

# Morphett Creek Main Line Valve Coating Assessment Report

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**Contents**

1 Introduction ..... 1

2 Method ..... 1

3 Results..... 1

    3.1 DCVG ..... 1

    3.2 Coating Inspection ..... 2

    3.3 Metal loss ..... 2

    3.4 LRUT ..... 2

4 Discussion..... 3

5 Recommendation..... 3

6 Conclusion..... 4

Appendix 1 MLV Layout. .... 5

Appendix 2 Coating Damage Assessment Forms ..... 6

Appendix 3 Photo Log ..... 7

Appendix 4 LRUT ..... 0



## 1 Introduction

Direct Current Voltage Gradient (DCVG) surveys have been conducted at each scraper station along the Amadeus Gas Pipeline (AGP) to give an indication of the condition of the coating at each site. However, the accuracy of these DCVG surveys at the scraper stations is uncertain due to the possibilities of Cathodic Protection (CP) shielding and interactions between different pipe sections.

To correlate the DCVG results to actual defects, 5 scraper stations, 4 Main Line Valves (MLVs) and 9 anchor blocks have been selected to be excavated and to undergo coating assessment. The results of these excavations and coating assessments will help determine the expected condition of the remaining stations and MLV's, and provide key information into the decision to excavate them or not.

Morphett Creek is the second of the MLV sites to be excavated and assessed. This report compares the DCVG results for Morphett Creek to the results of the coating assessment following excavation including Long Range Ultrasonic Testing (LRUT).

After coating assessments had been conducted, the station pipework was cleaned by abrasive blasting and recoated with Luxepoxy, a high build 2 part epoxy coating.

## 2 Method

In April 2012 a DCVG survey was conducted on the Morphett Creek MLV. These results have been included in this report for comparison to determine if there is a correlation between the DCVG survey data and actual coating defects around the MLV.

The Morphett Creek MLV has been excavated and assessed, see Appendix 1. For major defects a coating defect assessment has been conducted, completed coating defect assessment forms are in Appendix 2. Appendix 3 contains any referenced photos and the photo log.

The results of the DCVG survey and the coating defects assessments have been compared to determine if there is a correlation between the DCVG survey and actual coating defects in Section 4 Discussion.

Finally, the LRUT survey results from GL Noble are examined to determine whether there is any metal loss on the pipe within concrete anchor blocks or support blocks.

## 3 Results

### 3.1 DCVG

There was one recorded DCVG result at Morphett Creek MLV. The defect are summarised in Table 1 below. As there is only the single result a plan and elevation drawing is shown in Appendix 1.

Table 1: DCVG Detected Defects

DCVG Defect Number	Section	IR
1	Morphett Creek MLV	0.9 %

Dig up of the Morphett Creek MLV reported the following coating defects of Table 2.

**Table 2: Coating Defects Within Vicinity of DCVG Detected Defects**

DCVG Defect Number	Section	Photo Log / Notes
-	Coating Defect #1	Appendix 3, Photo 1218, 1720, 1747 and 1754. 750mm crack in yellowjacket. No corrosion reported.
-	Coating Defect #2	Appendix 3, Photo 1219, 1721, 1746 and 2017. 620mm crack in yellowjacket. No corrosion reported.
-	Coating Defect #3	Appendix 3, Photo 1220, 1747 and 2017. 820mm crack in yellowjacket. No corrosion reported.
-	Coating Defect #4	Appendix 3, Photo 1221, 1735 and 2019. 810mm crack in yellowjacket. No corrosion reported.
-	Coating Defect #5	Appendix 3, Photo 1222, 1714, 1734 and 1756. 1705mm crack in yellowjacket. No corrosion reported.
-	Coating Defect #6	Appendix 3, Photo 1223, 1715, 1734 and 1756. 1040mm crack in yellowjacket. No corrosion reported.
1	MLV	Appendix 3, Photo 1701, 1702, 1703, 1707, 1708, 1709, 1710, 1711, 2019 Several small areas of coating damage reported on MLV. No corrosion reported.

### **3.2 Coating Inspection**

There were six serious recordings of yellowjacket coating defects around the Morphett Creek MLV, and several small coating defects on the MLV coating itself. The yellowjacket defects were cracks ranging between 620 to 1705mm in length. Unlike at previous sites the canusa sleeves did not present with corrosion however the split in the yellowjacket extended into some of the canusa sleeves. Coating Damage Assessment reports were prepared to document the coating defects for each of the yellowjacket splits and the MLV coating defects, refer to Appendix 2.

### **3.3 Metal loss**

Metal loss was not reported at Morphett Creek MLV.

### **3.4 LRUT**

LRUT was conducted at Morphett Creek MLV from November 25-27, 2012. Extracts from the LRUT report are presented in Appendix 4. The diagram in Appendix 4 shows the setup and location of the LRUT probe when undertaking the test. Two LRUT 'shots' were conducted from the south (Test Point 1, TP1) and north (Test Point 2, TP2) in order to examine the condition of the pipe wall underneath the support blocks.

#### **Test Point 1**

Test Point 1 is the forward LRUT shot at Morphett Creek MLV. The concrete support block begins 2.45m from the sensor head and as shown in the results of Appendix 4 there are no anomalies detected from this point onwards for this shot. The T-piece was detected at 3.16m, a pipe clamp was detected at 3.78m, some minor coating related result at 4.40m and the MLV at 4.58m.



## Test Point 2

Test Point 2 is a forward shot at Tindal looking at the north support block. The concrete support block begins 2.7m from the sensor head as shown in the results of Appendix 4, the T-piece was detected at 3.5m and a reading from the pipe clamp is shown at 4.07m. The MLV was correctly detected at a range of 4.9m. There was no reported coating defect or corrosion evident during blasting.

## 4 Discussion

Comparing the results of DCVG to the areas of dig up, it is possible to compare the results and correlate the DCVG data to areas of coating defects and corrosion. Due to the limited area of pipe which was dug up there are only few results to report.

### DCVG and Coating Defects

There were five significant coating defect found at Morphett Creek MLV, all were cracks in the yellowjacket coating ranging from 620mm to 1705mm in length. Only small traces of CP product build-up within the coating defect suggest that this is the likely cause of the DCVG reading. The canusa sleeves were subject to cracks from the yellowjacket, however did not suffer corrosion as a result as has been found at previous sites.

### DCVG and Metal Loss Defects

Metal loss was not detected at Morphett Creek MLV.

### Coating Condition

As can be seen in photos the yellowjacket pipe coating appeared to be in poor condition. The FBE coating on the MLV was reported to have several small defects and photos indicate some signs of blistering, though not as severe as other sites.

### LRUT

No anomalies were detected at the Morphett Creek MLV.

## 5 Recommendation

Corrosion was not detected within the support blocks at Morphett Creek MLV, nor in any of the areas examined. The condition of the yellowjacket coating found was poor due to five separate cracks ranging from 760mm to 1705mm in length.

The coating was removed, the exposed area of the pipe was blasted and recoated with Luxepoxy, a high build 2 part epoxy coating. No further recommendation is therefore made.



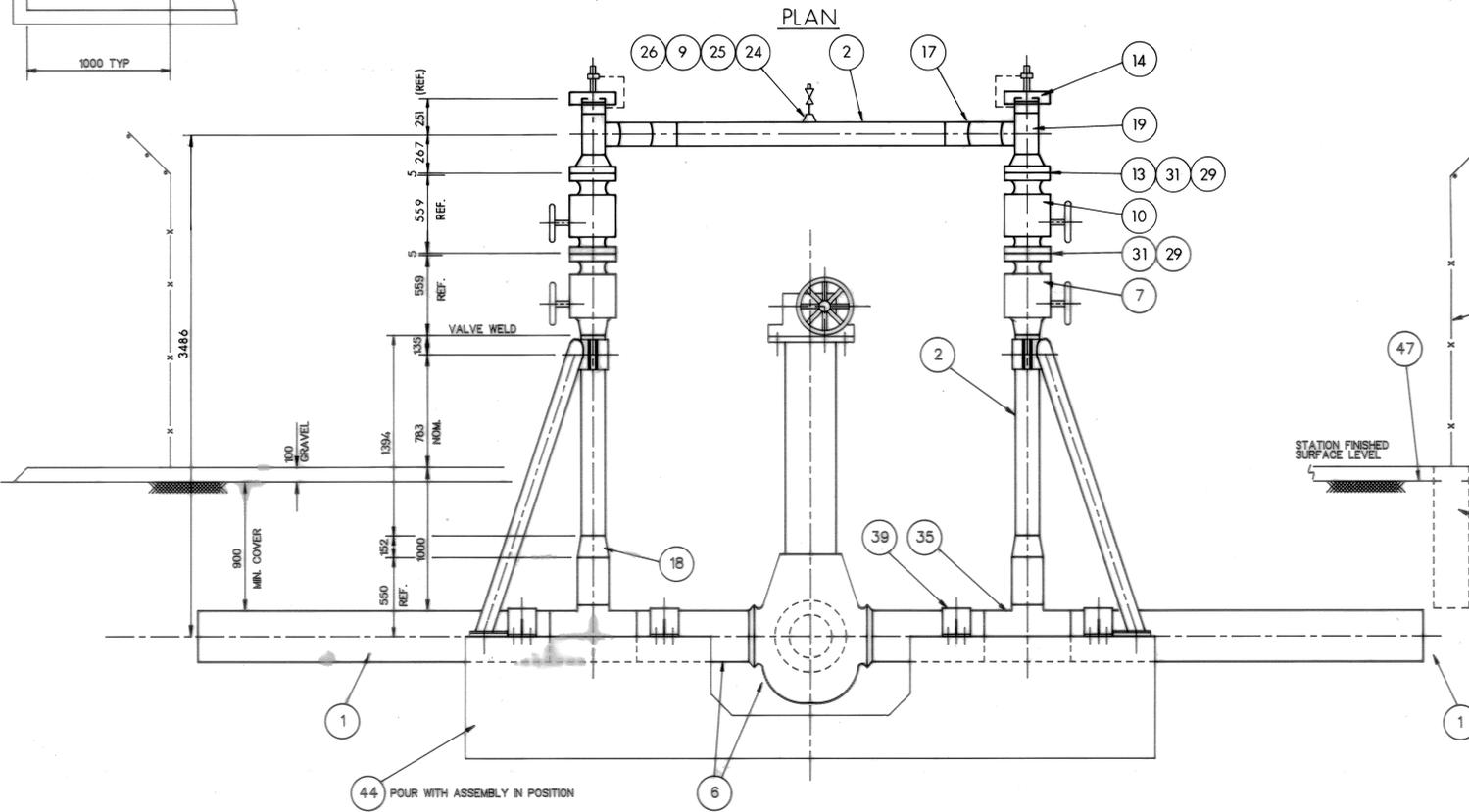
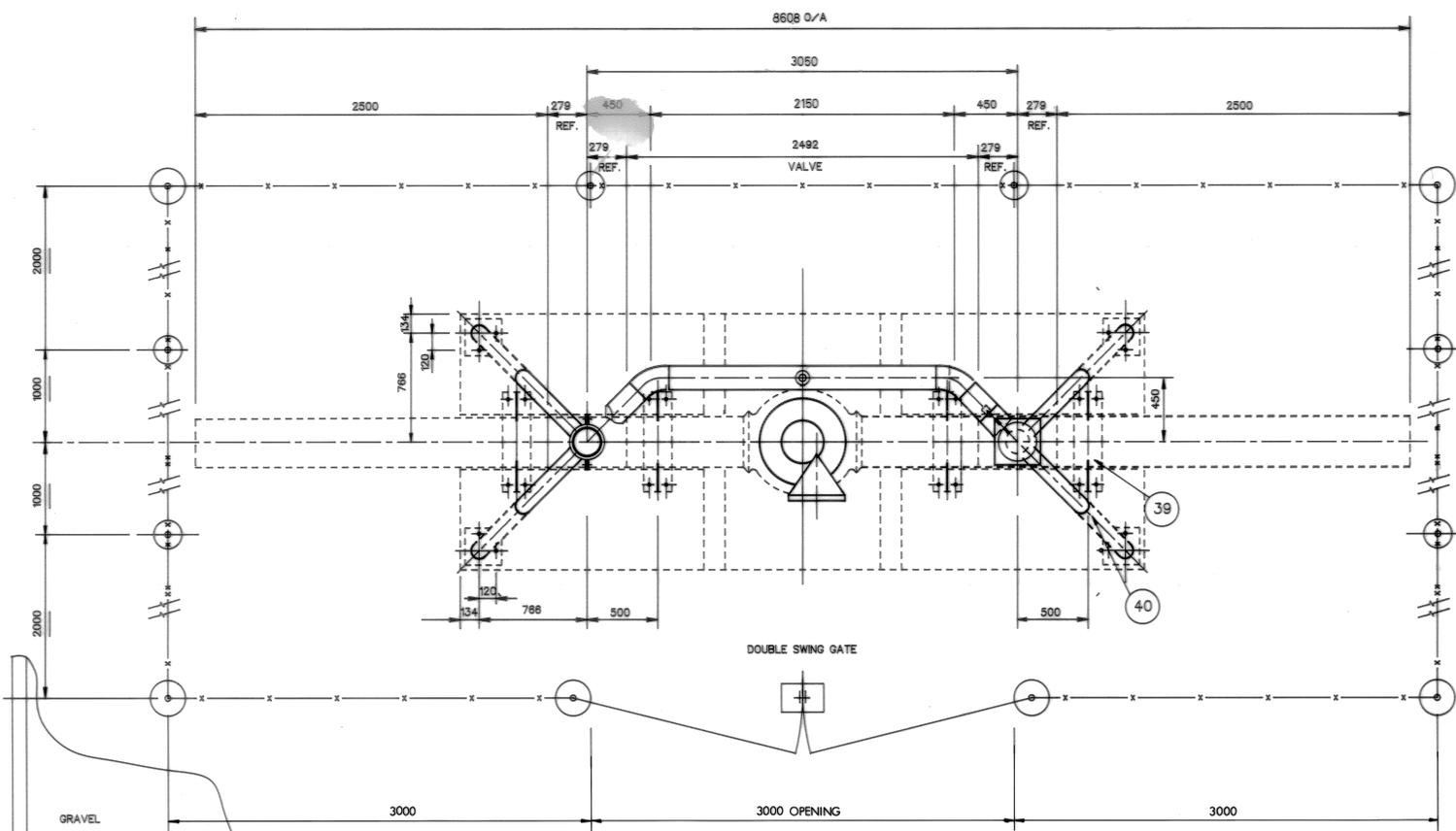
## 6 Conclusion

Due to the limited area of excavation at the site, conclusions on the effectiveness of the DCVG survey cannot be drawn on the basis of this survey alone. The DCVG did however successfully detect the appearance of several large crack defects in the yellowjacket coating around the MLV, though the DCVG reading was extremely small when considering the size of the defects.

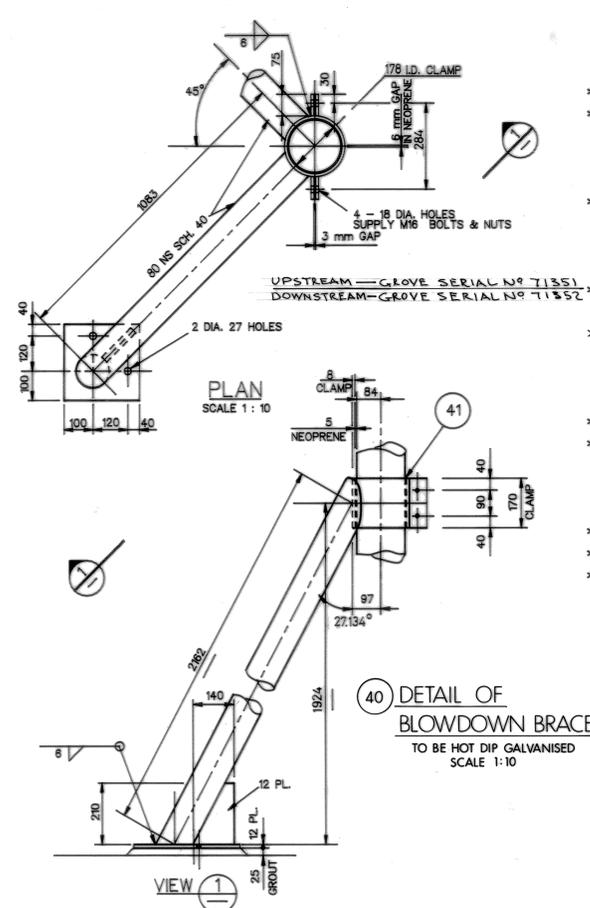
No anomalies were detected using LRUT and no metal loss was detected within the concrete support blocks. The condition of the FBE coating on the MLV was satisfactory with only a small number of defects and blisters reported.



## **Appendix 1      MLV Layout.**

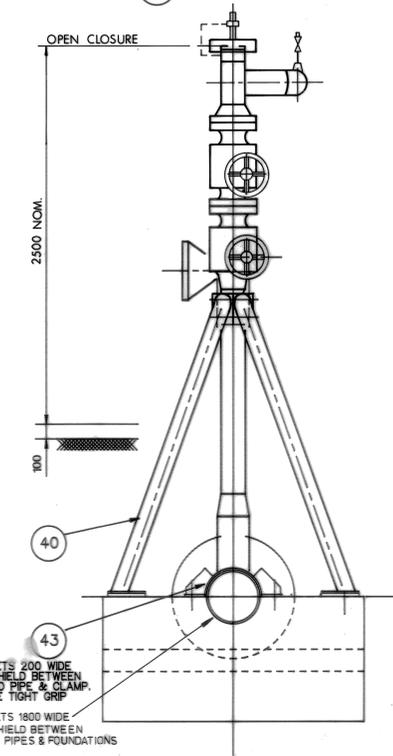


ELEVATION  
SCALE 1:20



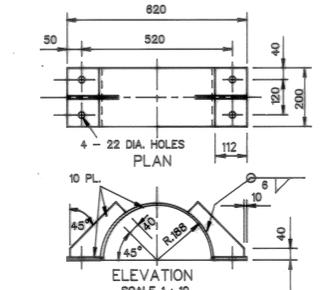
PLAN  
SCALE 1:10

40 DETAIL OF BLOWDOWN BRACE  
TO BE HOT DIP GALVANISED  
SCALE 1:10



END ELEVATION  
SCALE 1:20

BILL OF MATERIAL					CODE NO
ITEM	QTY.	DESCRIPTION			
* INDICATES MATERIAL TO BE SUPPLIED BY PRINCIPAL					
1	5.0m	PIPE	350 NS	8.74 WT	API 5L X 60 00006
2	5.8m	PIPE	150 NS	XS	ASTM A106 B 00064
3					
4					
5					
6	1	VALVE BALL	350 NS	800# WE XS FULL BORE 2492 VA	00180
LGTH. C/W PUPS. GEAR OPERATOR MOUNTED ON EXTENSION 2100 ABOVE @ VALVE GROVE SERIAL NO. 71405					
7	2	VALVE BALL	150 NS	800# FE RF/WE XS	00180
INC. GEAR OPERATOR					
8					
9	1	VALVE BALL	25 NS	800# SW/NPT	00240
10	2	ORBIT BALL VALVE	150NS	600# RF/RF XS INC. GEAR OPERATOR	
11					
12					
13	2	FLGE WN	150 NS	800# RF XS	ASTM A105 00538
14	2	CLOSURE	150 NS	800# WE XS	ASTM A105 00889
VERT C/W DAVIT					
15					
16					
17	2	ELBOW 45°	150 NS	XS	ASTM A234 WPB 00738
18	2	REDUCER CON	200 x 150 NSXS		ASTM A234 WPB 00818
19	2	TEE EQUAL	150 NS	XS	ASTM A234 WPB 00755
20					
21					
22					
23					
24	1	SOL	250-150 x 25 NS	3000#	ASTM A105
25	1	NIPPLE	25 NS x 100 SCH 160 PBE		ASTM A106
26	1	PLUG HEX HD	25 NS	SCR NPT	ASTM A105
27					
28					
29	48	STUBBOLT	1" UNC x 170		ASTM A193 B7
C/W 2 NUTS ASTM A194 2H					
30					
31	4	GASKET	150 NS	800# 4.4mm THK	METAFLEX SG
32					
33					
34					
35	2	TEE RED BAR	350 x 200 NS		DRG No AD0000-6103
36					
37					
38					
39	4	PIPE CLAMP	(FABRICATE AS DETAILED)		
40	2	BLOWDOWN BRACE	(FABRICATE AS DETAILED)		
41	2	NEOPRENE SHEET	- 80 DUROMETER 5 THK 170 x 544		
42					
43	AS REQD	ROCKSHIELD	5mm THK		
44	1	FOUNDATION	DRG No AD0000-1002		
45	1 SET	FENCE 2 RAIL TYPE	2.29m HIGH INCL 45° OVERHANG 30m O/A LENGTH COMPRISING 4 CORNER, 2 GATE & 6 INTERM POSTS, DOUBLE GATE 3.0m OPENING WITH DROP BOLTS & LOCK, CHAINWIRE MESH, BARB WIRES - GALVANISED CYCLONE OR EQUIV.		
46	1 SET	FENCE FOUNDATIONS	COMPRISING 6 / 250 DIA x 1010 DEEP CORNER/GATE POST FOOTINGS, 6 / 200 DIA x 710 DEEP INTERM. POST FOOTINGS ONE 300 x 200 x 200 DEEP GATE PAD WITH 2 HOLES FOR DROP BOLTS - 20 MPa MASS CONCRETE		
47	90m <sup>2</sup>	POLYTHENE SHEET	0.1 mm THK (COVER AREA GIVEN)		
48	9m <sup>3</sup>	GRAVEL GRADED	(COMPACTED VOLUME GIVEN)		



39 DETAIL OF PIPE CLAMP  
TO BE HOT DIP GALVANISED

APPROVED FOR CONSTRUCTION

AS BUILT

ASD9006142

INFORMATION CONFIDENTIAL: ALL PLANS, DRAWINGS, SPECIFICATIONS AND OR INFORMATION CONTAINED HEREIN OR FURNISHED HERewith ARE AND SHALL REMAIN THE PROPERTY OF WILLIAMS BROTHERS CMPS ENGINEERS AND SHALL BE HELD CONFIDENTIAL AND SHALL NOT BE USED FOR ANY PURPOSE OR PURPOSES OTHER THAN THOSE FOR WHICH THEY HAVE BEEN SUPPLIED OR PREPARED.

DWG. No.	REFERENCE DRAWINGS
AD0000-7013	P & I DIAGRAM

NOTES:

1. ROCKSHIELD TO BE FIXED WITH PLASTIC TIES TO ENSURE TIGHT FIT WITH SURFACE COATING

No.	DATE	REVISION	By	CHKD. ENGR.	ENG. MGR.	PROJ. MGR.	APPD.
1	2-10-89	2 - 150 NS VALVES (ITEM 10) ADDED; ITEM 29 QUANTITY WAS 2; ITEM 31 QUANTITY WAS 2	T.L.				
0	29-1-87	REPRODUCED FROM AD0000-6010 REV. 1, VALVE SERIAL NOS. ADDED.	G.T.				

NT GAS	
NUMBER	REV N
AD0783-6010	1

AMADEUS BASIN TO DARWIN PIPELINE  
MAINLINE VALVE ASSEMBLY k.m. 783.  
350 NS (900 COVER)

WILLIAMS BROTHERS CMPS ENGINEERS  
SYDNEY N.S.W.

SCALE: SCALE 1:20, 1:10 JOB No: 6850-000



## **Appendix 2      Coating Damage Assessment Forms**

KP:

Work Order No:

Form created by Ben Parkin Apr 09  
Approved by Henry Dupal

# COATING DAMAGE ASSESSMENT

Page 1

## Location

Pipeline: ~~MLV~~ Excavation Date: 2/11/2012  
 Section: SOUTH SIDE OF MLV Digup Reason: COATING INSPECTION  
 Kilometre Point: MORPHETT CREEK MLV DCVG Measurement: NIL  
 Zone: \_\_\_\_\_ Defect Length from survey (m): \_\_\_\_\_  
 Easting: \_\_\_\_\_ CMMS Work Order No: 141 153  
 Northing: \_\_\_\_\_  
 Surrounding Description: \_\_\_\_\_  
 (Buildings, drains, etc)

## Photos

Has the camera date and time been set correctly?

Please remember to take both close up (no closer than 500mm) and wide photos.

Description	Time(s) photo taken or viewfinder number
Surrounding landscape	
Site facing increasing chainage	
Site facing decreasing chainage	
Pipe with coating	1218
Pipe with coating removed	1720
Pipe cleaned	1747
Pipe repaired	1754

## Soil and CP

Soil Description (tick one or more from each column):

<input checked="" type="checkbox"/> Sand	<input type="checkbox"/> Fine	<input type="checkbox"/> Dusty
<input checked="" type="checkbox"/> Loam	<input type="checkbox"/> Coarse	<input type="checkbox"/> Dry
<input type="checkbox"/> Clay	<input type="checkbox"/> Gravel	<input checked="" type="checkbox"/> Damp
<input type="checkbox"/> Black	<input type="checkbox"/> Rocky	<input type="checkbox"/> Wet
<input checked="" type="checkbox"/> Red Dirt		

Pipeline Soil Cover Depth (m): 1.3 Soil pH: 6.0  
 Pipe To Soil Potential (V): -1.887 Soil Resistivity (Ohms): PHOTO 1740 Pin Spacing 1.5m

## Coating

Is there a coating defect (Y/N)? Y  
 Coating Description: Any white buildup from cathodic protection (Y/N)? Y  
 Yellow Jacket Any evidence of termite damage (Y/N)? N  
 Sleeve Any moisture inside the coating (Y/N)? N  
 Wrapping Any stress corrosion cracking (Y/N)? N/A If yes, complete APA pipeline damage report  
 FBE Has the coating lifted away from the pipe (Y/N)? N  
 Paint If yes, how far around the pipe has it lifted (mm)? \_\_\_\_\_  
 Sketch of coating / corrosion damage completed (Y/N)? \_\_\_\_\_

Coating Defect Length (mm): 750 Coating Defect Width (mm): 10

Coating Defect Comments:

YELLOW JACK SPLIT STARTING AT CANUSA SLEEVE.  
COATING DEFECT # 1

**Metal Loss**

Is there any deformation of the pipe (dent, gouge or not round) (Y/N)?

N

If Yes, Engineering must be contacted IMMEDIATELY.

Is there any metal loss (Y/N)?

N

If there is any metal loss, complete the remaining section of this form and contact Engineering IMMEDIATELY.

The following measurements should indicate whether defects INTERACT

Interaction Rules:

1. Consider each defect as a rectangular box.
2. Draw a larger box around each defect, extending length and width as per Figure 1.
3. IF BOTH larger boxes intersect with the original defect boxes, the defects interact.
4. The dimensions reported on this form are the dimensions of the defect after interaction - dimensions A and B as shown in Figure 1.

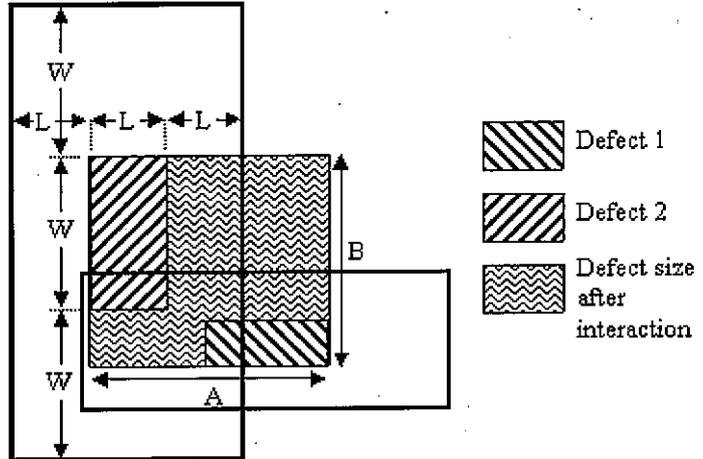


Figure 1

Maximum Depth (mm):

Wall thickness (mm):

Longitudinal dimension (A) (mm):

Circumferential dimension (B) (mm):

Clock Position (looking in direction of flow):

Distance from longitudinal weld (mm):

Distance from nearest girth weld (mm):  
(if no girth weld has been found, do not excavate further)

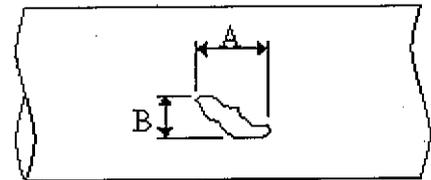


Figure 2

**Repair**

Length of Pipe Wrapped (mm): \_\_\_\_\_

Other Repair Information:

ENTIRE PIPE OUT TO 5M FROM MLV PAINTED WITH LUXAROX UHB

Dig Up Comments:

SOME SMALL STONES IN SOIL, SOIL DAMP.

Operator: Wayne Duff

Signature: [Signature]

Date: 22/11/2012

KP:

Work Order No:

Form created by Ben Parkin Apr 09  
Approved by Henry Dupal

# COATING DAMAGE ASSESSMENT

Page 1

## Location

Pipeline: \_\_\_\_\_ Excavation Date: 21/11/2012  
 Section: SOUTH OF MLV Digup Reason: COATING INSPECTION  
 Kilometre Point: MORPHETT CRK MLV DCVG Measurement: NIL  
 Zone: \_\_\_\_\_ Defect Length from survey (m): \_\_\_\_\_  
 Easting: \_\_\_\_\_ CMMS Work Order No: 141 153  
 Northing: \_\_\_\_\_  
 Surrounding Description: \_\_\_\_\_  
 (Buildings, drains, etc)

## Photos

Has the camera date and time been set correctly?

Please remember to take both close up (no closer than 500mm) and wide photos.

Description	Time(s) photo taken or viewfinder number
Surrounding landscape	
Site facing increasing chainage	
Site facing decreasing chainage	
Pipe with coating	<u>1219</u>
Pipe with coating removed	<u>1721</u>
Pipe cleaned	<u>1746</u>
Pipe repaired	<u>2017</u>

## Soil and CP

Soil Description (tick one or more from each column):

<input type="checkbox"/> Sand	<input type="checkbox"/> Fine	<input type="checkbox"/> Dusty
<input checked="" type="checkbox"/> Loam	<input type="checkbox"/> Coarse	<input type="checkbox"/> Dry
<input type="checkbox"/> Clay	<input type="checkbox"/> Gravel	<input checked="" type="checkbox"/> Damp
<input type="checkbox"/> Black	<input type="checkbox"/> Rocky	<input type="checkbox"/> Wet
<input checked="" type="checkbox"/> Red Dirt		

Pipeline Soil Cover Depth (m): 1.3 Soil pH: 6

Pipe To Soil Potential (V): 1.887 Soil Resistivity (Ohms): PHOTO 1740 Pin Spacing 1.5m

## Coating

Coating Description:  Yellow Jacket  Sleeve  Wrapping  FBE  Paint

Is there a coating defect (Y/N)? Y  
 Any white buildup from cathodic protection (Y/N)? Y  
 Any evidence of termite damage (Y/N)? N  
 Any moisture inside the coating (Y/N)? N  
 Any stress corrosion cracking (Y/N)? N/A If yes, complete APA pipeline damage report  
 Has the coating lifted away from the pipe (Y/N)? N  
 If yes, how far around the pipe has it lifted (mm)? \_\_\_\_\_  
 Sketch of coating / corrosion damage completed (Y/N)? \_\_\_\_\_

Coating Defect Length (mm): 620 Coating Defect Width (mm): 10

Coating Defect Comments:

YELLOW JACKET SPLIT STARTING AT SLEEVE.  
COATING DEFECT # 2.

KP:

Work Order No:

Page 2

**Metal Loss**

Is there any deformation of the pipe (dent, gouge or not round) (Y/N)?

N

If Yes, Engineering must be contacted IMMEDIATELY.

Is there any metal loss (Y/N)?

N

If there is any metal loss, complete the remaining section of this form and contact Engineering IMMEDIATELY.

The following measurements should indicate whether defects INTERACT

Interaction Rules:

1. Consider each defect as a rectangular box.
2. Draw a larger box around each defect, extending length and width as per Figure 1.
3. IF BOTH larger boxes intersect with the original defect boxes, the defects interact.
4. The dimensions reported on this form are the dimensions of the defect after interaction - dimensions A and B as shown in Figure 1.

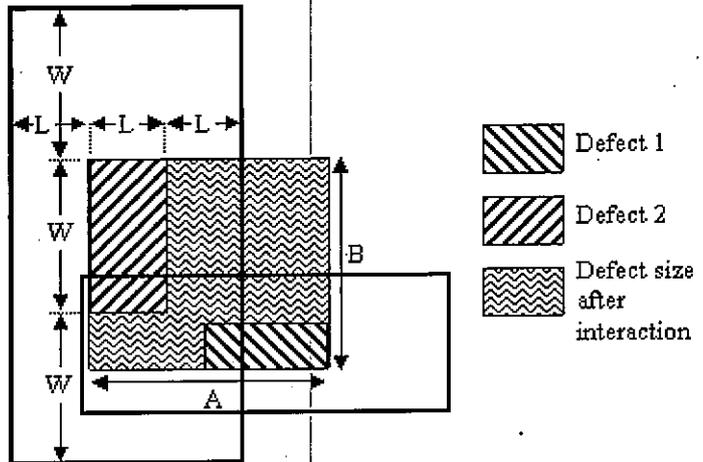


Figure 1

Maximum Depth (mm):

\_\_\_\_\_

Wall thickness (mm):

\_\_\_\_\_

Longitudinal dimension (A) (mm):

\_\_\_\_\_

Circumferential dimension (B) (mm):

\_\_\_\_\_

Clock Position (looking in direction of flow):

\_\_\_\_\_

Distance from longitudinal weld (mm):

\_\_\_\_\_

Distance from nearest girth weld (mm):  
(if no girth weld has been found, do not excavate further)

\_\_\_\_\_

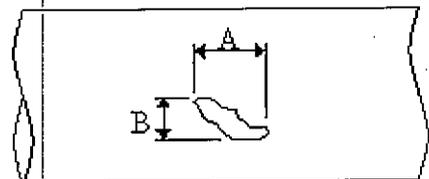


Figure 2

**Repair**

Length of Pipe Wrapped (mm): \_\_\_\_\_

Other Repair Information:

5 M OUT FROM MLV PAINTIEN WITH LUXAPOXY UHB.

Dig Up Comments:

SOME SMALL STONIE IN SOIL, SOIL DAMP.

Operator: *Amre Dilly*

Signature: *[Signature]*

Date: 22/11/2012

KP:

Work Order No:

Form created by Ben Parkin Apr 09  
Approved by Henry Dupal

# COATING DAMAGE ASSESSMENT

Page 1

## Location

Pipeline: \_\_\_\_\_ Excavation Date: 21/11/2012  
 Section: SOUTH OF MLV Digup Reason: COATING DEFECT  
 Kilometre Point: MORPHETT CRK MLV DCVG Measurement: NIL  
 Zone: \_\_\_\_\_ Defect Length from survey (m): \_\_\_\_\_  
 Easting: \_\_\_\_\_ CMMS Work Order No: 141 153  
 Northing: \_\_\_\_\_

Surrounding Description: \_\_\_\_\_  
 (Buildings, drains, etc)

## Photos

Has the camera date and time been set correctly?

Please remember to take both close up (no closer than 500mm) and wide photos.

Description	Time(s) photo taken or viewfinder number
Surrounding landscape	
Site facing increasing chainage	
Site facing decreasing chainage	
Pipe with coating	<u>1220</u>
Pipe with coating removed	<u>PIPE WAS ABRASIVE BLASTED BEFORE PHOTOS TAKEN.</u>
Pipe cleaned	<u>1747</u>
Pipe repaired	<u>2017</u>

## Soil and CP

Soil Description (tick one or more from each column):

<input type="checkbox"/> Sand	<input type="checkbox"/> Fine	<input type="checkbox"/> Dusty
<input checked="" type="checkbox"/> Loam	<input type="checkbox"/> Coarse	<input type="checkbox"/> Dry
<input type="checkbox"/> Clay	<input type="checkbox"/> Gravel	<input checked="" type="checkbox"/> Damp
<input type="checkbox"/> Black	<input type="checkbox"/> Rocky	<input type="checkbox"/> Wet
<input checked="" type="checkbox"/> Red Dirt		

Pipeline Soil Cover Depth (m): 1-3 Soil pH: 6

Pipe To Soil Potential (V): 1.887 Soil Resistivity (Ohms): PHOTO 1740 Pin Spacing 1.5m

## Coating

Coating Description:

- Yellow Jacket  
 Sleeve  
 Wrapping  
 FBE  
 Paint

Is there a coating defect (Y/N)? Y  
 Any white buildup from cathodic protection (Y/N)? Y  
 Any evidence of termite damage (Y/N)? N  
 Any moisture inside the coating (Y/N)? N  
 Any stress corrosion cracking (Y/N)? N/A If yes, complete APA pipeline damage report  
 Has the coating lifted away from the pipe (Y/N)? N  
 If yes, how far around the pipe has it lifted (mm)? \_\_\_\_\_  
 Sketch of coating / corrosion damage completed (Y/N)? \_\_\_\_\_

Coating Defect Length (mm): 820 Coating Defect Width (mm): 10

Coating Defect Comments:

YELLOW JACKET SPLIT STARTING AT CANUSA SLITTING.  
COATING DEFECT # 3

**Metal Loss**

Is there any deformation of the pipe (dent, gouge or not round) (Y/N)?

N

If Yes, Engineering must be contacted IMMEDIATELY.

Is there any metal loss (Y/N)?

N

If there is any metal loss, complete the remaining section of this form and contact Engineering IMMEDIATELY.

The following measurements should indicate whether defects INTERACT

Interaction Rules:

1. Consider each defect as a rectangular box.
2. Draw a larger box around each defect, extending length and width as per Figure 1.
3. IF BOTH larger boxes intersect with the original defect boxes, the defects interact.
4. The dimensions reported on this form are the dimensions of the defect after interaction - dimensions A and B as shown in Figure 1.

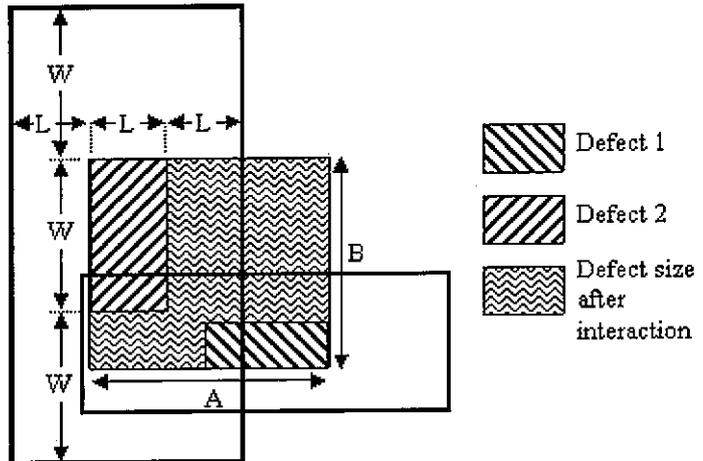


Figure 1

Maximum Depth (mm): \_\_\_\_\_

Wall thickness (mm): \_\_\_\_\_

Longitudinal dimension (A) (mm): \_\_\_\_\_

Circumferential dimension (B) (mm): \_\_\_\_\_

Clock Position (looking in direction of flow): \_\_\_\_\_

Distance from longitudinal weld (mm): \_\_\_\_\_

Distance from nearest girth weld (mm): \_\_\_\_\_  
(if no girth weld has been found, do not excavate further)

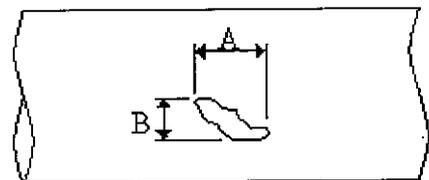


Figure 2

**Repair**

Length of Pipe Wrapped (mm): \_\_\_\_\_

Other Repair Information:

5 M OUT FROM EACH SIDE OF MLW PAINTED WITH LUXA POXY UHB.

Dig Up Comments:

SOIL DAMP, SOME SMALL STONIE

Operator: Wayne Duff

Signature: [Signature]

Date: 22/11/2012

KP:

Work Order No:

Form created by Ben Parkin Apr 09  
Approved by Henry Dupal

# COATING DAMAGE ASSESSMENT

Page 1

## Location

Pipeline: \_\_\_\_\_ Excavation Date: 21/11/2012  
 Section: C NORTH OF MLV Digup Reason: COATING INSPECTION  
 Kilometre Point: MORPHETT CRK MLV DCVG Measurement: NIL  
 Zone: \_\_\_\_\_ Defect Length from survey (m): \_\_\_\_\_  
 Easting: \_\_\_\_\_ CMMS Work Order No: 141 153  
 Northing: \_\_\_\_\_  
 Surrounding Description: \_\_\_\_\_  
 (Buildings, drains, etc)

## Photos

Has the camera date and time been set correctly?

Please remember to take both close up (no closer than 500mm) and wide photos.

Description	Time(s) photo taken or viewfinder number
Surrounding landscape	
Site facing increasing chainage	
Site facing decreasing chainage	
Pipe with coating	<u>1221</u>
Pipe with coating removed	<u>PIPE BLASTED BEFORE PHOTO TAKEN</u>
Pipe cleaned	<u>1747 1735</u>
Pipe repaired	<u>2019</u>

## Soil and CP

Soil Description (tick one or more from each column):

<input type="checkbox"/> Sand	<input type="checkbox"/> Fine	<input type="checkbox"/> Dusty
<input checked="" type="checkbox"/> Loam	<input type="checkbox"/> Coarse	<input type="checkbox"/> Dry
<input type="checkbox"/> Clay	<input type="checkbox"/> Gravel	<input checked="" type="checkbox"/> Damp
<input type="checkbox"/> Black	<input type="checkbox"/> Rocky	<input type="checkbox"/> Wet
<input checked="" type="checkbox"/> Red Dirt		

Pipeline Soil Cover Depth (m): 1-3 Soil pH: 6  
 Pipe To Soil Potential (V): 1.887 Soil Resistivity (Ohms): PHOTO 1740 Pin Spacing 1.5m

## Coating

Coating Description:  Yellow Jacket  Sleeve  Wrapping  FBE  Paint

Is there a coating defect (Y/N)? Y  
 Any white buildup from cathodic protection (Y/N)? Y  
 Any evidence of termite damage (Y/N)? N  
 Any moisture inside the coating (Y/N)? N  
 Any stress corrosion cracking (Y/N)? N/A If yes, complete APA pipeline damage report  
 Has the coating lifted away from the pipe (Y/N)? N  
 If yes, how far around the pipe has it lifted (mm)? \_\_\_\_\_  
 Sketch of coating / corrosion damage completed (Y/N)? \_\_\_\_\_

Coating Defect Length (mm): 810 Coating Defect Width (mm): 10

Coating Defect Comments:

YELLOW JACKET SPLIT STARTING AT CANUSA SLIDING.  
COATING DEFECT # 4

**Metal Loss**

Is there any deformation of the pipe (dent, gouge or not round) (Y/N)?

N

If Yes, Engineering must be contacted IMMEDIATELY.

Is there any metal loss (Y/N)?

N

If there is any metal loss, complete the remaining section of this form and contact Engineering IMMEDIATELY.

The following measurements should indicate whether defects INTERACT

Interaction Rules:

1. Consider each defect as a rectangular box.
2. Draw a larger box around each defect, extending length and width as per Figure 1.
3. IF BOTH larger boxes intersect with the original defect boxes, the defects interact.
4. The dimensions reported on this form are the dimensions of the defect after interaction - dimensions A and B as shown in Figure 1.

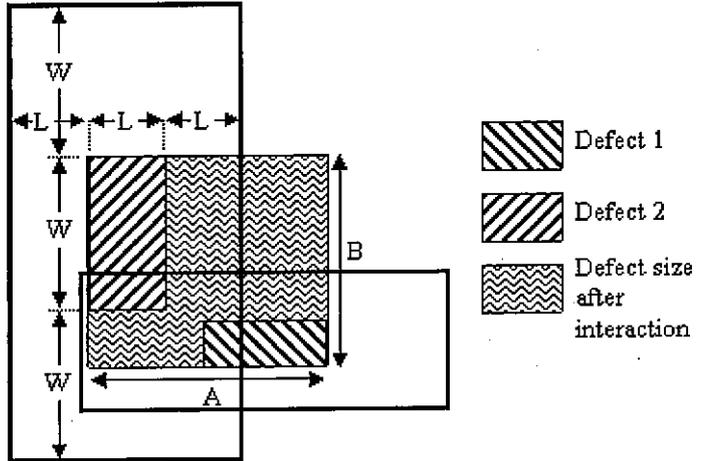


Figure 1

Maximum Depth (mm):

Wall thickness (mm):

Longitudinal dimension (A) (mm):

Circumferential dimension (B) (mm):

Clock Position (looking in direction of flow):

Distance from longitudinal weld (mm):

Distance from nearest girth weld (mm):  
(if no girth weld has been found, do not excavate further)

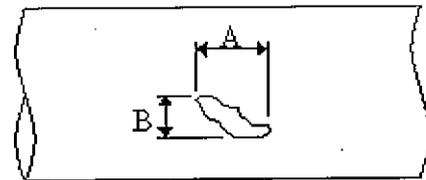


Figure 2

**Repair**

Length of Pipe Wrapped (mm): \_\_\_\_\_

Other Repair Information:

5m OUT FROM EACH SIDE OF MLV PAINTED WITH LUXALOX UHB.

Dig Up Comments:

SOIL DAMP, SOME SMALL STONES

Operator: [Signature]

Signature: [Signature]

Date: 22/11/2012

KP:

Work Order No:

Form created by Ben Parkin Apr 09  
Approved by Henry Dupal

# COATING DAMAGE ASSESSMENT

Page 1

## Location

Pipeline: \_\_\_\_\_ Excavation Date: 21/11/2012  
 Section: NORTH OF MLV Digup Reason: COATING INSPECTION  
 Kilometre Point: MORPHETT CRIC MLV DCVG Measurement: NIL  
 Zone: \_\_\_\_\_ Defect Length from survey (m): \_\_\_\_\_  
 Easting: \_\_\_\_\_ CMMS Work Order No: 141153  
 Northing: \_\_\_\_\_  
 Surrounding Description: \_\_\_\_\_  
 (Buildings, drains, etc)

## Photos

Has the camera date and time been set correctly?

Please remember to take both close up (no closer than 500mm) and wide photos.

Description	Time(s) photo taken or viewfinder number
Surrounding landscape	
Site facing increasing chainage	
Site facing decreasing chainage	
Pipe with coating	<u>1222, 1206</u>
Pipe with coating removed	<del>Pipe Protection 812002 Photo 1714</del> <u>1714</u>
Pipe cleaned	<u>1734, 1735</u>
Pipe repaired	<u>1756</u>

## Soil and CP

Soil Description (tick one or more from each column):

<input type="checkbox"/> Sand	<input type="checkbox"/> Fine	<input type="checkbox"/> Dusty
<input checked="" type="checkbox"/> Loam	<input type="checkbox"/> Coarse	<input type="checkbox"/> Dry
<input type="checkbox"/> Clay	<input type="checkbox"/> Gravel	<input checked="" type="checkbox"/> Damp
<input type="checkbox"/> Black	<input type="checkbox"/> Rocky	<input type="checkbox"/> Wet
<input checked="" type="checkbox"/> Red Dirt		

Pipeline Soil Cover Depth (m): 1.3 Soil pH: 6  
 Pipe To Soil Potential (V): 1.887 Soil Resistivity (Ohms): PHOTO 1740 Pin Spacing 1.5m

## Coating

Coating Description:  Yellow Jacket  Sleeve  Wrapping  FBE  Paint

Is there a coating defect (Y/N)? Y  
 Any white buildup from cathodic protection (Y/N)? N  
 Any evidence of termite damage (Y/N)? N  
 Any moisture inside the coating (Y/N)? N  
 Any stress corrosion cracking (Y/N)? N/A If yes, complete APA pipeline damage report  
 Has the coating lifted away from the pipe (Y/N)? N  
 If yes, how far around the pipe has it lifted (mm)? \_\_\_\_\_  
 Sketch of coating / corrosion damage completed (Y/N)? \_\_\_\_\_

Coating Defect Length (mm): 1705 Coating Defect Width (mm): 10

Coating Defect Comments:

YELLOW JACKET SPLOT STARTING AT CANUSA SLIPPIER  
COATING DEFECT # 5

**Metal Loss**

Is there any deformation of the pipe (dent, gouge or not round) (Y/N)?

N

If Yes, Engineering must be contacted IMMEDIATELY.

Is there any metal loss (Y/N)?

N

If there is any metal loss, complete the remaining section of this form and contact Engineering IMMEDIATELY.

The following measurements should indicate whether defects INTERACT

Interaction Rules:

1. Consider each defect as a rectangular box.
2. Draw a larger box around each defect, extending length and width as per Figure 1.
3. IF BOTH larger boxes intersect with the original defect boxes, the defects interact.
4. The dimensions reported on this form are the dimensions of the defect after interaction - dimensions A and B as shown in Figure 1.

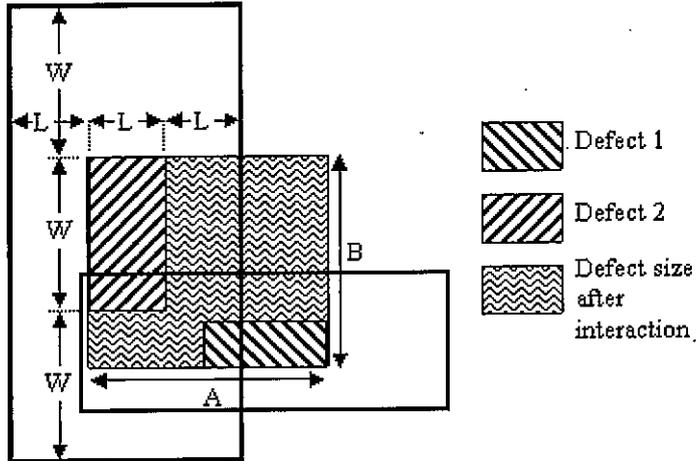


Figure 1

Maximum Depth (mm): \_\_\_\_\_

Wall thickness (mm): \_\_\_\_\_

Longitudinal dimension (A) (mm): \_\_\_\_\_

Circumferential dimension (B) (mm): \_\_\_\_\_

Clock Position (looking in direction of flow): \_\_\_\_\_

Distance from longitudinal weld (mm): \_\_\_\_\_

Distance from nearest girth weld (mm): \_\_\_\_\_  
(if no girth weld has been found, do not excavate further)

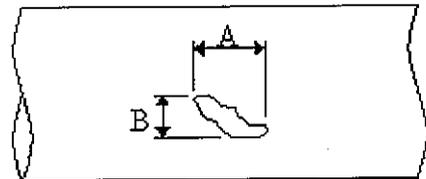


Figure 2

**Repair**

Length of Pipe Wrapped (mm): \_\_\_\_\_

Other Repair Information:

PIPE PAINTED WITH LUXAPOXY UHB FOR 5M OUT FROM MLV

Dig Up Comments:

SOIL DAMP, SOME SMALL STONES

Operator: Wayne Duff

Signature: [Signature]

Date: 23/11/2012

KP:

Work Order No:

Form created by Ben Parkin Apr 09  
Approved by Henry Dupal

# COATING DAMAGE ASSESSMENT

Page 1

## Location

Pipeline: \_\_\_\_\_ Excavation Date: 21/11/2012  
 Section: NORTH 012 MLV Digup Reason: COATING INSPECTION  
 Kilometre Point: MORPHETT CREEK MLV DCVG Measurement: NIL  
 Zone: \_\_\_\_\_ Defect Length from survey (m): \_\_\_\_\_  
 Easting: \_\_\_\_\_ CMMS Work Order No: 141153  
 Northing: \_\_\_\_\_  
 Surrounding Description: \_\_\_\_\_  
 (Buildings, drains, etc)

## Photos

Has the camera date and time been set correctly?

Please remember to take both close up (no closer than 500mm) and wide photos.

Description	Time(s) photo taken or viewfinder number
Surrounding landscape	
Site facing increasing chainage	
Site facing decreasing chainage	
Pipe with coating	<u>1223</u>
Pipe with coating removed	<u>1715</u>
Pipe cleaned	<u>1734</u>
Pipe repaired	<u>1756</u>

## Soil and CP

Soil Description (tick one or more from each column):

<input checked="" type="checkbox"/> Sand	<input type="checkbox"/> Fine	<input type="checkbox"/> Dusty
<input checked="" type="checkbox"/> Loam	<input type="checkbox"/> Coarse	<input type="checkbox"/> Dry
<input type="checkbox"/> Clay	<input type="checkbox"/> Gravel	<input checked="" type="checkbox"/> Damp
<input type="checkbox"/> Black	<input type="checkbox"/> Rocky	<input type="checkbox"/> Wet
<input checked="" type="checkbox"/> Red Dirt		

Pipeline Soil Cover Depth (m): 1.3 Soil pH: 6  
 Pipe To Soil Potential (V): 1.887 Soil Resistivity (Ohms): PHOTO 1740 Pin Spacing 1.5m

## Coating

Coating Description:  Yellow Jacket  Sleeve  Wrapping  FBE  Paint

Is there a coating defect (Y/N)? Y  
 Any white buildup from cathodic protection (Y/N)? Y  
 Any evidence of termite damage (Y/N)? N  
 Any moisture inside the coating (Y/N)? N  
 Any stress corrosion cracking (Y/N)? N/A If yes, complete APA pipeline damage report  
 Has the coating lifted away from the pipe (Y/N)? N  
 If yes, how far around the pipe has it lifted (mm)? \_\_\_\_\_  
 Sketch of coating / corrosion damage completed (Y/N)? \_\_\_\_\_

Coating Defect Length (mm): 1040 Coating Defect Width (mm): 10

Coating Defect Comments:

YELLOW JACKET SPLIT AWAY FROM CANUSA SLIBIEVE.  
NOTE THE IRREGULAR SHARP CUT INTO THE YELLOW JACKET  
WHERE THE SPLIT STARTS FROM.  
COATING DEFECT # 6

**Metal Loss**

Is there any deformation of the pipe (dent, gouge or not round) (Y/N)?

  N  

*If Yes, Engineering must be contacted IMMEDIATELY.*

Is there any metal loss (Y/N)?

  Y  

*If there is any metal loss, complete the remaining section of this form and contact Engineering IMMEDIATELY.*

*The following measurements should indicate whether defects INTERACT*

Interaction Rules:

1. Consider each defect as a rectangular box.
2. Draw a larger box around each defect, extending length and width as per Figure 1.
3. IF BOTH larger boxes intersect with the original defect boxes, the defects interact.
4. The dimensions reported on this form are the dimensions of the defect after interaction - dimensions A and B as shown in Figure 1.

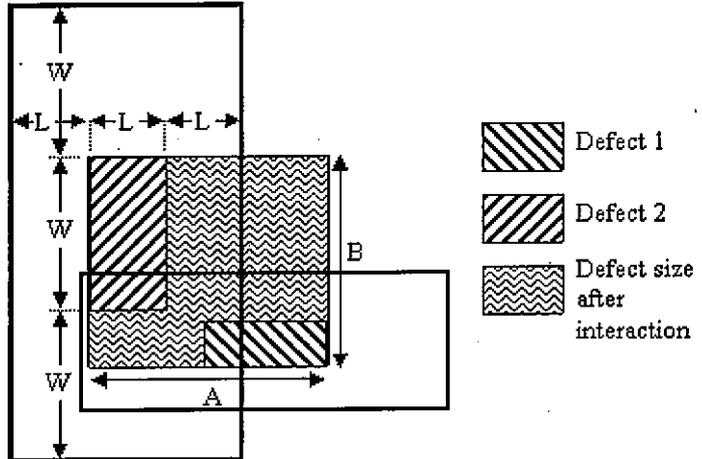


Figure 1

Maximum Depth (mm): \_\_\_\_\_

Wall thickness (mm): \_\_\_\_\_

Longitudinal dimension (A) (mm): \_\_\_\_\_

Circumferential dimension (B) (mm): \_\_\_\_\_

Clock Position (looking in direction of flow): \_\_\_\_\_

Distance from longitudinal weld (mm): \_\_\_\_\_

Distance from nearest girth weld (mm): \_\_\_\_\_  
(if no girth weld has been found, do not excavate further)

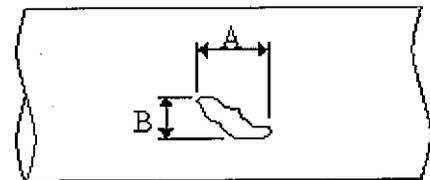


Figure 2

**Repair**

Length of Pipe Wrapped (mm): \_\_\_\_\_

Other Repair Information:

  PIPE COATED WITH LOXAPOXY UH13  

Dig Up Comments:

  SOIL DAMP, SOME SMALL STONES  

Operator:   Wayne Dyff  

Signature:   [Signature]  

Date:   23/11/2012

KP:

Work Order No:

Form created by Ben Parkin Apr 09  
Approved by Henry Dupal

# COATING DAMAGE ASSESSMENT

Page 1

## Location

Pipeline: \_\_\_\_\_  
 Section: MLV  
 Kilometre Point: MORPHETT MLV  
 Zone: \_\_\_\_\_  
 Easting: \_\_\_\_\_  
 Northing: \_\_\_\_\_

Excavation Date: 27/11/2012  
 Digup Reason: COATING INSPECTION  
 DCVG Measurement: 0.9  
 Defect Length from survey (m): \_\_\_\_\_  
 CMMS Work Order No: 141153

Surrounding Description: \_\_\_\_\_  
 (Buildings, drains, etc)

## Photos

Has the camera date and time been set correctly?

Please remember to take both close up (no closer than 500mm) and wide photos.

Description	Time(s) photo taken or viewfinder number
Surrounding landscape	
Site facing increasing chainage	
Site facing decreasing chainage	
Pipe with coating	<u>1701, 1702, 1703</u>
Pipe with coating removed	<u>1707, 1708, 1709, 1710, 1711</u>
Pipe cleaned	<u>" " " " "</u>
Pipe repaired	<u>2019,</u>

## Soil and CP

Soil Description (tick one or more from each column):

<input type="checkbox"/> Sand	<input type="checkbox"/> Fine	<input type="checkbox"/> Dusty
<input checked="" type="checkbox"/> Loam	<input type="checkbox"/> Coarse	<input type="checkbox"/> Dry
<input type="checkbox"/> Clay	<input type="checkbox"/> Gravel	<input checked="" type="checkbox"/> Damp
<input type="checkbox"/> Black	<input type="checkbox"/> Rocky	<input type="checkbox"/> Wet
<input type="checkbox"/> Red Dirt		

Pipeline Soil Cover Depth (m): 1.3 Soil pH: 6.0 PHOTO 1740  
 Pipe To Soil Potential (V): -1.887 Soil Resistivity (Ohms): ✓ Pin Spacing 1.5m

## Coating

Coating Description:

- Yellow Jacket  
 Sleeve  
 Wrapping  
 FBE  
 Paint

Is there a coating defect (Y/N)? ✓  
 Any white buildup from cathodic protection (Y/N)? N  
 Any evidence of termite damage (Y/N)? N  
 Any moisture inside the coating (Y/N)? N  
 Any stress corrosion cracking (Y/N)? If yes, complete APA pipeline damage report N/A  
 Has the coating lifted away from the pipe (Y/N)? N  
 If yes, how far around the pipe has it lifted (mm)? \_\_\_\_\_  
 Sketch of coating / corrosion damage completed (Y/N)? \_\_\_\_\_

Coating Defect Length (mm): \_\_\_\_\_ Coating Defect Width (mm): \_\_\_\_\_

Coating Defect Comments:

SEVERAL SMALL AREAS OVER MLV

KP:

Work Order No:

Page 2

**Metal Loss**

Is there any deformation of the pipe (dent, gouge or not round) (Y/N)?

*N*

If Yes, Engineering must be contacted IMMEDIATELY.

Is there any metal loss (Y/N)?

*N*

If there is any metal loss, complete the remaining section of this form and contact Engineering IMMEDIATELY.

The following measurements should indicate whether defects INTERACT

Interaction Rules:

1. Consider each defect as a rectangular box.
2. Draw a larger box around each defect, extending length and width as per Figure 1.
3. IF BOTH larger boxes intersect with the original defect boxes, the defects interact.
4. The dimensions reported on this form are the dimensions of the defect after interaction - dimensions A and B as shown in Figure 1.

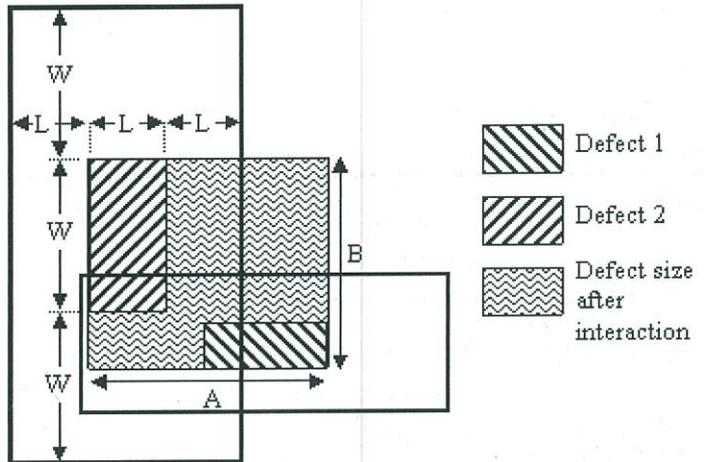


Figure 1

Maximum Depth (mm):

Wall thickness (mm):

Longitudinal dimension (A) (mm):

Circumferential dimension (B) (mm):

Clock Position (looking in direction of flow):

Distance from longitudinal weld (mm):

Distance from nearest girth weld (mm):  
(if no girth weld has been found, do not excavate further)

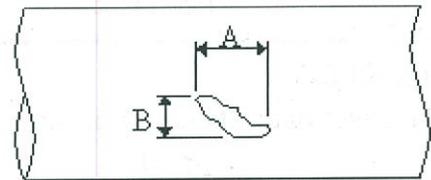


Figure 2

**Repair**

Length of Pipe Wrapped (mm):

Other Repair Information:

*ENTIRE MLV ABRASIVE BLASTED & PAINTED WITH DULUX LUXAPOXY UHB*

Dig Up Comments:

*SOME SMALL ROCKS IN SOIL, SOIL DAMP.  
EXCAVATED APPROXIMATELY 5M PAST COMPOUND FENCH  
ON BOTH NORTH & SOUTH SIDE OF MLV BECAUSE OF SPLIT  
YELLOW JACKET.*

Operator: *Wayne Duff*

Signature: *[Signature]*

Date: *22/11/2012*



## Appendix 3 Photo Log

Photos:

1218

1219

1221

1222

1223

1701

1702

1703

1708

1709

1710

1711

1714

1715

1720

1721

1734

1735

1746

1747

1756

1757

2017

2019

## Appendix 4 LRUT

GL Noble Denton



Client: APA Group (Australia) Pty Ltd  
Job No.: A12A25-1/2

Date Completed : 27<sup>th</sup> November 2012

Location : Northern Territory, Australia  
Page : 8

### INSPECTION REPORTS – Cont'd

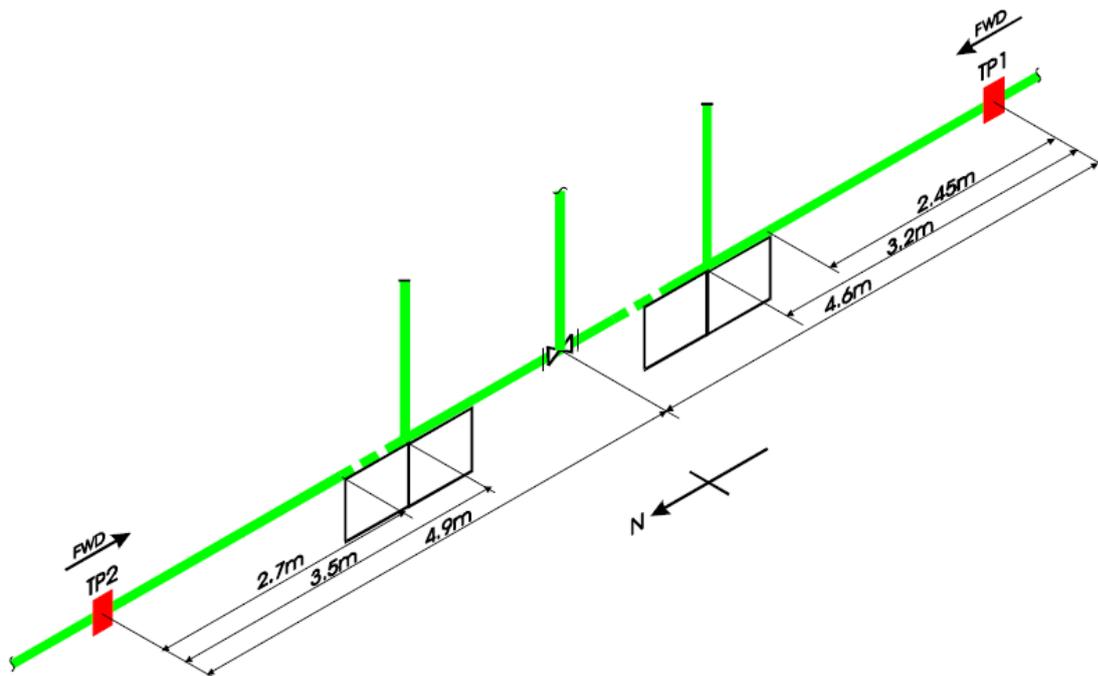
	Date of Insp.	Thickness measured at Head Location (mm)		LRUT Coverage Distance (m)			Anomaly categories			Inspection Findings / Comments / Remarks
		Min	Max	AG	UG	R/C	1	2	3	
<b>Line ID: 14" Morphett creek anchor block (Forward only)</b>										
TP 1	27.11.2012	8.8	9.0	-	4.58	-				No significant findings noted along test length during testing.
<b>Line ID: 14" Morphett creek anchor block (Forward only)</b>										
TP 4	27.11.2012	8.7	9.0	-	4.89	-				No significant findings noted along test length during testing.

Legend: Underground (UG), Aboveground (AG), Road Crossing (RC), NRWT – Net Remaining Wall Thickness

### PIPELINE SCHEMATIC DRAWINGS

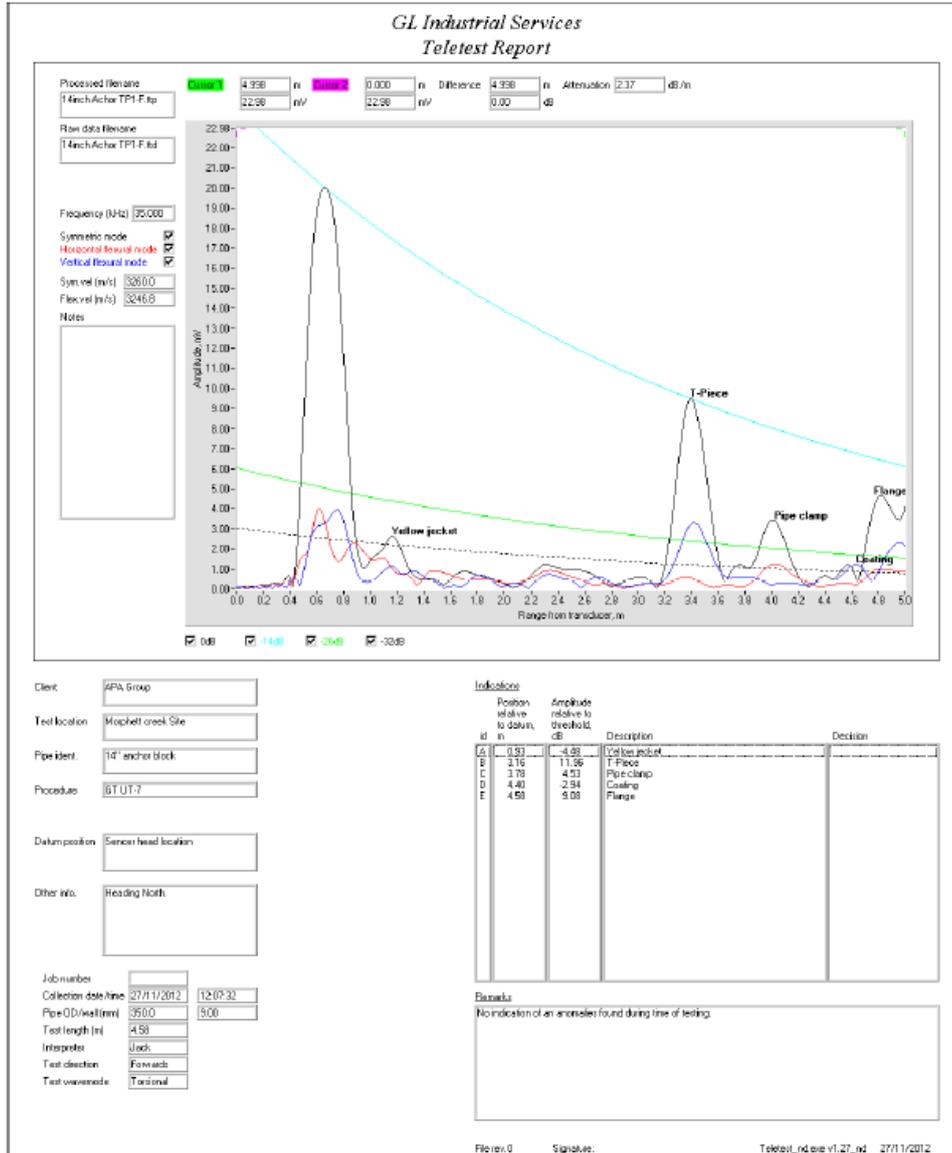
#### Line ID: 14" Morphett creek anchor block

Legend	
	Head Location (TP)
	Valve Fitting



Test Point 1 Line ID: 14" Morphett creek anchor block

(Forward shot only)



Test Point 2 Line ID: 14" Morphett creek anchor block

(Forward shot only)

