METER ERROR REPORT

FINAL

Reconcile?	Y
Safety Issue?	N
Thesis Report No.	

1. EXECUTIVE SUMMARY

SITE NAME	Easton Grey	
LDZ	SW	
START DATE (actual)	25th June 2009	
LAST GOOD DATE		
END DATE	21st June 2010	
SIZE OF ERROR (No reconciliation required if under 0.1%)	Above 0.1 % over-registration on 11 days (58,625 scm)	
ESTIMATE – Y/N?		
ROOT CAUSE	Low Differential Pressure transmitter failed (AF) validation check	
ANALYSIS	Estimation of error based on AF validation and DP data	
METER TYPE	Orifice	
AUTHOR	B. Kirkman	
CHECKED BY	S.Kimpton	
ACCEPTED BY WWU NETWORK		
RECONCILIATION	Distribution	Transportation

2. BACKGROUND

Easton Grey has one orifice plate meter stream using a gas chromatograph for CV determination and PTZ correction.

The metering system is validated at least every 12 months in accordance with WWU adopted procedure T/PR/ME/2. On 21st June 2010, the low differential pressure (DP) transmitter failed a validation check (As Found). The transmitter was then recalibrated and subsequently passed the check (As Left).

The previous validation of this transmitter passed (As Found /As Left) on 25th June 2009.

3. ERROR QUANTIFICATION AND IMPACT

The DP reading is impacted by the combined error of the transmitter check and the analogue to digital convertor ADC check. Using the combined errors from both these checks, the DP reading is out of tolerance above 25 mbar (average of rising and falling).

DP (mbar)	Error (%Span)	Flow Error (%)
0	-0.0132	
12.5	0.11405	
25	**0.20075**	**0.2**
37.5	**0.2906**	**0.193**
50	**0.3181**	**0.158**

Table 1 – DP error and corresponding flow error

The metering system uses a low : high : standby differential pressure transmitter arrangement. The low DP transmitter is ranged 0 to 50 mbar and the high and standby are ranged 0 to 500 mbar. The reading switches between these transmitters at 47.5 mbar (rising) or 45 mbar (falling).

The flow errors were corrected for when the DP was between 25 and 50 mbar using linear interpolation. The total volume error was then expressed as a percentage of the (Gemini billed) daily volume.

This shows that the overall over-registration was less than 0.1 %, but the 0.1 % threshold was exceeded on 11 days.

4. CAUSES

Failure of low DP transmitter validation check.

5. RECOMMENDATIONS AND LEARNING

Failure of these checks will occur infrequently as the transmitter output drifts over time. If the failures become more frequent or more severe then consideration should be given to replacing the transmitters.

This shows that the overall over-registration was less than 0.1 %, but the 0.1 % threshold was exceeded on 11 days. Therefore the error should be reconciled using the daily correction factors in the Appendix B.

REFERENCES

HPMIS Database

Failed Low DP transmitter check 21st June 2010 – shown in Appendix A

Passed Low DP ADC check June 2010 – shown in Appendix A

EastonGrey_Error.xls – spreadsheet for calculation of span error

EastonGrey_OrificeCalcs.xls – spreadsheet for calculation of flow error

EastonGrey_Data.xls – spreadsheet for calculation of correction

VERSION HISTORY

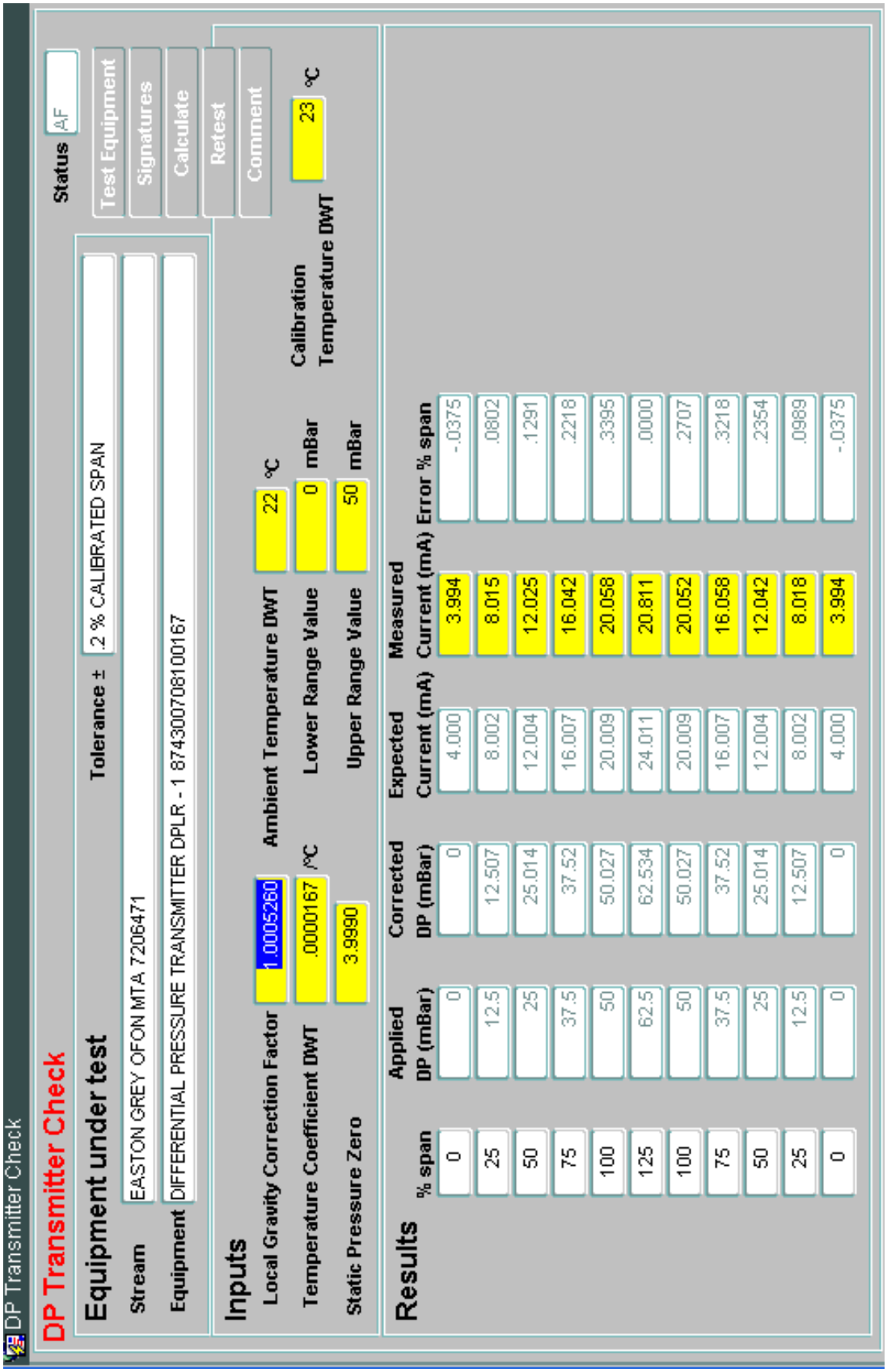
Version	*Changes*	*Author*	*Date*
O	*Original*	*B. Kirkman*	*16/11/10*
1	*Updated following comments*	*B. Kirkman*	*14/03/11*
2	*Updated following comments*	*B. Kirkman*	*23/03/11*
3	*Daily Corrections inverted*	*B. Kirkman*	*30/03/11*

DISTRIBUTION

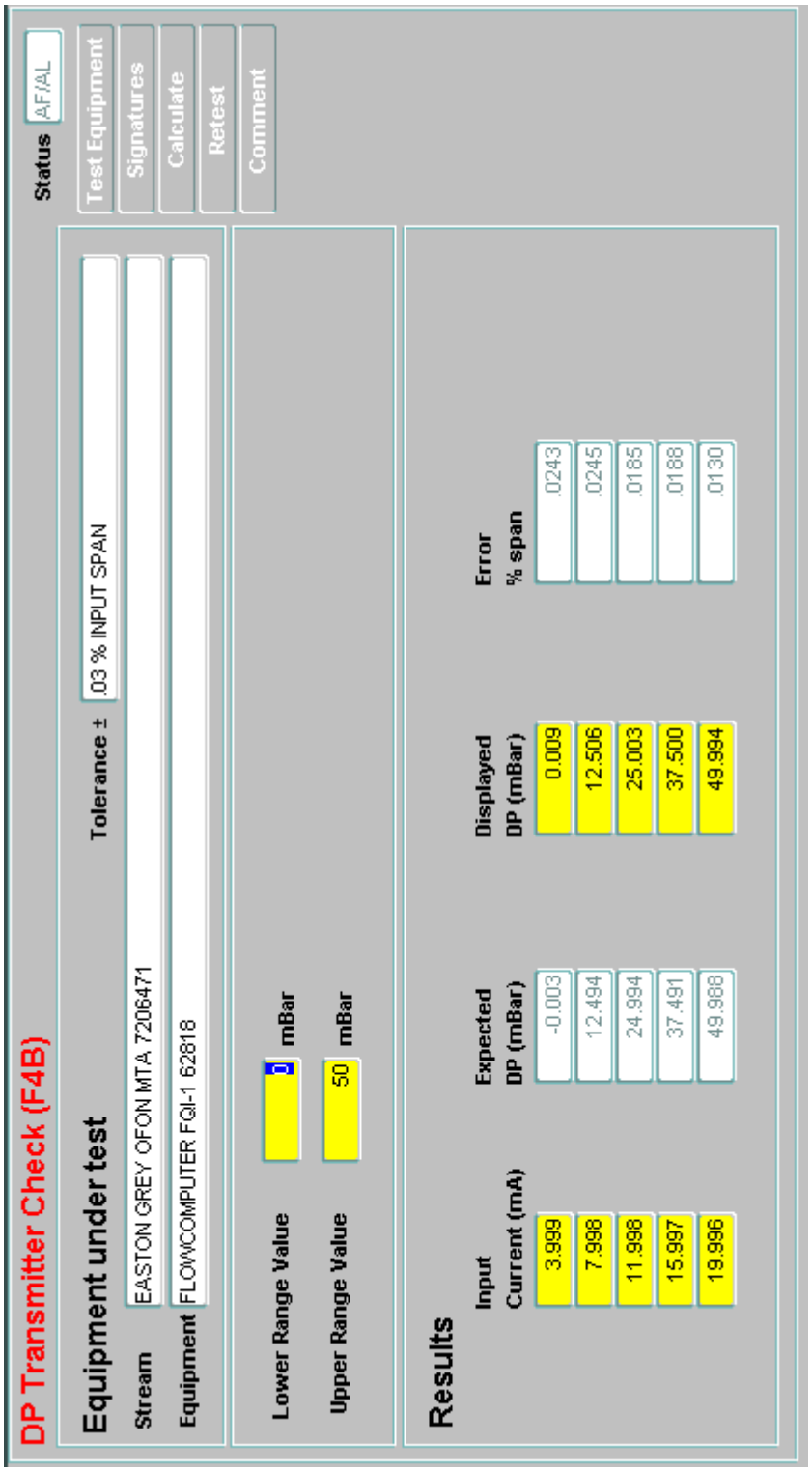
Wales & West Utilities Plc

APPENDIX A – Validation Results

As Found Low DP Transmitter Check – 21st June 2010



As Found/As Left Low DP ADC Check – June 2010



APPENDIX B – Daily Correction Factors

Gas Day	Error (scm)	Gemini Daily Volume (scm)	Daily Correction Factor
02-Jul-09	4.5	11100	0.999595
06-Oct-09	20.0	37800	0.999472
07-Oct-09	64.0	414300	0.999846
09-Oct-09	251.8	729100	0.999655
12-Oct-09	228.2	385100	0.999408
13-Oct-09	313.4	251800	0.998757
15-Oct-09	326.1	332900	0.999021
16-Oct-09	4.9	340000	0.999986
02-Nov-09	50.6	423100	0.999880
03-Nov-09	350.6	506500	0.999308
04-Nov-09	436.1	982700	0.999556
05-Nov-09	299.3	1054900	0.999716
06-Nov-09	1263.2	899300	0.998597
07-Nov-09	1261.1	935600	0.998654
08-Nov-09	751.7	963800	0.999221
09-Nov-09	355.0	1446500	0.999755
10-Nov-09	232.9	1352900	0.999828
11-Nov-09	612.7	782800	0.999218
12-Nov-09	869.1	557200	0.998443
13-Nov-09	526.8	853800	0.999383
16-Nov-09	179.6	910400	0.999803
17-Nov-09	541.3	1049900	0.999485
18-Nov-09	616.2	727300	0.999154
19-Nov-09	458.3	452700	0.998989
20-Nov-09	247.5	400000	0.999382
21-Nov-09	672.7	527000	0.998725
22-Nov-09	786.3	1035700	0.999241
23-Nov-09	402.7	744500	0.999459
24-Nov-09	138.8	612500	0.999773
25-Nov-09	365.7	1115300	0.999672
26-Nov-09	541.7	1343800	0.999597
27-Nov-09	173.8	1410300	0.999877
28-Nov-09	439.2	1144700	0.999616
29-Nov-09	513.3	1100800	0.999534
30-Nov-09	285.3	1335800	0.999786
01-Dec-09	201.3	1358500	0.999852
02-Dec-09	151.5	1230200	0.999877
03-Dec-09	87.5	1459800	0.999940
04-Dec-09	73.8	1477700	0.999950
05-Dec-09	722.0	994000	0.999274
06-Dec-09	386.9	1077200	0.999641
07-Dec-09	232.8	1212400	0.999808
08-Dec-09	72.7	1177000	0.999938
09-Dec-09	632.4	1027500	0.999385
10-Dec-09	172.3	1174900	0.999853
11-Dec-09	328.8	1447300	0.999773
12-Dec-09	261.5	1097900	0.999762

Gas Day	Error (scm)	Gemini Daily Volume (scm)	Daily Correction Factor
13-Dec-09	505.2	1198800	0.999579
14-Dec-09	336.8	1342800	0.999749
15-Dec-09	90.1	1392100	0.999935
16-Dec-09	31.3	1472700	0.999979
17-Dec-09	378.7	1594100	0.999762
18-Dec-09	158.2	1510100	0.999895
19-Dec-09	435.5	1571100	0.999723
20-Dec-09	362.2	1477100	0.999755
22-Dec-09	302.2	1784100	0.999831
23-Dec-09	112.6	1728200	0.999935
24-Dec-09	79.5	1601000	0.999950
25-Dec-09	57.6	1487800	0.999961
26-Dec-09	126.4	1330000	0.999905
27-Dec-09	291.3	1468800	0.999802
28-Dec-09	440.5	1569600	0.999719
29-Dec-09	157.8	1638700	0.999904
30-Dec-09	466.7	1586800	0.999706
31-Dec-09	423.2	1609100	0.999737
01-Jan-10	279.8	1771500	0.999842
02-Jan-10	309.0	1653000	0.999813
03-Jan-10	242.7	1613600	0.999850
06-Jan-10	42.7	2009500	0.999979
07-Jan-10	37.5	2151200	0.999983
09-Jan-10	21.8	1680300	0.999987
10-Jan-10	133.9	1774800	0.999925
12-Jan-10	22.0	1907200	0.999988
13-Jan-10	148.2	1830700	0.999919
14-Jan-10	497.6	1607300	0.999691
15-Jan-10	371.0	1518900	0.999756
16-Jan-10	263.8	1271400	0.999793
17-Jan-10	379.9	1259300	0.999698
18-Jan-10	544.7	1269000	0.999571
19-Jan-10	382.0	1239700	0.999692
20-Jan-10	135.6	1633100	0.999917
21-Jan-10	270.4	1542200	0.999825
22-Jan-10	587.8	1159700	0.999493
23-Jan-10	280.2	1163300	0.999759
24-Jan-10	348.2	1290900	0.999730
25-Jan-10	88.1	1409600	0.999938
27-Jan-10	69.2	1602900	0.999957
28-Jan-10	412.6	1422400	0.999710
29-Jan-10	536.1	1341100	0.999600
30-Jan-10	635.4	1326300	0.999521
31-Jan-10	189.2	1598200	0.999882
01-Feb-10	332.1	1668900	0.999801
02-Feb-10	150.1	1538000	0.999902
03-Feb-10	225.8	1277000	0.999823
04-Feb-10	275.2	1157000	0.999762
05-Feb-10	504.0	1184200	0.999575
06-Feb-10	251.7	1322900	0.999810

Gas Day	Error (scm)	Gemini Daily Volume (scm)	Daily Correction Factor
07-Feb-10	118.0	1481300	0.999920
08-Feb-10	279.7	1554300	0.999820
09-Feb-10	296.1	1590000	0.999814
10-Feb-10	285.4	1575810	0.999819
11-Feb-10	251.6	1592800	0.999842
12-Feb-10	470.4	1509800	0.999689
13-Feb-10	444.3	1544590	0.999712
14-Feb-10	293.4	1398400	0.999790
15-Feb-10	827.4	1232900	0.999329
16-Feb-10	605.2	1257900	0.999519
17-Feb-10	452.5	1469990	0.999692
19-Feb-10	313.3	1568200	0.999800
20-Feb-10	479.2	1448700	0.999669
21-Feb-10	137.4	1373700	0.999900
22-Feb-10	275.2	1425500	0.999807
23-Feb-10	190.1	1567900	0.999879
24-Feb-10	169.5	1262000	0.999866
25-Feb-10	237.7	1204410	0.999803
26-Feb-10	577.7	1310100	0.999559
27-Feb-10	224.8	1377200	0.999837
28-Feb-10	149.9	1588700	0.999906
01-Mar-10	486.5	1012200	0.999520
02-Mar-10	362.3	1254800	0.999711
03-Mar-10	312.0	1497900	0.999792
04-Mar-10	91.2	1403400	0.999935
05-Mar-10	825.6	1130900	0.999271
06-Mar-10	756.0	1130700	0.999332
07-Mar-10	232.0	1213300	0.999809
08-Mar-10	422.4	1413300	0.999701
09-Mar-10	201.0	1258100	0.999840
10-Mar-10	327.5	1427000	0.999771
11-Mar-10	284.8	1366500	0.999792
12-Mar-10	467.9	1204300	0.999612
13-Mar-10	1226.6	932300	0.998686
14-Mar-10	519.3	1112800	0.999534
15-Mar-10	194.2	1054100	0.999816
16-Mar-10	452.6	1037000	0.999564
17-Mar-10	231.1	904900	0.999745
18-Mar-10	288.3	880200	0.999673
19-Mar-10	485.6	687600	0.999294
20-Mar-10	513.3	768600	0.999333
21-Mar-10	412.1	638600	0.999355
22-Mar-10	193.2	1011300	0.999809
23-Mar-10	316.1	1174200	0.999731
24-Mar-10	425.0	812200	0.999477
25-Mar-10	548.4	1016200	0.999461
26-Mar-10	627.1	874700	0.999284
28-Mar-10	744.3	954800	0.999221
29-Mar-10	577.4	698600	0.999174
30-Mar-10	1106.3	914600	0.998792

Gas Day	Error (scm)	Gemini Daily Volume (scm)	Daily Correction Factor
31-Mar-10	773.0	1306600	0.999409
01-Apr-10	419.9	1260800	0.999667
02-Apr-10	764.2	1014500	0.999247
03-Apr-10	397.2	992300	0.999600
04-Apr-10	698.6	827400	0.999156
05-Apr-10	187.0	855200	0.999781
06-Apr-10	205.0	454300	0.999549
07-Apr-10	4.7	472400	0.999990
08-Apr-10	258.0	254600	0.998988
14-Apr-10	61.1	113700	0.999463
02-May-10	4.6	755000	0.999994
03-May-10	996.2	742100	0.998659
04-May-10	170.2	142100	0.998803
08-May-10	4.5	624100	0.999993
09-May-10	418.3	740000	0.999435
10-May-10	160.5	368000	0.999564
11-May-10	87.2	773800	0.999887
12-May-10	625.5	915100	0.999317
13-May-10	48.7	205900	0.999763