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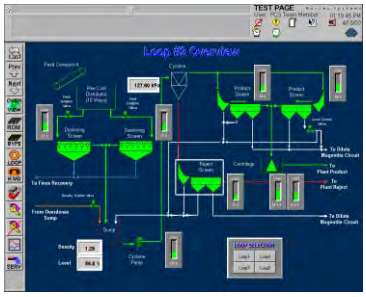

Quality System

Quality Endorsed Company
ISO9001
QEC 14406
Standards Australia

Queensland Urban Utilities

Carole Park Control System Upgrade

Operation & Maintenance

iPS Reference 11671

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CAROLE PARK WWTP
CITECT OPERATORS MANUAL

Client: Queensland Urban Utilities
Project: Carole Park WWTP Citect 7.10 Upgrade and BW Standard Adaptation

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0.10	Tim Waggett	19/05/2008	Brisbane Water, V7 Upgrade Functionality Details Added
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DOCUMENT CONTENTS

LIST OF FIGURES

LIST OF TABLES

DEFINITIONS

Term	Description
QUU	Queensland Urban Utilities – owner/operator of system
iPS	i.Power Solutions – Principal Contractor
BW	Brisbane Water – Provider of the Standard Citect Include
BPS	Booster Pump Station
CMF	Central Monitoring Facility
GUI	Graphical User Interface
HMI	Human Machine Interface
I/O	Input/Output
IDC	Internet Display Client
RMF	Remote Monitoring Facility
RTU	Remote Terminal Unit
SCADA	Supervisory Control And Data Acquisition
WTP	Water Treatment Plant
WWTP	Waste Water Treatment Plant
VSD	Variable speed drive
SS	Soft Starter

1 INTRODUCTION

The Citect Operators Manual outlines the procedures for operating and interfacing the upgraded Citect system at Carole WWTP.

All required details for managing the day to day operations of the system are included herein such that an operator is able to use the plant with minimal input from external sources.

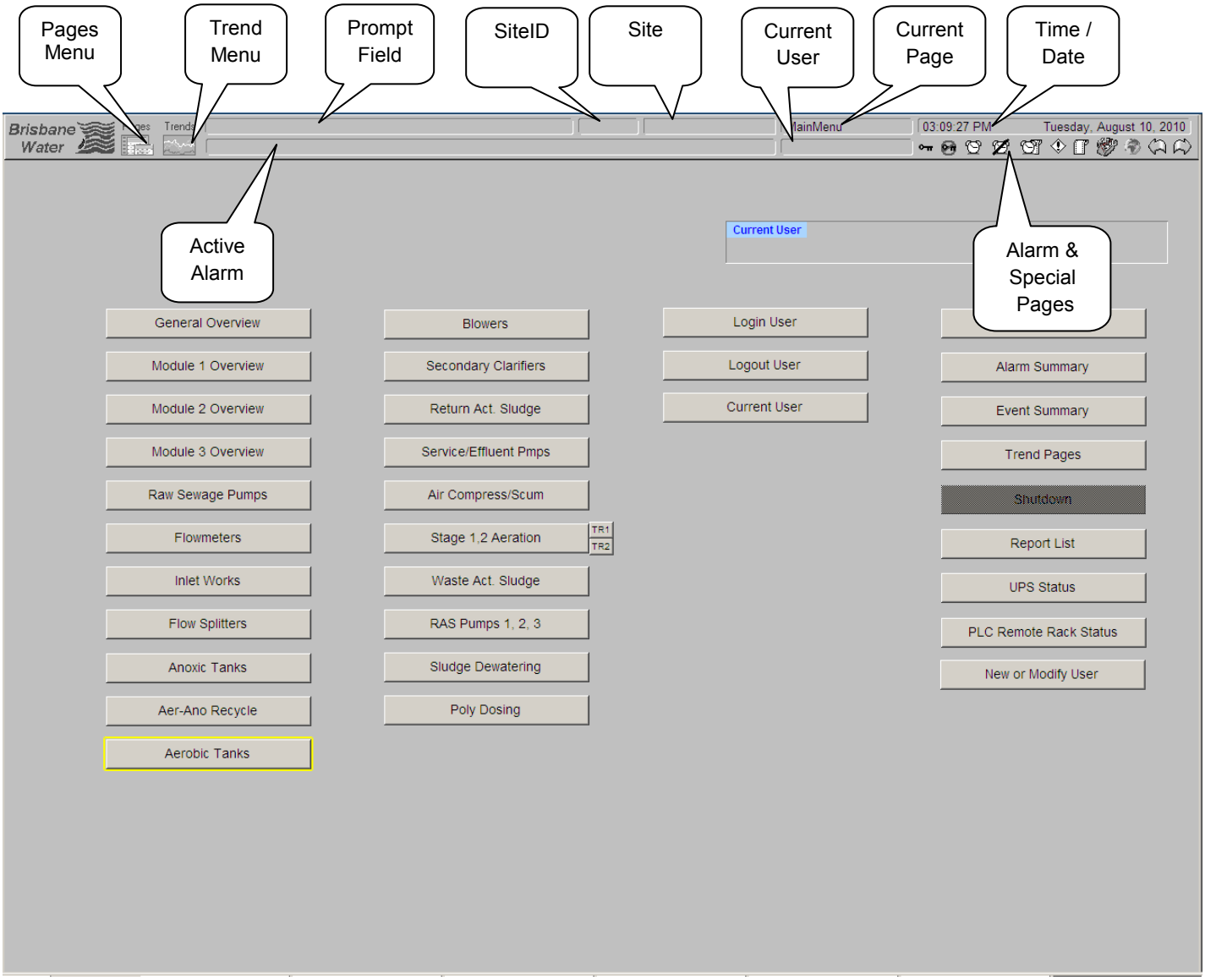


Figure 1 – Carole Park Startup Page

2 CITECT NAVIGATION AND USE

The new system is designed so that no more than 2 mouse clicks are required to access any part of the local plant.

When the mouse is moved over an item a yellow box will appear around it. A single click (not a double click) is required to activate the button.
Eg.

Figure 2 – Example of Highlighted "User Logout" Button

If you do not have access to a function/feature, the button will appear 'grey'd out'. You will not be able to do anything without the proper access rights. You will need to login if this is the case.viz:

Figure 3 – Example grey'd out button

No matter where you are in the system or what site you are currently attending the menu at the top of the page will remain unchanged. It contains 2 lines of inputs and information.

Figure 4 – Citect Template Bar

The top line has 4 information fields. These are:

- Prompt (interactive text) - white text
- Site ID (Cluster)
- Site Name
- Page Name
- Time
- Date

The bottom line provides access to all parts of the system and its utility pages.
The first button brings up a list of pages. Move the mouse over the page name you wish to display and click once.
Eg.

Figure 5 – Page Menu Button

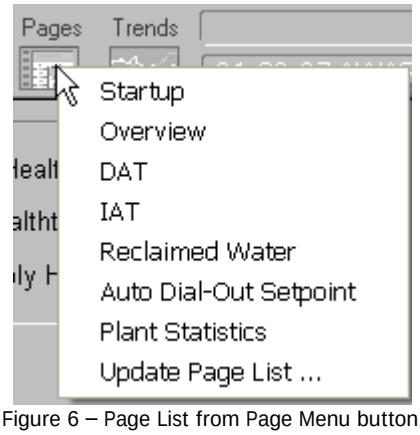


Figure 6 – Page List from Page Menu button

The second button operates the same as the first. It displays the available trend pages. At the bottom of the list is an Operator Trends selection. This is used to configure your own page.

Eg.

Figure 7 – Trend Select Button

The next field displays the last alarm. The displayed alarm can be acknowledged by clicking on it.

Figure 8 – Latest Current Alarm

The next field shows the user that is currently logged in. The user will be automatically logged out after a certain period of time. For the operator it is 15 minutes.

Figure 9 – Current User Logged In

The key symbol will bring up a window to enable you to enter your username and password.

Figure 10 – User Login Button

Figure 11 – User Login Form

The next symbol of a key crossed out is used to log out. When leaving the machine it is good practice to log out. This logout is also used to shutdown an IDC client (the remove access machines)

Figure 12 – User Logout Button

The next four symbols are for the alarms. If there are any active alarms these will flash. By clicking on these they will display the appropriate alarm page. These are Alarms, Disabled Alarms, Alarm Summary and Hardware alarms.

Figure 13 – Alarm Navigation Buttons

The next button will bring up the utilities page. From the Utilities page you have access to general utilities and will have access to WWTP Reports, once they are implemented in later stages of the Carole Park WWTP Upgrade, which are not part of this project. Other buttons on the page may be disabled according to your user privilege.

Figure 14 – Utilities Button

The next key is the global key which will be used at a later stage to connect to other treatment plants. Follow the instructions on the main screen. This feature is not part of the current project.

Figure 15 – Global Connect

The last 2 buttons move you through your previous page selections. They enable you to navigate to the last page viewed, and back again to the current page. This is handy for returning to where you were if you deciede to go back a few screens to check on something.

Figure 16 – Page Previous/Last Button

3 KEYBOARD KEYS

The following Keyboard keys are available through Citect. These keys are also presented on a keyboard template for quick reference.

Table 1 – Citect Shortcut Keys

Key Sequence	Operational Description
F1	Help
F2	Global Connect
F3	Login
F4	Logout
F5	Quick Display (Operator's preset screens)
F6	Page Up
F7	Page Down
F8	Page Last
F9	Alarm Page
F10	Disabled Alarm Page
F11	Alarm Summary Page
F12	Hardware Alarm Page
Ctrl-F9	Alarm Enable
Ctrl-F10	Alarm Disable
Ctrl-I	Infoform
Ctrl-P	Screen dump directly to Printer
Home	Display Main Overview page
Page Down	Display previous available Trend or Mimic page
Page Up	Display next available Trend or Mimic page

3.1 F1 – HELP

Pressing the F1 button opens up this document in Word for reference. This will work from any Citect terminal throughout Brisbane Water.

3.2 F2 – Global Connect

Pressing the F2 button function has not been implemented in this project.

3.3 F3 – User Login

Pressing the F3 button presents the user Login form. Same as pressing the  key.

3.4 F4 – User Logout

Pressing the F4 button logs the current user out of the Citect system. Same as pressing the  key.

3.5 F5 – Quick Display

Presents the Quick Display form. This enables operators to customise and save 10 display configurations relative to each WWTP to their liking. You must be logged in to access this form to enable saving under your officer code. This form floats above all other Citect pages, and can be moved around to see things behind. This works on single as well as multi-monitor sites, and stores your configuration on the main server for access via any terminal on the Citect system. .

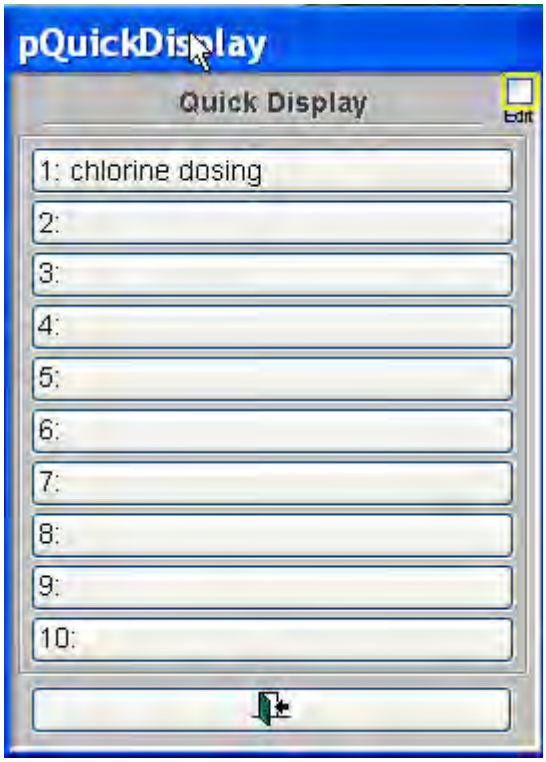


Figure 17 – Quick Display

To setup a custom entry, first select the page/pages you wish to store as a preset using the normal Pages button (e.g. Screen 1 as ‘Plant Overview’, Screen 2 as ‘Blowers’, Screen 3 as ‘Alarms’). Press F5 to bring up

the Quick Display popup (if you haven't done so previously) and click on the 'Edit' checkbox. This disables the shortcut buttons and enabled editing of the button text – this will show as Italic script. Viz:

Figure 18 – Quick Display Edit Mode

Highlight the text button you wish to change and left mouse click. You will be presented with the following keypad to enter your desired button text. For this example I've entered 'New Quick Display' Viz:

Figure 19 – Quick Display New Entry

Alternatively, highlight the desired text and start typing, pressing the enter key when you have finished. Viz:

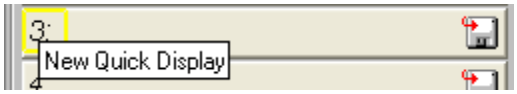


Figure 20 – Quick Display New Entry – Direct Method

Click on the ‘SAVE’ button when you are done. This gathers the pages you have selected and saves them to disk. When finished, just un-check the ’Edit’ box to prevent further editing and to allow you to press the desired button.

You can edit and erase the buttons as desired. These keys will be stored on the site Citect server.

3.6 Setpoint Entry

The new Citect systems require the operator to enter the reason for making a change to any setpoint. This provides and audit trail and assigns responsibility to the person logging in and changing the system.

When a setpoint is required to be changed, the operator will be presented with the following display popup.

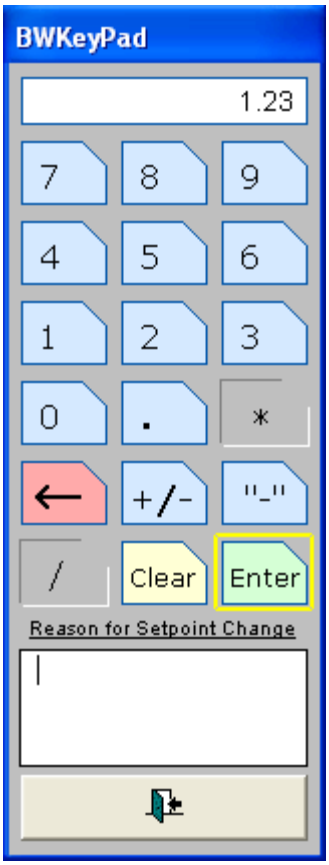


Figure 21 – Setpoint Entry / Change Control

Press the keypad to enter the required value. You will need to enter a reason for making the setpoint change. (e.g. “Tank Level Probe Moved” or “Under Direction of Process Engineer”) before the new setpoint will be accepted. All your login details and where you made the change will be logged to a change control database.

4 MAIN PAGE – STARTUP

The Main page contains an aerial photo of the site.

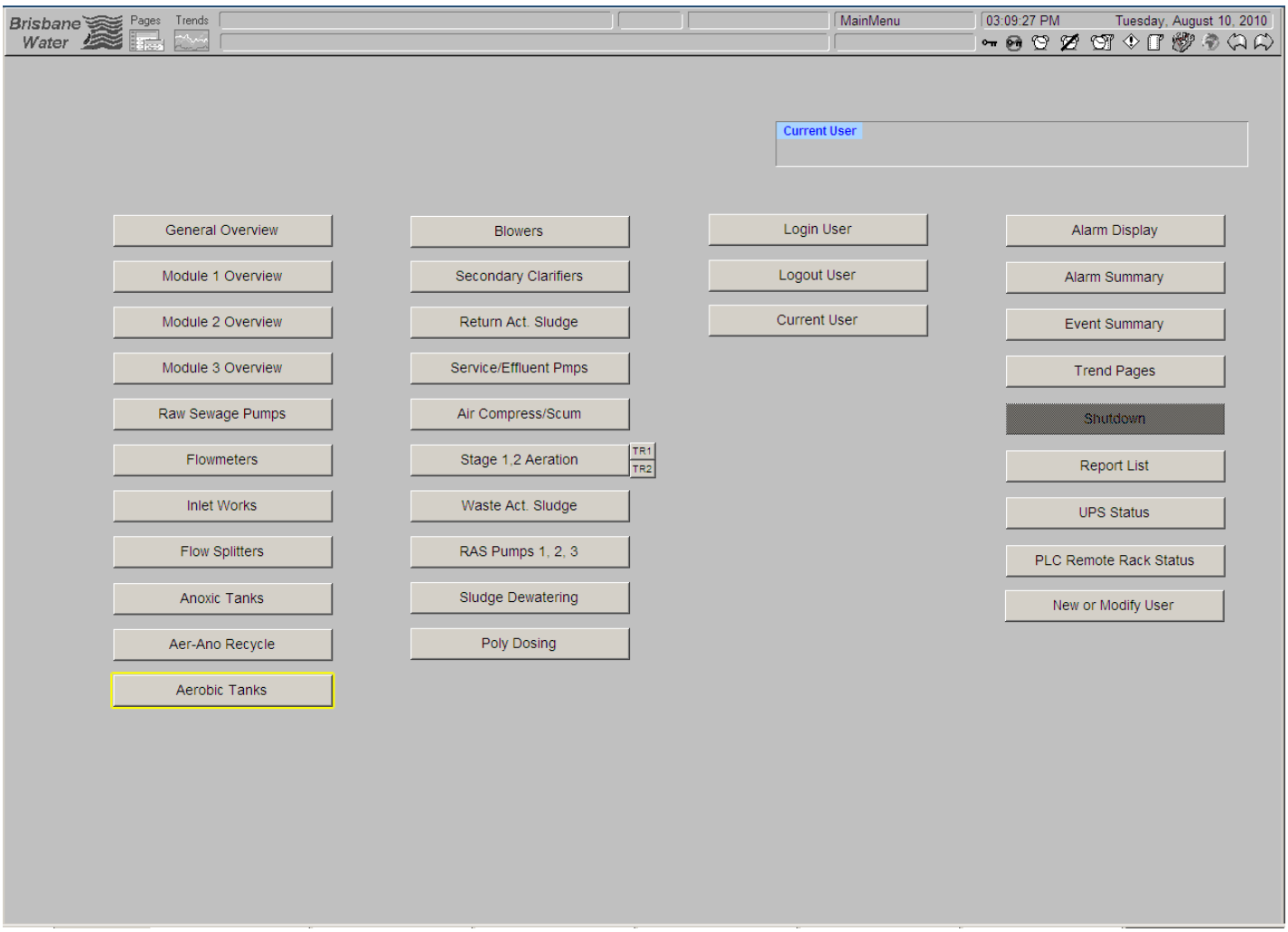


Figure 22 – Carole Park Startup

5 SYSTEM COLOURS

The following is a guide to colours used on the Citect HMI System.

Table 2 – System Colours

Colour	Description
Green	Healthy / Ready to run
Red	Running / Open
Flashing Red	Fault

6 ALARMS PAGE

The alarm page appears as follows:

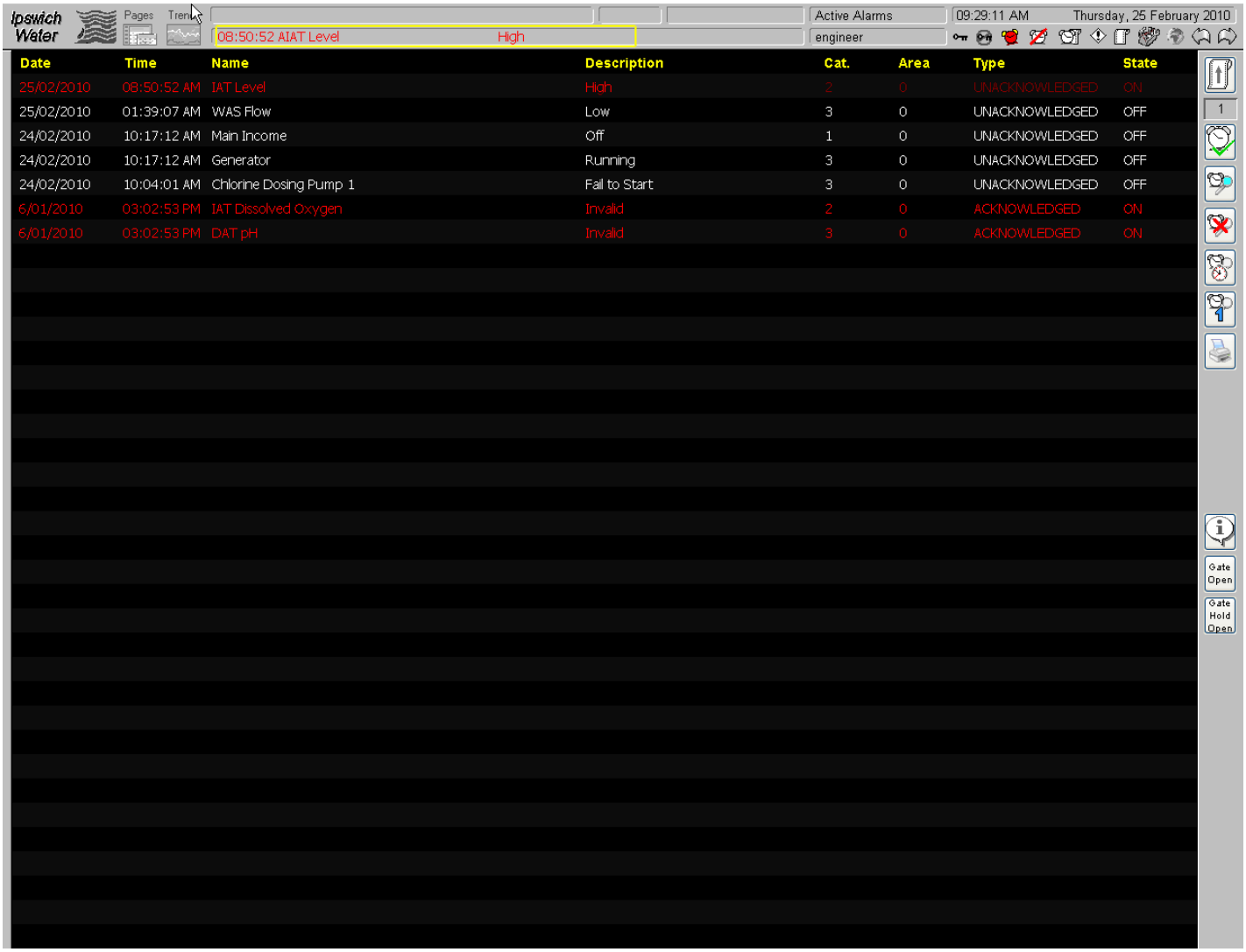


Figure 23 – Alarms Page

The alarms are displayed as a list and vary in colour depending on their current state

Table 3 – Alarm Colours

Alarm State	Colour	Description
Ack-Off	White	Acknowledged and Off
Ack-On	Red	Acknowledged and On
Disabled	Blue	Disabled
UnAck-Off	Flashing Yellow	Un-Acknowledged and Off
UnAck-On	Flashing Red	Un-Acknowledged and On

You must be logged in to acknowledge and enable/disable alarms.

Clicking on an Alarm will acknowledge that alarm. To Acknowledge all Alarms press the Ack All Alarms button.

Note that the current active alarm displayed in the toolbar area can also be acknowledged by clicking on it.

Figure 24 – Acknowledge All Alarms Button

CTRL F10 will disable an alarm, or use the right mouse click to bring up the following menu to Acknowledge, Disable, and get help on the current displayed alarms:

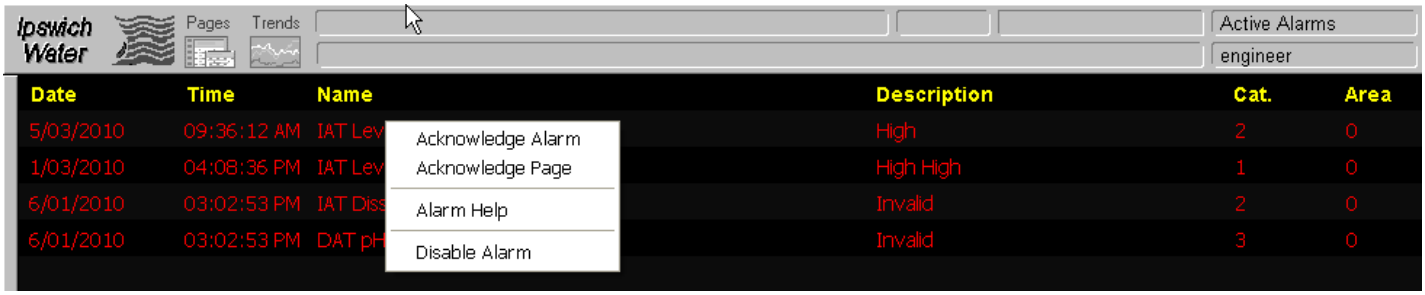


Figure 25 – Active Alarms Right Mouse Click Menu

Use the Page Scroll Buttons to move through the alarms.

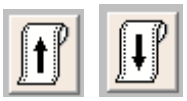


Figure 26 – Alarm Scroll Buttons

To filter the alarms when there are too many displayed use the filter alarm key. To remove filtering press the disable filter key.

Figure 27 – Alarm Filter Buttons

The Alarm Filter popup will appear upon pressing the above buttons. You can filter the alarm via entering the date you with to display, or via the Alarm Name, Tag, or Area/state. Tick the checkbox beside the criteria you wish to enable.

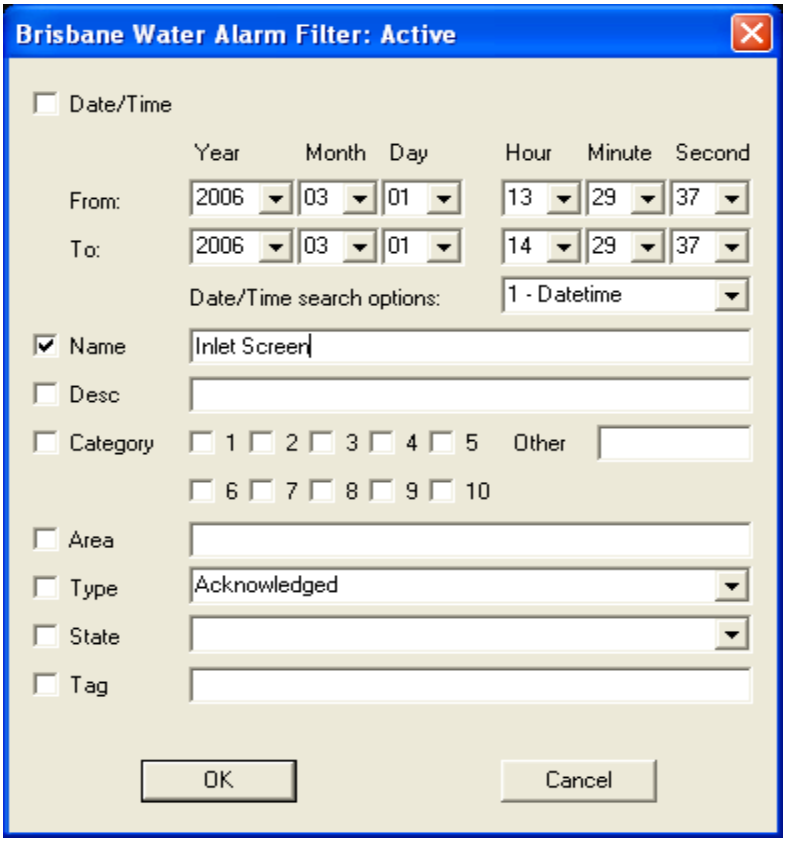


Figure 28 – Alarm Filter Form

The Alarm list can be sorted by either 'ON' time, or by Category/Priority by pressing the appropriate button. The default display format is by 'ON' time which will put the latest alarm at the top of the alarm list.

Figure 29 – Sort Alarm List by Time (newest alarm at top of list)

Figure 30 – Sort Alarm List by Priority (Category '1' (highest priority) at the top of the list)

The Alarm Print button on each of the Alarm pages (Active, Summary, and Disabled) will dump a plain text version to the system printer via Notepad.

Figure 31 – Alarm Print Button

7 DISABLED ALARMS PAGE

The alarm disabled page is used to temporarily disable alarms. Typical use would relate to recurring alarms when there is a known cause for it. This ensures that the operator is not distracted from any new alarms.

For Example a Plant Technician may disable an alarm when a part will not be available for a piece of equipment for an extended period of time. Rather than have the alarm permanently alarming he would disable it until the equipment was repaired.

When there are disabled alarms present, the line through the alarm bell on the navigation bar will turn red.

CTRL F9 will enable the alarm at the mouse cursor, or use mouse right clicking on an alarm to bring up the following menu to Enable (same as Ctrl-F9), and get help on the current displayed alarm:

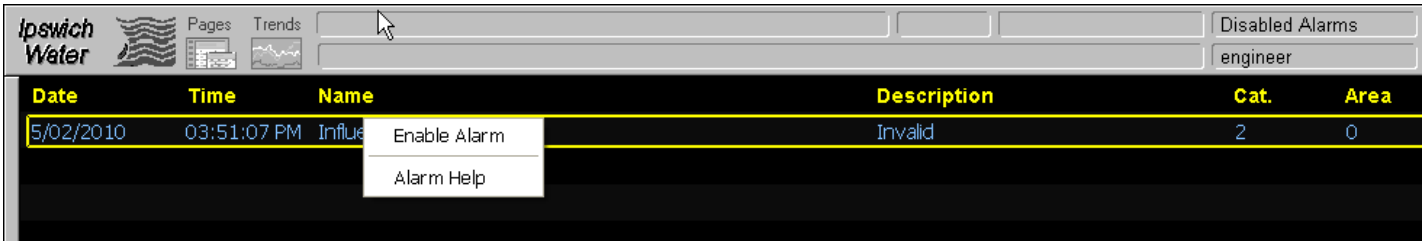


Figure 32 – Disabled Alarms Right Mouse Click Menu

The Disabled Alarms can also be filtered as per the Alarms page.

8 ALARM SUMMARY PAGE

The Alarm Summary page holds every alarm that has occurred. It shows the on and off time as well as when the alarm was acknowledged. The user is also listed.

The colours are as per the alarm page if they are still active or unacknowledged.

The Alarm Summary can also be filtered as per the Alarms page.

Date	On	Off	Ack	Name	Description	Cat.	Area	User
5/03/2010	06:04:16 AM	07:22:09 AM	09:10:22 AM	IAT Level	High	2	0	neville jones
5/03/2010	12:36:56 AM	01:59:55 AM	0	IAT Level	High	2	0	System
4/03/2010	08:10:21 PM	09:51:16 PM	0	IAT Level	High	2	0	System
4/03/2010	07:31:38 PM	09:46:39 AM	09:10:22 AM	Chlorine Dosing Pump 1	Fail to Start	3	0	neville jones
4/03/2010	04:44:51 PM	06:10:57 PM	0	IAT Level	High	2	0	System
4/03/2010	01:07:37 PM	02:25:55 PM	0	IAT Level	High	2	0	System
4/03/2010	12:20:04 PM	04:33:04 PM	04:42:16 PM	Chlorine Dosing Pump 1	Fail to Start	3	0	engineer
4/03/2010	08:52:41 AM	10:44:57 AM	11:05:19 AM	IAT Level	High	2	0	neville jones
4/03/2010	05:45:02 AM	07:21:50 AM	0	IAT Level	High	2	0	System
4/03/2010	01:56:36 AM	03:38:13 AM	0	IAT Level	High	2	0	System
3/03/2010	10:14:30 PM	12:04:40 AM	0	IAT Level	High	2	0	System
3/03/2010	06:54:09 PM	08:48:33 PM	0	IAT Level	High	2	0	System
3/03/2010	03:41:16 PM	05:39:26 PM	0	IAT Level	High	2	0	System
3/03/2010	12:54:31 PM	02:35:23 PM	01:25:48 PM	IAT Level	High	2	0	neville jones
3/03/2010	12:29:04 PM	12:54:32 PM	01:25:48 PM	WAS Flow	Low	3	0	neville jones
3/03/2010	09:29:18 AM	11:29:12 AM	11:36:39 AM	IAT Level	High	2	0	neville jones
3/03/2010	06:22:42 AM	08:24:38 AM	0	IAT Level	High	2	0	System
3/03/2010	03:16:55 AM	05:17:43 AM	0	IAT Level	High	2	0	System
3/03/2010	12:10:31 AM	02:11:02 AM	0	IAT Level	High	2	0	System
2/03/2010	09:03:35 PM	11:06:43 PM	0	IAT Level	High	2	0	System
2/03/2010	08:42:23 PM	09:02:45 PM	11:36:39 AM	WAS Flow	Low	3	0	neville jones
2/03/2010	05:57:37 PM	08:01:46 PM	0	IAT Level	High	2	0	System
2/03/2010	05:37:40 PM	05:57:37 PM	0	WAS Flow	Low	3	0	System
2/03/2010	02:52:19 PM	04:55:40 PM	0	IAT Level	High	2	0	System
2/03/2010	02:32:30 PM	02:52:19 PM	0	WAS Flow	Low	3	0	System
2/03/2010	11:46:01 AM	01:50:46 PM	01:57:24 PM	IAT Level	High	2	0	neville jones
2/03/2010	11:26:23 AM	11:46:01 AM	01:57:24 PM	WAS Flow	Low	3	0	neville jones
2/03/2010	08:46:38 AM	10:44:46 AM	0	IAT Level	High	2	0	System
2/03/2010	05:46:48 AM	07:44:26 AM	08:32:06 AM	IAT Level	High	2	0	neville jones
2/03/2010	02:49:41 AM	04:42:29 AM	0	IAT Level	High	2	0	System
2/03/2010	01:20:33 AM	01:39:59 AM	0	IAT Level	High	2	0	System
2/03/2010	12:11:46 AM	01:19:25 AM	0	IAT Level	High	2	0	System
1/03/2010	03:44:52 PM	04:08:35 PM	03:48:12 PM	IAT Level	High High	1	0	engineer
1/03/2010	03:29:00 PM	03:44:50 PM	03:29:18 PM	IAT Level	High High	1	0	engineer
1/03/2010	03:00:10 PM	03:28:58 PM	03:02:11 PM	IAT Level	High High	1	0	engineer

Figure 33 – Alarm Summary Page

9 HARDWARE ALARM PAGE

The hardware alarm pages displays information relating to background services of Citect. As an operator, you can ignore anything on this page. If you do notice a lot of errors, please contact the Control Room.

None of the alarms here will cause plant error, or are sent out via the paging system. They are for Engineer information only.

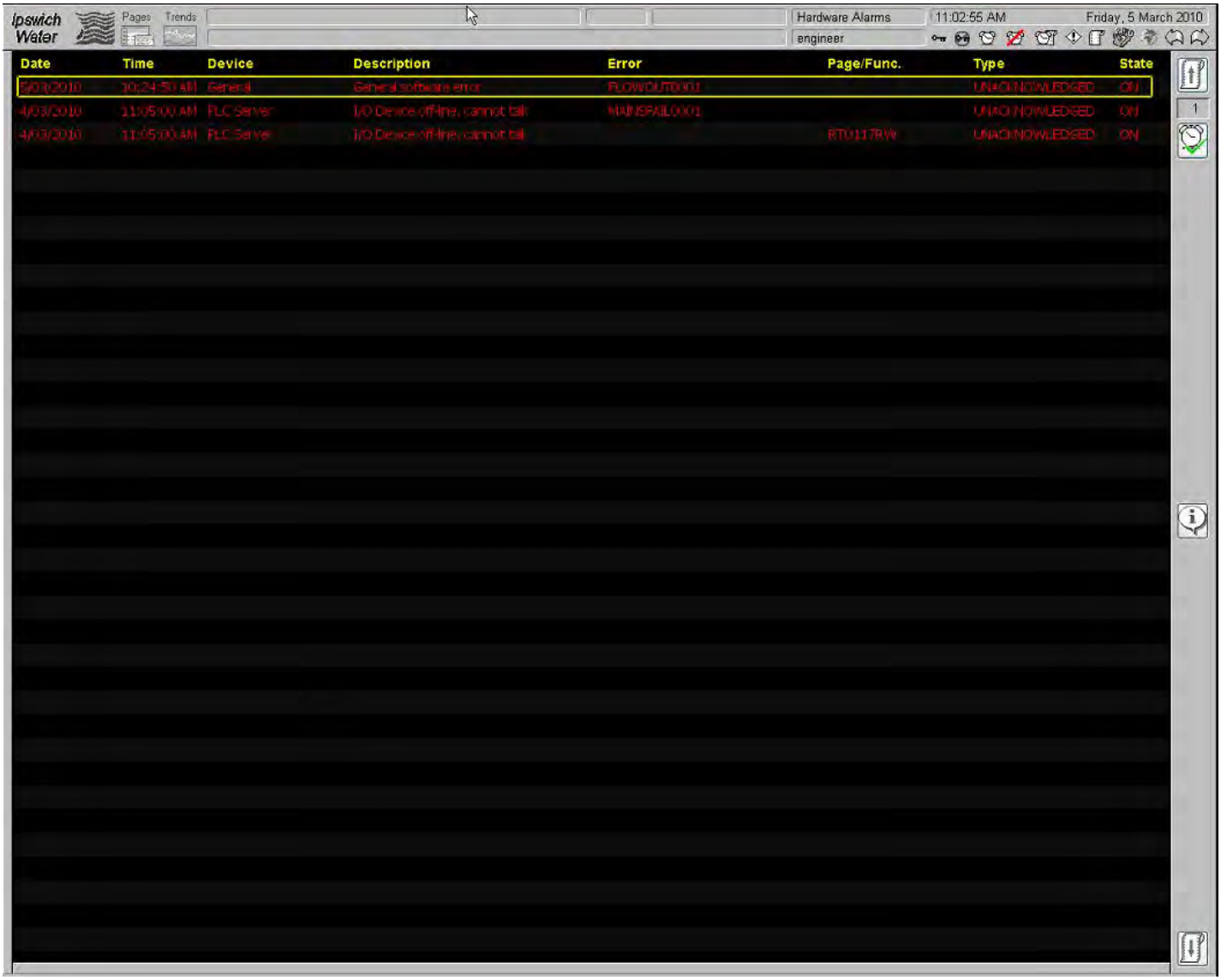


Figure 34 – Hardware Alarms Page

10 TREND PAGES

Trend pages are accessed via the Trend menu on the toolbar. Each trend page from this menu has been pre-configured to display specific trend pens upon loading.
All trends will display their title in the top left hand corner of the trend. There are 8 trend pens available per page, with the comment for each pen shown in the corresponding colour rectangle at the bottom of the page.

The display will show the values for the current trend pen selected. To put a pen in focus (ie display the appropriate range on the trend page or to operate on the trend parameters) left click on the desired pen cursor rectangle at the bottom of the page.

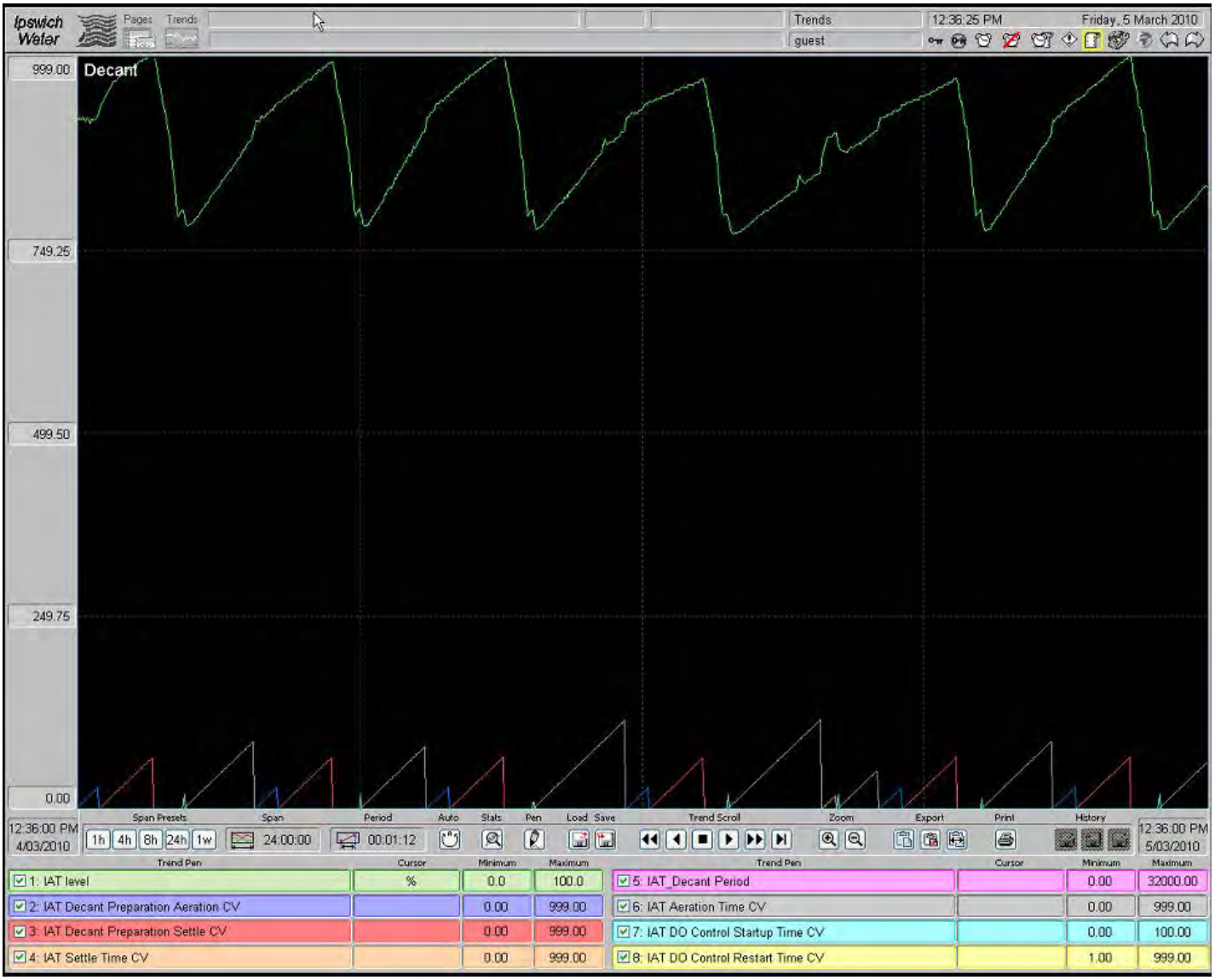


Figure 35 – Decant Trend Page

The time and period displayed can be manipulated as explained below. This does not actually change how the trend is configured and is also limited to how much data is available. For example if a trend is taking a sample every 30 seconds it will always sample at 30 seconds even if the period is changed to 2 seconds.

To set the start and/or finish date and time, or the span, or the sample period, click on the respective value and enter the required data. There are preset for commonly used spans.

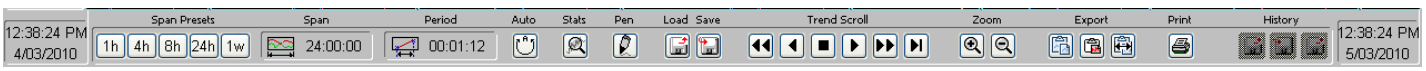


Figure 36 – Trend Sample Parameters

If you wish to trim the displayed range to include the maximum and minimum value of the trend pens as displayed on the current page use the Auto Scale Key.

Figure 37 – Trend Auto Scale Button

If you wish to view the Average, Maximum, Minimum, Standard deviation of a trend, press the Stats key. This will bring up the statistics popup window.

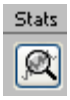


Figure 38 – Trend Statistics Button

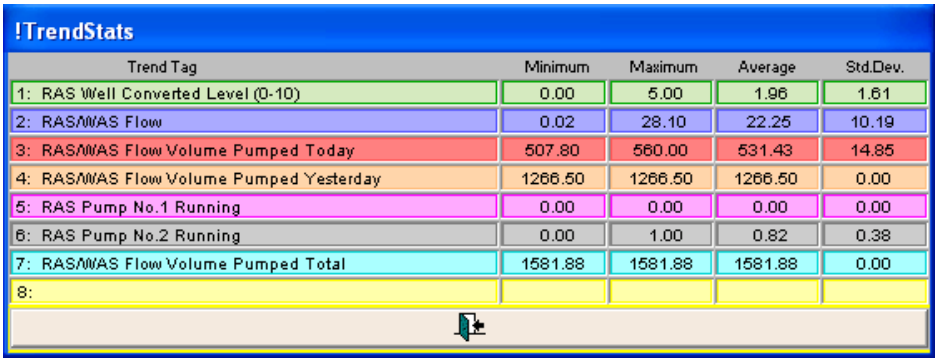


Figure 39 – Trend Statistics information popup

If you wish to change or add a pen to a page use the Change Pen Key. This menu is also enabled by left mouse clicking on the required trend pen description at the bottom of the screen.

Figure 40 – Change Trend Pen Button

If you add or delete trends as described above, this is not a permanent change and the default pens for the project Trend page will return when the page is displayed next time. If you wish to set up pens permanently set the trends as desired and save it as an Operator Trend using the ‘Save’ button. This will store a copy of the trend on the server for access at a later date by using the ‘Load’ button. It is good practice to prefix your save name with the Site name as operator trends for multiple people will be recorded in the same file.

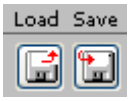


Figure 41 – Load & Save Buttons

The Scroll buttons move the trend forward or back to view data from different periods. If you want to ‘freeze’ a trend, press the stop button. To return to real time, press the scroll to real-time button on the right. The Tool Tip for each button shows the buttons operation.

Figure 42 – Trend Scroll Buttons

The zoom function can be used either directly which zooms in on the current screen or by clicking and dragging on an area of the screen and then pressing the zoom plus key.

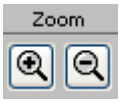


Figure 43 – Trend Zoom Buttons

You can export trend data directly to a .CSV format via the export buttons at the bottom of the trend. You can export the current viewed trend setup directly to .CSV or clipboard (which allows pasting into applications such as Word or Access) by selecting the respective button.

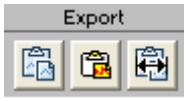


Figure 44 –Export Buttons

However, if you would like to specify the sample period and export data over a large range you can select the 'Export to .CSV + Parameters' button. This will present you with the following form after you select your export to file.

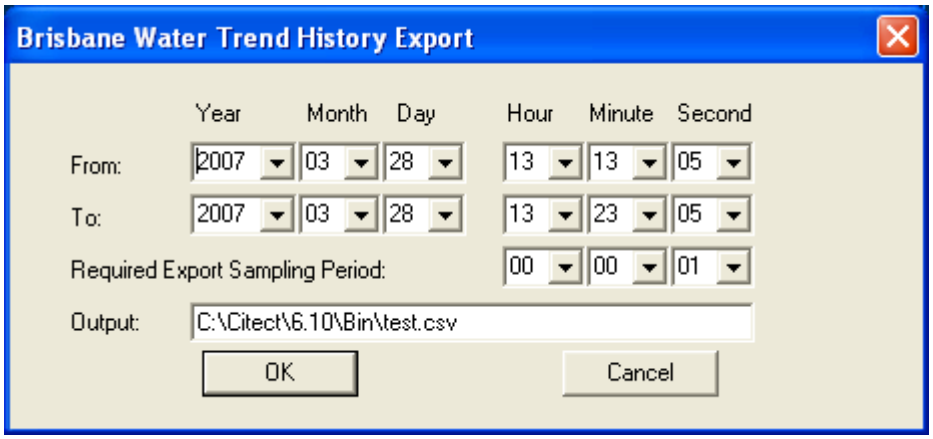


Figure 45 –Trend Export with Parameters

Here you can sample the trend at your desired interval. Note that this can be different to the trend sample period. Just specify the start/stop dates and times, and the desired sampling interval.

The trend History, Archive and Restore buttons allow archived trend data to be added back to the runtime system. This is usually done by inserting the backup CD and following the prompts. The Trend Archive and Restore buttons are currently disabled. This will be enabled at a later date and will allow trends to be backed up to removable media.

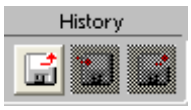


Figure 46 –Trend History/Archine/Restore Buttons

Trend Pen Information is displayed at the bottom and is colour coded with the trend graph. This information gives you the Trend pen, the Value of the tag at the cursor and the currently displayed Minimum and Maximum Scaling. Left mouse click on the cursor rectangle will put the pen in focus; left mouse click on the trend pen will enable you to select/delete the trend.

Figure 47 – Trend Pen Detail

To change the scaling use the colour coded Vertical display to the left of the Trend Graph. The Maximum and Minimum can be set from the areas on the left side of the trend after the correct pen has been selected, or by clicking on the minimum/maximum value on the trend pen detail.
To update the values on the left hand side of the trend page to bring the min/max limits up for a desired pen, just left click on the desired pen Cursor coloured box at the bottom of the page. Note the change of scale colours according to pen selected.

Trend pens can be hidden if they are cluttering up the current trend page by toggling the ‘Show/Hide’ checkbox beside each trend pen. Note that this does not delete the trend from the page, but just makes the pen invisible on the trend.

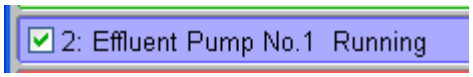


Figure 48 – Trend Pen Show/Hide

To activate the trend cursor, left mouse click somewhere on the trend page. To move the cursor to the desired location, left mouse click on the cursor and drag it. Alternatively, you can press the arrows in the Trend cursor to move the cursor left or right. To remove the cursor, click on the close cross in the top right-hand corner. The Cursor is the Vertical Line shown on the trend. The cursor time shows the date and time of its position. It can be picked up from the far right on the trend, and it can be moved by holding the left mouse down and dragging to desired position. The 'cursor' field will display the value at the cursor time for the respective pen.

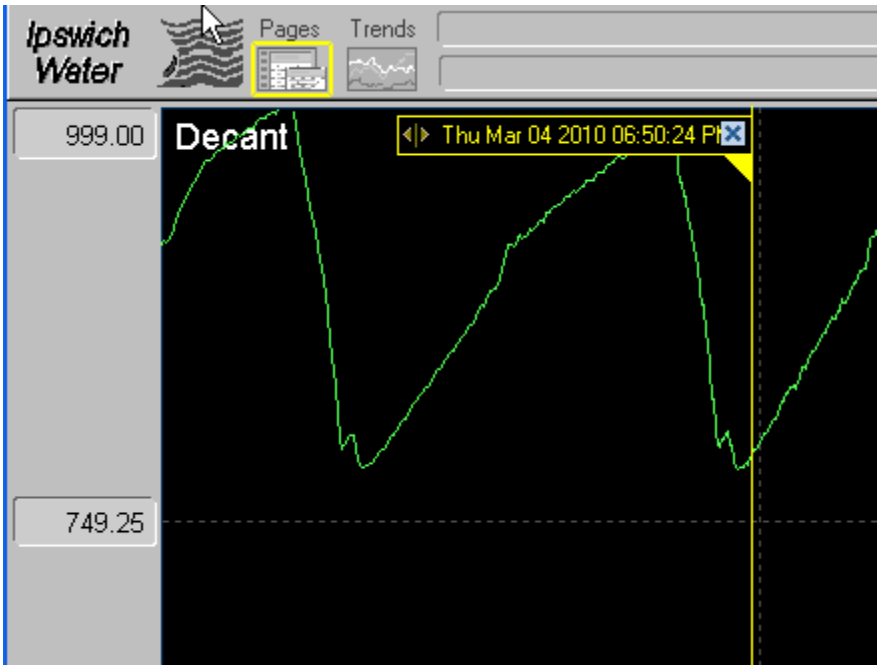


Figure 49 – Trend Cursor

11 UTILITY PAGE

The Utilities page has some standard functions for operators.
From this selection you can gain access to the Online Reports system, the Operator Setpoints spreadsheet, site Diary/Journal.

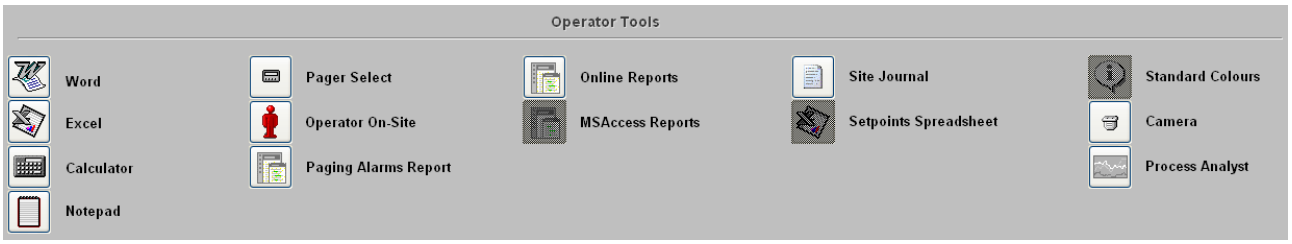


Figure 50 – Utilities – Operator Tools

The Pager Select Button, which functionality will be implemented in the near future, will provide the following popup

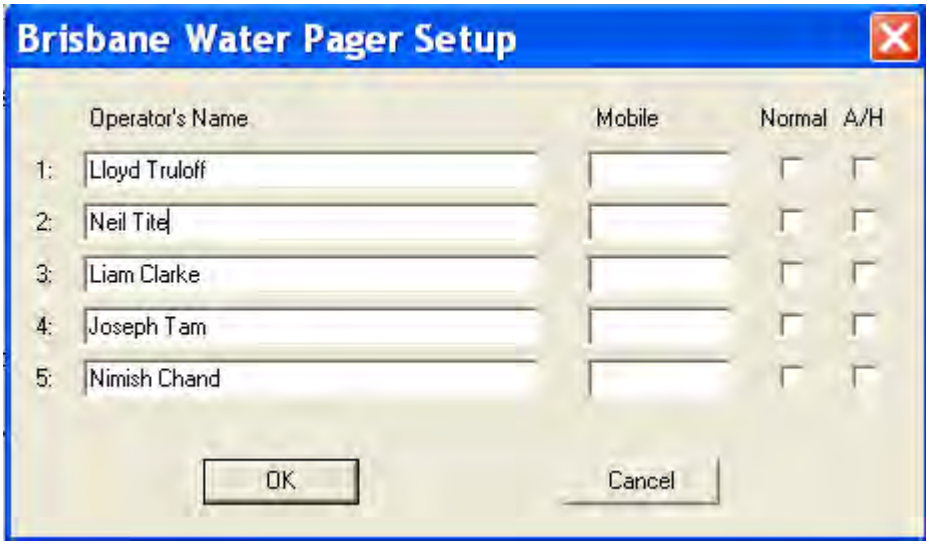


Figure 51 – Utilities – Pager Select

Enter your user name, and your mobile number. Select whether you wish to receive pages during normal business hours (6am-4pm) or after hours (4pm-6am), or both. Press OK to update details.

The Operator On-site button toggles the operator offsite alarm – this is handy as it triggers the 'operator offsite' alarm which can be used to see if the paging system is working correctly

The Paging Alarms Report button will display a list of ALL alarms currently setup to be paged out.

11.1 EASY JOURNAL

Pressing the Journal button runs the WWTP diary as shown below: Use this to record any information related to the plant.

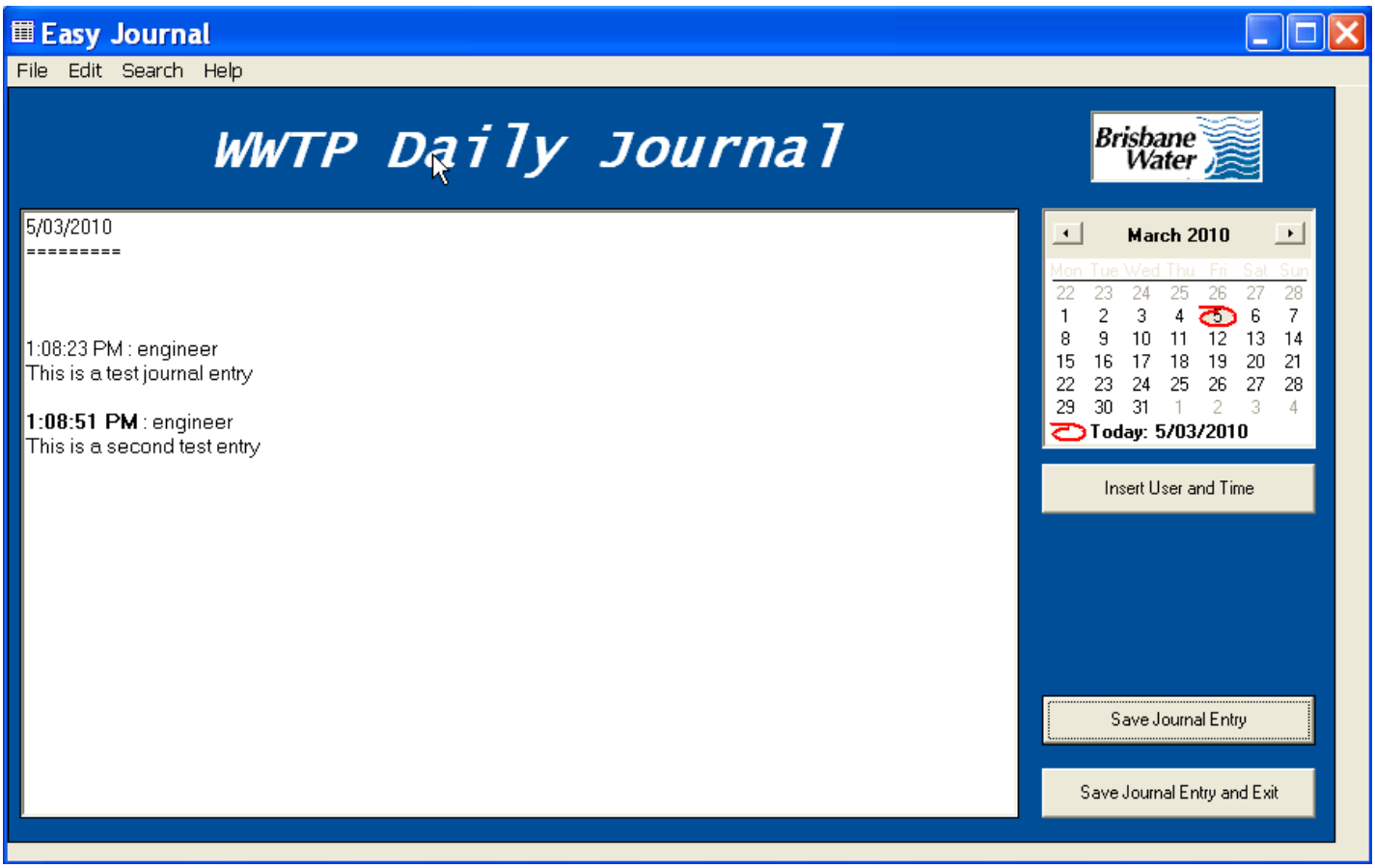


Figure 52 – Utilities – Easy Journal

Select the day you wish to view by clicking on the day via the calender control on the right hand side. By default, the diary will open to the current day's date. You can select previous and next day to move through the diary.

Press the 'Insert User and Time' to insert your user name (from Citect) and the current time into the journal if you wish to put a new section under your name.

You can search the diary for text – search options cover current day as well as the whole journal.

To save your current entry, press the 'Save Journal Entry' button. To save and exit the diary press 'Save Journal Entry and Exit', which will showdown the journal.

12 UTILITY PAGE

Selecting the desired equipment will bring up a standard Brisbane Water popup. Depending on the type of equipment you may be presented with a few different variations of a similar popup. If an item is 'greyed' out then the device does not have this signal available, or the control is locked out to someone with greater authority.

12.1 START/STOP CONTROL

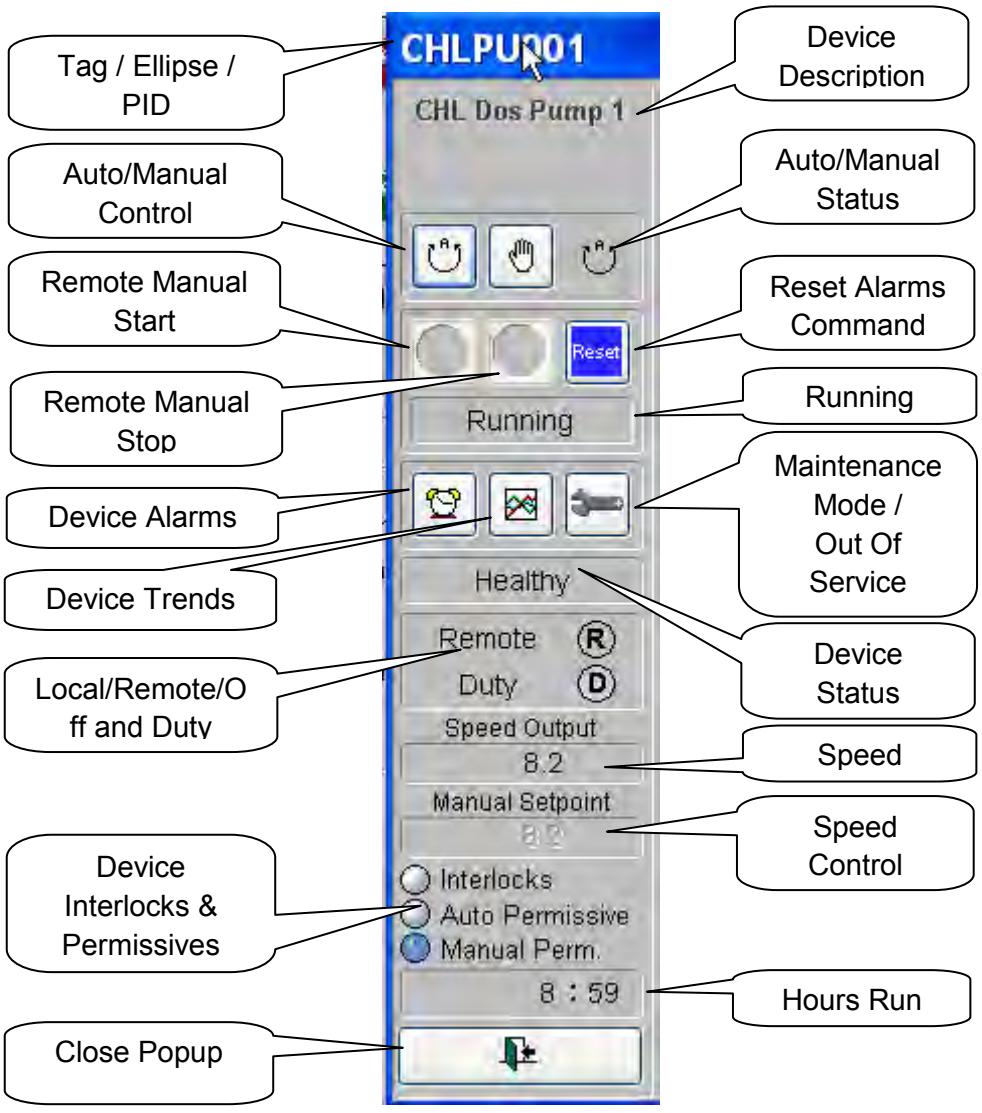


Figure 53 – Start/Stop Control

Device Balloons:

- Auto/Manual: select the control device to Automatic or Manual control. In Manual Control the Start/Stop buttons are enabled. The current mode is displayed beside the buttons.
- Start/Stop: Enables you to start or stop the device when in Manual.
- Reset: sends a reset command to the device.
- Running Status: if feedback exists for the device, then a running/stopped status is displayed.
- Device Alarms: Displays the Alarm extension for the device.
- Device Trends: Displays the Trend extension for the device.
- Maintenance Mode: Puts a device out of service. This disables all alarms and inhibits the device from running. A grey spanner will appear over the device.
- Device Status: Whether the device is healthy or faulted.
- Local/Remote/Off: Displays the position of the local/remote switch.
- Speed Output: If the device has VSD/Speed control this shows the current running speed (Hz or %)
- Manual Setpoint: If the device has VSD/Speed control this enables a speed setpoint to be entered.
- Interlocks: This shows whether the device has any Interlocks or Permissives which are preventing if from running. If there is Interlocks or Permissive information, then clicking on the respective light will bring up a popup displaying this. This is only available for pumps which have been chosen to require the additional page.
- Run Hours: Shows the run time for today (midnight to midnight)

With all of the popups, pressing the Alarm  button will extend the popup to display a list of alarms for the device

Figure 54 – Device Alarm Popup Extension

Pressing the Trend  button brings out the trend extension. This will load up to 8 trends of the current device (in this case CHLPU001, Chlorine Dosing Pump 1).

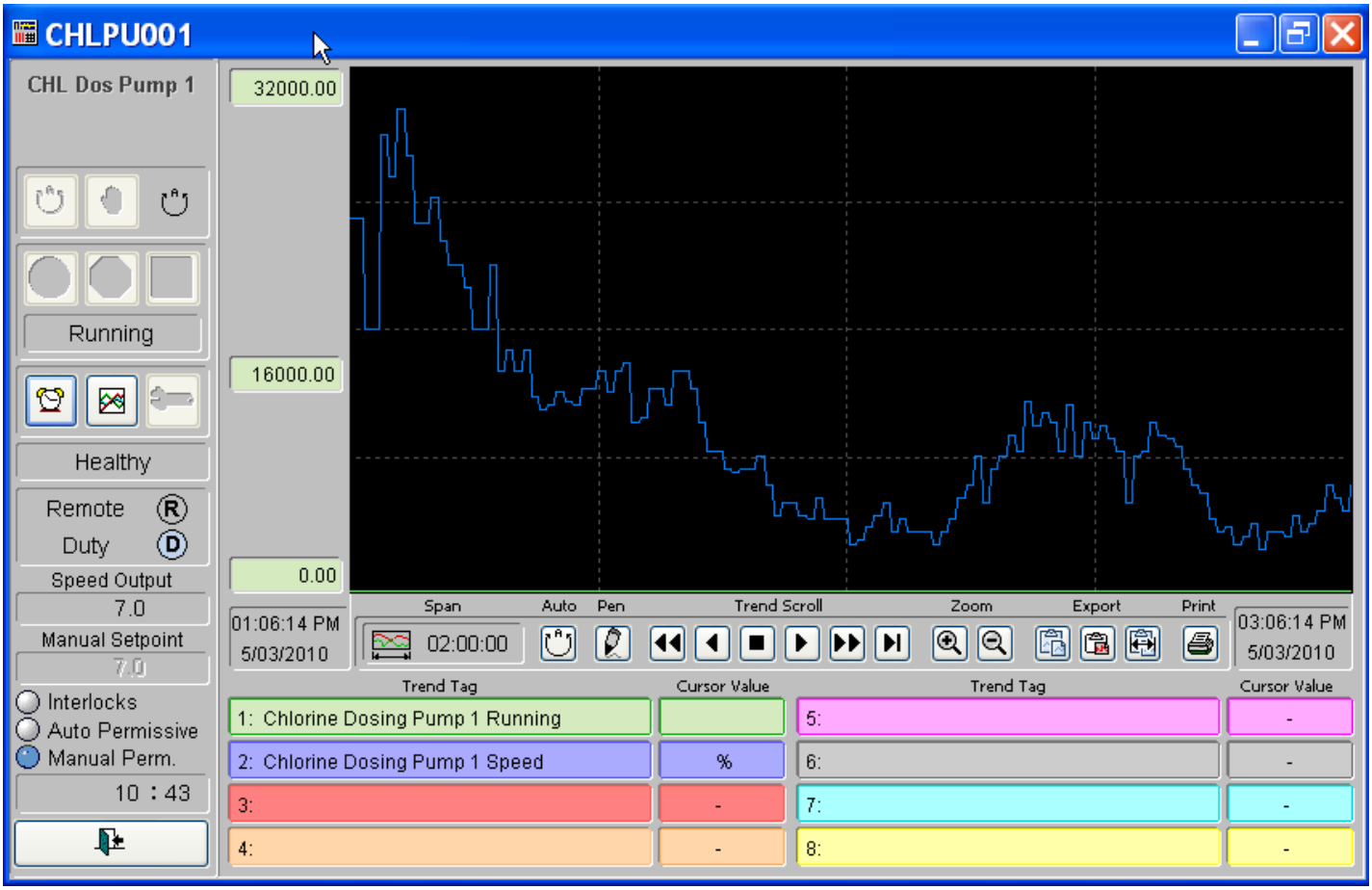


Figure 55 – Device Trend Popup Extension

For information on the Trend buttons please refer to the Trend page section. Note not all Trend functionality is available from the popup.

When a pump or motor has “faulted” its symbol  will flash red on the graphics page. An alarm will be raised and when the popup is opened the device status field will display “Fault” as seen below.

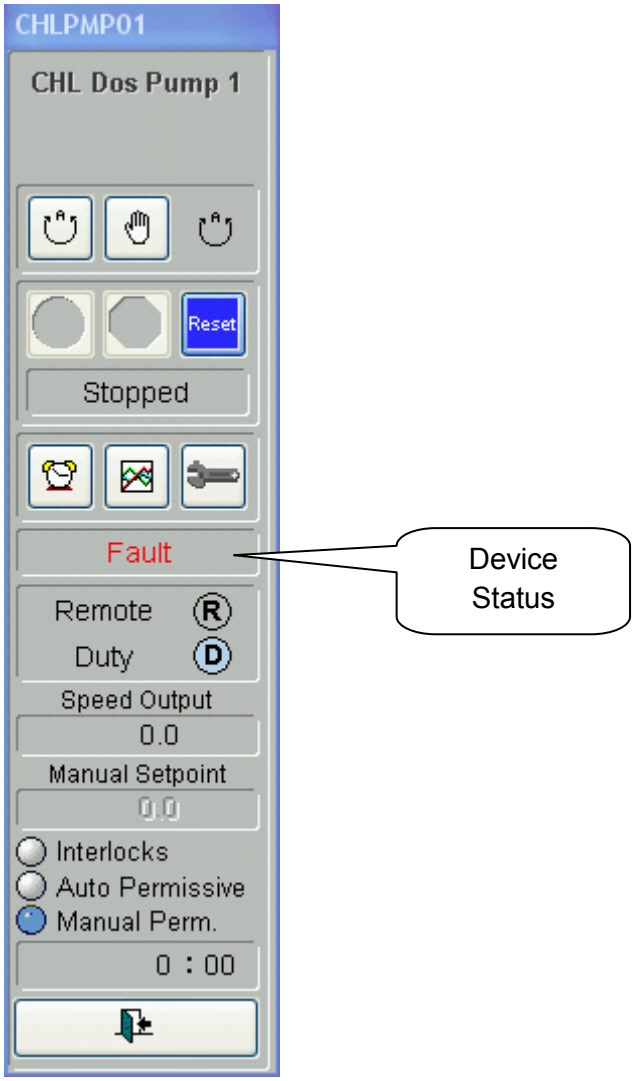


Figure 56 – Device Popup showing Device Status - Fault

12.2 OPEN/CLOSE DEVICES

The Open/Close device is similar to the Start/Stop Device

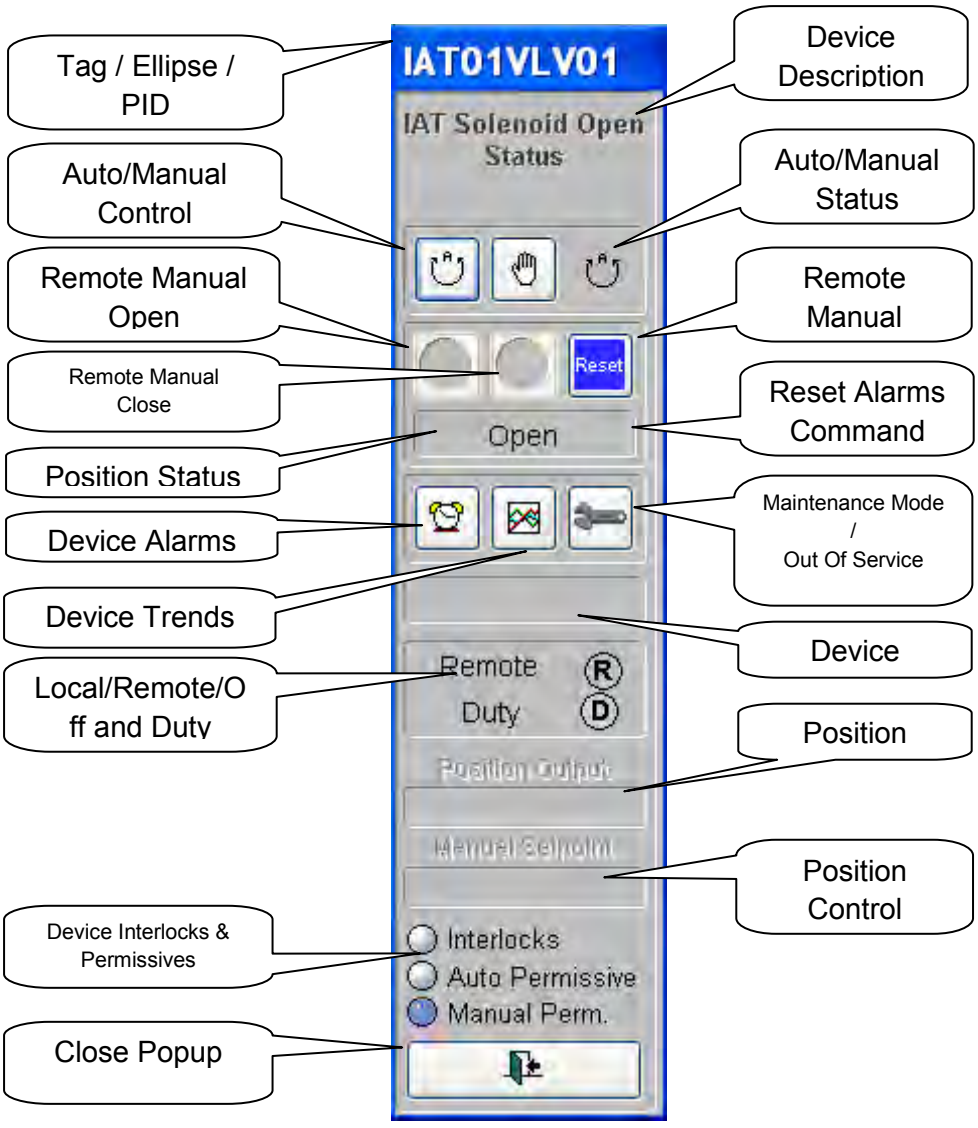


Figure 57 – Open Close Control

Device Baloons (only those different from the start/stop are discussed:

- Open/Close/Stop : Manual Control to open or close the device, and the ability to stop movement if required.
- Position Staus : Displays position feedback of the device Open/Close/In Transit etc.
- Position Output : Position of the device (e.g. Valve 0-100% position)
- Manual Setpoint : Required position Setpoint to go to in Manual Mode

The Alarm and Trend extensions are the same as the Start/Stop popup.

12.3 FORWARD/REVERSE DEVICES

The Forward/Reverse device is similar to the Start/Stop and the Open/Close Device.

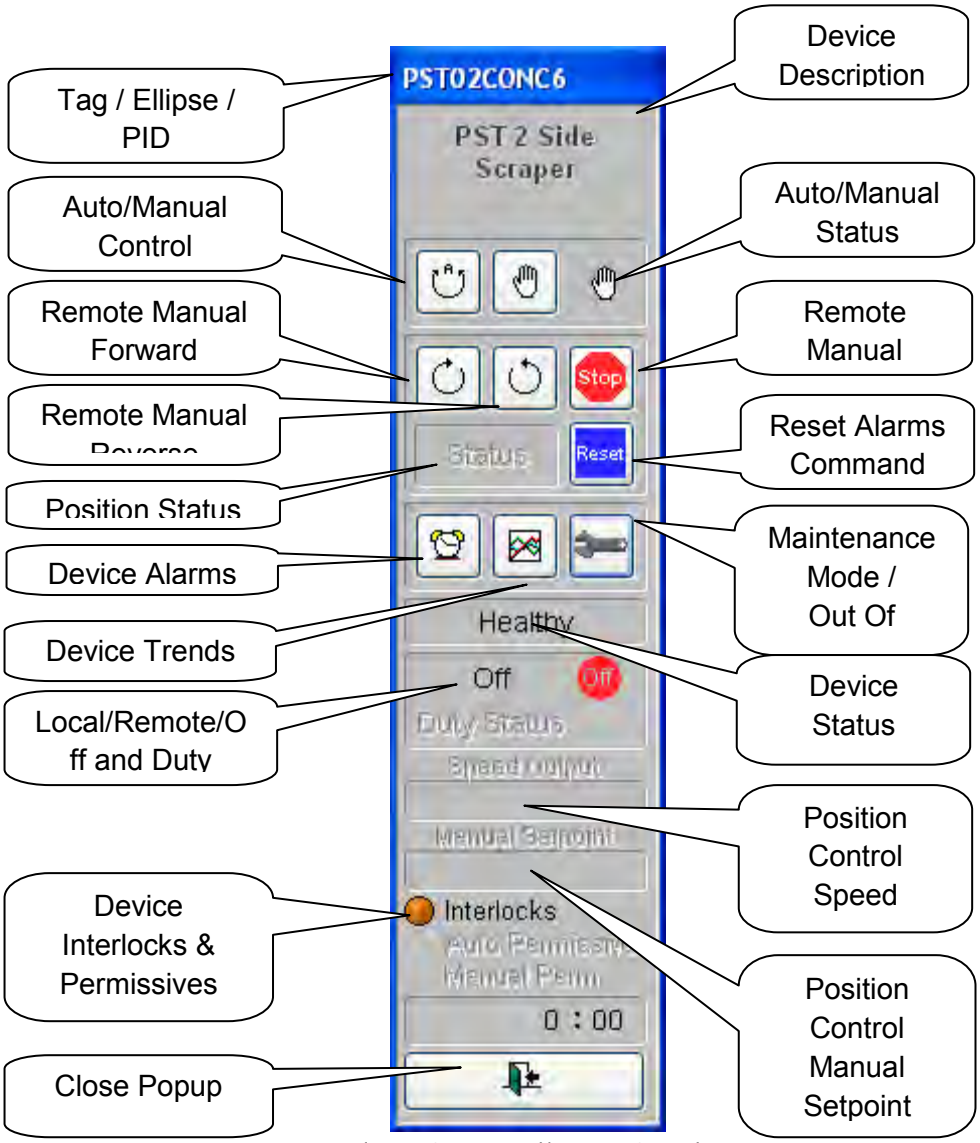
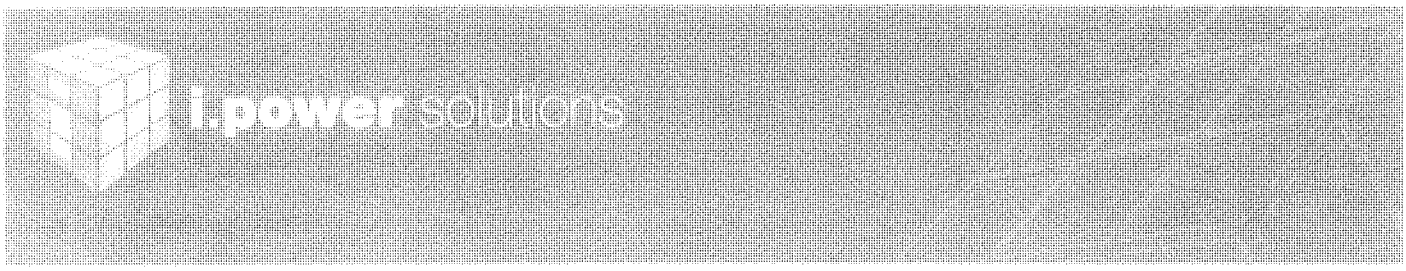


Figure 58 – Forward/Reverse Control

Device Baloons (only those different from the start/stop are discussed:

- Forward/Reverse/Stop : Manual Control to drive the device Forward or Reverse, and the ability to stop movement if required.

The Alarm and Trend extensions are the same as the Start/Stop popup.



SOFTWARE SAT

Project
Carol Park WWTP Upgrade

Contract
09SW3633

Document for
Ipswich Water

Document No
00011667-DT-01

Revision
A

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Revision	Date	Reason
A	28/09/2010	First Release

Associated Documents

Document Number	Description

Document Control

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Prepared By:	Bashier WG
	Senior Control Systems Engineer
Reviewed By:	Jasenko Sabljić
	Senior Control Systems Engineer
Accepted By:	

Acronym List

Acronym	Meaning
IW	Ipswich Water – owner/operator of system
iPS	i.Power Solutions – Principal Contractor
SPS	Sewage Pump Station
CMF	Central Monitoring Facility
RMF	Remote Monitoring Facility
HMI	Human Machine Interface
I/O	Input/Output
IDC	Internet Display Client
IGIC	Ipswich Global Information Center
RTU	Remote Terminal Unit
SCADA	Supervisory Control And Data Acquisition
URL	Uniform Resource Locator
VPN	Virtual Private Network
PLC	Programmable Logic Controller

Table of Contents

1 DOCUMENT PURPOSE

This Functional Specification describes the Software Factory Acceptance Test Plan to be performed to confirm operation of the Goodna WWTP Citect SCADA upgrade from version 5.42 to 7.10.

2 INTRODUCTION

The project consists of an upgrade of the CitectSCADA System from version 5.4 to version 7.10. This is performed in order to have a common Citect platform across the 4 treatment plants and the telemetry system. Due to the plant being replaced in the near future no changes are performed on the screens used for the operation of the plant or the genies. The major graphical change performed, is the menu to streamline the navigation of each plant on a common system. The other major change is to the standard colours used for equipment:

- Stopped and Ready to Run – Green
- Running – Red
- Faulted – Flashing Red

A summary of the upgrade is detailed below:

- Upgrade of CitectSCADA 5.4 system to a CitectSCADA 7.10 System
- Modification of old trend tags to be added to the new site to continue using previously trended statistics
- Modification of alarms to run on the new Citect 7.10 System
- Upgrade of the Citect menu to be consistent to the BW Include

3 TEST PROCEDURE

3.1 Unwitnessed Testing

Unwitnessed testing shall be performed prior to SunWater performing any witnessed tests. Unwitnessed shall utilise same documentation as that created for witnessed testing.

3.2 Witnessed Testing

For each individual test, the following information shall be detailed:

Pass/Fail	Test Result, with possible results of Pass (P), Minor Failure (MF), Significant Failure (SF)
Initials	Initials of testing personnel
Comment	Appropriate Comment

A Minor Failure of a test shall not prevent testing to continue.

A Significant Failure may result in testing being suspended until the fault has been rectified and the individual test repeated. This will be at the discretion of IW personnel.

4 PAGE DISPLAYS

Each page shall be checked for correct display of plant operation. This shall be confirmed by comparing the old version of Citect SCADA(5.42) and the upgraded version at run time. All device monitoring, digital status and analog status shall be checked for the following pages:

Page Name	Page Title	Pass/Fail	IPS Initials	IW Initials	Comment
AARecycle	Aerobic-Anoxic Recycle Pumps				
Aeration12	Stage 1,2 Aeration				
AerobicTanks	Aerobic Tanks 1,2				
AirCompSum	Air Compressors/ Scum Pumps				
Alarm	Alarm Page				BW Standard
AlarmDisplay	AlarmDisplay				
AlarmSummary	AlarmSummary				
AnoxicTanks	Anoxic Tanks 1,2 and Mixers				
Blowers	Aeration Blowers				Drives
Clarifiers	Secondary Clarifiers 3,4				No Change
EventSummary	EventSummary				BW Standard
FlowSplitters	Flow Splitters				
InletFlow	Inlet Flowmeters				Flowmeters
Menu	MainMenu				Trend Pages
Module2Overview	Module 2 Overview				No Change
New Operator	New Operator				No Change
Overview	Carole Park WPCW Plant Overview				No Change
PLC_Racks	PLC Remote Rack Status				No Change
PolyDosing	Poly Dosing				Level transmitters
RawSewagePumps	Raw Sewage Pumps				Pumps,Flowmeters
ReturnActivatedS	Return Activated Sludge Pumps				Flowmeters
ServiceEffluent	Service Water / Effluent Pumps				Analysers
SludgeDewatering	Sludge Dewatering				Flowmeters
SludgePumps					
Startup					No Change
Summary					BW Standard
Utilities					No Change

Page Name	Page Title	Pass/Fail	IPS Initials	IW Initials	Comment
WasteActivatedS					

5 OPERATION

Test users will be created to test operation of the SCADA system. The test users will have the following permissions:
TestOperator – Operator: modification of setpoints and plant operation. Acknowledge, Disable and Enable alarms.
TestEngineer – Engineer: Operator privileges with SCADA tools and user control.
TestSupervisor – Supervisor: Operator privileges with user control.

User	Setpoints			Plant Operation			Alarm Ack			Alarm En/Dis			SCADA Tools			User Control			Comment
	Pass/Fail	IPS Initials	IW Initials	Pass/Fail	IPS Initials	IW Initials	Pass/Fail	IPS Initials	IW Initials	Pass/Fail	IPS Initials	IW Initials	Pass/Fail	IPS Initials	IW Initials	Pass/Fail	IPS Initials	IW Initials	
TestOperator																			
TestEngineer																			
TestSupervisor																			

Note that in the Brisbane Water standards, Engineers do not have user control. User control has been granted to Engineers at Goodna WWTP as they previously had this privilege in the old Citect SCADA system.

6 REPORTS

The following reports shall be checked:

Report	Pass/Fail	IPS Initials	IW Initials	Comment
Daily				
Monthly				
Current				Pages 3-5 of Daily Report

7 FURTHER TESTS

This section details further testing performed on the Citect Upgrade:

Component	Description	Pass/Fail	IPS Initials	IW Initials	Comments
Auto-Dialler	Test alarm dial-out				

Ipswich Water | Carol Park WWTP Upgrade | Software SAT

Blowers duty control has to be checked

ST052_BL0520_001	Blower 1				DOL Drive
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	
		dsRunning = 0		✓	
Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops (TRIGGERED BY SCADA)		✓	
	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm		✓	

ST052_BL0520_002	Blower 2				DOL Drive
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	
		dsRunning = 0		✓	

Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops ALARM TRIGGERED BY SCADA		✓	
	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm		✓	

ST052_BL0520_003	Blower 3				DOL Drive
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	stop inbetween low & high
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	
		dsRunning = 0		✓	
Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops ALARM TRIGGERED BY SCADA		✓	
	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm		✓	

FIXED
no change over of duty pump / one pump fails

ST052_VSD0540_001	A-A-R Pump 1				VSD Drive
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	
		dsRunning = 0		✓	
	Change Manual Speed Setpoint	Analogue Output changes		✓	
Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops TRIGGERED BY SCADA		✓	
	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm		✓	

ST052_VSD0540_002	A-A-R Pump 2				VSD Drive
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	
		dsRunning = 0		✓	
	Change Manual Speed Setpoint	Analogue Output changes		✓	
Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	

Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops ALARM TRIGGERED BY SCADA		✓	
	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay "		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm "		✓	

ST052_VSD0540_003	A-A-R Pump 3				VSD Drive
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	
		dsRunning = 0		✓	
	Change Manual Speed Setpoint	Analogue Output changes		✓	
Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops ALARM TRIGGERED BY SCADA		✓	
	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay "		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm "		✓	

ST052_VSD0540_004	A-A-R Pump 4	VSD Drive

Test Description	Action	Result	Old	New	Comment
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	
		dsRunning = 0		✓	
	Change Manual Speed Setpoint	Analogue Output changes		✓	
Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops ALARM TRIGGERED BY SCADA		✓	
	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm		✓	

ST052_FIT0590_004	DP Flowmeter				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_DO0590_003	Dissolved Oxygen Probe #1				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	

	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_DO0590_004	Dissolved Oxygen Probe #2				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_DO0590_005	Dissolved Oxygen Probe #3	OUT OF SERVICE			Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling				
	Check Units				
	Open Trend	Trend scaling & units OK			
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits			
	Change AI to trigger alarms	Alarms Trigger			

ST052_DO0590_006	Dissolved Oxygen Probe #4				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_DO0590_007	Dissolved Oxygen Probe #5				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	

Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_DO0590_008	Dissolved Oxygen Probe #6 OUT OF SERVICE				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling				
	Check Units				
	Open Trend	Trend scaling & units OK			
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits			
	Change AI to trigger alarms	Alarms Trigger			

ST052_FIT0590_001	A-A-R Flowmeter 1				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0590_002	A-A-R Flowmeter 2				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0690_001	RAS Flowmeter 1				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	

	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0690_002	RAS Flowmeter 2				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0590_003	WAS Flowmeter				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0190_001	Inlet Flowmeter				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0190_002	Module 1 Flowmeter				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_PIT0590_001	Air Pressure No1				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0420_001	Dewatering WAS Flowmeter				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0450_001	Digested Sludge Flow				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0450_002	Digested Sludge Flow				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_LIT0460_001	Poly Tank 1 Level				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_LIT0460_002	Poly Tank 2 Level				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_VSD0110_001	Raw Sewage Pump 1				VSD Drive
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	
		dsRunning = 0		✓	
	Change Manual Speed Setpoint	Analogue Output changes		✓	
Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops		✓	

	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm		✓	

ST052_VSD0110_002	Raw Sewage Pump 2				VSD Drive
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	
		dsRunning = 0		✓	
	Change Manual Speed Setpoint	Analogue Output changes		✓	
Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops		✓	
	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm		✓	

ST052_VSD0110_003	Raw Sewage Pump 3				VSD Drive
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Manual Start/Stop	Click "Manual"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
	Click "Start"	Animation on popup & page		✓	
		dsRunning = 1		✓	
	Click "Stop"	Animation on popup & page		✓	

		dsRunning = 0		✓	
	Change Manual Speed Setpoint	Analogue Output changes		✓	
Auto Mode	Click "Auto"	Animation on popup & page		✓	
		Mode changes in old logic		✓	
Run Hours	Start Drive	Run Hours increments every 1 min		✓	
		No. of Starts increments		✓	
	Set EOD to 1 on the PLC	Daily Run Hours resets to 0		✓	
Out Of Server	Set Maintenance bit	"Maintenance Due" animates		✓	
Fail to Start/Stop	Start Drive	"Fail to Start" alarm triggers after time delay & drive stops		✓	
	SetdsRunning = 1	"Fail to Stop" alarm triggers after time delay		✓	
Fault	Test drive stops and is prevented from starting	Fault alarm		✓	

ST052_LIT0190_001	Well Level Transmitter 1				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_LIT0190_002	Well Level Transmitter 2				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_TURB0790_001	Final Eff. CL Turbidity				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**

Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_CL0790_001	Final Effluent Chlorine Residual				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_pH0790_001	Effluent pH Transmitter				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0790_001	Final Effluent Flowmeter				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0190_003	Inlet Flowmeter				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	

	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_DO0590_001	Stage 1/2 Dissolved Oxygen Probe #1				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_DO0590_002	Stage 1/2 Dissolved Oxygen Probe #2				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0690_003	RAS Flowmeter 1				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	
	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

ST052_FIT0690_004	RAS Flowmeter 2				Analogue
Test Description	**Action**	**Result**	**Old**	**New**	**Comment**
Scaling & Range	Check Scaling			✓	
	Check Units			✓	

	Open Trend	Trend scaling & units OK		✓	
Alarms	Set Alarm Setpoints on Citect	Setpoints update within limits		✓	
	Change AI to trigger alarms	Alarms Trigger		✓	

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Electrical Control System
Risk Mitigation Procedures

Queensland Urban Utilities
Carole Park WWTP

Risk Overview

This document outlines the necessary mitigation measures required to manage risk within the Carole Park Electrical Control System. There are inevitably some risks to your business that you cannot eliminate. It is important to identify the hazard, the severity of the consequence and the likelihood of that consequence eventuating. Once the severity of the risk is assessed, a mitigation strategy can be devised and the risk reduced to as low as reasonably practical. In many situations, the greatest damage can occur because no one fully understands the nature of the problem and ends up making it worse. This can be avoided by common-sense procedures, which should be part of your risk mitigation approach:

- Do not take any actions that could **exacerbate the problem**. For example, if there is a problem with accessing files from a back-up tape using a tape drive, you should investigate whether the problem is caused by the drive, rather than just assuming there is a problem with the tape and then potentially damaging other tapes by placing them in a faulty drive.
- **Implement document procedures** for dealing with likely threats, and train your staff in their use. For example, there are many ways that a virus can get into your system, so you should have plans for quarantining affected parts of the system so that the problem doesn't spread.

Risk Assessment

The two greatest Electrical Control risks for the system at Carole Park are:

1. Documentation - Incorrect decisions made based on incorrect or out of date data (procedures, drawing, manuals)
2. SCADA & PLC System - A failure of the SCADA and/or PLC system

Documentation

Concern: Incorrect or out of date data will lead to poor decision-making and potential exacerbation of the situation.

Safeguard: A master document or check out/check in system should be in place to control the documentation for project work carried out the Goodna site.

Action: Goodna should use the QUU SVN repository document control system. Documents such as wiring diagrams, IO listing, SCADA software and PLC software, when issued to a contractor, should be checked out and a record of the documents the contractor has requested should be made. Once these documents have been checked out, the copy at Goodna should be locked out and no changes to be permitted until the documents have been checked back in again. When the contractor has completed the project and requires the documents and software to be checked back in again, each item should be checked off the list so it can be verified that all documents have been returned. All documents should contain revision history - revision numbers, date of update and the initials of the person who updated the document and the person who authorised the change.

SCADA & PLC System

Concern: SCADA &/or PLC system fails and due to lack of skill or knowledge the operators lose effective control of the plant and its associated systems:

Safeguard: A documented troubleshooting guide to assist operators

Action: *iPower solutions* have developed a “Contingency and Troubleshooting Guide” attached below. This guide contains information on the existing contingency and redundancy built into the design as well as how to interpret the visual indications (SCADA Screens & LEDs).

Contingency and Troubleshooting Guide

The Electrical Control System at Goodna is broken up into three systems:

- Communications (SCADA PC and network)
- PLC
- I/O Cards

Communications Contingency

The contingency plan for the SCADA system should be to have some form of redundancy should the primary system fail. At Carole Park there is only the primary server and no redundancy should the primary server fail, It is highly recommended that a redundant server be installed or until such time have at least a cloned hard drive available.

Primary system failure

If the primary system fails it will not be possible to control the plant, or generate any reports or alarms, any connection to the central control room will be lost too.

The operator should contact the QUU operations control room west to arrange for contractors etc to look at the problem.

Communications trouble shooting

The failure of the SCADA system could be none responsive screen, or the data fields are populated with hash signs (#com) indicating a loss of communications between the SCADA system and the PLC.

Non-responsive SCADA Screen

A non-responsive screen is indicative of a SCADA PC failure. If a PC re-boot does not correct the problem then an appropriate IT resource should be consulted via QUU operations control room west.

Data fields populated with #com

The first thing to try is restarting the SCADA PC to see if that corrects the problem, if not then check all the network cables are connected properly. If this has not resolved the issue, check communications between the SCADA PC and the PLCs. At Carole Park the communication between the SCADA system and the PLC's uses the Siemens Profibus network. See status and error indicators for DP interface.

PLC System Contingency

The Siemens S300 series PLC is a rack mounted system with a power supply module, CPU, Ethernet module and various IO modules.

Spares retained by Carole Park are the only effective contingency in the result of a PLC failure.

LEDs

SIMATIC S7 hardware offers diagnostics with LEDs.

These LEDs are implemented in three colours:

Green	Regular operation. Example: Power is on.
Yellow	Non-regular operating status. Example: Forcing is active.
Red	Fault. Example: Bus error.
LED Flashing	Special event.

Status and error displays of the CPU

LED						**Meaning**
SF	**MANT**	**DC5V**	**FRCE**	**RUN**	**STOP**	
OFF	OFF	OFF	OFF	OFF	OFF	CPU Power supply missing. Remedy: Check whether the power supply module is connected to mains and switched on.
OFF		ON		OFF	ON	The CPU is in stop mode. Remedy: Set the PLC to run mode.
ON		ON		OFF	ON	The CPU is in stop mode as a result of an error. Remedy: refer to the table below, evaluation of the SF LED.
		ON		OFF	Flashes (0.5Hz)	The CPU requests memory reset.
		ON		OFF	Flashes (2Hz)	The CPU executes memory reset.
		ON		Flashes (2Hz)	ON	The CPU is in Startup mode.
		ON		Flashes (0.5Hz)	ON	The CPU was halted by a programmed break point.
ON		ON				Hardware or software error. Remedy: refer to the table below, evaluation of the SF LED.
	ON					Loss of synchronization of the own station, or

						of a subordinate PROF INET IO device during IRT mode, or a different PROF INET IO maintenance request.
			ON			You have enabled the force function.
			Flashes (2Hz)			Node flashing test was activated.
Flashes		Flashes	Flashes	Flashes	Flashes	Your CPU has an internal system error. The procedure is as follows: 1. Set the mode selector switch to stop. 2. Perform power ON/OFF. 3. Read the diagnostics buffer with step7. 4. Read out the service data for CPU. 5. Contact your local Siemens partner.

Evaluating the SF LED in case of software errors

Possible problem	**Response of the CPU**	**Remedies**
TOD interrupt is enabled and triggered. However, a matching block is not loaded. (Software/configuration error)	Call of OB85. CPU goes into STOP if OB85 is not loaded.	Load OB10 (OB number is apparent from the diagnostic buffer).
Start time of the enabled TOD interrupt was jumped, e.g. by advancing the internal clock.	Call of OB80. goes into STOP if OB80 is not loaded	Disable the TOD interrupt before you set the time-of-day with SFC 29.
Delay interrupt triggered by SFC 32. However, a matching block is not loaded. (Software/configuration error)	Call of OB85. CPU goes into STOP if OB85 is not loaded.	Load OB 20 or 21 (CPU 317 only) (the OB number can be viewed in the diagnostic buffer).
Process interrupt is enabled and triggered. However, a matching block is not loaded. (Software/configuration error)	Call of OB85. CPU goes into STOP if OB85 is not loaded.	Load OB40 (OB number is apparent from the diagnostic buffer).
Status alarm is generated, but the appropriate OB55 is not loaded.	Call of OB85. CPU goes into STOP if OB85 is not loaded.	Load OB55
Update alarm is generated, but the appropriate OB 56 is not loaded.	Call of OB85. CPU goes to STOP if OB 85 is not loaded.	Load OB56
Vendor-specific alarm is generated, but the appropriate OB57 is not loaded.	Call of OB85. CPU goes into STOP if OB85 is not loaded.	Load OB57
Access to missing or defective module upon updating the process image (software or hardware error)	Call OB 85 (depending on the configuration in HW Config). CPU goes into STOP if OB 85 is not loaded.	Load OB85, the start information of the OB contains the address of the relevant module. Replace the relevant module or eliminate the program error.
The cycle time was exceeded. Probably too many interrupt	Call of OB80. CPU goes into STOP if OB80 is not loaded. The CPU	Extension of the cycle time (STEP 7 – Hardware configuration),

OBs called simultaneously.	switches to STOP despite loaded OB80 if the doubled cycle time was exceeded without retriggering cycle time 80.	changing the program structure. Remedy: If necessary, retrigger cycle time monitoring by calling SFC 43
Programming error • Block not loaded • Wrong block number • Wrong timer/counter number • Read/write access to wrong area	Calls OB121. CPU does not STOP if OB121 is loaded.	Eliminate the programming error. The STEP 7 testing function helps you to locate the error.
I/O access errors An error has occurred when module data was accessed	Calls OB122. CPU does not STOP if OB122 is loaded.	Check module addressing in HW Config or whether a module/DP slave has failed.
Global data communication error, e.g. insufficient length of the DB for global data communication.	Call of OB87. CPU goes into STOP if OB87 is not loaded.	Check global data communication in STEP 7. If required, correct the DB size.

Evaluating the SF LED in case of hardware errors

Possible problem	**CPU reaction**	**Possible remedies**
A module was removed or inserted while the system was in RUN.	CPU goes into STOP.	Screw-tighten the modules and restart the CPU.
A distributed module was removed or inserted on PROFIBUS DP while the system was in RUN.	Call of OB86. CPU goes into STOP if OB86 is not loaded. When the module is integrated by means of GSD file: Call of OB 82. CPU goes into STOP when OB 82 is not loaded.	Load OB86 or OB82.
A distributed module was removed or inserted on PROFINET IO while the system was in RUN.	Call of OB83. CPU goes into STOP if OB83 is not loaded. OB 86 is also called when one or several modules of an ET200S (IO device) are removed or inserted while the system is in RUN. CPU switches to STOP if OB 86 is not loaded.	Load OB 83 and OB 86.
A diagnosable module reports a diagnostic interrupt.	Call of OB82. CPU goes into STOP if OB82 is not loaded.	Reaction to the diagnostic event, based on the module configuration.
Attempt to access a missing or faulty module. Loose connector (software or hardware error).	Call of OB85, if access was attempted during update of the process image (OB 85 call must be enabled accordingly in the parameters). Call of OB 122 with direct I/O access. CPU switches to STOP if the OB is not loaded.	Load OB 85, the start information of the OB contains the address of the relevant module. Replace the relevant module, tighten the plug or eliminate the program error.
Faulty SIMATIC MMC.	The CPU goes into STOP mode and requests memory reset.	Replace the SIMATIC MMC, reset CPU memory, transfer the program again, then set the CPU to RUN mode.

LED					Meaning
SF	**5VDC**	**BF**	**BF1**	**BF2**	
ON	ON	ON/Flashers	N/A	N/A	PROFIBUS DP interface error. Remedy: See the table below
ON	ON	N/A	ON/Flashers	N/A	Fault at the second PROFIBUS DP interface of CPU 317 or CPU 319-3 PN/DP. Remedy: See the table below
ON	ON	N/A	N/A	ON/Flashes	Error on the second PROFIBUS DP interface of the CPU 317-2 DP or CPU 319-3 PN/DP. Remedy: See the tables below

Possible problem	CPU	Possible remedies
• Bus fault (hardware fault). • DP interface error. • Different transmission rates in multiple DP master mode. • If the DP slave / master interface is active: short-circuit on the bus. • With passive DP slave interface: transmission rate search, i.e. there are no other active nodes on the bus (a master, for example)	Call of OB 86, if the CPU is in RUN mode and communication between the DP master and DP slave functioned properly before the error occurred. CPU switches to STOP if OB 86 is not loaded.	• Check the bus cable for short-circuit or breaks. • Analyze the diagnostic data. Edit the configuration.

Possible Problem	CPU	Possible Remedies
The CPU is DP master: • Failure of a connected station • At least one of the configured slaves cannot be accessed. • Bad engineering configuration	Call of OB 86, if CPU is in RUN mode and operated DP slaves before the error occurred. CPU switches to STOP if OB 86 is not loaded.	Verify that the bus cable is connected to the CPU, or that the bus is not interrupted. Wait until the CPU has completed its startup. If the LED does not stop flashing, check the DP slaves or evaluate the diagnostic data for the DP slaves.
The CPU is active DP slave Possible causes: • The response monitoring time has elapsed. • PROFIBUS DP communication is down. • Wrong PROFIBUS address. • Bad engineering configuration	Call of OB 86, if CPU is in RUN mode and communicated as a DP slave with the DP master before the error occurred. CPU switches to STOP if OB 86 is not loaded.	• Check the CPU. • Verify that the bus connector is properly seated. • Check for breaks in the bus cable to the DP master. • Check the configuration data and parameters.

IO Card Problems

If the IO card deems to be faulty, make sure before replacing the card that no fault voltages and currents are present on the IO before replacing the card, you would not wish to damage another IO card.