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**8 th August 2006**

**OPERATING MANUAL FOR:**

**PROGRESS ROAD SUBMERSIBLE PUMP  
STATION  
SP 302**

**CLIENT:**

**BRISBANE WATER  
NETWORK SERVICES**

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## DRAWINGS

486/5/25- S101	Standard Sewerage Pump Station Cathodic Protection Unit
(No Number)	Bi Monthly Maintenance Program

## 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.

## 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.

## **PUMP DETAILS**

**Size:** 2 X 115.0 Kw submersible pumps.

**Coating:** Enamel coated.

**Length:** NA

**Location:** Progress Road Wacol  
UBD 217 H5

**Construction  
Drawings:**

486/5/25- S101                      Standard Sewerage Pump Station Cathodic Protection Unit.

## CATHODIC PROTECTION DETAILS

**Type of Cathodic Protection:** Impressed Current.

**Rectifier:** Standard 24 Volt, 5.0 amp direct current output system incorporated in the stainless steel switchboard. Rectifier has a 240V supply from the stainless steel switch board distribution panel.

**Cathode:** The cathode point is located on the discharge pipes in the reflux valve pit. The cathode point is where the cabling from the rectifier is attached to the structure under cathodic protection.

**Anodes:** One silicone iron anode is suspended from the roof of the well .

**Test Points:** Test points are installed on cathodically protected structures, to enable testing to ensure full protection of the pumps and pipes. On these pumps and pipes test points have been brought out to the cathodic protection test panel mounted in the No 1 variable speed drive bay in the rear of the switch board.

**Associated Drawings:**

Standard Rectifier Wiring Diagram  
Drawings

Combined with Pump Station

**Associated Standards:**

AS/NZS 3000 2000 Electrical Installations

AS/NZS 2832.1 1998 Cathodic Protection of Metals-Pipes and Cables

**Government Regulations:**

Queensland Electricity Safety Rules and Regulations 2002

## **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: Attached copies of above testing can be found in Appendix A.

## **CONCLUSION**

Full Cathodic protection has been achieved on these pumps and pipes.

## **MAINTENANCE**

The cathodic protection system shall be maintained on a regular basis after commissioning. The maintenance schedule recommended in AS2832.1 is as set out below.

- (a) Bi-monthly.
- (b) Six monthly.
- (c) Five yearly.

## Potential commissioning data.

Date: 08/08/2006.

Unit set at 4 volts 0.6 amps.

Potentials to copper sulphate reference cell.

Potentials	Natural	On	Off
Pipe 1	-359mV	-1323mV	-910mV
Pipe 2	-372mV	-1332mV	-900mV

Interference Testing.

	On	Off	Swing
Fence	-625mV	-625mV	0mV

Insulated Joints.

The two insulated joints were tested.

Pipe 1 Bolt to flange greater than 14 Megohms. Flange to flange 1 Kohms.

Pipe 2 Bolt to flange greater than 17 Megohms. Flange to flange 1.5 Kohms

Pipe 1 8 x  $\frac{3}{4}$  x 4 inch insulated bolts

Pipe 2 8 x  $\frac{3}{4}$  x 4 inch insulated bolts

Tested by J. Taylor.

## Appendix A

(Documents attached)

***Structure potential levels (Form 37)***

***Loop potentials.***

***Standard cathodic protection unit Drg # xxxxxxxxx***

***Submersible pump station general layout Drg #xxxxxxx***



**Brisbane Water Engineering Services**

CP Form No. 37

Electrical Engineering Unit

Page of

**Cathodic Protection Six Monthly Maintenance Check Form**Installation. Progress Rd. New P/stn CPS No. 226 SWB No. SP302Unit Reading before test 6 Volts. 1.6 Amps. Date. 8-8-06Unit Reading after test 4 Volts. 0.6 Amps.

Loop Resistance	
Voltage	Current
<u>4</u>	<u>0.6</u>
<u>6</u>	<u>1.6</u>
<u>8</u>	<u>2.1</u>

**Check List**

- (A) Check Switchboard for damage. (✓)  
 (B) Clean Switchboard Exterior. (✓)  
 (C) Zero Voltmeter and Ammeter. (✓)  
 (D) Check there are two spare fuses of each type in switchboard. (✓)  
 (E) Check Test Point Identification. (✓)  
 (F) Check Individual Anode String. (✓)  
 (G) Check Individual Anode Current. (✓)

(1)

(2)

(3)

Test Point No.	Potentials As Found		Potentials After Maint.	
	On	Off	On	Off
<u>P.</u>	<u>-2.047</u>	<u>-1.823</u>	<u>-1.323</u>	<u>-910</u>

COMMENTS:Instrument No. IN35

Revision 27/06/2005

Tested By. J. Taylor

### Cathodic Protection System Loop Resistance

Progress Rd. SP302 Rectifier CPS226

Cathodic Protection System:

System Operating Volts:

4

Progress Road Submersible Pump Station

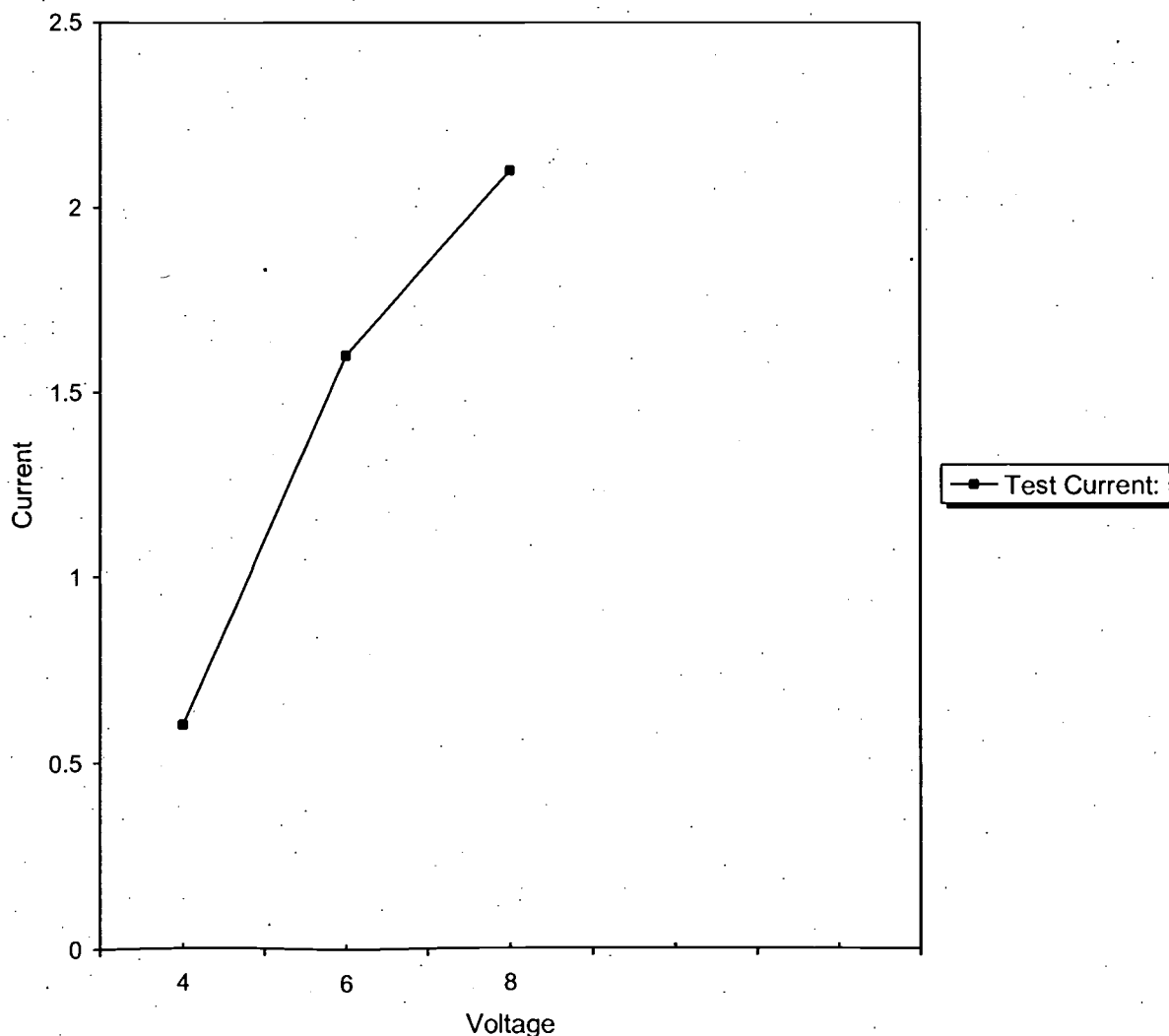
System Operating amps

0.6

Test Voltage:		Test Current:	
(volts)		(amps)	
4		0.6	
6		1.6	
8		2.1	

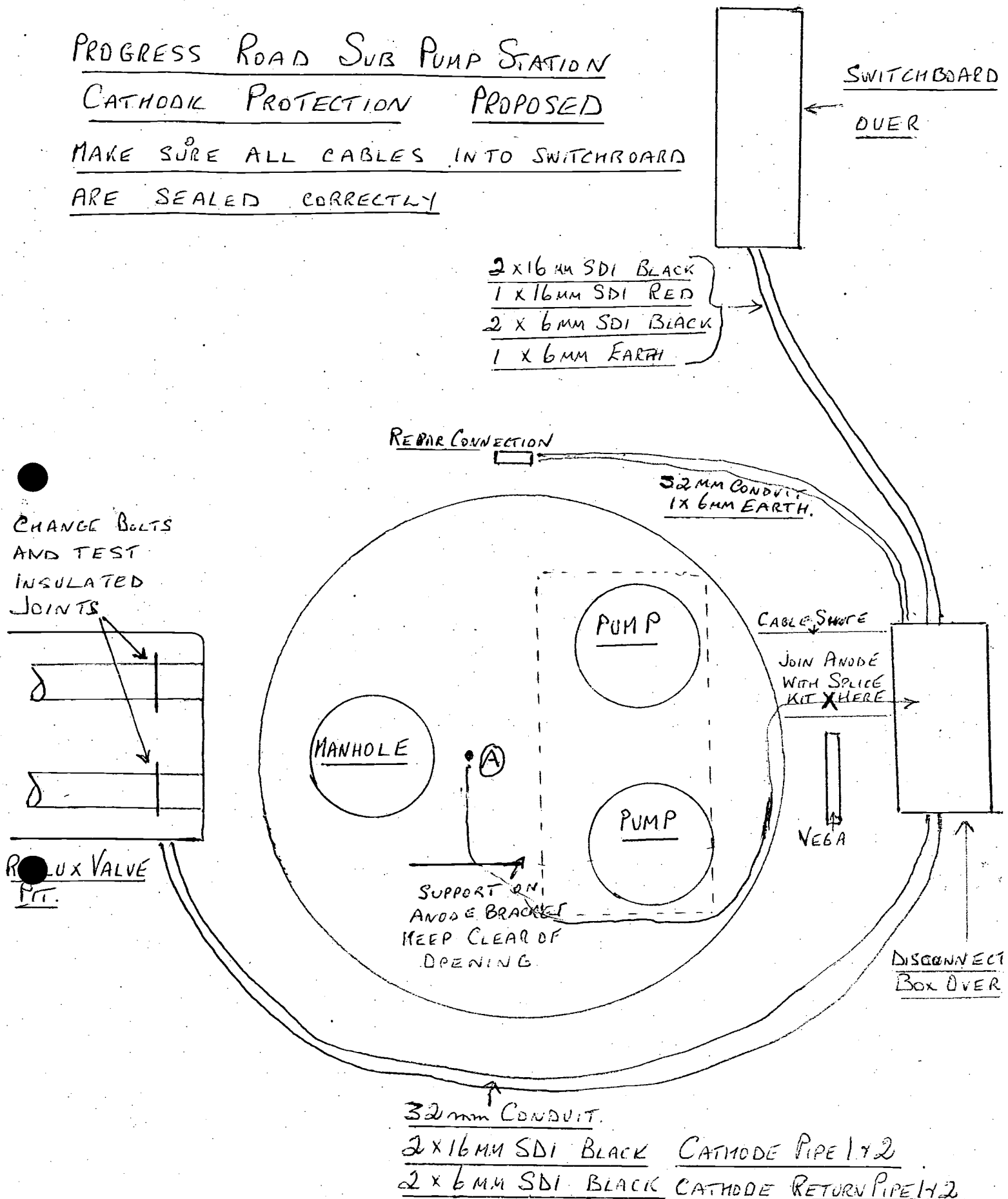
Loop Resistance (ohms)
3.8095238

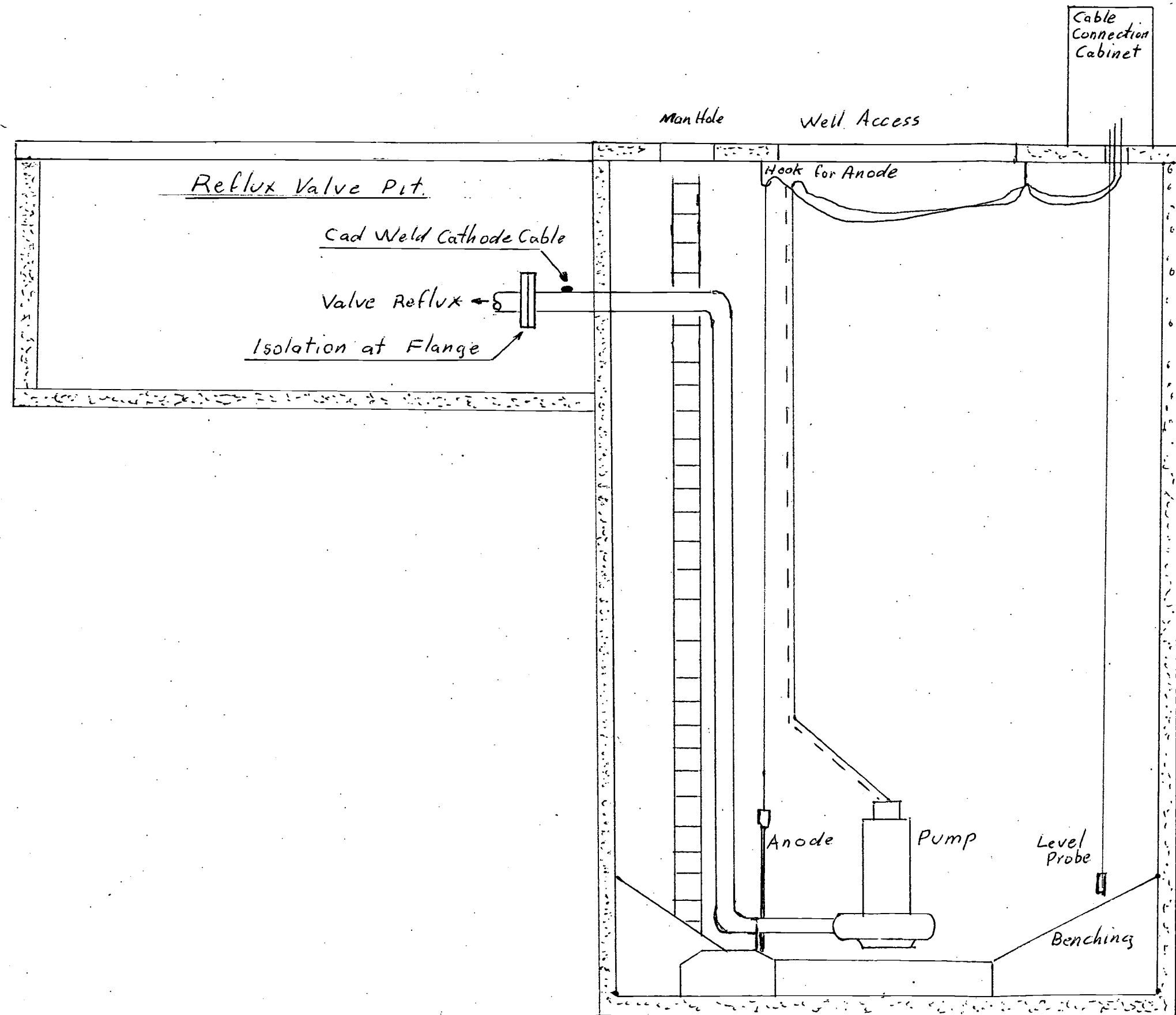
Loop Resistance



# PROGRESS ROAD SUB PUMP STATION CATHODIC PROTECTION PROPOSED

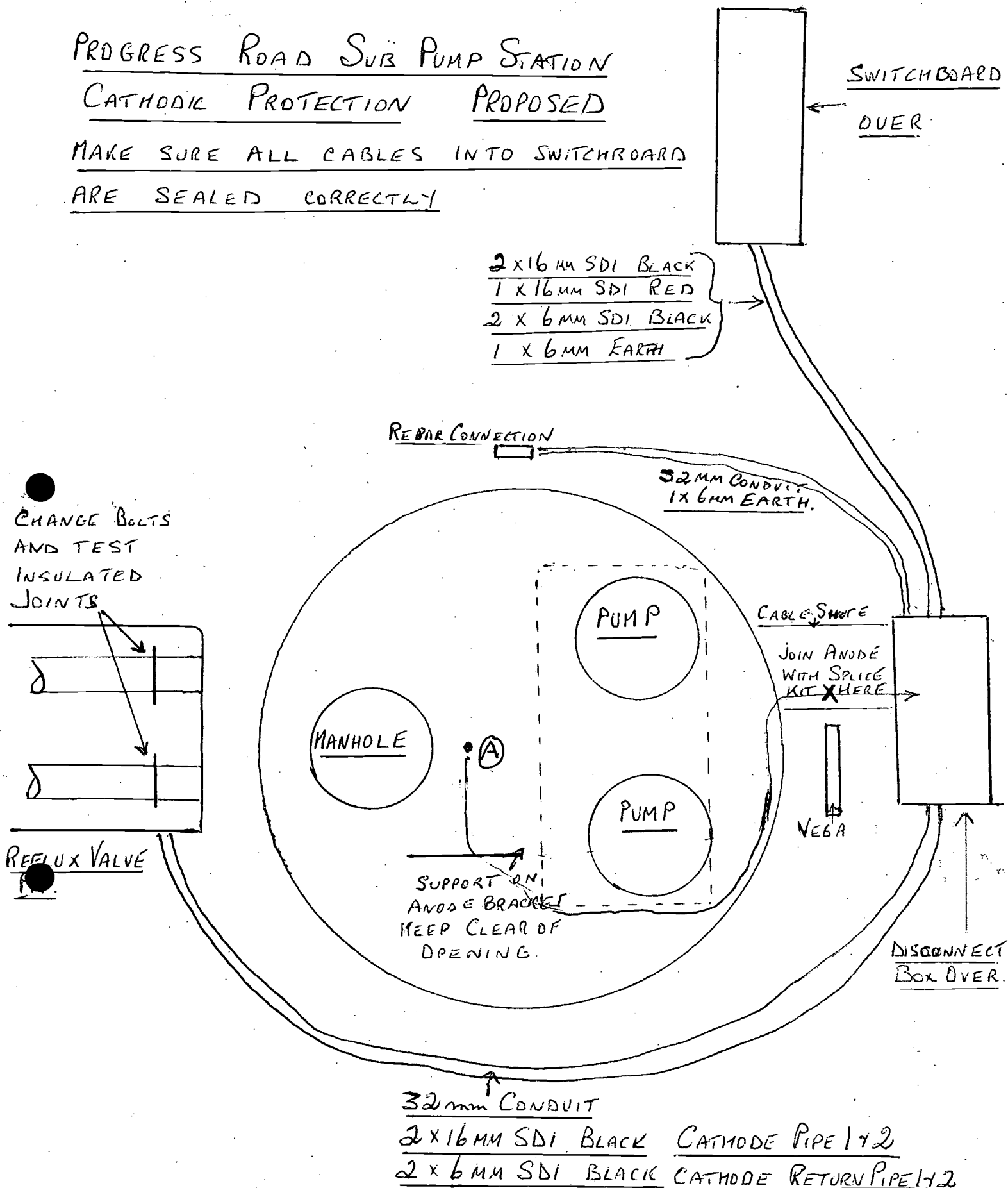
MAKE SURE ALL CABLES INTO SWITCHBOARD  
ARE SEALED CORRECTLY





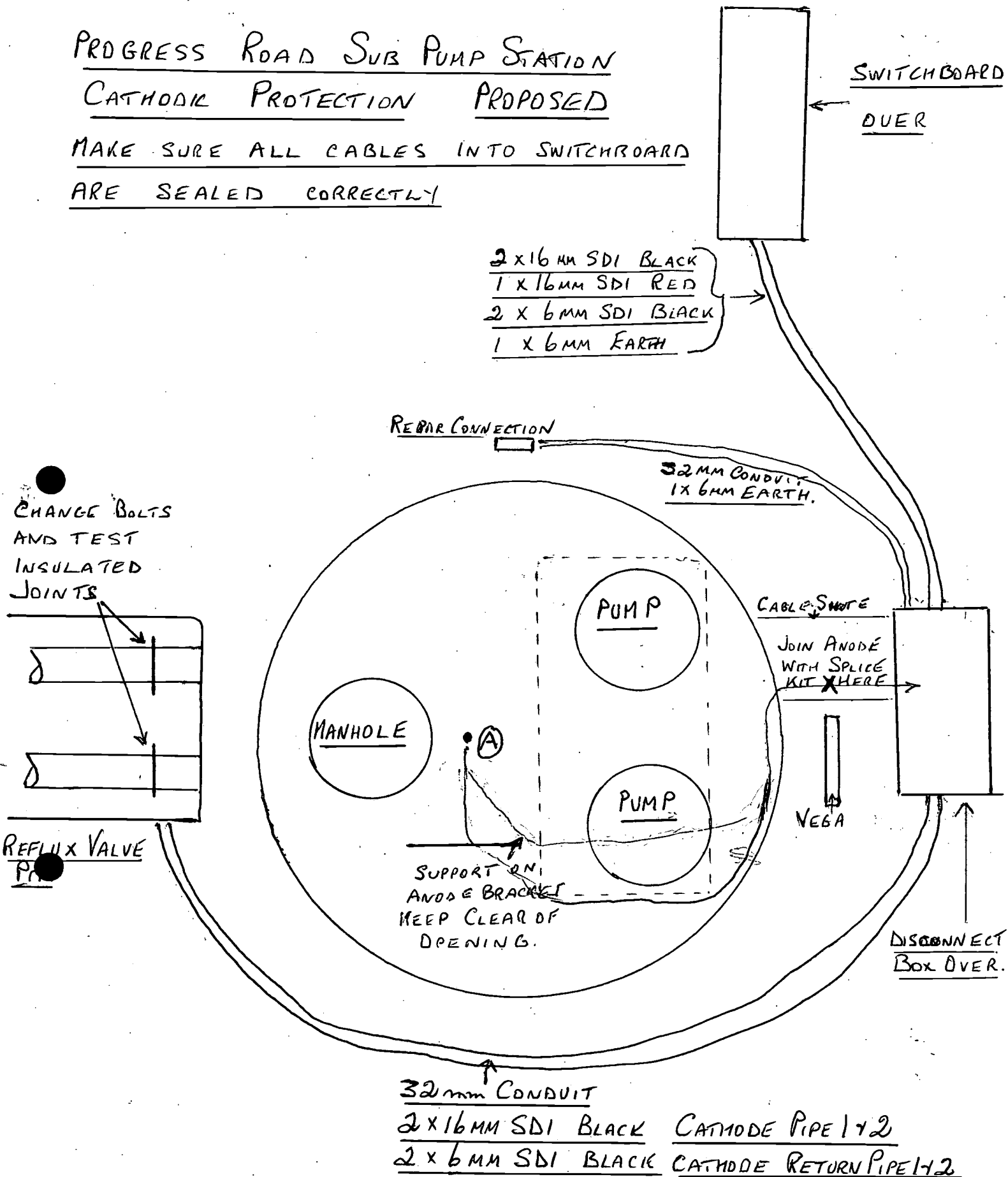
# PROGRESS ROAD SUB PUMP STATION CATHODIC PROTECTION PROPOSED

MAKE SURE ALL CABLES INTO SWITCHBOARD  
ARE SEALED CORRECTLY



# PROGRESS ROAD SUB PUMP STATION CATHODIC PROTECTION PROPOSED

MAKE SURE ALL CABLES INTO SWITCHBOARD  
ARE SEALED CORRECTLY



**Date:** 22/09/2005 **Themes:**  
**Time:** 07:37:41 Cadastre  
**Userid:** ee1esbw Water Supply BCC  
**Scale:** 1:1000

**Location:**  
501538 6954615

**Disclaimer:**

"While every care is taken by Brisbane City Council (BCC) and Dept. of Natural Resources & Mines (NRM) to ensure the accuracy of this data, BCC and NRM jointly and severally make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which may be incurred as a result of data being inaccurate in any way and for any reason."

Based on Data provided with the permission of NRM:  
Cadastral Data (July 2005) ·



# Brisbane Water Engineering Services

## Electrical Engineering Unit

### Cathodic Protection System Loop Resistance

Progress Rd. SP302 Rectifier CPS226

Date: 08th August 2006

Cathodic Protection System:

System Operating Volts:

4

Progress Road Submersible Pump Station

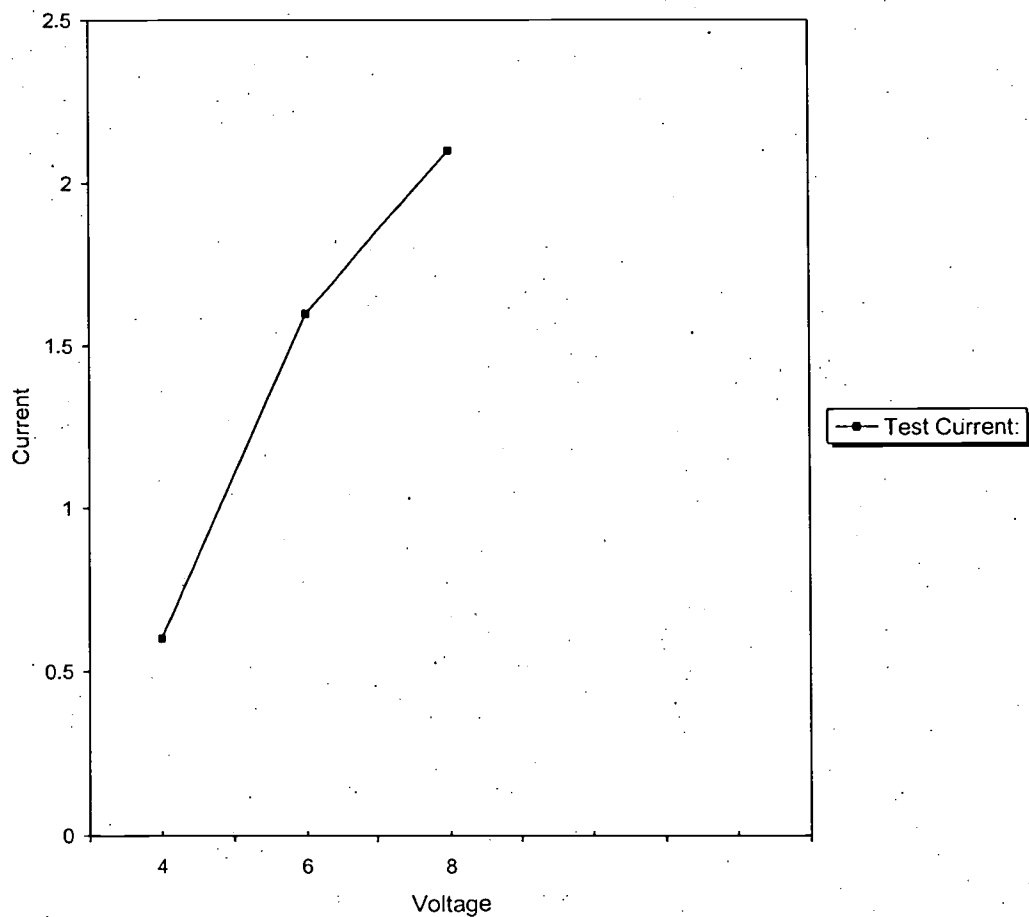
System Operating amps

0.6

Test Voltage:		Test Current:	
(volts)		(amps)	
4		0.6	
6		1.6	
8		2.1	

Loop Resistance (ohms)
3.8095238

Loop Resistance



3/10/2006



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## Electrical Engineering Unit

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Date: 08th August 2006

Cathodic Protection System:

System Operating Volts:

4

Progress Road Submersible Pump Station

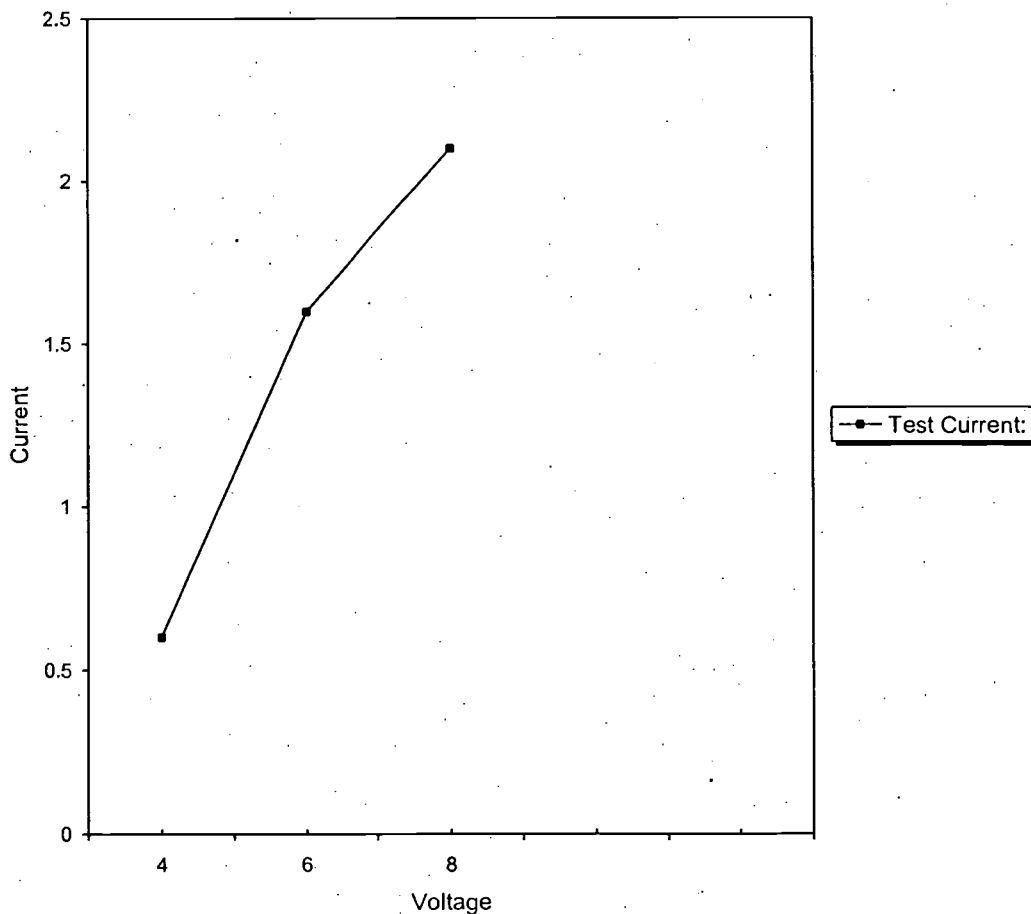
System Operating amps

0.6

Test Voltage:		Test Current:	
(volts)		(amps)	
4		0.6	
6		1.6	
8		2.1	

Loop Resistance (ohms)
3.8095238

Loop Resistance



3/10/2006



Brisbane City Council

MEMORANDUM

TO Quote. DATE 23-2-06

FROM \_\_\_\_\_ PHONE \_\_\_\_\_

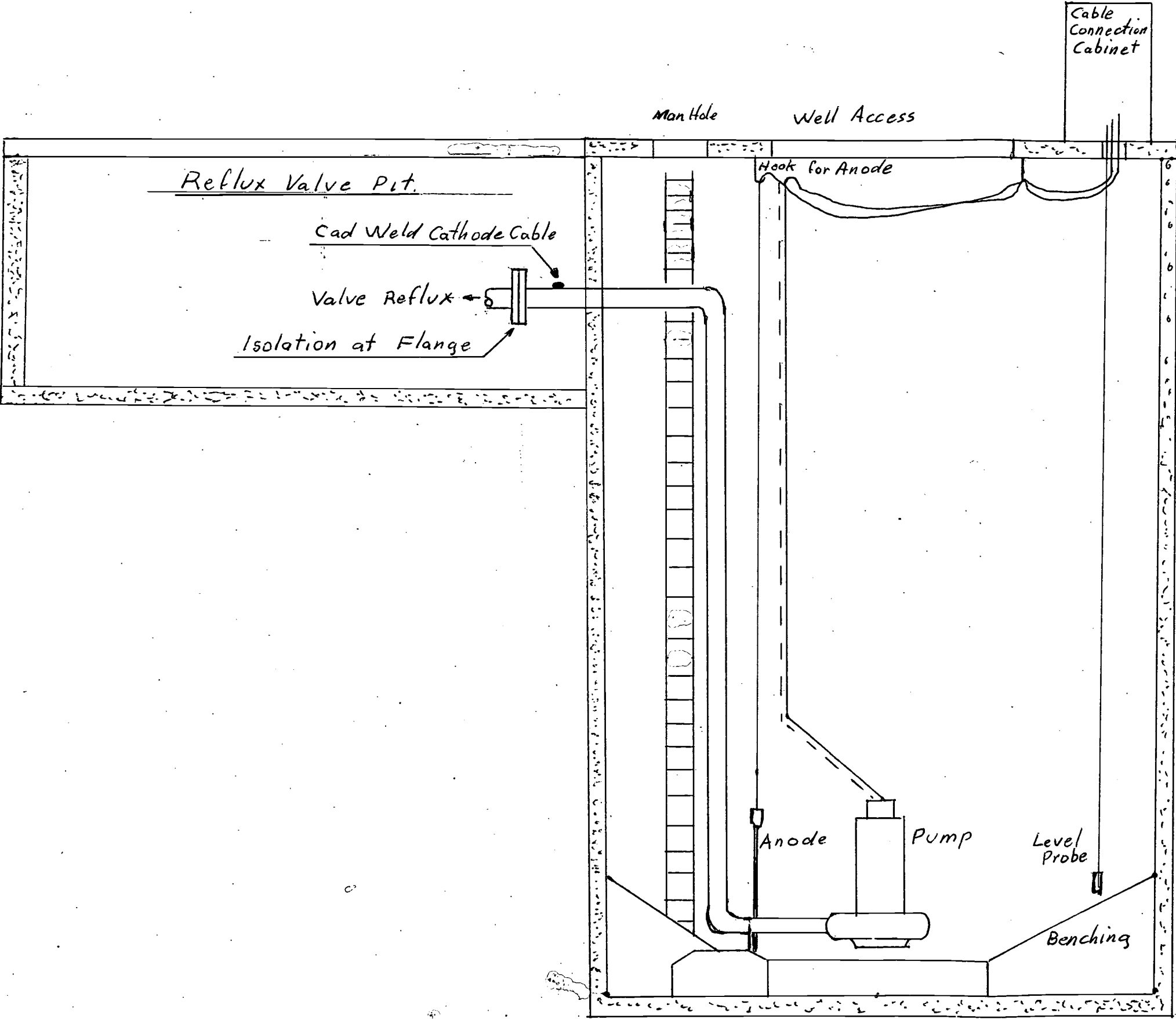
SUBJECT Progress Rd Sub Pump Stn C. P.

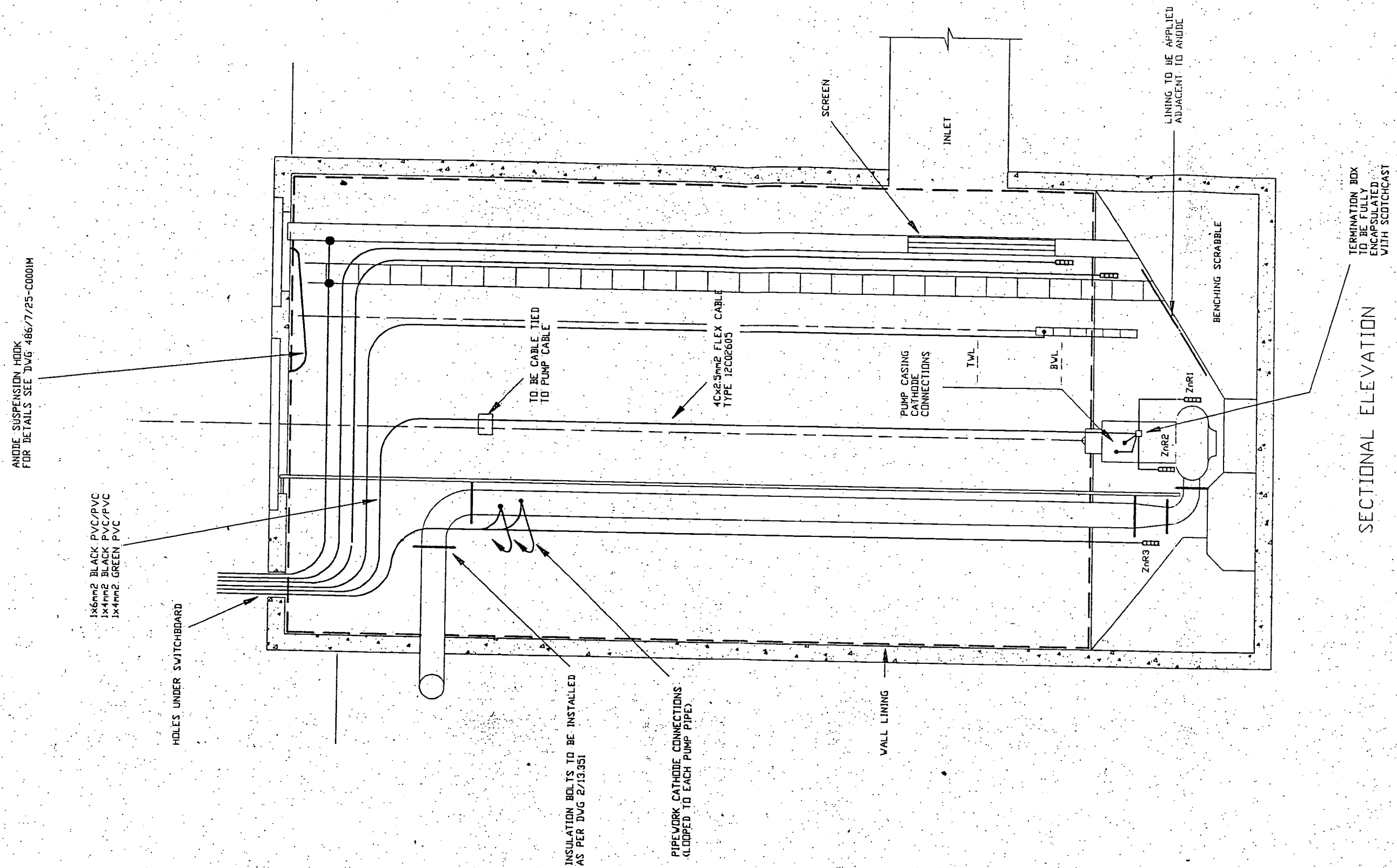
Anode	\$ 300.00
PVC Flange	\$ 20.00
Rope	\$ 25.00
Wire / Cable	\$ 200.00
Bolts	\$ 340.00
Splice Kit	\$ 20.00
Accessories	\$ 50.00
	<del>\$</del> 955.00.


Labour. 4 days x 2.

$\$850.00 \times 8 = \$6,800.00.$

Total = \$ 7,800.00.





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					
				DIRECTOR OF CONSTRUCTION	DIRECTOR OF M & E SERVICES	DIRECTOR OF SEW. OPERATIONS/W.S. DISTRIBUTION	CHECKED			TITLE SUBMERSIBLE PUMP STATION GENERAL LAYOUT					
							ENGINEER IN CHARGE								
No	DATE	AMENDMENT	BY	DATE:	DATE:	DATE:	SUPERVISING ENGINEER	CADD FILE No. 77C2188-			SCALE: NTS	No. 1 OF 1 SHEETS	AMEND.		
												DRAWING No.	486/7/7-PE1C2188E	Page 20 of 20	0