□ Electrical □ Mechanical □ Water Meters
25 Bunya Street Eagle Farm Q 4009
Ph. (07) 3403 1849
Fx. (07) 3403 1898

25th July.1999

OPERATING MANUAL FOR:

ASPLEY to BANYO TRUNK MAIN

S5 S43 and S44 TRUNK MAINS

CATHODIC PROTECTION SYSTEM

CLIENT:

BRISBANE WATER
WATER SYSTEM SERVICES

MANUAL CONTENTS

DRAWINGS

486/6/25-AA1C0021E	Standard Rectifier Wiring Diagram
(No Number)	Monthly Maintenance Program

(1.0) INTRODUCTION

Steel when immersed or covered in water has a tendency to corrode (or rust) as the oxidized form is more stable than the metal.

Because of this, precaution must be taken to stop or minimize the corrosion reaction to an acceptable level consistent with the design life of the structure. This is normally achieved by the use of protective coatings which control the corrosion reaction by isolating the steel from its surrounding environment.

However, it is not practical to achieve a perfect coating and coating damage will always occur with time. Because of this, corrosion may occur at imperfections in the paint coating, causing further deterioration in the coating as well as loss of metal.

As a result of this, the coating defects must be rectified by periodic maintenance or an additional method of protection used to prevent this deterioration and corrosion occurring. This additional protection is achieved by the cathodic protection system.

(2.0) CORROSION AND CATHODIC PROTECTION

Corrosion is an electrochemical process in that it is accompanied by a flow of electrical current.

Corrosion occurs on the surface of metals at active areas known as anodes, which are electrically continuous with less active or passive areas known as cathodes. The electric current flows from the anode through the electrolyte to the cathode, with the circuit being completed by the electrical continuity between the cathode and anode. In practice anodes and cathodes are generally part of the same metallic surface and individual anodic areas may be small.

In applying cathodic protection an external current is applied to the surface so that the entire surface to be protected acts as a cathode. This involves the use of an auxiliary anode and when the current flow from this anode is sufficient, no part of the structure acts as an anode.

An external source of direct current such as a transformer rectifier is used in conjunction with an anode consisting of material with a very slow corrosion rate.

While it is the flow of current which achieves the cathodic protection of the surface it is impractical to measure these currents over individual anodic areas to determine when cathodic protection has been achieved. However, with the flow of cathodic protection current, the structure becomes more negative with respect to the surrounding electrolyte. Because of this, it is possible to state values of metal/electrolyte potential at which corrosion does not occur. This metal/electrolyte potential is generally measured against a standard reference electrode which allows a reproducible potential at which corrosion does not occur to be quoted.

(3.0) MAINS DETAILS

Size: 1370 mm, 910mm, 755mm &600mm Dia mild steel cement lined.

Coating: Tar Epoxy.

Length: Appox 7.4 Km.

Location: From Valve 370 at Aspley Water Pumping Station to Valve 777 at the corner of St. Vincent Rd. and Royal Pde. Banyo.

Construction Drawings:

486/1/22-CC0024E	Cathodic Protection Standard Switchboard Cabinet .
486/1/22-AA1T0001E	Cathodic Protection Test Points
486/4/6 -WM001	Aspley to Banyo Trunk Water Main CP System Details.

(4.0) CATHODIC PROTECTION DETAILS

(4.1) Type of Cathodic Protection: Impressed Current.

(4.2) Rectifier: Special 32 Volt, 25 amp direct current output enclosed in a stainless steel switchboard. This system has 2 rectifiers installed. One rectifier is in Blinzinger Rd. and has a 240V supply from Energex Pole No.19207 located in Blinzinger Rd.Banyo. The second rectifier is adjacent to the toilet block in Ellison Rd. Chermside and has a 240V supply from this block.

(4.3) Cathode: One cathode point is located on the 600 mm dia mains, opposite test point No.13 in Kelly Rd. Banyo. The second cathode point is located on the 910 mm dia mains in Ellison Rd. opposite Boulter St. Aspley. The cathode point is where the cabling from the rectifier is attached to the structure under cathodic protection.

(4.4) Anodes: Four 1500 x 75mm silicone iron anodes were installed approximately 120 metres from the trunk mains, in a vertical bed 10 metres deep, at the corner of Elliott Rd.& Blinzinger Rd.Banyo. At the second location,in Marchant Park Aspley, five 1500 x 75mm anodes were installed approx.150 metres from the trunk mains, in a vertical bed 3 metres deep.The anodes are backfilled with cokebreeze thereby improving anode – ground resistance. The anodes are identified by a marker post and label. See layout drawing.

(4.5) Test Points: Test points are installed on cathodically protected structures to enable testing to ensure full protection of the mains. On these mains fitteen test points have been installed on the trunk main which can be identified from the layout drawing.

(4.6) Associated Drawings:
Cathodic Protection Test Point Details – 486/1/22–AA1T0001E
Standard Rectifier Wiring Diagram – 486/6/25–AA1C0021E

(4.7) Associated Standards:
AS 3000 1991 Australia Wiring Rules
AS 2832.1 1991 Pipes, Cables, Ducts, Guide to Cathodic Protection, Part One.

(4.8) Government Regulations:
Queensland Electricity Acts and Regulations.

(5.0) PERFORMED TESTING

(1) Natural Potential Survey.

(2) Testing of Insulated Flanges, Joints.

(3) Soil Resistance Testing.

(4) Current Drain Survey.

(5) Pipe Coating Anomaly Survey.

(6) Rectifier Loop Resistance.

(7) Foreign Structure Interference Survey and Mitigation.

(8) Final Potential Survey and Commissioning.

(6.0) CONCLUSION

Full Cathodic protection has been achieved on this section of trunk mains. The cathodic protection system is registered with the Electrical Safety Office, Department of Mines and Energy, and has approval to operate.

(7.0) MAINTENANCE

The cathodic protection system is maintained on a monthly basis after commissioning. These checks involve testing rectifier operation and recording of pipe to soil potentials.

25th July, 1999.
Electrical Engineering Unit.
Cathodic Protection

CPS Monthly Maintenance Details.

Required:

1/ Notify plant operator and/or sign entry logs where necessary.
2/ Have appropriate keying.

Labour:

One tradesperson, one vehicle. 20 minutes per site.

Procedure:

1/ Identify installation.
2/ Check system for operation.
3/ Record voltmeter.
4/ Record ammeter.
5/ Comments.
6/ Log entry.

25th July, 1999.
Electrical Engineering Unit.
Cathodic Protection

CPS 6 Monthly Maintenance Details.

Required:

1/ Notify plant operator and/or sign entry logs where necessary.
2/ Have appropriate keying.
3/ Set of tools. (Electricians)
4/ Multimeter.
5/ DC clampmeter.
6/ Copper sulphate reference cell and leads.
7/ Cleaning equipment.
8/ Gatic cover lifters.

Labour:

One tradesperson electrical, one laborer, one vehicle.
Two hours per site.

Procedure:

1/ Identify system.
2/ Check system for operation.
3/ Record voltmeter.
4/ Record ammeter.
5/ Record "on" potentials for all test points.
6/ Record "instant off" potentials for all test points.
7/ Record "off" potentials for all test points.
8/ Perform loop resistance and record.
9/ Check and record anode string currents.
10/ Comments.
11/ Log entry.

25th July, 1999.
Electrical Engineering Unit.
Cathodic Protection

CPS 60 Monthly Maintenance Details.

Required:

1/ Notify plant operator and/or sign entry logs where necessary.
2/ Have appropriate keying.
3/ Set of tools. (Electricians)
4/ Multimeter.
5/ DC clampmeter.
6/ Copper sulphate reference cell and leads.
7/ Cleaning equipment.
8/ Gatic cover lifters.
9/ Rectifier load bank.
10/ PCS2000 Detection Equipment.

Labour:

One tradesperson electrical, one laborer, one vehicle.
Eight hours per site.

Procedure:

1/ Identify system.
2/ Check system for operation.
3/ Record voltmeter.
4/ Record ammeter.
5/ Record "on" potentials for all test points.
6/ Record "instant off" potentials for all test points.
7/ Record "off" potentials for all test points.
8/ Perform loop resistance and record.
9/ Check and record anode string currents.
10/ Load test rectifier for 10 minutes.
11/ Check all switchboard and testpoint terminals for tightness.
12/ Check all switchboard and testpoints are labelled and I.D. tags attached.
13/ Check plans are correctly drawn and modify if necessary.
14/ Remove and inspect anodes.
15/ Recheck all interference (CPS) bleeds.
16/ Pipecamp structure if applicable.
17/ Apply to reregister system if applicable

Brisbane Water Engineering Services

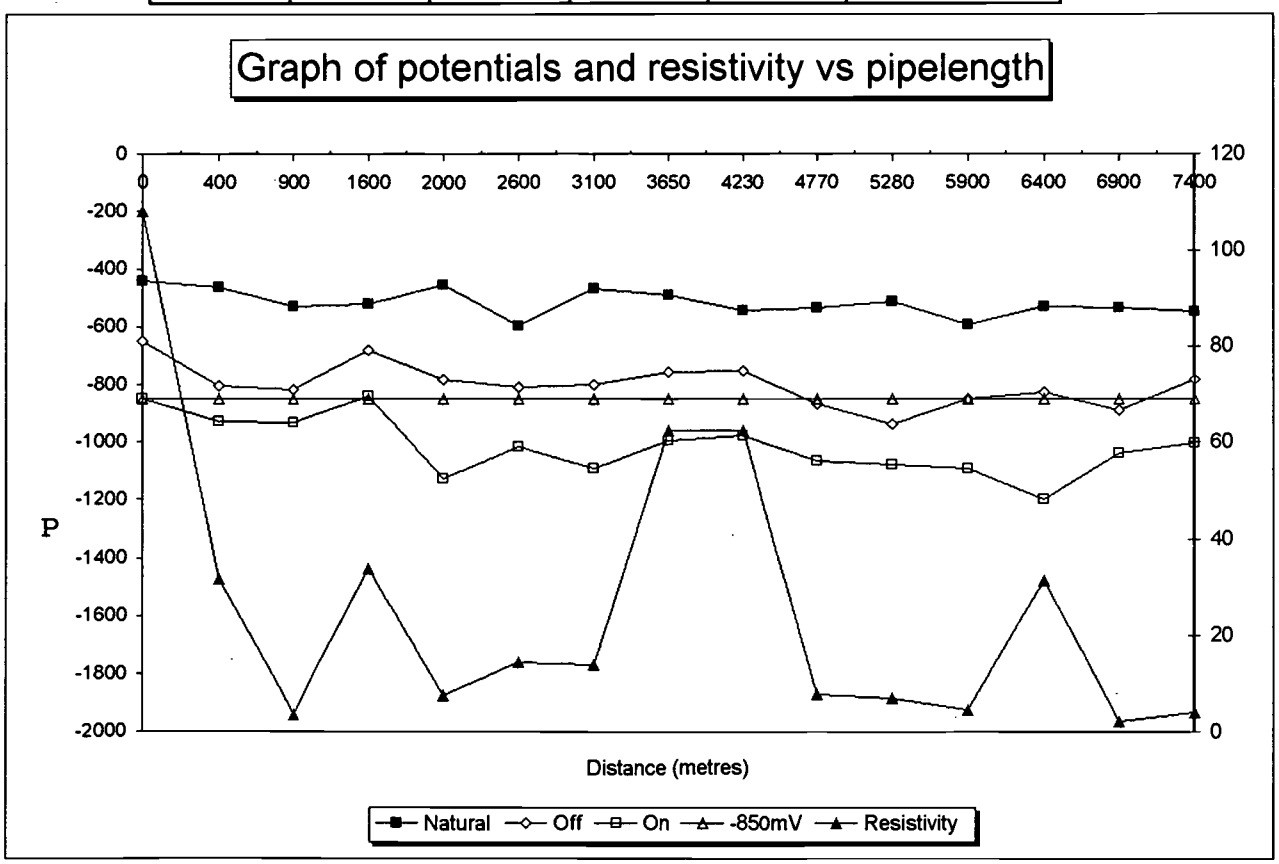
CP Form No. 23

Electrical Engineering Unit

Cathodic Protection System Potential Recording Form

Project ASPLEY / BANYO. TRUNK MAINS S5, S43, S44. **Date** 22nd Feb. 1999

Test Point number	Distances to T.P.	Potentials to CuSO4			Resistivities at 2 metres
		Natural	Off	On	
	(metres)	(mV)	(mV)	(mV)	(ohm.metres)
1	0	-440	-650	-850	108
2	400	-465	-805	-930	31.6
3	900	-528	-817	-933	3.5
4	1600	-520	-680	-840	33.9
5	2000	-454	-780	-1125	7.5
6	2600	-595	-807	-1017	14.3
7	3100	-470	-800	-1094	13.8
8	3650	-490	-755	-995	62.4
9	4230	-542	-750	-977	62.4
10	4770	-535	-865	-1065	7.7
11	5280	-510	-935	-1077	7
12	5900	-590	-850	-1090	4.5
13	6400	-528	-825	-1200	31.4
14	6900	-535	-887	-1040	2.3
15	7400	-549	-780	-1005	4



Rectifiers located at 2000M and 5900M

Potbany.wk4

Page 1

Brisbane Water Engineering Services
Ph. 34031838 Fx. 34031839
5 Bunya Street
Electrical Engineering Unit
Eagle Farm Q 4009

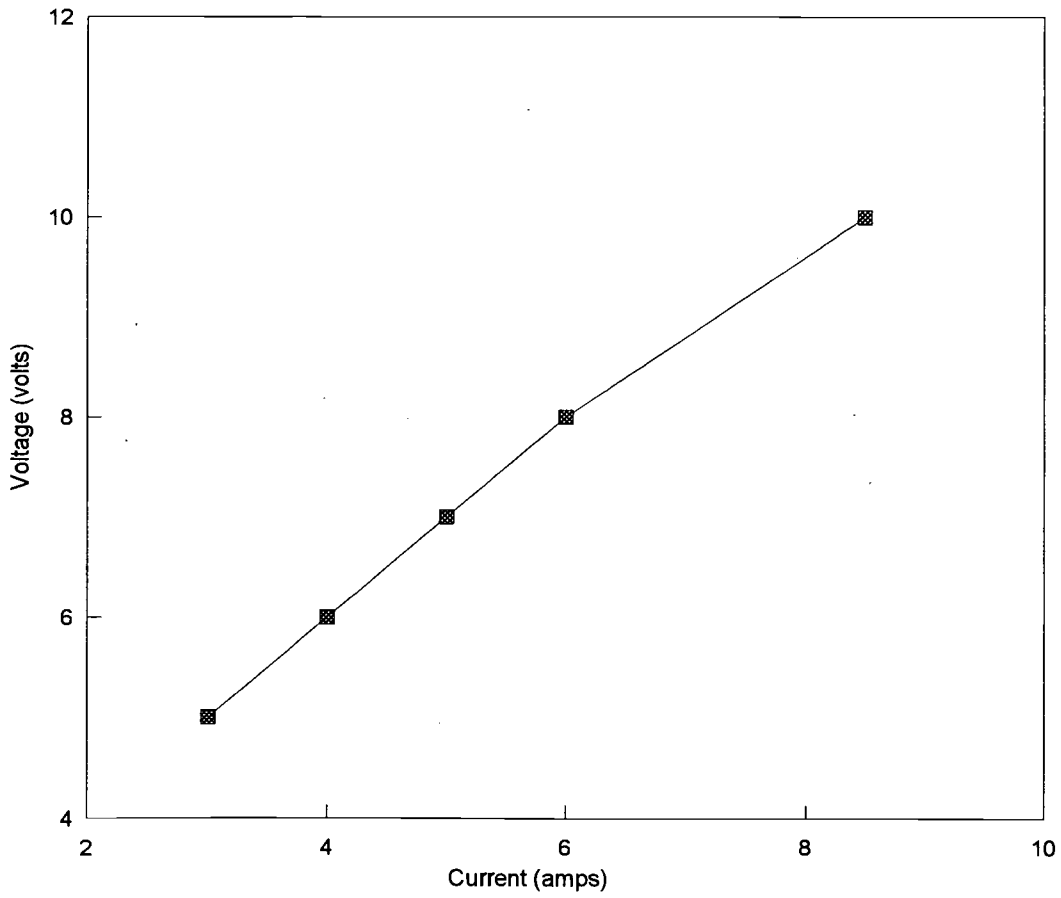
Cathodic Protection System Loop Resistance Ellison Road Rectifier. CPS166

Date: 20th JUNE 1999
Cathodic Protection System: Aspley to Banyo Trunk Main S5,S43 &S44
System Operating Volts 13.5 System Operating amp 13

Test Voltage: (volts)	Test Current: (amps)
5	3
6	4
7	5
8	6
10	8.5

Loop Resistance (ohms)
0.857143

Graph of System voltage vs current.



16/07/99 LPBANY1.WK4

Brisbane Water Engineering Services

Electrical Engineering Unit

Ph. 34031838 Fx. 34031839
5 Bunya Street
Eagle Farm Q 4009

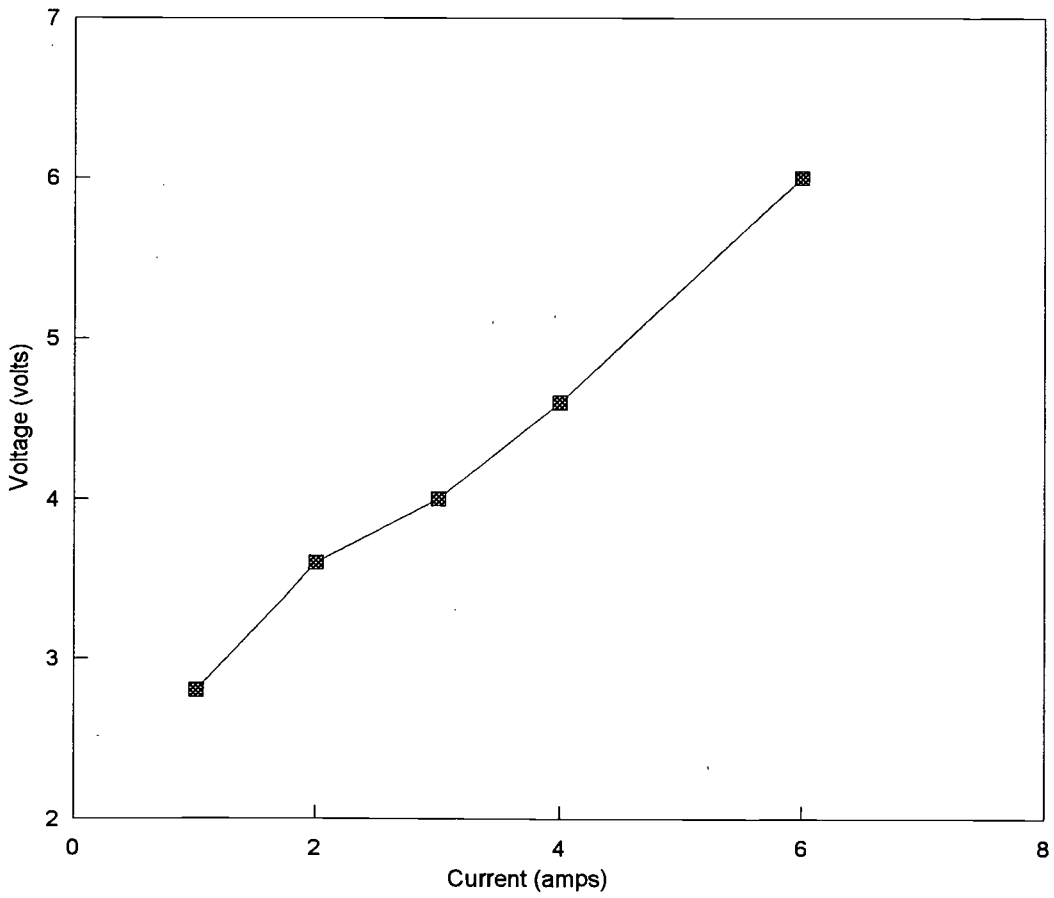
Cathodic Protection System Loop Resistance Blinzinger Road Rectifier. CPS155

Date: 20th JUNE 1999
Cathodic Protection System: Aspley to Banyo Trunk Main S5,S43 &S44
System Operating Volts 6 System Operating amp 6

Test Voltage: (volts)		Test Current: (amps)	
2.8		1	
3.6		2	
4		3	
4.6		4	
6		6	

Loop Resistance (ohms)
0.666667

Graph of System voltage vs current.



16/07/99

LPBANY2.WK4

Facsimile

Telstra

To	Jeff Say
Company	Brisbane Water Brisbane
Facsimile	34030271
From	J. J. Mc Monagle PTTO2
Subject	Interference tests
Date	23 June 1999
File	330/11/139 **Total Pages** 4
Attention	

Technology Services
External Plant Technology

Locked Bag 3583
Brisbane
QLD 9008
Australia

Telephone 07 38874879
Facsimile 07 32360541

Jeff,
The attached sheets show the test results of interference tests completed on 22/06/99 at three of your new C.P. installations.

ADVERSE Interference above +10 mv was found at five locations as per the attached sheets but due to the protection levels on the Telstra cable being more negative than your pipe line potentials I consider it impractical for Brisbane Water to mitigate this adverse interference economically and Telstra is prepared to accept this level of interference provided the output of the Marchant park ICU does not exceed 15 Amps and the Blizinger Rd ICU at the Virginia golf club does not exceed 10 Amps.

No interference was found due to the installation at Hockings St. South Brisbane and Telstra offers no objection to the operation of this system at the authorised operating current.

I have also sent results of tests conducted during march 1999 on the C.P. Systems connected to the Waste Line for the XXXX Brewery which showed no adverse interference.

Thank you for the opportunity to carry out these tests and for the continuing co operative arrangement that exists between Telstra and Brisbane Water.

J.J.McMonagle
for National Manager
External Plant Technology

24-JUN.'99(THU) 08:42 ENERGEX FIELD TESTS TEL:61 7 34075496 P.001
22/06'99 12:43 2680839 E/F ELEC W/SHOP -->0p34075496 Pg. 01

Brisbane City

TECHNOLOGY SERVICES
Brisbane Water Engineering Services

Manager, Nick Inskip	(ext. 31007)
Electrical Co-ordinator, Kerry McGovern ✔	(ext. 31635)
Facsimile	(ext. 31639)
Mechanical Co-ordinator, Duncan Berrie	(ext. 31643)
QA Co-ordinator, Paul Tuckey	(ext. 31641)
Water Meters Co-ordinator, Don Crook	(ext. 31642)

Brisbane Water

FACSIMILE

To: Bob Bell	**From:** John Taylor BCC E/FARM
Company: Energex	**Phone:** 34031840
Fax. No.: 34075496	**Date:** 21/6/99

Pages: 4

Subject: Test results for Aspley to Banyo Trunk Mains.

Please find attached interference test results for application for licence to operate a cathodic protection system.

The rectifiers are located in Blinzinger Rd. near the corner with Kelly Rd. Banyo and the anode bed at the corner of Blinzinger Rd. and Elliott Rd.The second rectifier is located in Ellison Rd. opposite Boulter St. Aspley with the anode bed in Marchant Park.

Please sign one of the lines below and return via fax at 34031839.

Do you accept the results ---------- Yes signed R Bell Date 24/6/99

Do you require witness testing. ---------- Yes signed _____ Date _____

Regards

John Taylor.
CP Technician

PROUD TO BE A BUSINESS OF BRISBANE CITY

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Brisbane Water Engineering Services

CP Form No. 21

Electrical Engineering Unit

Insulated Joint Testing Details Form

Project Marchant PK Pump St Ellison Rd **Date** 14-3-06

DESCRIPTION

MAINS DETAILS:
LOCATIONS: Ellison Rd Pump St.
SIZE: Valve 899
MATERIAL: Mild Steel
COATING: T/E
VALVE No. 899

IN GROUND TESTING

BOLT TO FLANGE RESISTANCE: all Bolts > 200Ω
NUMBER OF BOLT: 12
FLANGE TO FLANGE RESISTANCE: 1.6 MΩ
INSULATION CHECKER MODEL 702: N/A.

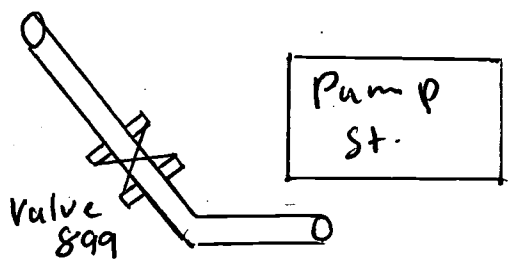
POTENTIAL DIFFERENCE TO REFERENCE CELL:

PROTECTED SIDE: -425 mV
UNPROTECTED SIDE: -357 mV

ABOVE TESTING

BOLT TO FLANGE RESISTANCE:
NUMBER OF BOLTS:
FLANGE TO FLANGE RESISTANCE:

COMMENTS / LOCATION DRAWING



Ellison Rd

TESTED BY P. SMYTH

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No. 28

Electrical Engineering Unit

Cathodic Protection Bleed Point Details Form

Project Webster RJ Date 20-3-06

Bleed Location Marchant PK CPB No. 117

FOREIGN STRUCTURE OWNER: Brisbane Water

F.S. LOCATION: Marchant PK Ellison RJ

F.S. IDENTIFICATION: Valve 385

REFERENCE POTENTIALS TO F.S. PRIOR TO BLEED CONNECTION:

REFERENCE TYPE: Cu/SO4

POTENTIAL OFF: -345 ON: -270 SW: +75mV

BLEED TYPE: 150 mΩ Resistor = 0.15Ω

BLEED MATERIAL:

BLEED WEIGHT:

BLEED O/C POTENTIAL: 480 mV

BLEED CURRENT OFF: 144 mA ON: 210 mA

REFERENCE POTENTIALS AFTER CONNECTION TO FOREIGN STRUCTURE:

Bond Off (Rectifier Off)			Bleed On			Resultant Swing
Bleed Off	Bleed On	Swing	Bond Off	Bond On	Swing	
-336	-384	-48	-384	-333	+51	+3

FOREIGN STRUCTURE OWNER AGREEABLE WITH MITIGATION? (Y/N) Yes

IDENTIFICATION TAG INSTALLED? (Y/N) Yes

COMMENTS:

INSTALLED / TESTED BY P. SMYTH

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley to Banyo **Date** 23-2-99

TP Location No 1 Resorvior **TP No.** 1

Mains Size ..... **TP Type** .....

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	.2 Ω
ZINC REFERENCE TO PIPE	440
CuSo4 REFERENCE TO PIPE	-440 mV
ZINC TO CuSo4	1138 mV

EARTH TESTING

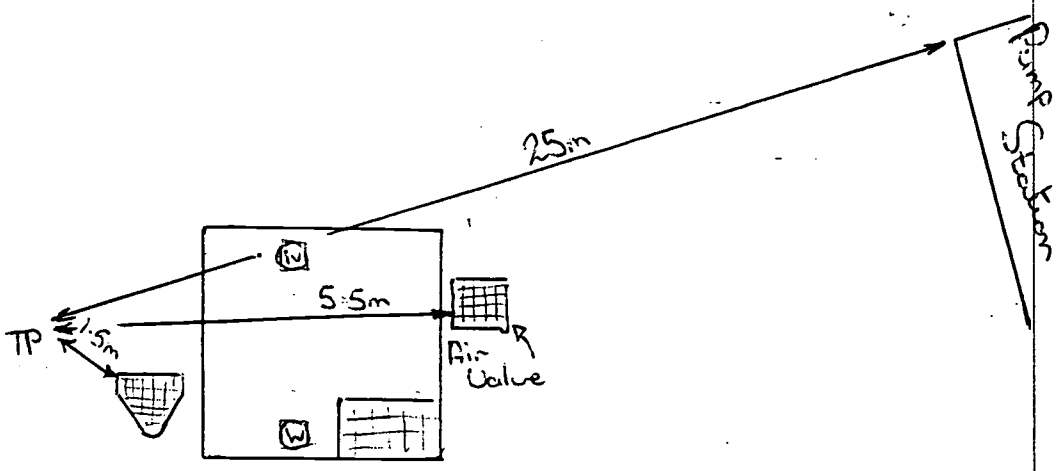
TEST NO. 1
PIN SPACING 2m RESISTIVITY 105 Ω Pin
MEGGER READING 8.6

TEST NO 2
PIN SPACING _____ RESISTIVITY _____
MEGGER READING _____

TEST NO 3
PIN SPACING _____ RESISTIVITY _____
MEGGER READING _____

COMMENTS / LOCATION DRAWING

O



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Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley to Banyo **Date** 23-2-99

TP Location No 2 Pie St House No **TP No.** 2

Mains Size 375 **TP Type**

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	.2 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-465 mV
ZINC TO CuSo4	

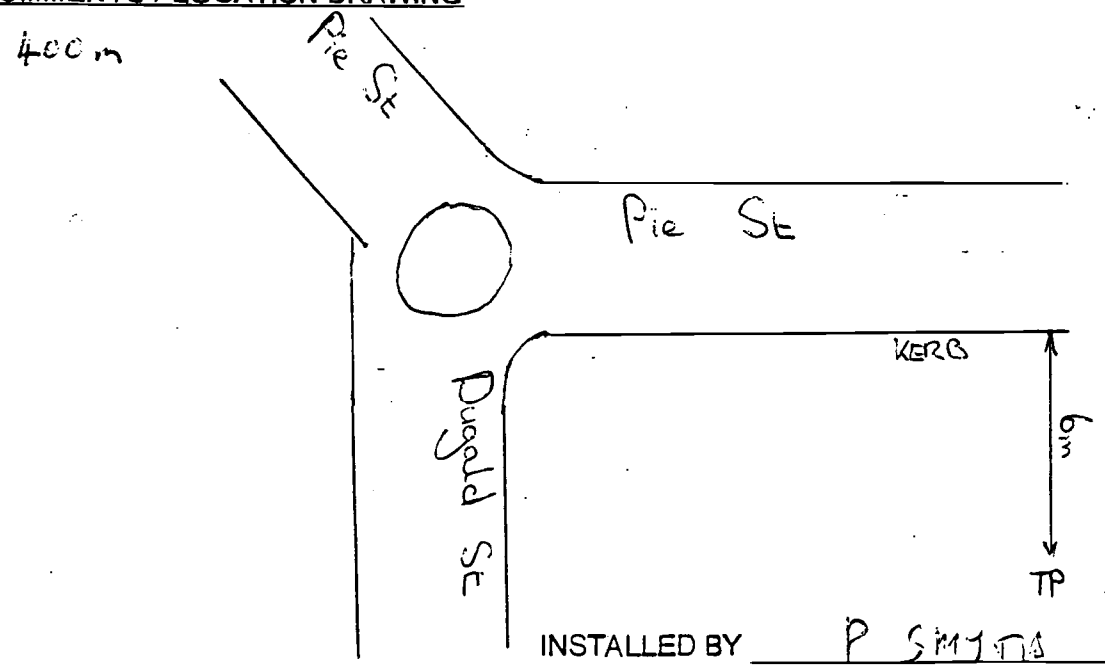
EARTH TESTING

TEST NO. 1
PIN SPACING 2 RESISTIVITY 31.6 Ω p.m
MEGGER READING 2.52

TEST NO 2
PIN SPACING RESISTIVITY
MEGGER READING

TEST NO 3
PIN SPACING RESISTIVITY
MEGGER READING

COMMENTS / LOCATION DRAWING



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Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley to Banyo **Date** 23-2-99

TP Location No3 Pie St Hawke No 27 **TP No.** No 3

Mains Size ..... **TP Type** .....

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	.3 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	−523 mV
ZINC TO CuSo4	1143 mV

EARTH TESTING

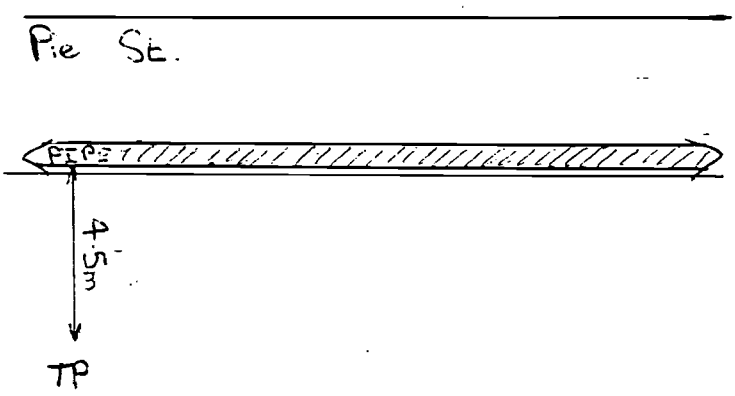
TEST NO. 1
PIN SPACING 2m RESISTIVITY 3·5 Ω.m
MEGGER READING <2Ω

TEST NO 2
PIN SPACING ____ RESISTIVITY ____
MEGGER READING ____

TEST NO 3
PIN SPACING ____ RESISTIVITY ____
MEGGER READING ____

COMMENTS / LOCATION DRAWING

900m.



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CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley to Banyo **Date** 23-2-99

TP Location No 4 Gympie Rd **TP No.** 4

Mains Size Valve 355 **TP Type**

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	.3 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-520
ZINC TO CuSo4	1103mv

EARTH TESTING

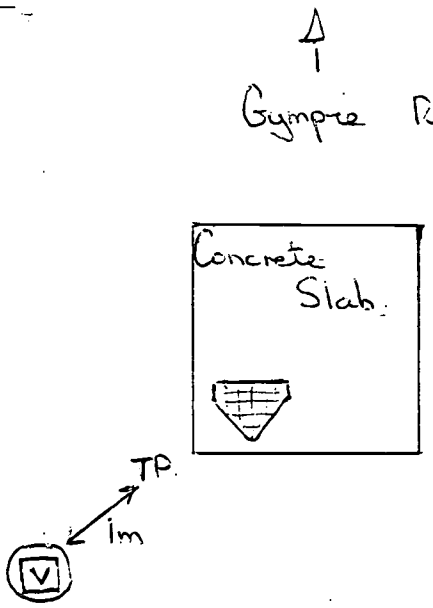
TEST NO. 1
PIN SPACING 2 RESISTIVITY 33.1 Pm
MEGGER READING 2.7

TEST NO 2
PIN SPACING RESISTIVITY
MEGGER READING

TEST NO 3
PIN SPACING RESISTIVITY
MEGGER READING

COMMENTS / LOCATION DRAWING

16000 m



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Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley to Banyo **Date** 23-2-99

TP Location No 5 Ellison Rd Park **TP No.** 5

Mains Size ..... **TP Type** .....

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	-1 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-454
ZINC TO CuSo4	1273 mV ✓

EARTH TESTING

TEST NO. 1
PIN SPACING 2 RESISTIVITY 7.5 Ωm
MEGGER READING 6

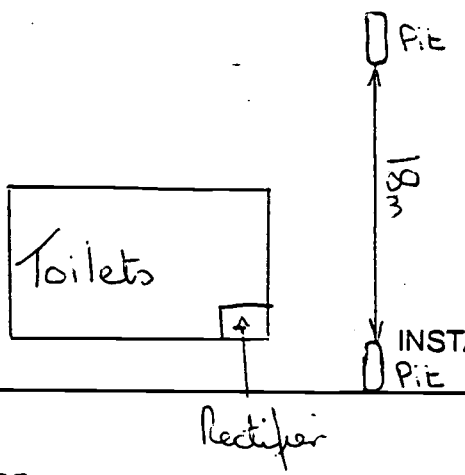
TEST NO 2
PIN SPACING ____ RESISTIVITY ____
MEGGER READING ____

TEST NO 3
PIN SPACING ____ RESISTIVITY ____
MEGGER READING ____

COMMENTS / LOCATION DRAWING

2000 m

Ellison Rd.



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Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley to Banyo **Date** 22-2-99

TP Location No 6 Ellison Rd Howe 383 **TP No.** 6

Mains Size ..... **TP Type** .....

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	.3 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-595
ZINC TO CuSo4	1145 mV

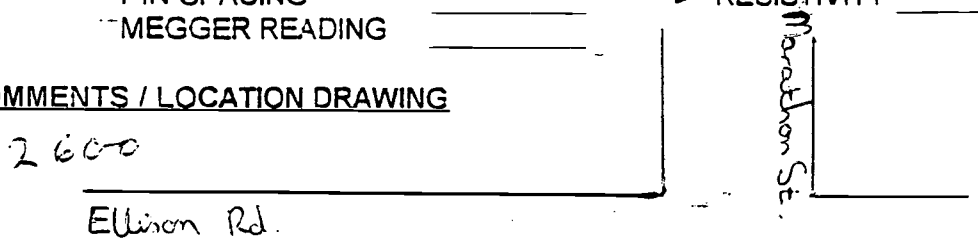
EARTH TESTING

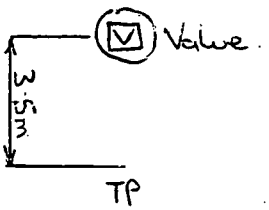
TEST NO. 1
PIN SPACING 2 RESISTIVITY 14.3Rρm
MEGGER READING 1.14

TEST NO 2
PIN SPACING ____ RESISTIVITY ____
MEGGER READING ____

TEST NO 3
PIN SPACING ____ RESISTIVITY ____
MEGGER READING ____

COMMENTS / LOCATION DRAWING





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Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley To Bunyo **Date** 23-2-99

TP Location No 7 Ellison Rd **TP No.** 7

Mains Size Hawke ~~150~~ 200 **TP Type**

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	.3 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-470mV
ZINC TO CuSo4	1152 mV

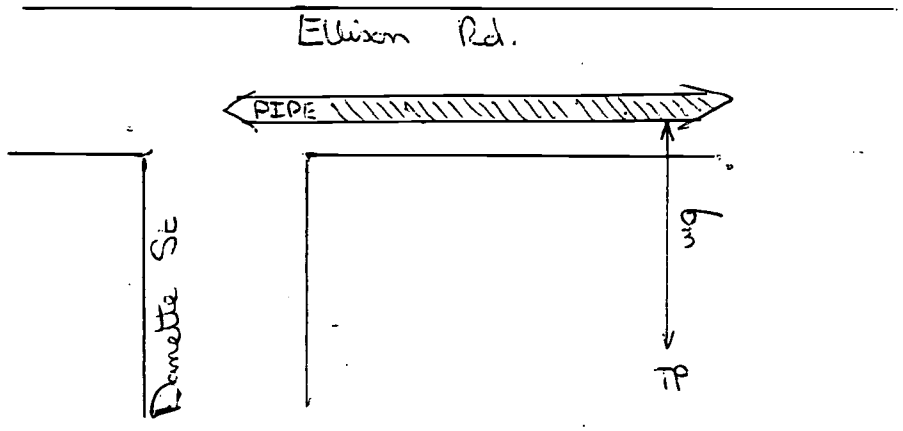
EARTH TESTING

TEST NO. 1
PIN SPACING 2 RESISTIVITY 13.8 Ω PM
MEGGER READING 14.1

TEST NO 2
PIN SPACING RESISTIVITY
MEGGER READING

TEST NO 3
PIN SPACING RESISTIVITY
MEGGER READING

COMMENTS / LOCATION DRAWING



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Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley To Banyo **Date** 23-2-94

TP Location No 8 Ellison Rd. **TP No.** 8

Mains Size 450 Howe 180 **TP Type**

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	01 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	- 490 mV
ZINC TO CuSo4	1113 mV

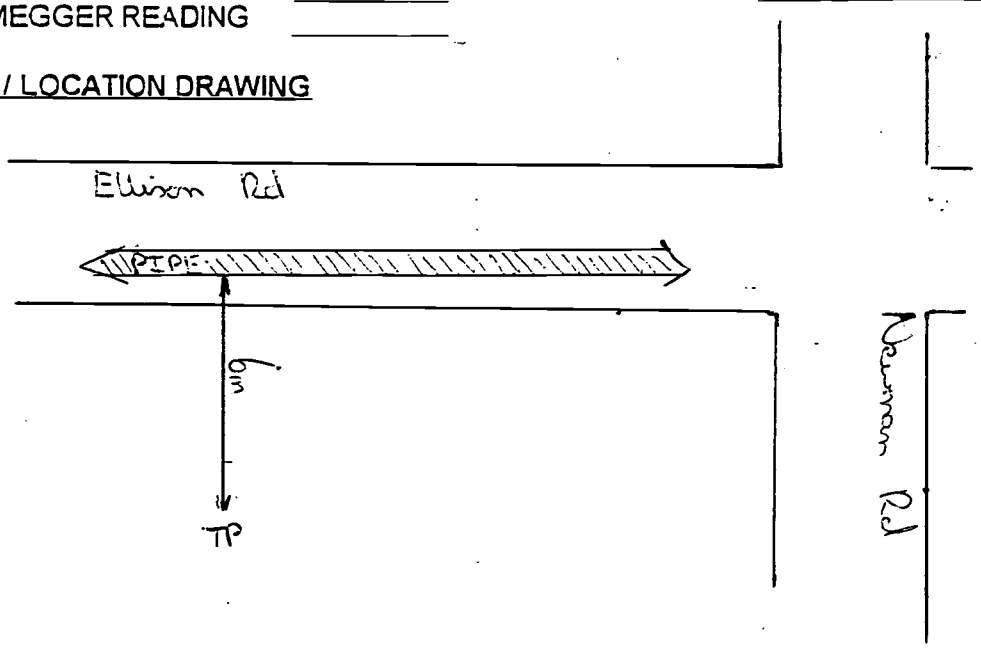
EARTH TESTING

TEST NO. 1
PIN SPACING 2 RESISTIVITY 62.4 Ω PM
MEGGER READING 4.97

TEST NO 2
PIN SPACING RESISTIVITY
MEGGER READING

TEST NO 3
PIN SPACING RESISTIVITY
MEGGER READING

COMMENTS / LOCATION DRAWING



INSTALLED BY P. SMYTH

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley To Banyo **Date** 23-2-99

TP Location No 9 Ellison Rd **TP No.** 9

Mains Size House 9/4 **TP Type**

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	-1 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-542 mV
ZINC TO CuSo4	1053 mV

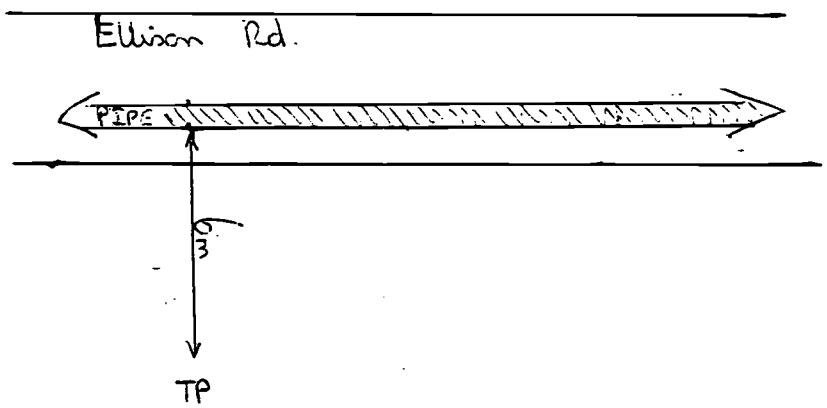
EARTH TESTING

TEST NO. 1
PIN SPACING 2 RESISTIVITY 62.42Ωm
MEGGER READING 4.97

TEST NO 2
PIN SPACING RESISTIVITY
MEGGER READING

TEST NO 3
PIN SPACING RESISTIVITY
MEGGER READING

COMMENTS / LOCATION DRAWING



INSTALLED BY P. SIMM

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley To Banyo **Date** 23-3-94

TP Location No 10 Ellison Rd & Bibsen **TP No.** 10

Mains Size House no 3 **TP Type**

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	.2 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-535
ZINC TO CuSo4	- 998 mV

EARTH TESTING

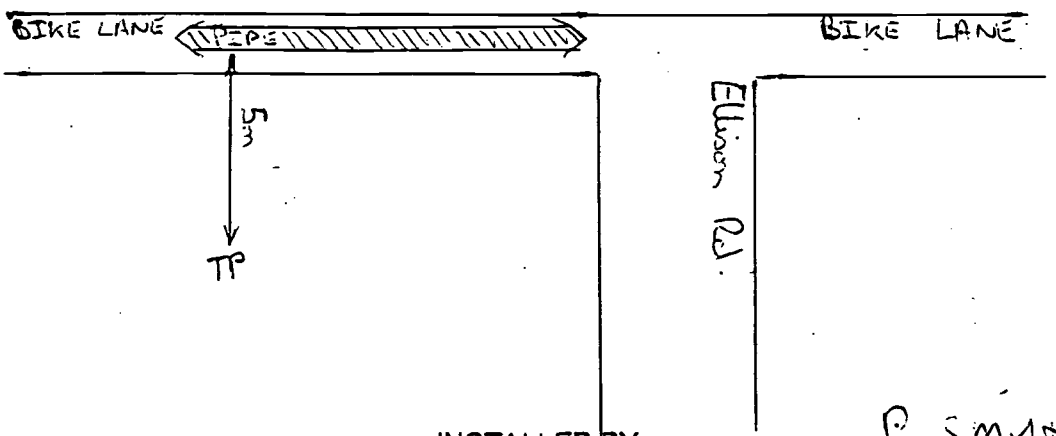
TEST NO. 1
PIN SPACING 2 RESISTIVITY 7.7 Ωm
MEGGER READING .62

TEST NO 2
PIN SPACING RESISTIVITY
MEGGER READING

TEST NO 3
PIN SPACING RESISTIVITY
MEGGER READING

COMMENTS / LOCATION DRAWING

Bibsen Rd



INSTALLED BY P SMYTH

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley To Banyo **Date** 23-2-99

TP Location Main Bilsen Rd **TP No.** 11

Mains Size Howe 75 **TP Type** .....

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	1
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-510 mV
ZINC TO CuSo4	380 mV

EARTH TESTING

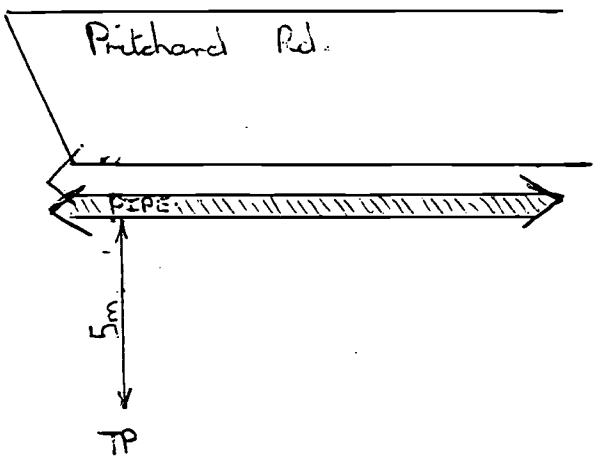
TEST NO. 1
PIN SPACING 2 RESISTIVITY 7.02 Ωm
MEGGER READING .5Ω

TEST NO 2
PIN SPACING _____ RESISTIVITY _____
MEGGER READING _____

TEST NO 3
PIN SPACING _____ RESISTIVITY _____
MEGGER READING _____

COMMENTS / LOCATION DRAWING

~~Tm .05cm~~



INSTALLED BY P. Smyth

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project AS Pley To Banyo **Date** 23-2-99

TP Location No 12 Sandgate Rd **TP No.** 12

Mains Size Valve 776 **TP Type** ....

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	<1 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-590 mV
ZINC TO CuSo4	1073 mV

EARTH TESTING

TEST NO. 1

PIN SPACING	2	RESISTIVITY	4.5 Ωm
MEGGER READING	.36		

TEST NO 2

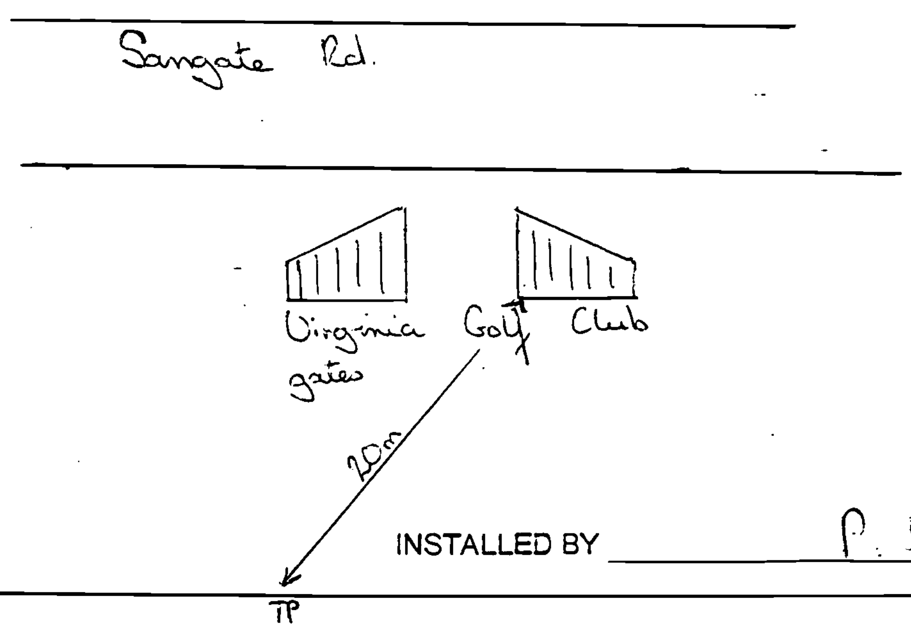
PIN SPACING		RESISTIVITY	
MEGGER READING			

TEST NO 3

PIN SPACING		RESISTIVITY	
MEGGER READING			

COMMENTS / LOCATION DRAWING

~~1m = 1cm @ 25cm~~



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Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley To Banyo **Date** 23-2-99

TP Location No 13 Kelly Rd **TP No.** 13

Mains Size Howe 45 Blinzinger **Type**

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	0.2 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-525 mV
ZINC TO CuSo4	

EARTH TESTING

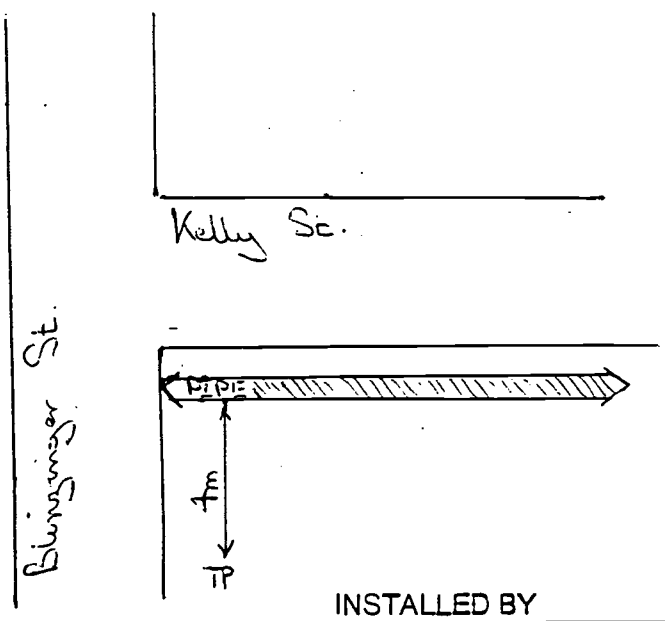
TEST NO. 1
PIN SPACING 2 RESISTIVITY 31.4 Ωm
MEGGER READING 2.5

TEST NO 2
PIN SPACING RESISTIVITY
MEGGER READING

TEST NO 3
PIN SPACING RESISTIVITY
MEGGER READING

COMMENTS / LOCATION DRAWING

~~1m - 0.5cm~~



INSTALLED BY P. Smith

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley To Banyo **Date** 23-2-99

TP Location No 14 ST Vincents Rd **TP No.** 14

Mains Size Hoods 19.7 **TP Type**

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	.2
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-535 mV
ZINC TO CuSo4	1143 mV

EARTH TESTING

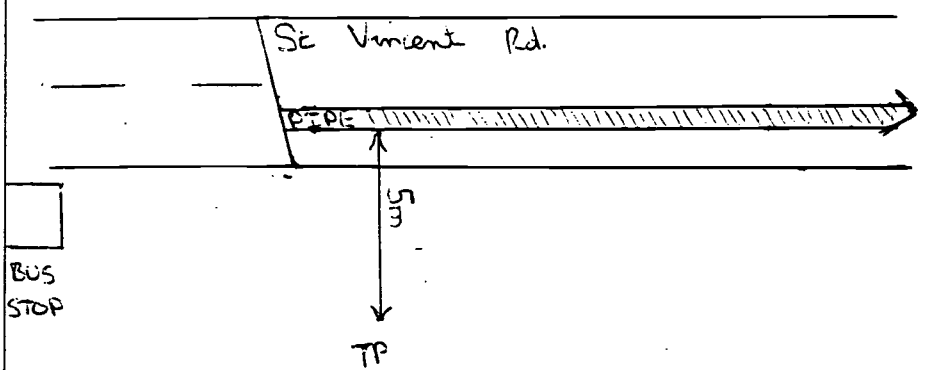
TEST NO. 1
PIN SPACING 3 RESISTIVITY 2-3 2Pin
MEGGER READING .19

TEST NO 2
PIN SPACING RESISTIVITY
MEGGER READING

TEST NO 3
PIN SPACING RESISTIVITY
MEGGER READING

COMMENTS / LOCATION DRAWING

~~1m - 0.5m~~



INSTALLED BY P. SMYTH

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering Form

Project Aspley To Banyo **Date** 22-2-99

TP Location No 15 St Vincents Rd **TP No.** 15

Mains Size House 2" + 8" **TP Type** P.t

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE)	.2 Ω
ZINC REFERENCE TO PIPE	
CuSo4 REFERENCE TO PIPE	-549 mV
ZINC TO CuSo4	1046 mV

EARTH TESTING

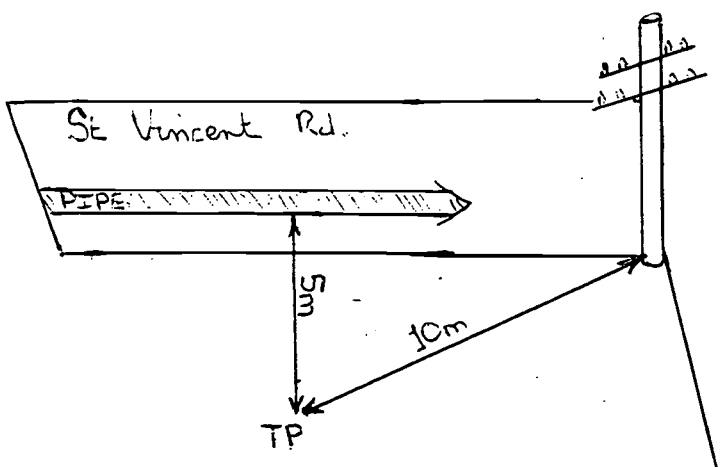
TEST NO. 1
PIN SPACING 2 RESISTIVITY 40 Ωm.
MEGGER READING .32

TEST NO 2
PIN SPACING RESISTIVITY
MEGGER READING

TEST NO 3
PIN SPACING RESISTIVITY
MEGGER READING

COMMENTS / LOCATION DRAWING

~~1m @ 5m~~



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Revision 09/28/95

Brisbane Water Engineering Services

CP Form No. 16

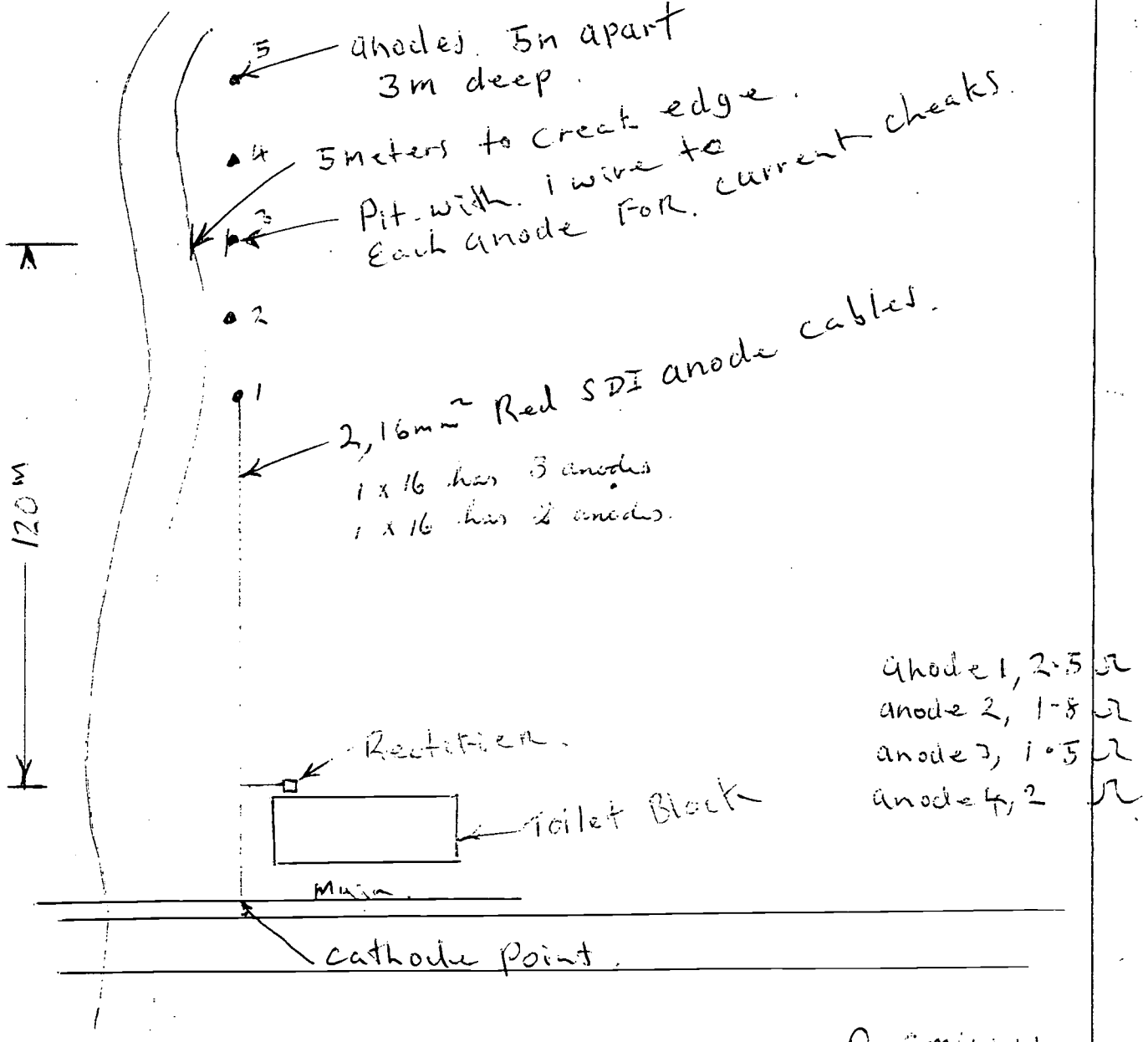
Electrical Engineering Unit

Site Plan Drawing Sheet

Project Aspley Res to Banyo

Date 23-3-99

Merchent Park anode site.



COMPILED BY F Smyth

Revision 09/28/95

Brisbane Water Engineering Services

CP Form No. 16

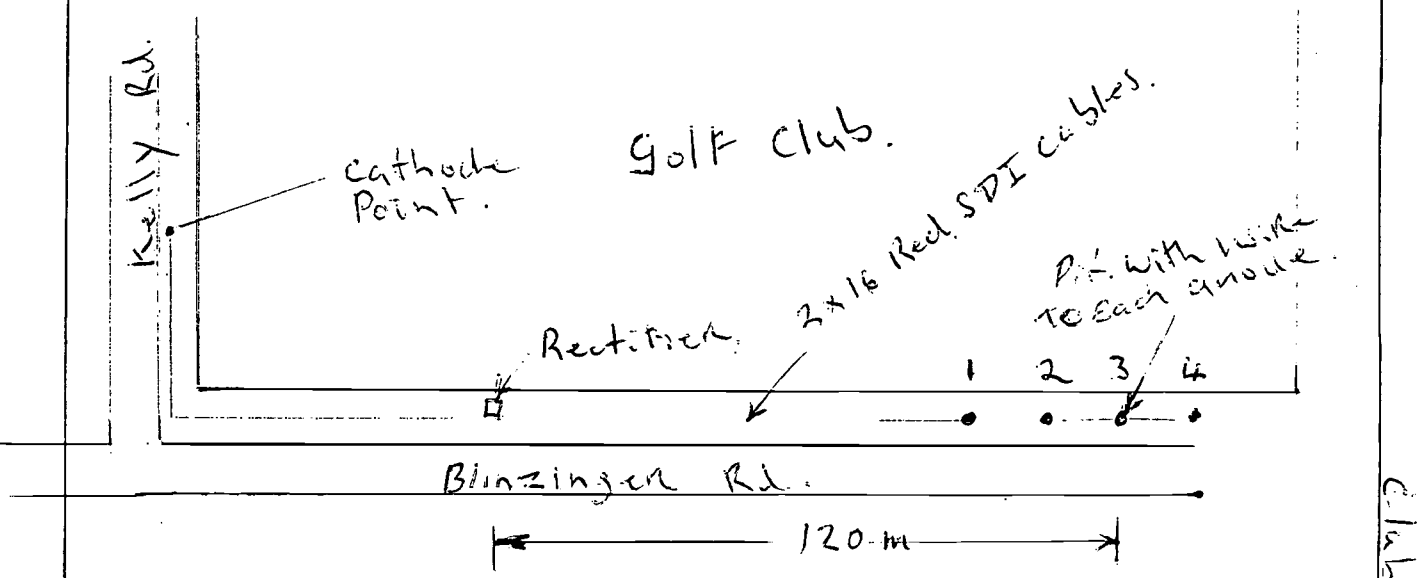
Electrical Engineering Unit

Site Plan Drawing Sheet

Project Aspley Res to Banyo

Date 23-3-99

Blinzinger Rd anode Site.



4 anodes 5m apart.

1x16 Cu 2 cables
1x16 Cu 2 cables

anode 1, 1.5Ω
anode 2, 1Ω
anode 3, 1.5Ω
anode 4, 2Ω

anode 1, 10m deep.
anode 2, 10m deep.
anode 3, 9m deep
anode 4, 5.7m deep

COMPILED BY P SMYTH

Revision 09/28/95

50 0 50 100 150 200 250

SCALE OF METRES
1 : 5000

DIRECTOR OF P.D. & P.S.		DATE	
ENGINEER IN CHARGE		DATE	
SUPERVISING ENGINEER	R.P.E.Q. NO.	DATE	
No. DATE	AMENDMENT	INITIALS	

	NAME	DATE
DESIGN		
DRAWN	B.O.B	JUNE '99
CHK'D.		

Brisbane City

JOB FILE		
CADD FILE	\WATER\GENERAL\ASPLEYCP.DTA	
SURVEY NO.		FIELD BOOK
SURVEYED		A.H. DATUM

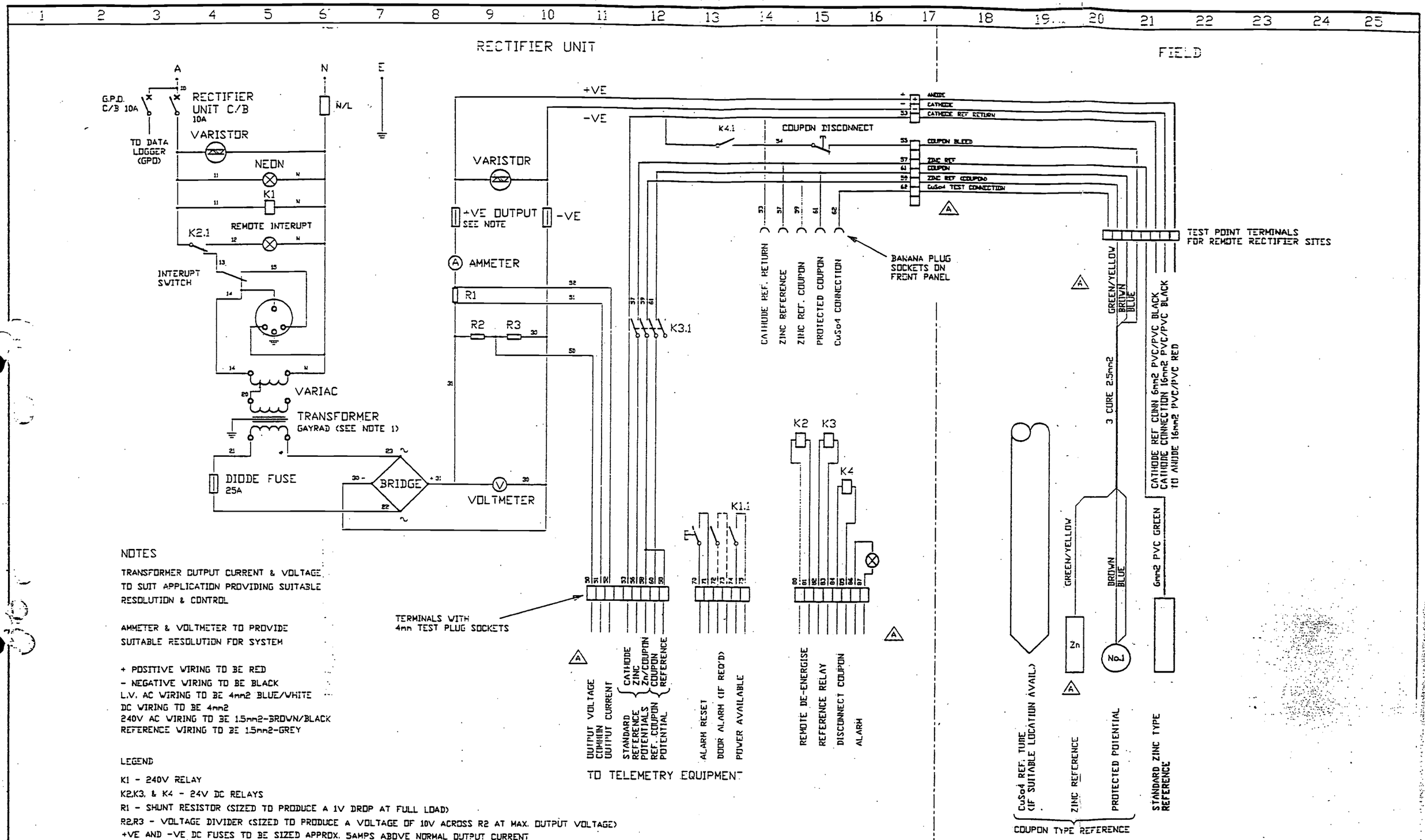
Brisbane Water — Professional Services — Engineering

PROJECT
S5 S43 S44
ASPLEY TO BANYO
TRUNK WATER MAIN

TITLE
CATHODIC PROTECTION
SYSTEM DETAILS

SCALE: AS SHOWN	No. 1 OF 1 SHEETS
DRAWING No.: 486/4/6-WM001	AMEND.: 0

5 0 10 20 30 40 50 60 70 90 100 110 120 130 140 150 160



NOTES

TRANSFORMER OUTPUT CURRENT & VOLTAGE TO SUIT APPLICATION PROVIDING SUITABLE RESOLUTION & CONTROL

AMMETER & VOLTMETER TO PROVIDE SUITABLE RESOLUTION FOR SYSTEM

+ POSITIVE WIRING TO BE RED
- NEGATIVE WIRING TO BE BLACK
L.V. AC WIRING TO BE 4mm2 BLUE/WHITE
DC WIRING TO BE 4mm2
240V AC WIRING TO BE 1.5mm2-BROWN/BLACK
REFERENCE WIRING TO BE 1.5mm2-GREY

LEGEND

K1 - 240V RELAY
K2,K3, & K4 - 24V DC RELAYS
R1 - SHUNT RESISTOR (SIZED TO PRODUCE A 1V DROP AT FULL LOAD)
R2,R3 - VOLTAGE DIVIDER (SIZED TO PRODUCE A VOLTAGE OF 10V ACROSS R2 AT MAX. OUTPUT VOLTAGE)
+VE AND -VE DC FUSES TO BE SIZED APPROX. 5AMPS ABOVE NORMAL OUTPUT CURRENT

NO.	BY	DATE	REVISION	CHECK	APPR
A	R.L.	18.10.93	CHANGES AS SHOWN		
0	R.L.	25.8.93	ISSUED FOR CONSTRUCTION		

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY & SEWERAGE
MECHANICAL & ELECTRICAL SERVICES

PROJECT: STANDARD CATHODIC PROTECTION

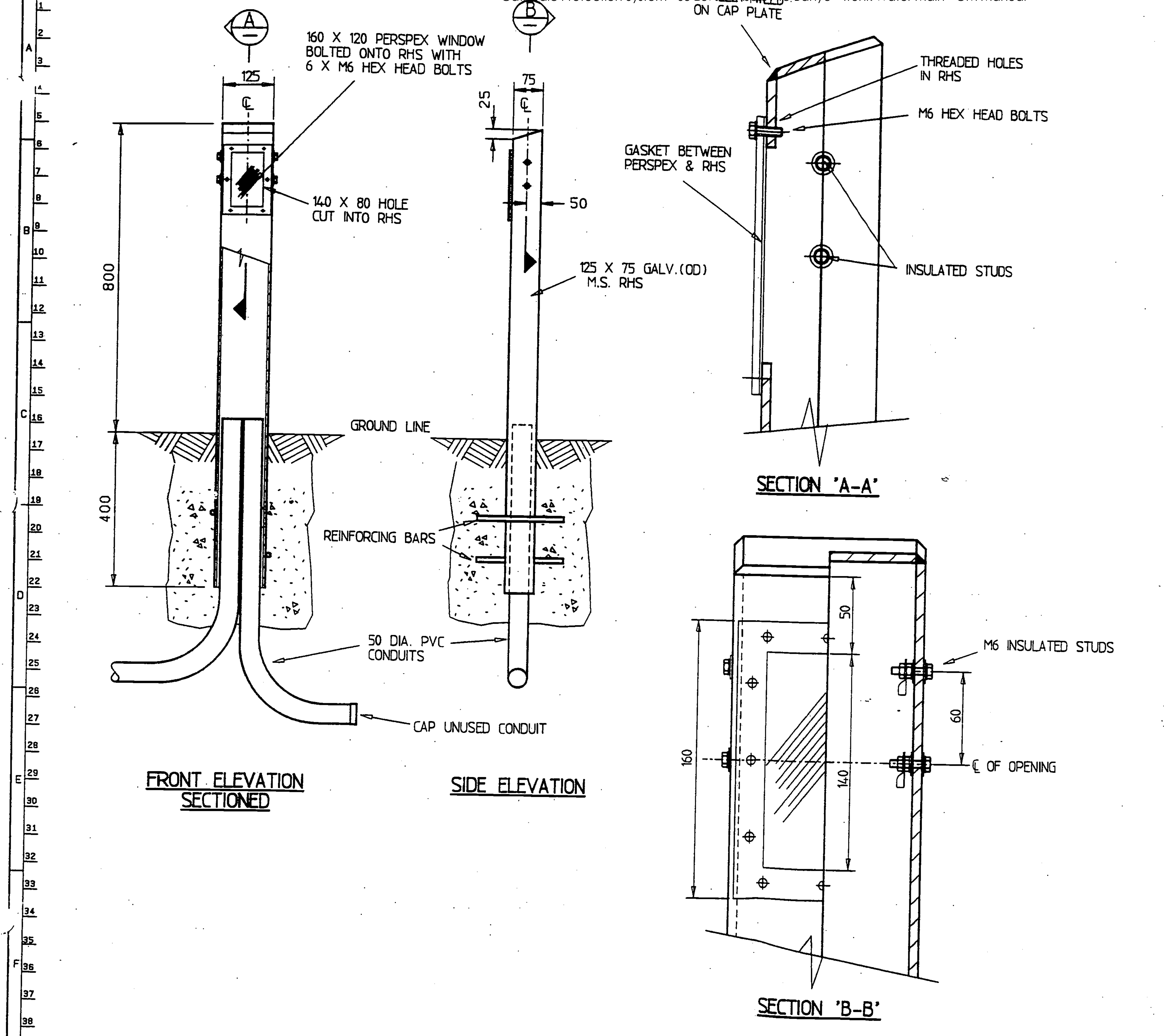
TITLE: RECTIFIER UNIT WITH DATA LOGGING FACILITIES WIRING DIAGRAM

	NAME	DATE		NAME	DATE	SCALE	SIZE
DRAWN	R.L.	3.8.93	SUPER ENG.	M.J.	25.8.93		A3
DESIGN	J.S.	3.8.93	SENIOR ENG.				
CHECKED	J.S.	25.8.93	ELECT. ENG.				AMEND

DRAWING No. 486/6/25-AA1C0021E

ACADRIZ FILE No. A625C21

AMEND A



NOTES

1. HOT DIP GALVANISE AFTER FABRICATION.

No	DATE	AMENDMENT	INITIALS
0	4.96	ISSUED FOR APPROVAL	O.L.P.

AMENDENT & ISSUE REGISTER

MANAGER DATE:		DIRECTOR OF TECHNOLOGY SERVICES DATE:	
DIRECTOR OF PLANNING & DESIGN DATE:	DIRECTOR OF WATER SUPPLY DATE:	DIRECTOR OF CONSTRUCTION DATE:	
DESIGN	J.S.	19.4.96	ENGINEER IN CHARGE
DRAWN	O.L.P.	22.4.96	SUPERVISING ENGINEER
TRACED			
CHECKED			A2 REDUCED

REFERENCES

CADD FILE No. 122T000010

THIS DRAWING WAS PRODUCED USING QIKDRAW

Brisbane City

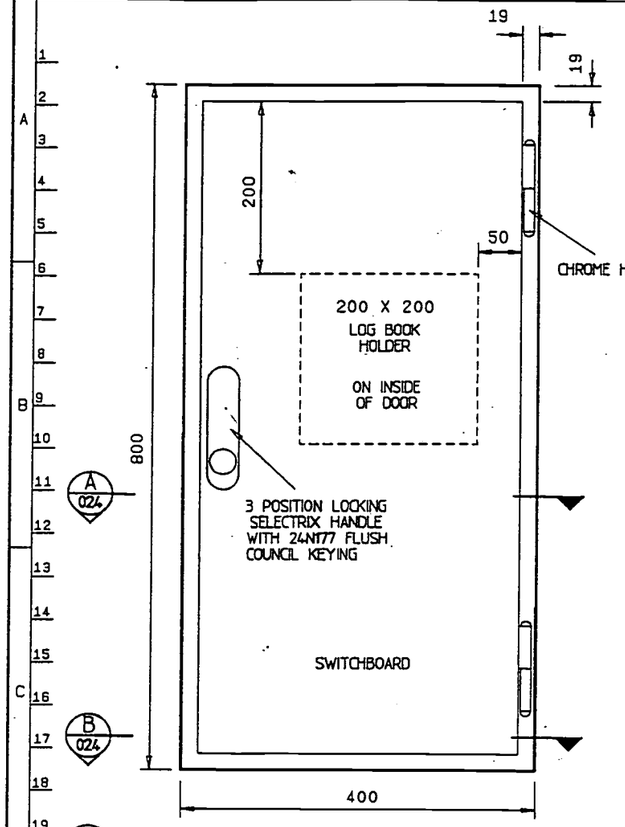
BRISBANE CITY COUNCIL
BRISBANE WATER
TECHNOLOGY SERVICES BRANCH
INFORMATION TECHNOLOGY

PROJECT: CATHODIC PROTECTION

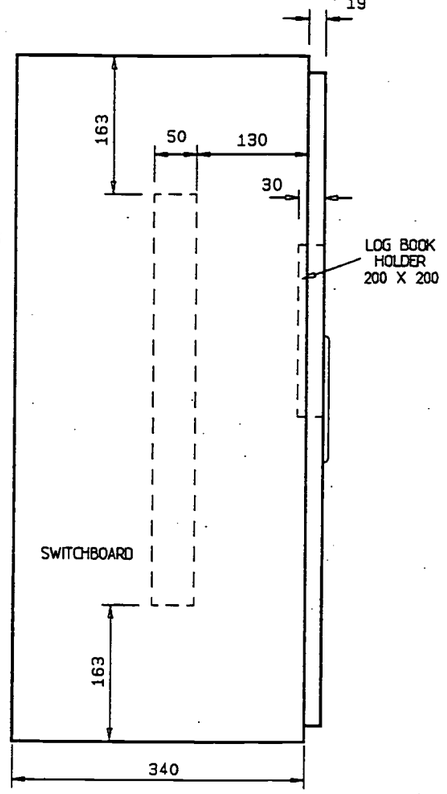
TITLE: STANDARD TEST POINT CONSTRUCTION DETAILS

SCALE: N.T.S. | No. 1 OF 1 SHEETS

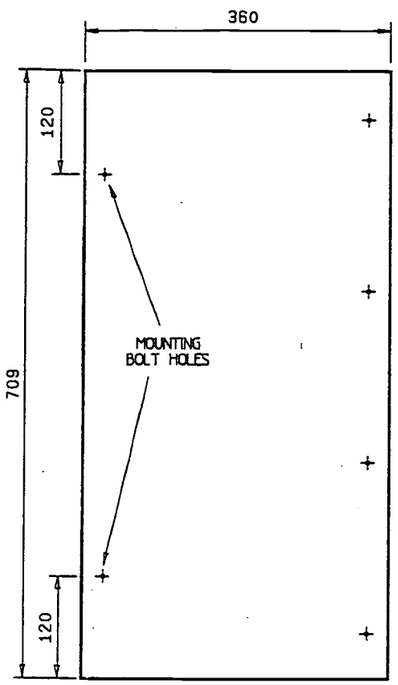
DRAWING No. 486/1/22-AA1T0001E | AMEND. 0



FRONT ELEVATION
SWITCHBOARD & PLINTH



SIDE ELEVATION
SWITCHBOARD & PLINTH



FRONT INSULATED PANEL
(6mm THICK) SUPPLIED

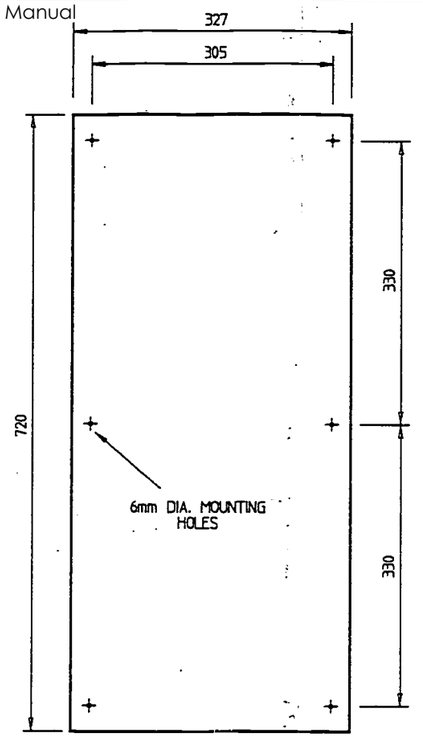
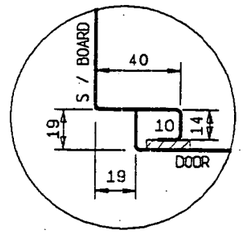
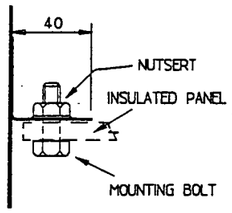


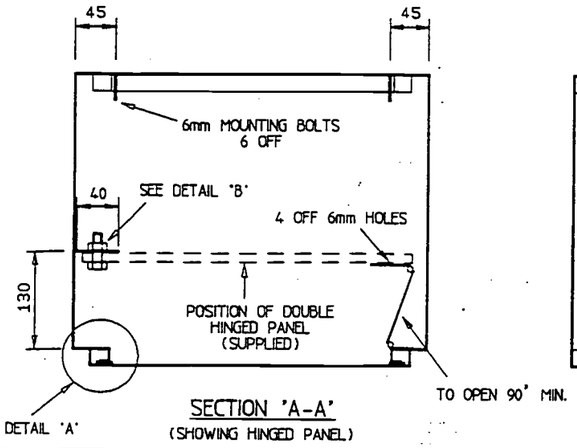
FIG.1
EQUIPMENT PANEL DETAILS



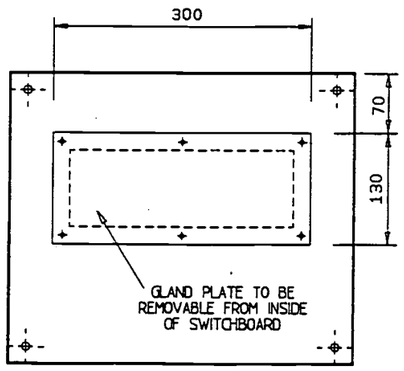
DETAIL 'A'
DOOR / CORNER DETAIL



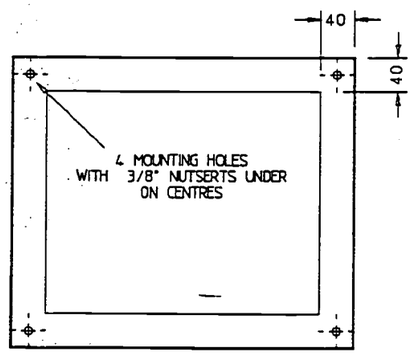
DETAIL 'B'



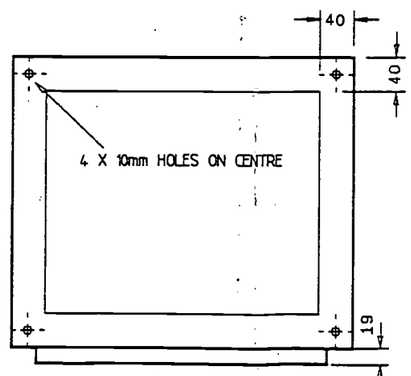
SECTION 'A-A'
(SHOWING HINGED PANEL)



SECTION 'B-B'
(SHOWING GLAND PLATE)



SECTION 'C-C'
PLINTH MOUNTING DETAILS



SECTION 'D-D'
PLINTH MOUNTING DETAILS

NUMBER OF SWITCHBOARDS REQUIRED

NUMBER OF PLINTHS REQUIRED

NOTES

1. CABINET TO BE MANUFACTURED FROM 1.6mm 316 2B STAINLESS STEEL.
2. UNLESS SPECIFIED, SUPPLY CABINET WITH PLINTH. (MOUNT PLINTH TO SWITCHBOARD CABINET USING STAINLESS STEEL SCREWS).
3. REAR EQUIPMENT PANEL TO BE ZINC PLATED STEEL. POWDER COATED 'ORANGE'. (FULL LENGTH & WIDTH & REMOVABLE). SEE FIG.1.
4. DOUBLE HINGED PANEL SUPPLIED BY B.C.C.
5. PROVIDE 1/4" WW S.S. EARTH STUDS TO DOOR & SWITCHBOARD CABINET.
6. DEGREE OF WEATHER PROTECTION IP55.
7. SELECTRIX TYPE HANDLE TO BE SUPPLIED & FITTED BY SWITCHBOARD MANUFACTURER. HANDLE TO BE 1107 SS CU1 KEY TO BE 1109071W
8. DOUBLE HINGED PANEL MOUNT TO BE SUPPLIED WITH MOUNTING BOLTS & NUTSERTS, TOP & BOTTOM. SEE DETAIL 'A'.

No	DATE	AMENDMENT	INITIALS
B	11.95	MODIFIED	O.L.P.
A	5.92	ISSUED FOR APPROVAL	O.L.P.

AMENDENT & ISSUE REGISTER

MANAGER	DIRECTOR OF TECHNOLOGY SERVICES	
DATE:	DATE:	
DIRECTOR OF PLANNING & DESIGN	DIRECTOR OF WATER SUPPLY	DIRECTOR OF CONSTRUCTION
DATE:	DATE:	DATE:

DESIGN	K.McG.	5.5.92	ENGINEER IN CHARGE
DRAWN	O.L.P.	7.5.92	SUPERVISING ENGINEER
TRACED			
CHECKED			A2 REDUCED

REFERENCES

CADD FILE No. 1220024B

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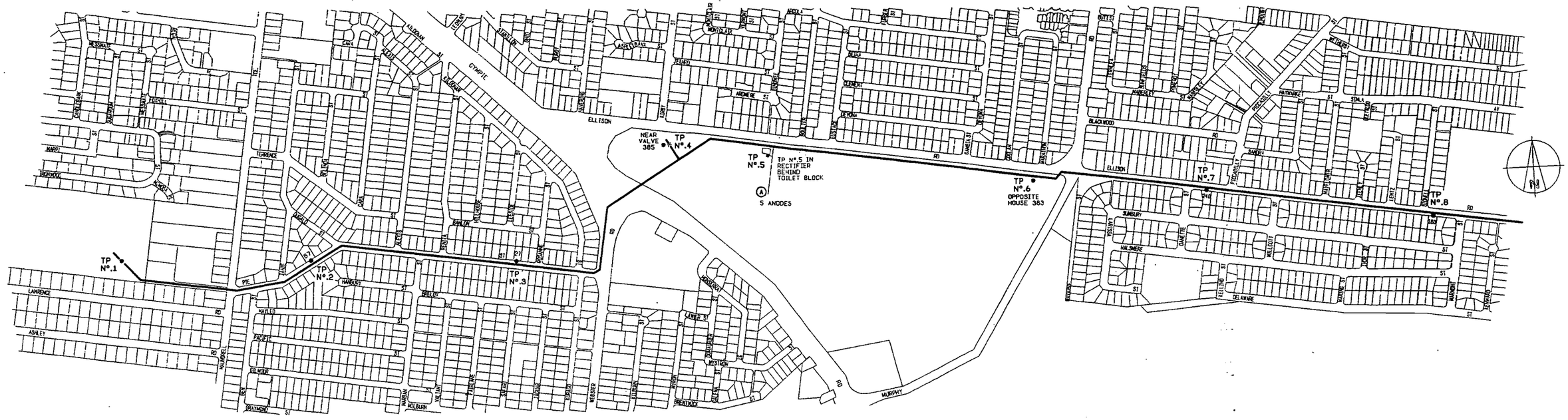
BRISBANE CITY COUNCIL
BRISBANE WATER
TECHNOLOGY SERVICES BRANCH
INFORMATION TECHNOLOGY

PROJECT:
CATHODIC PROTECTION

TITLE:
STANDARD
SWITCHBOARD CABINET

SCALE: N.T.S. | No. 1 OF 1 SHEETS

DRAWING No. 486/1/22-C0024E | AMEND. B



NO.	DATE	AMENDMENT	INITIALS	DIRECTOR OF P.D. & P.B.	DATE			
				ENGINEER IN CHARGE	DATE	DESIGN		
				SUPERVISING ENGINEER	RPEQ NO. DATE	DRAWN	B.O.B	JUNE '99
						CHK'D.		

Brisbane City

JOB FILE	
CADD FILE	\WATER\GENERAL\ASPLEYCP.DTA
SURVEY NO.	FIELD BOOK
SURVEYED	A.H. DATUM

Brisbane Water — Professional Services Engineering

PROJECT: ASPLEY TO BANYO TRUNK WATER MAIN

TITLE: CATHODIC PROTECTION SYSTEM DETAILS

SCALE: AS SHOWN | N° 1 OF 1 SHEETS

DRAWING N°: 486/4/6-WM001 | AMEND.: 0

5 0 10 20 30 40 50 60 70 90 100 110 120 130 140 150 160