



Brisbane Water Engineering Services

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

14th June 1966.

OPERATING MANUAL FOR:

ASHRIDGE ROAD DARRA 400/460 DIA RISING SEWER MAIN

CATHODIC PROTECTION SYSTEM

CLIENT:

DEPARTMENT OF WATER SUPPLY AND SEWERAGE
SEWERAGE OPERATIONS BRANCH.

MANUAL CONTENTS

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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 and 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: Dia 400/460 mild steel cement lined.

Coating: Tar Epoxy

Length: 1.25 km

Location: Ashridge Road Pumping Station to cnr Englefield St. & Holmedale St.
Darra.

Construction Drawings: Not Available

486/7/6-KD1T0001E ASHRIDGE Rd Cathodic Protection System

- (4.1) Type of Cathodic Protection: Impressed Current.
- (4.2) Rectifier: Special 32 Volt, 10 amp direct current output enclosed in a stainless steel switchboard. Rectifier has a 240V supply from the nearby Ashridge Rd. Submersible Sewerage Pumping Station..
- (4.3) Cathode: The cathode point is located on the 400 dia main adjacent to the submersible pump station. The cathode point is where the cabling from the rectifier is attached to the structure under cathodic protection.
- (4.4) Anodes: Two 1500 x 75mm silicone iron anodes were installed approximately 100 metres from the trunk mains in a vertical bed. The anodes were firstly packaged with cokebreeze thereby improving anode – ground resistance. The anodes are identified by a marker post and label.
- (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 four test points have been installed for details see dwg no. CE02/136.
- (4.6) Associated Drawings:
- | | |
|--|----------------------|
| Cathodic Protection Details | - 2/14.213 |
| Cathodic Protection Test Point Details | - 2/14.199 |
| Standard Rectifier Wiring Diagram | - 486/6/25-AA1C0021E |
| Vertical Ground bed Details | - 486/6/25-AA1C0024E |
- (4.7) Associated Standards:
- AS 3000 1986 Australia Wiring Rules
- AS 2832.1 1985 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 Queensland Electricity Commission 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.

12th October 1992
Electrical Workshop
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.

13th October 1992
Electrical Workshop
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.

13th October 1992
Electrical Workshop
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 for "continue to operate" permit if applicable.

Brisbane Water Engineering Services

CP Form No. 27

Electrical Engineering Unit

Cathodic Protection Interference Survey Results FormProject Ashridge Rd Unit Reading 2.1 v 2.1a Date 30-5-96

	Reading	Test Point I. D.	Location	Swing
On	-516	water	Pump. Station	
Off	-504	Main		
On	-533	Main	Rectifier.	
Off	-529	Earth.		
On	-689	Segeb	Pole 16470	
Off	-689	men	Queensland st	
On	-570	Segeb	Pole 10597	
Off	-520	men	Queensland st.	
On	-690	Gard	Queen Sland st.	+4
Off	-694	Rail		
On	-614	Foot	Queen Sland st.	
Off	-614	Bridge		
On	-530	Segeb	transformer Pole	
Off	-530	men	Queensland St.	
On	-623	Segeb	Pole 7244	
Off	-623	men	Queen Sland St.	
On	-516	Segeb	Pole 21156	
Off	-516	men	Queensland st	
On	-544	Segeb	Pole 21154	
Off	-540	men	Queensland st	
On	-529	Segeb	Pole 21153	
Off	-529	men	Queensland St.	
On	-467	Segeb	Pole 21148	
Off	-460	men	SHam Rock St.	
On	-494	Water	Darra depo	
Off	-476	Main		
On	-416	Fence	Darra depo	
Off	-416			
On	-518	Segeb	Pole 11313	
Off	-505	men	Ashridge Rd.	

TESTED BY P. Smyth

Brisbane Water Engineering Services

CP Form No. 27

Electrical Engineering Unit

Cathodic Protection Interference Survey Results FormProject Ashridge RdUnit Reading 2.1vDate 30-5-96

	Reading	Test Point I.D.	Location	Swing
On	-580	Segeb	Pole 11312.	
Off	-560	men	Ashridge St	
On	-535	Segeb	Pole 371394	
Off	-522	men	Ashridge St.	
On	-533	Segeb	Pole 19743	
Off	-523	men	Station ave	
On	-520	Segeb	Pole 18434	
Off	-516	men	Station ave	
On	-520	Segeb	Pole 31712	
Off	-516	men	Station ave.	
On				
Off				
On				
Off				
On				
Off				
On				
Off				
On				
Off				
On				
Off				
On				
Off				
On				
Off				

TESTED BY

Brisbane Water Engineering Services

Ph. 34031838 Fx. 34031839

Electrical Engineering Unit5 Bunya Street
Eagle Farm Q 4009**Cathodic Protection System Loop Resistance**

Date: 20th JUNE 1996

Cathodic Protection System:

Ashridge Rd. Darra Rising Sewer Main

System Operating Volts:

2.1

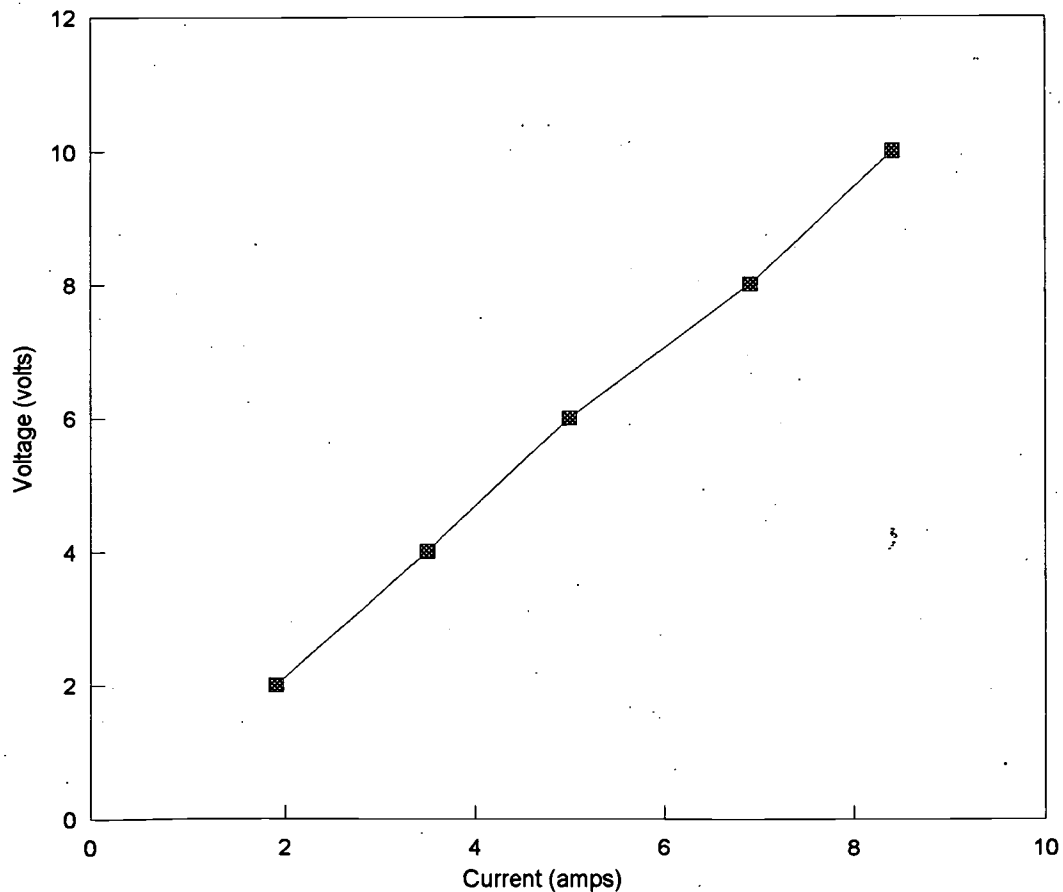
System Operating amps

2.1

Test Voltage:		Test Current:	
(volts)		(amps)	
2		1.9	
4		3.5	
6		5	
8		6.9	
10		8.4	

Loop Resistance (ohms)

1.176471

Graph of System voltage vs current.

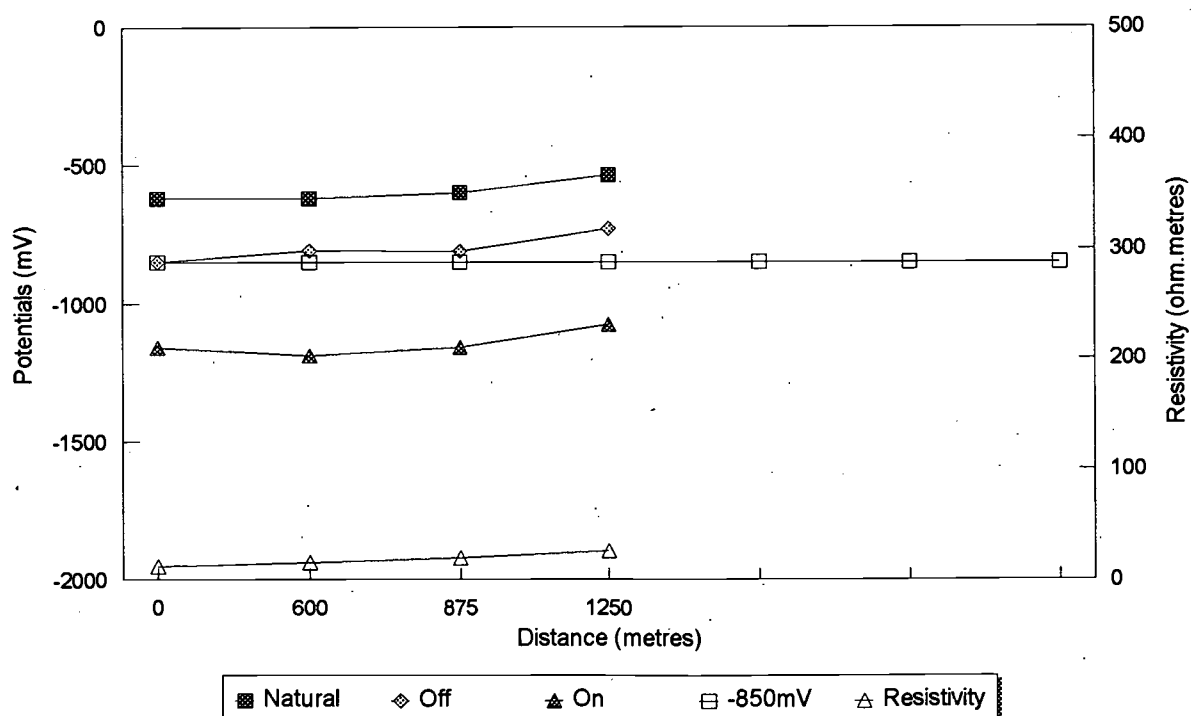
Brisbane Water Engineering Services

CP Form No. 23

Electrical Engineering Unit

Cathodic Protection System Potential Recording FormProject Ashridge Rd. Rising Sewer MainDate 20th June 1996

Test Point number	Distances to T.P. (metres)	Potentials to CuSO4			Resistivities at 2 metres (ohm.metres)
		Natural (mV)	Off (mV)	On (mV)	
1	0	-621	-850	-1160	11.42
2	600	-621	-808	-1190	15.07
3	875	-600	-810	-1160	18.84
4	1250	-538	-730	-1077	25.12
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

Graph of potentials and resistivity vs pipelength

Rectifier located at 0M.

Facsimile Transmission



TO: BRISBANE WATER ENGINEERING ATTENTION: KERRY MC GOVERN

SERVICES ELECTRICAL ENG. UNIT

FAX NO: (07) 3403 1839

FROM: STEVAN GAJINOV

TOTAL NO. OF PAGES: 1

DATE: 28-06-1996

(including this page)

RE: INTERFERENCE TEST RESULTS FOR ASHRIDGE ROAD,
DARRA

WE ACKNOWLEDGE RECEIPT OF YOUR FACSIMILE
DATED 14-06-1996 AND WOULD ADVISE THAT
BASED ON THE INFORMATION SUBMITTED ALLGAS
ENERGY LTD. HAS NO GAS MAINS OR SERVICES
IN THIS VICINITY.

WE THANK YOU FOR YOUR INQUIRY AND
ASSURE YOU OF OUR BEST ATTENTION AT ALL
TIMES

REGARD'S

A handwritten signature in dark ink, appearing to read "Stevan Gajinov", written over a horizontal line.

STEVAN GAJINOV
MANAGER DISTRIBUTION

ALLGAS ENERGY LTD
A.C.N. 009 666 446
Operations Centre
11 Dividend Street, Mansfield
Queensland, Australia 4122

P O Box 2025 Mansfield MDC
Queensland, Australia 4122
PHONE: (07) 3849 9111
FAX: (07) 3849 9265

Brisbane Water Engineering Services

CP Form No. 17

Electrical Engineering Unit

Cathodic Protection Anode Bed Testing

Project ASHRIDGE RDDate 1-7-96ANODE MATERIAL: Silicones / Zn

BURIAL:

VerticalANODE SIZE/WEIGHT: 1500x75 mm

TEST POINT TYPE:

P.t

ANODE PACKAGING:

48 kg anode
178 kg in container

SOIL RESISTIVITY:

ANODE DEPTH:

5.0 m

SIGNAGE:

YesRESISTANCE TO GROUND:ANODE No.1 2.6 Ω ANODE No.2 2.8 Ω

ANODE No.3

ANODE No.4

ANODE No.5

TOTAL

5.4 Ω ANODE CURRENTANODE No.1 1.3 ampsANODE No.2 1.1 amps

ANODE No.3

ANODE No.4

ANODE No.5

TOTAL

2.4 ampsLOCATION DRAWINGTESTED BY P. SMYTH

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering FormProject ASHRIDGE RD.....DARRA.....Date 20-5-94.....T P Location PUMP STATION.....T P No. 1.....Mains Size 460 DIA.....T P Type COUPON.....**POTENTIAL TESTING**

CATHODE TO CATHODE RETURN (RESISTANCE)

0.4 Ω

ZINC REFERENCE TO PIPE

+537 mV

CuSo4 REFERENCE TO PIPE

-621

ZINC TO CuSo4

1160 mV**EARTH TESTING**TEST NO. 1

PIN SPACING

2mRESISTIVITY 11.42 Ω

MEGGER READING

.910TEST NO 2

PIN SPACING

5mRESISTIVITY 24.80

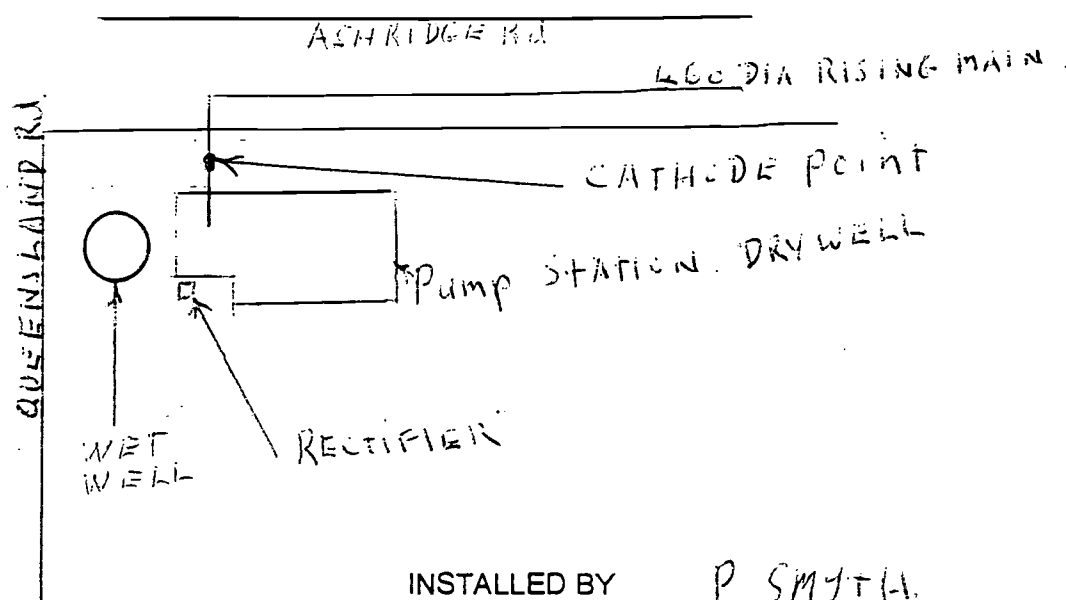
MEGGER READING

.790TEST NO 3

PIN SPACING

RESISTIVITY

MEGGER READING

COMMENTS / LOCATION DRAWING 600m TO TEST POINT NO.2.

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering FormProject ASHRIDGE RD DARRADate 20-5-96T P Location ASHRIDGE RdT P No. 2Mains Size 460 DIAT P Type B**POTENTIAL TESTING**

CATHODE TO CATHODE RETURN (RESISTANCE)

0.5 Ω

ZINC REFERENCE TO PIPE

+537 mV

CuSo4 REFERENCE TO PIPE

-621 mV

ZINC TO CuSo4

1200 mV**EARTH TESTING**TEST NO. 1

PIN SPACING

2 m

RESISTIVITY

15.07

MEGGER READING

1.2TEST NO 2

PIN SPACING

5 m

RESISTIVITY

28.26

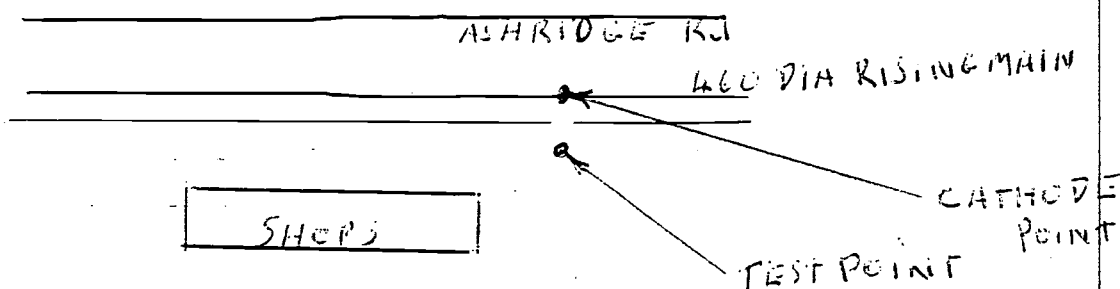
MEGGER READING

.90TEST NO 3

PIN SPACING

RESISTIVITY

MEGGER READING

COMMENTS / LOCATION DRAWING 275m to test Point 3INSTALLED BY P SMYTH

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit

Standard Cathodic Protection Test Point Data Gathering FormProject ASHRIDGE RD DARRADate 20-5-96T P Location ASHRIDGE RDT P No. 3Mains Size 640 DIAT P Type B**POTENTIAL TESTING**

CATHODE TO CATHODE RETURN (RESISTANCE)

ZINC REFERENCE TO PIPE

CuSo4 REFERENCE TO PIPE

ZINC TO CuSo4

0.65+590-6001220mV**EARTH TESTING**TEST NO. 1

PIN SPACING

MEGGER READING

2m1.5

RESISTIVITY

18.84TEST NO 2

PIN SPACING

MEGGER READING

5m1.1

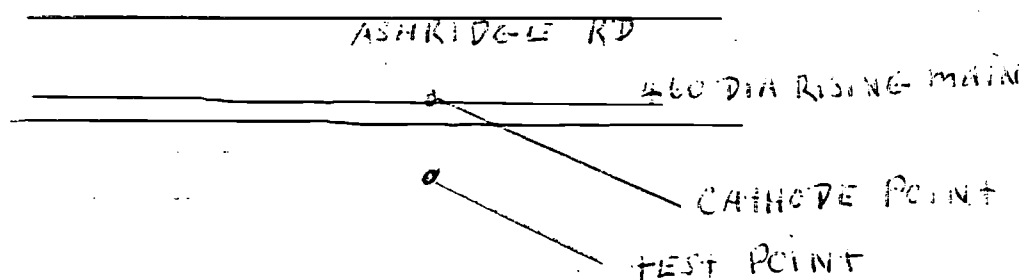
RESISTIVITY

34.54TEST NO 3

PIN SPACING

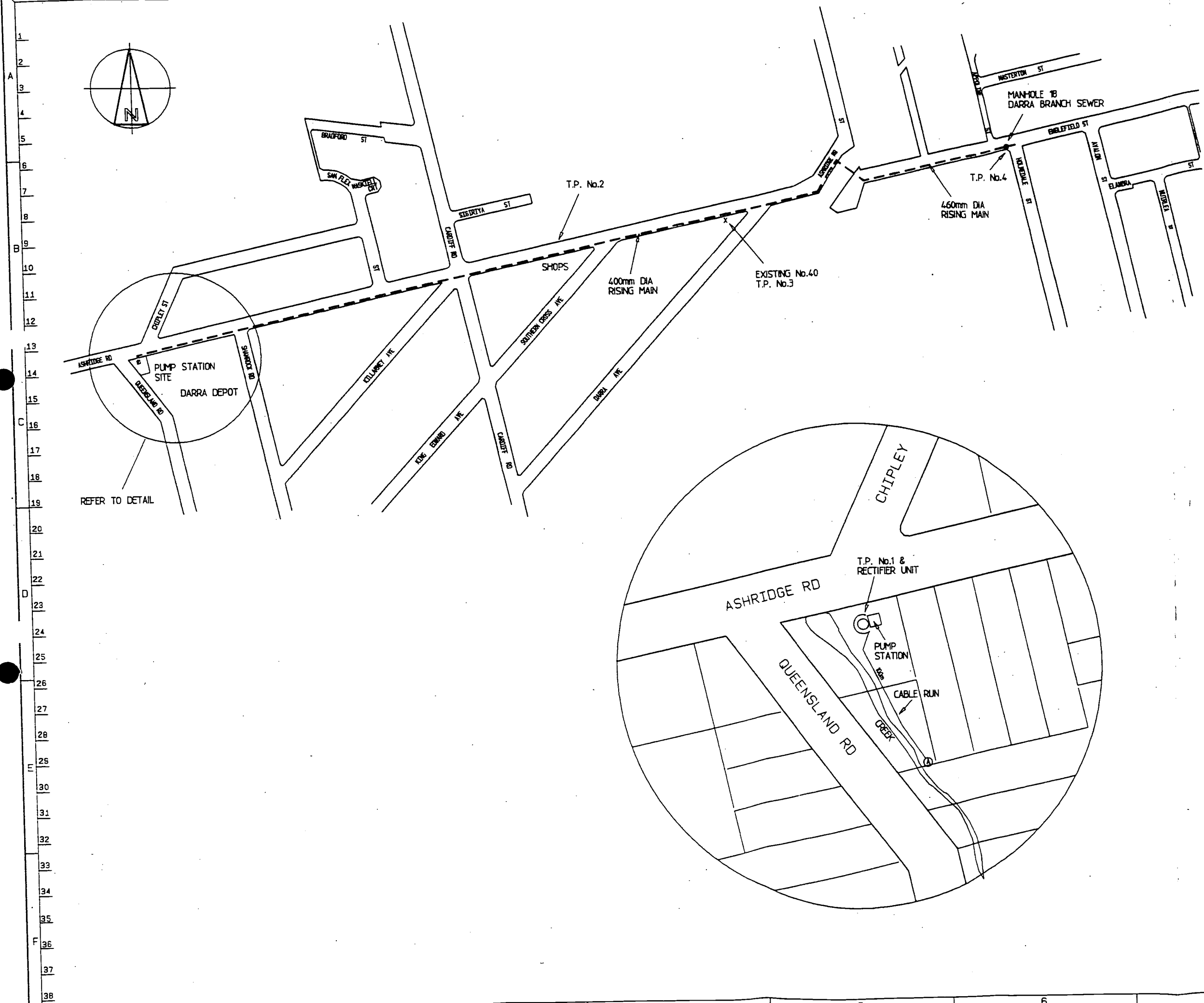
MEGGER READING

RESISTIVITY

COMMENTS / LOCATION DRAWING500m to test Point 4

INSTALLED BY

P. SMYTH



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<p align="center">AMENDMENT & ISSUE REGISTER</p> <table border="1"> <tr> <td colspan="2">MANAGER</td> <td colspan="2">DIRECTOR OF TECHNOLOGY SERVICES</td> </tr> <tr> <td colspan="2">DATE:</td> <td colspan="2">DATE:</td> </tr> <tr> <td>DIRECTOR OF PLANNING & DESIGN</td> <td>DIRECTOR OF WATER SUPPLY</td> <td colspan="2">DIRECTOR OF CONSTRUCTION</td> </tr> <tr> <td>DATE:</td> <td>DATE:</td> <td colspan="2">DATE:</td> </tr> <tr> <td>DESIGN</td> <td>J.S.</td> <td>13.2.96</td> <td>ENGINEER IN CHARGE</td> </tr> <tr> <td>DRAWN</td> <td>O.L.P.</td> <td>15.2.96</td> <td>SUPERVISING ENGINEER</td> </tr> <tr> <td>TRACED</td> <td></td> <td></td> <td></td> </tr> <tr> <td>CHECKED</td> <td></td> <td>A2</td> <td>REDUCED</td> </tr> </table>				MANAGER		DIRECTOR OF TECHNOLOGY SERVICES		DATE:		DATE:		DIRECTOR OF PLANNING & DESIGN	DIRECTOR OF WATER SUPPLY	DIRECTOR OF CONSTRUCTION		DATE:	DATE:	DATE:		DESIGN	J.S.	13.2.96	ENGINEER IN CHARGE	DRAWN	O.L.P.	15.2.96	SUPERVISING ENGINEER	TRACED				CHECKED		A2	REDUCED
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<p align="center">BRISBANE CITY COUNCIL BRISBANE WATER TECHNOLOGY SERVICES BRANCH TECHNICAL SERVICES</p>																																			
<p>PROJECT:</p> <p align="center">CATHODIC PROTECTION ASHRIDGE ROAD RISING MAIN</p>																																			
<p>TITLE:</p> <p align="center">CATHODIC PROTECTION ASHRIDGE ROAD SYSTEM</p>																																			
SCALE:		No. 1 OF 1 SHEETS																																	
DRAWING No.		AMEND.																																	
486/7/6-KD1T0001E		A																																	

Brisbane Water Engineering Services

CP Form No.18

Electrical Engineering Unit**Standard Cathodic Protection Test Point Data Gathering Form**

Project

Date 20-5-96T P Location ENGFIELD Rd - AppolineT P No. 4Mains Size 460 DIAT P Type B**POTENTIAL TESTING**

CATHODE TO CATHODE RETURN (RESISTANCE)

ZINC REFERENCE TO PIPE

CuSo4 REFERENCE TO PIPE

ZINC TO CuSo4

0.352+400 mV-538 mV-952 mV**EARTH TESTING****TEST NO. 1**

PIN SPACING

2mRESISTIVITY 25.12

MEGGER READING

2**TEST NO 2**

PIN SPACING

5mRESISTIVITY 56.52

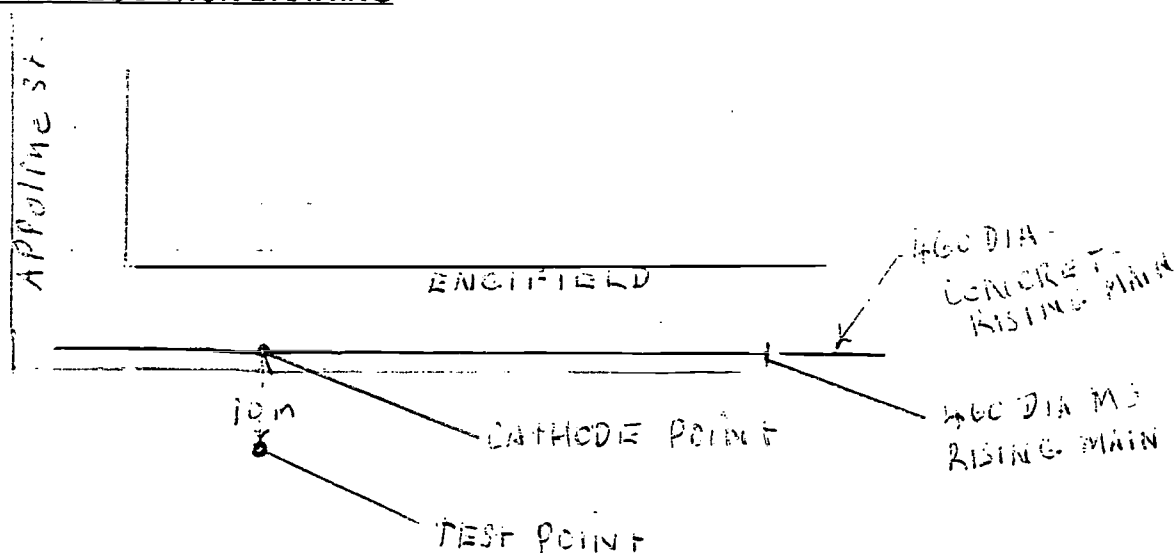
MEGGER READING

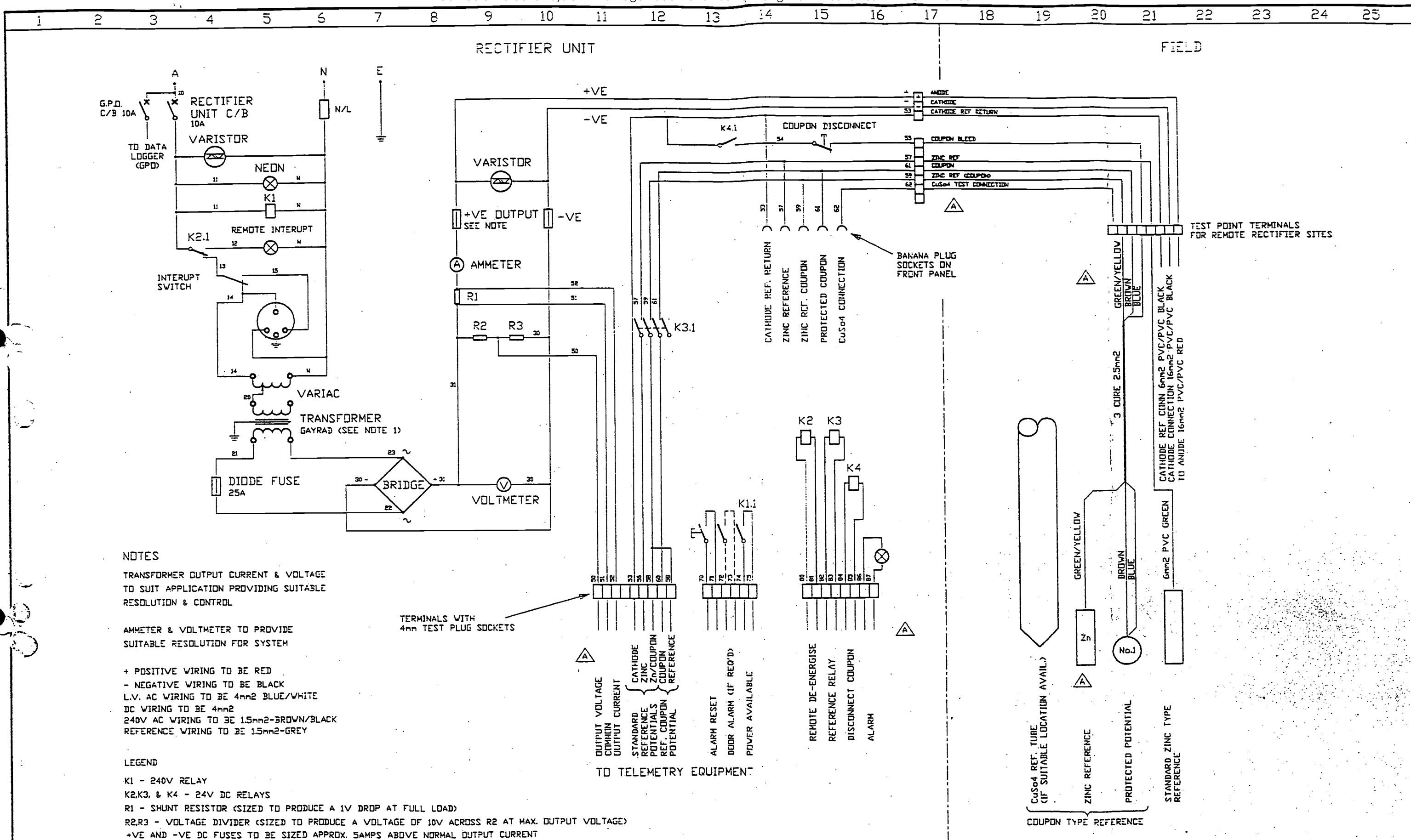
1.8**TEST NO 3**

PIN SPACING

MEGGER READING

RESISTIVITY

COMMENTS / LOCATION DRAWINGINSTALLED BY A. Smith



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



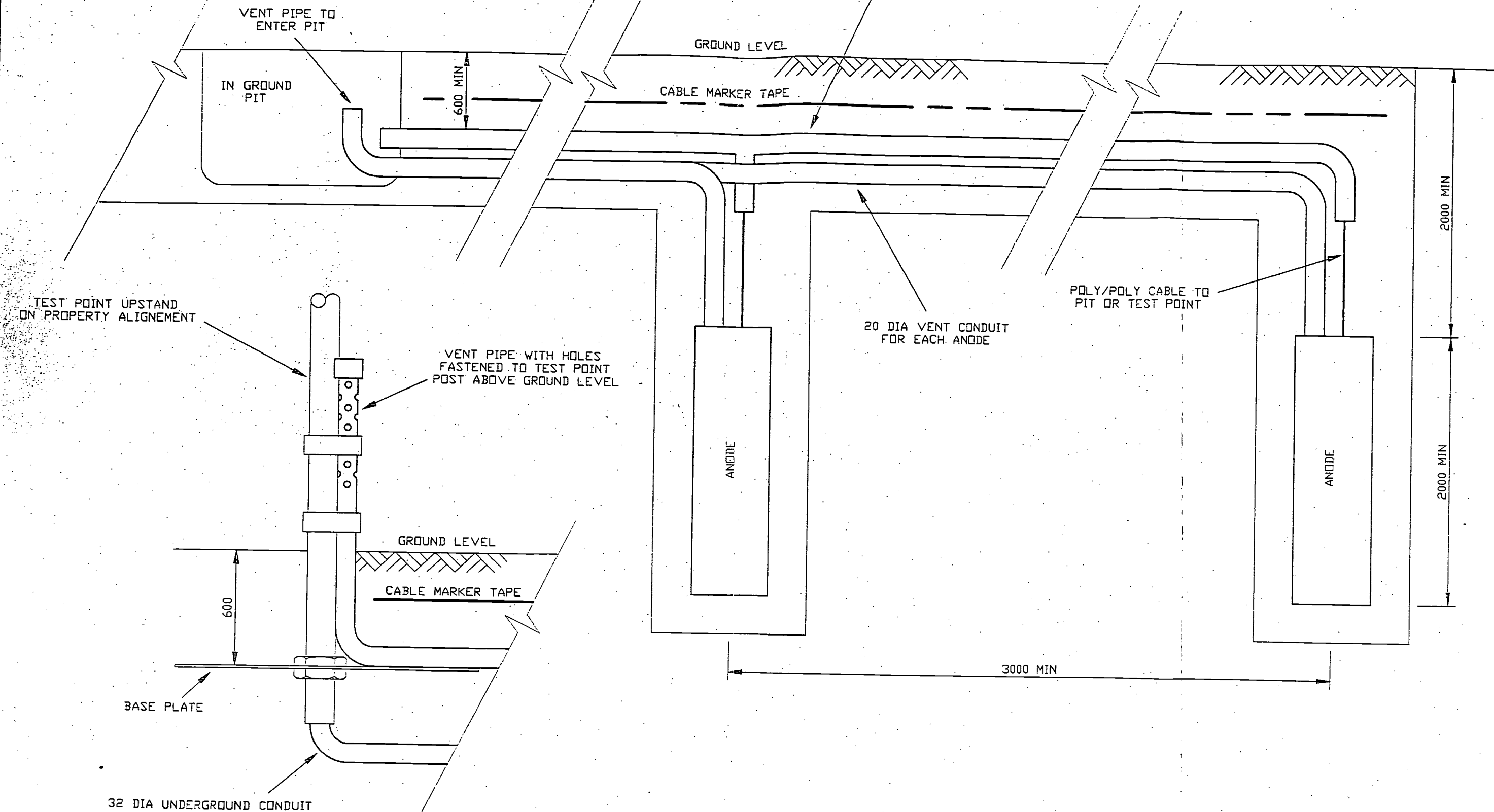
BRISBANE
CITY COUNCIL
DEPARTMENT OF WATER
SUPPLY & SEWERAGE
MECHANICAL & ELECTRICAL SERVICES


PROJECT
STANDARD
CATHODIC PROTECTION

TITLE
RECTIFIER UNIT
WITH DATA LOGGING FACILITIES
WIRING DIAGRAM

DRAWN	NAME	DATE	SUPER	NAME	DATE	SCALE	SIZE
DESIGN	R.L.	3.8.93	ENG.	M.J.	25.8.93		A3
CHECKED	J.S.	3.8.93	SENIOR				
	J.S.	25.8.93	ELECT. ENG.				
DRAWING No. 486/6/25-AA1C0021E						ACADIZ FILE No. A625C21	
							AMEND A

32 DIA UNDERGROUND CONDUIT



O	2.12.93	ISSUED FOR CONSTRUCTION	R.L.	MANAGER		DIRECTOR OF PLANNING & DESIGN		DESIGN			PROJECT STANDARD CATHODIC PROTECTION	 BRISBANE CITY COUNCIL DEPARTMENT OF WATER SUPPLY AND SEWERAGE MECHANICAL & ELECTRICAL SERVICES			
				DATE:		DATE:		DRAWN	R.LISTON	2.12.93					
				DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES		DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION		CHECKED					TITLE
				DATE:		DATE:		DATE:		ENGINEER IN CHARGE			VERTICAL GROUNDBED DETAILS		
No	DATE	AMENDMENT	BY	DATE:	DATE:	DATE:	SUPERVISING ENGINEER		CADD FILE No. A625C024E		SCALE: NTS	No. 1 OF 1 SHEETS			
											DRAWING No.	486/6/25-AA1C0024E	AMEND.		
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