

☐ Electrical ☐ Mechanical ☐ Water Meters

5 Bunya Street Eagle Farm Q 4009

Ph. (07) 3403 1849

Fx. (07) 3403 1898



Brisbane Water Engineering Services

OPERATING MANUAL FOR:

SUMNER ESTATE SUBMERSIBLE PUMP STATION

CATHODIC PROTECTION SYSTEM

CLIENT:

DEPARTMENT OF WATER SUPPLY AND SEWERAGE
SEWERAGE OPERATIONS BRANCH

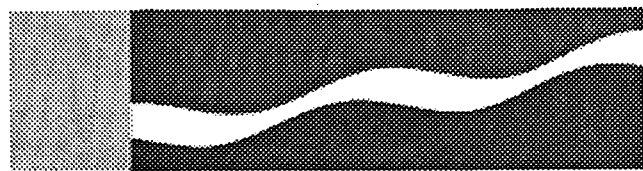
22 NOVEMBER 1995.

☐ Electrical ☐ Mechanical ☐ Water Meters

5 Bunya Street Eagle Farm Q 4009

Ph. (07) 3403 1849

Fx. (07) 3403 1898



Brisbane Water Engineering Services

OPERATING MANUAL FOR:

SUMNER ESTATE SUBMERSIBLE PUMP STATION

CATHODIC PROTECTION SYSTEM

CLIENT:

DEPARTMENT OF WATER SUPPLY AND SEWERAGE
SEWERAGE OPERATIONS BRANCH

22 NOVEMBER 1995.



Brisbane City

BRISBANE CITY COUNCIL
MEMORANDUM

To	File No.	
From	Date 15/1/96	
Subject Sumner Park Sub P. Stn. Brumby Crt		

Interference Testing 3.5 Volts @ 130 ma

Ladder in Pit	-522 mV on	-461 mV off	-61 mV
Ladder hand Rail L	-452 mV on	-478 mV off	+26 mV
Ladder hand Rail R	-480 mV on	-505 mV off	+25 mV
Reinforcing Bar	-542 mV on	-463 mV off	-79 mV
Water Supply	-9 mV on	-6 mV off	-3 mV
Outgoing Pipes L	-512 mV on	-460 mV off	-52 mV
Outgoing Pipes R	-511 mV on	-460 mV off	-51 mV
SEQEB Tower EHT	-272 mV on	-270 mV off	-2 mV
SEQEB Light Pole 3772287	-477 mV on	-470 mV off	-7 mV

MANUAL CONTENTS

- 1.0 Introduction**
- 2.0 Corrosion and Cathodic Protection**
- 3.0 Pump Station Details**
- 4.0 Cathodic Protection Details**
 - 4.1 Type of System**
 - 4.2 Rectifier**
 - 4.3 Cathode**
 - 4.4 Anodes**
 - 4.5 Test Points**
 - 4.6 Associated Drawings**
 - 4.7 Associated Standards**
 - 4.8 Government Regulations**
- 5.0 Testing Performed**
- 6.0 Conclusion**
- 7.0 Maintenance**
 - 7.1 Monthly maintenance procedure.**
 - 7.2 Six monthly maintenance procedure.**
 - 7.3 Sixty monthly maintenance procedure.**

DRAWINGS

- | | |
|---------------------------|--|
| 486/6/25-AA1C0023E | Standard Rectifier Wiring Diagram |
| 2/14.213 | Cathodic Protection Details |
| (No Number) | Monthly Maintenance Program |

(1.0) INTRODUCTION

Steel when buried or immersed has a tendency to corrode (rust) as the oxidised form is more stable than the metal.

Because of this, precautions must be taken to stop or minimise 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 practicable to expect a perfect coating during construction and coating damage will also occur with time. Because of this, corrosion may occur at imperfections.

(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 low 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 and is generally measured against a standard reference electrode, which permits a reproducible potential at which corrosion does not occur to be quoted.

(3.0) STRUCTURE DETAILS

Size: 2 x 7.4 KW Submersible Sewerage Pumps

Coating: Tar Epoxy Coating

Length: N.A.

Location: Brumby Crescent Sumner Park UBD 40L6

Drawings: Construction:

486/5/7-PE09RC Pump Station Reinforcement

Included Drawings:

486/7/7-PE1C2188E Submersible Pump Station
General Layout

486/7/7-PE1C2189E Rectifier Unit With Data
Logging Facilities, Wiring
Diagram

486/7/7-PE1C2190E Cathodic Protection Cable
Layout

(4.0) CATHODIC PROTECTION DETAILS

4.1 Type of Cathodic Protection: Impressed Current

4.2 Rectifier: Standard 32 Volt, 10 Amp direct current output enclosed in a poly carbonate enclosure, installed in the main switchboard. Rectifier has a 240VAC supply from within the Switchboard of pump station SP 263.

4.3 Cathode: The cathode point is made directly to each pump as indicated on the diagrams

4.4 Anodes: One 1000 x 50 silicon iron anode was installed suspended from the top of the wetwell from a suspension bar, cast into the roof of the well.

4.5 Testpoints: Testpoints are installed on cathodically protected structures to enable testing to confirm that full cathodic protection of the structure is maintained. On this structure 2 testpoints have been installed on the pumps and connected via disconnect plugs to terminals on the C.P. unit.

4.6 Associated Drawings:
Nil

4.7 Associated Standards:

AS 2832.1 1985 Pipes, Cables, Ducts, Guide to Cathodic Protection. Part 1.

AS 3000 1991 Australian Wiring Rules

4.8 Government Regulations:

Queensland Electricity Acts and Regulations

(5.0) PERFORMED TESTING

- (1) Natural Potential Survey
- (2) Testing of Insulated Flanges, Joints
- (3) Current Drain Survey
- (4) Rectifier Loop Resistance

(5) Foreign Structure Interference Survey and Mitigation.

(6) Final Potential Survey and Commissioning.

NOTE: Details of above testing have not been included in this manual but are available upon request.

(6.0) CONCLUSION

Full cathodic protection has been achieved on these sewerage pumps.

The cathodic protection system is to be 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 pump to electrolyte potentials. Monthly, Six monthly and sixty monthly maintenance procedures are detailed as attached below.

(7.1) 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.

(7.2) 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.

(7.3) 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

Ph. 34031838 Fx. 34031839

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

Date : 22 November 1995

Cathodic Protection System:

Sumner Park Brumby Crt Sub Pump Stn.

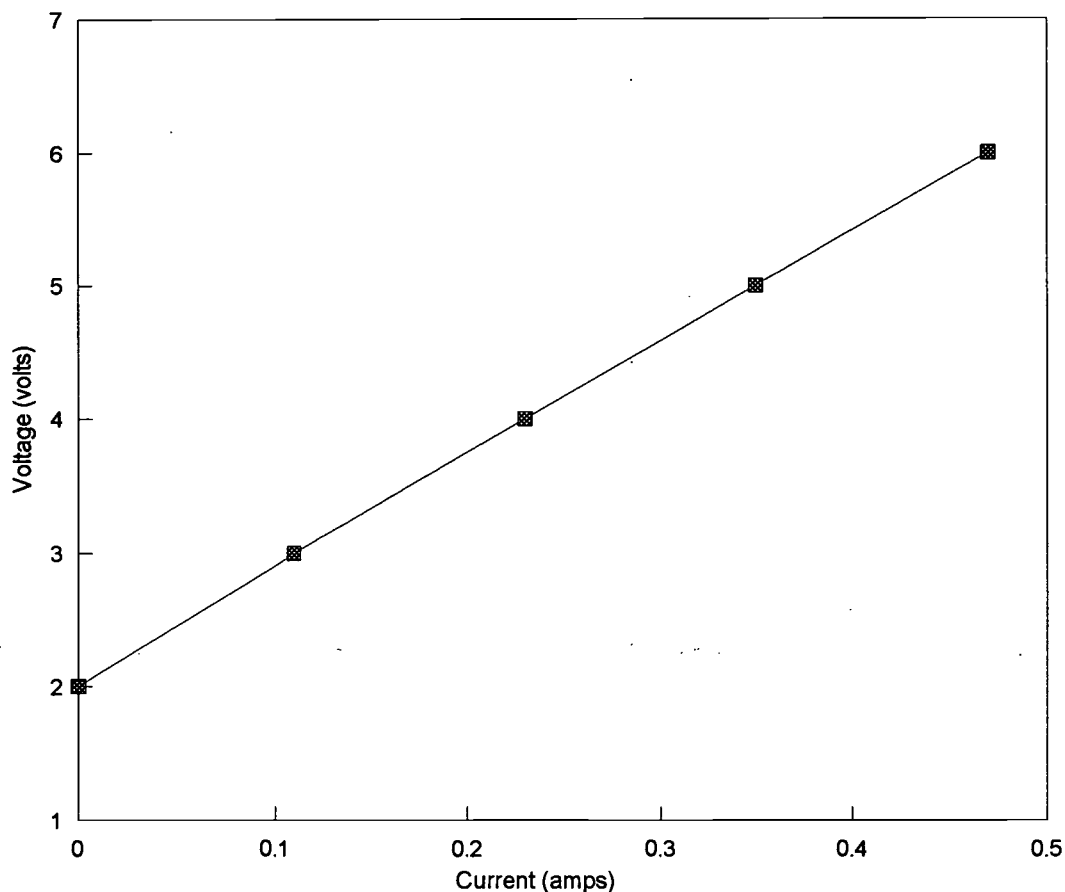
System Operating Volts: 3.5

System Operating amps 145 ma

Test Voltage:		Test Current:	
(volts)		(amps)	
2		0	
3		0.11	
4		0.23	
5		0.35	
6		0.47	

Loop Resistance (ohms)

8.333333

Graph of System voltage vs current.



MEMORANDUM

To	File No.	
From	Date 11/9/95	
Subject Sumner Residential estate Pump Station SP263 C.P.		

Natural Potentials unit. 3v 120 ma

CuSO₄ - Pump 1 772 mv
CuSO₄ - Pump 2 772 mv
CuSO₄ - Ladder 774 mv

CuSO₄ - ZN Pump 1 1216 mv
CuSO₄ - ZN Pump 2 1273 mv
CuSO₄ - ZN Ladder 1199 mv

ZN - Pump 1 +200 mv
ZN - Pump 2 +201 mv
ZN - P Ladder +125 mv

ON OFF Potentials

	on	OFF
CuSO ₄ Pump 1	-1136	-840
CuSO ₄ Pump 2	-1142	-840
CuSO ₄ Ladder	-1156	-840

ZN Pump 1	+067	+237
ZN Pump 2	+108	+280
ZN Ladder	+40	+170

CuSO₄ Rebar -451 on -390 OFF

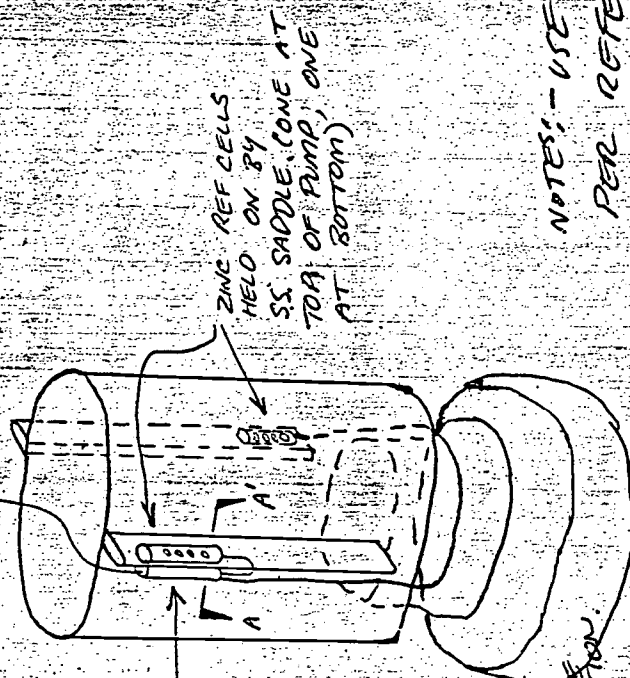
The Rising Mains From the Pumps
to top of wet well are Rubber pipes.

Rebar to trunk mains 1 1.3 Ω
2 1.5 Ω

4 CORE FLEX
COLOR CODING

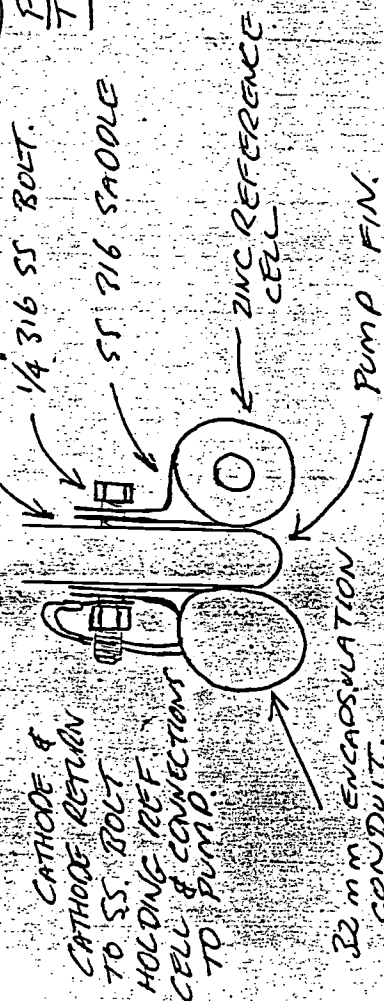
RED - TOP REFERENCE
WHITE - LOWER REFERENCE
BLUE - CATHODE RETURN
GREEN/YELLOW - CATHODE

4 CORE CABLE
EPOXIED INTO
32mm CONDUIT
AND CONNECTIONS
TO 2 ZINC REF
AND CATHODE &
CATHODE RETURN
(HELD ON BY SS
SADDLES).



NOTES: - USE 2 SADDLES
PER REFERENCE CELL
- ZINC REFERENCES
TO HAVE D.I. CABLE.

PUMP
TYPICAL



A-A

SCALE: -	DATE: -
NTS	13-9-95
SUMNER PK SUBMERSIBLE PUMP STATION CATHODIC PROTECTION ZINC REFERENCE AND CONNECTION TO PUMP DETAILS.	

WJH

31-7-91.

Sumner Residential Estate SUBMERSIBLE PUMP STATION CATHODIC PROTECTION

ANODE DETAILS.

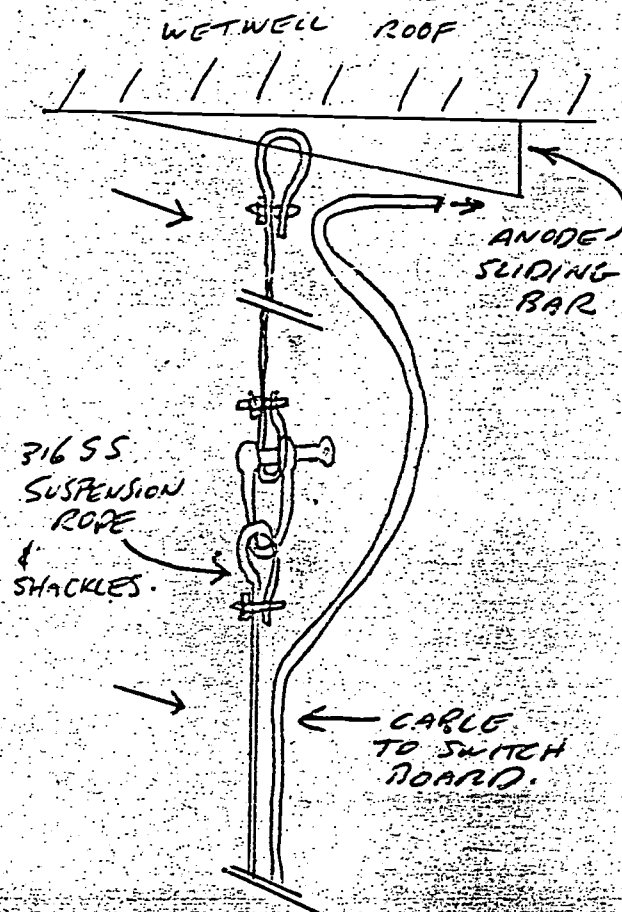
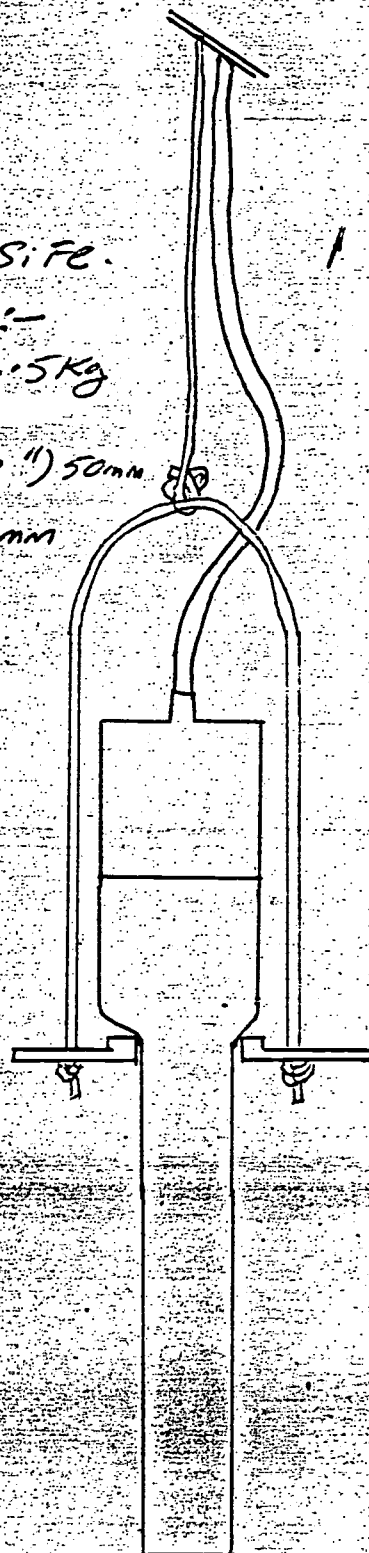
ANODE MATERIAL :- SIFC.

NUMBER OF ANODES :-

ANODE WEIGHT :- 16.5kg

ANODE DIAMETER :- (2") 50mm

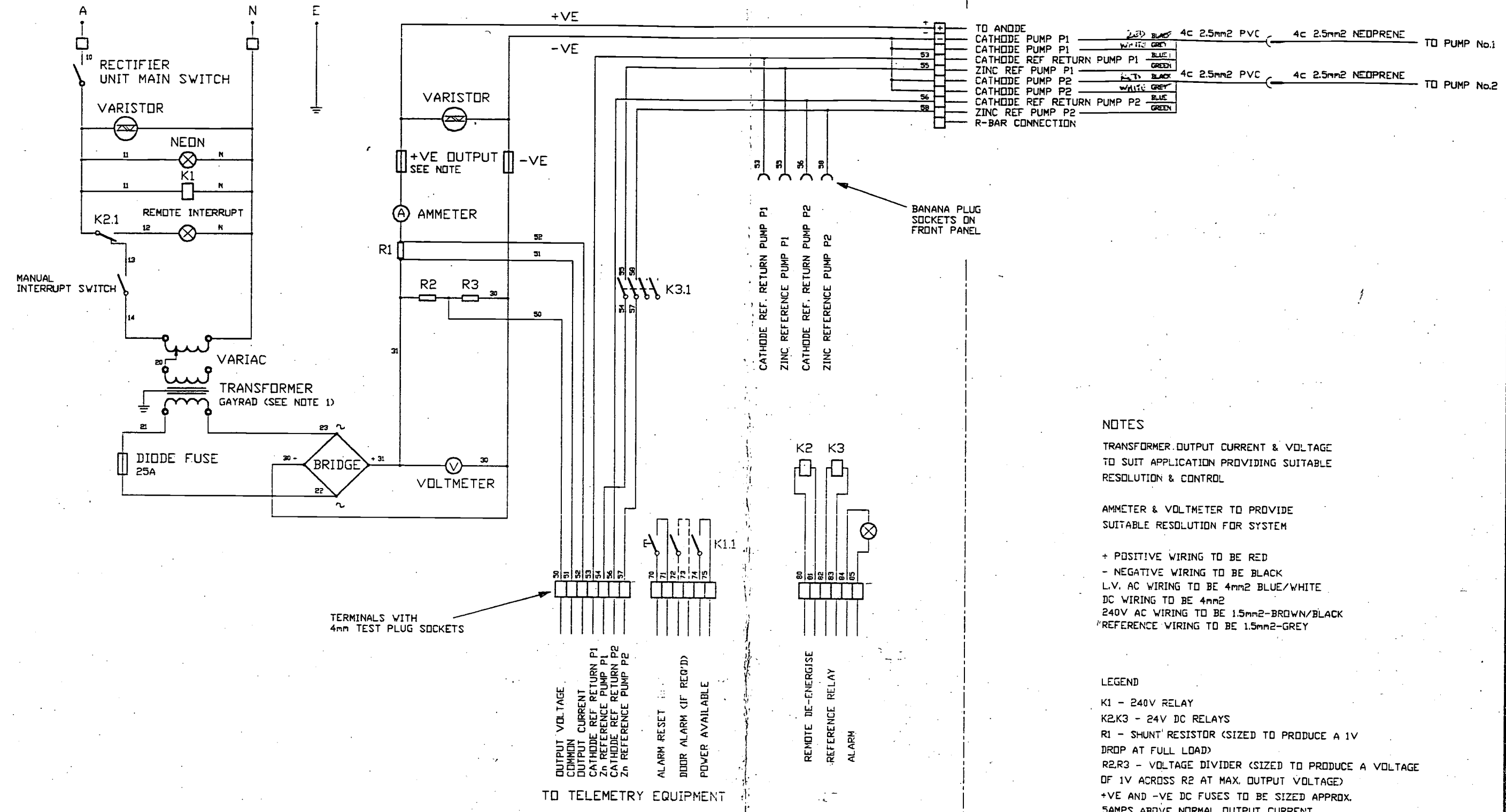
ANODE LENGTH :- 1000mm



ANODE SUSPENSION DETAILS LOWER

RECTIFIER UNIT

FIELD



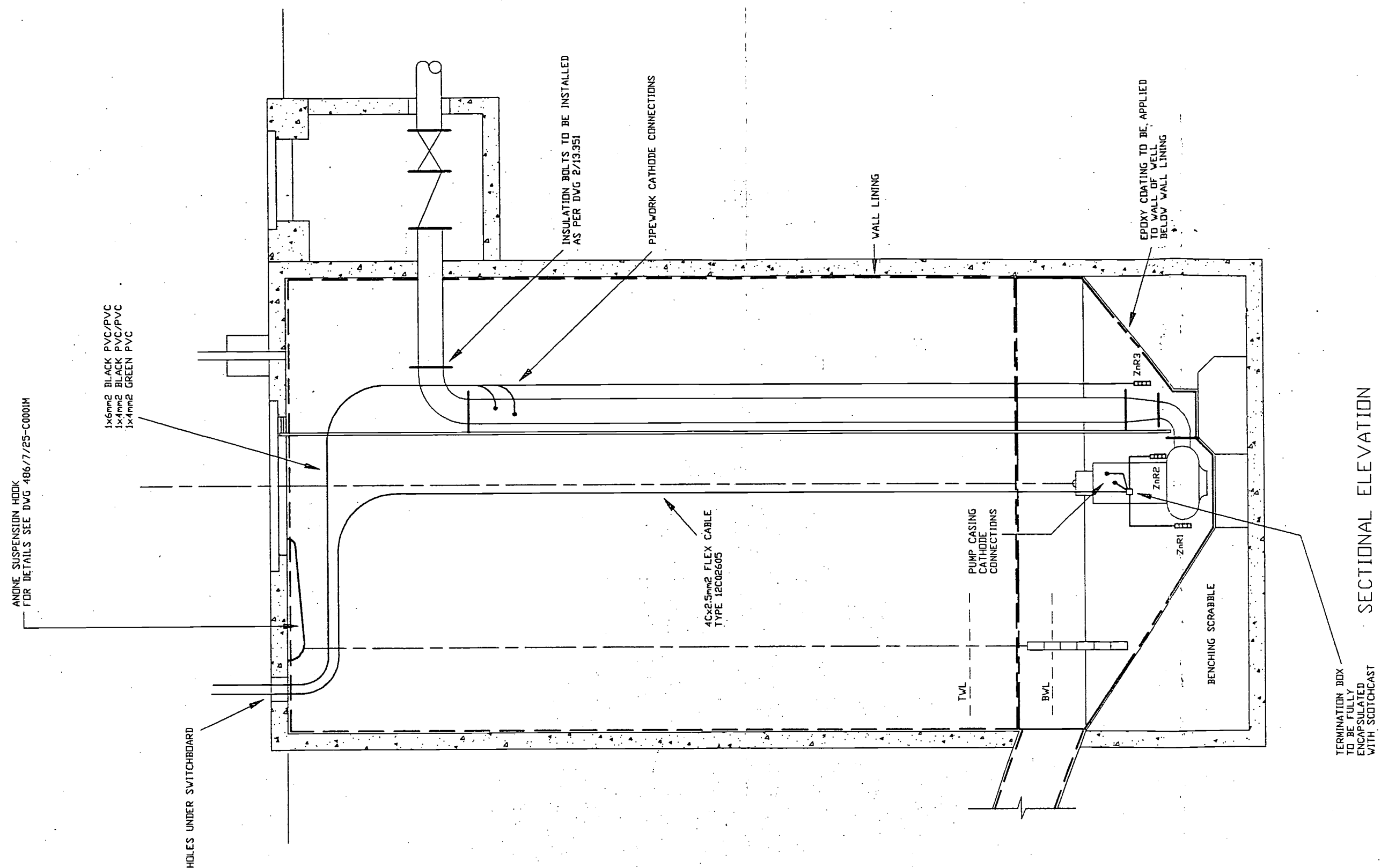
No.	BY	DATE	REVISION	CHECK	APPR
B	R.L.	16.1.95	WIRE NUMBERS ADDED		
A	R.L.	22.12.94	CIRCUIT CHANGES		
D	R.L.	25.8.93	ISSUED FOR CONSTRUCTION		




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

PROJECT STANDARD
CATHODIC PROTECTION
SUBMERSIBLE PUMP STATION
TITLE RECTIFIER UNIT
WITH DATA LOGGING FACILITIES
WIRING DIAGRAM

DRAWN	NAME	DATE	SUPER ENG.	NAME	DATE	SCALE	SIZE
DESIGN	J.S.	15.10.93	SENIOR ENG.				A3
CHECKED	J.S.	22.10.93	ELECT. ENG.				AMEND
DRAWING No.	486/6/25-AA1C0023E						B
ACAD12 FILE No. A625C23							



O	16.12.93	ISSUED FOR CONSTRUCTION	R.L.	MANAGER	DIRECTOR OF PLANNING & DESIGN	DESIGN	PROJECT: OXLEY ARCHERFIELD CATHODIC PROTECTION		 BRISBANE CITY COUNCIL DEPARTMENT OF WATER SUPPLY AND SEWERAGE MECHANICAL & ELECTRICAL SERVICES
				DATE:	DATE:	DRAWN R.LISTON 16.12.93	TITLE: SUBMERSIBLE PUMP STATION GENERAL LAYOUT		
N	DATE	AMENDMENT	BY	DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	CHECKED	CADD FILE No. A77C51E		SCALE: NTS
				DATE:	DATE:	ENGINEER IN CHARGE	DRAWING No. 486/7/7-PE1C0051E		No. 1 OF 1 SHEETS
Q-Pulse	16.12.93			DATE:	DATE:	SUPERVISING ENGINEER			AMEND. 0