

BRISBANE CITY COUNCIL  
DEPARTMENT OF WATER SUPPLY AND SEWERAGE  
MECHANICAL AND ELECTRICAL BRANCH  
ELECTROLYSIS SECTION  
EAGLE FARM PUMPING STATION

OPERATING MANUAL FOR:

GAY ST TO PINELANDS RD, 1220 - 910 DIA TRUNK WATER MAIN  
CATHODIC PROTECTION SYSTEM

CLIENT:

DEPARTMENT OF WATER SUPPLY AND SEWERAGE  
WATER MAINTENANCE SECTION



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## DRAWINGS

JE02/104	Standard Rectifier Wiring Diagram
2/14.213	Cathodic Protection Details
	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)      MAINS DETAILS**

**Size:**                      Dia 1220 - Dia 910 mild steel cement lined

**Coating:**                Fibre Glass Enamel Coated

**Location:**              3.4 km

**Construction Drawings:**    Gay St. Coopers Plains to Sunnybank Reservoir,  
and extending to Pinelands Rd. Sunnybank.

The 1220 dia and the 910 dia mains are  
electrically bonded adjacent to the Sunnybank  
Reservoir Pump Station.





**(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 stainless steel switchboard. Rectifier has a 240VAC supply from a nearby power pole, No 29894 located on the corner of Stones Rd and Beenleigh Rd. UBD Map 43 L6
- 4.3 Cathode:** The cathode point is located adjacent to the scour valve pit located on the corner of Stones Rd and Beenleigh Rd, near the rectifier.
- A coupon test facility is installed directly in front of the rectifier in Beenleigh Rd with all terminations being within the rectifier cabinet.
- 4.4 Anodes:** Two silicon iron anodes were installed approximately 250 metres from the trunk mains in a horizontal bed 2 metres deep. The anodes were first backfilled with a cokebreeze surround to improve anode ground resistance. The anode location can be identified by an in-ground pit.  
Refer dwg no. 2/14.213?
- 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 these mains 8 testpoints have been installed with a further test location being the Valve Pit in Pinelands Rd.  
Refer dwg no. 2/14.213? for details.
- 4.6 Associated Drawings:**
- |                                       |            |
|---------------------------------------|------------|
| Cathodic Protection Details           | - 2/14.213 |
| Cathodic Protection Testpoint Details | - 2/14.213 |
| Standard Rectifier Wiring Diagram     | - JE02/104 |
- 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) 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.

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 sections of the 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. 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 City Council**  
**Dept. W.S. & S.**  
**Metropolitan Division**  
**Eagle Farm Pump Station**

Cathodic Protection System Loop Resistance

09-Apr-94

Cathodic Protection System:

**Stones Rd. 910mm to 1220mm diameter trunk**

System Operating Volts:

2

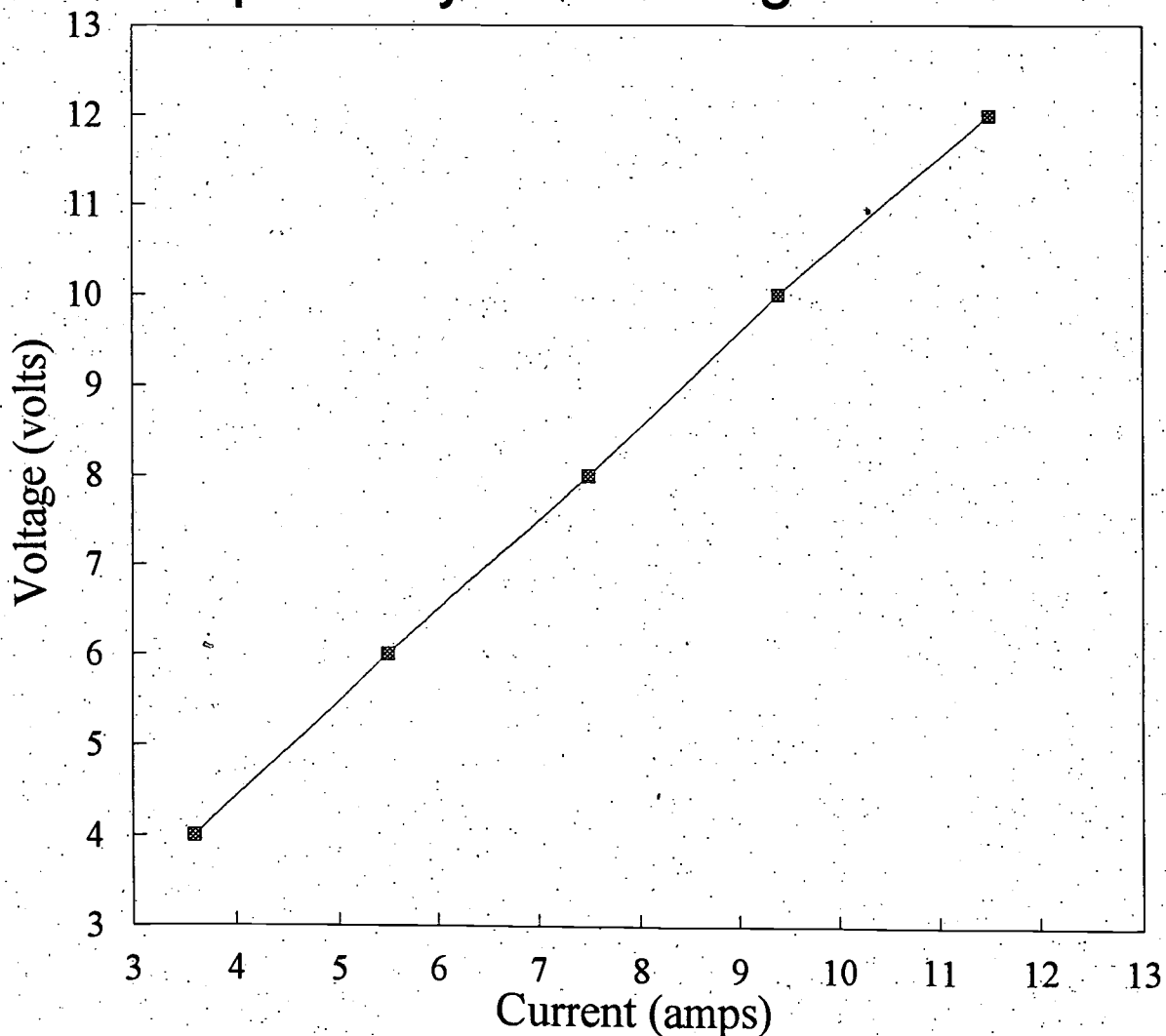
System Operating amps:

3.5

Test Voltage:		Test Current:	
(volts)		(amps)	
4		3.6	
6		5.5	
8		7.5	
10		9.4	
12		11.5	

Loop Resistance (ohms)
1

## Graph of System voltage vs current.





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**Metropolitan Division**  
**Eagle Farm Pumping Station**  
**09-Apr-94**

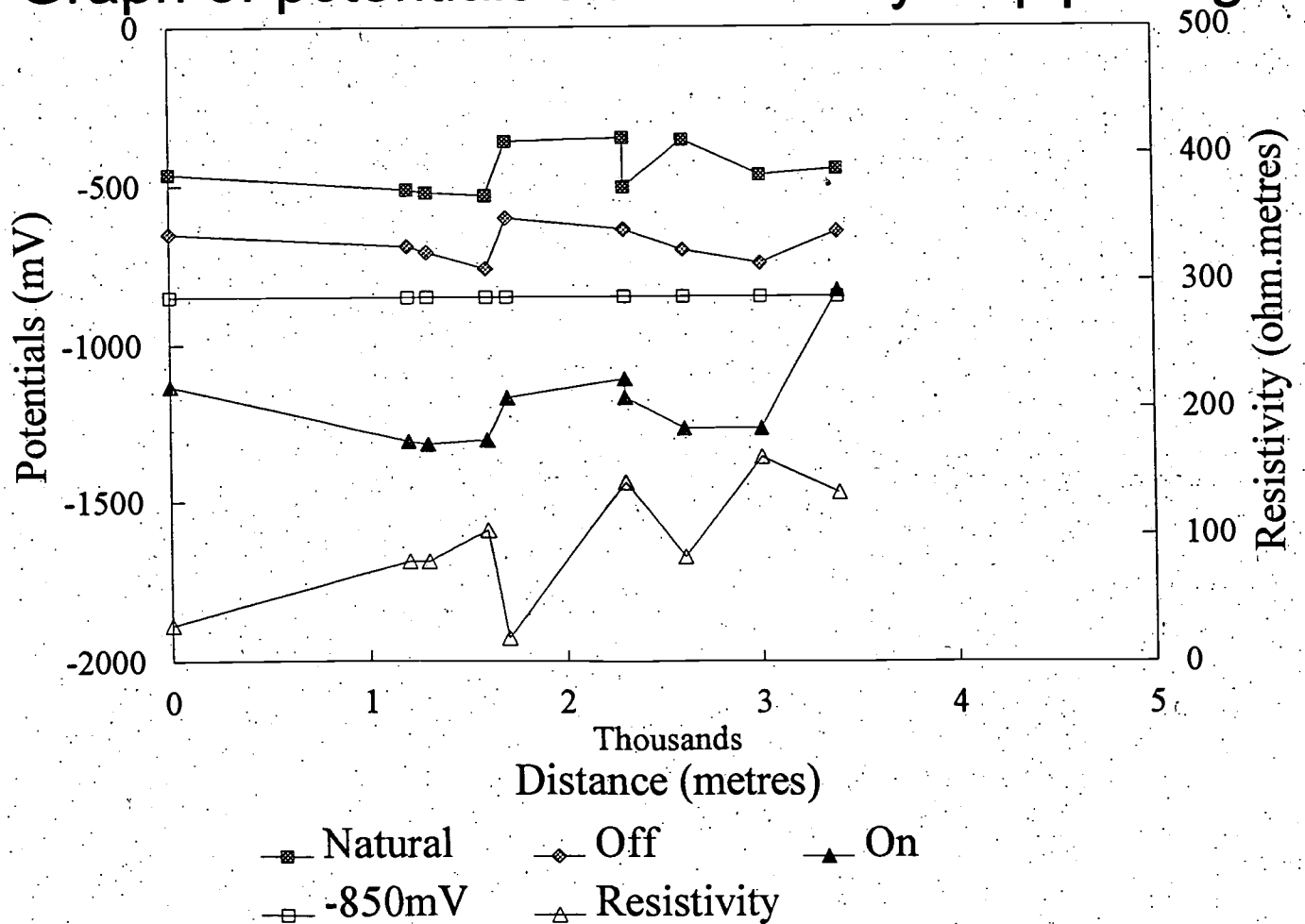
**Electrical Workshop**

**System:** Stones Rd. 910mm to 1220mm diameter trunk main

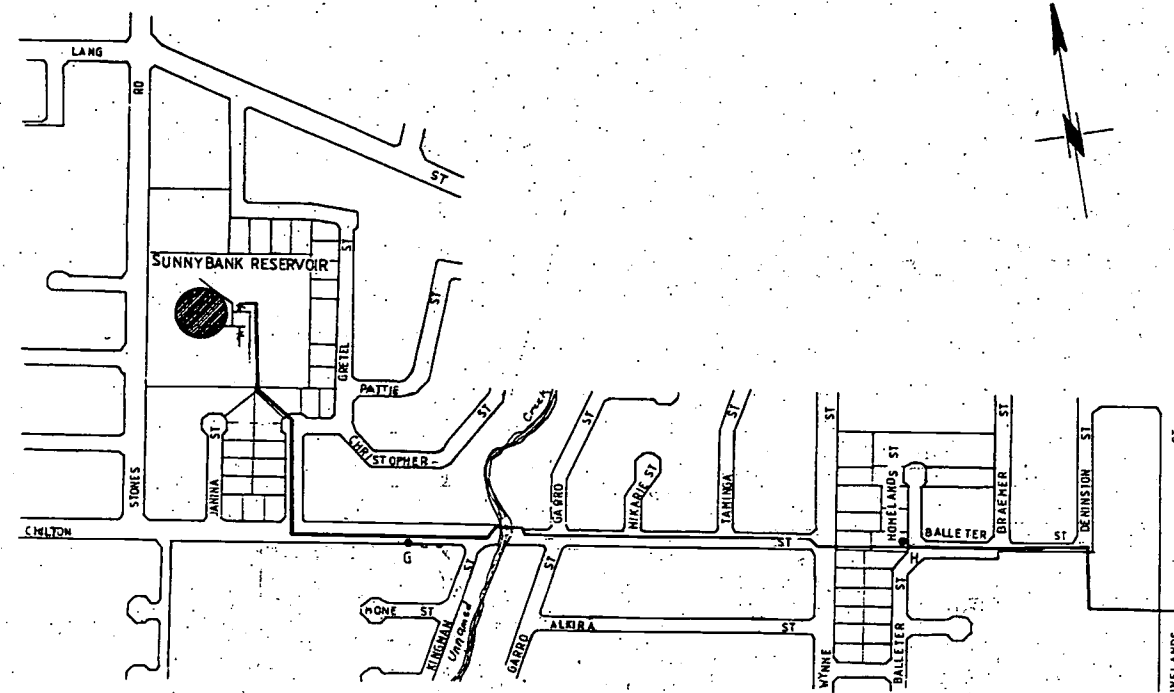
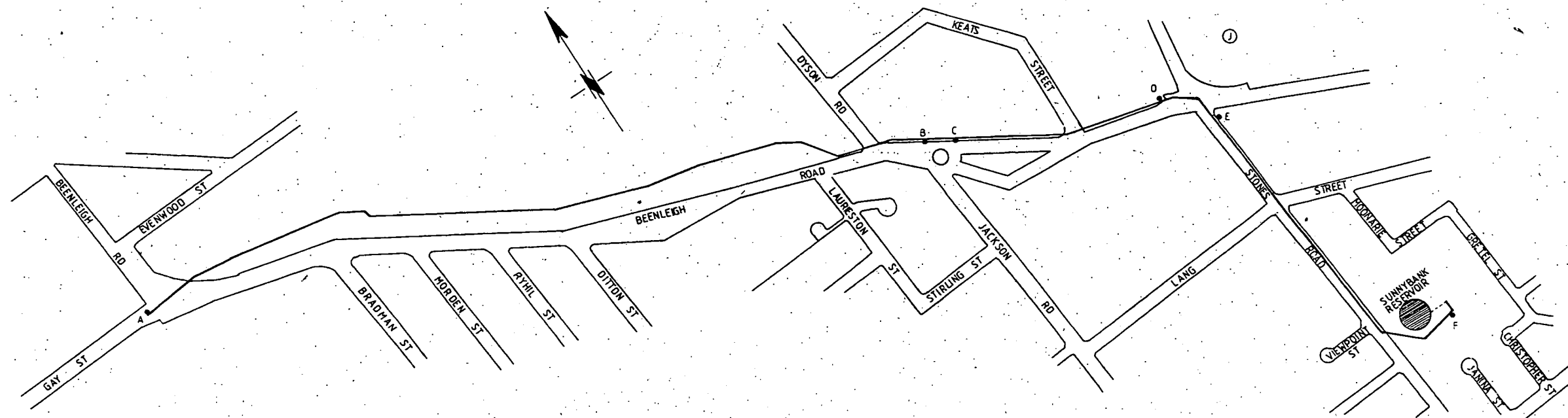
Cathodic Protection System reference potential and earth resistivity graph.

Test Point number	Distances to T.P. (metres)	Potentials to Natural (mV)	CuSO4 Off (mV)	On (mV)	Resistivities at 2 metres (ohm.metres)
1	0	-465	-650	-1130	28
2	1200	-512	-690	-1305	78
3	1300	-521	-709	-1314	78
4	1600	-532	-760	-1300	103
5	1700	-359	-602	-1167	18
6	2300	-350	-638	-1109	141
7	2300	-506	-640	-1167	141
8	2600	-356	-703	-1265	82
9	3000	-468	-745	-1265	161
10	3400	-450	-645	-830	133

**Graph of potentials and resistivity vs pipelength**







## TEST POINT NOS AND LOCATIONS

- A GAY STREET PROTECTED/UNPROTECTED
- B JACKSON ROAD ROUNDABOUT. TYPE 'B' ON ROUNDABOUT
- C JACKSON ROAD JUST OFF ROUNDABOUT 'B'
- D BEENLEIGH ROAD/STONES ROAD AT RECTIFIER. COUPON TYPE.
- E STONES ROAD/BEENLEIGH ROAD TYPE 'B'
- F RESERVOIR. TYPE 'B' 1200mm AND 900mm MAINS. BRIDGED.
- G 125 CHILTON STREET. TYPE 'B'
- H 8 HOMELAND STREET. TYPE 'B' IN PIT.
- B & C ACTUALLY IN BEENLEIGH ROAD.
- J ANODE GROUNDED

## NOTE

FOR RECTIFIER/ANODE AND RESERVOIR DETAILS, REFER DWG. NO. 486/6/6-RC10007E.

## LOCALITY PLAN

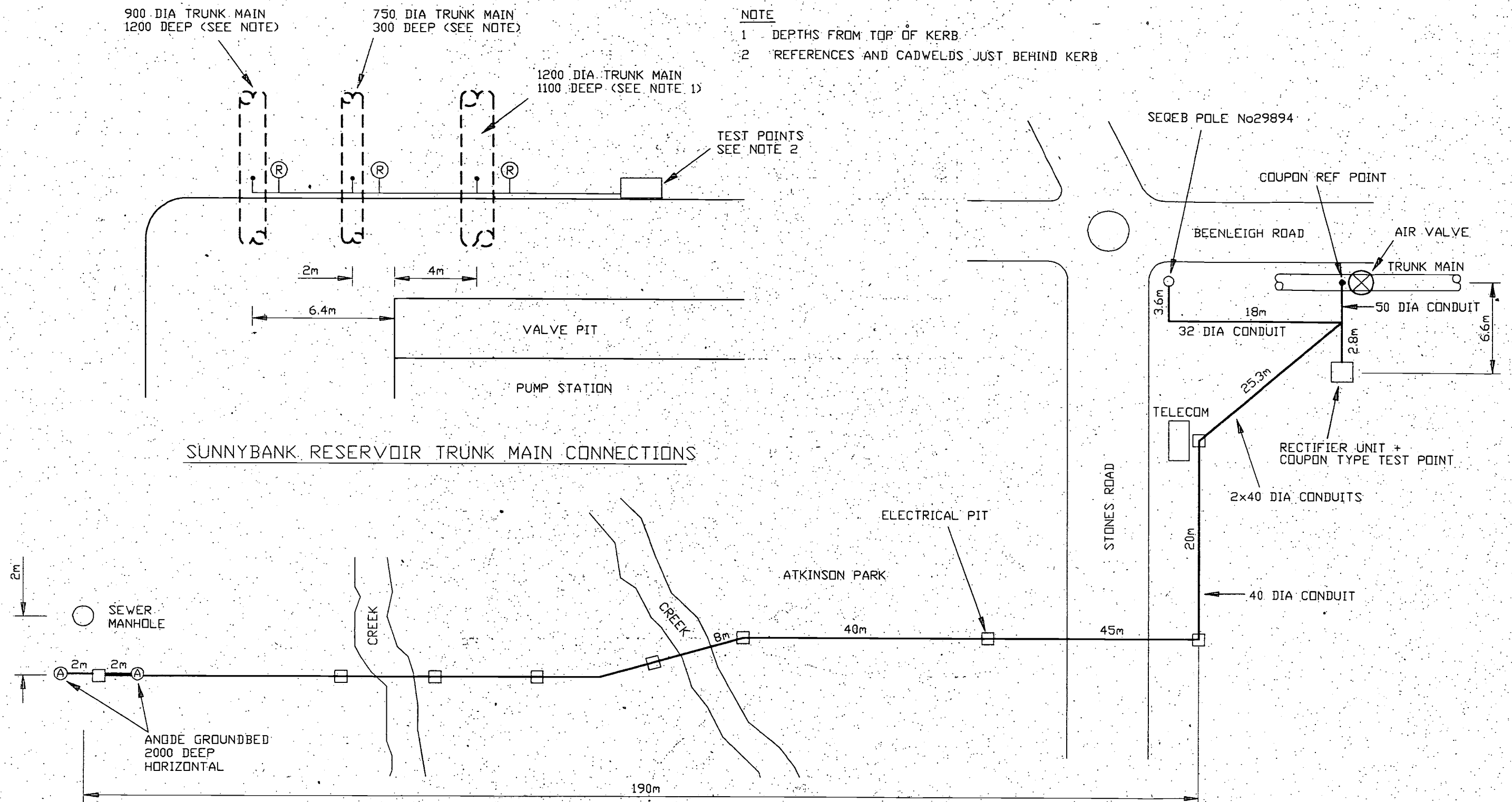
ALL DIMENSIONS ARE METRIC




CHIEF ENGINEER & MANAGER	ENGINEER FOR DESIGN	DESIGN	K.M.H. 2-3-87	ENGINEER IN CHARGE	REFERENCES	AMENDMENTS		BRISBANE CITY COUNCIL DEPT. OF WATER SUPPLY & SEWERAGE	M C F E D C B A	
	CONSTRUCTION ENGINEER	DRAWN	M.E. 11-3-87	ASST. ENG. <i>M.E.</i>		NO. DATE	INITIALS			
		TRACED		LEVEL BOOK		A 1293	TEST PTS/LOCATIONS ADDED			R.L.
	M & E ENG. MAINT. ENG. S. W.S.	CHECKED	J.S. 17-2-83	FIELD BOOK						
			A.M. DATUM	SURVEYED						
CATHODIC PROTECTION MILD STEEL TRUNK MAINS - GAY STREET TO PINELANDS ROAD										
SCALE 1:3000 approx									NO. OF SHEETS	ONLY 202-7726







0	2.12.93	AS BUILT	R.L.	MANAGER		DIRECTOR OF PLANNING & DESIGN		DESIGN	J. STEELE	2.12.93	PROJECT	STONES RD. C.P. SYSTEM GAY ST/PINELANDS RD T.W.M.	 BRISBANE CITY COUNCIL DEPARTMENT OF WATER SUPPLY AND SEWERAGE MECHANICAL & ELECTRICAL SERVICES					
				DATE:		DATE:		DRAWN	R. EISTON	2.12.93								
No.	DATE	AMENDMENT	BY	DATE:	DATE:	DATE:	DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	CHECKED	A	23/3/94	TITLE	1220mm/900mm DIA M.S.C.L. WATER TRUNK MAIN C.P. DETAILS	SCALE: NTS	No. 1 OF 1 SHEETS	DRAWING No. 486/6/6-RC1C0007E	AMEND: 0
							SUPERVISING ENGINEER			CADD FILE No. A66C007E								

