BP America Production Co.

In-Water Integrity Management

ATLANTIS

2010 ROV INSPECTION REPORT

January 2011

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Revision	Pages	Description
01		New document
02	All	Document revised throughout based on client comments provided in 1/20/2011 Meeting
	7,14	The CP potential limits are updated to per the anomaly defect reporting criteria.
	9-13	Reported flowline spans are updated based on review of the inspection video
03	10-15, 22	DC1 & DC3 freespan tables updated after video review.
04	All	Updated document number from 3800-RPT-60001 to 3800-RPT-60003 and 1440-57-RAEC-RP-0057 to 1440-57-RAEC-RP-0059 due to error in document register.
	6	Added anomaly on damaged coating during strake cleaning
	15,23	Updated DC1 & DC3 freespan tables per WGIM video review

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1 INTRODUCTION AND SUMMARY

1.1 Introduction

This report details a preliminary review and technical assessment for the 2010 ROV inspection observation for Atlantis Drill Centers 1 (DC1) and 3 (DC3). The scope of this inspection includes the following, as defined in the Atlantis 2010 workscope document [2]:

Component	Count
Wet spools	6
Steel Catenary Risers (SCRs)	6
DC1 Flowlines	6
DC1 Flowline Holdback Anchor	6
DC1 PLETs	6
DC1 Dynamic Umbilicals	9
DC3 Flowlines	1
DC1 Well Jumpers	8
DC1 Flowline Jumpers	9
MAN-1 Pigging Loop	1
Wellheads	27
Total	**85**

Table 1.1 – Atlantis 2010 Planned Component Inspections

The inspection was executed by inspectors, provided by Wood Group Integrity Management (WGIM) and Oceaneering International, under the supervision of BP's In-Water Inspection Execution team. On completion of the inspection, WGIM provided a preliminary observation report [1] detailing the completed scope and highlighting all noted features requiring preliminary review and assessment.

2H Offshore Inc. (2H) is contracted by BP for Integrity Management (IM) services related to the fitness for purpose of in-water equipment [18]. This report documents the preliminary technical review and assessment of the WGIM observation report, including supporting documentation and video, and provides recommendations on which observations require further detailed assessment. The recommendations are based on visual inspection, positional information, and data recorded such as CP readings and span lengths. A cross profiler survey was also conducted on the flowlines. The survey data is currently being processed and will be included in the anomaly closeout process.

Detailed assessment of perceived integrity threats is carried out as part of the ongoing anomaly process [19] and is beyond the scope of this document.

1.2 Summary and Recommendations

The goal of the inspection, to gather information relevant to integrity on the Atlantis in-water equipment, is achieved. In general the systems are found to be in good condition and no observations are reported which indicate the flowline is unfit for service. A number of observations were identified which should be further assessed as part of the ongoing IM program, within the anomaly reporting and resolution process. A brief summary is given below with supporting details provided in the following sections of this document.

Based on recommendations from the Atlantis 2009 IMP [1], 14 RBI driven and 18 anomaly driven inspection activities were planned for the inspection. Of these, all were completed with the exception of 2 RBI driven and 3 anomaly driven activities. These activities comprised inspection requirements for 85 components, of which 1 Jumper was not inspected and 6 wet spools were only partially inspected. The impact of the missed activities is perceived to be low and should be completed during the next planned inspection.

A total of 43 new observations were documented by WGIM, from that five observations are recommended by 2H for further detailed review and assessment.

Following are key recommendations from the inspection findings;

- Conduct strake cleaning and a GVI from EL -40ft to Mean Water Level(MWL).
- 5 identified unstraked flowline spans exceeded the allowable length for VIV and are recommended for VIV checks. 5 identified straked flowline spans have exceeded the as laid span length and static stresses are considered a possible integrity threat. These spans should be re-assessed as appropriate.
- The Flow Assurance Team is recommended to review the insulation coating defects on well and flowline jumpers for thermal integrity.
- Bent locking latches and keepers pins on holdback anchors and Devil's claws are identified. This should be further assessed to determine the root cause and impact.
- The cross profiler data should be further assessed to quantify the extent of flowline lateral movement and unsupported span lengths.

A complete description of the results obtained from the inspection is given in Section 2 on a component wise basis.

The wellhead inspections were requested at the behest of the BP Wells IM group; the observations and data collected for the wellheads are not within the IWIM remit and are therefore reported separately.

2 INSPECTION FINDINGS

2.1 Wet Spools

The wet spools are generally in good condition. All wet spools were inspected from MWL to SCR hang-off. All wet spools were cleaned except from MWL to -40ft due to inclement weather and possible obstruction.

During strake cleaning, multiple strake bands were noted to be missing or corroded by the inspectors along the W2 SCR. This was first observed during the 2008 ROV inspection [16]. The W2 SCR and Flowline are known to have been installed with a combination of carbon steel and Inconel bands. The missing or corroded strake bands are believed to be the carbon steel bands used during installation. In accordance the Production PIP Straking plan [20], the carbon steel bands are expected to corrode and the remaining Inconel would support the strakes. Therefore, no integrity threat is perceived by the corroded or missing bands.

The strake cleaning was performed, as per the inspection workscope [2] with the exception of from EL -40 ft. to the MWL. Adverse weather conditions and access restriction with the adjacent umbilicals prevented inspection and cleaning of the upper wet spool strakes. Anomaly report 3800-ANM-60022 [10] has been raised to track the completion of the outstanding scope.

2.2 SCRs

The infield SCRs and strakes were inspected and reported to be in generally good condition.

In addition to the inspection, strake cleaning was performed from just below the hang-off to approximately 250ft below MSL. Little to no marine growth was noted 250ft below MSL, hence cleaning was determined not to be necessary beyond this depth.

Prior to cleaning, marine growth on the SCR's was recorded, for growth trending, to be less than 1/3rd of the strake fin height with 100% coverage at the hang-off tapering to no marine growth at 250ft below MSL.

During strake cleaning on the W2 riser, sections of the FBE coating were inadvertently removed with the cavitation tool. Two separate areas of approximately 1 square foot were reported to be removed; one on the J-lay collar at 135ft below MSL, and one approximately three feet above the j-lay collar. Anomaly 3800-ANM-60033 [22] has been raised to determine the root cause and if any procedural changes are required. To avoid further damage during this inspection, marine growth was not cleaned where strakes were not present. The measured CP potential is sufficient to prevent external corrosion for the noted feature, hence no remediation is recommended.

Multiple strake gaps were noted on all SCRs. This was first observed during the 2008 ROV inspection [16]. The SCRs are known to have been installed with gaps, and shown to have greater than 90% strake coverage, which is the anomaly threshold. The gaps are unchanged and no deterioration was noted, hence pose no integrity threat.

Multiple missing strake bands were noted on SCR's P, P3 and W2. This was first observed during the 2008 ROV inspection [16]. The SCRs are known to have been installed with a combination of carbon steel and Inconel bands. The missing or corroded strake bands are believed to be the carbon steel bands used during installation. In accordance with the straking plan [20] the carbon steel bands are expected to corrode and the remaining Inconel bands will support the strakes. Therefore, no integrity threat is perceived by the corroded or missing bands.

An area of mechanical damage was noted on the TSA and FBE coating, below the J-lay collar at -1798ft, on the T SCR. The dimensions of the scrape are estimated at 1.5inch width x 3ft long. It is likely that this coating damage has existed for some time since marine growth has covered both the affected and surrounding area. Additionally, a number of areas of known minor coating damage as previously noted in the 2008 inspection report [16] are reported to be unchanged. The measured CP potential is sufficient to prevent external corrosion for the known areas of exposed steel due to coating damage, hence no remediation is recommended.

2.2.1 CP Survey of Riser Sections

A CP survey of straked riser sections was conducted from the riser hang off to beyond the TDP for all straked riser sections; all recorded values are within acceptable limits. A plot of the recorded CP measurement is given in Figure 2.1.

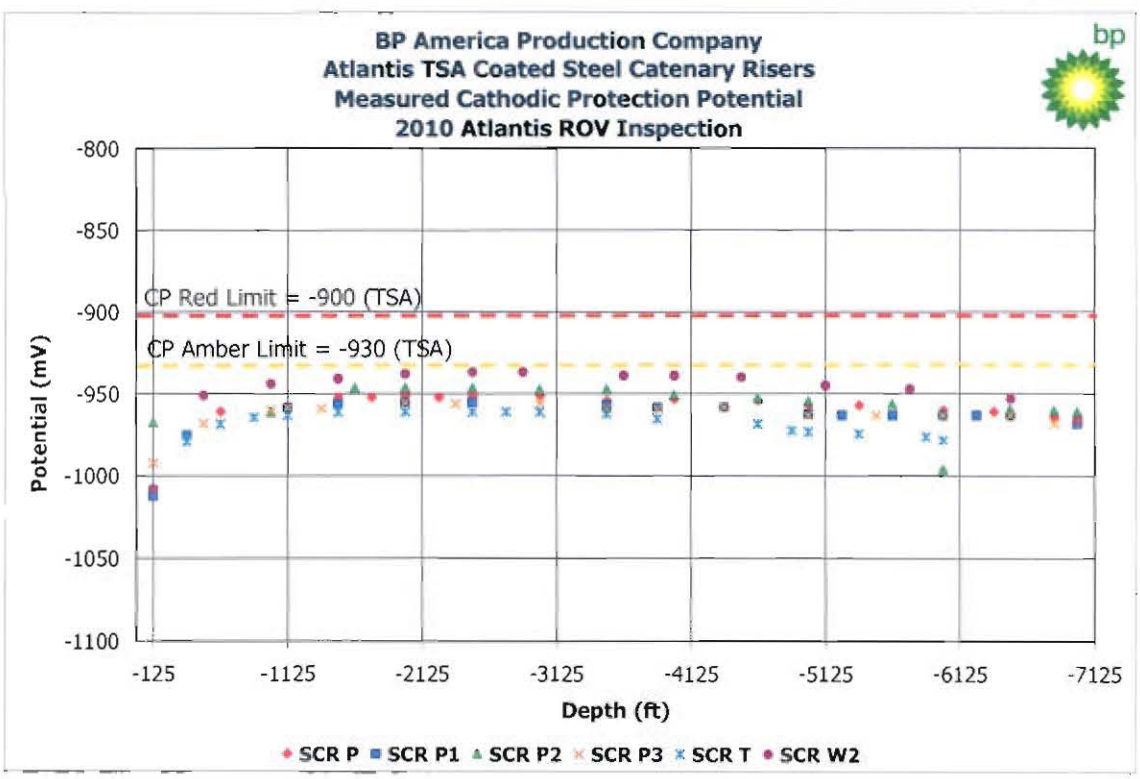

Figure 2.1 – Atlantis Risers Measured CP Potential

Numerous areas of TSA activation adjacent to the J lay collars were noted by inspectors as shown in Figure 2.2. In some instances the spent TSA material is reported to bulging through the strake seams. The corrosion protection for this riser system is afforded by a combination sacrificial anode CP system and TSA coating. TSA coating will provide CP protection for this section of the riser by self depletion.

TSA coating systems are generally designed such that the coating material is anodic to the substrate metal. In other words, they corrode preferentially to steel, acting as sacrificial coatings preventing the corrosion of the underlying steel substrate. TSA coating will provide CP protection for these sections of the riser by self depletion until it is completely consumed leaving the sacrificial anode CP system as the only source of protection. Complete depletion of the TSA coating will result to increased CP demand thereby increasing the anode depletion rate. Because measured CP potentials are within acceptable limits, the TSA is undergoing normal and expected polarization, hence pose no integrity threat.

Figure 2.2 – Example TSA Activation on P3 Riser

2.3 DC1 Flowlines

All DC1 flowlines were inspected and found to be in generally good condition.

The area of coating disbondment, first observed in the 2008 ROV inspection [16], on the W2 flowline was not observed, as required in the inspection workscope [2], due to localized flowline burial. Progression of the coating disbondment beyond the previously noted area, into the unburied area is not observed, hence no further action is recommended.

Lateral movement of the flowline was first reported in the 2008 ROV inspection [16]. A preliminary assessment was documented in 3235-RPT-60023 [17] recommending survey of the flowlines. Indications of possible lateral movement were noted during current inspection in each flowline. Estimates of movement were not recorded as required by the inspection workscope [2]. The flowlines were surveyed using a cross profiler to quantify the extent of movement. At the time of writing the cross profiler data is undergoing evaluation to quantify the extent flowline movement and will be included in the anomaly closeout process.

2.3.1 DC1 Flowline Free Spanning

Free span lengths on all DC1 flowlines were measured by recording the span start and end locations. No spans were found on the DC1 flowlines to be above the approved limit within unstraked areas for VIV [21] as shown in Table 2.1. One span on the W2 flowline, as noted in Figure 2.8, is reported to be longer than the maximum length recorded and analyzed from the as laid survey in 2008. Plots of measured span length for the P, P1, P2, P3, T and W2 flowlines are shown in Figure 2.3 through Figure 2.8 respectively.

Further assessment of the reported span on W2 is recommended, per anomaly 3800-ANM-60005 [5]. The review should confirm the reported lengths based on the cross profiler data, which will be included in the anomaly closeout.

Flowlines	Number of spans over approved limit without strakes from 2010	Number of spans over approved limit without strakes from as laid survey	Number of span over maximum as laid length from 2010
P	0	1	0
P1	0	2	0
P2	0	0	0
P3	0	2	0
W2	0	0	1
T	0	8	0

Table 2.1 –2010 and As Laid ROV Inspection Flowline Span Results

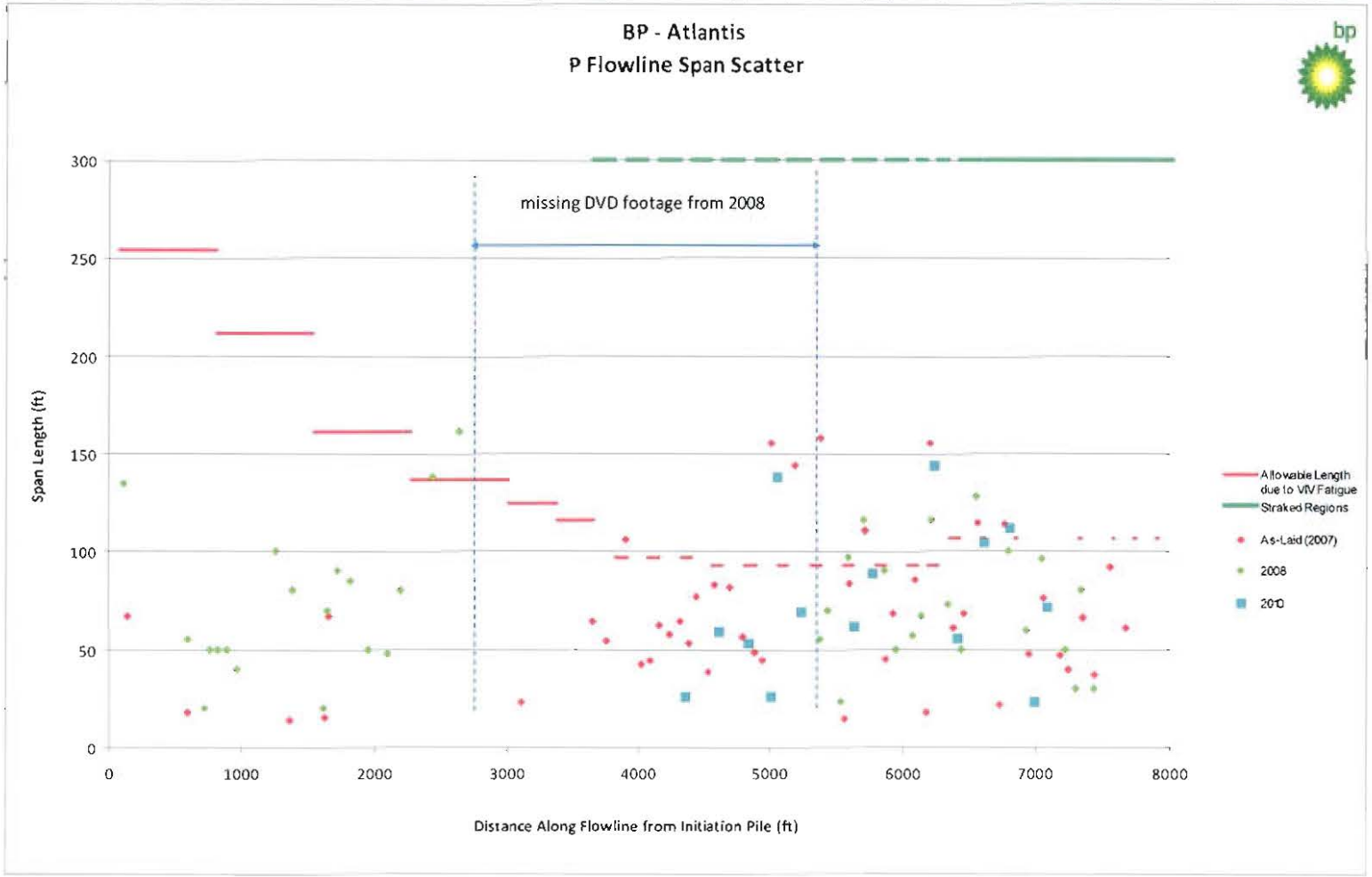

Figure 2.3 – Span Length Assessment for P Flowline

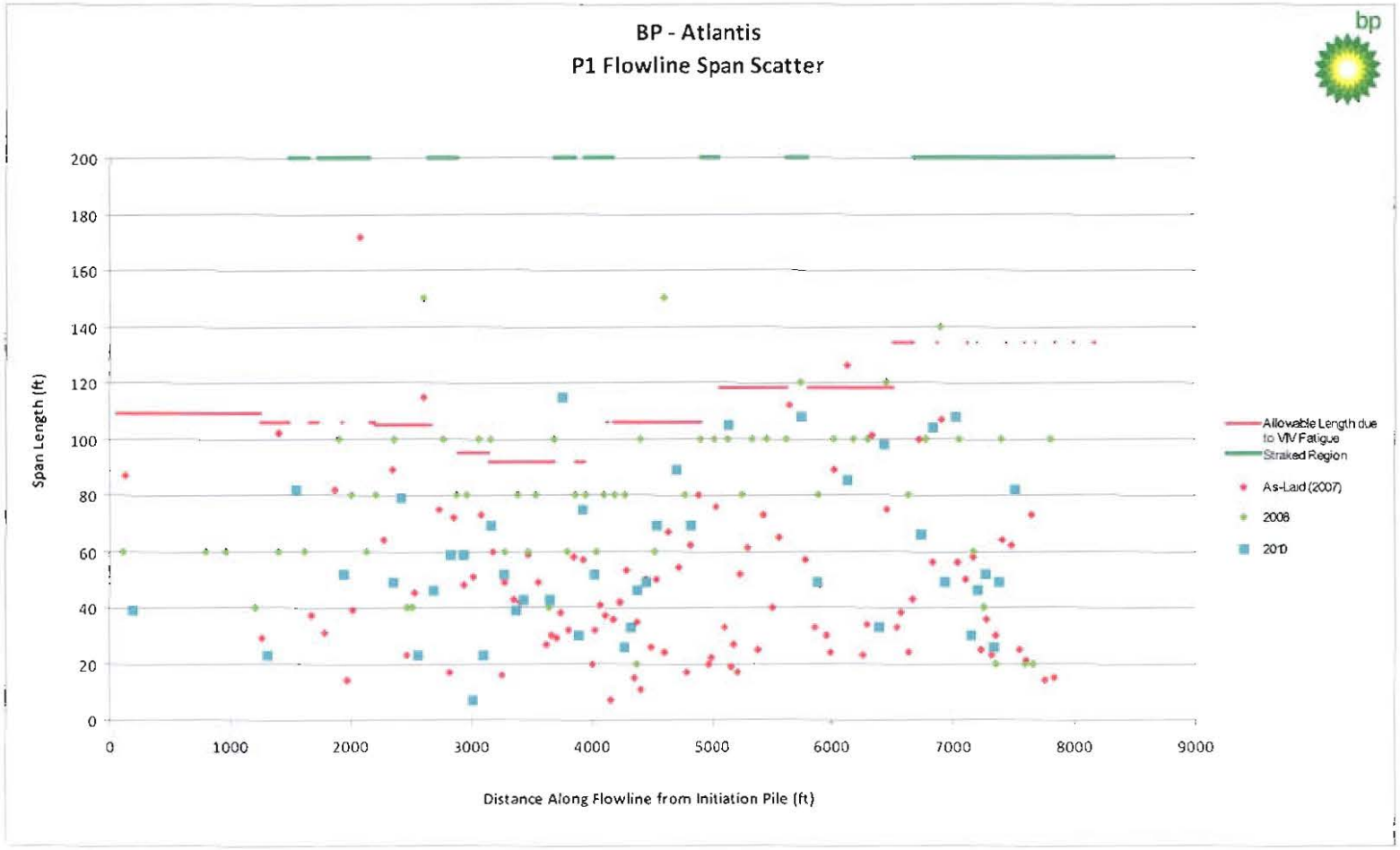

Figure 2.4 – Span Length Assessment for P1 Flowline

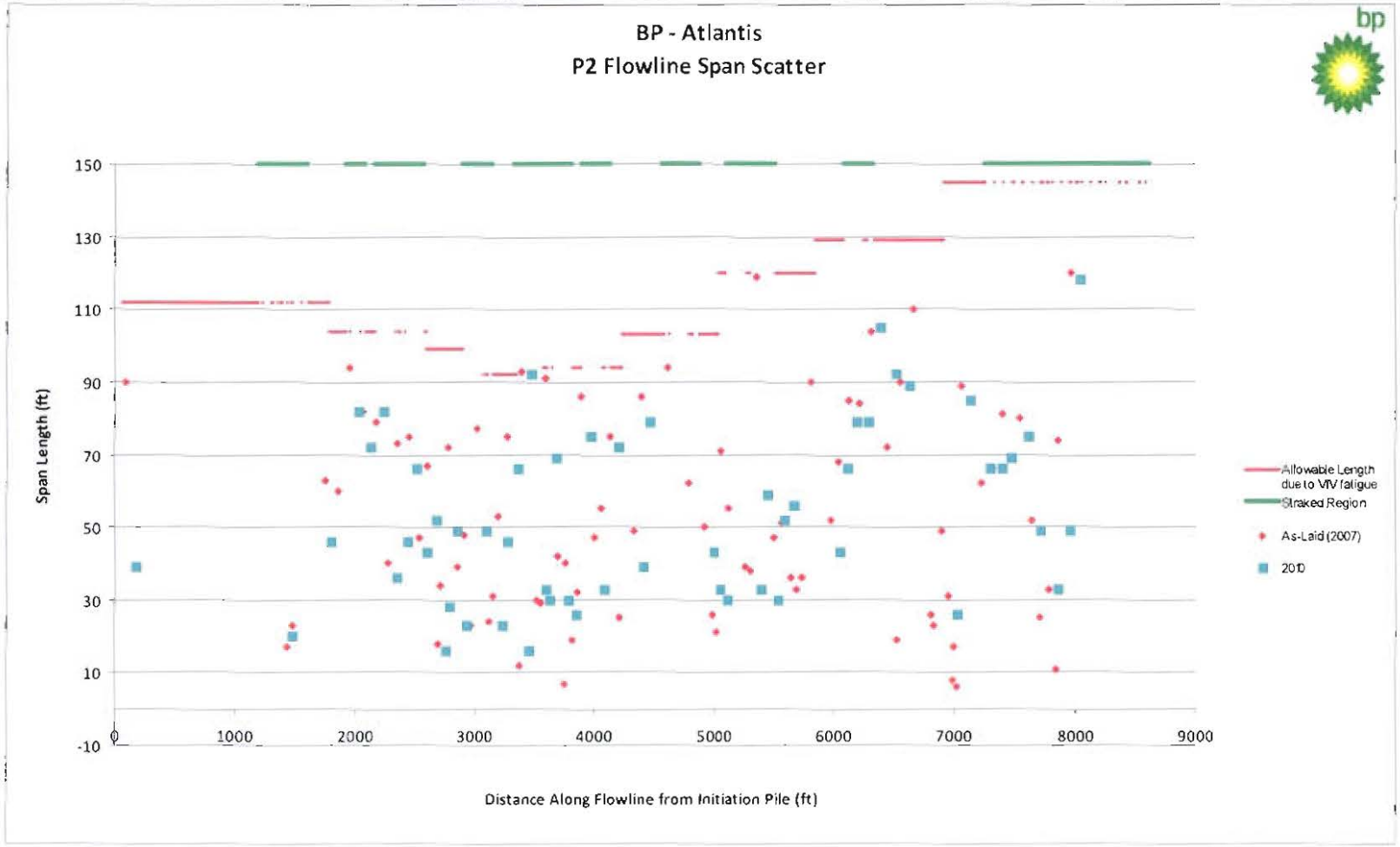

Figure 2.5 – Span Length Assessment for P2 Flowline

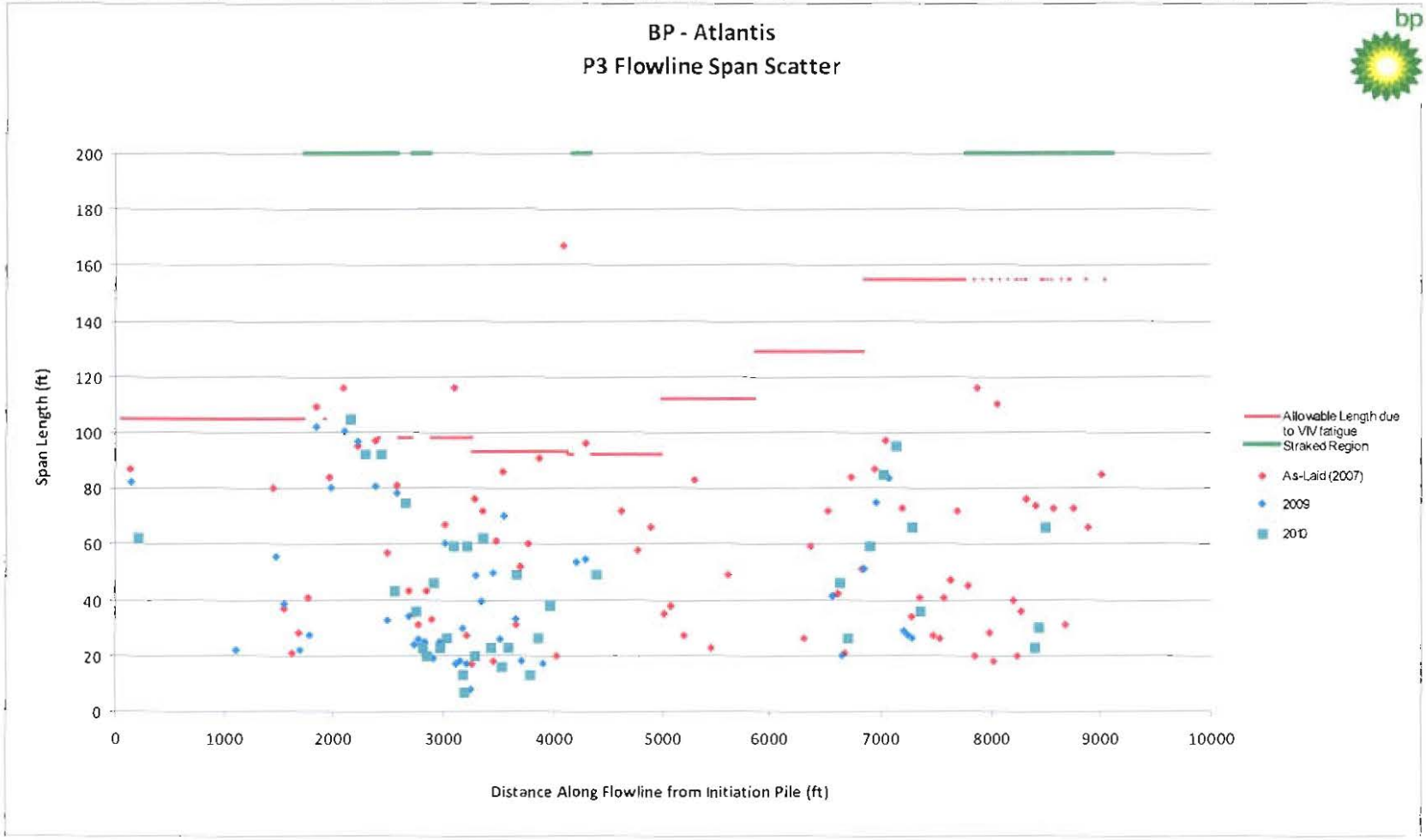

Figure 2.6 – Span Length Assessment for P3 Flowline

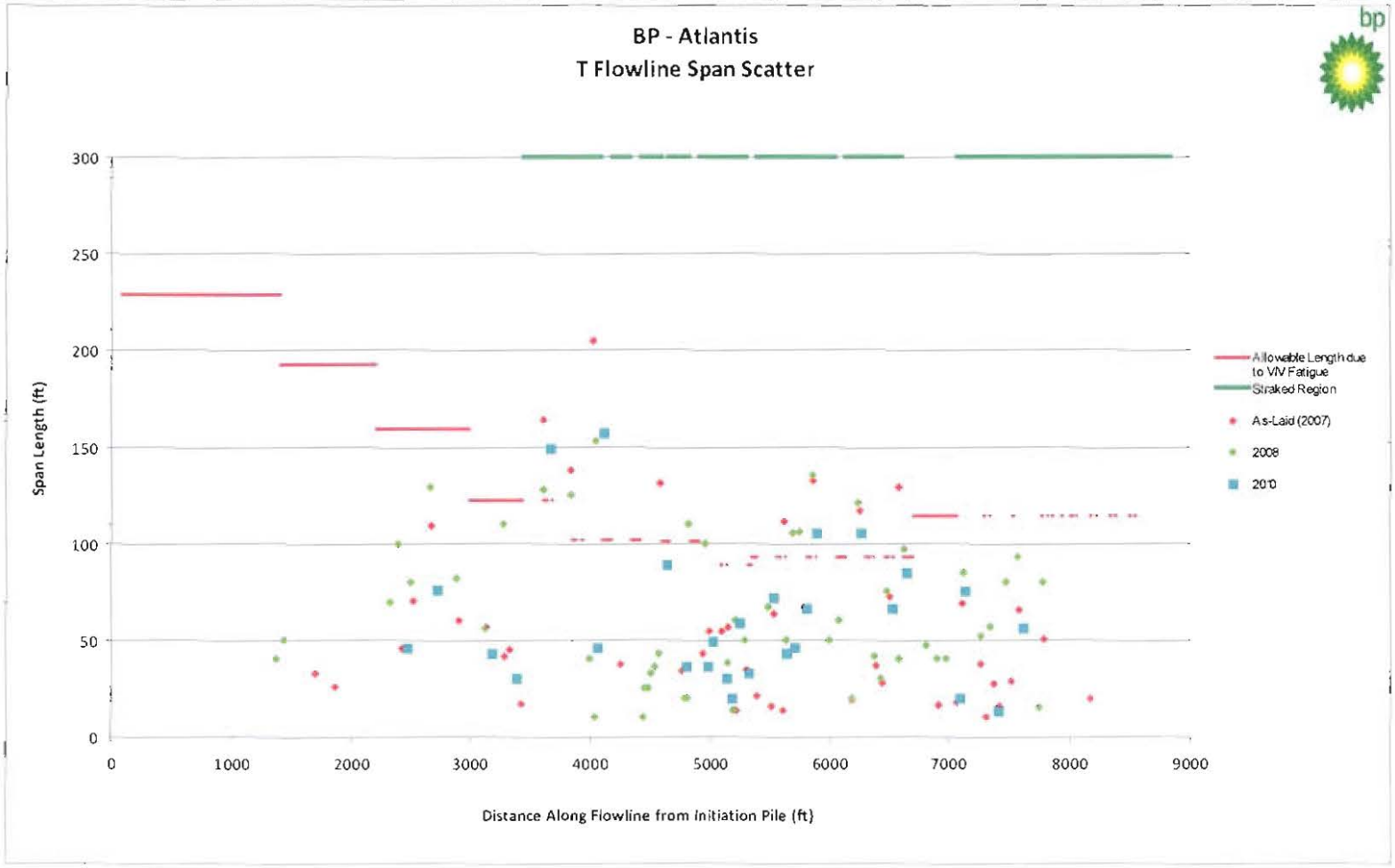

Figure 2.7 – Span Length Assessment for T Flowline

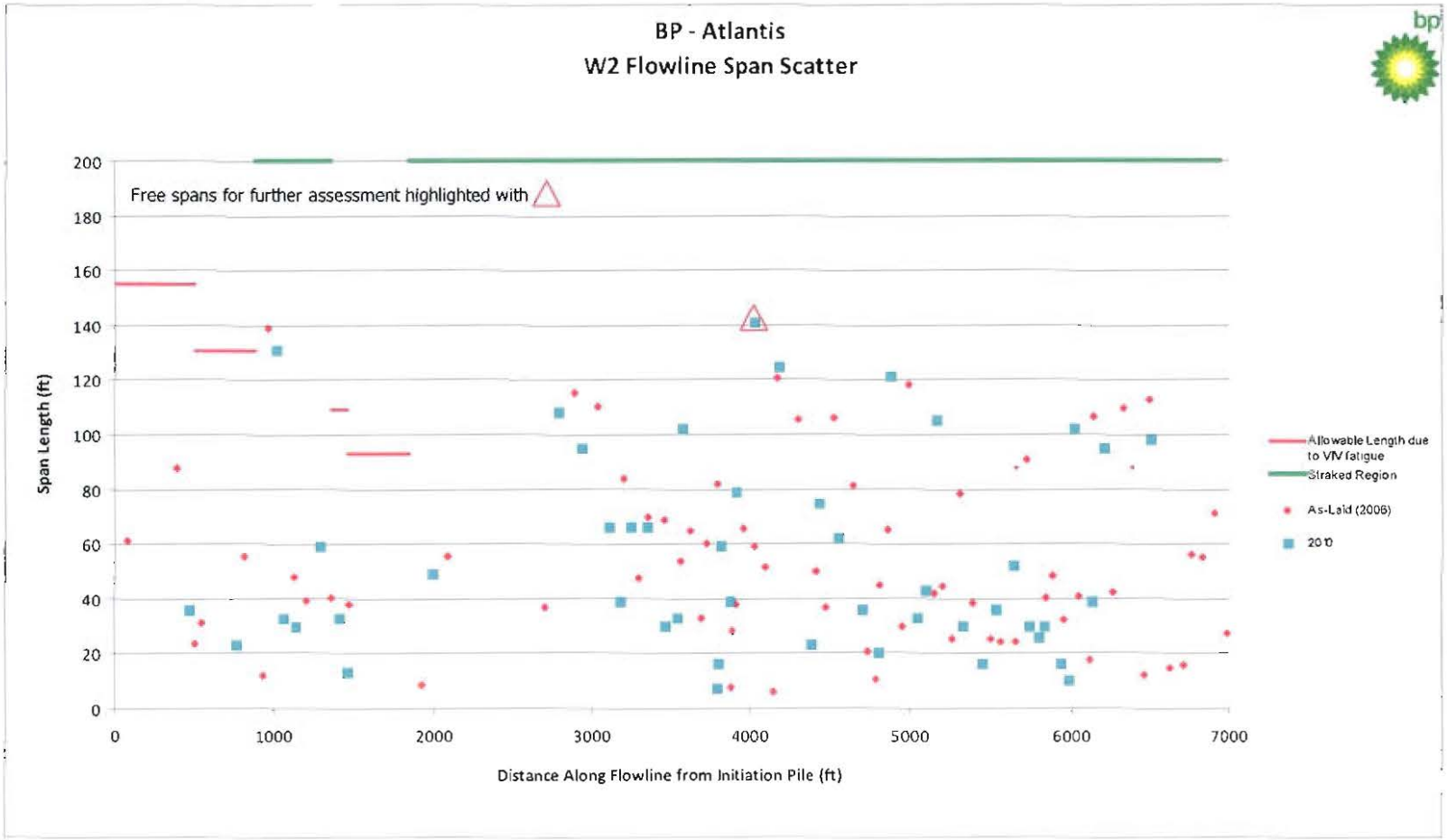

Figure 2.8 – Span Length Assessment for W2 Flowline

2.3.2 CP Survey of DC1 Flowlines

A CP survey of the DC1 flowlines was conducted from the TDP's to the PLET's. A plot of the recorded CP measurements for all of the DC1 flowlines is given in Figure 2.9. All recorded CP measurements are within acceptable limits.

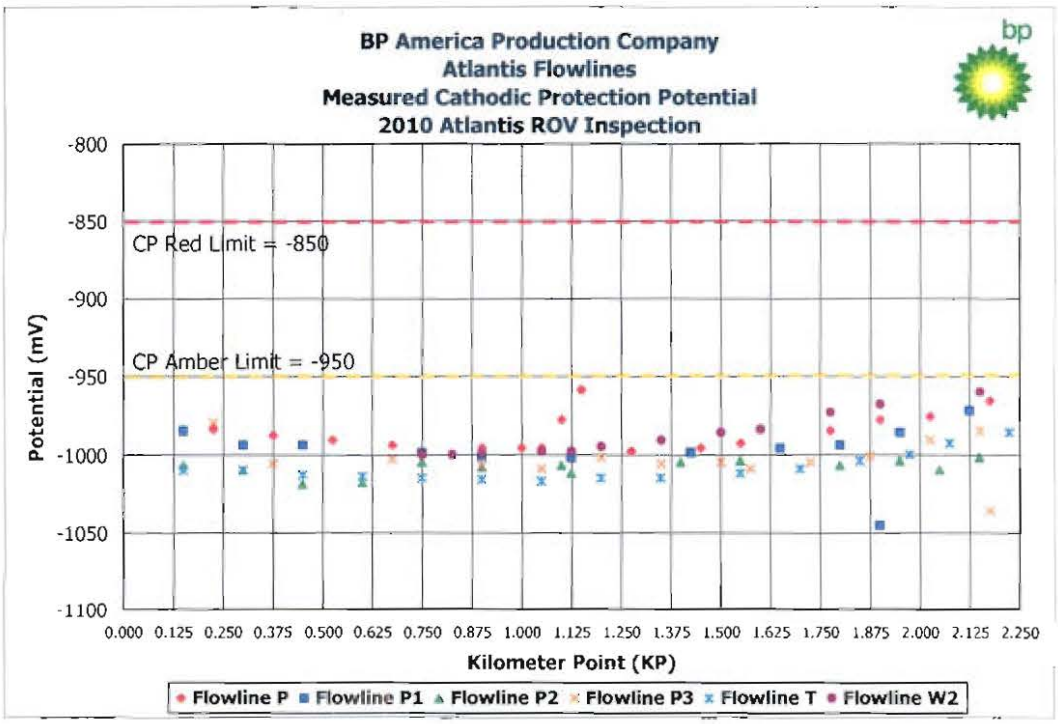

Figure 2.9 – Atlantis Flowlines Measured CP Potential

Previously noted areas of excessive anode wastage were inspected. Cleaning and anode sizing, per the inspection workscope [2], was found to be difficult. The observations and dimensions that were recorded are given in Table 2.2. Because CP measurements are within acceptable limits, the anode wastage is undergoing normal and expected polarization, hence no remedial action is required.

DC1 Flowline Segment	Location	Dimension of Anode (Height x Wide) (ft)
P2	N/A	N/A (Anode is buried)
P	2408.1ft from P PLET	0.17 x 1
P3	N/A	N/A (No Activity Done)
W2	1246.7ft from W2 PLET	Unable to measure due to build up anode
P1	1965ft from P1 PLET	0.25 x 0.67
T	7034.1ft from T PLET	0.25 x N/A

Table 2.2– Anode Dimensions

2.4 DC1 Flowline Holdback Anchor and PLETs

The holdback anchor yokes are generally in good condition in terms of corrosion and anode wastage.

Position of expansion slide indicators was noted along with readings from in line and cross line inclinometers. The reading from the sliding gauges and inclinometers are given in Table 2.3.

PLET	Slide Position		In line Reading (deg)	Cross Line Readings (Deg)
	Left side (ft)	Right side (ft)		
P	0.17	0.17	2.5W	2NE
P1	0.25	0.25	1.5SW	2.25NW
P2	0.42	0.42	1.5SW	1.5SE
P3	0.67	0.67	2NE	3.25SE
T	0.17	0.17	2.25SE	0.75NE
W2	0.17	0.17	4.5NW	1.5NE
U	N/A	N/A	3.5SE	N/A

Table 2.3 - Readings from DC1 PLET Inclinometers and Slide Indicators

ROV Keeper pins on P and P3 #1 Devil's Claws were damaged. The Masterlink guide pins were not engaged on P1, P2, P3 and T flowline yokes. Anomaly 3800-ANM-60030-1 [14] has been raised to conduct a detailed assessment. Locking latches on P, T and W2 holdback anchor yokes were bent and yoke locking latch for P3 was not engaged. Anomaly 3800-ANM-60031-1 has been raised to conduct a detailed assessment.

The hold back anchor piles on P, P1, P2, P3 and T flowlines have indications of soil scouring. An example figure is shown below The P2 SCR east devil's claw pile, showing a 0.5ft gap as seen in Figure 2.10. The chains and the flowline yokes are also noted to be taut. Anomaly 3800-ANM-60035 [15] has been raised to conduct a detailed assessment of the above observations.

Figure 2.10 - P2 SCR Pile for Devil's Claw Connector from East Soil Scoured Approximate 0.5ft

2.4.1 CP survey of Holdback Anchors and Devil's Claws

CP readings were taken for all holdback anchors, all recorded measurements are within the acceptance criteria (less than -950mV). The anodes are all active with moderate wastage on the Devils claws and yokes. Light to moderate anode depletion was seen in all segments of holdback anchor yoke. Details of the CP readings for all holdback anchor segments are given in Table 2.4.

Anchor Segments	CP Readings (mV)
P	-1032/-1035
P1	-1070/-1073
P2	-1021/-1024
P3	-1011/-1014
T	-990/-993
W2	-1022/-1025

Table 2.4 – CP Readings for DC1 Flowline Holdback Anchors

The CP readings for the devils claw connectors are within the acceptance criteria (less than -950mV). Details of the CP readings for the East and West devil's claw connectors are given in Table 2.5.

Anchor Segments	CP Readings (mV)	
	West	East
P	-1005/-1008	-1027/-1030
P1	-1039/-1042	-1045/-1047
P2	-1042/-1046	-1040/-1044
P3	-1036/-1039	-1042/-1045
T	-1007/-1009	-1013/-1015
W2	-1040/-1042	-1037/-1040

Table 2.5 – CP Readings for Devil's Claw Connector for East and West side

2.5 Dynamic Umbilicals

The dynamic umbilicals are in generally good condition with no abrasion or debris observed. Vibration along the umbilical TDP region, from 0ft to EL +500ft off the sea floor was first observed during the 2008 inspection [16]. During the current inspection umbilical vibration was again observed in low amplitude, and the estimated amount of movement is given in Table 2.6. The observed motion was used to further assess anomaly 3800-ANM-60007 [4]. BP has reviewed the video footage and stated the umbilicals are behaving as designed. The anomaly was subsequently closed.

Umbilical Line	Umbilical Movement (ft)
E4	0.33
H5	0.08
H6	0.08-0.17
H8	0.33

Table 2.6 – Umbilical Movement at Touchdown Point

The thickness of hard marine growth at the MWL on umbilicals E2, H2, H4, H6 and H7 is recorded to be 0.5 inches with approximately 50% to 100% surface coverage. The thickness of growth tapers down with depth. The marine growth is reported as soft growth of about 0.5 to 1 inch thick at EL -500 ft.

The Buoyancy modules for all umbilicals appear to be in good condition. The position of all umbilical buoyancy modules remains relatively unchanged from the previous inspection. The recorded depths of the sag/hog bend regions are given in Table 2.7.

Umbilical Line	Low points (ft)	High Points (ft)
E2	-6861	-6743
E4	-6871	-6778
H2	-6847	-6722
H3	-6823	-6716
H4	-6851	-6727
H5	-6835	-6714
H6	-6851	-6734
H7	-6811	-6685
H8	-6875	-6772

Table 2.7 - Sag Bend Low point and Hog Bend High Point

2.6 DC3 Flowline

Free span lengths on DC3 U flowline was measured by recording the span start and end locations. Five spans were found on the DC3 U flowline to be above the approved limit within unstraked areas for VIV [21]. Three spans on the DC3 U flowline are reported to be longer than the maximum length recorded and analyzed from the as laid survey. The plot of measured span length for the DC3 U flowline is shown in Figure 2.11 with the spans for further assessment highlighted.

Further assessment of the reported spans on DC3 U flowline is recommended, per anomaly 3800-ANM-60005 [5]. The review should confirm the reported lengths based on the cross profiler data which is being assessed as part of the anomaly closeout process.

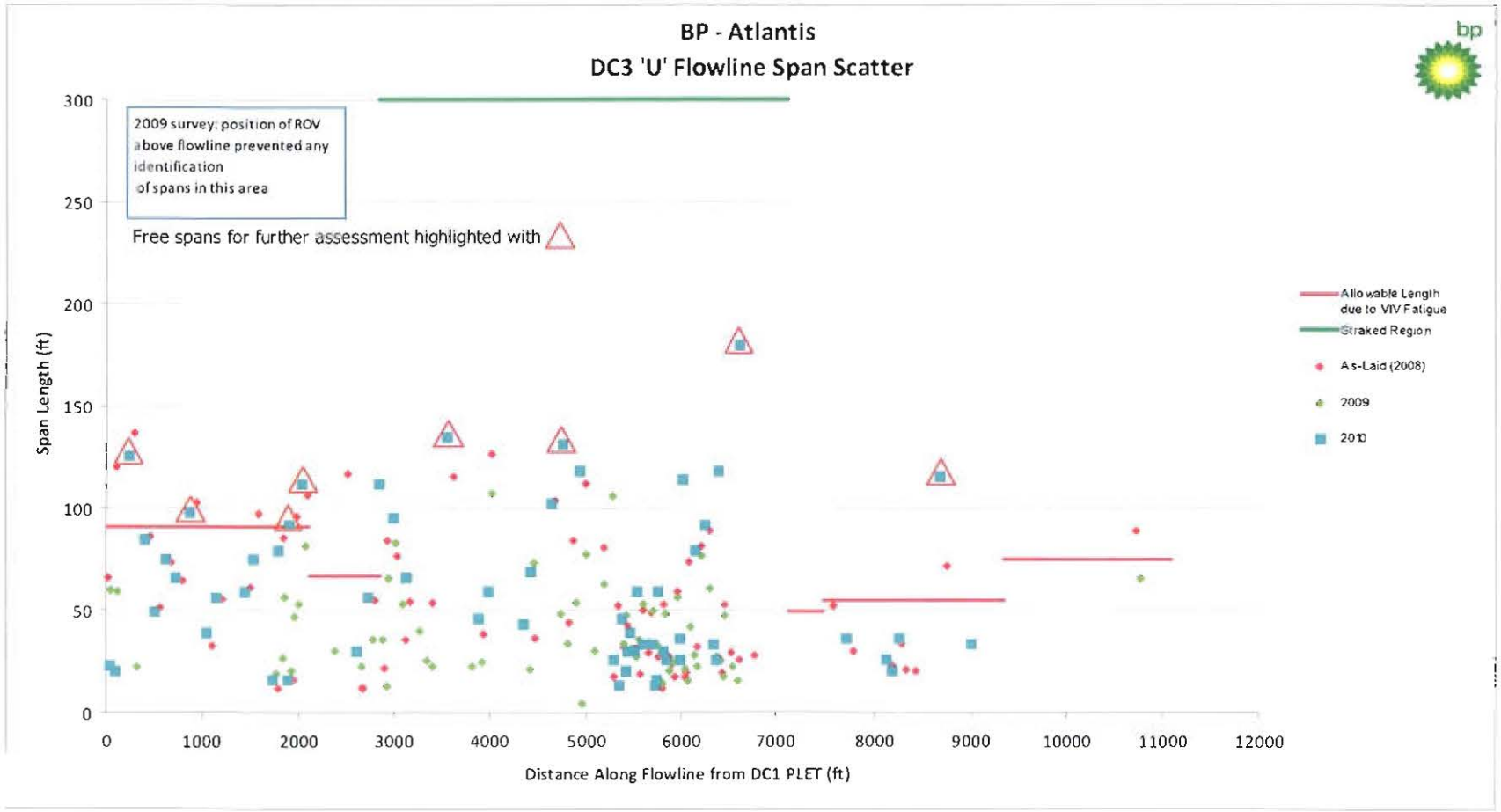

Figure 2.11 – Span Length Assessment for DC3-U Flowline

2.7 DC1 Well Jumpers

Well jumpers 11P, 13T, 14T, 21P, 22T, 23T, 42P and 43T were inspected. The insulation on all DC1 well jumpers was found with numerous coating cracks. The insulation coating defects were first noted in the 2008 inspection [16]. No change to previously noted defects is observed nor any new defects documented. The Flow Assurance Team is recommended to review the insulation coating defects on well and flowline jumpers for thermal integrity. The current plan is to remove all DC1 jumpers and manifolds affected in 2012 therefore no remedial action is needed.

The CP measurements for well jumpers 11P, 23T, 42P and 43T are within acceptable limits. Low CP readings were first noted on well jumper ROV panel 13T and 42P in the 2008 inspection [16]. During the current inspection previously noted low CP measurements are unchanged. All CP measurements are given in Table 2.8.

The well jumper ROV panels provided access to jumper seal test ports during installation and are not further required for jumper integrity. No interim remediation actions are recommended as the associated jumpers are planned for removal in 2012.

Location	CP Readings (mV)				
	11P	13T	23T	42P	43T
Max 8 connector tree end – jumper inner body	-1004/ -1006	-1009/ -1012	-1005/ -1008	-1001/ -1004	-995/ -998
Max 8 connector tree end – jumper outer body	-1001/ -1004	-1006/ -1009	-1002/ -1005	-999/ -1003	-992/ -995
ROV panel tree end – panel structure	-863/ -865	-998/ -1001	-994/ -998	-981/ -985	-956/ -959
ROV panel tree end – seal test receptacle located on front panel	-988/ -990	-933/ -996	-994/ -998	-981/ -983	-962/ -965
Intrusive Sand detector	-1014/ -1017	N/A	N/A	-1015/ -1017	N/A
ROV Panel manifold end - panel structure	-1003/ -1006	-659/ -662[1]	-1003/ -1006	-1005/ -1008	-997/ -997
ROV Panel manifold end - seal test receptacle located on front panel	-1005/ -1008	-663/ -666[1]	-1000/ -1004	-835/ -837[1]	-989/ -991
Max 8 connector manifold end - jumper inner body	-1015/ - 1017	-1017/ -1020	-1015/ -1018	-1013/ -1016	-1015/ -1018
Max 8 connector manifold end - jumper outer body	-1017/ -1020	-1018/ -1021	-1017/ -1020	-1014/ -1018	-1019/ -1021

Note 1: The values on these ROV panels are outside of KPI acceptance limits. These panels are used for installation only and not required for ongoing integrity.

Table 2.8 - CP Survey for Well Jumpers

2.8 DC1 Flowline Jumpers

All flowline jumpers were inspected except PP2/3-P3 as required by the inspection workscope [2]. The insulation on all DC1 well jumpers was found with numerous coating cracks. The insulation coating defects were first noted in the 2008 inspection [16]. There were multiple new insulation defects observed on the flowline jumpers which are given in Table 2.9 and documented in the defect register [13]. The defect observation locations are given in Appendix A. The Flow Assurance Team is recommended to review the insulation coating defects on well and flowline jumpers for thermal integrity. The current plan is to remove all DC1 jumpers and manifolds affected in 2012 therefore no remedial action is needed.

Jumper	Coating Defect Reference #	Comments
1-TP	175	TP PLET END, Circumferential at first elbow above connector
2-TP	165	Split on insulation, MAN-2 connector cap
2-TP	166	Circumferential Crack in insulation
2-TP	167	Several cracks at elbow and adjacent to horizontal strake, MAN-2 end
2-TP	168	Vertical crack in insulation from just above the connector cap up to the first elbow, MAN-2 end
2-TP	169	Circumferential crack at top of insulating connector cap, PLET TP end
2-PP2/3	162	Vertical crack above connector, MAN-2 end of jumper
2-PP2/3	163	Circumferential crack, lower inside elbow, PLEM PP2/3 end
2-PP2/3	164	Circumferential crack, upper horizontal section, adjacent to elbow, PLEM PP2/3 end
P1-42	170	Vertical crack below ROV panel, MAN-4 end
P1-42	171	Circumferential crack, covered by VIV strake, below ROV panel, MAN-4 end, thermal activity
P1-42	172	Several cracks, mid horizontal section, adjacent to VIV strake
P1-42	173	Circumferential crack, upper elbow, MAN-2 end
P1-42	174	Circumferential crack, covered by VIV strake, below ROV panel, MAN-2 end, thermal activity

Table 2.9 – New Insulation Coating Defects [13]

The condition reported in 3800-ANM-60006 [7] for the 2-PP1 flowline jumper defects appears unchanged, however, previously unreported thermal activity was noted in the defect areas therefore this anomaly is left open for detailed review.

CP readings were within acceptable limit for all well jumpers except the P1-42 jumper. Low CP readings were first noted on flowline jumper ROV panel P1-42 in the 2008 inspection [16]. During the current inspection previously noted low CP measurements are unchanged. All CP measurements are given in Table 2.10.

The flowline jumper ROV panels provided access to jumper seal test ports during installation and are not further required for jumper integrity. No interim remediation actions are recommended as the associated jumpers are planned for removal in 2012.

Location	CP Measurements		
	P1-42	**T-42**	**1-PP**
Hub Connector Outer Body	-1016/-1019	-1017/-1020	-1013/-1017
Hub Connector Inner Body	-1012/-1015	-1010/-1013	-1013/-1016
ROV Panel Structure	-590/-593[1]	-985/-988	-997/-1001
Seal Test Receptacle on Front Panel	-594/-594[1]	-978/-980	-986/-991
Seal Test Receptacle on Front Panel	-985/-987	-991/-994	-986/-991
ROV Panel Structure	-748/-750	-902/-904	-1008/-1005
Hub Connector Inner Body	-1013/-1015	-1010/-1012	-1008/-1015
Hub Connector Outer Body	-1023/-1026	-1016/-1019	-1010/-1016
Elbow Missing I	N/A	N/A	-1008/-1015

Note 1: The values on these ROV panels are outside of KPI acceptance limits. These panels are used for installation only and not required for ongoing integrity.

Table 2.10 - CP Survey for Flowline Jumpers

2.9 MAN-4 Pigging Loop

The MAN-4 pigging loop was inspected. A new insulation defect approximately 10in. Long x 0.5in wide is observed and documented in anomaly 3800-ANM-60001 [6] and the defect register [12]. The Flow Assurance Team is recommended to review the insulation coating defects on well and flowline jumpers for thermal integrity. The current plan is to remove all DC1 jumpers and manifolds affected in 2012 therefore no remedial action is needed.

All CP readings taken on the MAN-4 pigging loop are within the range of -800mV to -1100mV. The recorded measurements are given in Table 2.11.

Test Point	Location	CP Reading (mV)
CP1	Hub 'A' connector outer body	-1021/-1024
CP2	Hub 'A' connector Inner body	-1011/-1014
CP3	ROV Panel Structure	-950/-952
CP4	Seal Test Receptacle on Front Panel	-981/-983
CP5	Hub 'B' connector Outer body	-1010/-1012
CP6	Hub 'B' connector Inner body	-1016/-1019

Table 2.11 - CP Reading Measurement of MAN-4 Pigging Loop Jumper

3 CONCLUSIONS

The inspection campaign was completed in accordance with the Atlantis 2010 workscope [2]. A sufficient amount of the prescribed tasks were completed satisfactorily, providing a basis of information with which to assess integrity. The primary conclusions and recommendations are provided in the following sections:

3.1 Risers & Flowlines

The observations documented by WGIM, relevant to the integrity of the risers and flowlines, are assessed. The SCRs and Flowlines are found to be in overall good condition. There were no immediate integrity threats identified during this inspection, however further action is required on the following observations:

- The wet spools straked section above -40ft was unable to be cleaned due to weather and access restrictions. A detailed review and recommendations should be identified per anomaly 60022 [10]
- There are anomalous spans identified in the DC1 and DC3 flowlines. The span length should be verified with the cross profile data and re-assessed against the design predicted lengths and associated static stresses per anomaly 60005 [5].
- The DC1 flowline have indications of lateral movement. The extent and impact of movement should be assessed per anomaly 60036 [11]
- Bent pins and soil disturbance are noted on the devils claw and yokes for the flowline anchors. These should be further assessed against the as-installed condition and a root cause determined per anomaly 60030 [14].

The cross profiler survey data is currently being processed. On completion of post processing the data should be used to aid assessment of key free spans and flowline lateral movement and will be included in the anomaly closeout process.

3.2 Subsea Equipment

The observations documented relevant to the integrity of the DC1 and DC3 subsea equipment are assessed. The subsea equipment is found to be in good condition, with exception of jumper insulation which is shown to have numerous cracks.

The insulation coating on flowline and well jumpers throughout DC1 is prematurely cracking as documented in anomaly 60001 [6]. The number of new instances of insulation coating defects is, however, less than previous inspections. These jumpers are planned to be replaced in 2012 and no interim remediation actions are recommended. Review with the Flow Assurance team should be conducted, however, to confirm that expected thermal performance is adequate.

→ There were no immediate integrity threats identified during this inspection.

3.3 CP Survey

The measured CP potentials for all risers, flowlines and subsea components indicate adequate CP protection. The measured potential was within prescribed limits with the exception of 3 jumper ROV panels.

No interim remediation actions are recommended as the associated jumpers are planned for removal in 2012.

4 REFERENCES

[1] Wood Group IM – "Atlantis DC-1, DC-3 and Riser, Inspection", Document No. IM-RP-0005, 10th October 2010.

[2] 2H Offshore Inc. – "2010 ROV Inspection Workscope", Document No. 3800-IWP-60002-06, 30th September 2010.

[3] 2H Offshore Inc. – "Atlantis DC1 Flowline Anode Wastage", Document No. 3800-ANM-60003-2, 1st July 2010.

[4] 2H Offshore Inc. – "Atlantis DC1 Dynamic Umbilical Vibration at TDP", Document No. 3800-ANM-60007-1, 10th August 2010.

[5] 2H Offshore Inc. – "U Flowline Freespan", Document No. 3800-ANM-60005-1, 13th July 2010.

[6] 2H Offshore Inc. – "Insulation Coating Defects", Document No. 3800-ANM-60001-1, 1st July 2010.

[7] 2H Offshore Inc. – "Jumper Unknown Substances", Document No. 3800-ANM-60006-1, 13th August 2010.

[8] 2H Offshore Inc. – "Flowline Jumper 1-PP Insulation Damage", Document No. 3800-ANM-60004-1, 1st July 2010.

[9] BP – "Riser Flowline IRM Risk Report", Document No. # 3478-BOP-RA-0001, 21st June 2007.

[10] 2H Offshore "Atlantis SCR Strake Cleaning Defiency", Document No. # 3800-ANM-60022, December 2010.

[11] 2H Offshore "Atlantis DC1 Flowline Lateral Movement", Document No. # 3800-ANM-60036 January 2010.

[12] 2H Offshore "Atlantis DC1 Facilities Insulation Cracks", Document No. 3800-DWG-60001-2, January 2011.

[13] 2H Offshore "Atlantis DC1 Insulation Coating Defects", Document No. 3800-RES-60001-2, January 2011.

[14] 2H Offshore "Atlantis – Keeper pins on Holdback Anchors P1 and P3", Document No. 3800-ANM-60030-1, January 2011.

[15] 2H Offshore "Atlantis – Holdback Anchor Soil Scouring", Document No. 3800-ANM-60035-1, January 2011.

[16] 2H Offshore "Atlantis August 2008 Subsea Inspection Report", Document No. 3235-RPT-60016-3, May 2009.

[17] 2H Offshore "Atlantis DC1 Flowline Movement", Document No. 3235-RPT-60023-2, November 2009.

[18] BP "In Water Integrity Management Program Plan", Document No. 2010-T2-IM-PN-0002, November 2009.

[19] BP "Anomaly Procedure", Document No. 2010-T2-IM-PR-0003, November 2009.

[20] BP "Production PIP Straking Plan", Document No. 1440-34-PL-DG-0222-002, date unknown.

[21] Technip Offshore – "Span Analysis for Flowlines" Document No. 1440-34-FL-RP-0007, rev 2, April 2008.

[22] 2H Offshore "W2 Protective Coating Damage During Cleaning", Document No. 3800-ANM-60033-1, January 2011.

APPENDIX A – DC1 JUMPER COATING DEFECT OBSERVATIONS

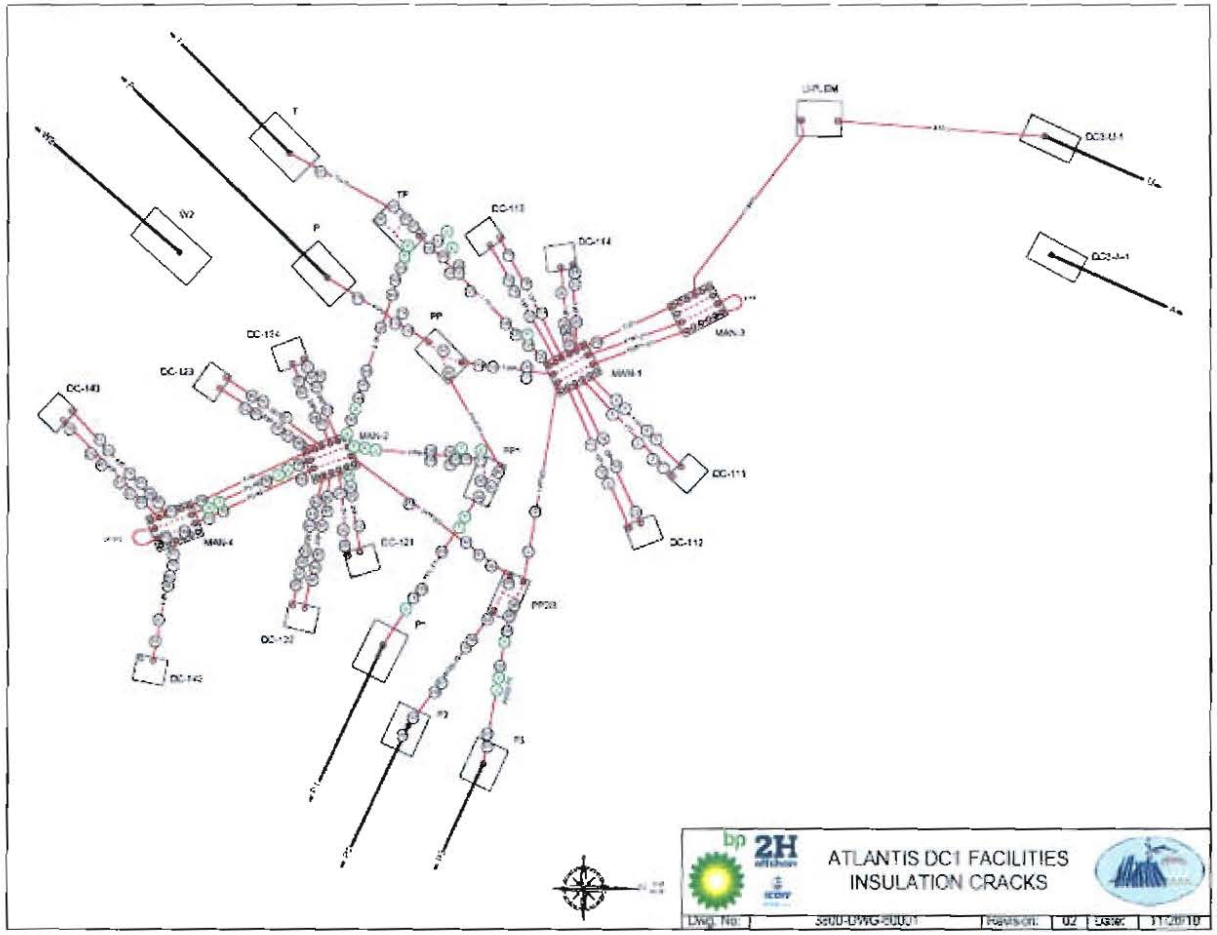

Figure A.1 – Atlantis DC1 Coating Defects – New Observations in Green

APPENDIX B – ANOMALY STATUS SUMMARY

2010 ROV Preliminary Inspection Findings		
Number	**Anomaly Description**	**Status**
3800-ANM-60003	Atlantis DC1 Flowline Anode Wastage	Recommended for closure
3800-ANM-60007	Atlantis DC1 Dynamic Umbilical Vibration at TDP	Recommended for closure
3800-ANM-60022-1	Wet Spool cleaning from EL -40ft not being cleaned	Issued for client comments
3800-ANM-60030-1	ROV Keeper pin at P Devil's Claw Bent and Master link Keeper Pins on holdback anchor yokes for P1 and P3 flowlines not engaged	Issued for client comments
3800-ANM-60031-1	Flowline Yoke Locking Larches	Issued for client comments
3800-ANM-60033-1	W2 Riser Protective Coating Damaged During Cleaning	New anomaly to be issued
3800-ANM-60005-2	Anomalous Spans Exceeding Limit (Within Unstraked Areas)	To be updated with inspection findings
3800-ANM-60034-1	Anomalous Spans Exceeding Limit (Within Straked Areas)	New anomaly to be issued
3800-ANM-60036-1	Lateral movement of DC1 Flowlines	New anomaly to be issued