

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

OPERATING MANUAL FOR:

ADAM STREET TWIN 450 DIA RISING SEWER MAIN
CATHODIC PROTECTION SYSTEM

CLIENT:

DEPARTMENT OF WATER SUPPLY AND SEWERAGE
SEWERAGE OPERATIONS BRANCH

30 JUNE 1994

MANUAL CONTENTS

- 1.0 Introduction
- 2.0 Corrosion and Cathodic Protection
- 3.0 Mains 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

- JEO2/104 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) MAINS DETAILS

Size: Twin 450 Dia mild steel cement lined sewer rising mains.

Coating: Fibreglass enamel wrapped.

Length: Approx 2.3km

Location: From Adam street pump station, Wynnum to Wynnum WWTP, Lytton

Construction

Drawings: 3030/5058 to 3030/5070

486/6/6-XQIC013E

Crown St CP System

(4.0) CATHODIC PROTECTION DETAILS

4.1 Type of Cathodic Protection: Impressed Current

4.2 Rectifier: Standard 32 Volt, 20 Amp direct current output enclosed in a stainless steel switchboard. Rectifier has a 240VAC supply from Property Pole No 2030. Rectifier is located near the entrance of Elanora Park, corner of Crown and Granada Sts, Wynnum.

4.3 Cathode: The cathode point is located approx 55M from the Rectifier Unit, in Granada St, Wynnum. The cathode point is where the cabling from the rectifier is attached to the structure under cathodic protection.

4.4 Anodes: Two silicon iron anodes were installed approximately 210 metres from the trunk mains in a vertical bed 5 metres deep. The anodes were first backfilled with a cokebreeze surround to improve anode ground resistance. The anode location is identified by a marker pit and label.

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 6 testpoints have been installed. For further details see CP details layout drg. 486/6/6-XQIC0013E

4.6 Associated Drawings:

486/6/25-AA1C0021E	Std Rectifier Wiring Diagram
486/1/22-C0023E	Silicone Iron Anode details.
486/6/25-AA1C0026E	Installation details conduit and rectifier.
486/6/25-AA1C0024E	Vertical groundbed details.
No number	Maintenance Details.
486/6/6-XQIC0013E	Crown St C.P. System Twin 18 Inch Rising Main.

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 this section of the trunk mains.

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 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.

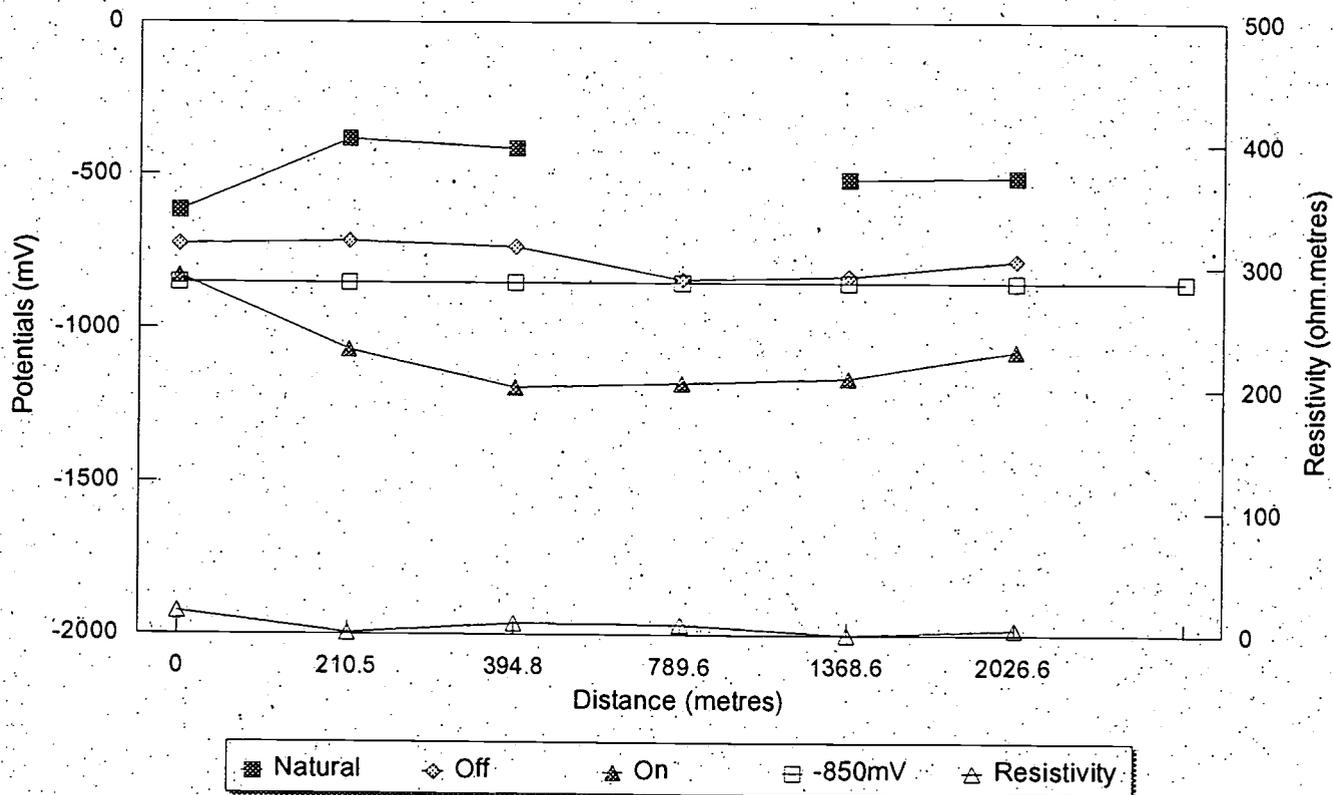
Brisbane City Council
Dept. W.S. & S.
Metropolitan Division
Eagle Farm Pumping Station
Date: 30th June 1994
Electrical Workshop

System: Adam St Twin Rising Sewer Main

Cathodic Protection System reference potential and earth resistivity graph.

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	-618	-726	-830	18.22
2	210.5	-383	-717	-1070	0.754
3	394.8	-413	-735	-1194	8.67
4	789.6		-840	-1179	7.84
5	1368.6	-514	-830	-1161	0.125
6	2026.6	-509	-780	-1073	3.89
7					
8					
9					
10					
11					
12					
13					
14					

Graph of potentials and resistivity vs pipelength



Rectifier located at 1300M.

Brisbane City Council
Dept. W.S. & S.
Metropolitan Division
Eagle Farm Pump Station

Cathodic Protection System Loop Resistance

Date: 29th June 1994

Cathodic Protection System:

Adam Street Rising Sewer Mains

System Operating Volts: 5.5

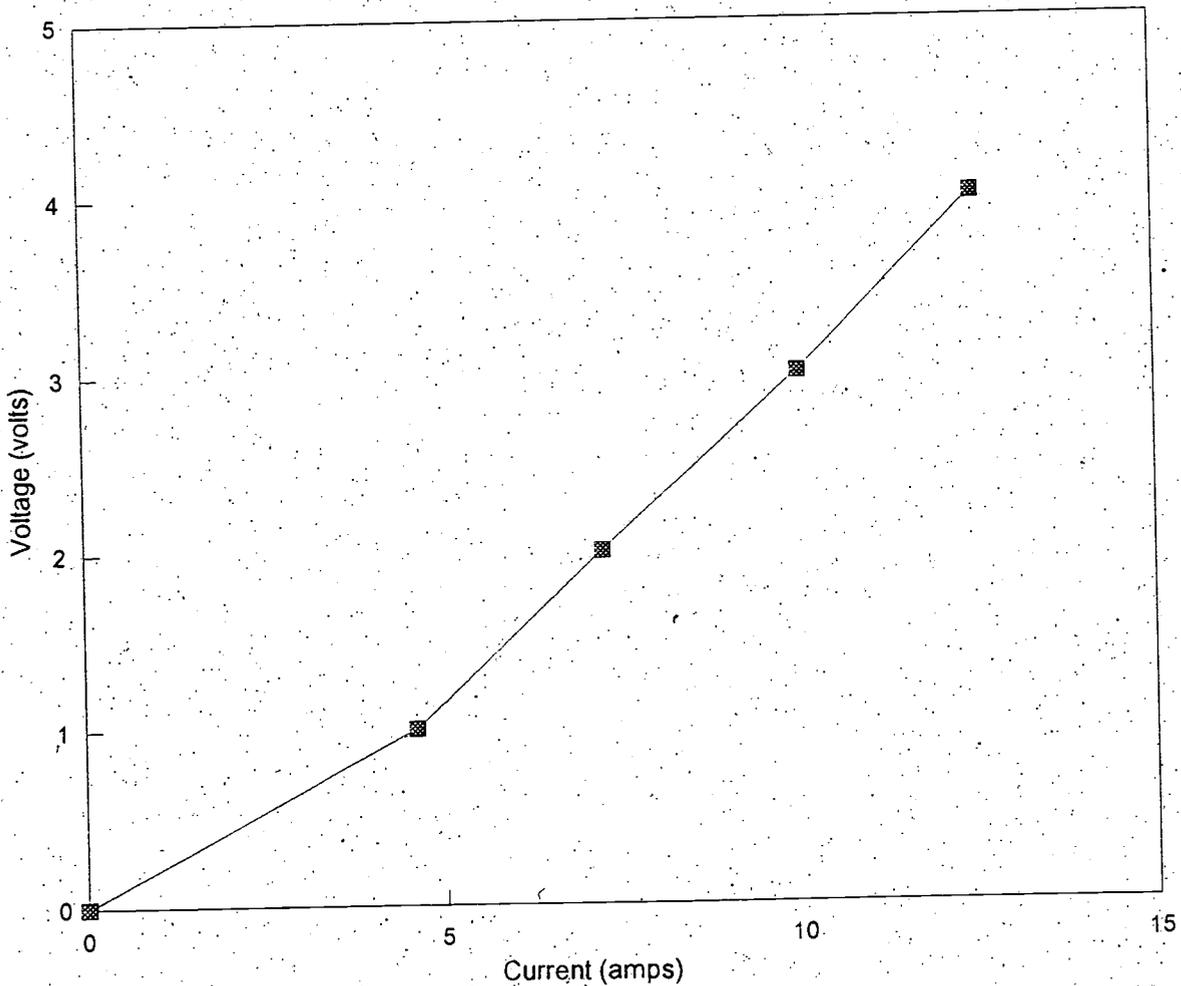
System Operating amps

16.6

Test Voltage:		Test Current:	
(volts)		(amps)	
0		0	
1		4.6	
2		7.25	
3		10	
4		12.5	

Loop Resistance (ohms)
0.380952

Graph of System voltage vs current.



MEMORANDUM

To	File No.
From	Date 29/6/94
Subject Adam St. Potentials	
1 of 2	

Pump Stn.

CuSO₄ - Pipe 1 - 830 mv ON - 726 mv off
 Pipe 2 - 830 mv ON - 726 mv off

Old Test Point Single

CuSO₄ - Pipe - 1105 mv ON - 885 mv off

TP 2

CuSO₄ - Pipe 1 - 1091 mv ON - 720 mv off

Zn 1 - 924 mv ON - 906 mv off

Zn 1 - Pipe 1 - 155 mv ON - 194 mv off

CuSO₄ - Pipe 2 - 1050 mv ON - 713 mv off

Zn 2 - 925 mv ON - 922 mv off

Zn 2 - Pipe 2 - 120 mv ON - 207 mv off

Rectifier - 1200 mv ON - 760 mv off. Start Test

CuSO₄ Pipe - 1194 mv ON - 735 mv off. End Test

" Zn - 1198 mv ON - 736 mv off " "

Zn. Pipe - 0.3 mv ON + 0.3 mv off " "

TP 4

CuSO₄ - Pipe 1 - 1168 mv ON - 845 mv off

" Zn 1 - 1042 mv ON - 1036 mv off

Zn 1 - Pipe 1 - 125 mv ON - 199 mv off

CuSO₄ - Pipe 2 - 1190 mv ON - 835 mv off

" - Zn 2 - 1042 mv ON - 1036 mv off

Zn 2 - Pipe 2 - 103 mv ON - 179 mv off

MEMORANDUM

To	File No.
From	Date 29/6/94
Subject Adam St Potentials	
2 of 2	

TP 5

CuSO₄ - Pipe 1 - 1165 mv on - 830 mv off

" - Zn 1 - 882 mv on - 899 mv off

Zn 1 - Pipe 1 - 300 mv on + 52 mv off

CuSO₄ - Pipe 2 - 1157 mv on - 830 mv off

- Zn 2 - 996 mv on - 1001 mv off

Zn 2 - Pipe 2 - 169 mv on + 147 mv off

TP 6 Wynnum Treatment Plant.

CuSO₄ - Pipe Left - 1075 mv on - 764 mv off

" Pipe Right - 1071 mv on - 795 mv off

Jim.
INTERFERENCE RESULTS

DATE: 25-5-94

UNIT READING: 16 Amp.

TYPE OF BLEED	CURRENT IN BLEED	TEST POINT NUMBER	BOND OFF			BLEED ON			RESULTANT SWING
			BLEED OFF	BLEED ON	SWING	BOND OFF	BOND ON	SWING	
Zn	6.5 ma	CPB26	-616mv	-706mv	-90mv	-706mv	-698mv	+8mv	-82mv
Zn x2	9.4 ma	CPB38	-278	-368	-90mv	-368mv	-294	+74mv	-16mv

COMPILED BY: A.J. TAYLOR

DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL BRANCH
METROPOLITAN DIVISION
EAGLE FARM PUMPING STATION

ELECTRICAL WORKSHOP

INSULATED JOINT TESTING DETAILS:

DATE 30-5-94

DESCRIPTION Adam St.

MAINS DETAILS: 18"

LOCATIONS: Inside Pump Str on Header.

SIZE:

MATERIAL:

COATING:

NUMBER:

IN GROUND TESTING

BOLT TO FLANGE RESISTANCE:

NUMBER OF BOLT:

FLANGE TO FLANGE RESISTANCE:

INSULATION CHECKER MODEL 702:

POTENTIAL DIFFERENCE TO REFERENCE CELL:

PROTECTED SIDE:

UNPROTECTED SIDE:

ABOVE TESTING

BOLT TO FLANGE RESISTANCE: > 5 meg ohm

NUMBER OF BOLTS: 12

FLANGE TO FLANGE RESISTANCE: > 1 ohm

COMMENTS

Flange To Flange Potential 28 mV

TESTED BY J. TAYLOR

INTERFERENCE RESULTS

DATE: 25-5-94

UNIT READING:

TYPE OF BLEED	CURRENT IN BLEED	TEST POINT NUMBER	BOND OFF			BOND ON			RESULTANT SWING
			BLEED OFF	BLEED ON	SWING	BOND OFF	BOND ON	SWING	
Zn	6.5 ma	CPB26	-616mv	-706mv	-90mv	-706mv	-698mv	+8mv	-82mv
Zn x2	9.4 ma	CPB38	-278	-368	-90mv	-368mv	-294	+74mv	-16mv

COMPILED BY.....

BRISBANE CITY COUNCIL

MEMORANDUM

To	File No.
From	Date 16.1.5194
Subject Adam St	

Adam St Pump Sta Isolation Joint 12 Bolts $\frac{1}{8}$ " whit
1" hole upto $\frac{1}{2}$ " out of alignment Filled ~~by~~ standard insulators used
all bolts $> 200 m\Omega$ 1 bolt 5% cl $> 2 m\Omega$ $V\Delta$ 4.87 mV.

Pipe 1. closest to Sta Rect Set 16.5 Amps.

Pipe 1 Nat. -614 mV -800 mV ON -634 mV OFF

Pipe 2 Nat. -614 mV. -795 mV ON -635 mV OFF

CP Bleed. 26 Behind Rect.

-688 mV Nat. -597 ~~616~~ mV ON -616 mV OFF No bleed

-693 mV Nat + Bleed. 698 mV ON 706 mV OFF 6.5 MA bleed ON.

TP2

CuSO₄ - Pipe N1 1168 mV ON 623 mV OFF

Zn 1123 mV ON 1098 mV OFF

Zn - Pipe -48 mV ON +475 mV OFF

Pipe N2 1130 mV ON 626 mV OFF

Zn 1114 mV ON 1108 mV OFF

Zn - Pipe -22 mV ON +480 mV OFF

TP4

CuSO₄ - Pipe 1 -1185 mV ON +723 mV OFF

Zn 1 -1196 +1189

Zn Pipe 1 +3.2 mV +478

CuSO₄ Pipe 2 -1211 725

-1239 -1136

+~~421~~+20 +431

Ferrule ST Cooparoo 10.15

TP3 Aect

61	Red	-1325 mv on	-713 mv off	Protected Zn Coupon
59	Green	-1334 mv on	-1176 mv off	Zn Coupon
55	Blue	-1327 mv on	-686 mv off	Coupon Rtn-cath
53	Black	-1321 mv on	-690 mv off	Cathode ret.
00	white	-881 mv on	-743 mv off	unprotected coupon

TP5 Wagonum Nth Rd.

CuSO ₄ Pipe 1	-	-1194 mv on	-744 mv off
Zn 1	-	-1110 mv on	-1144 mv off
Zn 1 Pipe	-	-63 mv on	+394 mv off
CuSO ₄ Pipe 2	-	-1186 mv on	-763 mv off
Zn 2	-	-1132 mv on	-1145 mv off
Zn Pipe 2	-	-53 mv on	+381 mv off

TP6 WWTP.

CuSO ₄ Pipe 1	-	-1070 mv on	-726 mv off
CuSO ₄ Pipe 2	-	-1073 mv on	-739 mv off
Pump Sta Transformer earth	-	-379 mv on	-460 mv off. ΔV +91 mv

16530

BRISBANE CITY COUNCIL
MEMORANDUM

To	File No.
From	Date 17/5/94
Subject Adam St Potentials after isolation at Pump stn 1 of	

Complete insulating bolts Flange header inside Pump stn.

10 bolts > 200 m Ω

1 bolt > 5 m Ω

1 bolt > 2 m Ω

12 Bolts total 7/8" whit

	Original Natural	Now Natural	Rectifier ON	Instant Off
Pipe 1.	-548 mv	-618 mv	-800 mv	-634 mv
Pipe 2	-548 mv	-614 mv	-795 mv	-635 mv

Rectifier Set to 16 Amps. TP3

CuSO ₄ - Protected Coupon	-1325 mv ON	-713 mv off	-612
CuSO ₄ - Zn Coupon	-1334 mv ON	-1176 mv off	-158
CuSO ₄ - Coupon Return	-1327 mv ON	-686 mv off	-641
CuSO ₄ - Cathode Return	-1321 mv ON	-690 mv off	-631
CuSO ₄ - Unprotected Coupon	-881 mv ON	-743 mv off	-138

BRISBANE CITY COUNCIL
MEMORANDUM

To	File No.
From	Date 16/5/94
Subject Adam St Potentials after Isolation at Pump Stn. 2 of	

TP2

CuSO₄ - Pipe 1 - 1168 mv on - 623 mv off ΔV - 545 mv
 " Zn - 1123 mv on - 1098 mv off ΔV - 25 mv
 Zn - Pipe 1 - 48 mv on + 475 mv off ΔV - 523 mv
 CuSO₄ - Pipe 2 - 1130 mv on - 626 mv off ΔV - 504 mv
 " Zn - 1114 mv on - 1108 mv off ΔV - 6 mv
 Zn Pipe 2 - 22 mv on + 480 mv off ΔV - 502 mv

TP4

CuSO₄ - Pipe 1 - 1195 mv on - 723 mv off ΔV - 472 mv
 " Zn - 1196 mv on - 1189 mv off ΔV - 7 mv
 Zn Pipe 1 + 3.2 mv on + 478 mv off ΔV - 481.2 mv
 CuSO₄ - Pipe 2 - 1211 mv on - 725 mv off ΔV - 486 mv
 " Zn - 1239 mv on - 1136 mv off ΔV - 3 mv
 Zn Pipe 2 + 20 mv on + 431 mv off ΔV - 451 mv

TP5

CuSO₄ - Pipe 1 - 1194 mv on - 744 mv off ΔV - 450 mv
 " Zn - 1110 mv on - 1144 mv off ΔV + 34 mv
 Zn Pipe 1 - 63 mv on + 394 mv off ΔV - 457 mv
 CuSO₄ - Pipe 2 - 1186 mv on - 763 mv off ΔV - 423 mv
 " Zn - 1132 mv on - 1145 mv off ΔV + 7 mv
 Zn Pipe 2 - 53 mv on + 381 mv off ΔV + 434 mv

TP6

CuSO₄ - Pipe 1 - 1070 mv on - 726 mv off ΔV - 374 mv
 " 2 - 1073 mv on - 739 mv off ΔV - 334 mv

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION

INTERFERENCE SURVEY RESULTS

JOB DESCRIPTION - Adam St.
4.5.94

UNIT READING - **16 Amps**

	READING	TEST POINT I.D.	LOCATION	SWING
ON OFF	-173 mV -120 mV	Earth Stake	Rectifier	-53mV
ON OFF	-571 mV -606 mV	Fence	behind Rectifier	+35mV
ON OFF	+64 mV +62 mV	Tap	behind Rectifier	+2mV
ON OFF	-691 mV -689 mV	Play Pen	Rugby Union Park	-2mV
ON OFF	-436 mV -431 mV	Swing	" " "	-5mV
ON OFF	-462 mV -431 mV	H Ladder	" " "	-31mV
ON OFF	-663 mV -660 mV	V Ladder	" " "	-3mV
ON OFF	-385 mV -370 mV	Flood Light Pole NE	" " "	-15mV
ON OFF	-310 mV -290 mV	Flood Light Pole NW	" " "	-20mV
ON OFF	-343 mV -342 mV	Flood Light Pole SW	" " "	-1mV
ON OFF	-402 mV -390 mV	Flood Light Pole SE	" " "	-12mV
ON OFF	-478 mV -398 mV	Earth stake Hut	" " "	-80mV

COMPILED BY: **J. TAYLOR**

BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION

INTERFERENCE SURVEY RESULTS

JOB DESCRIPTION - Adam St.

4. 5. 94

UNIT READING: - 1.6 Amps

	READING	TEST POINT I.D.	LOCATION	SWING
ON	-468 mv	Gas Pipe	Rugby Union Park	-98mv
OFF	-370 mv	Hut		
ON	-434 mv	Air Break SW	Warra St.	-15mv
OFF	-419 mv	Pole 9508		
ON	-236 mv	Tap	House 1 WARRA ST	-4mv
OFF	-232 mv			
ON	-452 mv	MEN.	" " " "	+8mv
OFF	-460 mv	Earth Stake		
ON	-250 mv	Pole Transformer	Granada St	-50mv
OFF	-200 mv	33994		
ON	-18 mv	Pole	Park Behind Rectifier	+1.5mv
OFF	-19.5 mv	2030		
ON	-17.5 mv	Water Service	" " " "	+0.3mv
OFF	-17.8 mv			
ON	-347 mv	Soft Ball ◊	" " " "	+0
OFF	-347 mv	Fence		
ON	-332 mv	Soft Ball ◊	" " " "	-2mv
OFF	-330 mv	Tap		
ON	-419 mv	Base Ball ◊	" " " "	+2mv
OFF	-421 mv	Fence		
ON	-8.7 mv	Tap	" " " "	-0.2mv
OFF	-8.5 mv	club house		
ON	-585 mv	Tap	" " " "	-3mv
OFF	-582 mv	Toilet block		

COMPILED BY: J. TAYLOR

**BRISBANE CITY COUNCIL
DEPARTMENT OF WATER SUPPLY AND SEWERAGE
MECHANICAL AND ELECTRICAL SECTION**

INTERFERENCE SURVEY RESULTS

**JOB DESCRIPTION:- Adam St
4.5.94.**

UNIT READING:- 1.6 Amps...

	READING	TEST POINT I.D.	LOCATION	SWING
ON OFF	+660 +690	Metal shed	Park Behind Rectifier	-30mv
ON OFF	-457 -391	Gas Pipe	House next Rectifier	-66mv
ON OFF	-459 -435	Tap + MEN	" " "	-24mv
ON OFF	-379 -460	Earth Mains Transformer	Adam St. Pump Stn	+101mv
ON OFF				

COMPILED BY: **J. TAYLOR**

To	File No.
From	Date 29/03/94
Subject ADAM STREET RISING MAIN ON POTENTIALS (NON POLARIZED)	

RECTIFIER SET AT	5.5V	15.25A
	SW/B AS IS	COUPON WIRING CHANGE
Zn TO PIPE	+29 mV	+86 mV
Zn TO PRO COUPON	+377 mV	-404 mV
Zn TO UNPRO COUPON	+394 mV	+400 mV
CuSO ₄ TO PIPE	-1049 mV	-997 mV
CuSO ₄ TO PRO COUPON	-709 mV	-1482 mV
CuSO ₄ TO UNPRO COUPON	-683 mV	-687 mV
Zn TO CuSO ₄	-1078 mV	-1087 mV

NOTE: - rectifiers wiring returned to original state.

ADAM ST. PUMPING STATION (SYSTEM ON FOR 24 HRS)

VALVE PIT (NEAR TRANSFORMER)

PIPE N°1 -706 mV_{on} -618 mV_{off}

PIPE N°2 -723 mV_{on} -615 mV_{off}

VALVE PIT (NEAR TREES)

PIPE N°1 -818 mV_{on} -628 mV_{off}

INFORMATION FOR CURRENT TEST

DISTANCE BETWEEN T/P N°2 & RECTIFIER.

TOTAL 148.5 M

T/P N°2 TO CATH PIT 109 M.

POTENTIAL -40.2 mV

RECT SET AT 5.5V 16.2A

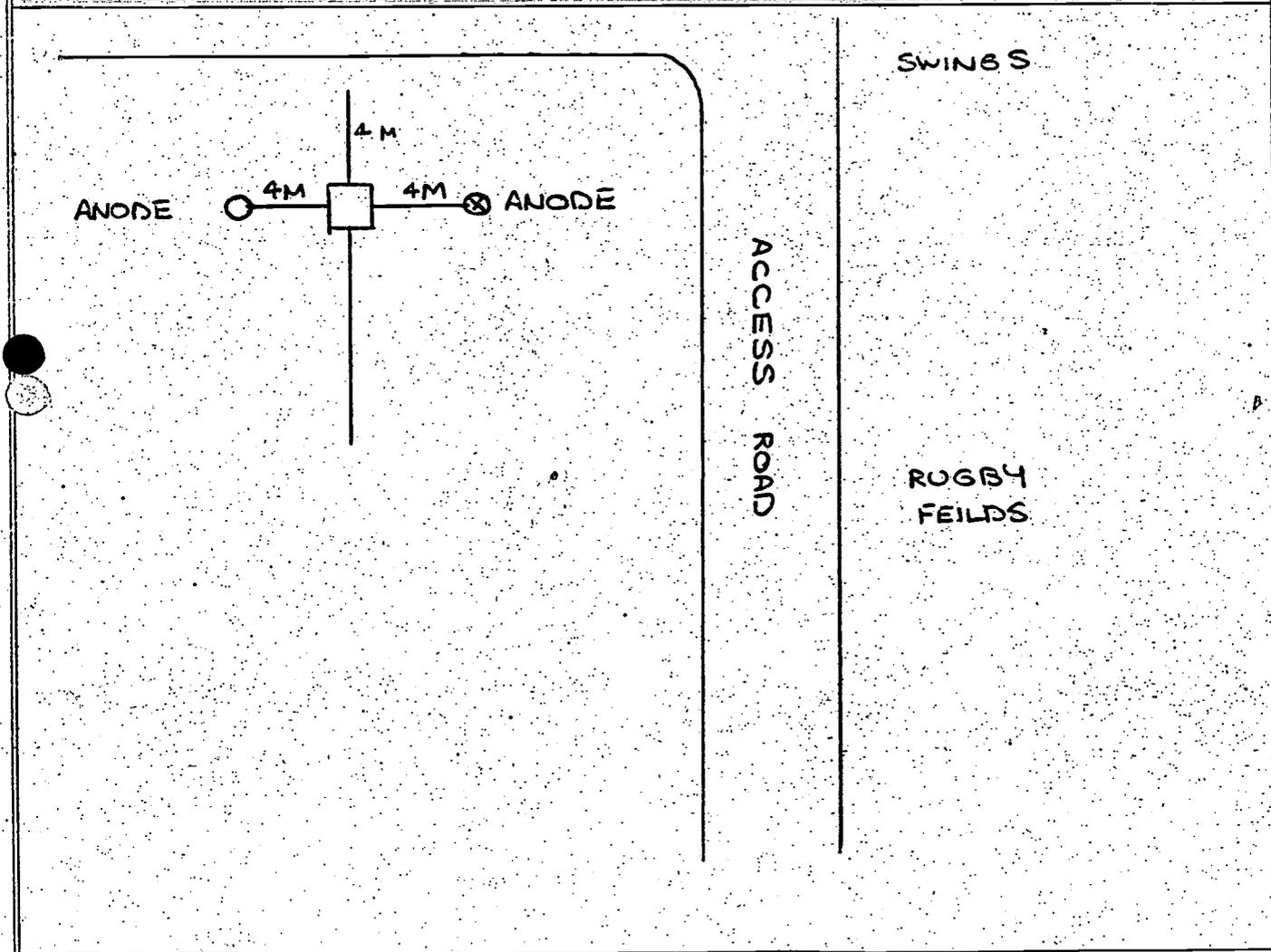
F

Brisbane City Council
 Dept. W.S.& S.
 Metropolitan Division
 Eagle Farm Pump Station

Electrical Workshop

Cathodic Protection Anode Bed Testing

Date: <u>25 MARCH 1994</u>		Structure: <u>ADAM STREET RISING MAIN</u>	
Anode material: <u>SILICON IRON</u>		Anode size/weight:	
Packaging: <u>2000MM X 300MM CANISTOR</u>		Burial: <u>VERTICAL</u>	
Depth: <u>5M</u>		Resistivity: <u>2M (4x0.01) 210R = 6.58 ΩM</u> <u>5M (8x0.01) 210R = 2.513 ΩM</u>	
Test Point type: <u>400MM X 400MM INGROUND PIT</u>		Signage: <u>O.K</u>	
Resistance to ground:			
Anode 1 <u>4 x 0.01 = 0.04 Ω</u>	Anode 2 <u>3 x 0.01 = 0.03 Ω</u>	Anode 3	Anode 4
Tested by: <u>MURRY McCORMICK Murray McCormick</u>			Anode 5
Locality Plan:			



BRISBANE CITY COUNCIL

MEMORANDUM

To	File No.
From	Date 28/03/14
Subject ADAM STREET RISING MAIN ON POTENTIALS (NON POLARIZED)	

RECTIFIER SET TO	5.5V	16.6A
POTENTIAL	CUSO ₄	-1020 mV
LOOP RESISTANCE	1V	4.6A
	2V	7.25A
	3V	10A
	4V	12.5A
ANODE CURRENT: - TOTAL	16.5A	
	Nº1	6.4A
	Nº2	7.9A
Zn TO PIPE	+75 mV _{on}	+60 mV _{off}
Zn TO PRO COUPON	+375 mV _{on}	+375 mV _{off}
Zn TO UNPRO COUPON	+393 mV _{on}	+393 mV _{off}
CUSO ₄ TO PIPE	-1025 mV _{on}	-485 mV _{off}
CUSO ₄ TO PRO COUPON	-728 mV _{on}	-723 mV _{off}
CUSO ₄ TO UNPRO COUPON	-706 mV _{on}	-705 mV _{off}
Zn TO CUSO ₄	-1100 mV _{on}	-1097 mV _{off}
TEST POINT Nº2		
Zn TO PIPE Nº1	+105 mV _{on}	+530 mV _{off}
CUSO ₄ TO PIPE Nº1	-960 mV _{on}	-519 mV _{off}
Zn TO CUSO ₄	-1061 mV _{on}	-1039 mV _{off}
Zn TO PIPE Nº2	+139 mV _{on}	+513 mV _{off}
CUSO ₄ TO PIPE Nº2	-909 mV _{on}	-518 mV _{off}
Zn TO CUSO ₄	-1048 mV _{on}	-1048 mV _{off}
OLD TEST POINT		
Zn TO PIPE	+84 mV _{on}	+345 mV _{off}
CUSO ₄ TO PIPE	-970 mV _{on}	-684 mV _{off}
Zn TO CUSO ₄	-1047 mV _{on}	-1020 mV _{off}

BRISBANE CITY COUNCIL

MEMORANDUM

To	File No.
From	Date 08/03/94
Subject ADAM STREET RISING MAIN ON POTENTIALS (NON POLARIZED)	

ADAM ST PUMPING STATION

HEADER PIPE

CuSO₄ TO PIPE -405 mV_{on} -468 mV_{off}

VALVE PIT (NEXT TO TRANSFORMER)

PIPE N^o1 -674 mV_{on} -570 mV_{off}PIPE N^o2 -690 mV_{on} -579 mV_{off}

VALVE PIT (NEXT TO TREES)

CuSO₄ TO PIPE N^o1 -765 mV_{on} -555 mV_{off}TEST POINT N^o5ZN TO PIPE N^o1 +110 mV_{on} +484 mV_{off}CuSO₄ TO PIPE N^o1 -977 mV_{on} -633 mV_{off}ZN TO CuSO₄ -1086 mV_{on} -1103 mV_{off}ZN TO PIPE N^o2 +163 mV_{on} +495 mV_{off}CuSO₄ TO PIPE N^o2 -953 mV_{on} -633 mV_{off}ZN TO CuSO₄ -1117 mV_{on} -1121 mV_{off}TEST POINT N^o6 (WYNNUM W.W.T.P.)CuSO₄ TO PIPE N^o1 -871 mV_{on} -621 mV_{off}CuSO₄ TO PIPE N^o2 -904 mV_{on} -618 mV_{off}

MEMORANDUM

To	File No.
From	Date 25/03/94
Subject ADAM STREET RISING MAIN NATURAL POTENTIALS	

RECTIFIER

CATH TO CATH RET	0.1Ω
ZN TO PIPE	+ 703 mV
ZN TO PRO COUPON	+ 376 mV
ZN TO UNPRO COUPON	+ 393 mV
CUSO ₄ TO PIPE	- 413 mV
CUSO ₄ TO PRO COUPON	- 740 mV
CUSO ₄ TO UNPRO COUPON	- 724 mV
ZN TO CUSO ₄	- 1118 mV

TEST POINT N^o 2

ZN TO PIPE N ^o 1	+ 626 mV
CUSO ₄ TO PIPE N ^o 1	- 384 mV
ZN TO CUSO ₄	- 1012 mV
ZN TO PIPE N ^o 2	+ 624 mV
CUSO ₄ TO PIPE N ^o 2	- 382 mV
ZN TO CUSO ₄	- 1007 mV

OLD TEST POINT

ZN TO PIPE	+ 438 mV
CUSO ₄ TO PIPE	- 576 mV
ZN TO CUSO ₄	- 1015 mV

ADAM ST PUMPING STATION - HEADER PIPE

CUSO ₄ TO PIPE	- 525 mV
---------------------------	----------

MEMORANDUM

To	File No.
From	Date 25/03/94
Subject ADAM STREET RISING MAIN NATURAL POTENTIAL	

TEST POINT N°5

Zn TO PIPE N°1	+598 mV
CuSO ₄ TO PIPE N°1	-513 mV
Zn TO PIPE	-1112 mV
Zn TO PIPE N°2	+615 mV
CuSO ₄ TO PIPE N°2	-515 mV
Zn TO CuSO ₄	-1130 mV

TEST POINT N°6

CuSO ₄ TO PIPE N°1	-509 mV
CuSO ₄ TO PIPE N°2	-509 mV

(NOTE :- both pipes are concrete encased at the inlet grit chamber.)

TEST POINT N°2

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 8-03-94
TEST POINT TYPE: B

LOCATION: CNR PROSPECT & GRANADA
MAINS SIZE: 2x 450 MM

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE): PIPE N°1	0.1Ω	PIPE N°2	0.1Ω
ZINC REFERENCE TO PIPE:	+643 mV		+640 mV
CuSO ₄ REFERENCE TO PIPE:	-464 mV		-460 mV
ZINC TO CuSO ₄ :	-1106 mV		-1102 mV

EARTH TESTING

PIN SPACING: 2M MEGGER READING: (6x0.01) RESISTIVITY: 2TΩR = 0.754 Ωm
 PIN SPACING: 5M MEGGER READING: (3x0.01) RESISTIVITY: 2TΩR = 0.942 Ωm

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)

CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: J TAYLOR

COMMENTS: TESTED BY M. McCORMICK

1 COPY TO FILE
1 COPY TO T.O.

TEST POINT N°3

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE:
TEST POINT TYPE:

LOCATION:
MAINS SIZE:

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE):
ZINC REFERENCE TO PIPE:
CuSO₄ REFERENCE TO PIPE:
ZINC TO CuSO₄:

EARTH TESTING

PIN SPACING: 2M

MEGGER READING: (69 x 0.01) RESISTIVITY: 2TAR = 8.67 Ωm

PIN SPACING: 5M

MEGGER READING: (9 x 0.01) RESISTIVITY: 2TAR = 2.827 Ωm

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)

CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

INSTALLED BY: M. McCORMICK

COMMENTS:

1 COPY TO FILE
1 COPY TO T.O.

BRISBANE CITY COUNCIL
EAGLE FARM PUMP STATION
CORROSION SECTION

STANDARD CATHODIC PROTECTION TEST POINT DATA GATHERING

DATE: 9-03-94
TEST POINT TYPE: B

LOCATION: WYNNUM NORTH RD
MAINS SIZE: 2x 450MM.

POTENTIAL TESTING

CATHODE TO CATHODE RETURN (RESISTANCE):	PIPE N°1 - 0.1 Ω	PIPE N°2 - 0.1 Ω
ZINC REFERENCE TO PIPE:	+ 600 mV	+ 617 mV
CuSO ₄ REFERENCE TO PIPE:	- 558 mV	- 559 mV
ZINC TO CuSO ₄ :	- 1159 mV	- 1177 mV

EARTH TESTING

PIN SPACING: 2M MEGGER READING: (1x0.01) RESISTIVITY: 2πaR = 0.125 Ωm

PIN SPACING: 5M MEGGER READING: (3x0.01) RESISTIVITY: 2πaR = 0.942 Ωm

SACRIFICIAL ANODE
(IF INSTALLED)

ANODE TYPE:
ANODE SIZE:
ANODE TO PIPE POTENTIAL:
ZINC REF TO PIPE:
(ANODE CONNECTED)

CuSO₄ REF TO PIPE:
(ANODE CONNECTED)

SACRIFICIAL ANODE CURRENT:

BLEED RESISTOR SIZE:
(IF INSTALLED)

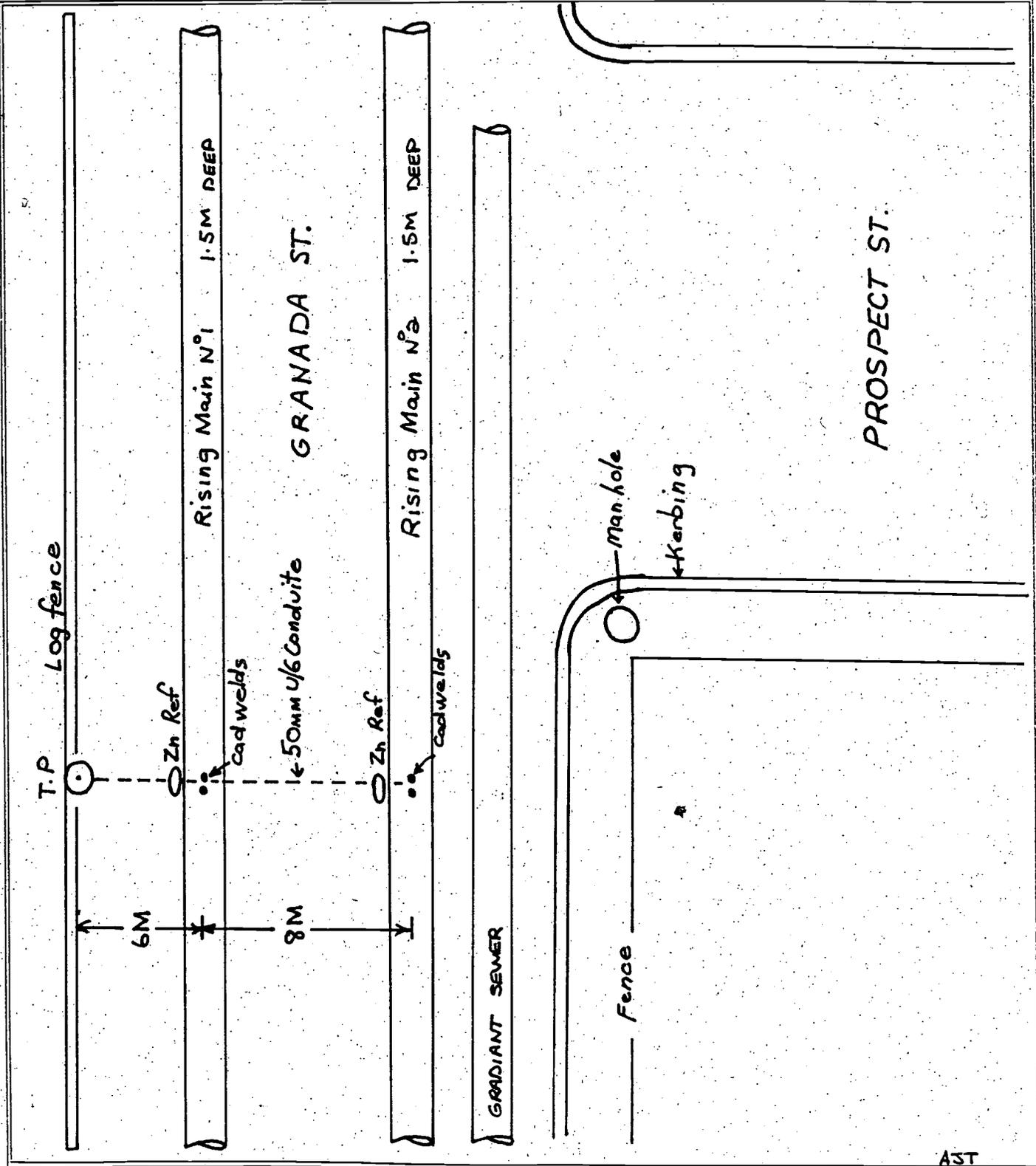
INSTALLED BY: J. TAYLOR

COMMENTS: TESTED BY M. MCORMICK

1 COPY TO FILE
1 COPY TO T.O.

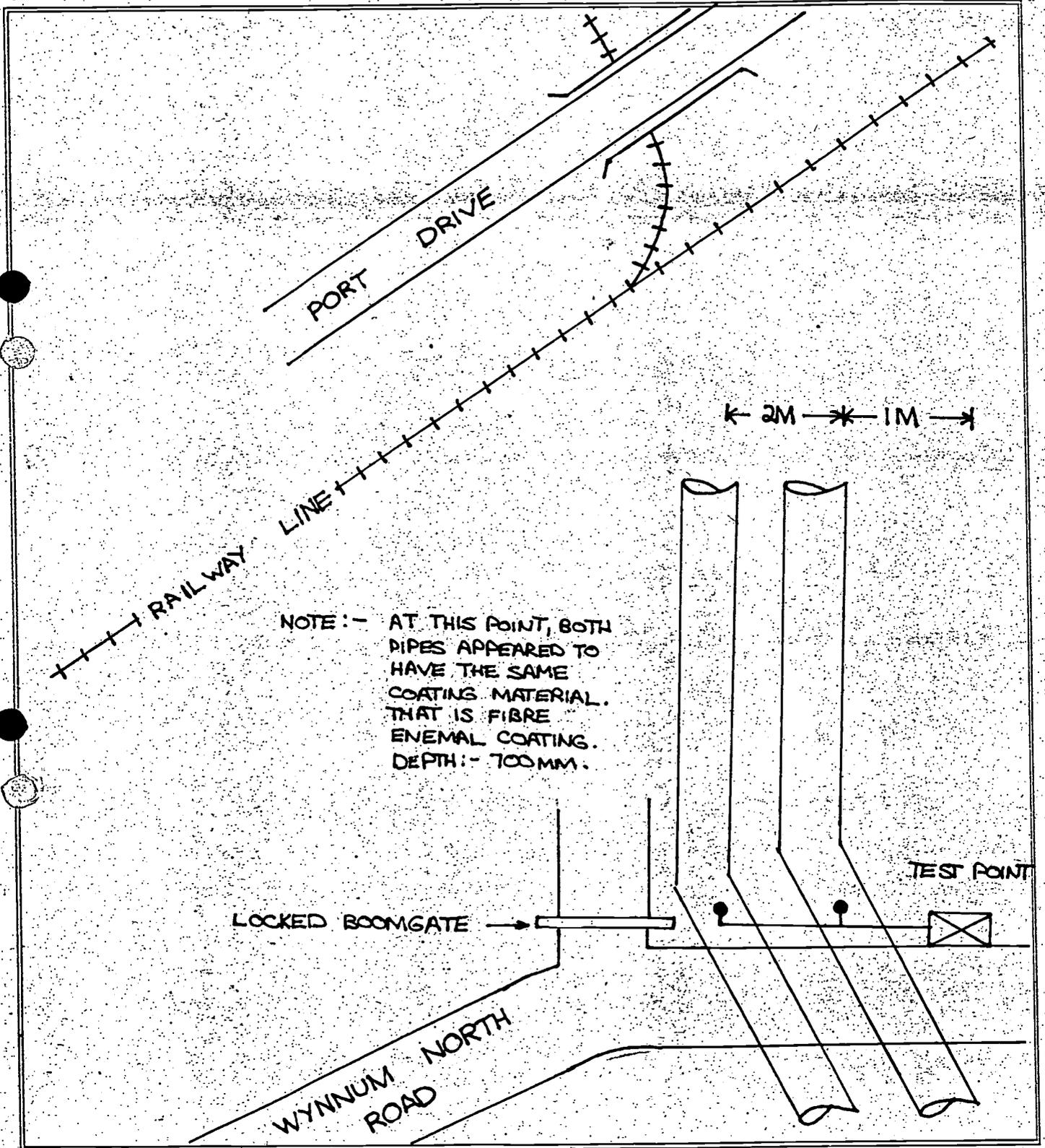
Brisbane City Council
Dept of Water Supply and Sewerage
Eagle Farm Pump Station
Electrical Workshop

Date: 24-2-94
Site Plan for: Adam St Rising Sewer Mains
T/P N°2



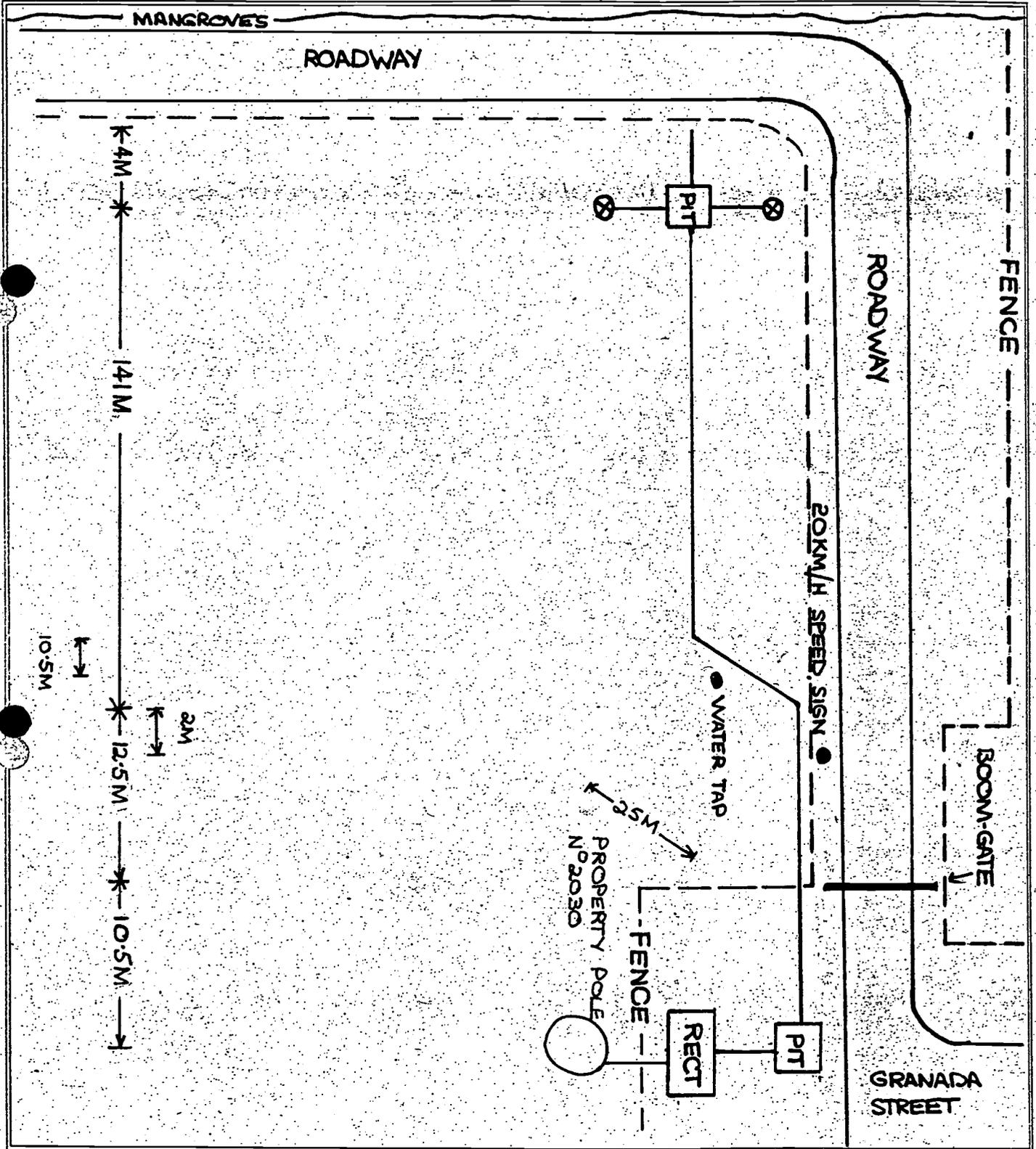
Brisbane City Council
Dept of Water Supply and Sewerage
Eagle Farm Pump Station
Electrical Workshop

Date: 25-02-94
Site Plan for: ADAM STREET RISING MAIN
TEST POINT N° 5, WYNNUM NORTH ROAD



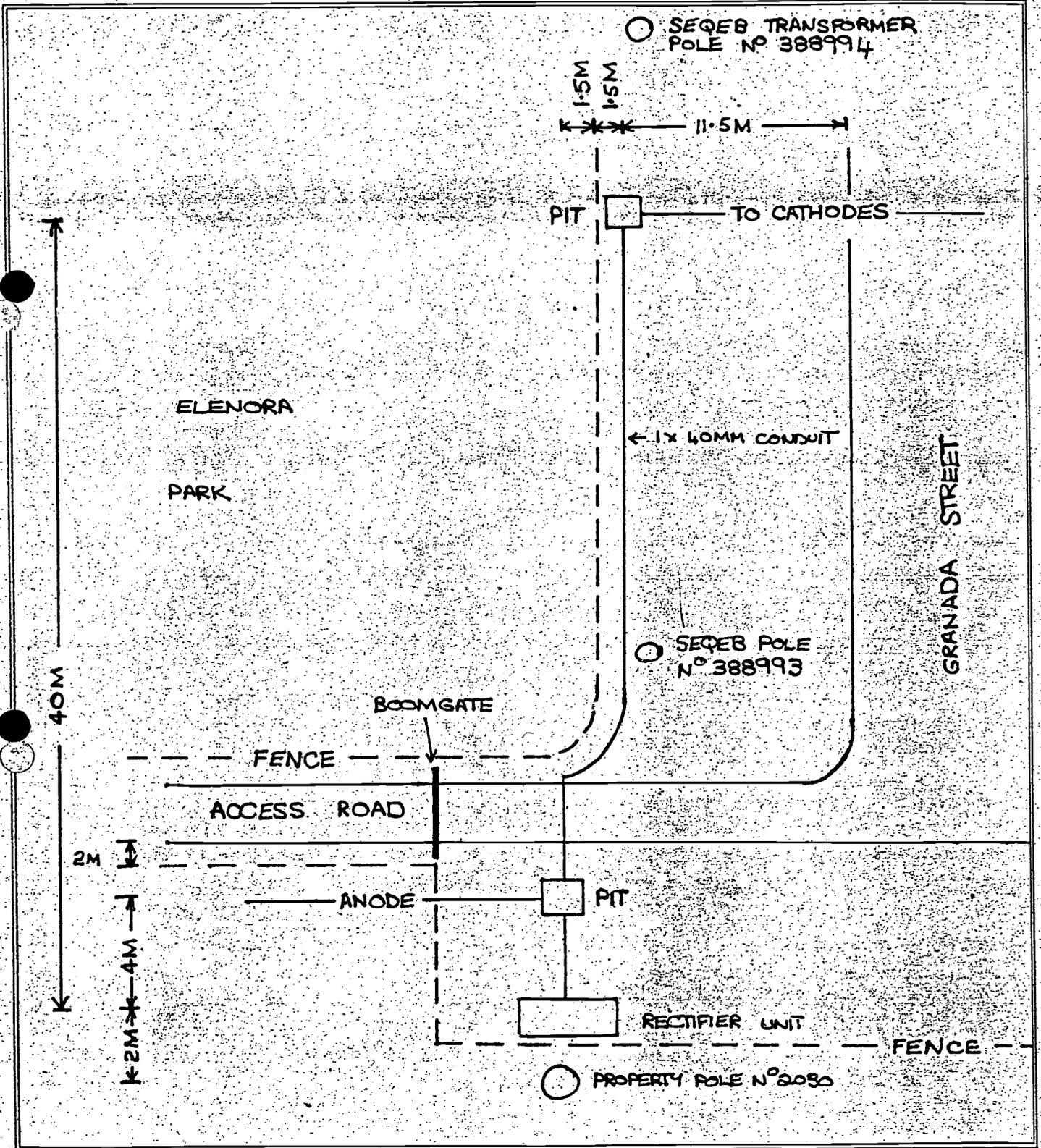
Brisbane City Council
 Dept of Water Supply and Sewerage
 Eagle Farm Pump Station
 Electrical Workshop

Date: 15-03-94
 Site Plan for: ADAM STREET RISING MAINS



Brisbane City Council
 Dept of Water Supply and Sewerage
 Eagle Farm Pump Station
 Electrical Workshop

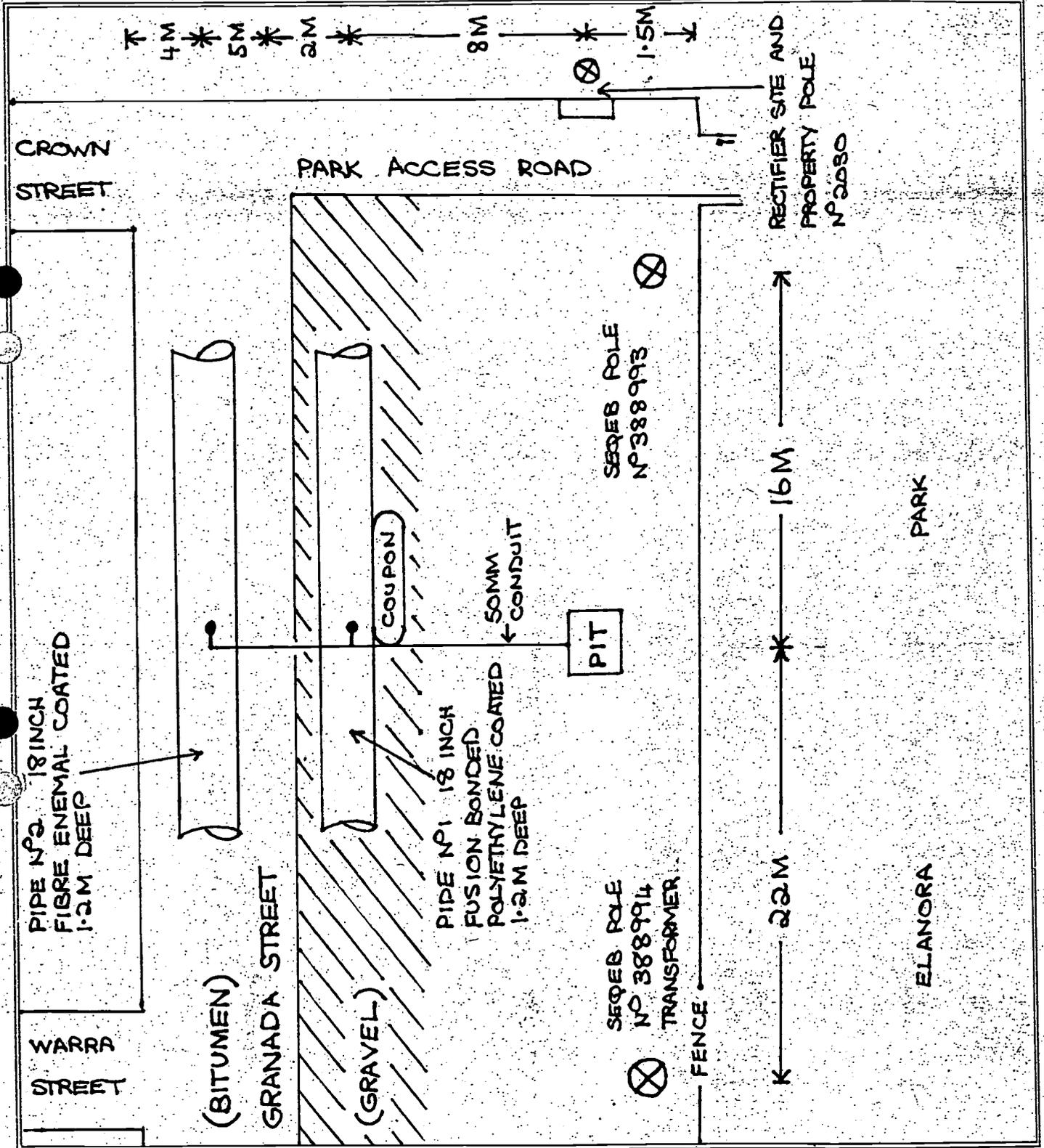
Date: 16-03-94
 Site Plan for: ADAM STREET RISING MAIN



Brisbane City Council
 Dept of Water Supply and Sewerage
 Eagle Farm Pump Station
 Electrical Workshop

Date: 23-02-94

Site Plan for: ADAM STREET RISING MAINS: - CATHODE POINTS

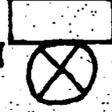


Brisbane City Council
Dept of Water Supply and Sewerage
Eagle Farm Pump Station
Electrical Workshop

Date: 22-02-94
Site Plan for: ADAM STREET RISING MAIN
RECTIFIER PLYMTH

PLAN

SWITCH BOARD
1x 32A SUB MAIN
METER N° 524057



PROPERTY POLE
N° 8030

FENCE

↑
445 MM
↓

END ELEVATION

40 32 40 32 25

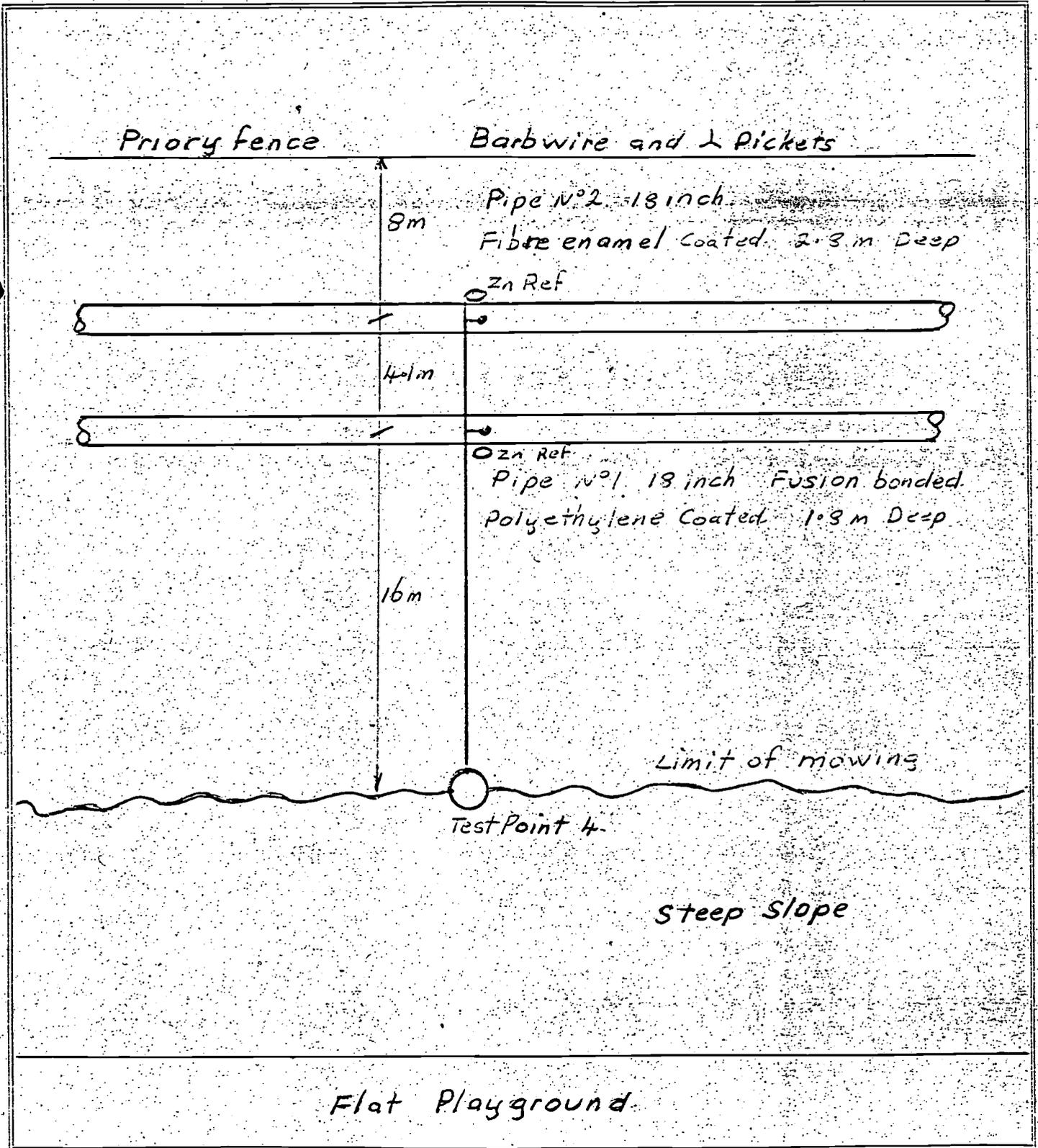
SOIL

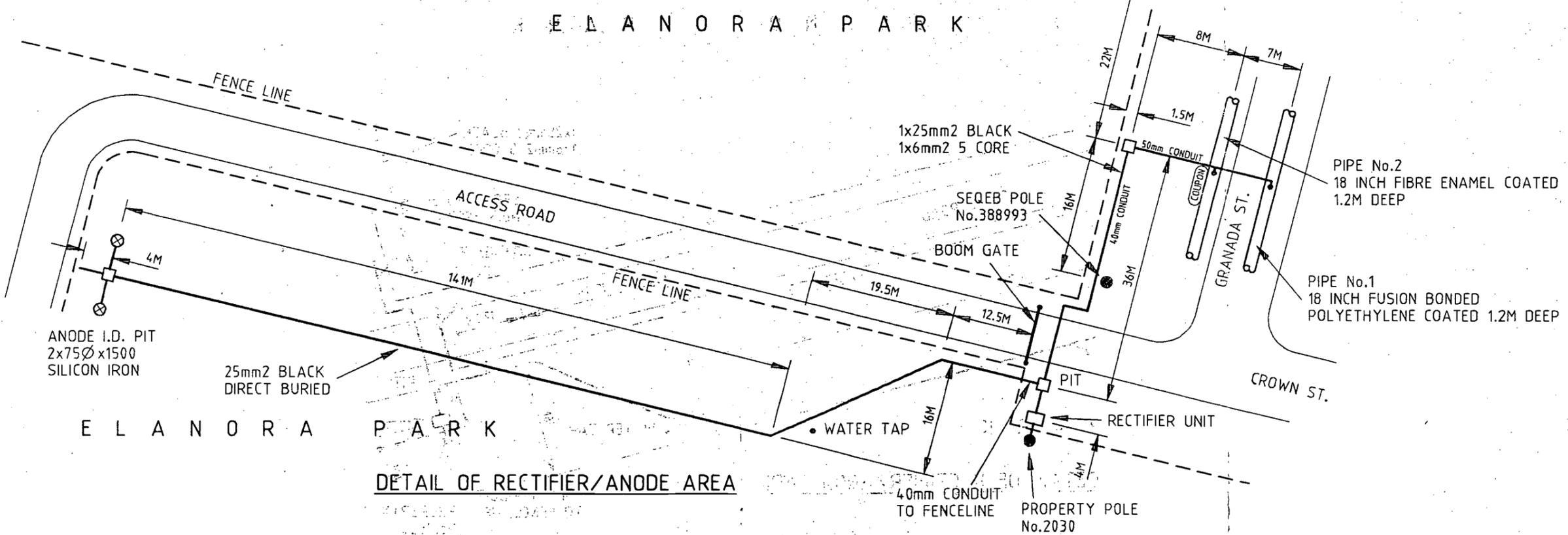
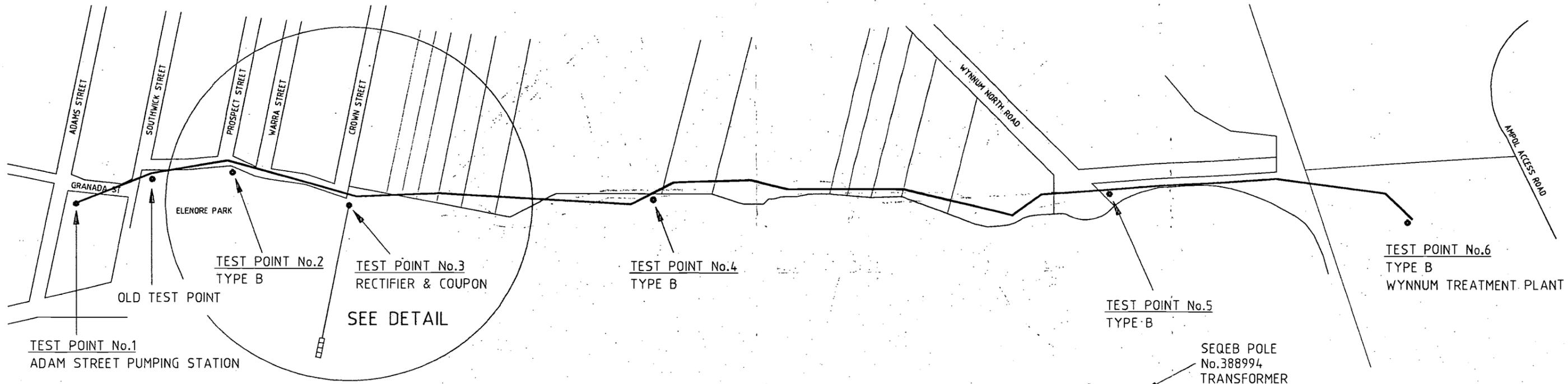
↑
210 MM
↓

← 605 MM →

Brisbane City Council
Dept of Water Supply and Sewerage
Eagle Farm Pump Station
Electrical Workshop

Date: 21-4-94
Site Plan for: Adam St Test Point N°4





DETAIL OF RECTIFIER/ANODE AREA

MANAGER	DIRECTOR OF PLANNING & DESIGN		DESIGN	J. STEELE	7.4.94	PROJECT ADAM ST PUMPING STATION RISING MAIN	 BRISBANE CITY COUNCIL DEPARTMENT OF WATER SUPPLY AND SEWERAGE MECHANICAL & ELECTRICAL SERVICES
	DATE:	DATE:	DRAWN	R. LISTON	7.4.94		
DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	CHECKED	<i>AL</i>	18.4.94	TITLE CROWN ST C.P. SYSTEM TWIN 18 INCH RISING MAIN ADAM ST P/S-WYNNUM T/P	DRAWING No.
DATE:	DATE:	DATE:	ENGINEER IN CHARGE	<i>M. G. ...</i>		CADD FILE No. A66C013E	486/6/6-XQ1C0013E
AMENDMENT	BY	DATE:	SUPERVISING ENGINEER				AMEND. 0