Brisbane City

Brisbane Water Project Management

Client :

BRISBANE WATER

Document Title : **KOORINGAL DVE SEWAGE PUMPING STATION OPERATION and MAINTENANCE DATA MANUAL**

Issue : ***Book 1 of 1***

Date of Issue : ***August 2000***

Author : ***Peter Hague***

Brisbane City Council

Project Acceptance Certificate

Brisbane Water Business Asset Services
Project Management Section

PROJECT ACCEPTANCE CERTIFICATE

Project: ***Kooringal Drive Sewage Pumping Station Electrical Upgrade***

Date: ***28th July 2000***

The project is complete as per the Project Delivery Document, has been commissioned and is now in operation.

Certified By: _____

Stuart Low Project Manager

The Operation and Maintenance Manuals have been accepted by:

_____

Engineering Services

The Project is accepted with the attached defects.

_____ / /
Stuart Low Project Manager

_____ / /
Client's Representative

Attachments: Defects List

Brisbane City

Brisbane Water Project Management

Client :

BRISBANE WATER

Document Title : ***Kooringal Drive Sewage Pumping Station Electrical Upgrade***

Item 1 Nil.

Regards

Peter Hague

Table of Contents *Kooringal Drive Sewage Pumping Station Electrical Upgrade* O & M manuals

1 Book 1

Maintenance copy

1.1 *Maintenance Data Manual*

Contains equipment details, supplier, programming and/or setup data.

1.2 *Functional Spec*

Functional requirement Specification

1.3 *Misc.*

Miscellaneous information on construction, installation and operation.

1.4 *VFD and Startco*

VFD manuals and Startco parameters

1.5 *Schematics.*

Contains all of the final as commissioned drawing for the project.

SET POINTS FOR KOORINGAL DR.

The set points will be as follows:

Wet Well Level Metres	Indicator %	Metres AHD	Function
		9.530	Probable slab level
		9.277	Probable Probe suspension level
		7.130	Surcharge Imminent suspension Length
		9.500	Probe Suspension Length
3.000	100.0%	2.777	Probe upper range 20mA
0.0	00.00%	-0.223	Probe lower range 4 mA
2.663	88.7%	2.440	Surcharge Level by survey
2.370	79.0%	2.147	Surcharge Imminent
1.573	52.4%	1.350	Start lead pump
0.450	16.6%	0.227	Stop lead pump (BWL)
2.023	67.4%	1.800	Start lag pump
1.123	37.4%	0.900	Stop lag pump
1.923	64.0%	1.700	Top of inlet screen. Pump is running at 50Hz
1.723	57.0%	1.500	Bottom of inlet screen. PID set point.

KOORINGAL DR.

Report of all parameter settings

Drive type: 6100 **Drive bus address: None**

Date: 2/08/00 11:23:59

No.	Name	Setup 1	Setup 2	Setup 3	Setup 4
1	Language	English	English	English	English
2	Active setup	Multi setup	Multi setup	Multi setup	Multi setup
5	Custom readout	100.00	100.00	100.00	100.00
6	Cust. read. unit	%	%	%	%
8	Small readout 1	Frequency [Hz]	Frequency [Hz]	Reference [%]	Reference [%]
9	Small readout 2	Analog input 60 [mA]	Feedback [units]	Motor current [A]	Motor current [A]
10	Small readout 3	Power [kW]	Power [kW]	Power [kW]	Power [kW]
11	Unit of loc ref	Hz	Hz	Hz	Hz
12	Hand start bttn	Enable	Enable	Enable	Enable
13	Stop button	Disable	Enable	Enable	Enable
14	Auto start bttn	Enable	Enable	Enable	Enable
15	Reset button	Enable	Enable	Enable	Enable
16	Data change lock	Not locked	Not locked	Not locked	Not locked
17	Power up action	Auto restart	Auto restart	Auto restart	Auto restart
100	Config. mode	Open loop	Open loop	Open loop	Open loop
101	Vt charact.	Aeo function	Aeo function	Aeo function	Aeo function
102	Motor power	63.00 kW	63.00 kW	75.00 kW	75.00 kW
103	Motor voltage	415 V	415 V	380 V	380 V
104	Motor frequency	50 Hz	50 Hz	50 Hz	50 Hz
105	Motor current	115.00 A	115.00 A	149.47 A	149.47 A
106	Motor nom. speed	1470 RPM	1470 RPM	1480 RPM	1480 RPM
107	Auto motor adapt	No ama	No ama	No ama	No ama
108	Multim.startvolt	3.0 V	3.0 V	3.0 V	3.0 V
109	Resonance damp.	100 %	100 %	100 %	100 %
110	High start torq.	0.0 s	0.0 s	0.0 s	0.0 s
111	Start delay	0.0 s	0.0 s	0.0 s	0.0 s
112	Motor preheat	Disable	Disable	Disable	Disable
113	Preheat dc curr.	50 %	50 %	50 %	50 %
114	Dc brake current	50 %	50 %	50 %	50 %
115	Dc braking time	10.0 s	10.0 s	10.0 s	10.0 s
116	Dc brake cut-in	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
117	Mot.therm protec	Etr trip 1	Etr trip 1	Etr trip 1	Etr trip 1
200	Frequency range	0-120 hz	0-120 hz	0-120 hz	0-120 hz
201	Min. frequency	0.0 Hz	24.0 Hz	0.0 Hz	0.0 Hz
202	Max. frequency	50.0 Hz	50.0 Hz	50.0 Hz	50.0 Hz
203	Reference site	Linked to hand/auto	Linked to hand/auto	Linked to hand/auto	Linked to hand/auto
204	Min. reference	0.000	24.000	0.000	0.000
205	Max. reference	50.000	50.000	50.000	50.000
206	Ramp up time	20 s	20 s	50 s	50 s
207	Ramp down time	20 s	20 s	100 s	100 s
208	Autoramping	Enable	Enable	Enable	Enable
209	Jog frequency	0.0 Hz	30.0 Hz	10.0 Hz	10.0 Hz

No.	Name	Setup 1	Setup 2	Setup 3	Setup 4
210	Ref. function	Sum	Sum	Sum	Sum
211	Preset ref. 1	0.00 %	0.00 %	0.00 %	0.00 %
212	Preset ref. 2	0.00 %	0.00 %	0.00 %	0.00 %
213	Preset ref. 3	0.00 %	0.00 %	0.00 %	0.00 %
214	Preset ref. 4	0.00 %	0.00 %	0.00 %	0.00 %
215	Curr limit motor	115.0 A	115.0 A	147.0 A	147.0 A
216	Freq bypass b.w.	0 Hz	0 Hz	0 Hz	0 Hz
217	Bypass freq. 1	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
218	Bypass freq. 2	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
219	Bypass freq. 3	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
220	Bypass freq. 4	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
221	Warn. current lo	0.0 A	0.0 A	0.0 A	0.0 A
222	Warn. current hi	161.7 A	161.7 A	161.7 A	161.7 A
223	Warn. freq. low	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
224	Warn. freq. high	120.0 Hz	120.0 Hz	120.0 Hz	120.0 Hz
225	Warn. low ref.	-999999.999	-999999.999	-999999.999	-999999.999
226	Warn. high ref.	999999.999	999999.999	999999.999	999999.999
227	Warn. low fdbk	-999999.999	-999999.999	-999999.999	-999999.999
228	Warn. high fdbk	999999.999	999999.999	999999.999	999999.999
300	Digital input 16	Reset	Reset	Reset	Reset
301	Digital input 17	Freeze reference	Freeze reference	Freeze reference	Freeze reference
302	Digital input 18	Start	Start	Start	Start
303	Digital input 19	No operation	No operation	Reversing	Reversing
304	Digital input 27	Coast inverse	Coast inverse	Coast inverse	Coast inverse
305	Digital input 29	Jog	Jog	Jog	Jog
306	Digital input 32	Setup select lsb	Setup select lsb	No operation	No operation
307	Digital input 33	No operation	No operation	No operation	No operation
308	Ai [V] 53 funct.	No operation	Reference	Reference	Reference
309	Ai 53 scale low	0.0 V	0.0 V	0.0 V	0.0 V
310	Ai 53 scale high	10.0 V	10.0 V	10.0 V	10.0 V
311	Ai [V] 54 funct.	No operation	No operation	No operation	No operation
312	Ai 54 scale low	0.0 V	0.0 V	0.0 V	0.0 V
313	Ai 54 scale high	10.0 V	10.0 V	10.0 V	10.0 V
314	Ai [mA] 60 funct	Reference	No operation	Reference	Reference
315	Ai 60 scale low	4.0 mA	4.0 mA	4.0 mA	4.0 mA
316	Ai 60 scale high	20.0 mA	20.0 mA	20.0 mA	20.0 mA
317	Live zero time	10 s	10 s	10 s	10 s
318	Live zero funct.	No function	No function	No function	No function
319	Ao 42 function	Motor cur. 4- 20 ma	Motor cur. 4- 20 ma	Motor cur. 0- 20 ma	Motor cur. 0- 20 ma
320	Ao 42 puls scale	5000 Hz	5000 Hz	5000 Hz	5000 Hz
321	Ao 45 function	Out. freq. 4- 20 ma	Out. freq. 4- 20 ma	Out. freq. 0- 20 ma	Out. freq. 0- 20 ma
322	Ao 45 puls scale	5000 Hz	5000 Hz	5000 Hz	5000 Hz
323	Relay1 function	Ready	Ready	Alarm	Alarm
324	Relay1 on delay	0 s	0 s	0 s	0 s
325	Relay1 off delay	0 s	0 s	0 s	0 s
326	Relay2 function	Running	Running	Running	Running
327	Pulse ref. max	5000 Hz	5000 Hz	5000 Hz	5000 Hz
328	Pulse fdbk. max.	25000 Hz	25000 Hz	25000 Hz	25000 Hz
400	Reset function	Manual reset	Manual reset	Manual reset	Manual reset

No.	Name	Setup 1	Setup 2	Setup 3	Setup 4
401	Autorestart time	10 s	10 s	10 s	10 s
402	Flying start	Disable	Disable	Disable	Disable
403	Sleep mode timer	301 s	301 s	301 s	301 s
404	Sleep frequency	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
405	Wakeup frequency	10.0 Hz	31.0 Hz	50.0 Hz	50.0 Hz
406	Boost setpoint	100 %	100 %	100 %	100 %
407	Switch freq.	3.5 kHz	3.5 kHz	3.0 kHz	3.0 kHz
408	Noise reduction	Fixed switching freq	Fixed switching freq	Asfm	Asfm
409	Funct. low curr.	Warning	Warning	Warning	Warning
410	Mains failure	Trip	Trip	Trip	Trip
411	Funct. overtemp.	Trip	Trip	Trip	Trip
412	Overload delay	61 s	61 s	61 s	61 s
413	Min. feedback	0.000	0.000	0.000	0.000
414	Max. feedback	100.000	100.000	100.000	100.000
415	Ref./fdbk. unit	%	%	%	%
416	Feedback conv.	Linear	Square root	Linear	Linear
417	2 feedback calc.	Maximum	Maximum	Maximum	Maximum
418	Setpoint 1	0.000	34.000	0.000	0.000
419	Setpoint 2	0.000	34.000	0.000	0.000
420	Pid nor/inv.ctrl	Inverse	Normal	Normal	Normal
421	Pid anti windup	Enable	Enable	Enable	Enable
422	Pid start value	50.0 Hz	24.0 Hz	0.0 Hz	0.0 Hz
423	Pid prop. gain	1.00	0.30	0.30	0.30
424	Pid integr. time	9999.00 s	9999.00 s	9999.00 s	9999.00 s
425	Pid diff. time	0.00 s	0.00 s	0.00 s	0.00 s
426	Pid diff. gain	5.0	5.0	5.0	5.0
427	Pid filter time	0.01 s	0.01 s	0.01 s	0.01 s
503	Coasting	Logic or	Logic or	Logic or	Logic or
504	Dc brake	Logic or	Logic or	Logic or	Logic or
505	Start	Logic or	Logic or	Logic or	Logic or
506	Reversing	Digital input	Digital input	Digital input	Digital input
507	Select. setup	Logic or	Logic or	Logic or	Logic or
508	Select. speed	Logic or	Logic or	Logic or	Logic or
555	Bus time inter.	60 s	60 s	60 s	60 s
556	Bus time funct.	No function	No function	No function	No function
560	N2 over.rel.time	65534 s	65534 s	65534 s	65534 s
565	Fln time inter.	60 s	60 s	60 s	60 s
566	Fln time funct.	No function	No function	No function	No function
618	Reset kwh count	Do not reset	Do not reset	Do not reset	Do not reset
619	Reset run. hour	Do not reset	Do not reset	Do not reset	Do not reset
620	Operation mode	Normal operation	Normal operation	Normal operation	Normal operation
700	Relay06 function	Drive in auto mode	Drive in auto mode	Alarm	Alarm
701	Relay6 on delay	0 s	0 s	0 s	0 s
702	Relay6 off delay	0 s	0 s	0 s	0 s
703	Relay07 function	Running	Running	Alarm	Alarm
704	Relay7 on delay	0 s	0 s	0 s	0 s
705	Relay7 off delay	0 s	0 s	0 s	0 s
706	Relay08 function	Running	Running	Alarm	Alarm
707	Relay8 on delay	0 s	0 s	0 s	0 s

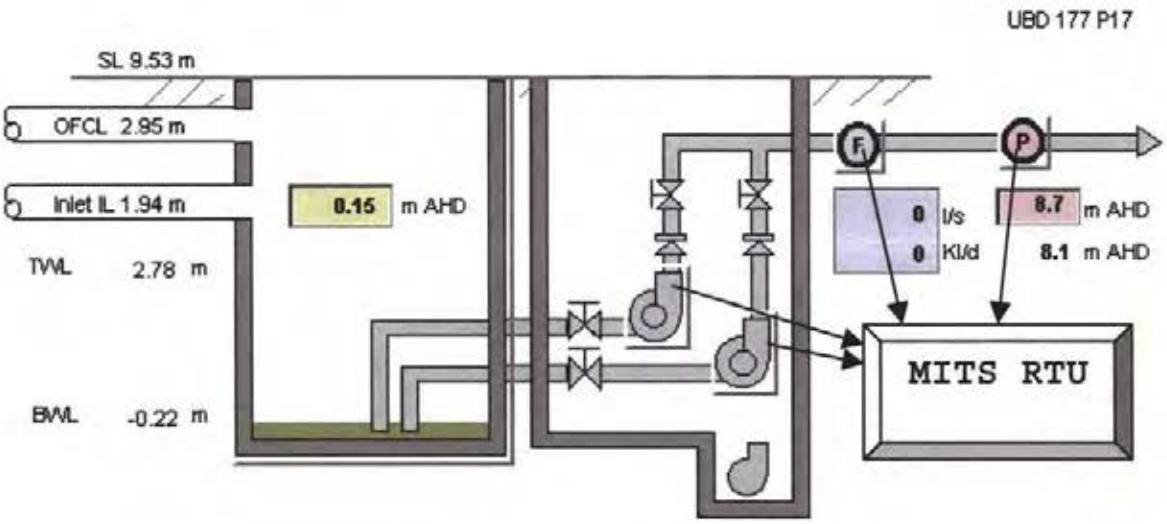
No.	Name	Setup 1	Setup 2	Setup 3	Setup 4
708	Relay8 off delay	0 s	0 s	0 s	0 s
709	Relay09 function	Alarm or warning	Running	Alarm	Alarm
710	Relay9 on delay	0 s	0 s	0 s	0 s
711	Relay9 off delay	0 s	0 s	0 s	0 s

Functional Spec.

CENTENARY HWY (SP 19) SEWAGE PUMPING STATION

FUNCTIONAL SPECIFICATION

FOR MITS RTU



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Document Approval

Author	R. Janfada	Rev.O signed by R.J.	13 / 01 / 00
Design Verifier	F. Walker	Rev.O signed by R.F.W	18 / 01 / 00
P.S.E. – Engineer-in-Charge	R. Bowring		..... / ..... / 00
Project Management	P. Tranter		..... / ..... / 00
Field Operations	Ken Vaheesan		..... / ..... / 00

Document History and Status

Issued	Date of Issue	Reviewer – Sign & Date									
		RJ	Date	RFW	Date	KV	Date	PT	Date	S&IM	Date
Draft 1	16/12/99	✓	16/12/99	✓	7/01/00						
Draft 2	13/01/99	✓	13/01/99	✓	18/01/00						
Rev. O	13/01/99	✓	13/01/99	✓	18/01/00			✓	18/01/00		

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Draft 1	16/12/99	Draft Issue for comments;	R.J.
Draft 2	18/01/00	Comments incorporated and approved by RFW	R.J
Rev. O	24/01/00	Original Issue	R.J.
Rev. 1	11/02/00	P. Tranter's comments were incorporated	R.J.
Rev. 2	23/02/00	Incorporate control philosophy from Oldfield Rd. and revise control levels.	Peter Tranter

TABLE OF CONTENTS

Attachments

1 Introduction

1.1 Scope of Document

This document has been written based on the existing Developed Software Detailed Design Specification (DSDDS) prepared by MITS dated 1995 with updated sections that outlines the functional requirements for the control, monitoring, and telemetry of Centenary Highway (SP 19) sewerage pumping station incorporating the two new Variable Frequency Drives (VFDs).

On the basis of this document, the existing DSDDS will be updated and the MITS RTU software program will be modified to incorporate the changes associated with the installation of the two new VFDs.

The control circuitry for the pumping station is shown on drawings 486/5/7-HG001 to 486/5/7-HG013 inclusive and this document should be read in conjunction with these drawings.

The functional requirements for this pumping station have been detailed in DSDDS and there is no need to repeat them in this document in great details. Therefore, reference has been made to DSDDS wherever it was necessary in this document.

1.2 Purpose and Scope of Upgrade

Over the past several years there have been an increasing amount of odour complaints received from residents in the areas around S2 Darra Branch Sewer Duplication that stretches from Fortrose Street Pumping Station to Oxley Creek Waste Water Treatment Plant (Refer to S2 Sewer Overall Flow Diagram Drawing No. 486/5/6-S2069).

As part of S2 Sewer Odour Abatement Project, it is intended to increase flows from Fortrose Street Rising Main to reduce the sewage retention time in the rising mains. When this occurs, the Centenary Hwy Sewage Pumping Station will have to pump against increased flows in the rising main. This will require upgrading pump impellers and installing VFDs at this pumping station. Installation of (VFD's) on the existing sewage pumps will also overcome the surge problem in the rising main, which will reduce the odorous gas emission.

The upgrade works for this Sewage Pumping Station is part of the S2 Catchment Odour Abatement Project scope.

1.3 Centenary Hwy Pumping Station Overview

Refer to Drawing No. 486/5/6-S2069- Darra Branch Sewer Overall Flow Diagram;
The Centenary Hwy Sewerage Pumping Station is an existing underground conventional sewage pumping station with an Average Dry Weather Flow (ADWF) of 21.3 L/sec and an average wet well volume of 25.86 Kilo Litres. Currently there are two 63kW submersible type sewage pumps installed in the Pump Well, operating as duty/Lag units. Pumps are interlocked so only one pump can operate at a time. Current station output with one pump operating is approximately 100 L/sec with two pumps operating the station output will be limited to 140 L/sec.

An outdoor type electrical switchboard supplies the pumping station equipment and also incorporates the telemetry RTU. Currently there are two soft starters for the two main sewage pumps that are located in the upper level of the pump well. These two soft starters will be replaced with the two new 75kW Variable Frequency Drives (VFDs) as part of the S2 Catchment Odour Abatement project.

In addition there are two (2) Hydrogen Peroxide Dosing Pumps on this site one for Fortrose Street and one for Centenary Hwy. The Fortrose Street dosing pump is being controlled by both the RTU and from an existing remote micro switch already cabled to the site. The Centenary Hwy dosing pump is controlled by the RTU and operates when either of the main pumps is running.

1.4 Existing Control System

A MITS RTU that has been programmed to control the pump station and to interface with the Central Control Room at Newstead is currently controlling the pump station. Therefore, where the term "OPERATOR" or "WORKSTATION" or "MASTER STATION" is used in this document, this shall mean the Newstead Control Room Operator.

2 I/O Listing

The attached I/O List is the existing I/O List associated with the Centenary Hwy Pumping Station MITS RTU with the new I/O highlighted in *Italic* format.

Digital Input Module DIT102 ADDR 10 (DIM1)

Item:	CH.	Description:
Digital Input 1	0	RTU Battery Low
Digital Input 2	1	RTU Mains Power Fault
Digital Input 3	2	Site Attention Acknowledge
Digital Input 4	3	Cathodic Protection Door Limit Switch
Digital Input 5	4	Cathodic Protection Local Start
Digital Input 6	5	Cathodic Protection Mains Power
Digital Input 7	6	Spare
Digital Input 8	7	Sewage Pumping Station Mains Power
Digital Input 9	8	Wet Well Surcharge-Detector
Digital Input 10	9	Sewage Pumping Station Local/Remote
Digital Input 11	10	Sewage Pumping Station Pump Well Flooded
Digital Input 12	11	Sump Pump Run Status
Digital Input 13	12	Fortrose Street Sewage Pumping Station Run Status
Digital Input 14	*13*	*Pump Station Delivery Flowmeter Fault*
Digital Input 15	14	Spare
Digital Input 16	15	Spare

Digital Input Module DIT102 ADDR 11 (DIM2)

Item:	CH.	Description:
Digital Input 17	0	Sewage Pump 1 Reflux Valve
Digital Input 18	1	Sewage Pump 1 Mains Power
Digital Input 19	2	Sewage Pump 1 Thermal Overload Status
Digital Input 20	3	Sewage Pump 1 Local Start
Digital Input 21	4	Sewage Pump 1 Local Stop
Digital Input 22	5	Sewage Pump 1 Thermistor Status
Digital Input 23	*6*	*Sewage Pump 1 VFD Ready*
Digital Input 24	7	Sewage Pump 1 Local Rest
Digital Input 25	*8*	*Sewage Pump 1 VFD Running*
Digital Input 26	9	Sewage Pump 1 Line Contactor Closed
Digital Input 27	*10*	*Sewage Pump 1 VFD Auto Selected*

Digital Input 28	*11*	*Sewage Pump 1 VFD Warning*
Digital Input 29	12	Spare
Digital Input 30	13	Spare
Digital Input 31	14	Spare
Digital Input 32	15	Spare

Digital Input Module DIT102 ADDR 12 (DIM3)

Item:	CH.	Description:
Digital Input 33	0	Sewage Pump 2 Reflux Valve
Digital Input 34	1	Sewage Pump 2 Mains Power
Digital Input 35	2	Sewage Pump 2 Thermal Overload Status
Digital Input 36	3	Sewage Pump 2 Local Start
Digital Input 37	4	Sewage Pump 2 Local Stop
Digital Input 38	5	Sewage Pump 2 Thermistor Status
Digital Input 39	*6*	*Sewage Pump 2 VFD Ready*
Digital Input 40	7	Sewage Pump 2 Local Rest
Digital Input 41	*8*	*Sewage Pump 2 VFD Running*
Digital Input 42	9	Sewage Pump 2 Line Contactor Closed
Digital Input 43	*10*	*Sewage Pump 2 VFD Auto Selected*
Digital Input 44	*11*	*Sewage Pump 2 VFD Warning*
Digital Input 45	12	Spare
Digital Input 46	13	Spare
Digital Input 47	14	Spare
Digital Input 48	15	Spare

Digital Output Module DOM102 ADDR 60 (DOM1)

Item:	CH.	Description:
Digital Output 1	0	Site Attention Indicator Lamp
Digital Output 2	1	Cathodic Protection Connect Reference Electrode
Digital Output 3	2	Cathodic Protection De-energise Rectifier
Digital Output 4	3	Sewage Pump 1 Line Contactor Operate
Digital Output 5	4	Sewage Pump 1 Indicator Lamp
Digital Output 6	*5*	*Sewage Pump 1 VFD Run/Stop*
Digital Output 7	*6*	*Sewage Pump 1 Fault Reset*
Digital Output 8	7	Cathodic Protection Indicator Lamp
Digital Output 9	8	Spare
Digital Output 10	9	Spare
Digital Output 11	10	Spare
Digital Output 12	11	Spare
Digital Output 13	12	Spare
Digital Output 14	13	Spare
Digital Output 15	14	Spare
Digital Output 16	15	Spare

Digital Output Module DOM102 ADDR 61 (DOM2)

Item:	CH.	Description:
Digital Output 17	0	Sewage Pump 2 Line Contactor Operate
Digital Output 18	1	Sewage Pump 2 Indicator Lamp
Digital Output 19	*2*	*Sewage Pump 2 VFD Run/Stop*
Digital Output 20	*3*	*Sewage Pump 2 Fault Reset*

Digital Output 21	4	Spare
Digital Output 21	5	Spare
Digital Output 21	6	Centenary Hwy Oxy. Inj. Pump Start/Stop
Digital Output 22	7	Fortrose Street Oxy. Inj. Pump Start/Stop
Digital Output 9	8	Spare
Digital Output 10	9	Spare
Digital Output 11	10	Spare
Digital Output 12	11	Spare
Digital Output 13	12	Spare
Digital Output 14	13	Spare
Digital Output 15	14	Spare
Digital Output 16	15	Spare

Analog Input Module AIM 105 ADDR 40 (AIM1)

Item:	CH.	Description:
Analog Input 1	0	Cathodic Protection Rectifier Current
Analog Input 2	1	Cathodic Protection Rectifier Voltage
Analog Input 3	2	Cathodic Protection Reference Electrode Voltage
Analog Input 4	3	Cathodic Protection Reference Electrode Voltage
Analog Input 5	4	Wet Well Level
Analog Input 6	5	Delivery Pressure
Analog Input 7	6	Delivery Flow
Analog Input 8	7	Sewage Pump 1 Motor Power
Analog Input 9	8	Sewage Pump 1 Motor Current
Analog Input 10	9	Sewage Pump 2 Motor Power
Analog Input 11	10	Sewage Pump 1 Motor Current
Analog Input 12	*11*	*Sewage Pump 1 Running Speed*
Analog Input 13	*12*	*Sewage Pump 2 Running Speed*
Analog Input 14	13	Spare
Analog Input 15	14	Spare
Analog Input 16	15	Spare

Analog Output Module AOM 106 ADDR 49 (AOM1)

Item:	CH.	Description:
Analog Output 1	*0*	*Sewage Pump 1 Speed Control*
Analog Output 2	*1*	*Sewage Pump 2 Speed Control*
Analog Output 3	*2*	*Spare*
Analog Output 4	*3*	*Spare*
Analog Output 5	*4*	*Spare*
Analog Output 6	*5*	*Spare*
Analog Output 7	*6*	*Spare*
Analog Output 8	*7*	*Spare*
Analog Output 9	*8*	*Spare*
Analog Output 10	*9*	*Spare*
Analog Output 11	*10*	*Spare*
Analog Output 12	*11*	*Spare*
Analog Output 13	*12*	*Spare*
Analog Output 14	*13*	*Spare*
Analog Output 15	*14*	*Spare*
Analog Output 16	*15*	*Spare*

3 Pump Station Functional Requirements

The following functional requirements are as per the details of a document called: Developed Software Detailed Design Specification (DSDDS) for Kooringal Drive SP 19 (Centenary Hwy) Sewage Pumping Station prepared by MITS in 1995 with the new changes shown in ***Italics***.

The Centenary Hwy Pumping Station comprises the following:-

- One Duty and one Lag Raw Sewage Pumps No. 1 and 2
- Wet well level transmitter type: submersible Vega probe
- Surcharge imminent electrode type level switch
- Pump Station outlet Pressure Transmitter
- Pump Station outlet Flowmeter ultrasonic type that is not functioning properly *and will be replaced by a Magnetic type Flowmeter as part of this upgrade.*
- Motor Thermistor Relays
- *Variable Frequency Drives VFD1, VFD2 replacing the existing soft starters*
- Reflux Valve Limit Switches
- Emergency Stops
- On/Off Selector Switches located adjacent to pumps in the Pump Well
- Pump Station Local/Remote Selector Switch mounted in the Switchboard
- MITS RTU located in the Switchboard
- Switchboard incorporating pump power and controls
- Pump Motor Power and Current Transmitters
- Sump Pump in the Pump Well
- Oxygen Pumps 1&2

3.1 Pump Station Operation

The pump station normally operates with the Pump Station Selector Switch in Remote mode. This enables the pumps to be controlled in response to the wet well level. When the Pump Station Selector Switch is Local, both pumps can be started or stopped by using the local Start/Stop push buttons and the speed is set by means of a potentiometer. In both modes of operations the pumps will be controlled by the RTU.

The previous program in the RTU allowed only one pump to operate at any time but as part of the new modifications in the pumps starting system (ie replacing Soft Starters with VFDs), the RTU program will allow two pumps to run at the same time as required.

When the wet well level reaches a predetermined moderate value, the Primary duty pump is started, provided it satisfies all the enabling conditions.

If the wet well level reaches a high value, the lag pump is started provided it satisfies all its enabling conditions as detailed in Section 3.3.2.5.

The RTU will control the operation of the pump station as detailed in Section 3.3.2.5.

3.2 Pump Individual Control

3.2.1 Pump Availability

A sewerage pump is deemed to be available when there is power to the site, there are no failures or faults, and any fault counters have not exceeded the defined limits.

An available pump is either running or can be started to run if the pump start conditions are met. If a pump becomes unavailable for RTU control, it will be stopped and prevented from starting until it becomes available again as detailed below.

A pump will be available for RTU control if the following conditions are met:

- Pump Station Power Available
- No pump Thermal Overload Fault
- No Pump Thermistor Fault
- *Pump VFD is Ready*
- *Pump VFD is in Auto Mode*
- No Pump Failure Signal is on
- No Pump Thermal Overload Count Exceeded (Operator Adjustable)
- No Pump Thermistor Fault Count Exceeded (Operator Adjustable)
- *No Pump VFD Fault Count Exceeded* (Operator Adjustable)
- Pump Well Not Flooded
- Pump Emergency Stop Not Operated
- No Pump Reflux Valve Failed Signal on
- No Pump Reflux Valve Failed Count Exceeded (Operator Adjustable)

If any of these conditions are not met, then the pump is unavailable for RTU control and will not be able to be started automatically or locally via the LOCAL START push-button.

A brief description of each signal is given below. For more details on the control algorithm refer to DSDDS.

3.2.1.1 Pump Station Power Available

If a "Station Power Failure" signal (provided by Power Failure Relay – PFR) is detected from the site, an alarm will be generated after a pre-defined time period has elapsed. This will make both pumps unavailable for RTU control. The alarm will be monitored at the Newstead Central Control Room. The pumps shall become available if the power has been restored and the fault signal has been cleared.

3.2.1.2 No pump Thermal Overload Fault

With station power available, the presence of a pump thermal overload fault will cause the pump to be unavailable for RTU control.

The pump thermal overload fault will be unlatched and the pump will become available for RTU control if any of the following conditions are true:

1. The pump thermal overload condition is reset (OverLoad signal inactive) and the

local reset push-button is pressed.

2. The pump thermal overload condition is reset (OverLoad inactive) and a reset is issued from the operator workstation at Newstead.

3. The thermal overload delay reset timer times out. This will be indicated by the pump thermal overload auto reset flag being active.

When the pump cools and the thermal overload resets automatically, the thermal overload delay reset timer (initially set to 10 minutes) will start. The thermal overload timer is used to allow a pre-set time to pass for the pump to cool down and after this time delay it will unlatch the thermal overload fault flag.

3.2.1.3 No pump Thermistor Fault

With station power available, the presence of a pump thermistor fault signal will cause the pump to be unavailable for RTU control.

The pump thermistor fault will be unlatched and the pump will become available for RTU control if any of the following conditions are true:

1. The pump thermistor fault condition is reset (thermistor relay trip signal inactive) and the local reset push-button is pressed.

2. The pump thermistor fault condition is reset (thermistor relay trip signal inactive) and a reset is issued from the operator workstation.

3. The thermistor relay trip reset delay timer times out. This will be indicated by the pump thermistor relay trip auto reset flag being active.

When the pump thermistor cools and resets, the thermistor delay reset timer will start. The thermistor delay reset timer is used to allow a preset time to pass before unlatching the fault. During this delay, the motor windings may have cooled to an acceptable level for a restart.

3.2.1.4 Pump VFD Ready and In Auto Mode

The two sewage pumps at the Centenary Hwy Pumping Station will be driven by two VFDs (type Danfoss VLT6100). The local control keypad for each VFD will be mounted on the VFD Cabinet. The following control functions are available on the keypad:

- *When the VFD is selected to Local mode at the keypad, it will be controlled via the buttons on the keypad and any remote control signal coming to the VFD will be inactive.*
- *When the VFD is selected to Auto mode with the Pump Station Mode Selector Switch in Remote, the VFD will be controlled via the remote RTU signals coming to the VFD with all local keypad control signals being inactive. When the Pump Station is selected to Local mode and the VFD is in Auto, the VFD it will be controlled via a local potentiometer and the VFD keypad signals will be inactive.*

The following VFD signals will be connected to the pump station RTU:

- *"VFD Warning" RTU digital input signal: this signal will be on when the VFD is powered up and one of the non-essential faults in the VFD is detected. Some of the non-essential faults are:*

- *Mains Imbalance;*
- *Overvoltage or Undervoltage;*
- *Inverter Overloaded;*
- *Motor Thermal Overload;*
- *Motor Thermistor Fault;*
- *Overcurrent;*
- *Refer to page 157 of the VLT 6000 Series Design Guide or Page 108 of the VLT6000 operating instruction for the full list of signals that causes VFD Warning signal to be on.*

When the VFD Warning signal is detected, the VFD will try to run the pump at a reduced load to let the motor to recover from the fault conditions without stopping it. If the fault does not clear within a time period set in the VFD, then the pump will be tripped by the VFD and the "VFD Ready" RTU input signal will be off.

- *"VFD Ready" RTU digital input signal: this signal will be on when the VFD is powered up and the following conditions are not present:*

  - *one of the VFD Warning signals listed above has not tripped the pump;*
  - *One of the VFD essential faults has not been detected. The VFD essential faults are:*
    - *Earth Fault;*
    - *Switch Mode Fault;*
    - *Short Circuit;*
    - *Auto-optimisation not OK;*
    - *Heat-sink Temperature Too High;*
    - *Motor Phase Failure;*
    - *Inverter Fault*

  If any one of these essential faults are detected, the VFD will stop the pump and the "VFD Ready" RTU input signal will be off.

- *"VFD Auto mode Selected" this signal will be on if the drive is selected to Auto on the keypad and is ready for remote control;*
- *"VFD Running" this signal will be on when the drive is running;*
- *"VFD Running Speed" RTU analog input signal will provide 4-20mA VFD running Hz to the RTU;*
- *When selected to Auto mode, each Variable Frequency Drive speed will be controlled via an analogue output from the RTU. The pump operating speed will be set by the RTU as explained in Section 3.3.2.5.*

A VFD will be available for RTU control if the "VFD Ready" and "VFD Auto Selected" signals are on.

The pump "VFD Not Ready" fault will be unlatched and the pump will become available for RTU control if any of the following conditions are true:

1. *The pump VFD Not Ready fault condition is reset (VFD Ready RTU input signal active) and the local reset push-button is pressed.*

2. *The pump VFD Not Ready fault condition is reset (VFD Ready RTU input signal active) and a reset is issued from the operator workstation.*

3. *The pump VFD Not Ready fault condition is reset (VFD Ready RTU input signal*

active) and the Pump VFD Not Ready reset delay timer in the RTU times out. This will be indicated by the pump VFD Ready auto reset flag being active.

When the pump VFD faults, the VFD Auto reset timer will start. The VFD Auto reset timer is used to allow a preset time to pass before unlatching the fault. Meanwhile the RTU may block the reset operation based on the number of "VFD Not Ready"' conditions exceeded the limit (refer to Section 3.2.1.8).

For convenience, when the soft starters were replaced be the VFDs, the motor line contactor and thermal overload were left in circuit on the line side of the VFD. The contactor now provides safety isolation for the motor circuit when the Emergency Stop or Local Control Switch is operated.

3.2.1.5 No Pump Failure Signal is On

If a "Pump Failure" signal is detected from the site, an alarm will be generated after a pre-defined time period has elapsed. This will make the pump unavailable for RTU control. The alarm will be monitored at the Newstead Central Control Room.

3.2.1.6 No Pump Thermal Overload Count Exceeded

The maximum number of times an overload is permitted to reset in any 8 (eight) hour period is selected by the operator from the master station. The selection shall be 0, 1, 2, or 3 (e.g., if 0 is selected, the pump shall lockout on the first overload). If the fault count gets upto the selected limit, a fault count exceeded flag will be set. This will lockout the pump and will make it unavailable for RTU control. The pump lockout will be cleared if one of the following conditions are met:

1. The Local pump fault reset push-button is pressed;

2. The Remote pump Fault reset is issued from the operator workstation.

3.2.1.7 No Pump Thermistor Fault Count Exceeded

The maximum number of times a thermistor is permitted to trip and be re-set in any 8 (eight) hour period is selected by the operator from the master station. The selection shall be 0, 1, 2, or 3 (e.g., if 0 is selected, the pump shall lockout on the first trip). If the fault count gets upto the selected limit, a fault count exceeded flag will be set. This will lockout the pump and will make it unavailable for RTU control. The pump lockout will be cleared if one the following conditions are met:

1. The Local pump fault reset push-button is pressed;

2. The Remote pump Fault reset is issued from the operator workstation.

3.2.1.8 No Pump VFD Fault Count Exceeded

The maximum number of times a VFD Not Ready signal is permitted to trip and be re-set in any 8 (eight) hour period is selected by the operator from the master station. The selection shall be 0, 1, 2, or 3 (e.g., if 0 is selected, the pump shall lockout on the first trip). If the fault count gets upto the selected limit, a fault count exceeded flag will be set. This will lockout the pump and will make it unavailable for RTU control. The pump lockout will be cleared if one the following conditions are met:

1. The Local pump fault reset push-button is pressed;

2. *The Remote pump Fault reset is issued from the operator workstation.*

3.2.1.9 Pump Well Not Flooded

The sump pump shall start when the high level probe is reached. A sump pump running warning shall be initiated and displayed on the operator workstation. The sump pump shall continue to run until the level falls below the low level probe.

Both main pumps shall be locked out in the event of the pump well flooding. This is activated by a level probe at the pump well sump. Pump well flooding also initiates an alarm. The pump lockout condition can only be cleared by pressing the LOCAL RESET pushbutton at the switchboard.

3.2.1.10 Pump Emergency Stop Not Operated

Upon detection of the operation of the pump EMERGENCY STOP pushbutton via RTU digital input, the Pump Emergency Stop Flag will be latched on and the pump will be unavailable. If the station is in REMOTE, the flag will remain latched on until the EMERGENCY STOP pushbutton has been released and either the pump LOCAL RESET pushbutton has been operated or the station is switched to LOCAL. If the station is in LOCAL the flag will remain latched on until the EMERGENCY STOP pushbutton has been released.

Refer to DSDDS for more details and control algorithm.

3.2.1.11 No Pump Reflux Valve Failed Signal On

The RTU will monitor the pump reflux valve microswitch digital input when the pump is both running and stopped.

The reflux valve microswitch contact states will be as follows:

Pump Stopped	- Reflux Down & Reflux Microswitch Contact CLOSED
Pump Running	- Reflux Up & Reflux Microswitch Contact OPEN

On pump startup, an RTU reflux microswitch timer of 30 seconds shall be started. If the reflux valve fails to open within this time period, then the reflux valve fail to open flag will be latched on and the pump shall stop and become unavailable for RTU control. If a pump is running, and the reflux valve closes, and remains closed for 30 seconds, then the reflux valve fail to open flag, will be latched on and the pump shall also immediately stop and become unavailable for RTU control.

If the pump reflux fails to open, the pump reflux fail to open delay reset timer will start. The Pump Reflux Valve Fail To Open fault will be unlatched if any of the following three conditions are true:

1) The local reset pushbutton is pressed

2) A reset from the operator workstation occurs

3) The pump reflux fail to open delay reset timer times out. This will be indicated by the pump reflux fail to open fault auto reset flag being active.

If a pump stops and the reflux valve fails to close within a set time period, only an alarm "Pump Reflux Valve Closing Fault" flag will be generated on the operator computer. This condition will not cause the pump to become unavailable for RTU control. The closing fault will be cleared based on conditions 1 and 2 above.

3.2.1.12 No Pump Reflux Valve Failed Count Exceeded

The maximum number of times the reflux valve is permitted to trip in any 8 (eight) hour period is selected by the operator from the master station. The selection shall be 0, 1, 2, or 3 (e.g., if 0 is selected, the pump shall lockout on the first trip). If the fault count gets upto the selected limit, a fault count exceeded flag will be set. This will lockout the pump and will make it unavailable for RTU control. The pump lockout will be cleared if one the following conditions are met:

1. The Local pump fault reset push-button is pressed;

2. The Remote pump Fault reset is issued from the operator workstation.

3.2.2 Pump Start / Stop Sequence

The pump individual control function monitors any request for the pump to start and/or stop. This results in the issuing of a start or a stop control to the pump.

The duty/Lag configuration will now allow one or both pumps to operate.

The primary duty pump will start if all the following conditions are true:

1) the pump is available for RTU control
2) the pump is not locked out
3) the pump, is requested to run

The pump will stop if any of the following conditions are true:

1) the pump, is requested to stop
2) the pump is no longer available RTU control

When the station is switched to local, any running pump will be stopped and the RTU will perform no automatic pump controls until the station is returned to remote.

With the station in local, the pumps can be started via the "Start" pushbutton. The pump will run only while the "Start" pushbutton is pressed.

The start-up sequence for a pump will be executed in the following manner:

- Wet well level transmitter signal reaches an intermediate value *or in local and the Start button is pressed.*
- *Check that the isolating contactor is closed, if not then energise the contactor closing relay.*

1.1.1.1 After a time delay of 10 seconds, energise VFD Run/Stop relay. The VFD ramps to minimum running speed (set within the PLC NOT the VFD) in 0 - 20 secs, VFD running relay changes state to indicate the pump is running. Set VFD fail to ramp timer at 30 secs delay (initially).

- *Reflux Valve Limit Switch delay timer (0 - 35 secs) is energised.*

- *If the Reflux Valve Limit Switch breaks before Reflux Valve Limit Switch delay timer expires, then the energised run relay remains energised.*
- *Pump running light on local panel is energised and hours run meter is started.*

The stop sequence for a pump will be executed in the following manner:

- Wet Well Level is at its common stopping point or *in local and the Stop button has been pushed*
- *De-energise VFD Run/stop relay, VFD deceleration is initiated.*
- Start reflux timer (0 - 60 secs) delay.
- *Once the VFD has ramped down to 0 Hz, the VFD running signal will be inactive.*
- Run light on local panel is de-energised and hours run meter is stopped.

Note: for normal stop mode of operation the Contactor will remain closed after the stop sequence is completed.

The Emergency Stop sequence for a pump will be executed in the following manner:

- Local Emergency Stop push-button is pressed.
- This will open the LINE Contactor via its hard-wired circuits.
- *De-energise VFD Run/stop relay, VFD deceleration is initiated but pump will coast to a stop.*
- Run light on local panel is de-energised and hours run meter is stopped.

3.2.3 Pump Abnormal Operation

If the RTU is not available, the pump station will not be operational. In case of emergency with the RTU down, electrician (only) may operate a pump locally, by bridging the line contactor close control circuit and then selecting the VFD to Local mode on its keypad this will allow the VFD to be started via its start button on the keypad.

3.3 RTU Functionality

3.3.1 RTU Alarms and Calculations

The following is a summary of the alarms and calculations performed in the RTU:

1. Station Power Fail Alarm
2. RTU Power Fail Alarm
3. RTU Low Battery Alarm
4. Wet Well Level
5. Wet Well Volume
6. Wet Well Monitor
7. Wet Well Inflow And Inflow Integration
8. Wet Well Overflow Volume
9. Wet Well Surcharge Probable Alarm
10. Wet Well Surcharge Imminent Alarm
11. Wet Well Surcharge Occurrence Duration And Alarm
12. Flow Rate Conversion
13. Delivery Flow Rate Monitor
14. Flow Rate Integration

15. Pressure Measurement Conversion
16. Delivery Pressure Monitor
17. Pump Availability
18. Pump Running
19. Pump Number Of Starts
20. Pump Hours Run
21. Pump Thermal Overload
22. Pump Thermistor Fault
23. Pump Reflux Valve Failure
24. *Pump Variable Frequency Drive Warning*
25. *Pump Variable Frequency Drive Not Ready*
26. Pump Emergency Stop
27. Pump Lockout Due To Pump Well Flooded
28. Plant Availability Index for Pumps
29. Plant Utilisation Index for Pumps
30. Hydraulic Power Consumption
31. Electrical Power Consumption
32. Motor Current Monitor
33. Motor Power Monitor
34. Motor Efficiency
35. *Pump Not in Auto Mode*
36. *Pump Running Speed*
37. *Pump Speed Control*

A brief description of each item is given below. For full functional description and control algorithm of each of these alarms or calculations refer to DSDDS document. The items shown in *Italics* are new modifications and their functional description is given in full.

3.3.1.1 Station Power Fail Alarm: (Refer to Section 3.2.1.1);

3.3.1.2 RTU Power Fail Alarm

When a "RTU Power Failure" (derived from battery charger input under voltage) signal is detected from the site, an alarm will be generated after a pre-defined time period has elapsed. The alarm will be monitored at the master station.

3.3.1.3 RTU Low Battery Alarm

When a "Battery LOW" signal is detected from the RTU battery, an alarm will be generated after a pre-defined time period has elapsed. The alarm will be monitored at the master station.

3.3.1.4 Wet Well Level

The Wet Well level is derived from the standard 4-20mA analogue signal scaled in MAHD (Metres Australian Height Datum). For every level probe signal, the level input is validated and latched at the 4-20mA boundaries for display purposes.

The level readings will be clamped and alarmed at the minimum and maximum levels of the level probe with a preset percentage variance. A level average figure will be calculated over a 5 by 5 second sampling periods.

3.3.1.5 Wet Well Volume

The Wet Well Volume is derived from the Wet Well Level. The level is compared against an adjustable look up table that derives a volume based on level segment entries.

3.3.1.6 Wet Well Monitor

The filtered wet well level will be checked for operator adjustable limits. At RTU initialisation the limits will be set to default values stored in the RTU.

3.3.1.7 Wet Well Inflow And Inflow Integration

Flow into the wet well will be calculated using the wet well level. From the wet well level signal and using provided constants, the storage value (in cubic metres) for any wet well level can be determined. At constant specified periods an increase in storage capacity will be calculated for that period. The increase will be converted to litres per minute inflow value. This calculation will only occur when the pumps are not in operation.

During times when a pump is operating, and for a defined period after the pump has stopped, the inflow will be kept constant at the value prior to the pump operation.

The measured inflow shall be integrated to give cumulative total, in kiloLitres (kL), of the flow through the sewage system site. The daily flows shall be used in reports.

Integration of the flow during periods where the Wet Well Level signal is determined to be invalid will use a zero value for Flow Rate.

3.3.1.8 Wet Well Overflow Volume

The overflow volume shall be calculated during the overflow incident from the time that the level is above the overflow level and from the look-up table relating the volume flowing through the overflow to this height. The overflow volume shall be recorded for use in reports.

The overflow volume calculation shall be performed every 5 seconds when a surcharge is occurring.

3.3.1.9 Wet Well Surcharge Probable Alarm

A "surcharge probable" alarm for each wet well level will be generated when the predicted time to overflow is 30 minutes or less. For a particular wet well, the alarm calculations shall be initiated when the level in the wet well is above the highest pump cut-in level and shall be reset when the level falls below this level.

The rate of change in level shall then be calculated over a rolling 5 minute period.

From the actual level in the wet well, the overflow level and the rate of change of level, a predicted time to overflow shall be calculated. If this time is less than 30 minutes, an alarm shall be generated.

This alarm shall be used to initiate an indication on the detail pageof the time of day when the predicted surcharge will occur (ie. time of day of alarm plus predicted time until surcharge).

3.3.1.10 Wet Well Surcharge Imminent Alarm

A "surcharge imminent" alarm for each wet well level will be generated when the "Surcharge Imminent" level switch, mounted 300mm below the overflow level is activated.

Note that the Surcharge Imminent Alarm is not raised if a Wet Well Calibration is in progress (refer to Section 3.3.2.3). This is due to the Calibration using the Surcharge Imminent Electrode as the sequence terminator.

Once activated, an alarm dead band shall maintain this alarm active for a minimum period of ten (10) minutes.

3.3.1.11 Wet Well Surcharge Occurrence Duration And Alarm

A surcharge occurs when the sewage level is at or above a level 25mm below the overflow level. Once this alarm has been activated, an alarm dead band shall maintain this alarm for a minimum period of ten (10) minutes.

The surcharge incident duration shall also be calculated. The duration of a surcharge incident shall be defined as the time from which a "surcharge occurring" alarm becomes active until the same alarm becomes inactive. The beginning time and the end time of the surcharge incident shall be recorded for use in reports.

3.3.1.12 Flow Rate Conversion

The flow rate is derived from standard 4-20mA analogue signal scaled in litres per second (L/sec). For every flow meter signal, the "Flow Rate Conversion" is performed to get the equivalent flow rate in kilolitres per day (kL/day).

Flow rate readings will be clamped at the minimum and maximum flow rate of the flow meter range with a preset percentage variance.

3.3.1.13 Delivery Flow Rate Monitor

The Delivery Flow Rate Alarm function will monitor flow rate signal from Delivery Flow Meter. Flow meter signals exceeding alarm limits will cause alarms to be generated.

Flows which are calculated from pump characteristics shall not be alarmed.

Separate high and low alarms shall be provided for each single and parallel pump combinations.

Example, for a Two-Pump System

For Flow Meter X, the alarm limits used are:

i) with one Pump running alone:	One Pump - High Flow Limit, and One Pump - Low Flow Limit,
ii) with two Pumps running:	Two Pumps - High Flow Limit, and Two Pumps - Low Flow Limit,

The alarming for flow meter shall be inhibited when there are no pumps running to avoid nuisance

alarms.

When any one pump, begins to run or stop, the Flow Meter Inhibit Alarm Timer (set to 30 secs) shall begin timing. The alarming for flow meter shall be temporarily inhibited until after this timer expires.

The Flow Meter Alarm Inhibit Flag will be reset when the alarming for flow meter is inhibited and set when alarming is activated.

3.3.1.14 Flow Rate Integration

The flow rate from the pump station flow meter shall be integrated to give a total flow reading in kilolitres (kl).

The RTU shall calculate and retain total flow figures, similar to an ordinary flow meter, with sufficient significant figures for at least one year consumption.

Facilities shall be provided for the operator at the workstation to overwrite the calculated figures to correct errors. This includes the resetting of the total flow figure to zero.

The system shall also flag "invalid" readings due, for example, the loss of input signal from the associated flow meter. Invalid flow rate readings will not be included into the integration calculation. The total flow figure will, however, be flagged as "invalid".

The volume invalid signal will not be automatically reset after the flow rate signal comes good. All recorded data for the period that the flow rate input signal was invalid shall be flagged as "invalid" reading. The invalid signal will be reset after an updated value followed by an overwrite signal is applied to the volume figure or the volume figure is reset to zero.

At predefined periods the accumulated volume shall be reset to zero for accumulation calculations for the next period. (ie. Water flow meters will be reset once a year, where as sewage flow meters will be reset daily).

The flow integration shall be performed every 5 seconds.

3.3.1.15 Pressure Measurement Conversion

The Pressure Measurements Conversion will calculate the equivalent pressure in kiloPascals (kPa) and Metres Above Australian Height Datum (MAHD). The field input shall be read as kPa.

Pressure readings will be clamped at the minimum and maximum pressure readings for the pressure gauge range with a preset percentage variance.

The pressure in kPa is required to be converted to Meters Water Gauge (MWG).

Conversion to MWG

Pressure kPa is converted to MWG by dividing by a conversion factor.

Pressure (MWG) = Pressure (kPa) / k

Where: - Pressure (kPa) is the engineering units signal from the pressure transmitter in kPa units.

- Pressure (MWG) is the pressure in meters water gauge.
- k is the kPa to MWG conversion factor of 9.803.

Conversion to MAHD

The pressure MAHD is calculated by adding the elevation value of the pressure transducer to the pressure measurement:

Pressure (MAHD) = Pressure(MWG) + Ep(MAHD)

where: - Pressure (MWG) is the pressure in metre unit.
- Ep(MAHD) is the elevation of the pressure transducer
- Pressure(MAHD) is the pressure in MAHD unit

3.3.1.16 Delivery Pressure Monitor

The Delivery Pressure Alarm function will monitor pressure signals from Delivery Pressure meter. Pressure signals exceeding alarm limits will cause alarms to be generated.

Separate high and low alarms shall be provided for each single and parallel pump combinations.

Example, for a Two-Pump System

For Pressure meter X, the alarm limits used are:

i) with one Pump running alone:	One Pump - High Pressure Limit, and One Pump - Low Pressure Limit,
ii) with two Pumps running:	Two Pumps - High Pressure Limit, and Two Pumps - Low Pressure Limit,

The alarming for pressure meter shall be inhibited when there are no pumps running to avoid nuisance alarms.

When any one pump begins to run or stop, the pressure Inhibit Alarm Timer (set to 10 secs) for the pressure meter shall begin timing. The alarming for the pressure meter shall be temporarily inhibited until after the time expires.

The Pressure Alarm Inhibit Flag will identify the alarming inhibited period. The Pressure Alarming Enabled Flag will identify when alarming is required (ie. a pumps is running).

3.3.1.17 *Pump Availability* (Refer to Section 3.2.1.);

3.3.1.18 Pump Running

The Pump Running function will determine whether a particular pump is running or stopped by monitoring the Pump Variable Frequency Drive "VFD Running" digital input.

The function will set the pump running flag if the pump is running or reset the same flag if the pump is stopped.

3.3.1.19 Pump Number Of Starts

This function is NOT required at Kooringal Drive as the starters are VFD's.

The Pump Number Of Starts function will monitor and calculate the number of pump starts that have occurred since reset.

A pump, when selected in remote, is only permitted 12 starts within any 1 hour period. To ensure this limit is not exceeded, the pump will not be permitted to start again for five (5) minutes after the pump completes a full start-up sequence. This will ensure that only a maximum of 12 pump starts can occur for each pump every hour.

In the event of a surcharge, or the pump being selected is in LOCAL, this lockout will be disabled allowing the pump to start.

3.3.1.20 Pump Hours Run:

The Pump Hours Run function will monitor the number of hours that is run by a pump.

3.3.1.21 *Pump Thermal Overload* (Refer to Section 3.2.1.2);

3.3.1.22 *Pump Thermistor Fault* (Refer to Section 3.2.1.3);

3.3.1.23 *Pump Reflux Valve Failure* (Refer to Section 3.2.1.12);

3.3.1.24 *Pump Variable Frequency Drive Warning* (Refer to Section 3.2.1.4);

3.3.1.25 *Pump Variable Frequency Drive Not Ready* (Refer to Section 3.2.1.4);

3.3.1.26 *Pump Emergency Stop* (Refer to Section 3.2.1.11);

3.3.1.27 *Pump Lockout Due To Pump Well Flooded* (Refer to Section 3.2.1.10);

3.3.1.28 Plant Availability Index for Pumps

A progressive monthly plant availability index shall be calculated for each group of functionally related plant. An item of plant is said to be "available" whenever normal operation is possible, i.e., when the following conditions are true:

1- the equipment is available for normal operation (ie. not local, power available and no tripped faults).
2- the equipment is not locked out and a request to operate has been made.

For each item of plant, including sewage pumps, and remote controlled valves, the times and dates of changes in the "plant availability" shall be recorded for use in the calculation of a plant availability index.

NOTE: The time and date of changes in the "plant availability" will be stored in an analogue history buffer at the master station. A process called "histproc" will handle this functionality.

At any instant, percentage availability "A" shall be given by:

A = (Capacity Available / Capacity Installed) x 100

The plant availability index shall be the progressive mean of "A" above, reset at the beginning of every month.

A low priority "station outage" alarm shall be produced and used to initiate reports when the plant availability for the group of functionally related plant falls below an operator adjustable minimum percentage.

The intention is that the alarm should indicate when insufficient plant is available for normal design operation. For example, in a site with three pumps where one is normally for Lag, the alarm shall be initiated when the plant availability is less than 2/3.

3.3.1.29 Plant Utilisation Index for Pumps

A progressive monthly plant utilisation index shall be calculated for each group of functionally related plant. An item of plant is said to be "utilised" when it is operating normally, i.e., pump is on-line or running.

At any instant, the percentage utilisation "U" shall be given by:

U = (Capacity Operating / Capacity Installed) x 100

The plant utilisation index shall be the progressive mean of "U" above, reset at the beginning of every month.

3.3.1.30 Hydraulic Power Consumption

The Hydraulic Power Consumption will be used to calculate Motor Efficiency as explained in Section 3.3.1.33.

Daily hydraulic power consumption shall be calculated for each single pump from the product of pressure and flow as follows:

Ph = K * Fe * M * dT

where:
- Ph - the hydraulic power consumption (kWHr)
- Fe - the pump delivery flow rate (L/S) derived (see "Flow Estimation")
- M - the differential pressure generated by the pump (see "Differential Pressure" over leaf)
- K - an estimated constant derived from the pump test characteristics relating the product of F * P to power (kW)
- dT - the number of hours in the integration period (24 hrs)

In order to calculate the hydraulic energy supplied by a pump, it is necessary to measure the differential pressure (M) and the estimated generated flow (Fe).

Flow Estimation, Fe

When a pump is operating singly, the flow used in the efficiency calculation shall be the measured flow from the flow meter signal.

When pumps operate in parallel, the flow for each pump shall be estimated according to the ratio of the nominal capacity of an individual pump to the total nominal capacity of all operating units:

$$Ct = Cn + Cn+1 + ...$$

$$Fen = (Cn / Ct) * Ft$$

$$Fen+1 = ((Cn + 1) / Ct) * Ft$$

where:
- Cn - nominal capacity of pump n
- Ct - total nominal capacity of all pumps operating in parallel
- Fen - estimated flow generated by pump n
- Ft - flow signal measured from the flow meter when all pumps are operating in parallel

Differential Pressure, M

The differential pressure can be calculated using pump delivery pressures less pump suction pressure:

M = DeliveryPressure - SuctionPressure
- or -
M = DeliveryPressure - ReservoirLevel(MAHD)
- or -
M = DeliveryPressure - WetWellLevel(MAHD)

where: M is the differential pressure generated by the pump

The calculations shall not be carried out when a pump is not operating i.e., the last calculated value shall be retained as the current value.

It shall be possible for the operator to readily adjust calculations and constants. Adjustments would, for example, be required when a pump is replaced or overhauled.

3.3.1.31 Electrical Power Consumption

The Electrical Power Consumption calculation will work out the electrical power consumption of each pump. Power consumption shall be calculated using the motor kW readings and by integration over the operating time.

$$Pe = P * dT$$

where:
- Pe - the electrical power consumption (kWHr)
- P - power (kW) reading
- dT - the number of hours in the integration period Daily electrical power consumed for each single pump shall be calculated.

The calculations shall not be carried out when a pump is not operating i.e., the last calculated

value shall be retained as the current value.

It shall be possible for the operator to readily adjust calculations and constants. Adjustments would, for example, be required when a pump is replaced or overhauled.

3.3.1.32 Motor Current Monitor

The Motor Current sequence will monitor the motor current signal and generate appropriate alarms. High and low alarms shall be provided for each motor current monitored.

Alarms shall be inhibited when the pump is off. Alarms shall also be inhibited for a given period of time after the pump starts running.

Each pump will have individual operator adjustable time delay period initially set to 30 seconds.

3.3.1.33 Motor Power Monitor

The Motor Power function will monitor the motor power (kW) signal, perform signal filtering, and generate appropriate high and low alarms for each pump.

Each single and parallel pump combinations have separate upper and lower alarm limits.

The alarming for a given pump, shall be inhibited when the pump stops running. The high and low alarm flags shall not cause any control action to be initiated, e.g., stopping a pump already running.

When another pump starts to run, the Pump Power Inhibit Alarm Timer (set to 30 secs) for the operating pump shall begin timing. The alarming for pump pmpX shall be temporarily inhibited until after the timer times out.

The Pump Power Alarm Inhibit Flag will be set when the alarming for pump is inhibited and reset when alarming is activated.

3.3.1.34 Motor Efficiency

The motor efficiency will be calculated as the ratio between the hydraulic power consumption, Ph, over the electrical power consumption, Pe, measured over the same period of time:

$$Ee = \frac{Ph}{Pe} \times 100$$

where: Ee - percentage motor efficiency
Pe - electrical power consumption
Ph - hydraulic power consumption

Separate efficiency calculations shall be carried out for each pump.

3.3.1.35 Pump Not in Auto Mode (Refer to Section 3.2.1.5);

3.3.1.36 Pump Running Speed

Each pump VFD will provide a 4-20mA analog input to the RTU to indicate the pump running speed. The RTU will transfer this signal to Newstead for monitoring purposes.

3.3.1.37 Pump Speed Control

When the pumping station is in Remote mode, the pump speed will be controlled by the RTU as explained in Section 3.3.2.5.

When the Selector Switch is in Local, the pump speed will be controlled by the speed potentiometer as in Section 3.3.25 & 3.2.1.4.

3.3.2 RTU Controls and Sequences

The following is a summary of the controls and sequences performed in the RTU:

1. Site Attention Alarm
2. Cathodic Protection Test Sequence
3. Wet Well Level Instrument Calibration Check
4. Pump Duty Selection
5. Pump Station Control
6. Pump Individual Control
7. Pump Status Indication Lamp
8. Chemical Dosing Pumps
9. Chemical Dosing Pumps (Other Site)

Refer to DSDDS Section 3.2 for details of each control or sequence. Presented below are a brief description of each item and its functionality.

3.3.2.1 Site Attention Alarm

The site has been provided with an "attention alarm" and a local "acknowledge" pushbutton.

Operators shall be able to initiate and cancel the "attention alarm" from the detail displays at the workstation. Officers on site will be required to contact the relevant control room by radio or telephone when they see the alarm.

Once activated, the attention alarm shall remain on for an operator adjustable period (initially set to 15 minutes) and then reset automatically if not already reset by the control room operator or by the operation of the local "acknowledge" pushbutton.

3.3.2.2 Cathodic Protection Test Sequence

The Cathodic Protection Test Sequence will control the cathodic protection equipment and monitor its performance.

The monitoring and control sequence shall be as follows:

a) The digital input "CP door" shall be continuously monitored and logged upon a change of state. The digital input "CP power available" shall be continuously monitored and, upon change of

state, logged and alarmed.

b) The rectifier voltage and current shall be continuously monitored and alarmed and logged if the values are above or below alarm limits. These alarm limits shall be readily adjustable by the operator from the control page. Upon the above alarm being initiated, the rectifier unit shall be de-energised via the digital output "De-energise CP rectifier unit", until the local or remote reset is activated.

c) At predetermined times, selectable by the operator from a control set-up page on the workstation, a test sequence shall be initiated. It shall also be possible to initiate a sequence at any time by "manual" selection. It is likely that the sequence will be initiated no less frequently than once a month or more frequently than once every 12 hours, i.e.

12 hours <= time between test sequences <= 1 month.

d) When the test sequence is initiated, the digital output "Connect CP reference electrodes" shall be energised. After this relay is energised, the reference electrode "on potential" voltages shall be monitored, logged and alarmed if the values are above or below alarm limits. These alarms shall be readily adjustable by the operator from the control page.

e) Upon completion of the above and after a time delay of one second, the digital output "De-energise CP rectifier unit" shall operate, causing the reference voltage to decay. After an operator adjustable time delay, of between 0.1 and 60 seconds, the analog "off potential" shall be monitored, logged, and alarmed if the values are above or below limits. Theses alarm limits shall be readily adjustable by the operator from the control page.

f) After the completion of the above, the relay "Connect CP reference electrodes" and relay "De-energise CP rectifier unit" shall de-energise and the sequence returns to the start.

3.3.2.3 Wet Well Level Instrument Calibration Check

The controls for each sewerage pumping station shall include a Wet Well "Calibration Check" sequence. This sequence is used to check the validity of the level probe reading.

The sequence shall either be initiated remote manually (by an operator) or automatically (on a monthly basis at predetermined times and dates). The automatic start of the calibration shall still require operator confirmation before starting; this is to cater for wet weather conditions.

It shall be possible for the operator to readily inhibit automatic and manual operation.

Once a calibration check is initiated, the following shall occur:

1) The sequence shall not start until the wet well level reaches the lowest pump stop level and all pumps have stopped.

2) Normal controls and related level alarms shall be inhibited and the pumps shall be stopped.

3) The level in the wet well will increase until the "surcharge imminent" electrode is reached. The level of the wet well shall be recorded at this point and compared with the known level of the "surcharge imminent" electrode. An alarm shall be generated if the level is not within 25mm of the surcharge electrode level.

4) The pump or pumps shall start.

5) A short time delay shall be allowed for the level to fall during which time normal level alarms shall remain inhibited.

6) Control and associated alarms shall then return to normal.

During the calibration the following actions can take place:

1) The operator can inhibit / stop the calibration sequence.

2) If a site worker switches the pumps to local mode while the calibration sequence is in progress, the sequence is suspended.

3) The operator is notified of the suspension. Once the pumps have returned to remote mode the calibration shall restart from the beginning of the sequence, only after acknowledgment from the operator.

4) If the duration of a calibration sequence exceeds 8 hours the operator shall be notified.

3.3.2.4 Pump Duty Selection

The Pump Duty Selection function will monitor the availability of both pumps and control the rotation of the pumps so that the Duty Pump is rotated every time the current Duty Pump starts and then eventually stops. It is also rotated whenever the duty pump is unavailable.

The true duty pump will be known as "Duty Pump". The second operational duty pump will be known as "Lag Pump".

3.3.2.5 Pump Station Control :

The pump station can operate in two modes as follows:

- Remote (Auto Mode), and
- Local Manual.

These modes are selectable via a selector switch mounted on the switchboard. When Remote is selected, the control of the pump station will be based on the current state of the sewage wet well level with the station operating on a duty/Lag configuration.

When the pump station is in Remote mode, remote manual operations are also available to the Newstead operators and a pump can be started or a running pump can be stopped.

When the pump station is in Local mode, any of the pumps can be started or stopped via local start/stop push-buttons mounted on the switchboard in combination with the manual speed

potentiometer.

3.3.2.5.1 Pump Station Auto Control :

Control of the pump station will be based on the current state of the wet well level with the pumps operating on a Duty/Lag configuration. Under normal conditions, with the wet well rising and the wet well level and flow signals valid, the site will pump in a combination of level and flow control affected by a Proportional/Integral/Derivative (P.I.D) Controller that will reside in the RTU.
In the event of a failure of the wet well level probe, all pumps will immediately stop.

The set points will be as follows:

Wet Well Level	Indicator %	Metres AHD	Function
			Minimum speed = 28 Hz ≈ 60l/sec? *Maximum speed = 31 Hz* = 140 l/sec? *Minimum flow = 60 l/sec?* *Maximum (station) flow =140 l/sec?*
		9.530 m	Probable Slab Level
		9.277 m	Probable Probe suspension level
			Probe length 9.500 m
3.000 m	100%	2.777 m	Probe upper range 20mA
0.000 m	0%	-0.223m	Probe lower range 4 mA Probe length 9.500m
2.663m	88%	2.440m	Surcharge
2.370m	79%	2.147m	Surcharge Imminent Alarm
2.323m	77%	2.100m	Start lag pump. At the same speed as the lead pump..
2.223m	74%	2.000m	The PID output will have reached 100 % ie the lead pump is running at 50Hz.
2.023m	67%	1.800m	Set Point. Invert level of inlet pipe-work in wet well

1.923m	64%	1.650m	Start duty pump at minimum speed. PID control is enabled after a delay of 45 sec. This enables the flow to stabilise and acts as an anti - integral wind-up function. Once activated this remains in activation until the pump stops
1.473m	49%	1.250m	Stop Lag Pump
0.450m (BWL)	15%	0.227m	Stop duty pump

The lead pump will be requested to start at minimum speed (this speed will be a set constant and will be used in all Auto PLC controlled conditions as the pump minimum speed.) when the wet well level exceeds the start duty pump level.
The pump will continue to run at minimum speed until a delay period expires to allow for stabilisation. The set point shall be the PID control level.

A wet well level PID control loop shall cascade to a flow PID control loop where the output of the level loop controller shall be the set-point for the flow loop controller.
Pump speed shall be capable of varying from minimum speed to maximum speed.

The modulating PID control will continue until the stop duty pump level is reached.

Should the level rise to the lag pump start set point the lag pump shall start. The flow controller shall then control both pumps at the same speed determined by the calculated PID speed.
Both pumps will continue to run until the wet well level drops to the Stop Lag Pump level Set point for a time period (initially set to 30 seconds). At this point the lag pump will stop. The lead pump will continue to run as described above.

3.3.2.5.2 Maximum Station Flow *:*

The station output flow will be limited when either 1 or 2 pumps are operating to the "Maximum Station Flow" value.
The "Maximum Station Flow" value will be determined on site based on the pump capabilities.

Note: 2 pumps operating together and delivering "Maximum Station Flow":
1. Are more efficient than 1 pump operating at the extremity of its pump curve. (The input power to output work ratio is better)
2. Is less likely to cause the pumps to cavitate and therefor wear or damage the impellor.
3. Will only occur in when one pump would be required to run for an extended period of time.

3.3.2.5.3 Surcharge imminent electrode:

Surcharge imminent electrode:

On activation of the surcharge imminent electrode
the lead pump will start, a surcharge imminent alarm shall immediately be sent to the operator. This function while active shall override the wet well control.
The lead pump will operate at 100% speed until the surcharge imminent electrode goes inactive and has been inactive for a time period (initially set to 3 minutes).

In Remote mode, "Time" controls shall also be provided to enable pumps to be started or stopped according to the time of day. For example, time restrictions will apply to automatic pump operation during ENERGEX peak periods. A "Start Time Control" will be issued prior to the peak period time to ensure that the wet well is empty just prior to the start of the period.

Likewise, prior to the end of the peak period, any pumps operating will be stopped to try and have the wet well as full as possible. If correctly calibrated, pumping will resume once in the ENERGEX off-peak period.

Once a sewage pump has been started or stopped from a time controller or remote manual operation, control shall return to the normal set point profile level control.

Pump start control will be temporarily inhibited while the Wet Well Level Instrument Calibration Check is in progress (refer Section 3.3.2.3).

Should the current duty pump fail to start, thereby becoming unavailable for RTU control, the Lag pump shall be available to start immediately based on the wet well level set-points.

3.3.2.5.4 Auto Mode Flow Meter Failure:

In the event of a failure of the flowmeter, an alarm shall be generated at the operators SCADA system. An additional level only PID loop controller shall become the speed control output for the VFD's bypassing the flow loop..
Control shall remain as 3.3.2.5.1.

3.3.2.5.5 Slime Stripping:

The Centenary Hwy Sewage Pumping Station does not require any modification to achieve slime stripping, because the slime stripping flows in the Rising Main occurs when Fortrose Street Pumping Station operates at the same time. This is a relatively likely event (estimated to occur

15% of the time during PDWFs). The capacity increase at the Centenary Hwy Sewage Pumping Station will further improve the slime stripping process in the Rising Main.

3.3.2.6 *Pump Individual Control:* Refer to Section 3.2.

3.3.2.7 Pump Status Indication Lamp:

The Pump Status Indication Lamp RTU output will remain steady on if the pump has completed its start up sequence and the pump VFD running input is active. The lamp will remain active until this signal becomes inactive.

The pump status indication lamp will flash slow (1 sec on / 1 sec off) if the pump is unavailable for RTU control. The lamp will cease to flash slow when the pump becomes available for RTU control.

The pump status indication lamp will flash fast (0.3 sec on / 0.3 sec off) if the pump is locked out due to the lock out timer not expired. The lamp will cease to flash fast when the lockout timer expires.

3.3.2.8 Chemical Dosing Pump (Centenary Hwy)

This site has been installed with Hydrogen Peroxide dosing equipment. The RTU shall control the dosing pump via digital output. The dosing pump will operate when any of the main sewerage pumps are operating.

3.3.2.9 Chemical Dosing Pumps (Other Site)

This site has been installed with Hydrogen Peroxide dosing equipment for Fortrose Street Sewage Pumping Station. The RTU shall run the dosing pump via a digital output when the Fortrose Street Pumping Station is operating.

3.3.3 Summary of RTU Generated Alarms

The following alarms will be generated by the RTU and sent to the Newstead Central Control Room. Most of these alarms are point attributes that are set and reset using handlers in the RTU. Some, however, are actual digital inputs (DIT) and pseudo digital inputs (DIP) allocated a channel in the RTU.

Code	Alarm Description	Type
stnXmainsFail	Power Fail Alarm	DIP
rtuXmainsFail	RTU Power Fail Alarm	DIP
rtuXbatteryAlarm	RTU Battery Alarm	DIP
wwlXlevelInvalid	Wet Well Level Invalid	DIP
wwlXhighAlarm	Wet Well High level	DIP
wwlXlowAlarm	Wet Well Low Level	DIP
wwlXsurchPrbAlm	Surcharge Probable Alarm	DIP
wwlXsurchImmAlm	Wet Well Surcharge Imminent Alarm	DIP
wwlXsurchOccAlm	Surcharge Occurring Alarm	DIP
flwXinvalid	Flow rate invalid	DIP
flwXlowAlarm	Flow rate Low Alarm Flag	DIP
flwXhighAlarm	Flow rate High Alarm Flag	DIP

flwXvolInvalid	Volume Invalid Flag	DIP
preXinvalid	Pressure invalid flag	DIP
preXalarmInhibit	Pressure Alarming Inhibited	DIP
preXlowAlarm	Pressure Low Alarm Flag	DIP
preXhighAlarm	Pressure High Alarm Flag	DIP
pmpXthmlFault	Thermal Overload Fault Flag	DIP
pmpXthmlReset	Thermal Overload Fault Auto Reset Flag	DIP
pmpXthmlExcd	Thermal Overload Fault Count Exceeded Flag	DIP
pmpXthmstrFault	Thermistor Fault Flag	DIP
pmpXthmstrReset	Thermistor Fault Auto Reset Flag	DIP
pmpXthmstrExcd	Thermistor Fault Count Exceeded Flag	DIP
pmpXrflxOpenFlt	Reflux Valve Fail To Open Flag	DIP
pmpXrflxOpenRst	Reflux Fail To Open Fault Auto Reset Flag	DIP
pmpXrflxCloseFlt	Reflux Valve Closing Fault Flag	DIP
pmpXrflxOpenExcd	Reflux Valve Fault Count Exceeded Flag	DIP
pmpXVFDFault	*V. F. Drive Not Ready Flag*	*DIP*
pmpXVFDExcd	*V.F. Drive Fault Count Exceeded Flag*	*DIP*
pmpXVFDReset	*V.F. Drive Trip Auto Reset Flag*	*DIP*
pmpXemergencyStp	Emergency Stop Pushbutton Fault Flag	DIP
pmpXlockout	Lockout Flag	DIP
pmpXpmpWellFlood	Pump Well Flooded Fault Flag	DIP
stnXoutage	Plant station outage alarm	DIP
pmpXcurrLoAlarm	Current Low Alarm Flag	DIP
pmpXcurrHiAlarm	Current High Alarm Flag	DIP
pmpXmotorPwrLoAl	Power Low Alarm Flag	DIP
pmpXmotorPwrHiAl	Power High Alarm Flag	DIP
cprXrectVoltLoAl	Rectifier Voltage Low Alarm	DIP
cprXrectVoltHiAl	Rectifier Voltage High Alarm	DIP
cprXrectCrntLoAl	Rectifier Current Low Alarm	DIP
cprXrectCrntHiAl	Rectifier Current High Alarm	DIP
cprXonPtnlLoAl	Refr Electrode On Potential Lo Alarm	DIP
cprXonPtnlHiAl	Refr Electrode On Potential Hi Alarm	DIP
cprXofPtnlLoAl	Refr Electrode Off Potential Lo Alarm	DIP
cprXofPtnlHiAl	Refr Electrode Off Potential Hi Alarm	DIP
wwlXcaliFault	Calibration Error Alarm Flag	DIP
wwlXcaliStrtReq	Operator Initiate Calibration Check Request	DIP
wwlXcaliFailed	Calibration Sequence Failed Flag	DIP
wwlXcaliAborted	Calibration Aborted Flag	DIP
wwlXcaliLocAbort	Calibration suspended due to Local Mode switch	DIP
wwlXcaliRemResum	Resume Calibration Check after Suspend Rqst	DIP
stnXoperate	Duty Pump Required to Operate	DIP
pmpXfault	Pump Failure Status	DIP

ATTACHMENT 1
DRAWING SCHEDULE

Drawing Nr	Title
486/5/6-S2069	Darra Branch & Darra Branch Duplication Sewers Overall Flow Diagram
486/5/7-HG001	Switchboard Pump Circuits Power & Metering Schematic (Sht. 1 of 8)
486/5/7-HG002	Sewage Pump No.1 Power & Metering Schematic (Sht. 2 of 8)
486/5/7-HG003	Sewage Pump No.2 Power & Metering Schematic (Sht. 3 of 8)
486/5/7-HG004	Switchboard RTU Digital I/O Schematic Diagram (Sht. 4 of 8)
486/5/7-HG005	Switchboard RTU Analog I/O Schematic Diagram (Sht. 5 of 8)
486/5/7-HG006	Switchboard Equipment and Label Schedule (Sht. 6 of 8)
486/5/7-HG007	Switchboard Cubicle Construction and General Arrangement (Sht. 7 of 8)
486/5/7-HG008	Switchboard Cubicle Construction and General Arrangement (Sht. 8 of 8)
486/5/7-HG009	RTU General Arrangement
486/5/7-HG010	RTU Cubicle Wiring Diagram (Sht. 1 of 2)
486/5/7-HG011	RTU Cubicle Power Supplies Connection Diagram (Sht. 2 of 2)
486/5/7-HG012	Dry Well Electrical Equipment General Arrangement
486/5/7-HG013	Dry & Wet Wells Plan Electrical Equipment General Arrangement

ATTACHMENT 2
ELECTRICAL DRAWINGS

MEMORANDUM

Brisbane City

Brisbane Water

Professional Services - Engineering
TC Beirne Centre
315 Brunswick Street Mall
Fortitude Valley, Brisbane, Qld 4006
GPO Box 1434
Brisbane, Qld 4001

Ph.: 07 3403 3261
Fax: 07 3403 0205

To: Peter Tranter, Jim Karydas, Henri Lai, Nev Stanton

Date:19/4/00

Attn:

CC:

From: **Owen Kennard**

Re: Kooringal Drive Pump Station

We are running into problems here which need to be overcome fairly quickly.

History

1 When run at 50Hz the initial impellers had an NPSH problem at around 120l/sec so smaller impellers had been fitted limiting flow to 110l/sec.

Changes now implemented

2 VSDs and a flowmeter were being installed to fulfill other requirements which allowed us to go to the largest impellers and limit flow with the VSDs.

3 These impellers were installed in the pumps to cope with the increased head they will see in the future as the catchment develops fully.

Situation

The pumps can not be run at more than 31Hz beyond which they begin to vibrate unacceptably. Both pump impellers have been changed and both show the same effects. Until now I had thought we had reached our NPSH flow limit of around 120l/sec and that we could limit output as planned [even though this had seemed a lower than expected frequency].

Today the flow meter has been commissioned and has changed the picture somewhat.

- It records flow at 31Hz is around 48l/sec and at 25Hz around 22l/sec.
- These points do accord with the original system curve envelope from Mike Seymour.
- They are well below Wet weather flow requirements.

Where to from here

Firstly there is some doubt about the flow meter calibration settings and these need to be sorted out asap [although given the points do fit my curve I doubt there is a problem with the flowmeter].

Secondly pressure gauges or transmitters should be set up on inlet and outlet lines - the pump flanges are tapped for these - so that we can be sure of what is going on.

The Problem

- Given the flowmeter readings are correct then the problem is **not** one of inadequate NPSH.

At 50l/sec the pump NPSHr is ~ 5m.

NPSHa is 9.8m +0.9m[TWL] -[friction losses ~1m] =9.7m.

Suction piping is a total of 6m of 300nb pipe including one bellmouth bend, one 22.5 elbow, a gate valve and suction reducer. Vel at 100l/sec =1.37m/sec. I believe also that you are operating above what was previously TWL by ~700mm.

Previously NPSH problems appeared at 120l/sec and we would expect that to happen again.

- Even though both pumps show the same effects I believe that the impellers are out of balance

Given the previous history even to the original installation we should be able to achieve the 108l/sec that we got with the turned down impeller.

SO I say check out our instruments, add the pressure readings for safety's sake and then if the results we need to strip the pumps out and check out alignment, bearings [I believe these were replaced] wear rings and impeller balance.

Regards
Owen Kennard

VFD Manuals

SEQEB
C.T. METERING
(TARIFF 23)
E N R W B

L1
L2
L3
N

SEQEB
3 PHASE, 415V SUPPLY
MAXIMUM PROSPECTIVE
3 PHASE FAULT LEVEL
3.5kA FOR 1 SEC.

01 250A MAIN CIRCUIT BREAKER

70kA

00

(NOTE 3) 02 CT1 5A 13 C13 08 TOL 1 06 V.F. DRIVE No.1 (NOTE 1) M 3~
250A
MAIN PUMP No.1
63kW
FLC=115A
CONTROL SCHEMATIC
REF DWG:- 486/5/7-HG002

(NOTE 3) 02 CT2 5A 13 C23 08 TOL 2 06 V.F. DRIVE No.2 (NOTE 1) M 3~
250A
MAIN PUMP No.2
63kW
FLC=115A
(NOTE 7)
CONTROL SCHEMATIC
REF DWG:- 486/5/7-HG003

03 (NOTE 3) C53 TDL 5 10 (NOTE 1) M 3~
16A
SUMP PUMP
2.2kW
FLC = 5A

SUB-DISTRIBUTION BOARD ISOLATOR
63A

525 TOL5-1 526 LCR5-1 527 C53 N5 LINE CONTACTOR

LCR5 51
L1 C HI LO L2
528 529
START 57
STOP 58 530
STOP
START

SUMP PUMP CONTRDL RELAY

(NOTE 3) 50 10A C73 TOL 7 12 (NOTE 1) N7 M 1~
CENTENARY HIGHWAY
DOSING PUMP No 1
0.33 kW
FLC = 1.9A

SUB-DISTRIBUTION BOARD

725 TOL7-1 726 RP71-1 727 C73 N7 LINE CONTACTOR

54 RP71 721+ 721-
FROM DDM2 CHANNEL 7
REF DWG:-
486/5/7-HG003

(NOTE 3) 50 10A C83 TOL 8 12 (NOTE 1) N8 M 1~
FORTROSE STREET
DOSING PUMP No 2
0.33 kW
FLC = 1.9A

825 TOL8-1 826 RP81-1 827 C83 N8 LINE CONTACTOR
FSIR

55 RP81 821+ 821-
FROM DDM2 CHANNEL 8
REF DWG:-
486/5/7-HG003

CONTINUED NEXT COLUMN

CONTINUED FROM PREVIOUS COLUMN

20 6A 670 671 672 PFR POWER FAILURE RELAY
PFR-1 607+ 607-
TO DIM1 CHANNEL 7
REF DWG:-
486/5/7-HG004

21 20A 673 674 675 3 PHASE 20 AMP OUTLET
22 10A 676 GPO (N11)
23 10A N11 677 PUMP WELL FLUORESCENT LIGHTS (N12)
24 2A 678 RTU LAPTOP G.P.O. (10A) (N13)
25 6A 679 SWITCHBOARD FLUORESCENT (DOOR SWITCHED) (N14)
26 6A N15 680 CATHODIC PROTECTION UNIT (NOTE 4)
27 10A N16 681 PUMP WELL VENTILATION FAN
28 6A N17 682 kW & CURRENT TRANSDUCERS AUX. SUPPLY
REF DWGS:- 486/5/7-HG002 & HG003
29 6A N18 683 RTU POWER SUPPLY
30 6A N19 684 FLOWMETER TRANSMITTER
REF DWG:- 486/5/7-HG005
31 6A N3 685 SPARE
31 6A N4 686 SPARE
31 6A N6 687 SPARE

LCR61 52
LCR61-1 608+ 608-
L1 C HI LO L2
TO DIM1 CHANNEL 8
REF DWG:- 486/5/7-HG004
N9 SURCHARGE IMMINENT ALARM
653 SURCHARGE IMMINENT ELECTROOE

LCR62 53
LCR62-1 610+ 610-
L1 C HI LO L2
TO DIM1 CHANNEL 10
REF DWG:- 486/5/7-HG004
N9 PUMP WELL FLOODED ALARM
654 ALARM ON

LEGEND:
- RELAY OR CONTACTOR COIL
- FIELD DEVICE
- R.T.U. FUSE TERMINAL
- R.T.U. LINK TERMINAL
- SWITCHBOARD TERMINAL
- CATHODIC PROTECTION TERMINAL
- RTU DIGITAL INPUT
- RTU DIGITAL OUTPUT
- RTU ANALOG INPUT (FUNCTION / ADDRESS)
- RTU ANALOG OUTPUT (FUNCTION / ADDRESS)
- 00 EQUIPMENT ITEM No.

1. MAIN PUMP DECONTACTORS, SUMP PUMP OUTLET & OXYGEN PUMPS OUTLETS ARE LOCATED IN UPPER SECTION OF PUMP WELL.
2. SWITCHBOARD NEUTRAL & EARTH BARS TO BE POSITIONED ADJACENT TO EACH DTHER IN CLOSE PROXIMITY TO THE MAIN INCOMING CIRCUIT BREAKER.
3. CIRCUIT BREAKERS RATINGS TO SUIT LOAD & ENSURE TYPE 2 COORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
4. CATHODIC PROTECTION - FUTURE. THIS UNIT TO BE SUPPLIED BY OTHERS. A 240V AC CABLE TO BE INSTALLED TO PROPOSED CATHODIC PROTECTION AREA TERMINAL STRIP FOR CONNECTION BY OTHERS.
5. THE VARIABLE FREQUENCY SPEED CONTROLLERS SHALL BE LOCATED EXTERNALLY TO THE SWITCHBOARD IN WALL MOUNTED CABINETS IN THE UPPER SECTION OF THE PUMP WELL.
6. THIS DRAWING HAS BEEN PRODUCED FROM ORAWING Nos:- E94-BM6000/A0 AND A1 REVISION E.
7. ALL ITEMS IN THE AREAS DELINEATED BY THE REVISION CLOUDS ARE NEW REVISIONS.

AS CONSTRUCTED
PLOTTED M.P. Gathercole DATE 8/00
CHECKED DATE 8/00

SUPERCEDES DRAWING Nos:- E94-BM6000/A0 AND A1 REVISION E

NO.	DATE	AMENDMENT	INITIALS
A	8/00	AS CONSTRUCTED ISSUE	
0	8/00	ORIGINAL ISSUE	

DIRECTOR OF P.D. & P.S. — DATE
ENGINEER IN CHARGE — R. BOWRING — 21/12/99 — DATE
SUPERVISING ENGINEER — NOTE 6 — R.P.E.Q. NO. — DATE

	NAME	DATE
DESIGN	NOTE 6 R.J.	3-12-99
DRAWN	NOTE 6	3-12-99
CHECKED		

Brisbane City

JOB FILE
ACAD FILE 57HG001 — SHEET SIZE A1
SURVEY No. — FIELD BOOK
SURVEYED — A.H. DATUM

Brisbane Water

PROJECT: CENTENARY HIGHWAY SEWAGE PUMP STATION SP19

TITLE: SWITCHBOARD PUMP CIRCUITS POWER & METERING SCHEMATIC

SCALE NTS — N° 1 OF 8 SHEETS
DRAWING N° 486/5/7-HG001 — AMEND. A

240V AC
AUX. SUPPLY FROM
DISTRIBUTION BOARD
CIRCUIT BREAKER
REF DWG:-
486/5/7-HG001

REF DWG:-
486/5/7-HG001

E N R W B

TL1
TEST
LINKS

CT1
5A

2A 2A 2A

IF1

IT1

KWT1

4 - 20mA

PUMP No 1 KILOWATTS
CHANNEL 7

REF DWG:-
486/5/7-HG005

(NOTE 2)

250A

TOL 1

C13

DANFOSS VLT6100
V.F. DRIVE No 1

(NOTE 1)

MAIN PUMP No.1
63kW
FLC=115A

CABLE C12

MANUAL SPEED CONTROL
1K POTENTIOMETER

RUN/
STOP

RESET

COMMON

SELECT
SET UP 2

SMC
REMOTE LOCAL

REF DWG:-
486/5/7-HG004
LINE No 13

CABLE C18
(11 CORE)

VFD 1 SPEED CONTROL
CHANNEL 0

VFD 1 RUNNING SPEED
CHANNEL 11

VFD 1 MOTOR AMPS
CHANNEL 8

REF DWG:-
486/5/7-HG005

0-115A ANALOG AMMETER (4-20mA)

RS485 CONNECTOR
MOUNTED IN THE
MAIN SWITCHBOARD

V.F.D. 2
RS485 TERM'LS
REF DWG:-
486/5/7-HG003

V.F. DRIVE
WARNING
REF DIM2 R.T.U.
INPUT CHANNEL 11

V.F. DRIVE
IN AUTO
REF DIM2 R.T.U.
INPUT CHANNEL 10

V.F. DRIVE
RUNNING
REF DIM2 R.T.U.
INPUT CHANNEL 8

CABLE C18

MAIN PUMP No.1

HOURS RUN

READY

V.F. DRIVE No 1
READY RELAY

CABLE C14

PUMP No 1 - DANFOSS VLT6100
VARIABLE FREQUENCY DRIVE CABINET

OVERLOAD SUPPLY

THERMISTOR RELAY
(AUTO RESET)

TO DIM2 CHANNEL 4
REFER RTU INPUT MODULE

CABLE C8
MOTOR
THERMISTOR
CABLE C8

BRIDGE

EMERGENCY
STOP

(NOTE 5)

LINE CONTACTOR

CONTROL CIRCUIT
POWER ON

RTU INPUTS MODULE [DIM2]

24N1 — R.T.U. 24V DC [REF 486/5/7-HG010] — DIM2+

(NOTE 4)

0	REFLUX MICRO SWITCH CHANNEL 0	
1	POWER ON CHANNEL 1	
2	THERMAL OVERLOAD CHANNEL 2	
3	LOCAL START CHANNEL 3	
4	EMERGENCY STOP CHANNEL 4	
5	THERMISTOR TRIP CHANNEL 5	
6	V.F.D. No 1 READY CHANNEL 6	
7	LOCAL RESET CHANNEL 7	
8	VFD No 1 RUNNING CHANNEL 8	
9	CONTACTOR CLOSE CHANNEL 9	
10	VFD No 1 AUTO SEL'D CHANNEL 10	
11	V.F.D. No 1 WARNING CHANNEL 11	
12	SPARE CHANNEL 12	
13	SPARE CHANNEL 13	
14	SPARE CHANNEL 14	
15	SPARE CHANNEL 15	

DISCONNECTED

REFERENCE LINE 30

SPARES

RTU OUTPUTS MODULE [DOM1]

DOM1+ — R.T.U. 24V DC [REF 486/5/7-HG010] — DOM1-

(NOTE 4)

0	SITE ALARM ATTENTION IND'RS CHANNEL 0	
1	CONNECT REF. ELECTRODES CHANNEL 1	
2	CATHODIC PROTECTION DE-ENERG. RECTIFIER CHANNEL 2	
3	CLOSE LINE CONT'R CHANNEL 3	RP12
4	PUMP STATUS CHANNEL 4	
5	RUN/STOP VFD No 1 CHANNEL 5	RP14
6	VFD 1 FAULT RESET CHANNEL 6	RP13
7	CATHODIC PROTECTION ALARM INDICATOR CHANNEL 7	
8	SPARE CHANNEL 8	
9	SPARE CHANNEL 9	
10	SPARE CHANNEL 10	
11	SPARE CHANNEL 11	
12	SPARE CHANNEL 12	
13	SPARE CHANNEL 13	
14	SPARE CHANNEL 14	
15	SPARE CHANNEL 15	

SPARES

NOTES:

1. MAIN PUMP DECONTACTORS ARE LOCATED IN UPPER SECTION OF PUMP WELL.
2. CIRCUIT BREAKERS RATINGS TO SUIT LOAD & ENSURE TYPE 2 COORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
3. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST COMPATIBLE LABELLING.
   THE FOLLOWING PREFIXES ARE USED:
   MAIN PUMP No. 1 = 1
   MAIN PUMP No. 2 = 2
   MAIN PUMP No. 3 = 3
   SUMP PUMP = 5
   COMMON WIRING = 6 (i.e. FLOW, LEVEL, PRESSURE)
   OXYGEN PUMP No. 1 = 7
   OXYGEN PUMP No. 2 = 8
4. 24V DC INPUT/OUTPUT INDIVIDUAL PROTECTION FUSES NOT SHOWN. (i.e. PART OF INTERFACE TERMINAL STRIP)
5. ON / OFF ISOLATOR SWITCHES LOCATED ADJACENT TO MOTORS IN PUMP WELL.
6. PUMP CONTROL CIRCUIT BREAKERS RATED AT 9KA FOR 1 SEC.
7. THE VARIABLE FREQUENCY SPEED CONTROLLERS SHALL BE LOCATED EXTERNALLY TO THE SWITCHBOARD IN WALL MOUNTED CABINETS IN THE UPPER SECTION OF THE PUMP WELL.
8. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- E94-BM6000/A0 & A2 REVISION E.
9. ALL ITEMS IN THE AREAS DELINEATED BY THE REVISION CLOUDS ARE NEW REVISIONS.

LEGEND:

- RELAY OR CONTACTOR COIL
- FIELD DEVICE
- R.T.U. FUSE TERMINAL
- R.T.U. LINK TERMINAL
- SWITCHBOARD TERMINAL
- CATHODIC PROTECTION TERMINAL
- FUNCTION / ADDRESS — RTU DIGITAL INPUT
- FUNCTION / ADDRESS — RTU DIGITAL OUTPUT
- FUNCTION / ADDRESS — RTU ANALOG INPUT
- FUNCTION / ADDRESS — RTU ANALOG OUTPUT
- 00 — EQUIPMENT ITEM No.
- 6 — CABLE CORE NUMBER

AS CONSTRUCTED
PLOTTED W.J. Gatliff DATE 8/00
CHECKED [illegible] DATE 8/00

SUPERCEDES DRAWING No:- E94-BM6000/A0 AND A2 REVISION E

NO.	DATE	AMENDMENT	INITIALS
A	8/00	AS CONSTRUCTED ISSUE.	
0	11/99	ORIGINAL ISSUE.	

DIRECTOR OF P.D. & P.S. — DATE
ENGINEER IN CHARGE — R. BOWRING — 21/12/99 — DATE
SUPERVISING ENGINEER — NOTE 6 — R.P.E.Q. NO. — DATE

	NAME	DATE
DESIGN	NOTE 8 R.J.	3-12-99
DRAWN	NOTE 8	3-12-99
CHECKED		

Brisbane City

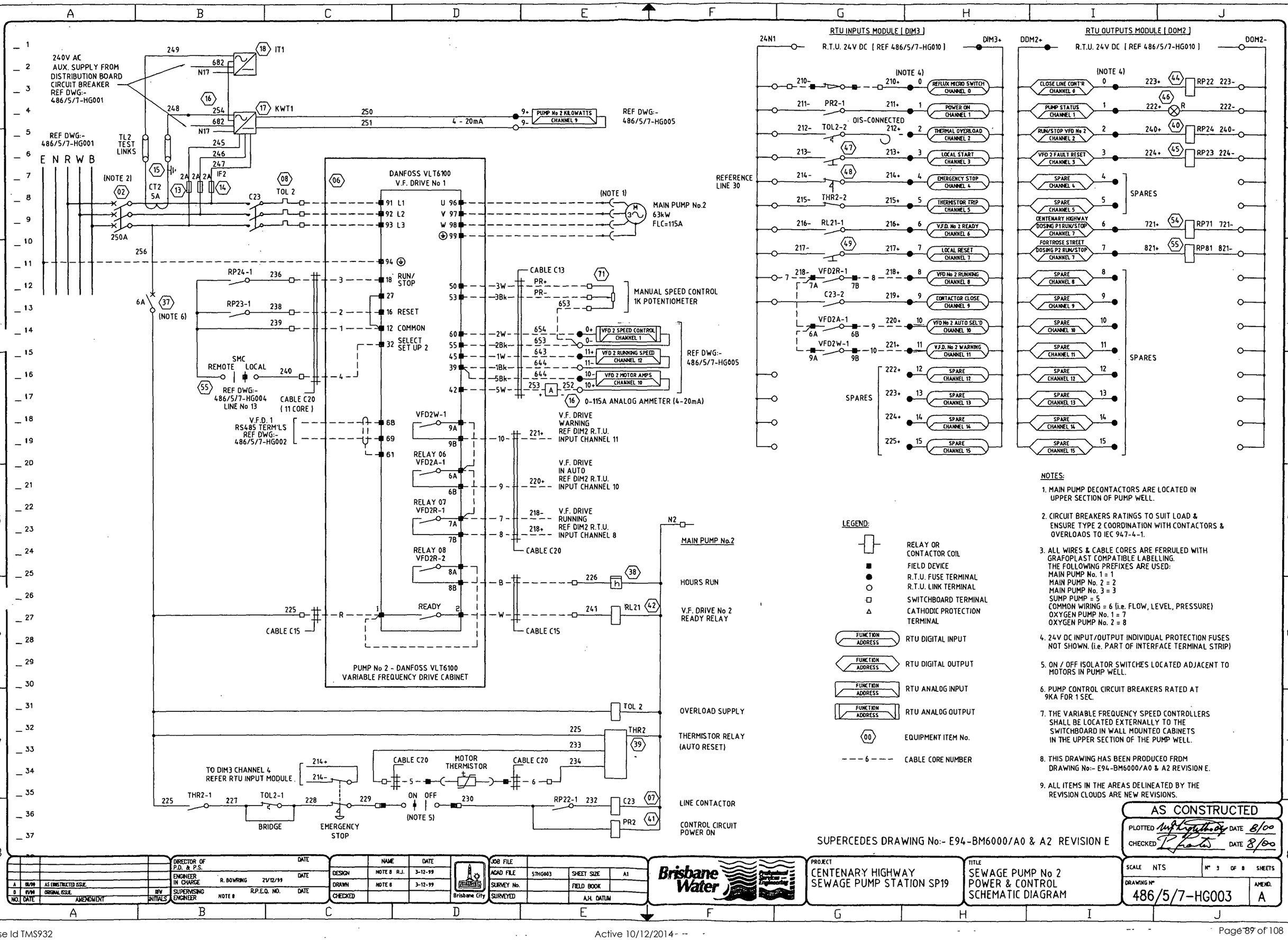
JOB FILE			
ACAD FILE	57HG002	SHEET SIZE	A1
SURVEY No.		FIELD BOOK	
SURVEYED		A.H. DATUM	

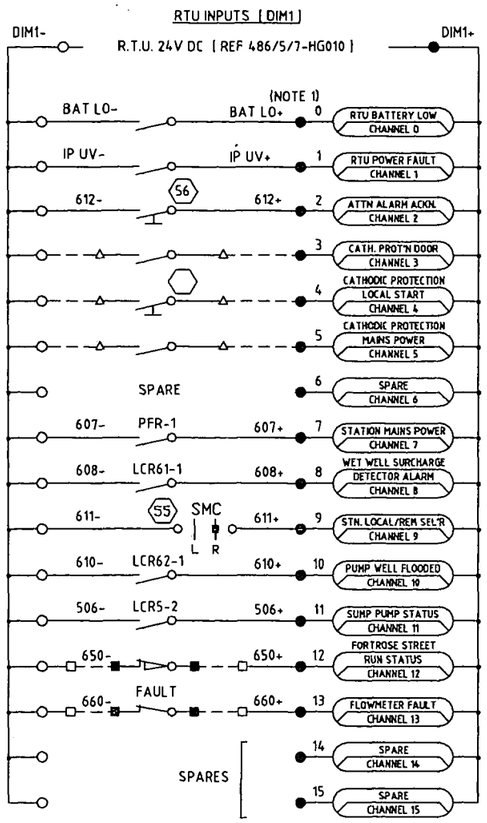
Brisbane Water

PROJECT: CENTENARY HIGHWAY
SEWAGE PUMP STATION SP19

TITLE: SEWAGE PUMP No 1
POWER & CONTROL
SCHEMATIC DIAGRAM

SCALE NTS — N° 2 OF 8 SHEETS
DRAWING N° 486/5/7-HG002 — AMEND. A


240V AC
AUX. SUPPLY FROM
DISTRIBUTION BOARD
CIRCUIT BREAKER
REF DWG:-
486/5/7-HG001
IT1
KWT1
PUMP No 2 KILOWATTS
CHANNEL 9
4 - 20mA
REF DWG:-
486/5/7-HG005
TL2
TEST
LINKS
CT2
5A
IF2
250A
TOL 2
DANFOSS VLT6100
V.F. DRIVE No 1
MAIN PUMP No.2
63kW
FLC=115A
MANUAL SPEED CONTROL
1K POTENTIOMETER
RUN/
STOP
RESET
COMMON
SELECT
SET UP 2
SMC
REMOTE LOCAL
CABLE C13
CABLE C20
(11 CORE)
0-115A ANALOG AMMETER (4-20mA)
V.F.D. 1
RS485 TERM'LS
REF DWG:-
486/5/7-HG002
V.F. DRIVE
WARNING
REF DIM2 R.T.U.
INPUT CHANNEL 11
RELAY 06
VFD2A-1
V.F. DRIVE
IN AUTO
REF DIM2 R.T.U.
INPUT CHANNEL 10
RELAY 07
VFD2R-1
V.F. DRIVE
RUNNING
REF DIM2 R.T.U.
INPUT CHANNEL 8
RELAY 08
VFD2R-2
MAIN PUMP No.2
HOURS RUN
READY
V.F. DRIVE No 2
READY RELAY
PUMP No 2 - DANFOSS VLT6100
VARIABLE FREQUENCY DRIVE CABINET
OVERLOAD SUPPLY
THERMISTOR RELAY
(AUTO RESET)
TO DIM3 CHANNEL 4
REFER RTU INPUT MODULE.
MOTOR
THERMISTOR
BRIDGE
EMERGENCY
STOP
LINE CONTACTOR
CONTROL CIRCUIT
POWER ON
RTU INPUTS MODULE [DIM3]
R.T.U. 24V DC [REF 486/5/7-HG010]
REFLUX MICRO SWITCH
POWER ON
OIS-CONNECTED
THERMAL OVERLOAD
LOCAL START
EMERGENCY STOP
THERMISTOR TRIP
V.F.D. No 2 READY
LOCAL RESET
VFD No 2 RUNNING
CONTACTOR CLOSE
VFD No 2 AUTO SEL'D
V.F.D. No 2 WARNING
SPARE
REFERENCE
LINE 30
RTU OUTPUTS MODULE [DOM2]
R.T.U. 24V DC [REF 486/5/7-HG010]
CLOSE LINE CONT'R
PUMP STATUS
RUN/STOP VFD No 2
VFD 2 FAULT RESET
CENTENARY HIGHWAY
DOSING P1 RUN/STOP
FORTROSE STREET
DOSING P2 RUN/STOP
RP22 223-
RP24 240-
RP23 224-
RP71 721-
RP81 821-
SPARES
NOTES:
1. MAIN PUMP DECONTACTORS ARE LOCATED IN UPPER SECTION OF PUMP WELL.
2. CIRCUIT BREAKERS RATINGS TO SUIT LOAD & ENSURE TYPE 2 COORDINATION WITH CONTACTORS & OVERLOADS TO IEC 947-4-1.
3. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST COMPATIBLE LABELLING.
THE FOLLOWING PREFIXES ARE USED:
MAIN PUMP No. 1 = 1
MAIN PUMP No. 2 = 2
MAIN PUMP No. 3 = 3
SUMP PUMP = 5
COMMON WIRING = 6 (i.e. FLOW, LEVEL, PRESSURE)
OXYGEN PUMP No. 1 = 7
OXYGEN PUMP No. 2 = 8
4. 24V DC INPUT/OUTPUT INDIVIDUAL PROTECTION FUSES NOT SHOWN. (i.e. PART OF INTERFACE TERMINAL STRIP)
5. ON / OFF ISOLATOR SWITCHES LOCATED ADJACENT TO MOTORS IN PUMP WELL.
6. PUMP CONTROL CIRCUIT BREAKERS RATED AT 9KA FOR 1 SEC.
7. THE VARIABLE FREQUENCY SPEED CONTROLLERS SHALL BE LOCATED EXTERNALLY TO THE SWITCHBOARD IN WALL MOUNTED CABINETS IN THE UPPER SECTION OF THE PUMP WELL.
8. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- E94-BM6000/A0 & A2 REVISION E.
9. ALL ITEMS IN THE AREAS DELINEATED BY THE REVISION CLOUDS ARE NEW REVISIONS.
LEGEND:
RELAY OR CONTACTOR COIL
FIELD DEVICE
R.T.U. FUSE TERMINAL
R.T.U. LINK TERMINAL
SWITCHBOARD TERMINAL
CATHODIC PROTECTION TERMINAL
RTU DIGITAL INPUT
RTU DIGITAL OUTPUT
RTU ANALOG INPUT
RTU ANALOG OUTPUT
EQUIPMENT ITEM No.
CABLE CORE NUMBER
AS CONSTRUCTED
SUPERCEDES DRAWING No:- E94-BM6000/A0 & A2 REVISION E
DIRECTOR OF P.D. & P.S.
ENGINEER IN CHARGE R. BOWRING 21/12/99
SUPERVISING ENGINEER NOTE 8
R.P.E.Q. NO.
DESIGN NOTE 8 R.J. 3-12-99
DRAWN NOTE 8 3-12-99
CHECKED
JOB FILE
ACAD FILE 57HG003
SURVEY No.
SURVEYED
SHEET SIZE A1
FIELD BOOK
A.H. DATUM
Brisbane Water
PROJECT CENTENARY HIGHWAY SEWAGE PUMP STATION SP19
TITLE SEWAGE PUMP No 2 POWER & CONTROL SCHEMATIC DIAGRAM
SCALE NTS
N° 9 OF 8 SHEETS
DRAWING N° 486/5/7-HG003
AMEND. A
A 08/00 AS CONSTRUCTED ISSUE
0 11/99 ORIGINAL ISSUE
NO. DATE AMENDMENT INITIALS



RTU INPUTS [DIM2]
[REF 486/5/7-HG002]

RTU INPUTS [DIM3]
[REF 486/5/7-HG003]

RTU OUTPUTS [DOM1]
[REF 486/5/7-HG002]

RTU OUTPUTS [DOM2]
[REF 486/5/7-HG003]

[NOTE:- SMC SELECTOR
ADDITIONAL POLES FOR LOCAL CONTROL
REF DWGS:- 486/5/7-HG002 AND HG003
LINE 16]

[REF DWG No:- 486/5/7-HG005]

NOTES:

1. 24V D.C. INPUT/OUTPUT INDIVIDUAL PROTETCION FUSES NOT SHOWN. [ie PART OF INTERFACE TERMINAL STRIP]
2. ALL WIRES & CABLE CORES ARE FERRULED WITH GRAFOPLAST COMPATIBLE LABELLING.
   THE FOLLOWING PREFIXES ARE USED:
   MAIN PUMP No. 1 = 1
   MAIN PUMP No. 2 = 2
   MAIN PUMP No. 3 = 3
   SUMP PUMP = 5
   COMMON WIRING = 6 (i.e. FLOW, LEVEL, PRESSURE)
   OXYGEN PUMP No. 1 = 7
   OXYGEN PUMP No. 2 = 8
3. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- E94-BM6000/A3 REVISION E.
4. ALL ITEMS IN THE AREAS DELINEATED BY THE REVISION CLOUDS ARE NEW REVISIONS.

LEGEND:

- RELAY OR CONTACTOR COIL
- FIELD DEVICE
- R.T.U. FUSE TERMINAL
- R.T.U. LINK TERMINAL
- SWITCHBOARD TERMINAL
- CATHODIC PROTECTION TERMINAL
- FUNCTION / ADDRESS — RTU DIGITAL INPUT
- FUNCTION / ADDRESS — RTU DIGITAL OUTPUT
- FUNCTION / ADDRESS — RTU ANALOG INPUT
- FUNCTION / ADDRESS — RTU ANALOG OUTPUT
- 00 — EQUIPMENT ITEM No.

AS CONSTRUCTED
PLOTTED mf Kopittke DATE 8/00
CHECKED T Lantz DATE 8/00

SUPERCEDES DRAWING No:- E94-BM6000/A3 REVISION E

NO.	DATE	AMENDMENT	INITIALS
A	08/99	AS CONSTRUCTED ISSUE.	
D	11/99	ORIGINAL ISSUE.	MFV

DIRECTOR OF P.D. & P.S.		DATE
ENGINEER IN CHARGE	R. BOWRING	21/12/99 DATE
SUPERVISING ENGINEER	NOTE 3	R.P.E.Q. NO. DATE

	NAME	DATE
DESIGN	NOTE 3 R.J.	3-12-99
DRAWN	NOTE 3	3-12-99
CHECKED		

Brisbane City

JOB FILE			
ACAD FILE	S7HG004	SHEET SIZE	A1
SURVEY No.		FIELD BOOK	
SURVEYED		A.H. DATUM	

Brisbane Water

PROJECT
CENTENARY HIGHWAY
SEWAGE PUMP STATION SP19

TITLE
SWITCHBOARD
R.T.U. DIGITAL I/O
SCHEMATIC DIAGRAM

SCALE NTS | N° 1 OF 8 SHEETS
DRAWING N° 486/5/7-HG004 | AMEND. A

RTU ANALOG INPUTS [AIM1]

(NOTE 2)

CATHODIC PROTECTION UNIT

4-20 mA	616	0-	RECTIFIER CURRENT CHANNEL 0	
	617	0+		
4-20 mA	618	1-	RECTIFIER VOLTAGE CHANNEL 1	
	619	1+		
4-20 mA	620	2-	REF ELECT. 1 VOLTAGE CHANNEL 2	
	621	2+		
4-20 mA	622	3-	REF ELECT. 2 VOLTAGE CHANNEL 3	
	623	3+		
R.T.U. 24V DC REF DWG:- HG011 COM1+		COM-		
COM1-		COM+	WELL LEVEL CHANNEL 4	
ANALOG LEVEL METER				
(VEGA E25 OSCILLATOR) WELL LEVEL TRANSMITTER 4-20mA	626	4+		
	625	COM-		
	624	COM+	DELIVERY PRESSURE CHANNEL 5	
DELIVERY LINE PRESSURE TRANSMITTER (APCS WT227) 4-20mA	629	5+		
	628	COM-		
MAGNETIC FLOWMETER TRANSMITTER FT1 REFER CONNECTION DETAIL BELOW REFER NOTE 3 (70) 4-20mA	632	6-	DELIVERY FLOW CHANNEL 6	
	631	6+		
PUMP No 1 KILOWATT TRANSDUCER REF DWG:- 486/5/7-HG002 (17) KWT1 4 - 20mA	151	7-	PUMP 1 KILOWATTS CHANNEL 7	
	150	7+		
PUMP No 1 V.F. DRIVE MOTOR AMPS REF DWG:- 486/5/7-HG002 39 42 153 A 4 - 20mA 0-115AMP AMMETER	641	8-	PUMP 1 AMPS CHANNEL 8	
	152	8+		
PUMP No 2 KILOWATT TRANSDUCER REF DWG:- 486/5/7-HG003 (17) KWT1 4 - 20mA	250	9-	PUMP 2 KILOWATTS CHANNEL 9	
	251	9+		
PUMP No 2 V.F. DRIVE MOTOR AMPS REF DWG:- 486/5/7-HG003 39 42 253 A 4 - 20mA 0-115AMP AMMETER	644	10-	PUMP 2 AMPS CHANNEL 10	
	252	10+		
MAIN PUMP No 1 V.F. DRIVE UNIT REF DWG:- 486/5/7-HG002 39 45 4 - 20mA	641	11-	V.F.D. 1 RUNNING SPEED CHANNEL 11	
	642	11+		
MAIN PUMP No 2 V.F. DRIVE UNIT REF DWG:- 486/5/7-HG003 39 45 4 - 20mA	644	12-	V.F.D. 2 RUNNING SPEED CHANNEL 12	
	643	12+		
SPARES		13-	SPARE CHANNEL 13	
		13+		
		14-	SPARE CHANNEL 14	
		14+		
		15-	SPARE CHANNEL 15	
		15+		

RTU ANALOG OUTPUTS [AOM1]

VFD1 SPEED CONTROL CHANNEL 0	0-	652	55	MAIN PUMP No 1 V.F. DRIVE UNIT SPEED CONTROL REF:- 486/5/7-HG002
	0+	651	60	
VFD2 SPEED CONTROL CHANNEL 1	1-	653	55	MAIN PUMP No 2 V.F. DRIVE UNIT SPEED CONTROL REF:- 486/5/7-HG003
	1+	654	60	
SPARE CHANNEL 2	2-			
	2+			
SPARE CHANNEL 3	3-			
	3+			
SPARE CHANNEL 4	4-			
	4+			
SPARE CHANNEL 5	5-			
	5+			
SPARE CHANNEL 6	6-			
	6+			
SPARE CHANNEL 7	7-			
	7+			
SPARE CHANNEL 8	8-			
	8+			
SPARE CHANNEL 9	9-			
	9+			
SPARE CHANNEL 10	10-			
	10+			
SPARE CHANNEL 11	11-			
	11+			
SPARE CHANNEL 12	12-			
	12+			
SPARE CHANNEL 13	13-			
	13+			
SPARE CHANNEL 14	14-			
	14+			
SPARE CHANNEL 15	15-			
	15+			

SPARES

NOTES:

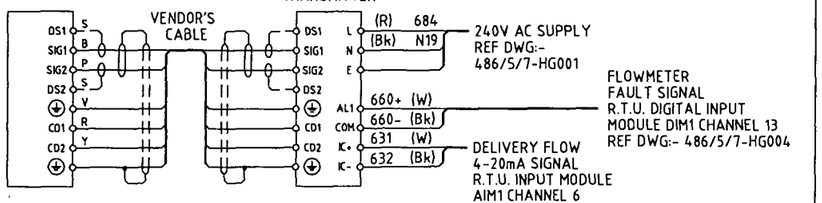
1. TRANSIENT PROTECTION INTEGRAL TO RTU ANALOGUE INPUTS.
2. CATHODIC PROTECTION - FUTURE. THIS UNIT TO BE SUPPLIED BY OTHERS. RTU I/O CABLING TO BE INSTALLED TO PROPOSED CATHODIC PROTECTION AREA TERMINAL STRIP FOR CONNECTION BY OTHERS
3. FLOWMETER SENSOR CABLES:-
   - UNSCREENED CABLE ENDS MUST BE KEPT AS SHORT AS POSSIBLE AND THE TWO CABLES MUST BE KEPT SEPARATE.
   - THE CABLES MUST BE IN ONE LENGTH AND MUST NOT BE TAKEN TO A DISTRIBUTION BOX OR SIMILAR TERMINAL ARRANGEMENT.
   - TERMINALS 81 AND 84 ARE ONLY CONNECTED WHEN SPECIAL ELECTRODE CABLE WITH DOUBLE SCREENING IS USED.
   - NORMALLY THE EXTERNAL SHIELD IS NOT CONNECTED TO THE SIGNAL CONVERTER.
   - IN ENVIRONMENTS WITH STRONG ELECTRICAL NOISE, THE EXTERNAL SCREEN MUST BE EARTHED AT BOTH ENDS.
4. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- E94-BM6000/A4 REVISION E.
5. ALL ITEMS IN THE AREAS DELINEATED BY REVISION CLOUDS ARE NEW MODIFICATIONS.

LEGEND:

- RELAY OR CONTACTOR COIL
- FIELD DEVICE
- R.T.U. FUSE TERMINAL
- R.T.U. LINK TERMINAL
- SWITCHBOARD TERMINAL
- CATHODIC PROTECTION TERMINAL
- FUNCTION ADDRESS — RTU DIGITAL INPUT
- FUNCTION ADDRESS — RTU DIGITAL OUTPUT
- FUNCTION ADDRESS — RTU ANALOG INPUT
- FUNCTION ADDRESS — RTU ANALOG OUTPUT
- (00) EQUIPMENT ITEM No.

ABB MAGMASTER MAGNETIC FLOWMETER FT1 CONNECTION DETAIL

[REFER NOTE 3 ABOVE]



AS CONSTRUCTED
PLOTTED DATE 8/00
CHECKED DATE 8/00

SUPERCEDES DRAWING No:- E94-BM6000/A4 REVISION E

NO.	DATE	AMENDMENT	INITIALS
A	08/99	AS CONSTRUCTED ISSUE	
0	01/99	ORIGINAL ISSUE	

DIRECTOR OF P.D. & P.S. — DATE
ENGINEER IN CHARGE R. BOWRING 21/12/99 DATE
SUPERVISING ENGINEER NOTE 4 R.P.E.Q. NO. DATE

	NAME	DATE
DESIGN	NOTE 4 R.I.	3-12-99
DRAWN	NOTE 4	3-12-99
CHECKED		

Brisbane City

JOB FILE
ACAD FILE 57HG005 SHEET SIZE A1
SURVEY No. FIELD BOOK
SURVEYED A.H. DATUM

Brisbane Water

PROJECT: CENTENARY HIGHWAY SEWAGE PUMP STATION SP19

TITLE: SWITCHBOARD R.T.U. ANALOG I/O SCHEMATIC DIAGRAM

SCALE NTS — N° 5 OF 8 SHEETS
DRAWING N° 486/5/7-HG005 — AMEND. A

SWITCHBOARD EQUIPMENT AND LABEL SCHEDULE

ITEM	QTY	MAKE and NUMBER	DESCRIPTION	LABEL
00	3	TERCEL IP70SD 70KA	LIGHTNING ARRESTORS	LIGHTNING ARRESTORS
01	1	TERASAKI XH-400NE/250 WITH XFHA34 HANDLE	MAIN CIRCUIT BREAKER	MAIN SWITCH
02	2	TERASAKI XH-250NJ/250 WITH XFHA23 HANDLE	MAIN PUMP No 1 & No 2	PUMP No 1 / No 2
			CIRCUIT BREAKERS	
03	1	TERASAKI DIN-T9-316	SUMP PUMP CIRCUIT BREAKER	REFER LEGEND CARD
04	1	NHP LKSI-63 WITH 3 X GEC TIS63 CARTRIDGES	SUB DISTRIBUTION BOARD ISOLATOR	SUB-DIST BOARD ISOLATOR
05	1	TERASAKI NO250A/24	SUB DISTRIBUTION CIRCUIT BREAKER CHASSIS	
06	2	DANFOSS VLT6100 VARIABLE SPEED DRIVE	MAIN PUMP No 1 & No 2 VARIABLE SPEED DRIVES	VFD1/VFD2
07	2	SPRECHER & SCHUH CA6-140-E-10-240V WITH CEF1-VS2 BUSBAR	MAIN PUMP No.1 & No.2 LINE CONTACTORS	C13/C23
08	2	SPRECHER & SCHUH CEF1-11-415V	MAIN PUMP No.1 & No.2 THERMAL OVERLOAD	TOL1/TOL2
09	1	SPRECHER & SCHUH CA3-23-10-A240	SUMP PUMP LINE CONTACTOR	C53
10	1	SPRECHER & SCHUH CT3-12 3.8-6.0A	SUMP PUMP THERMAL OVERLOAD	
11	2	SPRECHER & SCHUH CA3-23-10-A240	OXYGEN PUMPS No 1 & No 2 LINE CONTACTORS	C73/C83
12	2	SPRECHER & SCHUH CT3-12 1.6-2.5A	OXYGEN PUMPS No 1 & No 2 THERMAL OVERLOADS	
13	2	CROMPTON 782-943 150/5A CLASS 1 5VA	MAIN PUMP INSTRUMENT CURRENT TRANSFORMERS	PUMP No 1 / No 2
14	6	GEC SC20H WITH 6 X NS2 CARTRIDGES	MAIN PUMP INSTRUMENT FUSES	PUMP No 1 / No 2
15	4	KLIPPON SAKT2/35 TERMINALS	CURRENT TRANSFORMER	
	2	QVS2 SLIDELINKS	TEST LINKS	
	8	VH19 SLEEVES		
	8	BS SCREWS		
16	2	CROMPTON 243-01AG SCALE D-115A (ANALOG 4-20mA INPUT)	MAIN PUMP No 1 & No 2 AMMETERS	PUMP No 1 / No 2
17	2	MULTITEK M100-WA2 UHA (240VAC)	MAIN PUMP No 1 & No 2 KILOWATT TRANSDUCERS	KWT1/2
18	2	MULTITEK M100-AL1 UHA (240VAC)	MAIN PUMP No 1 & No 2 CURRENT TRANSDUCERS	IT1/2
19	1	CROMPTON 252-PSGW 3 WIRE 50 HZ 415 VAC	PHASE FAILURE RELAY	PFR
20	1	TERASAKI DIN-T6-306	PHASE FAILURE RELAY CIRCUIT BREAKER	REFER LEGEND CARD
21	1	TERASAKI DIN-T6-320	THREE PHASE 20A OUTLET CIRCUIT BREAKER	REFER LEGEND CARD
22	1	TERASAKI DIN-T6-110	SINGLE PHASE GPO CIRCUIT BREAKER	REFER LEGEND CARD
23	1	TERASAKI DIN-T6-110	PUMP WELL LIGHTING CIRCUIT BREAKER	REFER LEGEND CARD
24	1	TERASAKI DIN-T6-102	RTU LAPTOP GPO CIRCUIT BREAKER	REFER LEGEND CARD
25	1	TERASAKI DIN-T6-106	SWITCHBOARD FLUORESCENT LIGHT CIRCUIT BREAKER	REFER LEGEND CARD
26	1	TERASAKI DIN-T6-106	CATHODIC PROTECTION UNIT CIRCUIT BREAKER	REFER LEGEND CARD
27	1	TERASAKI DIN-T6-110	PUMP WELL VENTILATION FAN CIRCUIT BREAKER	REFER LEGEND CARD
28	1	TERASAKI DIN-T6-106	KW & CURRENT TRANSDUCERS AUX SUPPLY C/B	REFER LEGEND CARD
29	1	TERASAKI DIN-T6-106	RTU POWER SUPPLY CIRCUIT BREAKER	REFER LEGEND CARD
30	1	TERASAKI DIN-T6-106	FLOWMETER EVALUATION UNIT CIRCUIT BREAKER	REFER LEGEND CARD
31	3	TERASAKI DIN-T6-106	SPARE 240VAC CIRCUIT BREAKER	REFER LEGEND CARD
32	3	BURGESS DS3	SWITCHBOARD DOOR SWITCHES	
33	3	LANSON LBB113	13W FLUROESCENT SWITCHBOARD LIGHTS	
34	1	CROMPTON 243-01AG WITH SUPPLIMENTRY RED POINTER 4-20mA INPUT SCALE 0-100%	WELL LEVEL INDICATOR	WELL LEVEL
35	1	PLATYPUS 2 WITH APCS-WT227	DELIVERY PRESSURE TRANSMITTER	DELIVERY PRESSURE TRANSMITTOR
36	1	VEGA 137M/E258	WELL LEVEL TRANSMITTER	WELL LEVEL TRANSMITTER
37	2	TERASAKI DIN-T9-106	MAIN PUMP No 1 & No 2 CONTROL CIRCUIT BREAKER	PUMP No1/PUMP No2 CONTROL
38	2	CROMPTON 242-155G-240V	MAIN PUMP No 1 & No 2 HOUR RUN METER	
39	2	SPRECHER & SCHUH RT3-A-240V	MAIN PUMP No 1 & No 2 THERMISTOR RELAY	THR1/2
40	2	IZUMI RM2S-U-240V WITH SM2S-05U BASE	MAIN PUMP No 1&2 SOFT STR START RELAY	RP14/RP24
41	2	IZUMI RM2S-U-240V WITH SM2S-05U BASE	CONTROL CIRCUIT POWER ON RELAY	PR1/2
42	2	IZUMI RM2S-U-240V WITH SM2S-05U BASE	PUMP No 1 & No 2 V.F. DRIVE READY RELAY	RL11/21
44	2	IZUMI RM2S-U-24VDC WITH SM2S-05U BASE	RTU MAIN PUMP No1&2 CONTACTOR CLOSE RELAY	RP12/22
45	2	IZUMI RM2S-U-24VDC WITH SM2S-05U BASE	RTU MAIN PUMP No 1 & No 2 V.F. DRIVE FLT RESET	RP13/23
46	2	SPRECHER & SCHUH DL3-GRYW-EM WITH Bo 9s-I3-24V-2W (RED USED)	MAIN PUMPS No 1 & No 2 STATUS INDICATION LAMP	STATUS ON = RUNNING SLOW FLASH = FAULT FAST FLASH = START
47	2	SPRECHER & SCHUH DT3P-G-10M	MAIN PUMP No 1 & No 2 START PUSHBUTTON	START
48	2	SPRECHER & SCHUH DN3-30-01 WITH DE3-01 CONTACT BLOCK	MAIN PUMP No 1 & No 2 STOP PUSHBUTTON	EMERGENCY STOP
49	2	SPRECHER & SCHUH DT3P-MB-10M	MAIN PUMP No 1 & No 2 RESET PUSHBUTTON	LOCAL RESET
50	2	TERASAKI DIN-T8-310	OXYGEN PUMP No 1 & No 2 CIRCUIT BREAKER	REFER LEGEND CARD
51	1	MULTITRODE MTR-2	SUMP PUMP CONTROL RELAY	LCR5
52	1	MULTITRODE MTR-2	SURCHARGE ALARM RELAY	LCR61
53	1	MULTITRODE MTR-2	PUMP WELL FLOODED RELAY	LCR62
54	2	IZUMI RM2S-U-240V WITH SM2S-05U BASE	RTU OXYGEN PUMP No 1 & No 2 RUN RELAYS	RP71/81
55	1	KRAUS & NAIMER CG8-A220-E-604 HEADING STATION CONTROL LABEL LOCAL-REMOTE	STATION CONTROL MODE SELECTOR	
56	1	SPRECHER & SCHUH DT3P-MB-10M	SITE ATTENTION ALARM RESET PUSHBUTTON	ALARM RESET
57	1	SPRECHER & SCHUH DT3P-G-10M	SUMP PUMP START PUSHBUTTON	START
58	1	SPRECHER & SCHUH DT3P-R-01M	SUMP PUMP STOP PUSHBUTTON	STOP
59	1	SPRECHER & SCHUH DL3-GRYW-EM WITH Bo9s-I3-24V-2W (YELLOW USED)	SWITCHBOARD ATTENTION ALARM	ATTENTION ALARM
60	1	WATTMASTER KOBISHI 160K24-CLEAR	PUMP WELL SITE ATTENTION ALARM	
61	1	CLIPSAL 56C420	THREE PHASE OUTLET	415VAC
62	2	CLIPSAL 15	SINGLE PHASE OUTLET & RTU SINGLE PHASE OUTLET	240VAC/RTU LAPTOP SUPPLY
63	2	CLIPSAL BP165D12 WITH 2 X BP165F FEET	NEUTRAL LINKS	NEUTRAL
64	2	CLIPSAL BP165D12	EARTH LINKS	EARTH
65	77	KLIPPON SAK4 "G" RAIL	SWITCHBOARD TERMINALS	
66	16	KLIPPON SAKR "DIN" RAIL	LINK TERMINALS	
68	3	DIN-T DTLD LOCKDOGS	CIRCUIT BREAKER LOCKDOGS	
69	3	KLIPPON EK2.5/35 (066108) AND PARTITION (013016)	EARTH TERMINALS	
70	1	ABB MAGMASTER MAGNETIC FLOWMETER		FT1
71	2		1K POTENTIOMETER	PUMP 1/2 MANUAL SPEED CONTROL

1. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- E94-BM6000/AS REVISION D.
2. ALL ITEMS IN THE AREAS DELINEATED BY REVISION CLOUDS ARE NEW MODIFICATIONS.

LEGEND:

- RELAY OR CONTACTOR COIL
- ■ FIELD DEVICE
- ● R.T.U. FUSE TERMINAL
- ○ R.T.U. LINK TERMINAL
- □ SWITCHBOARD TERMINAL
- △ CATHODIC PROTECTION TERMINAL
- FUNCTION / ADDRESS — RTU DIGITAL INPUT
- FUNCTION / ADDRESS — RTU DIGITAL OUTPUT
- FUNCTION / ADDRESS — RTU ANALOG INPUT
- FUNCTION / ADDRESS — RTU ANALOG OUTPUT
- 00 — EQUIPMENT ITEM No.

SUPERCEDES DRAWING No:- E94-BM6000/AS REVISION D

AS CONSTRUCTED
PLOTTED DATE 8/00
CHECKED DATE 8/00

NO.	DATE	AMENDMENT	INITIALS
A	08/99	AS CONSTRUCTED ISSUE.	
D	11/99	ORIGINAL ISSUE.	RFW

DIRECTOR OF P.D. & P.S. — DATE
ENGINEER IN CHARGE R. BOWRING 21/12/99 — DATE
SUPERVISING ENGINEER NOTE 1 R.P.E.Q. NO. — DATE

	NAME	DATE
DESIGN	NOTE 1 R.J.	3-12-99
DRAWN	NOTE 1	3-12-99
CHECKED		

Brisbane City

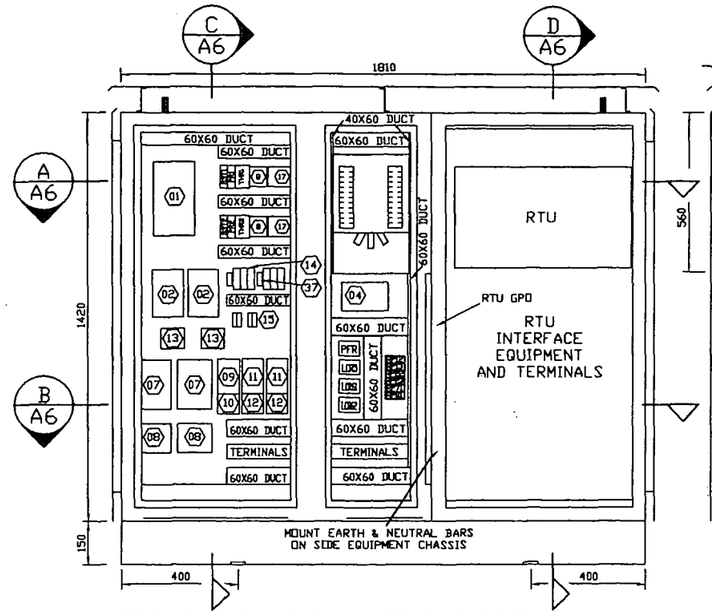
JOB FILE			
ACAD FILE	S7HG006	SHEET SIZE	A1
SURVEY No.		FIELD BOOK	
SURVEYED		A.H. DATUM	

Brisbane Water — Professional Services Engineering

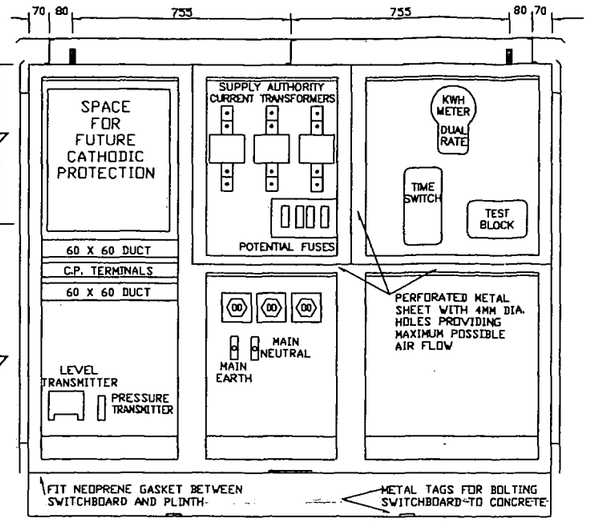
PROJECT: CENTENARY HIGHWAY SEWAGE PUMP STATION SP19

TITLE: SWITCHBOARD EQUIPMENT AND LABEL SCHEDULE

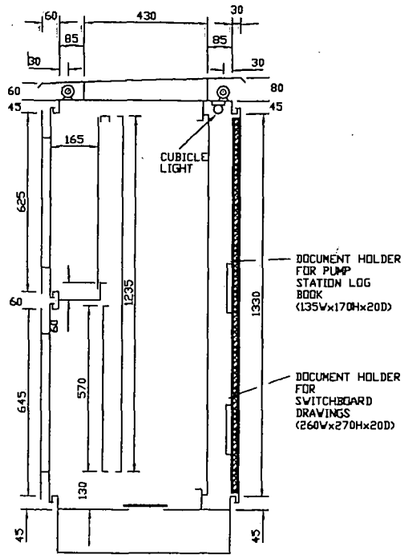
SCALE NTS — N° 6 OF 8 SHEETS
DRAWING N° 486/5/7-HG006 — AMEND. A



FRONT ELEVATION (WITHOUT DOORS



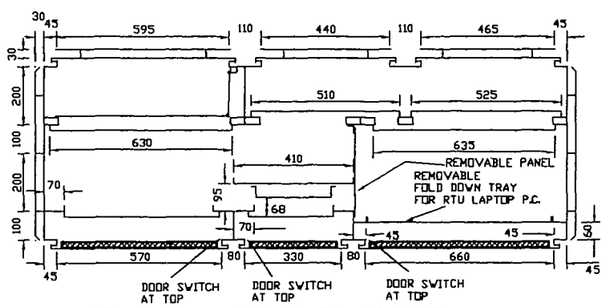
REAR ELEVATION (WITHOUT DOORS)



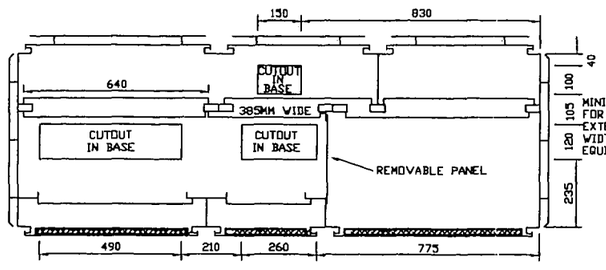
SECTION 'C'
(WITHOUT EQUIPMENT)

NOTES

1. EQUIPMENT CHASSIS SHALL BE BOLTED TO PICTURE FRAME SUPPORTS AT SIDES ONLY
2. A MINIMUM 50MM AIR GAP TO BE PROVIDED AT TOP AND BOTTOM OF EQUIPMENT CHASSIS TO ALLOW AIR MOVEMENT
3. EXTEND DIN RAIL FULL WIDTH OF EQUIPMENT CHASSIS FIELD INTERFACE TERMINAL DIN RAIL ALLOW 20% ADDITIONAL LENGTH
4. DOORS SHALL BE HELD OPEN BY DOOR STAYS
5. DOOR LOCKS SHALL BE SELECTRIX SEMIFLUSH SWING HANDLES WITH B.C.C. LOCKS
6. FOLD DOWN RTU TRAY TO BE REMOVABLE TO ALLOW EQUIPMENT CHASSIS INSTALLATION AND REMOVAL
7. GLAND PLATES TO BE 6MM THICK BAKELITE
8. SEGREGATION OF SEQEB METER AND CT COMPARTMENTS TO BE OBTAINED USING PERFORATED 316 S.S. SHEET TO ALLOW MAXIMUM POSSIBLE AIR FLOW
9. DOOR INSULATION TO BE 25MM THICK FIBERGLASS THERMAL INSULATION .
10. THE SUNSHIELD TO BE 1.6MM THICK 316 S.S. SHEET. 30MM LONG S.S. STANDOFFS TO BE MOUNTABLE FROM INSIDE THE CUBICLE BUT WELDED TO THE SUNSHIELD. THE TOP SUNSHIELD TO BE SUPPORTED BE 316 S.S. 'Z' SECTIONS WELDED TO THE TOP OF THE CUBICLE AND BOLTED TO THE SUNSHIELD
11. EQUIPMENT TO BE MOUNTED NO LOWER THAN 200MM ABOVE CUBICLE FLOOR
12. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- E94-BM6000/A6 REVISION C.

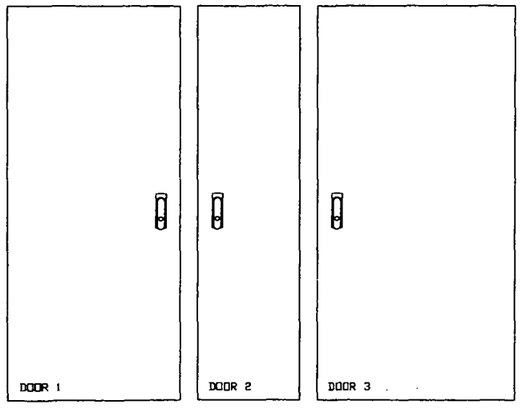


SECTION 'A' (WITHOUT EQUIPMENT)

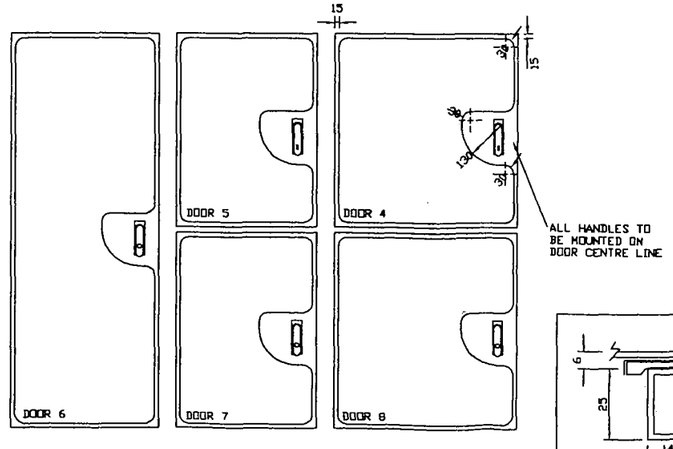


SECTION 'B' (WITHOUT EQUIPMENT)

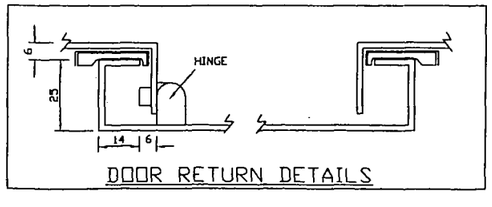
SECTION 'D'
(WITHOUT EQUIPMENT)



VIEW OF FRONT DOORS (WITHOUT HINGES)



VIEW OF REAR DOORS (WITHOUT HINGES)



DOOR RETURN DETAILS

SUPERCEDES DRAWING No:- E94-BM6000/A6 REVISION C

AS CONSTRUCTED
PLOTTED DATE 8/00
CHECKED DATE 8/00

NO.	DATE	AMENDMENT	RFV INITIALS
0	8/00	ORIGINAL ISSUE.	

AS CONSTRUCTED ISSUE.

DIRECTOR OF P.D. & P.S. — DATE
ENGINEER IN CHARGE — R. BOWRING — 21/12/99 — DATE
SUPERVISING ENGINEER — NOTE 12 — R.P.E.Q. NO. — DATE

	NAME	DATE
DESIGN	NOTE 12 R.I.	3-12-99
DRAWN	NOTE 12	3-12-99
CHECKED		

Brisbane City

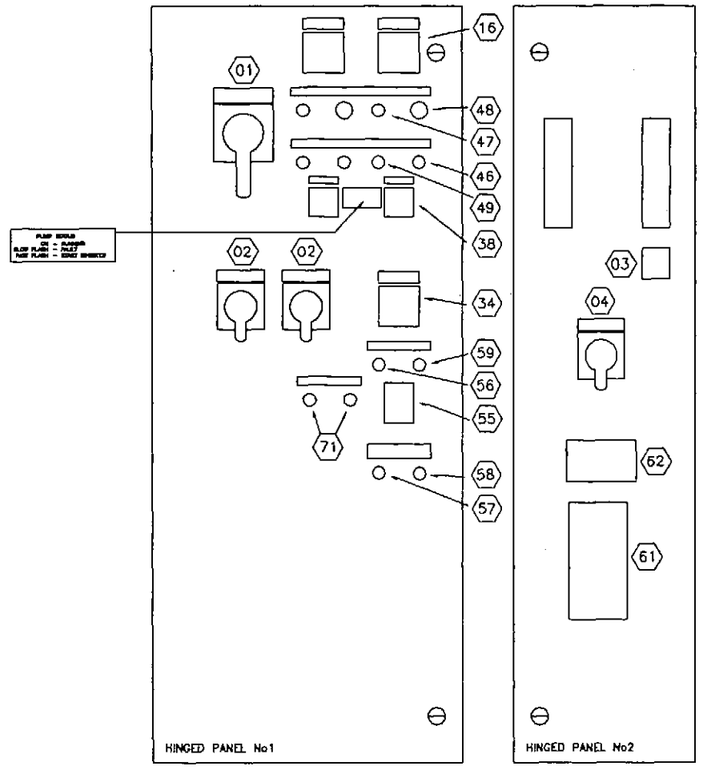
JOB FILE			
ACAD FILE	S7HG007	SHEET SIZE	A1
SURVEY No.		FIELD BOOK	
SURVEYED		A.H. DATUM	

Brisbane Water

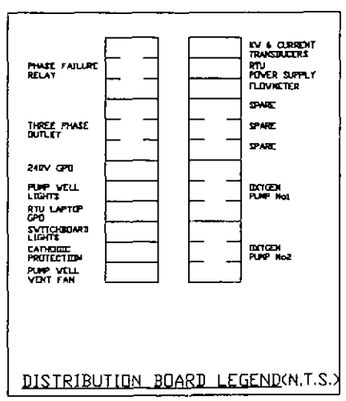
PROJECT: CENTENARY HIGHWAY SEWAGE PUMP STATION SP19

TITLE: SWITCHBOARD CUBICLE CONSTRUCTION & GENERAL ARRANGEMENT

SCALE NTS — N° 7 OF 8 SHEETS
DRAWING N° 486/5/7-HG007 — AMEND. A



VIEW OF HINGED PANEL
(WITHOUT HINGES) (SCALE 1:5)



DISTRIBUTION BOARD LEGEND(N.T.S.)

SWITCHBOARD CONSTRUCTION NOTES

CONSTRUCTION
- Cubicle to be of 1.6mm thick Grade 316 Stainless Steel 2B finish sheet folded, fully welded at joints, stiffened where necessary to form a rigid weather and vermin proof Plinth mounting enclosure, IP55 to AS1939.
- Hinged Panels to be 2.0mm thick Zinc Anneal sheet folded, fully welded at joints and stiffened where necessary.
- Door seals to be retained by use of metal framing.
- Equipment panels to be 3.0mm Steel sheet.
- Fit 4 M12 lifting Lugs to the top of the cubicle.
- Fit 6mm thick bakelite gland plates to cutouts in Base of cubicle.
- Fit one spare fuse receptacle in cubicle.
- Meter Panel to be double Hinged 6mm thick laminated phenolic resin.
- Fit catch stays to doors and hinged panels to allow minimum opening of 110° (Doors with external heat shields to open to 90°).
- Rear of Hinged Panels to be shrouded to IP21 of AS 1939.
- Fit 6mm earthing studs to doors, hinged panels and cubicle for earth continuity.
- Fit one drawing holder and one log book holder to the Rear of Door No1 as shown on General Arrangement Drawing.
- Fit one Legend Card Holder to Front of hinged panel No.2.
- Termination schedule to be mounted on hinged panel to show terminals and their connections. Schedule to be covered by Clear Perspex sheet of A4 size.
- Allow 20% spare terminal roll for future.

PAINTWORK - CUBICLE (EXTERNAL)
- Grind smooth all welds, descale, degrease and acid dip.

PAINTWORK - PLINTH
- Plinth to be 150mm x 50mm x 6mm Mild Steel Channel.
- Grind smooth all welds, descale and degrease and Hot Dip Galvanise.

PAINTWORK - EQUIPMENT CHASSIS, HINGED PANELS, LOG BOOK HOLDER AND DRAWING HOLDER
- Grind smooth all welds, descale and degrease. Finish with electrostatically applied, oven cured, polyester Powderkote to colour white.

HINGES - DOORS
- Lowe & Fletcher CP lift off Type KIS.

HINGES - HINGED PANEL
- Lowe & Fletcher CP lift off Type KIS.

LOCKS DOORS 4 & 5
- Selectrix 1107SSC04 handle (2 off).
- Selectrix 1107-U6 3 Point CAM (2 off).
- Enka 3 Point Locking Bars (2 off).
- SCOED Lockwood No 2343 45mm brass pin tumbler padlock (2 off).

LOCKS DOORS 1-3, 6-8
- Selectrix 1107SSCU3 Handle (6 off).
- Selectrix 1109-77W Barrel Lock (6 off).
- Selectrix 1107-U6 3 Point CAM (6 off).
- Enka 3 Point Locking Bars (6 off).

LOCKS - HINGED PANELS
- ENKA 1000-U45 housing with 1000-U142 slotted insert and 1000-25 Tongue and seal.

LABELS
- Internal labels to be W-B-W (except MAIN SWITCH and WARNING labels which are to be R-W-R) traffolyte inscribed as shown in label schedule. Main Switch labels' letter size to be 10mm, compartment labels' letter size to be 10mm and remainder labels' letter size to be 4mm. Internal labels to be secured with M3 Chrome Plated metal threads. External labels to be secured with M3 316 Grade Stainless Steel metal threads.
- Where Switchboard wiring obstructs labels mounted on equipment chassis the labels shall be mounted on duct lid and the lid secured by a single cable tie at one corner.

WIRING
All wiring to be PVC V75 600V Grade. Control and instrumentation wiring to be minimum 1.5mm2 tinned flexible copper conductors colour coded as shown below, numbered at each end and terminated by use of metal ferrules or crimp lugs. Power wiring to be minimum 2.5mm2 multistrand copper conductors phase colour coded as shown below.
Wire numbering system shall be Grafoplast.

COLOUR CODE

Phase wiring (A, B & C)	- red, white and blue
Voltmeter and current transformer connections	- red, white, blue and BLACK.
240V control active	- white
Thermistors and no volt contacts	- orange
240V neutral	- black
24V ELV positive	- grey
24V ELV negative	- grey
Intrinsically safe wiring	- blue
Earth	- green-yellow

Labels
1. 'TERMINALS 133, 134, 233, 234 THERMISTORS - DO NOT TEST ABOVE 2.2V'
   - 4mm R-W-R
   - Fit Adjacent to Terminal Strip
2. 'SP19' - 20mm W-B-W 316 Stainless Steel Fit to Door 2, label dimensions 150mm x 35mm.
3. 'DANGER 415V' 8mm R-W-R 316 Stainless Steel Fit to Door 2, label dimensions 120mm x 15mm.
4. 'SUPPLY AUTHORITY METER PANEL' 10mm W-B-W 316 Stainless Steel Fit to Door 4, label dimensions 300mm x 20mm.
   'PLEASE CHECK THAT THE')
   'STATION IS IN REMOTE') - Single Label 8mm W-B-W 316 Stainless Steel
   'MODE BEFORE LEAVING SITE') Fit to Door 2, label dimensions 210mm x 60mm
- Use 4mm2 earth wire for door/cubicle connection.
- Gland plate opening to be re-inforced with 25mm X 6mm metal strips drilled and tapped with 6mm holes.
- Fitting holes for gland plates to be spaced at a maximum of 150mm apart.
- Gland plate openings to be sealed with 25mm wide neoprene gaskets glued to the Switchboard.
- Sunshields to have rounded corners with all edges turned in.

NOTES:-
1. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- 1006-0353 SHEET 2 REV'N 3.
2. MANUAL SPEED CONTROL POTENTIOMETERS FOR PUMPS 1 AND 2 TO BE INSTALLED.

AS CONSTRUCTED
PLOTTED M.J. Lyttleton DATE 8/00
CHECKED [illegible] DATE 8/00

SUPERCEDES DRAWING No:- 1006-0353 SHEET 2 REV'N 03

NO.	DATE	AMENDMENT	REV INITIALS
A	08/00	AS CONSTRUCTED ISSUE.	
0	11/98	ORIGINAL ISSUE.	

DIRECTOR OF P.D. & P.S.			DATE
ENGINEER IN CHARGE	R. BOWRING	21/12/99	DATE
SUPERVISING ENGINEER	NOTE 1	R.P.E.Q. NO.	DATE

	NAME	DATE
DESIGN	NOTE 1 R.L.	3-12-99
DRAWN	NOTE 1	3-12-99
CHECKED		

Brisbane City

JOB FILE			
ACAD FILE	STNG008	SHEET SIZE	A1
SURVEY No.		FIELD BOOK	
SURVEYED		A.H. DATUM	

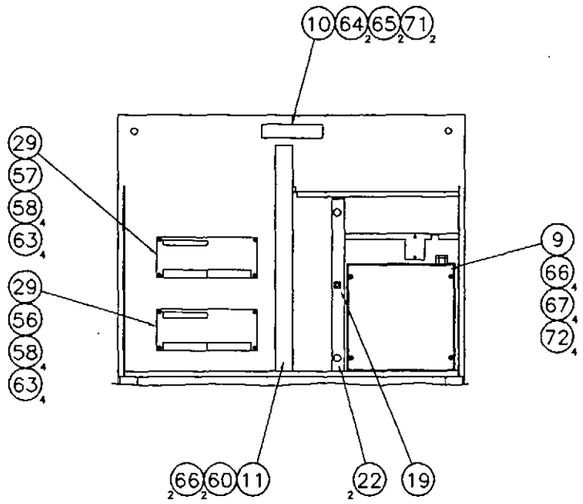
Brisbane Water

PROJECT: CENTENARY HIGHWAY SEWAGE PUMP STATION SP19

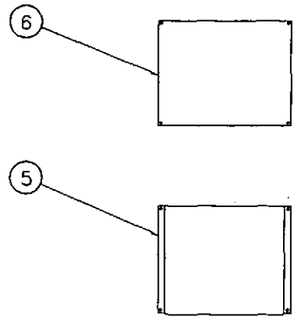
TITLE: SWITCHBOARD CUBICLE CONSTRUCTION & GENERAL ARRANGEMENT

SCALE NTS | N° 8 OF 8 SHEETS

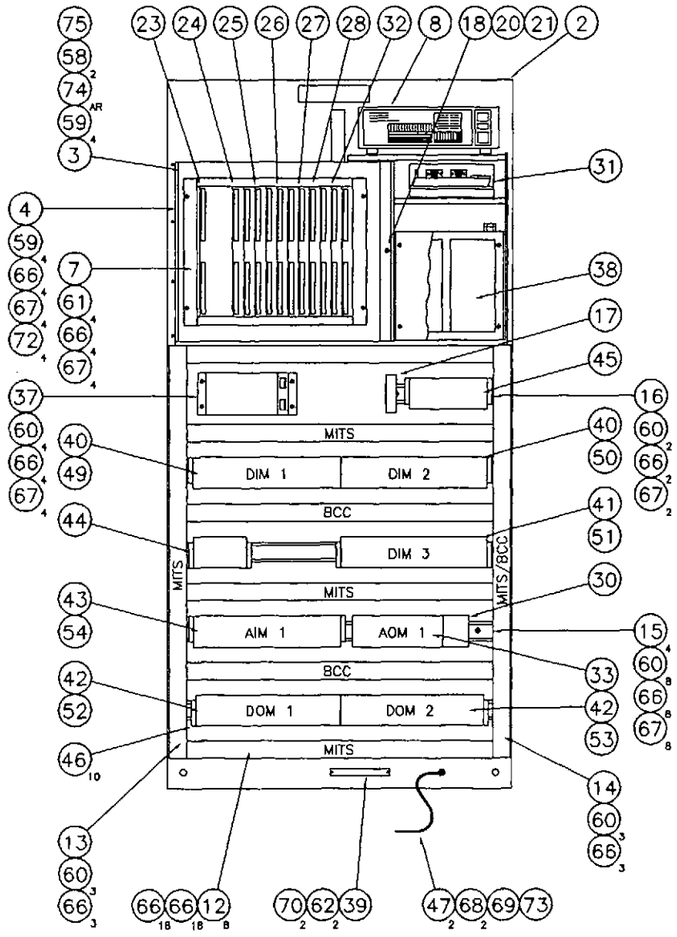
DRAWING N° 486/5/7-HG008 | AMEND. A



PART VIEW WITH SWING FRAME, RADIO & PSU REMOVED



ABOVE ITEMS ARE TO BE SUPPLIED LOOSE FOR FITTING TO THE SWITCHBOARD DOOR



PART FRONT VIEW
DETAILING TERMINAL LAYOUT

EQUIPMENT SCHEDULE

ITEM	PART NO	DESCRIPTION	QTY
1	486/5/7-HG010 & 11	WIRING DIAGRAM	REF
2		MTG PLATE	1
3		FRAME	1
4	400-1477	HINGE	1
5		DOCUMENT POCKET	1
6		PERSPEX COVER	1
7	400-1449	CARD FRAME ASSEMBLY	1
8	400-1295	POWER SUPPLY UNIT PSU-11	1
9	400-1477	G.A. BATTERY BOX	1
10	400-1477	LABEL	1
11	400-1477	DUCTING	1
12	400-1477	DUCTING	8
13	400-1461	DUCTING	1
14	400-1482	DUCTING	1
15	400-1479/1	RAIL	4
16	400-1479/2	RAIL	1
17	DTP9691	PUSHBUTTON SWITCH 'NHP'	1
18	82-11-480-16	1/4 TURN FASTENER 'SOUTHCO'	1
19	82-35-309-58	RECEPTACLE 'SOUTHCO'	1
20	82-46-101-38	WEAR WASHER 'SOUTHCO'	1
21	82-32-201-20	RETAINER 'SOUTHCO'	1
22	880	RUBBER BUFFER 'MACAM'	2
23	701-300-589	DOM-105	1
24	701-300-570	PM-121	1
25	701-300-552	CIM-107	1
26	701-300-543	DIM-102	3
27	701-300-505	DOM-102	2
28	701-300-582	AIM-105	1
29	701-300-581	RTM-101	2
30	1006-0120	AC TERMINALS	1
31	TC-900DR	RADIO 'TRIO'	1
32	701-300-503	AOM	1
33	1006-0109	AOM FIELD TERMINALS	
35			
36			
37	IEXR/24-12	DC-DC POWER SUPPLY 'POWERBOX'	1
38	AS12/18	BATTERY 'SONNENSCHIEN'	2
39	BP90A12	12 WAY EARTH BLOCK 'CLIPSAL'	1
40	1006-0110	DIM FIELD TERMINALS	2
41	1006-0102	DIM FIELD TERMINALS	1
42	1006-0104	DOM FIELD TERMINALS	2
43	1006-0109	AIM FIELD TERMINALS	1
44	1006-0105	COMMON TERMINALS	1
45	1006-0113	POWER TERMINALS	1
46	EW35/038356	ENO BRACKET 'KLIPPON'	10
47	300-510	EARTH STRAP	1
48	300-588	CABLE ASSEMBLY - CIM/TRIO	1
49	300-502/9	CABLE ASSEMBLY - DIM	1
50	300-502/10	CABLE ASSEMBLY - DIM	1

EQUIPMENT SCHEDULE

ITEM	PART NO	DESCRIPTION	QTY
51	300-502/11	CABLE ASSEMBLY - DIM	1
52	300-504/4	CABLE ASSEMBLY - RTM/FIELD	1
53	300-504/5	CABLE ASSEMBLY - RTM/FIELD	1
54	300-501/10	CABLE ASSEMBLY - AIM	1
55			
56	300-508/3	CABLE ASSEMBLY - DOM/RTM	1
57	300-508/4	CABLE ASSEMBLY - DOM/RTM	1
58		SCREW M3 X 6 PAN HD. M.S. ZINC PLATE	10
59		SCREW M4 X 6 PAN HD. M.S. ZINC PLATE	8
60		SCREW M4 X 8 PAN HD. M.S. ZINC PLATE	40
61		SCREW M4 X 10 PAN HD. M.S. ZINC PLATE	4
62		SCREW 5/32" WHIT X 3/8" CH HD. M.S. ZINC PLATE	2
63		WASHER M3 NYLON	8
64		WASHER M3 PLAIN EXTRA LARGE M.S. ZINC PLATE	2
65		WASHER M3 INT. STAR C.S. ZINC PLATE	2
66		WASHER M4 PLAIN M.S. ZINC PLATE	52
67		WASHER M4 INT. STAR C.S. ZINC PLATE	28
68		WASHER M6 PLAIN M.S. ZINC PLATE	2
69		WASHER M6 INT. STAR C.S. ZINC PLATE	2
70		WASHER 5/32 INT. STAR C.S. ZINC PLATE	2
71		NUT M3 HEX M.S. ZINC PLATE	2
72		NUT M4 HEX M.S. ZINC PLATE	8
73		NUT M6 HEX M.S. ZINC PLATE	2
74		LOCKTITE 242	AR
75	400-1490/12	LABEL	1
76			
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NOTES:-

1. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- 1006-0353 SHEETS 1 & 2 REV'N 3.
2. ALL ITEMS IN THE AREAS DELINEATED BY REVISION CLOUDS ARE NEW MODIFICATIONS.

AS CONSTRUCTED
PLOTTED W.J. Rowbotham DATE 8/00
CHECKED [signature] DATE 8/00

SUPERCEDES DRAWING No:- 1006-0353 SHEETS 1 & 2 REV'N 03

NO.	DATE	AMENDMENT	INITIALS
A	08/99	AS CONSTRUCTED ISSUE	RFW
0	11/98	ORIGINAL ISSUE	

DIRECTOR OF P.D. & P.S. — DATE
ENGINEER IN CHARGE — R. BOWRING — 21/12/99 — DATE
SUPERVISING ENGINEER — NOTE 1 — R.P.E.Q. NO. — DATE

	NAME	DATE
DESIGN	NOTE 1 R.J.	3-12-99
DRAWN	NOTE 1	3-12-99
CHECKED		

Brisbane City

JOB FILE			
ACAD FILE	57HG009	SHEET SIZE	A1
SURVEY No.		FIELD BOOK	
SURVEYED		A.H. DATUM	

Brisbane Water

PROJECT: CENTENARY HIGHWAY SEWAGE PUMP STATION

TITLE: R.T.U. GENERAL ARRANGEMENT

SCALE NTS | N° | OF | SHEETS

DRAWING N° 486/5/7-HG009 | AMEND. A

CARD FRAME

QC9 + | QC12 + | QC13 − | QC11 ⏚ | PM | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

PLB2 | PLB3 | PLB4 CIN | PLB5 DIM1 | PLB6 DIM2 | PLB7 DIM3 | PLB8 DOM1 | PLB9 DOM2 | PLB10 AIM1 | PLB11 AOM1 | PLB12

CF+ (R) | CF− (Bk) | CF (G/Y) — (7)4

300-508 | 300-502/9 | 300-502/10 | 300-502/11 | 300-508/3 | 300-508/4 | 300-501/10 | 300-503/1

SKA 1 | PLA | QC2 (7)2 — RTM 2 — 18 PLC 1 | 18 PLD 1 | SKC | SKD — 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 COM

300-504/4 | 300-504/5

SHT.2

(1) (2) (3) (4) (5)

(5)3 DIM2: GND, COM, DIM2 +, DIM2 −, DIM2 G/Y, R, Bk — 0 1 2 3 15 — REFER TO DWG No:- 486/5/7-HG002

(5)3 DIM3: G/Y, R, Bk, DIM3 +, DIM3 −, GND, COM — 0 1 2 3 15 — REFER TO DWG No:- 486/5/7-HG003

(5)2 DOM1: R, Bk, DOM1 +, DOM1 −, COM, Bk — 0 1 2 3 15 — REFER TO DWG No:- 486/5/7-HG002

(5)3 AOM1: GND, −VE, +VE, AOM1 G/Y, Bk, R, AOM1 +, AOM1 − — 0+ 0− 1+ 1− 2+ 2− 3+ 3− 7+ 7− — 651 652 653 654 — REFER TO DWG No:- 486/5/7-HG005 — NOT USED

(6)(5)14 2 — (5)3 DIM1: GND, COM, DIM1, DIM1 +, DIM1 −, G/Y, R, Bk — 0 1 2 3 15 — REFER TO DWG No:- 486/5/7-HG004

BAT LO +, BAT LO −, I/P UV +, I/P UV −, AL+, AL−

(5)4 COM1: COM1 +, COM1 −, Bk, 6+, 6−, 15+, 15− — (6)(5)2 14 — SEE NOTE 1 — REFER TO DWG No:- 486/5/7-HG005

(5)4 AIM1: GND1, GND2, AIM1, AIM1, G/Y, G/Y — 0+ 0− 6+ 6− 15+ 15−

(5)2 DOM2: R, Bk, DOM2 +, DOM2 −, COM, Bk — 0 1 2 3 15 — REFER TO DWG No:- 486/5/7-HG003

(6)(5)14 2

1. WIRING BETWEEN AIM's/COM's TERMINALS SHOW TYPICAL WIRING.
   i.e. EXTERNALLY POWERED CHANNELS 0 & 15
   INTERNALLY POWERED CHANNELS 6
   FOR ACTUAL INTERNAL POWERED CHANNELS REFER TO THE LIST BELOW:-
   AIM1/COM1 - 4, 5
   ALL OTHER CHANNELS ARE EXTERNALLY POWERED.
2. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- 1006-0553 SHEET 1 REV'N 5.
3. ALL ITEMS IN THE AREAS DELINEATED BY REVISION CLOUDS ARE NEW MODIFICATIONS.

SUPERCEDES DRAWING No:- 1006-0553 SHEET 1 REV'N 05

AS CONSTRUCTED
PLOTTED DATE 8/00
CHECKED DATE 8/00

NO.	DATE	AMENDMENT	INITIALS
A	18/99	AS CONSTRUCTED ISSUE	
0	17/99	ORIGINAL ISSUE	

DIRECTOR OF P.D. & P.S. — DATE
ENGINEER IN CHARGE — R. BOWRING — 21/12/99 — DATE
SUPERVISING ENGINEER — NOTE 2 — R.P.E.Q. NO. — DATE

	NAME	DATE
DESIGN	NOTE 2 R.J.	20-12-99
DRAWN	NOTE 2	20-12-99
CHECKED		

Brisbane City

JOB FILE			
ACAD FILE	S7HG010	SHEET SIZE	A1
SURVEY No.		FIELD BOOK	
SURVEYED		A.H. DATUM	

Brisbane Water

PROJECT: CENTENARY HIGHWAY SEWAGE PUMP STATION SP19

TITLE: R.T.U. CUBICLE POWER SUPPLIES WIRING DIAGRAM

SCALE NTS | N° 1 OF 2 SHEETS

DRAWING N° 486/5/7-HG010 | AMEND. A

DC-DC CONVERTER
I/P
O/P
DC-DC −
DC-DC +
PSU-11
RTU+ AUX1+ AUX2+ AUX3+ AUX4+ RTU− AUX1− AUX2− AUX3− AUX4− BAT+ BAT− BAT LO+ BAT LO− I/P UV+ I/P UV− GND GND
PL
SK
GND STUD
300-520/4
240V AC IN
RTU+ AUX1+ AUX2+ AUX3+ RTU− AUX1− AUX2− AUX3− BAT+ BAT− BAT LO+ BAT LO− I/P UV+ I/P UV− GND
300-588
PORT A
PORT B
TRIO RADIO
SMA
300-518
TO ANTENNA LIGHTNING ARRESTOR
BAT−
BAT+
BATTERY
300-517
SHT.1 DWG.
POWER TERMINALS
AUX1+
DIM1+ RD
DIM2+ RD
DIM3+ RD
1+
AUX1−
DIM1− BK
DIM2− BK
DIM3− BK
1−
AUX1+
DOM1+ RD
DOM2+ RD
2+
AUX1−
DOM1− BK
DOM2− BK
2−
AUX2+
COM1+ RD
3+
AUX2−
COM1− BK
3−
AOM1+ RD
AOM1− BK
AUX2+
AUX−
CF+ RD
CF− BK
4+ RTU+
4− RTU−
DC-DC+ RD
DC-DC− BK
R+ AUX3+
R− AUX3−
EARTH BLOCK
DIM1 GN/YL
DIM2 GN/YL
DIM3 GN/YL
AIM1 GN/YL
AIM1 GN/YL
AOM1 GN/YL
CF GN/YL
AL+
AL−
ATTENTION LIGHT RESET SWITCH
GND (PSU STUD) GN/YL
TO CUBICLE EARTH

1. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- 1006-0553 SHEET 2 REV'N 5.
2. ALL ITEMS IN THE AREAS DELINEATED BY REVISION CLOUDS ARE NEW MODIFICATIONS.

SUPERCEDES DRAWING No:- 1006-0553 SHEET 2 REV'N 05

AS CONSTRUCTED
PLOTTED DATE 8/00
CHECKED DATE 8/00

NO.	DATE	AMENDMENT	INITIALS
A	08/00	AS CONSTRUCTED ISSUE.	
0	05/00	ORIGINAL ISSUE.	RW

DIRECTOR OF P.D. & P.S. DATE
ENGINEER IN CHARGE R. BOWRING 21/12/99 DATE
SUPERVISING ENGINEER NOTE 1 R.P.E.Q. NO. DATE

	NAME	DATE
DESIGN	NOTE 1 R.J.	3-12-99
DRAWN	NOTE 1	3-12-99
CHECKED		

Brisbane City

JOB FILE			
ACAD FILE	57HG011	SHEET SIZE	A3
SURVEY No.		FIELD BOOK	
SURVEYED		A.H. DATUM	

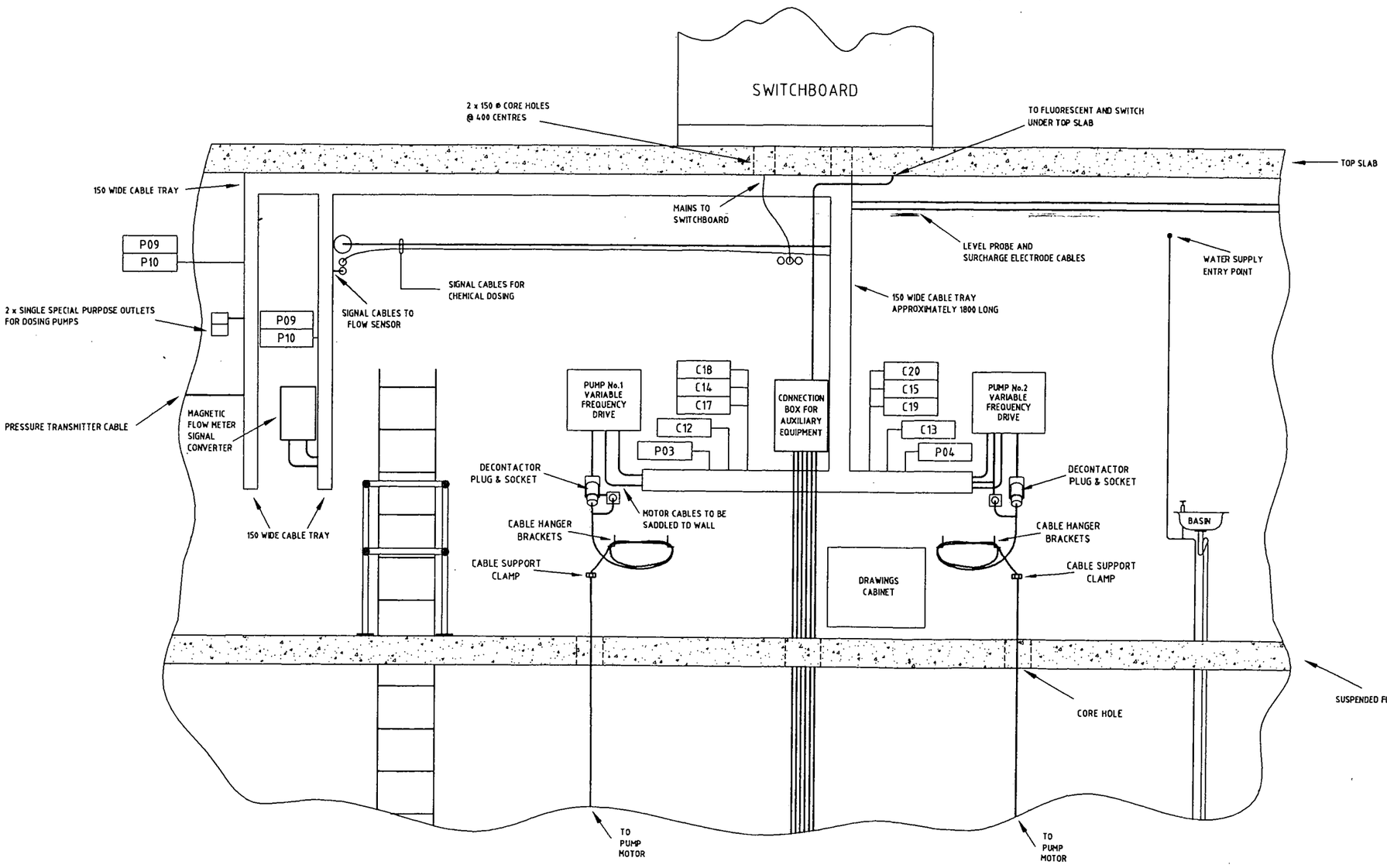
Brisbane Water

PROJECT
CENTENARY HIGHWAY
SEWAGE PUMP STATION SP19

TITLE
R.T.U. CUBICLE
POWER SUPPLIES
CONNECTION DIAGRAM

SCALE NTS
Nº 2 OF 2 SHEETS
DRAWING Nº 486/5/7-HG011
AMEND. A

CENTENARY HIGHWAY PUMPING STATION
SP 19



1. THE ELEVATION HAS BEEN DRAWN TO AN APPROXIMATE SCALE ONLY. NO ALLOWANCE HAS BEEN MADE FOR THE CURVATURE OF THE WALLS.
2. CABLE NUMBERING PREFIXES:-
   - 'P' POWER AND EARTH (240V)
   - 'C' EXISTING CABLING OR NEW TO BE INSTALLED ON A PERMANENT BASIS.
   - 'D' TEMPORARY INTERCONNECTION BETWEEN R.T.U.'s.
   - 'X' COMMUNICATION CABLES - RADIO OR TELECOM.
3. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- 486/7/HG1T093E REV'N D.
4. ALL ITEMS IN THE AREAS DELINEATED BY REVISION CLOUDS ARE NEW MODIFICATIONS.

LEGEND

CONDUIT

DUCTING

SECTION A
SCALE:NTS 092

SUPERCEDES DRAWING No:- 486/7/HG1T093E REV'N D

AS CONSTRUCTED
PLOTTED DATE 8/00
CHECKED DATE 8/00

NO.	DATE	AMENDMENT	INITIALS
A	08/99	AS CONSTRUCTED ISSUE	
0	11/99	ORIGINAL ISSUE	RFW

DIRECTOR OF P.D. & P.S. — DATE
ENGINEER IN CHARGE R. BOWRING 21/12/99 DATE
SUPERVISING ENGINEER NOTE 3 R.P.E.Q. NO. DATE

	NAME	DATE
DESIGN	NOTE 3 R.J.	21-12-99
DRAWN	NOTE 3	21-12-99
CHECKED		

Brisbane City

JOB FILE			
ACAD FILE	STHG012	SHEET SIZE	A1
SURVEY No.		FIELD BOOK	
SURVEYED		A.H. DATUM	

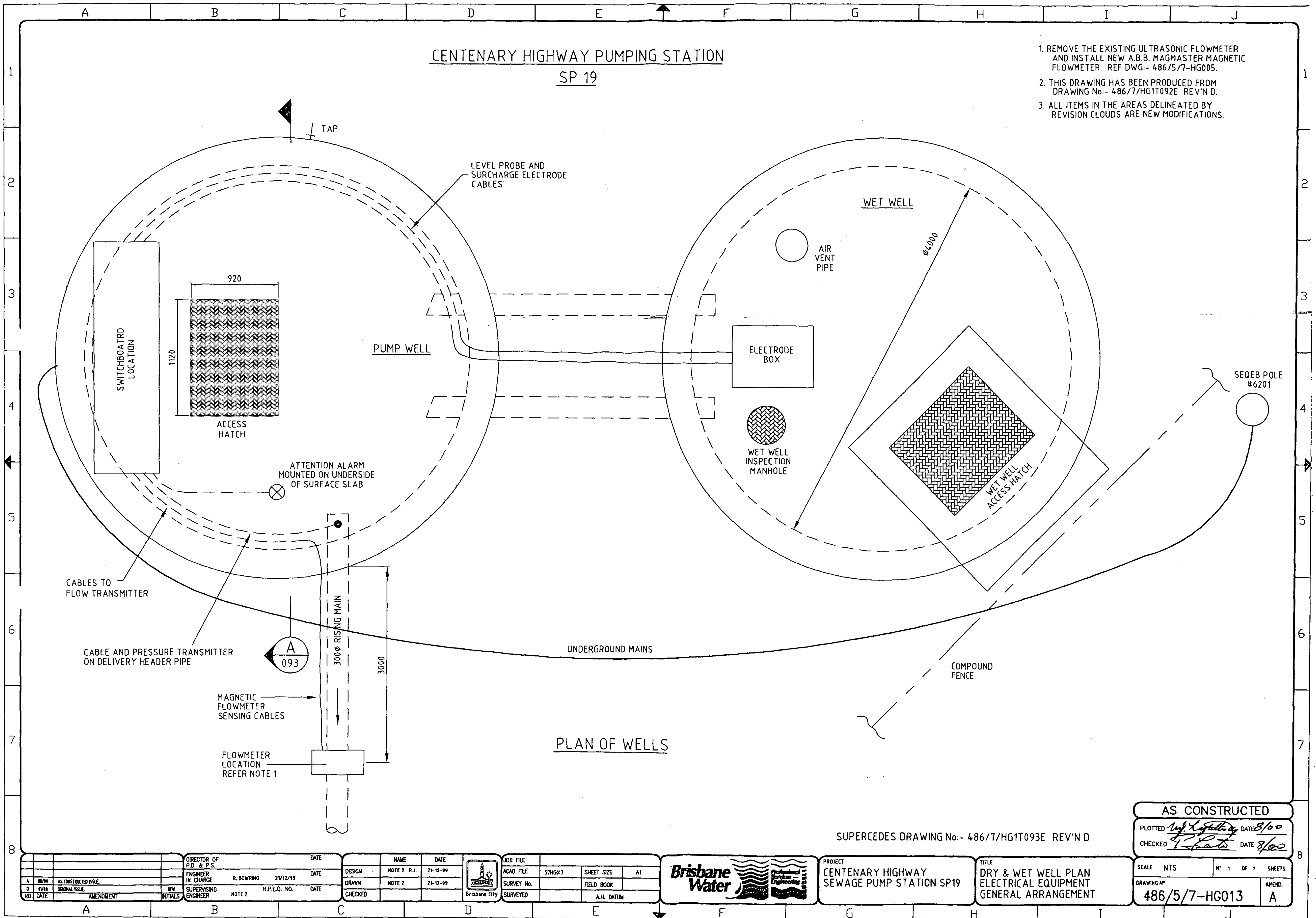
Brisbane Water

PROJECT: CENTENARY HIGHWAY SEWAGE PUMP STATION SP19

TITLE: DRY WELL: ELECTRICAL EQUIPMENT GENERAL ARRANGEMENT

SCALE NTS | N° 1 OF 1 SHEETS

DRAWING N° 486/5/7-HG012 | AMEND. A


CENTENARY HIGHWAY PUMPING STATION
SP 19
1. REMOVE THE EXISTING ULTRASONIC FLOWMETER AND INSTALL NEW A.B.B. MAGMASTER MAGNETIC FLOWMETER. REF DWG:- 486/5/7-HG005.
2. THIS DRAWING HAS BEEN PRODUCED FROM DRAWING No:- 486/7/HG1T092E REV'N D.
3. ALL ITEMS IN THE AREAS DELINEATED BY REVISION CLOUDS ARE NEW MODIFICATIONS.
TAP
LEVEL PROBE AND SURCHARGE ELECTRODE CABLES
WET WELL
AIR VENT PIPE
Ø4000
920
1120
SWITCHBOATRD LOCATION
PUMP WELL
ACCESS HATCH
ELECTRODE BOX
SEQEB POLE #6201
WET WELL INSPECTION MANHOLE
WET WELL ACCESS HATCH
ATTENTION ALARM MOUNTED ON UNDERSIDE OF SURFACE SLAB
CABLES TO FLOW TRANSMITTER
CABLE AND PRESSURE TRANSMITTER ON DELIVERY HEADER PIPE
A
093
300Ø RISING MAIN
3000
UNDERGROUND MAINS
COMPOUND FENCE
MAGNETIC FLOWMETER SENSING CABLES
FLOWMETER LOCATION REFER NOTE 1
PLAN OF WELLS
SUPERCEDES DRAWING No:- 486/7/HG1T093E REV'N D
AS CONSTRUCTED
PLOTTED DATE 8/00
CHECKED DATE 8/00
A 08/00 AS CONSTRUCTED ISSUE
0 12/99 ORIGINAL ISSUE
NO. DATE AMENDMENT INITIALS
DIRECTOR OF P.D. & P.S. DATE
ENGINEER IN CHARGE R. BOWRING 21/12/99 DATE
SUPERVISING ENGINEER NOTE 2 R.P.E.Q. NO. DATE
NAME DATE
DESIGN NOTE 2 R.J. 21-12-99
DRAWN NOTE 2 21-12-99
CHECKED
Brisbane City
JOB FILE
ACAD FILE 57HG013 SHEET SIZE A1
SURVEY No. FIELD BOOK
SURVEYED A.H. DATUM
Brisbane Water
PROJECT
CENTENARY HIGHWAY SEWAGE PUMP STATION SP19
TITLE
DRY & WET WELL PLAN ELECTRICAL EQUIPMENT GENERAL ARRANGEMENT
SCALE NTS
No 1 OF 1 SHEETS
DRAWING No
486/5/7-HG013
AMEND.
A