V_M = Measured potential

V_{IR} = Ohmic component (IR error)

V_P = Polarised Potential

$V_M = V_{IR} + V_P$

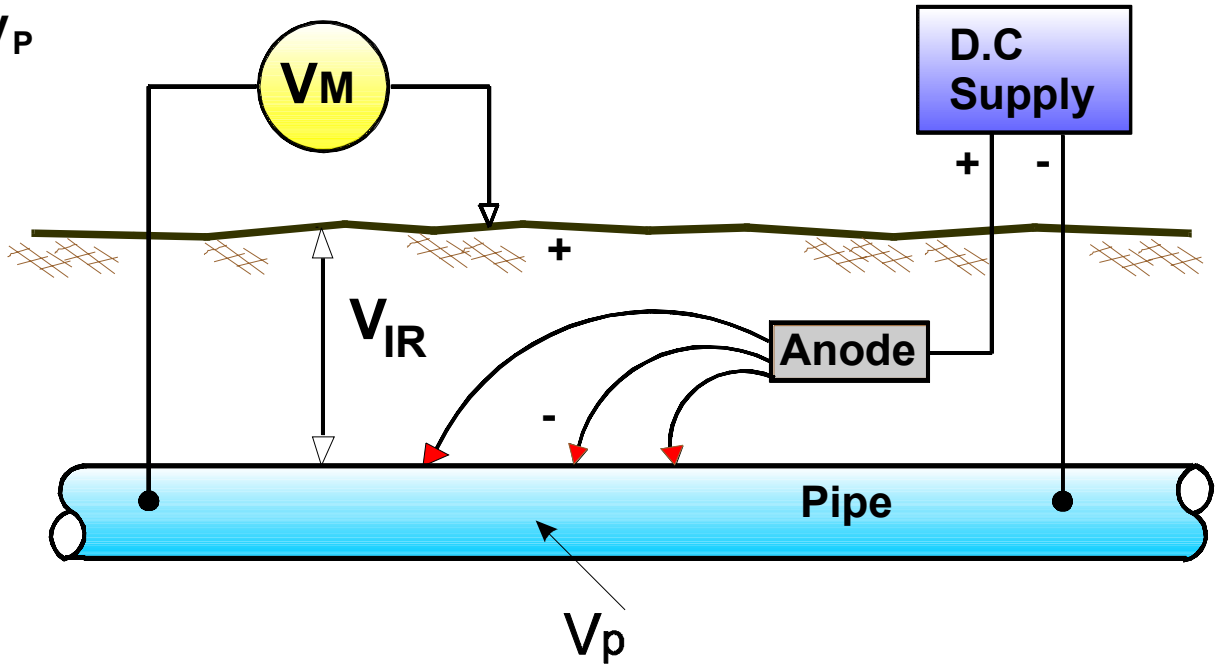


Fig 1
I.R. Drop Error Component of Potential Measurement

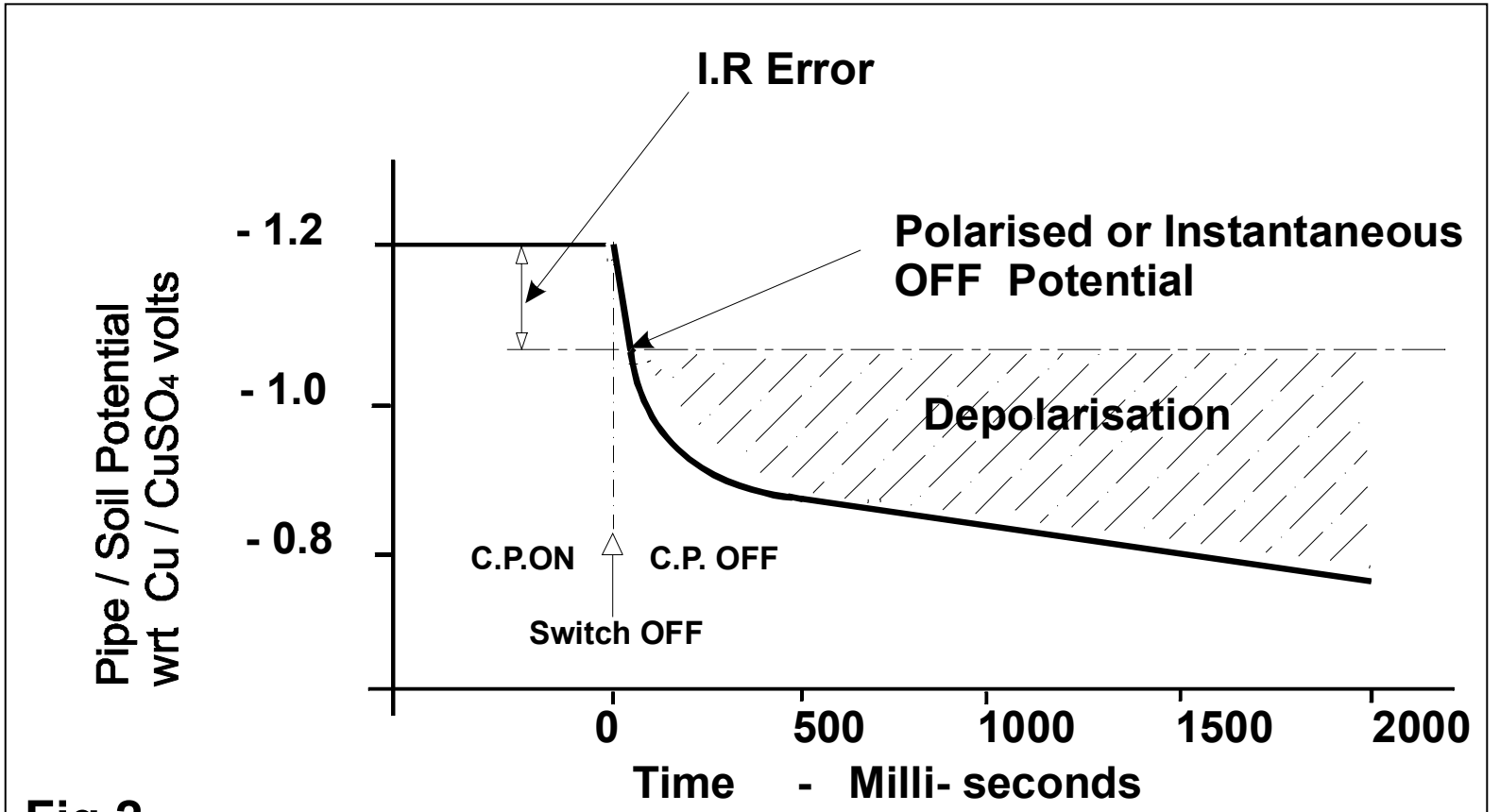


Fig 2
Idealised Polarised Potential Measurement

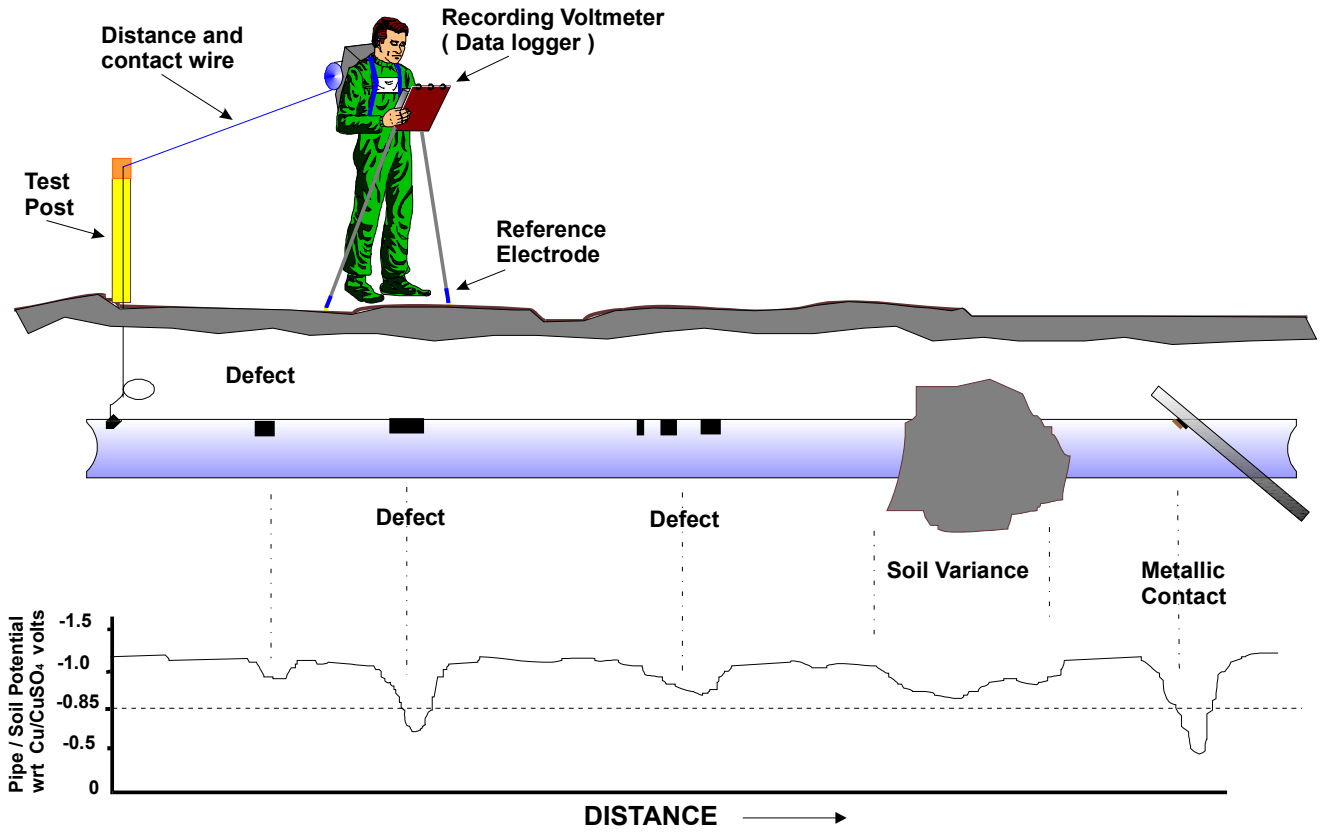


Fig 3
Close Interval Overline Potential Survey

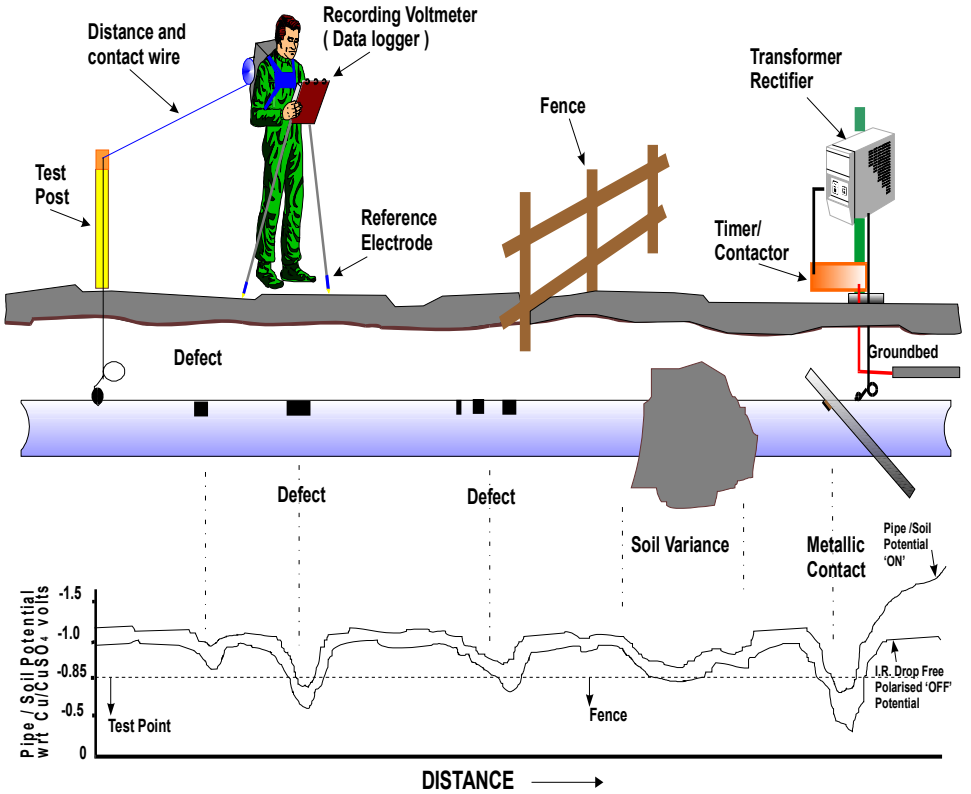


Fig 4
Close Interval Overline Polarised Potential Survey

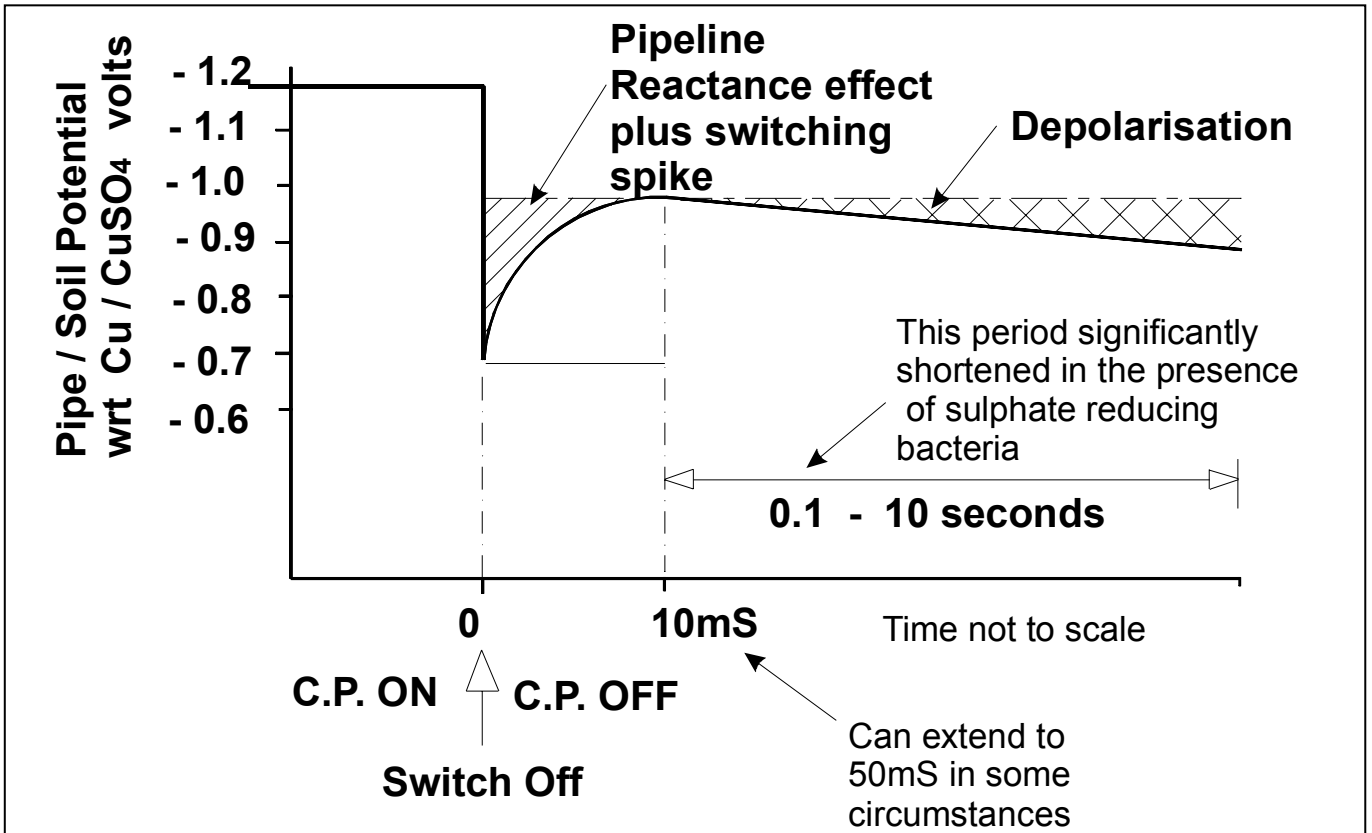
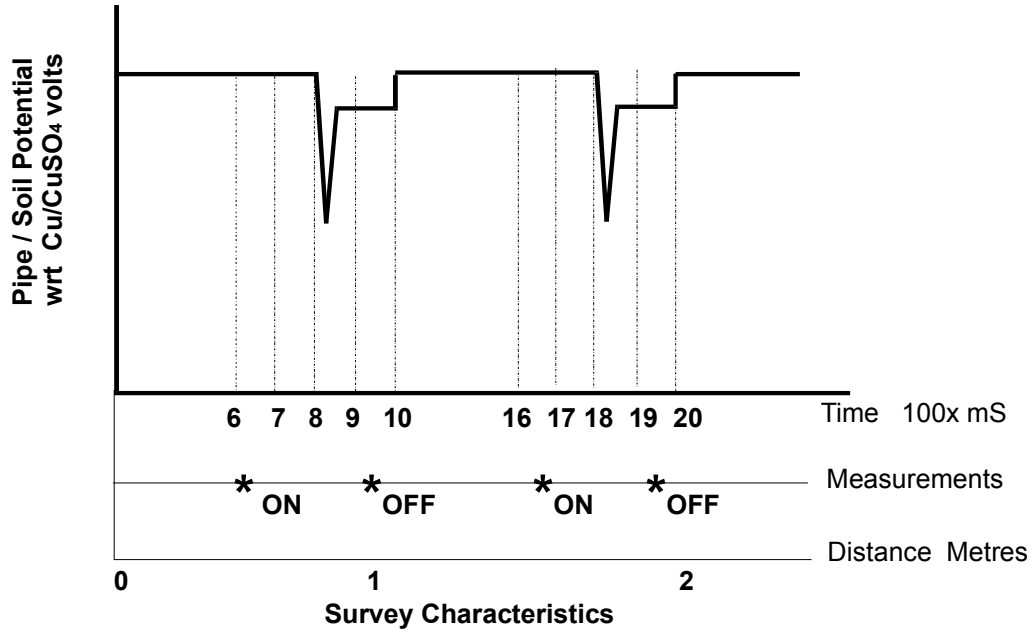


Fig 5
Polarised Potential Measurement
with Pipeline Reactance and Switching Spike Effects



Nominal Speed 1 metre / second (3.6km / hour)
ON : OFF Ratio 4:1
OFF Period 0.2 second
ON Period 0.8 second
Measurement spacing. 1 metre nominal
Measure both 'ON' and 'INSTANT OFF' every 1 metre

Fig 6
Typical Combination of 'ON' and 'OFF' Potential Measurements During Fast Survey

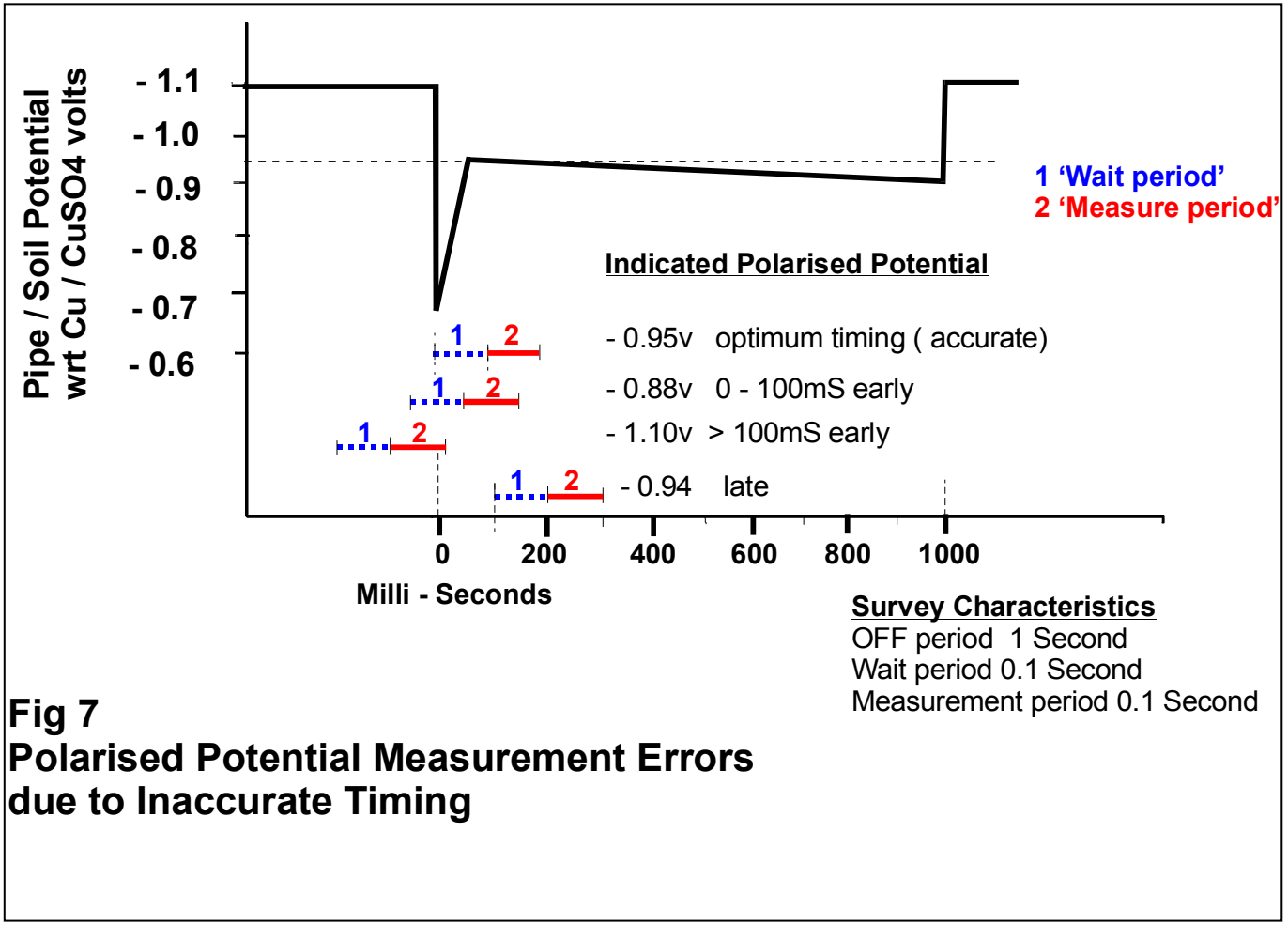


Fig 7
Polarised Potential Measurement Errors due to Inaccurate Timing

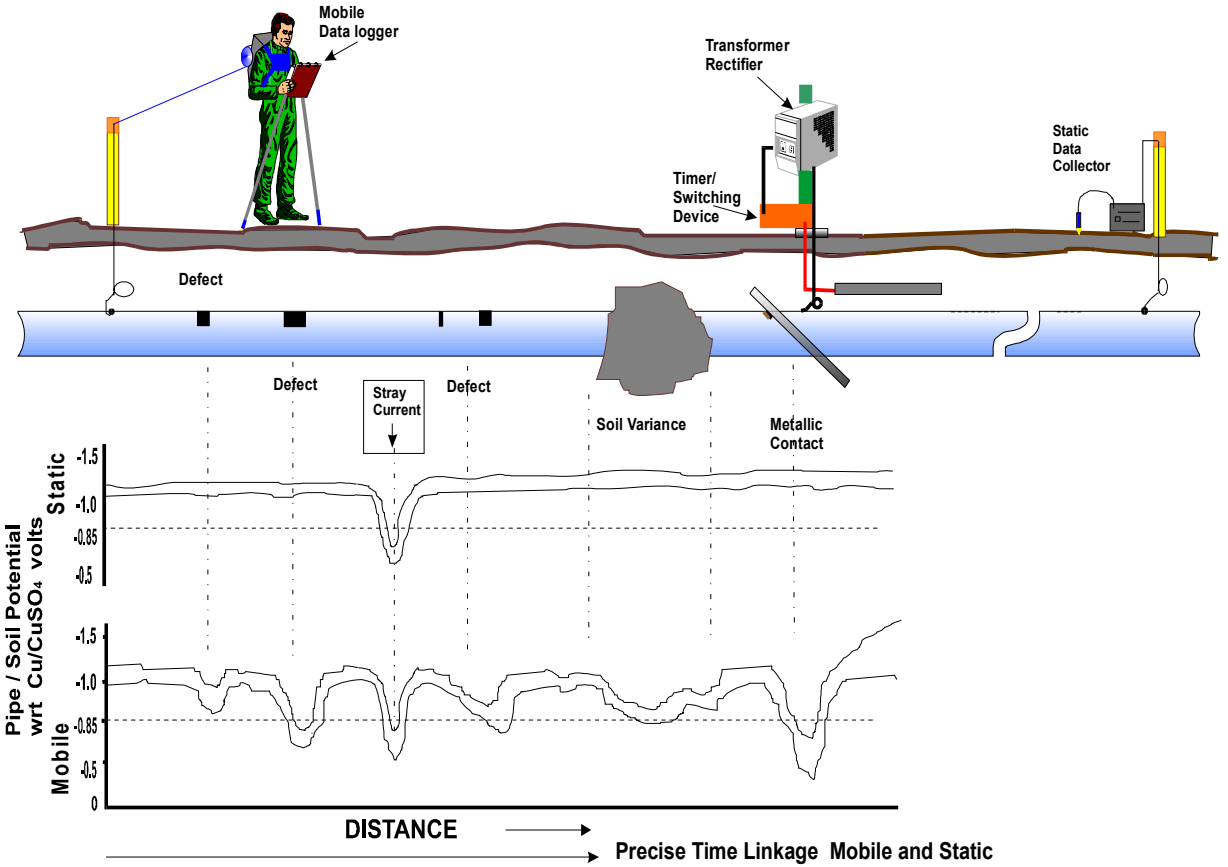


Fig 8
Close Interval Overline Polarised Potential Survey
Mobile + Static + Switching Device

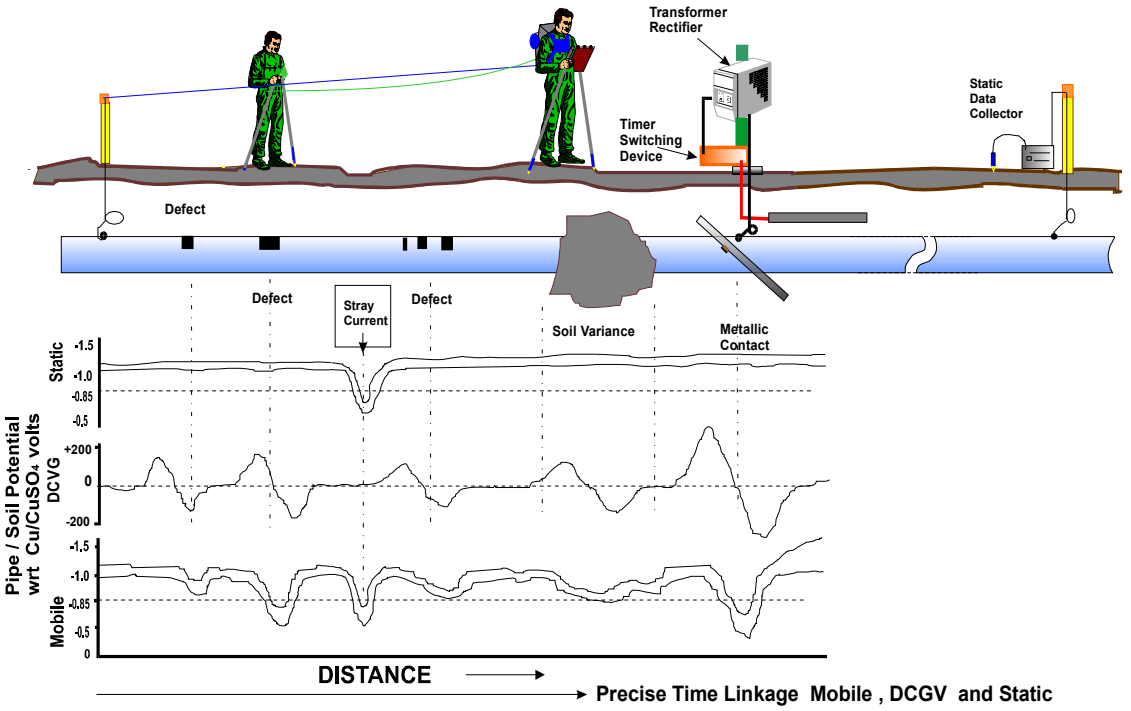


Fig 9
Close Interval Overline Polarised Potential Survey and DCVG
Mobile Data logger + Static + Switching Device

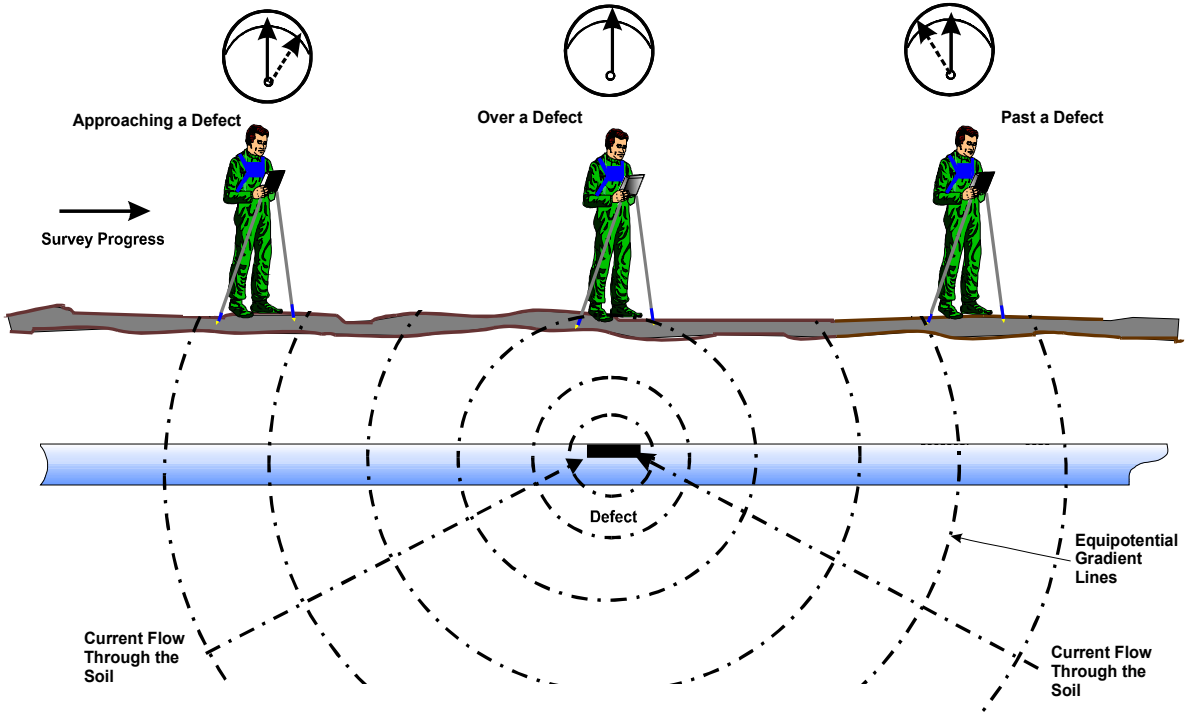
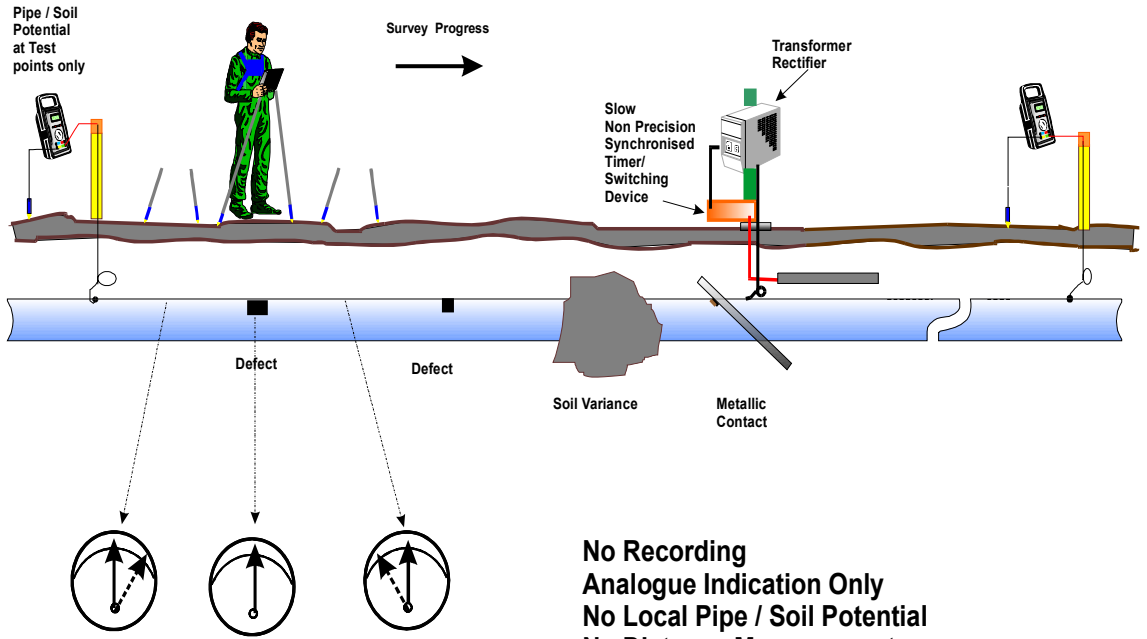
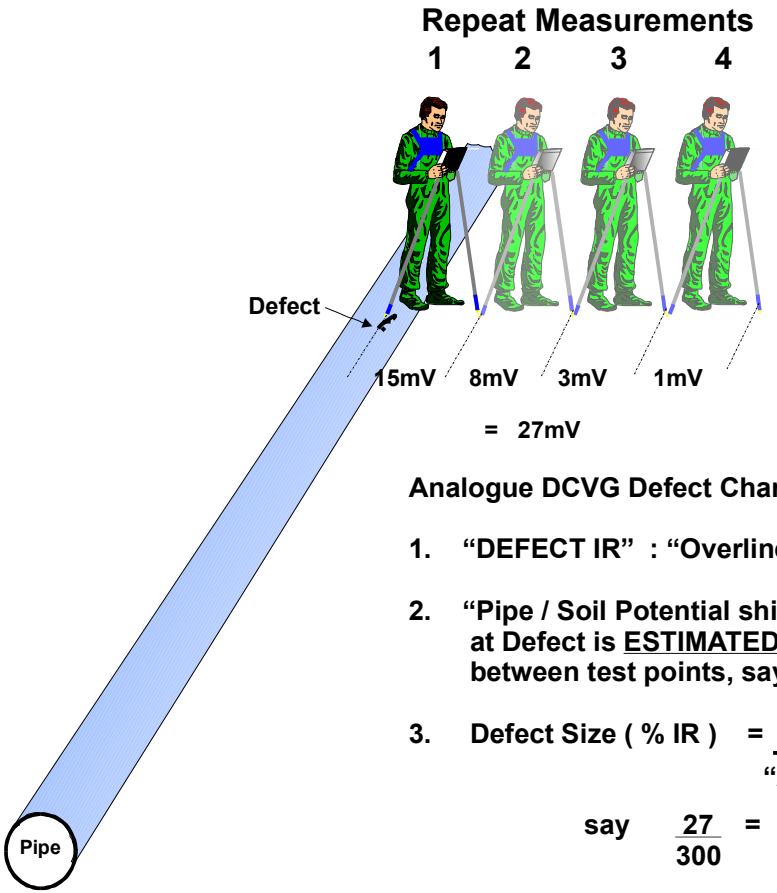


Fig 10
Basis of Analogue DCVG Defect Location.



No Recording
Analogue Indication Only
No Local Pipe / Soil Potential
No Distance Measurement
Peg / Mark and Manually Record

Fig 11
Non Recorded Analogue DCVG



Analogue DCVG Defect Characterisation

1. **"DEFECT IR" : "Overline to Remote Earth" = 27mV.**

2. **"Pipe / Soil Potential shift (ON - OFF) : Applied Signal" at Defect is ESTIMATED as straight line attenuation between test points, say 300mV**

3. **Defect Size (% IR) = " Defect IR" mV / "Applied Signal" mV**

   say 27 / 300 = 9%

Fig 12
Non Recorded Analogue DCVG Defect Characterisation

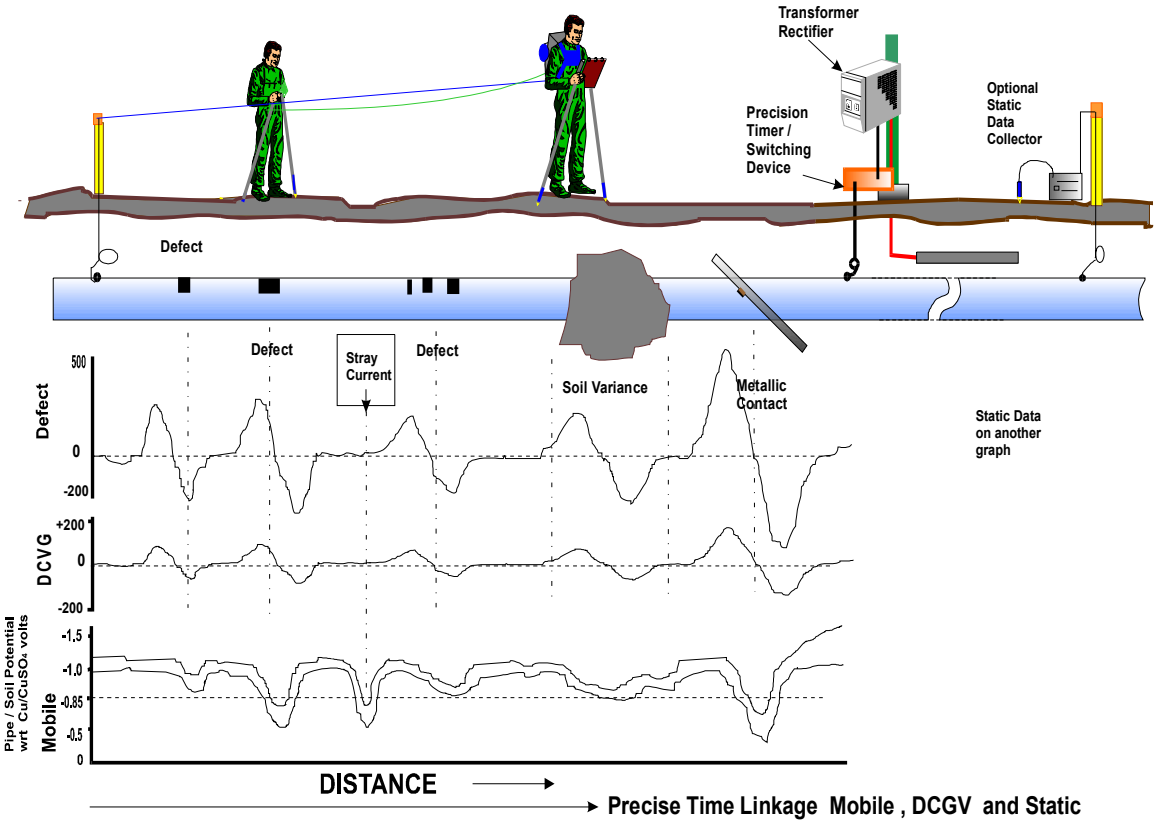
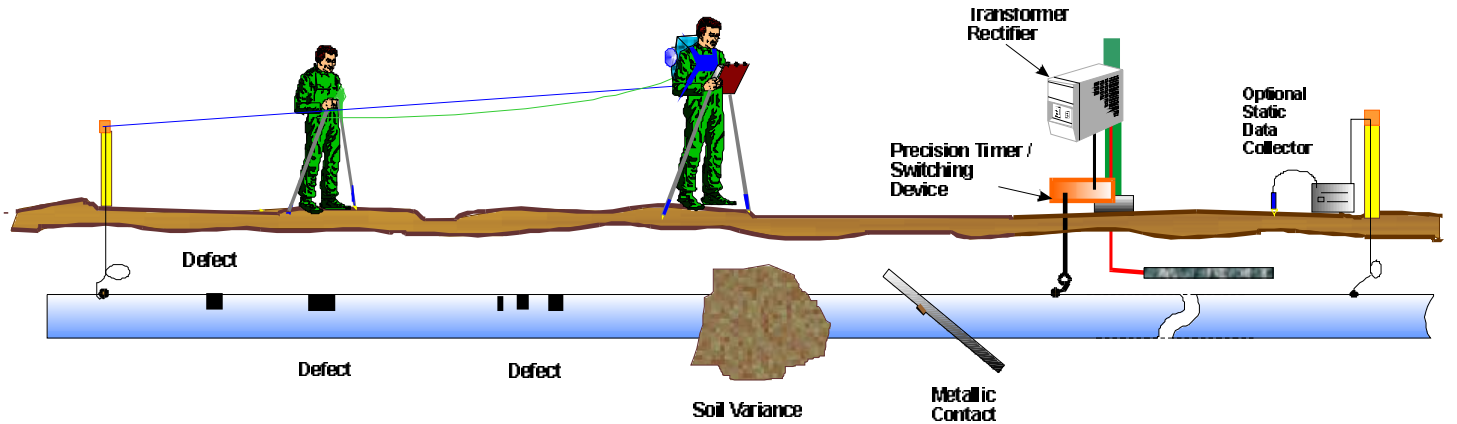


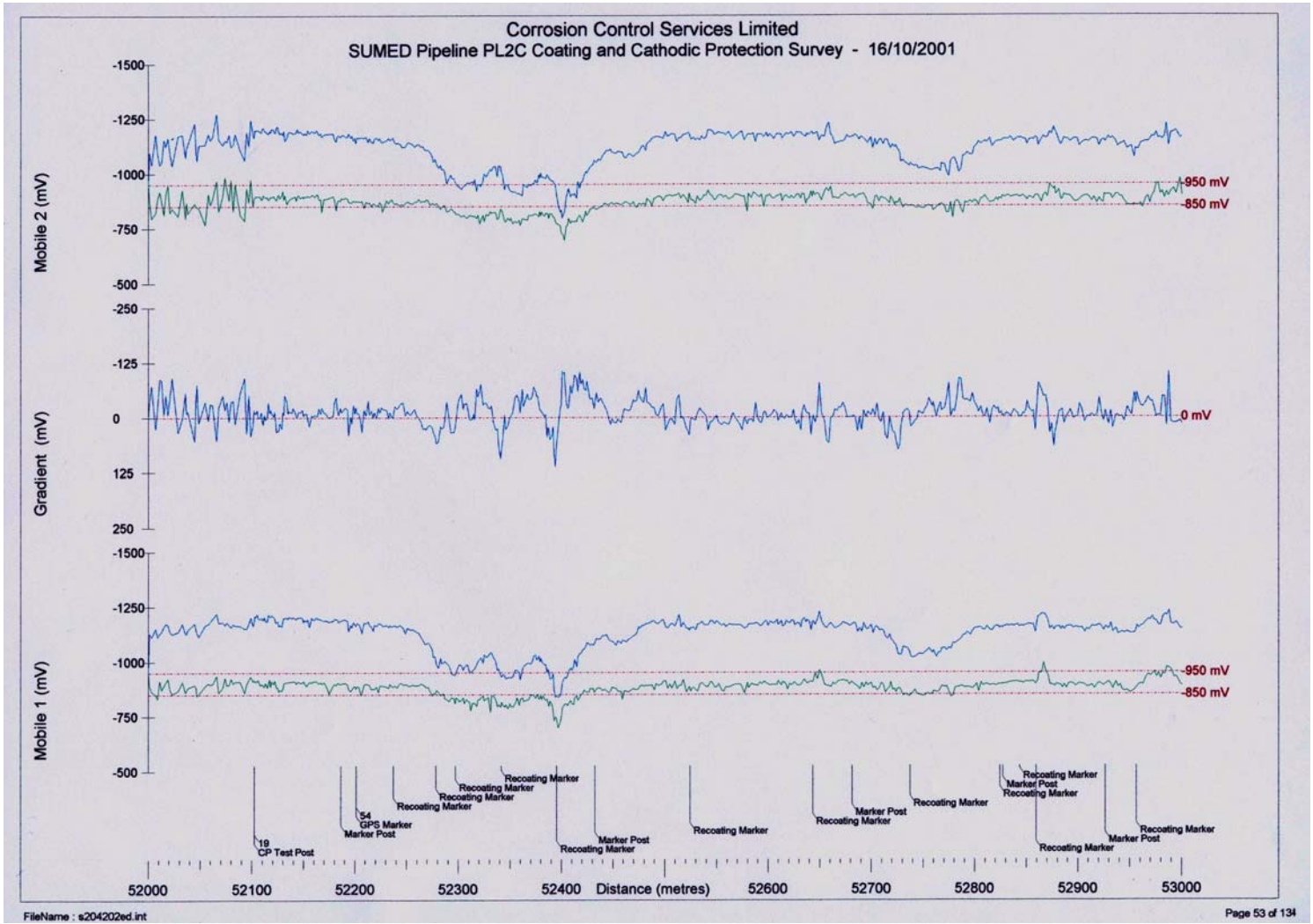
Fig. 13 Combined Enhanced CIPS & Recorded DCVG to Indicate Defect Size.

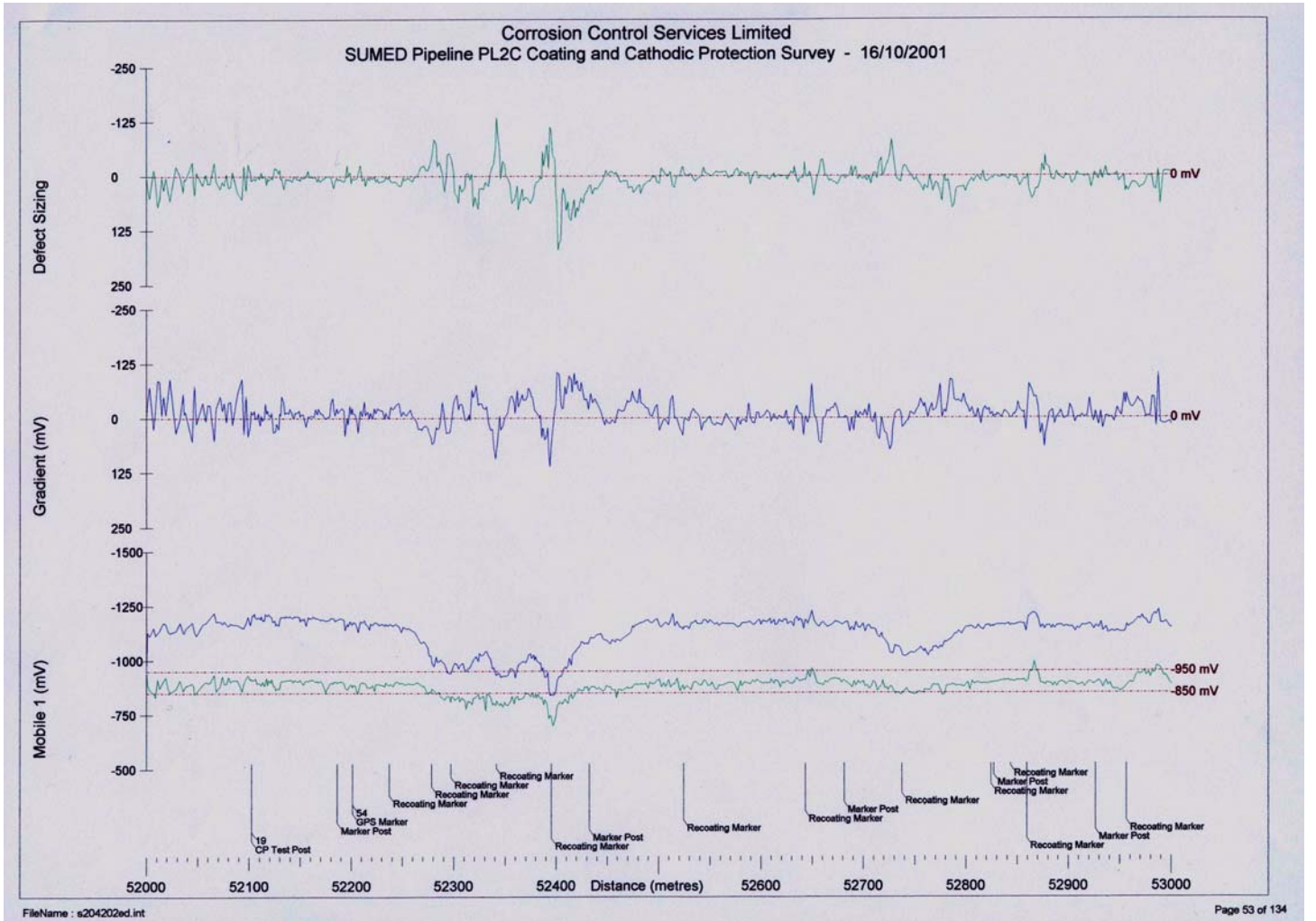


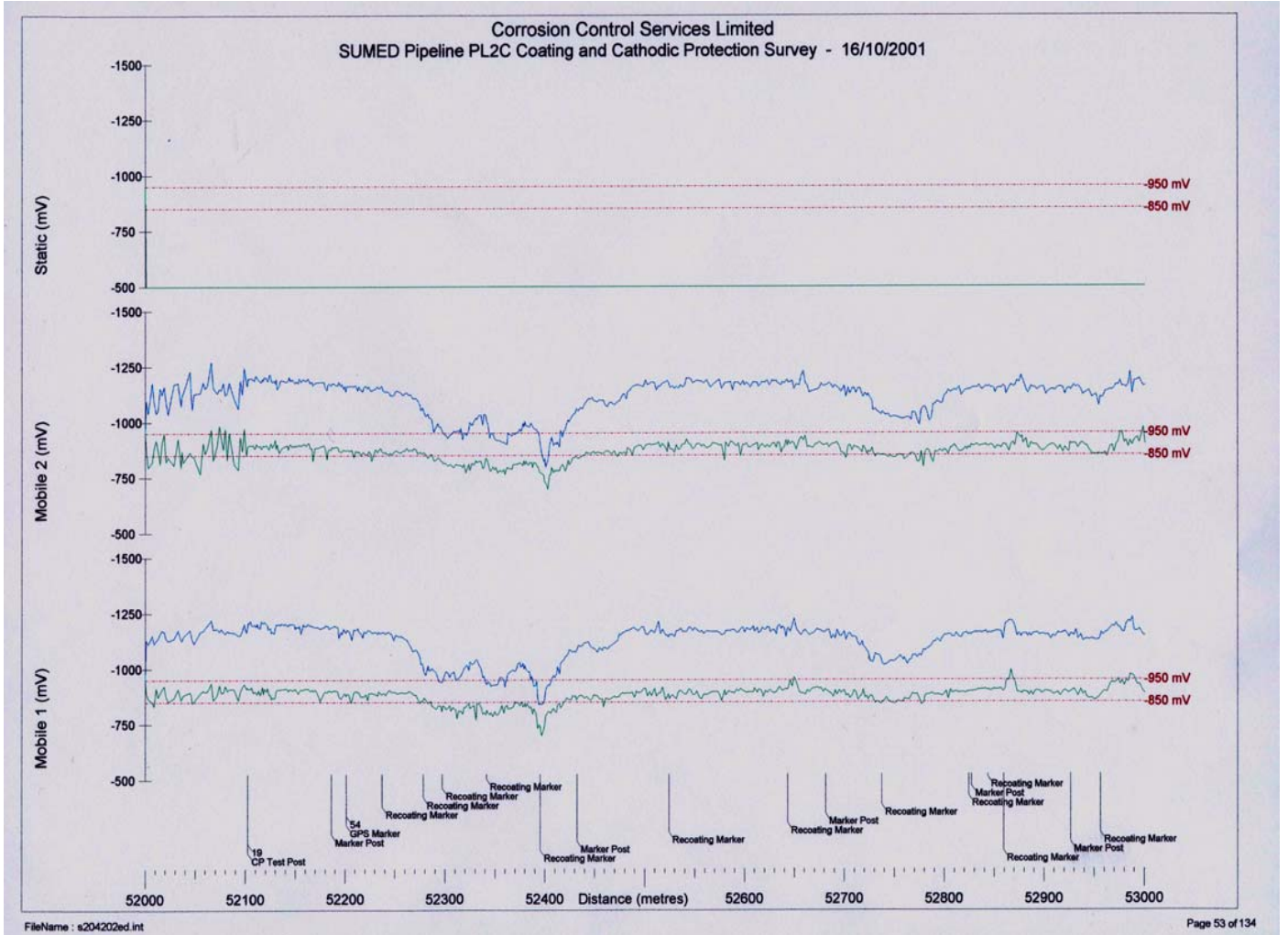
$$\text{Defect Size} \propto \frac{\Delta U \quad \text{FIELD GRADIENT}}{\Delta V \ (\text{ON - OFF}) \ \text{PIPE / SOIL POTENTIAL.}}$$

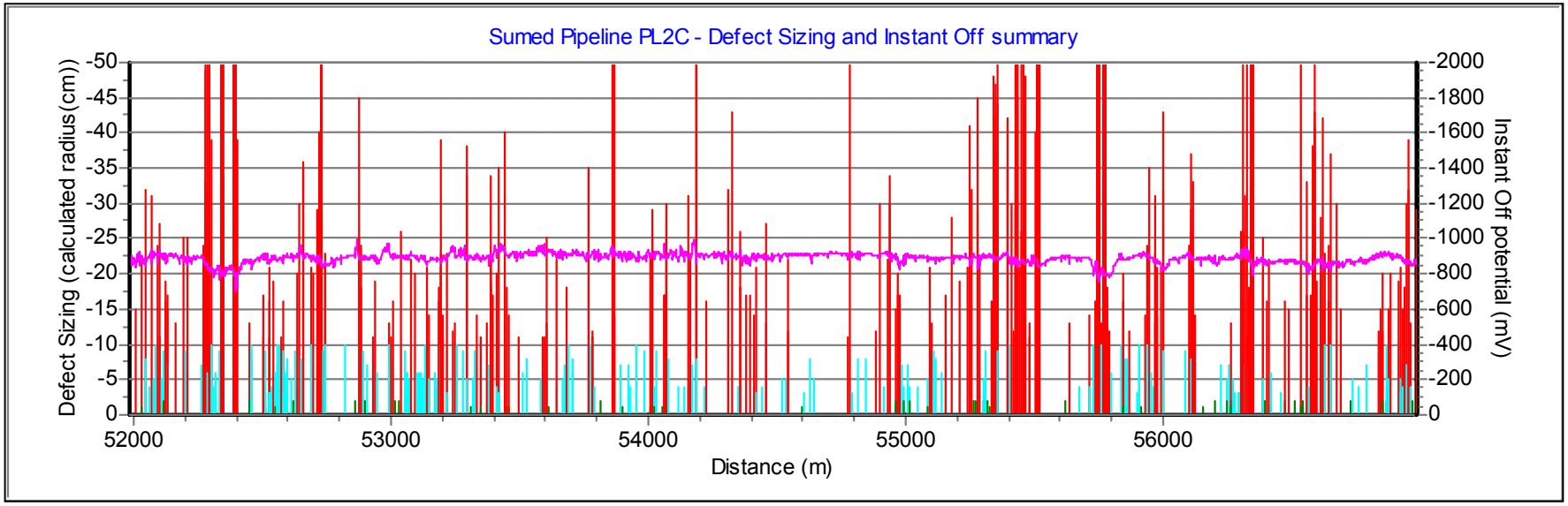
i.e. Similar to DCVG " %IR " But ALL data ACCURATELY measured (not interpolated), Cathodic Protection Status is accurately measured at each defect and location is accurately recorded.

Fig. 14 Combined Enhanced CIPS & Recorded DCVG Defect Characterisation.


Corrosion Control Services Limited
SUMED Pipeline PL2C Coating and Cathodic Protection Survey - 16/10/2001
Mobile 2 (mV)
-1500
-1250
-1000
-750
-500
-950 mV
-850 mV
Gradient (mV)
-250
-125
0
125
250
0 mV
Mobile 1 (mV)
-1500
-1250
-1000
-750
-500
-950 mV
-850 mV
19
CP Test Post
54
GPS Marker
Marker Post
Recoating Marker
Recoating Marker
Recoating Marker
Recoating Marker
Recoating Marker
Marker Post
Recoating Marker
Recoating Marker
Recoating Marker
Marker Post
Recoating Marker
Recoating Marker
Recoating Marker
Marker Post
Recoating Marker
Recoating Marker
Marker Post
Recoating Marker
52000
52100
52200
52300
52400
Distance (metres)
52600
52700
52800
52900
53000


Corrosion Control Services Limited
SUMED Pipeline PL2C Coating and Cathodic Protection Survey - 16/10/2001
Defect Sizing
-250
-125
0
125
250
0 mV
Gradient (mV)
-250
-125
0
125
250
0 mV
Mobile 1 (mV)
-1500
-1250
-1000
-750
-500
-950 mV
-850 mV
19
CP Test Post
54
GPS Marker
Marker Post
Recoating Marker
Recoating Marker
Recoating Marker
Recoating Marker
Recoating Marker
Recoating Marker
Marker Post
Recoating Marker
Recoating Marker
Recoating Marker
Marker Post
Recoating Marker
Recoating Marker
Recoating Marker
Marker Post
Recoating Marker
Recoating Marker
Marker Post
Recoating Marker
52000
52100
52200
52300
52400
Distance (metres)
52600
52700
52800
52900
53000


Corrosion Control Services Limited
SUMED Pipeline PL2C Coating and Cathodic Protection Survey - 16/10/2001
Static (mV)
Mobile 2 (mV)
Mobile 1 (mV)
-1500
-1250
-1000
-750
-500
-950 mV
-850 mV
19
CP Test Post
54
GPS Marker
Marker Post
Recoating Marker
Marker Post
Recoating Marker
52000
52100
52200
52300
52400
Distance (metres)
52600
52700
52800
52900
53000


Sumed Pipeline PL2C - Defect Sizing and Instant Off summary
Defect Sizing (calculated radius(cm))
-50
-45
-40
-35
-30
-25
-20
-15
-10
-5
0
Instant Off potential (mV)
-2000
-1800
-1600
-1400
-1200
-1000
-800
-600
-400
-200
0
52000
53000
54000
55000
56000
Distance (m)