CATHODIC PROTECTION MAINTENANCE SURVEY
OR TAMBO INTERNATIONAL AIRPORT
SEPTEMBER 2025

REPORT NUMBER: PR0452

Client: OR TAMBO INTERNATIONAL AIRPORT
ACSA

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A	26 September 2025	19	F. Moholisa	P Nadrajah	Internal review
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CLIENT	**:**	AIRPORTS COMPANY OF SOUTH AFRICA – OR TAMBO INTERNATIONAL AIRPORT
CONTACT PERSON	**:**	Nhlanhla Khanyi
PROJECT	**:**	Cathodic Protection Maintenance Survey at OR Tambo International Airport
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REPORT DISTRIBUTION:

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EXECUTIVE SUMMARY

UDI ENGINEERING SERVICES CC, hereafter referred to as UDI, was appointed by the Airports Company of South Africa (ACSA), to undertake the annual maintenance of the Cathodic Protection (CP) system protecting the buried jet fuel hydrant pipelines along airside at OR Tambo International Airport. This work forms part of the monthly Cathodic Protection maintenance scope of works.

This report shall detail the September 2025 findings:

- TRU inspections and cleaning.
- Spot - Pipe potentials along the hydrant pipeline.
- Inspect the IF kits at the fuel depot and verify that there is CP current leakage to above-ground structures through the newly installed bypass spool from 18 inch to 20 inch.
- Stray current survey.

1. INTRODUCTION

UDI ENGINEERING SERVICES CC, hereafter referred to as UDI, was appointed by the Airports Company of South Africa (ACSA), to undertake the annual maintenance of the Cathodic Protection (CP) system protecting the buried jet fuel hydrant pipelines along airside at OR Tambo International Airport. This work forms part of the monthly Cathodic Protection maintenance scope of works.

The Impressed Current Cathodic Protection (ICCP) system consists of two Impressed Current Cathodic Protection (ICCP) Systems, the BRAVO CP System and the GOLF CP System. The first, titled, “BRAVO CP SYSTEM”, consists of a Transformer Rectifier Unit (TRU) connected to a deep well groundbed system with the negative drain at VCB0 – CP21. The Bravo CP system is made up of six deep well groundbeds, which are linked to a positive junction box for the ease of isolating for each groundbed during inspections and circuit resistance measurements.

The second, titled” GOLF CP SYSTEM” consists of one three phase Transformer Rectifier Unit (TRU) connected to three deep-well groundbeds and is situated along the Golf Apron service road opposite hydrant pit valves GHPV2 and GHPV3, with the negative drain near the Delta service road.

This report represents a summary of the Cathodic Protection status for the month of September 2025.

2. SCOPE OF WORK

The scope of work for the as-found Cathodic Protection inspections is summarized below:

- TRU output results and circuit inspections,
- Spot Pipe-to-soil potential measurements,
- IF inspection on the 18” and 20” feeder pipelines,
- Stray current survey,

3. FINDINGS AND RESULTS

3.1 Bravo and Golf TRU's output readings

The status of the Bravo and Golf ICCP systems were checked and both systems were found to be functional on during two weekly and monthly inspections, which meant that the pipelines were protected for the full duration of the month.

The interior of both TRU's at Bravo and Golf ICCP systems were kept clean and the cable terminal connections checked for tightness and neatness. Further touch and feel temperature tests were done on the rectifier stacks and electrical connection to confirm proper operation and no indication of high contact resistance.

Further measurements were taken at the Bravo and Golf TRU systems for resistance of each groundbed, pipeline and overall circuit resistance combined. Table 1 below, illustrates the different measurements taken from the Bravo TRU on a weekly basis which is summarised with the RMU data received weekly. Table 2 below, shows readings measured from the Golf TRU system on a weekly basis as part of maintenance. A full inspection of both the Bravo and Golf TRU systems was carried out and no defaults or anomalies were identified

Table 1: Bravo TRU (CP22) output weekly results during the month of September versus the as – Measured

TRU AS FOUND SETTINGS AND CONDITION - BRAVO TRU CP22												
No.	**DATE**	**DC Amps**	**DC Volts**	**TRU PSP vs CSE (V)**	**Calculated Circuit Resistance (Ohms)**	**TRU Hours Off**	**Measured Circuit Resistance (Ohms)**	**Groundbed Type**	**TRU Rating**	**TRU Serial No**	**TRU Type**	**Wiring Diagram**
1	01-Sept-25	16,7	33	-4,51	1,98	6	6,7	DEEP WELL (x6)	75V/ 50A	CC9685	3 PHASE	GOOD
2	08-Sept-25	16,25	36,2	-5,1	2,23	6		DEEP WELL (x6)	75V/ 50A	CC9685	3 PHASE	GOOD
3	15-Sept-25	15,6	31,8	-4,5	2,04	6		DEEP WELL (x6)	75V/ 50A	CC9685	3 PHASE	GOOD
4	22-Sept-25	16,1	30,6	-4,48	1,90	6		DEEP WELL (x6)	75V/ 50A	CC9685	3 PHASE	GOOD
4	29-Sept-25	15,9	32	-4,51	2,01	6		DEEP WELL (x6)	75V/ 50A	CC9685	3 PHASE	GOOD
Average monthly protection = -4.5V												

Table 2: Golf TRU (CP43) output weekly results during the month of September versus the as – Measured

TRU AS FOUND SETTINGS AND CONDITION AT CP43 GOLF												
No.	**DATE**	**DC Amps**	**DC Volts**	**TRU PSP vs CSE (V)**	**Calculated Circuit Resistance (Ohms)**	**TRU Hours Off**	**Measured Circuit Resistance (Ohms)**	**Groundbed type**	**TRU earthing**	**TRU Serial No**	**TRU Type**	**Wiring Diagram**
1	01-Sept-25	11,75	9,8	-3,12	0,83	121,41	1,2	DEEP WELL (x3)	75V/ 50A	1324-03	3 PHASE	GOOD
2	08-Sept-25	11,7	9,64	-3	0,82	217,15		DEEP WELL (x3)	75V/ 50A	1324-03	3 PHASE	GOOD
3	15-Sept-25	10,9	9,9	-3,22	0,91	0		DEEP WELL (x3)	75V/ 50A	1324-03	3 PHASE	GOOD
4	22-Sept-25	11	9,7	-3,86	0,88	0		DEEP WELL (x3)	75V/ 50A	1324-03	3 PHASE	GOOD
4	29-Sept-25	11,6	10	-3,6	0,86	0		DEEP WELL (x3)	75V/ 50A	1324-03	3 PHASE	GOOD
Average monthly protection = -3,36V												

CORROSION / CATHODIC PROTECTION PREDICTOR

As a measure, there are several techniques used to verify the levels of efficacy of the Cathodic Protection (CP) system to ensure that the minimum specification guidelines are adhered to. For the buried underground jet fuel pipeline along airside, the pipe to soil potential measured with respect to a calibrated copper to copper sulphate reference electrode will be used as the 'corrosion predictor". In general, the natural potential of steel ie. (iron) in soils with respect to a calibrated copper to copper sulphate reference electrode is in the region of -0.4 to -0.5 Volts (DC). The underground coated (buried) jet fuel hydrant network shall be regarded as being under effective CP: A negative (Cathodic) potential of at least -0.95V with the Cathodic Protection applied. This potential is measured with respect to a saturated copper/copper sulphate reference electrode contacting the electrolyte.

Voltage drops across the structure-to-electrolyte boundary must be considered for valid interpretation of the voltage measurement. This additional negative potential ie. more negative than -0.85V is required for mitigation against Microbial Induced Corrosion and effects.

An alternative criterion used is, once a minimum of 100mV (0.1V) polarisation is obtained between the carbon steel surface of the pipeline and a stable reference electrode contacting the electrolyte. The formation or decay of polarisation may be measured to satisfy this criterion.

3.2 Pipe-to-Soil Potential (PSP) – Survey results

A pipe-to-soil spot potential (PSP) survey was carried out by measuring with reference to a permanent reference electrode using a portable digital voltmeter (TBM525) at different locations along the aprons on airside. The test locations are pre-selected a day before, but this can slightly vary on the day depending on access availability which can be limited by aircraft movements or inaccessible valve chambers due to high water levels within the chambers during the rainy season. The results are summarised in Table 3 below, and are compared to readings taken with a calibrated, portable copper-copper-sulphate reference electrode.

Table 3: Summary of the average spot pipe-to-soil potentials (Volts) recorded:

SPOT POTENTIAL MEASUREMENT SUMMARY - SEPTEMBER 2025						
CP ID.	**LOCATION**	**CONDITION**	**0FF - POTENTIAL (mV)**	**ON - POTENTIAL (mV)**	**DATE**	**STAND**
CP01 A - IF 18"	Tankfarm depot	IF KIT AND SPARK GAP, Short on IF	-1	-1,1	11 August 2025	TANK FARM DEPOT
CP02 - BUNKER (18" / 20" BOND)	Tankfarm depot	Good, Bonding Test point	-1,1	-2	11 August 2025	TANK FARM DEPOT
CP03 - BUNKER (18" / 20" BOND)	Near Super South road	Good, Bonding Test point	-0,89	-1,63	11 August 2025	AIRSIDE
CP04 - TP1	Near Super South road	Good, Bonding Test point	-0,89	-1,97	11 August 2025	AIRSIDE
CP05 - BUNKER	Near India taxiway	Good, Bonding Test point	-1	-2	11 August 2025	AIRSIDE
CP06 - VCM3	Charlie apron	Good, Test station and PRE	-1,03	-2,04	11 August 2025	C24
CP09 - VCC4	Charlie apron	Good, Test station	-0,65	-1,27	11 August 2025	C11
CP10 - VCC3	Charlie apron	Continuity bond	-1	-1,99	11 August 2025	C9
CP13 - VCA5	Alpha Apron	Good, Test station and PRE	-0,9	-1,86	11 August 2025	A13
CP17 - VCA2	Alpha Apron	Good, Test station and PRE	-1,38	-2,24	11 August 2025	A3
CP18 - VCM1	Bravo Apron	Good, Test station and PRE	-0,95	-2,27	11 August 2025	B13
CP22 - TRU	**Bravo Apron**	**Good, Test station and PRE**	-1,34	-4,57	11 August 2025	B1
CP24 - VCA1	Alpha Apron	Good, test station and PRE	-1,41	-2,44	11 August 2025	A1
CP25 -VCE1	Echo Apron	Good, Test station and PRE	-0,86	-1,77	11 August 2025	E1
CP26 - VCE2	Echo Apron	Continuity bond	1,18	-2,07	11 August 2025	E9
CP27 - VCE3	Echo Apron	Good, Test station and PRE	-1,3	-2,34	11 August 2025	E12
CP28 - VCF1	Fox trot Apron	Good, Test station and PRE	-1	-1,8	11 August 2025	F1
CP29 - VCF2	Fox trot Apron	Good, Test station and PRE	-1,15	-2,22	11 August 2025	F7
CP31 - VCD1	Delta Apron	Good, Test station and PRE	-1,84	-2,58	11 August 2025	D2R
CP32 - VCD2	Delta Apron	Good, Test station and PRE	-2,48	-3	11 August 2025	D4
CP33 - VCD3	Delta Apron	Continuity bond	-2,55	-3,11	11 August 2025	D8
CP35 - VCD5	Delta Apron	Good, Test station and PRE	-1,49	-1,77	11 August 2025	D18
CP36 - VCD6	Delta Apron	Good, Test station and PRE	-2,4	-3,03	11 August 2025	D24
CP38 - VCD8	Delta Apron	Good, Test station and PRE	-1,11	-2,15	11 August 2025	D38
CP39 - VCD9	Delta Apron	Good, Test station and PRE	NO BOND		11 August 2025	D42
CP40 - TP2	Delta Apron	Good, Test station	NO BOND		11 August 2025	D42
CP42 - VCD11	Delta Apron	Good, Test station and PRE	-1,23	-1,8	11 August 2025	D46
CP43 - TRU	**Golf Apron**	**Good, Test station and PRE**	-2,6	-3,1	11 August 2025	**G5**
CP44 - SATP3	Golf Apron	Good, Test station and PRE	-1,24	1,39	11 August 2025	G1

NOTE - **THE CURRENT REMOVED IF KIT (INSULATING FLANGE KIT) DURING THE INSTALLATION OF THE NEW 18 INCH TO 20 INCH BYPASS PIPE HAS NEGATIVE IMPACT ON THE ENTIRE CP SYSTEM (GROUNDBED). THIS HAS TO BE CORRECTED URGENTLY TO REDUCE THE RISK OF CONSUMPTION ON THE SYSTEM.**

3.3 Insulation Flange (IF kit) Inspection on the 18" and 20" Feeder Pipelines

The IF kits on the 18-inch feeder pipeline feeder pipeline were inspected and tested after access was granted into the fuel depot. No test was done on the 20 Inch as there was no IF kit. The IF kits that were tested are shown in Figure 1 below.

The following flange sizes were inspected and tested to confirm isolation:

- 18 Inch IF kit
- 20 Inch IF kit
- 3 Inch IF kit
- 1.5 Inch IF kit

Each IF was tested by means of checking the potential on the upstream (DEAD) side of the flange, and the downstream (LIVE) side of the flange as shown in Table 4 below.

Table 4: Illustration of each Insulating Flange test is shown in the table below:

18 INCH / 20 INCH FEEDER PIPES - Insulating Flange testing at the Tank farm depot				
Description	**18" Flange kit**	**3" Flange kit**	**1.5" Flange kit**	**20" Flange kit**
Potential Upstream **(DEAD SIDE)** (Vcse)	**-1.14V**	**-1.1V**	**-1.15V**	**-1.03V**
Potential Downstream **(LIVE SIDE)** (Vcse)	**-0.9V**	**-0.89V**	**-0.9V**	**-0.93V**

The results showed current leak (shorting) from the newly installed bypass pipe which links the 18-inch feeder to the 20-inch feeder pipeline, and this is placing severe pressure on the groundbed at Bravo CP system (CP22).

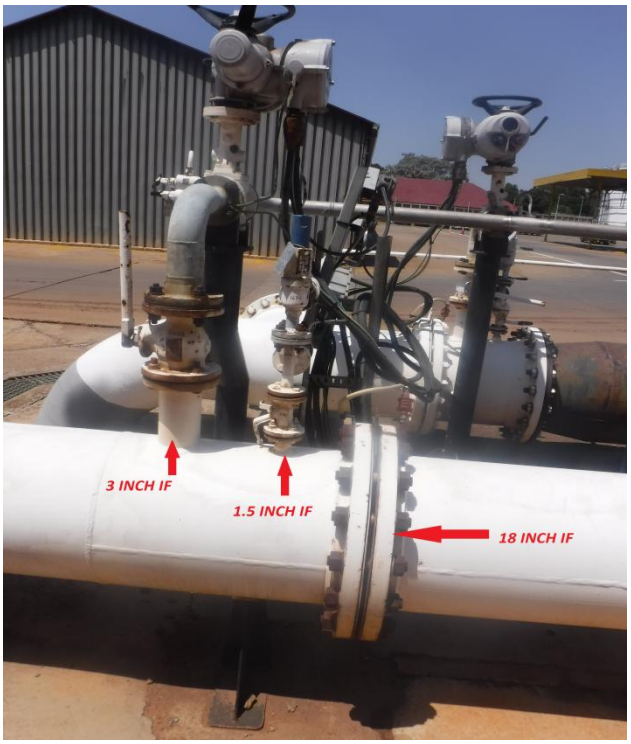


Figure 1: Insulating Flange kits on the 18 Inch feeder pipeline

Figure 2: 20 Inch flange with no IF kit after bypass installation

3.4 Stray Current Interference Survey

The stray current results complied with the specified criteria and are represented graphically in Figure 3 to Figure 11 below:

Figure 3: Stray current recording at CP02 bonding test post on the feeder pipes

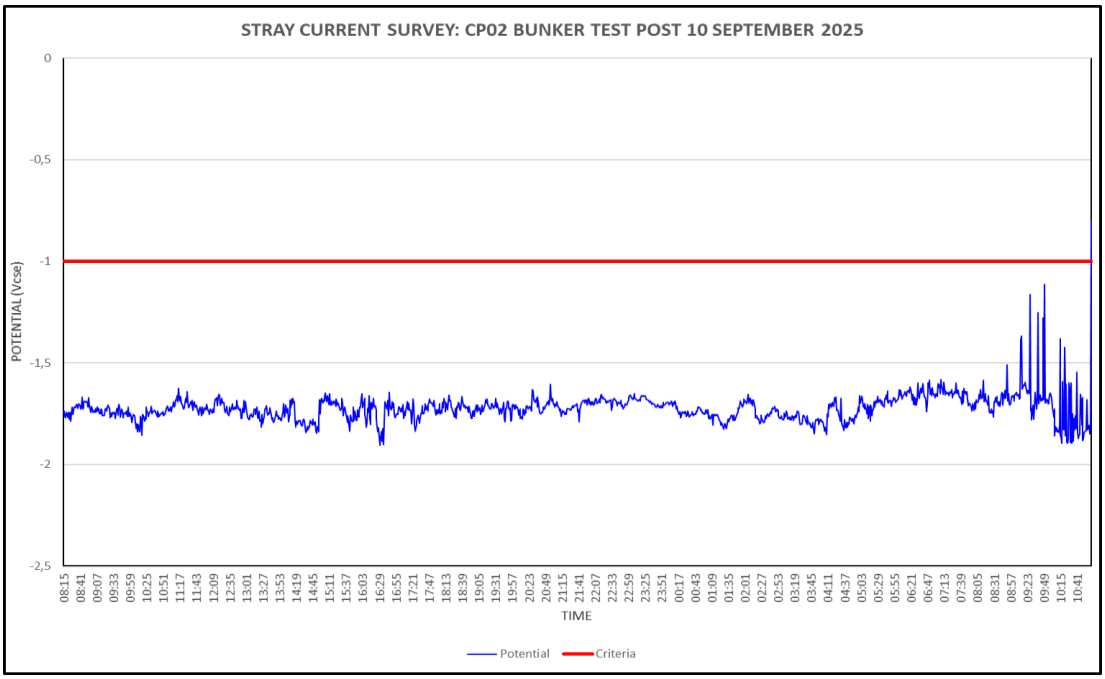


Figure 4: Stray current recording at CP03 bonding test post on the feeder pipes

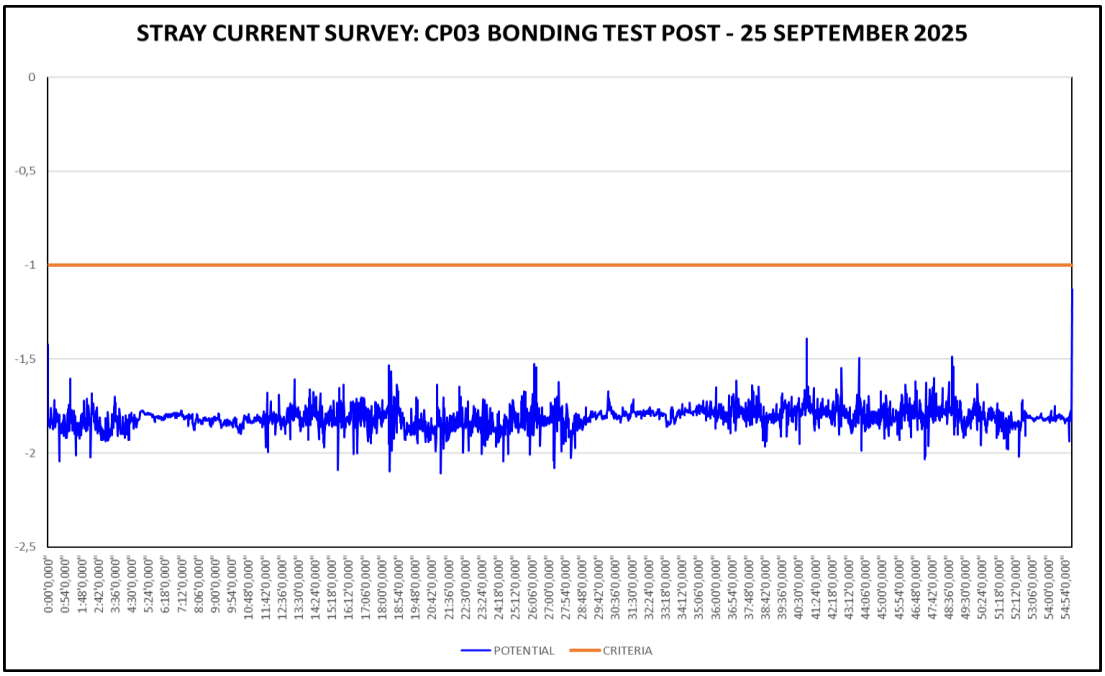


Figure 5: Stray current recording at CP17 test post inside VCA2

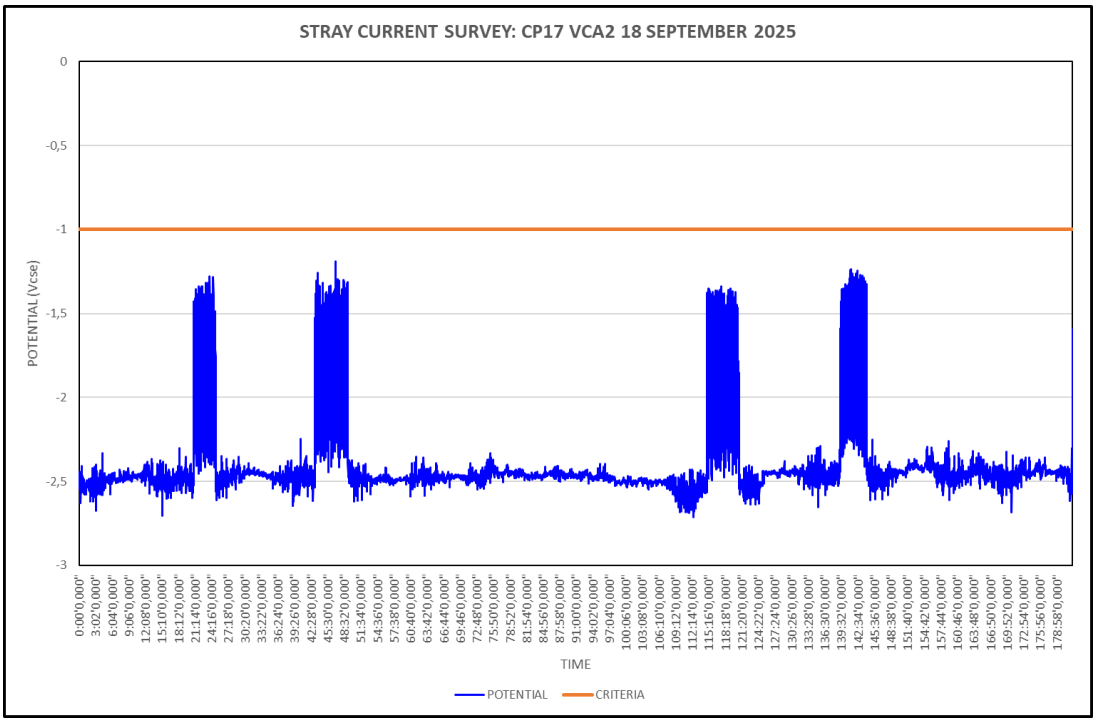


Figure 6: Stray current recording at CP18 test post inside VCM1

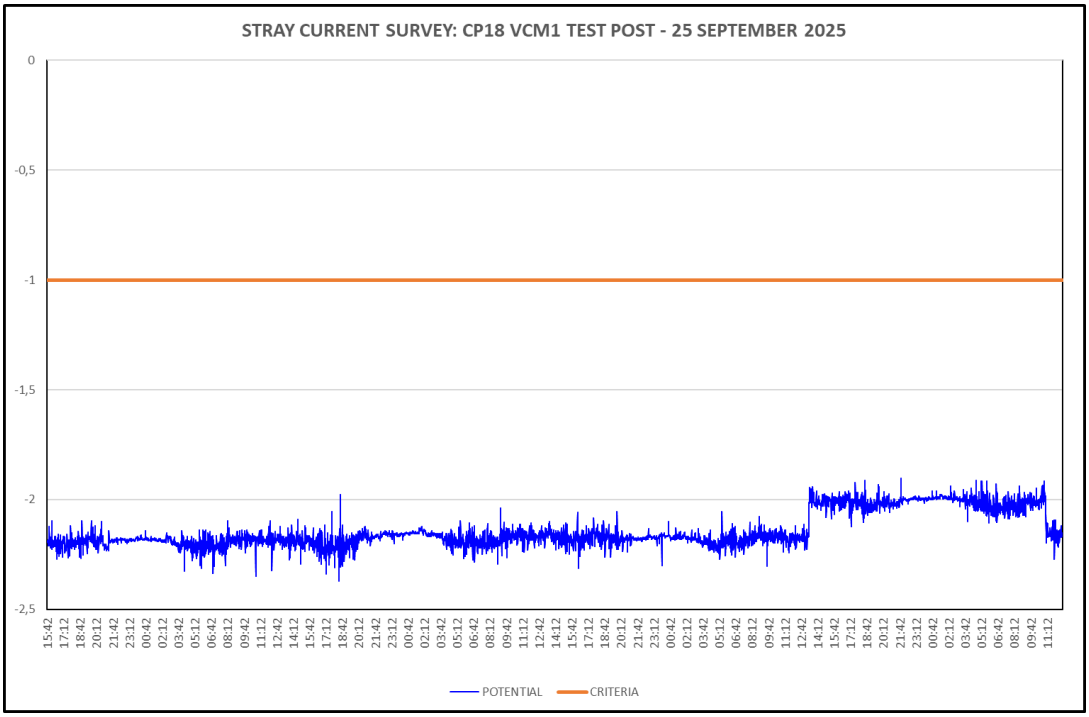


Figure 7: Stray current recording at CP27 test post inside VCE3

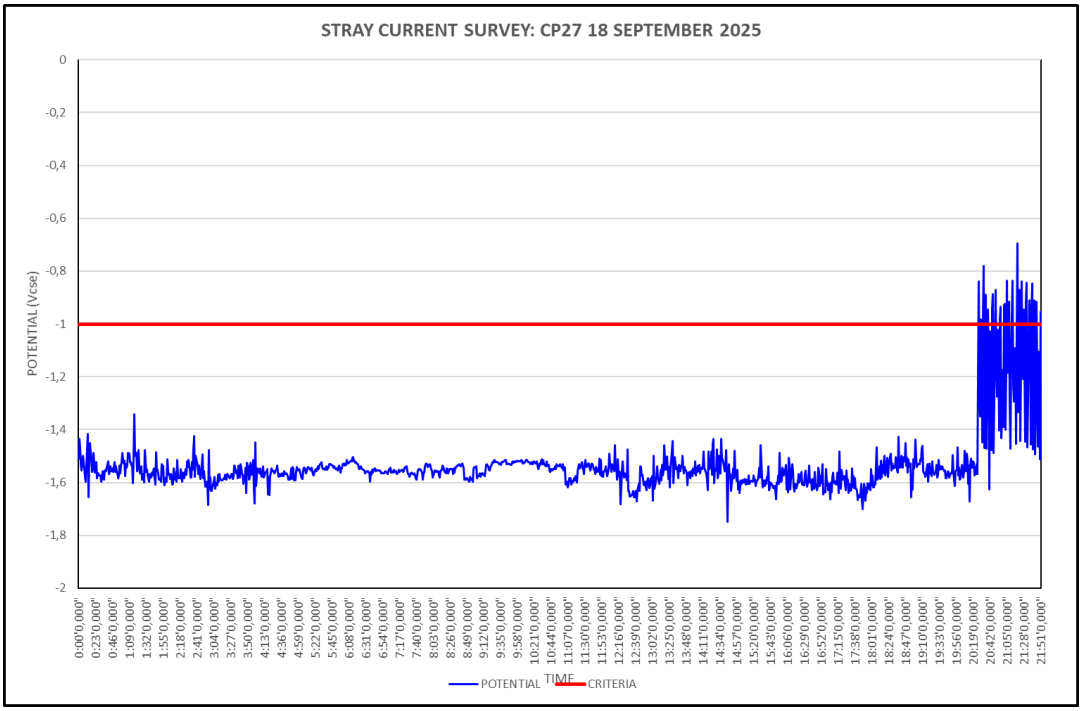


Figure 8: Stray current recording at CP29 test post inside VCF2

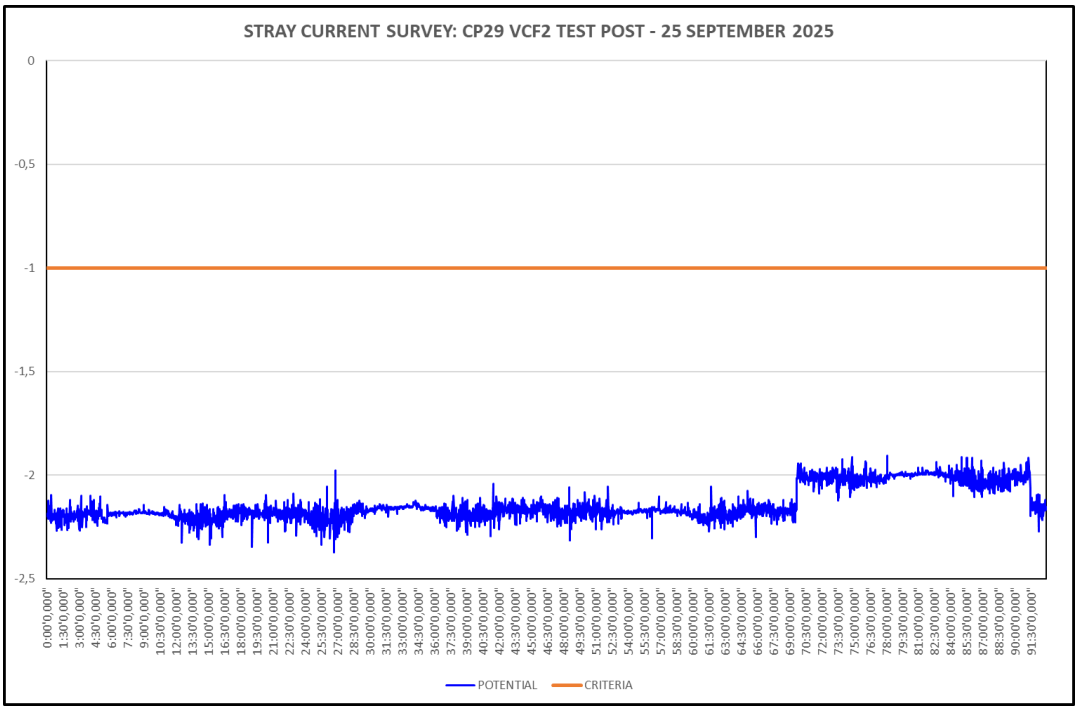


Figure 9: Stray current recording at CP32 test post inside VCD2

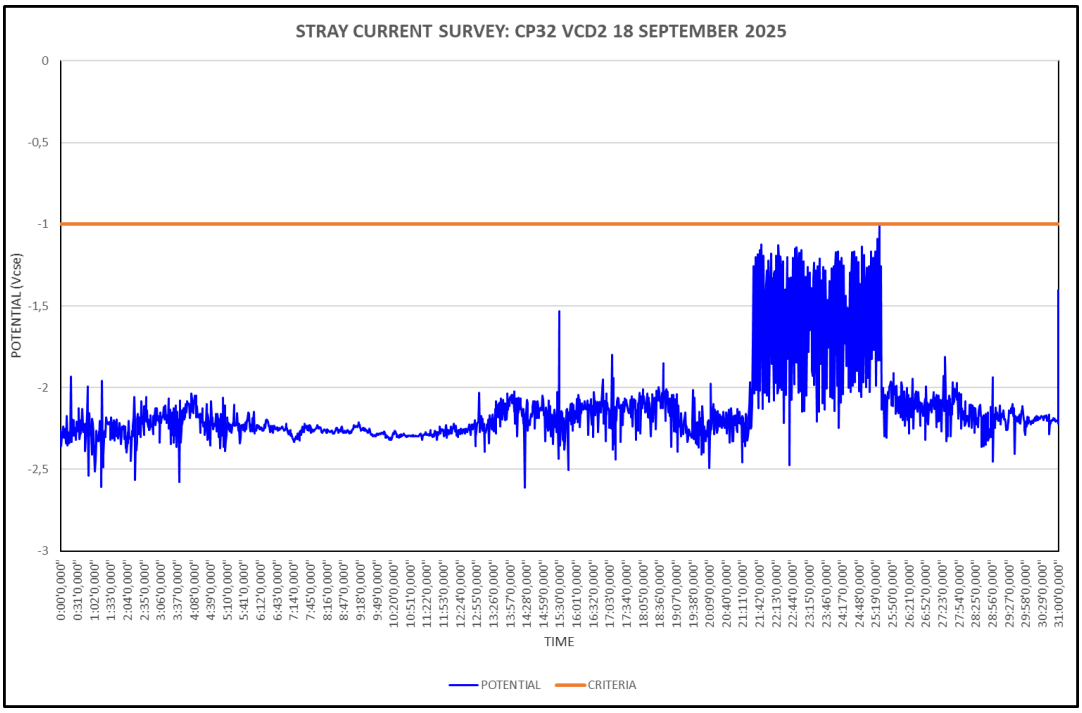


Figure 10: Stray current recording at CP43 test post inside Golf TRU

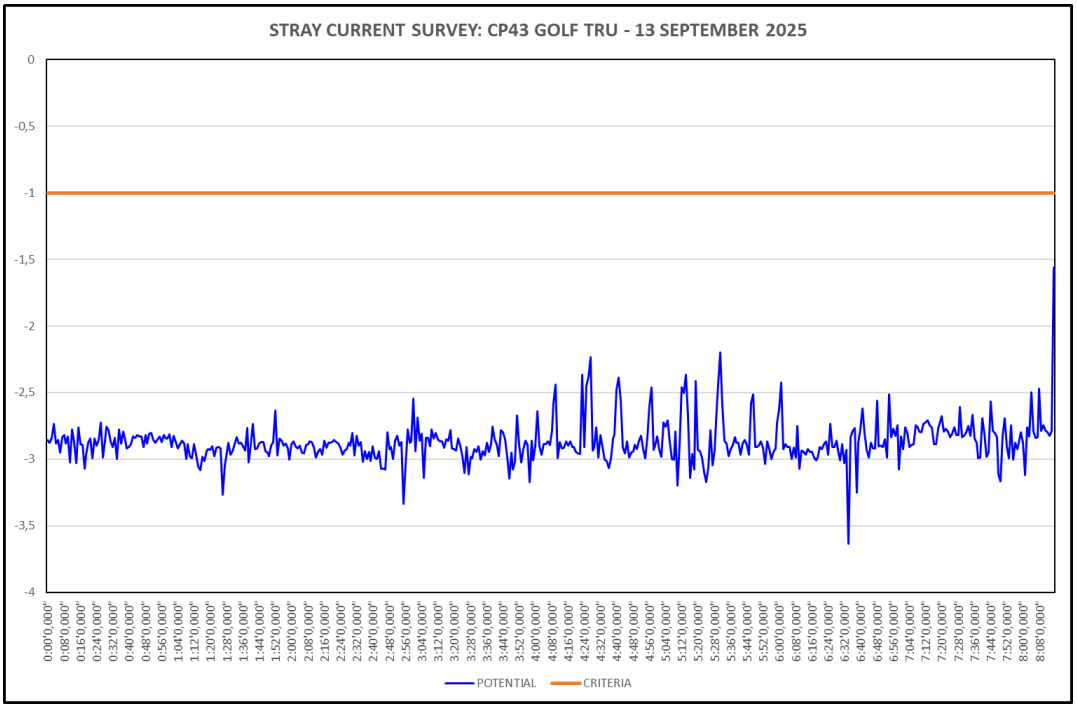
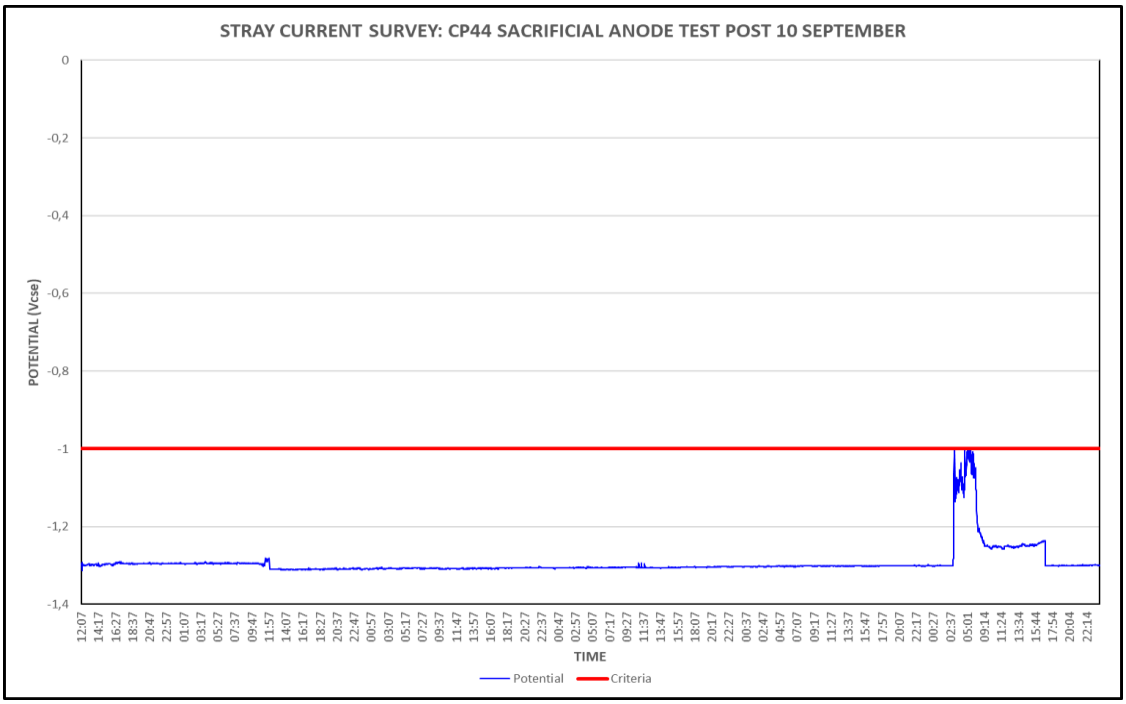


Figure 11: Stray current recording at CP44 test post inside SATP



4. CONCLUSION

This section shall detail the conclusions from the maintenance carried out during September 2025:

- The Cathodic Protection systems at Golf and Bravo aprons are providing adequate protection to the buried fuel reticulation system.
- The IF kit on the 18-inch feeder pipeline pipeline was inspected and tested, and found to be insulating and fully functional.
- Both Transformer Rectifier Units at Golf-CP43 and Bravo-CP22 Aprons were inspected and all the spares checked and verified against the spares inventory system.
- The newly installed bypass piping connection to the existing 20-inch feeder pipeline is currently impacting on the ground bed at the Bravo CP system due to uninstalled IF kit.
- The results from all the stray current recordings indicated negligible stray current influence.

5. RECOMMENDATIONS

This section shall detail the recommendations from the maintenance carried out during September 2025:

- Carry out further Bellows NDT inspection based on the approved program submitted last year.
- A new IF kit to be urgently installed at the IF (insulating flange) point on the 20-inch feeder.
- A new display monitor is required to be installed on the Bravo TRU system (CP22), as the current display is not visible and affects accuracy during data collection.

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