

**METER ERROR REPORT****FINAL**

Reconcile?	Y
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Safety Issue?	Y/N
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Thesis Report No.	
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**1. EXECUTIVE SUMMARY**

SITE NAME	Gilwern	
LDZ	WS	
START DATE (actual)		
LAST GOOD DATE	17 <sup>th</sup> May 2012	
END DATE	24 <sup>th</sup> June 2013	
SIZE OF ERROR (No reconciliation required if under 0.1%)	0.2552% over-registration	
ESTIMATE – Y/N?		
ROOT CAUSE	ADC errors found at annual validation and error in Gemini data	
ANALYSIS	Recalculation of volumes using corrected pressure and temperature	
METER TYPE	Ultrasonic	
AUTHOR	B. Kirkman	
CHECKED BY	S. Kimpton	
ACCEPTED BY WWU NETWORK		
RECONCILIATION	Distribution	Transportation

## 2. BACKGROUND

Gilwern has two ultrasonic meter streams using a gas chromatograph for CV determination and PTZ correction.

During an annual T/PR/ME/2 validation on Stream MT1 the pressure and temperature ADC errors were outside the required tolerance. The temperature transmitter errors were also up to the maximum allowable. Only Stream MT1 was used during this period.

A data error was discovered in the Gemini billed data which is also included in this report.

## 3. ERROR QUANTIFICATION AND IMPACT

The 'as found' errors from the ADC and transmitter checks were used to correct the pressure and temperature readings since the previous validation. The errors are shown in Tables 1 and 2.

Pressure (barg)	CP10 Error (% span)	CP4a Error (% span)	Combined Error (% span)
0	0.06565	0.0388	0.10445
20.009	-0.0274	0.0888	0.0614
40.019	-0.05795	0.1263	0.06835
60.028	-0.01655	0.1763	0.15975
80.038	0.0092	0.2200	0.2292

Table 1 – Pressure Errors

Temperature (°C)	CP12 Error (% span)	CP4e Error (% span)	Combined Error (% span)
-10	0.07185	0.0000	0.07185
2.5	0.06255	0.0400	0.10255
15	-0.05005	0.0600	0.00995
27.5	0.1594	0.0600	0.2194
40	-0.0563	0.1000	0.0437

Table 2 – Temperature Errors

Note: The CP10 and CP12 errors are the average of the rising and falling errors.

The density, flow rate and daily volumes were recalculated from the corrected pressure and temperature readings. The error was calculated on a daily basis as the difference between volume totals using measured and corrected inputs.

The daily volumes calculated from the 4-minutely data were compared to the Gemini billed volumes. This comparison highlighted an error in the Gemini billed data for 20<sup>th</sup> June 2012. The data was a copy of the previous

day whereas the end of day data showed a significant difference between the days. The daily correction factor for 20<sup>th</sup> June accounts for both errors.

The overall error is an over-registration of 0.2552%.

#### **4. CAUSES**

ADC errors were found on Stream MT1 at annual validation.

A data error was discovered in the Gemini billed volume data for 20<sup>th</sup> June 2012.

#### **5. RECOMMENDATIONS AND LEARNING**

The overall error is an over-registration of 0.2552%. As the start date of the ADC error is unknown half the ADC error should be reconciled, however the entire Gemini data error should be reconciled. It is recommended that the error is reconciled using the daily correction factors shown in Appendix A which include half of the ADC error and the entire Gemini data error.

There was a discrepancy between daily volumes registered on Gemini and in the RBD data for 18<sup>th</sup> May 2012 due to gaps in the recorded RBD data. A correction factor has been applied to this day based on the average of the subsequent correction factors for 19<sup>th</sup> to 21<sup>st</sup> May 2012.

There was also an error in the Gemini billed data for 20<sup>th</sup> June 2012. The data was a copy of the previous day whereas the end of day data showed a significant difference between the days. The daily correction factor for 20<sup>th</sup> June 2012 accounts for both errors.

**REFERENCES**

HPMIS Database

Gilwern\_Data.xlsx – calculation spreadsheet

Gilwern\_Summary.xlsx – results spreadsheet

**VERSION HISTORY**

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
<i>O</i>	<i>Original</i>	<i>B. Kirkman</i>	<i>02/12/2013</i>

**DISTRIBUTION**

*Wales and West Utilities*

**APPENDIX A – Daily Correction Factors**

The table below gives the daily correction factors which should be used to reconcile the error.

\*There was a discrepancy between daily volumes registered on Gemini and in the RBD data for 18th May 2012 due to gaps in the recorded RBD data. A correction factor has been applied to this day based on the average of the subsequent correction factors for 19th to 21st May 2012.

\*\*There was also an error in the Gemini billed data for 20<sup>th</sup> June 2012. The data was a copy of the previous day whereas the end of day data showed a significant difference between the days. The daily correction factor for 20<sup>th</sup> June 2012 accounts for both errors.

Gas Day	Daily Correction Factor
17-May-12	0.999431
<b>18-May-12</b>	<b>*0.998865</b>
19-May-12	0.998865
20-May-12	0.998869
21-May-12	0.998860
22-May-12	0.998925
23-May-12	0.998950
24-May-12	0.998952
25-May-12	0.998901
26-May-12	0.998826
27-May-12	0.998828
28-May-12	0.998837
29-May-12	0.998936
30-May-12	0.998867
31-May-12	0.998893
01-Jun-12	0.998896
02-Jun-12	0.998843
03-Jun-12	0.998837
04-Jun-12	0.998844
05-Jun-12	0.998863
06-Jun-12	0.998853
07-Jun-12	0.998856
08-Jun-12	0.998884
09-Jun-12	0.998853
10-Jun-12	0.998854
11-Jun-12	0.998883
12-Jun-12	0.998860
13-Jun-12	0.998828
14-Jun-12	0.998847
15-Jun-12	0.998880
16-Jun-12	0.998891
17-Jun-12	0.998871
18-Jun-12	0.998876
19-Jun-12	0.998852
<b>20-Jun-12</b>	<b>**0.859236</b>

Gas Day	Daily Correction Factor
21-Jun-12	0.998834
22-Jun-12	0.998862
23-Jun-12	0.998879
24-Jun-12	0.998863
25-Jun-12	0.998908
26-Jun-12	0.998901
27-Jun-12	0.998881
28-Jun-12	0.998830
29-Jun-12	0.998824
30-Jun-12	0.998809
01-Jul-12	0.998863
02-Jul-12	0.998932
03-Jul-12	0.998968
04-Jul-12	0.998955
05-Jul-12	0.998922
06-Jul-12	0.998937
07-Jul-12	0.998894
08-Jul-12	0.998899
09-Jul-12	0.998850
10-Jul-12	0.998820
11-Jul-12	0.998862
12-Jul-12	0.998895
13-Jul-12	0.998871
14-Jul-12	0.998844
15-Jul-12	0.998830
16-Jul-12	0.998850
17-Jul-12	0.998871
18-Jul-12	0.998869
19-Jul-12	0.998924
20-Jul-12	0.998908
21-Jul-12	0.998901
22-Jul-12	0.998980
23-Jul-12	0.999038
24-Jul-12	0.999019
25-Jul-12	0.998996

Gas Day	Daily Correction Factor
26-Jul-12	0.999004
27-Jul-12	0.999011
28-Jul-12	0.998973
29-Jul-12	0.998962
30-Jul-12	0.998989
31-Jul-12	0.998980
01-Aug-12	0.998919
02-Aug-12	0.998815
03-Aug-12	0.998842
04-Aug-12	0.998873
05-Aug-12	0.998873
06-Aug-12	0.998876
07-Aug-12	0.998858
08-Aug-12	0.998827
09-Aug-12	0.998867
10-Aug-12	0.998848
11-Aug-12	0.998864
12-Aug-12	0.998868
13-Aug-12	0.998859
14-Aug-12	0.998826
15-Aug-12	0.998836
16-Aug-12	0.998846
17-Aug-12	0.998819
18-Aug-12	0.998802
19-Aug-12	0.998797
20-Aug-12	0.998843
21-Aug-12	0.998818
22-Aug-12	0.998801
23-Aug-12	0.998801
24-Aug-12	0.998821
25-Aug-12	0.998809
26-Aug-12	0.998822
27-Aug-12	0.998798
28-Aug-12	0.998818
29-Aug-12	0.998827
30-Aug-12	0.998815
31-Aug-12	0.998830
01-Sep-12	0.998859
02-Sep-12	0.998826
03-Sep-12	0.998845
04-Sep-12	0.998847
05-Sep-12	0.998830
06-Sep-12	0.998846
07-Sep-12	0.998885
08-Sep-12	0.998869
09-Sep-12	0.998862
10-Sep-12	0.998863
11-Sep-12	0.998858
12-Sep-12	0.998884
13-Sep-12	0.998879

Gas Day	Daily Correction Factor
14-Sep-12	0.998870
15-Sep-12	0.998885
16-Sep-12	0.998872
17-Sep-12	0.998869
18-Sep-12	0.998913
19-Sep-12	0.998910
20-Sep-12	0.998921
21-Sep-12	0.998934
22-Sep-12	0.998934
23-Sep-12	0.998920
24-Sep-12	0.998920
25-Sep-12	0.998905
26-Sep-12	0.998939
27-Sep-12	0.998935
28-Sep-12	0.998934
29-Sep-12	0.998942
30-Sep-12	0.998937
01-Oct-12	0.998979
02-Oct-12	0.998937
03-Oct-12	0.998946
04-Oct-12	0.998932
05-Oct-12	0.998923
06-Oct-12	0.998945
07-Oct-12	0.998956
08-Oct-12	0.998976
09-Oct-12	0.998941
10-Oct-12	0.998953
11-Oct-12	0.998924
12-Oct-12	0.998906
13-Oct-12	0.998933
14-Oct-12	0.998932
15-Oct-12	0.998929
16-Oct-12	0.998896
17-Oct-12	0.998848
18-Oct-12	0.998899
19-Oct-12	0.998961
20-Oct-12	0.998968
21-Oct-12	0.998952
22-Oct-12	0.998914
23-Oct-12	0.998909
24-Oct-12	0.998912
25-Oct-12	0.998909
26-Oct-12	0.998948
27-Oct-12	0.998949
28-Oct-12	0.998931
29-Oct-12	0.998919
30-Oct-12	0.998891
31-Oct-12	0.998920
01-Nov-12	0.998912
02-Nov-12	0.998900

Gas Day	Daily Correction Factor
03-Nov-12	0.998922
04-Nov-12	0.998977
05-Nov-12	0.998877
06-Nov-12	0.998871
07-Nov-12	0.998912
08-Nov-12	0.998918
09-Nov-12	0.998943
10-Nov-12	0.998913
11-Nov-12	0.998877
12-Nov-12	0.998901
13-Nov-12	0.998847
14-Nov-12	0.998902
15-Nov-12	0.998864
16-Nov-12	0.998862
17-Nov-12	0.998872
18-Nov-12	0.998900
19-Nov-12	0.998959
20-Nov-12	0.998985
21-Nov-12	0.999054
22-Nov-12	0.998994
23-Nov-12	0.998865
24-Nov-12	0.998875
25-Nov-12	0.998864
26-Nov-12	0.998878
27-Nov-12	0.998855
28-Nov-12	0.998857
29-Nov-12	0.998875
30-Nov-12	0.998883
01-Dec-12	0.998888
02-Dec-12	0.998864
03-Dec-12	0.998846
04-Dec-12	0.998869
05-Dec-12	0.998879
06-Dec-12	0.998902
07-Dec-12	0.998893
08-Dec-12	0.998908
09-Dec-12	0.998919
10-Dec-12	0.998877
11-Dec-12	0.998872
12-Dec-12	0.998940
13-Dec-12	0.998881
14-Dec-12	0.998976
15-Dec-12	0.998918
16-Dec-12	0.998922
17-Dec-12	0.998908
18-Dec-12	0.998899
19-Dec-12	0.998890
20-Dec-12	0.998916
21-Dec-12	0.998885
22-Dec-12	0.998864

Gas Day	Daily Correction Factor
23-Dec-12	0.998866
24-Dec-12	0.998875
25-Dec-12	0.998874
26-Dec-12	0.998870
27-Dec-12	0.998926
28-Dec-12	0.998855
29-Dec-12	0.998883
30-Dec-12	0.998870
31-Dec-12	0.998851
01-Jan-13	0.998869
02-Jan-13	0.998905
03-Jan-13	0.998876
04-Jan-13	0.998908
05-Jan-13	0.998896
06-Jan-13	0.998914
07-Jan-13	0.998892
08-Jan-13	0.998876
09-Jan-13	0.998891
10-Jan-13	0.998961
11-Jan-13	0.998918
12-Jan-13	0.998940
13-Jan-13	0.998898
14-Jan-13	0.998917
15-Jan-13	0.998876
16-Jan-13	0.998909
17-Jan-13	0.998867
18-Jan-13	0.998876
19-Jan-13	0.998966
20-Jan-13	0.998978
21-Jan-13	0.998902
22-Jan-13	0.998924
23-Jan-13	0.998885
24-Jan-13	0.998870
25-Jan-13	0.998886
26-Jan-13	0.998914
27-Jan-13	0.998896
28-Jan-13	0.998955
29-Jan-13	0.998939
30-Jan-13	0.998918
31-Jan-13	0.998953
01-Feb-13	0.998985
02-Feb-13	0.998966
03-Feb-13	0.998929
04-Feb-13	0.998949
05-Feb-13	0.998972
06-Feb-13	0.998952
07-Feb-13	0.998975
08-Feb-13	0.999014
09-Feb-13	0.998966
10-Feb-13	0.998923

Gas Day	Daily Correction Factor
11-Feb-13	0.998976
12-Feb-13	0.999014
13-Feb-13	0.998989
14-Feb-13	0.998921
15-Feb-13	0.998975
16-Feb-13	0.998978
17-Feb-13	0.998976
18-Feb-13	0.998974
19-Feb-13	0.998984
20-Feb-13	0.998988
21-Feb-13	0.999003
22-Feb-13	0.999031
23-Feb-13	0.998955
24-Feb-13	0.998918
25-Feb-13	0.999024
26-Feb-13	0.998902
27-Feb-13	0.998861
28-Feb-13	0.998982
01-Mar-13	0.998882
02-Mar-13	0.998934
03-Mar-13	0.998958
04-Mar-13	0.998906
05-Mar-13	0.998872
06-Mar-13	0.998961
07-Mar-13	0.998928
08-Mar-13	0.998957
09-Mar-13	0.998936
10-Mar-13	0.998943
11-Mar-13	0.998924
12-Mar-13	0.998943
13-Mar-13	0.998916
14-Mar-13	0.998943
15-Mar-13	0.998902
16-Mar-13	0.998998
17-Mar-13	0.999001
18-Mar-13	0.998942
19-Mar-13	0.998900
20-Mar-13	0.998918
21-Mar-13	0.998969
22-Mar-13	0.998947
23-Mar-13	0.998894
24-Mar-13	0.998891
25-Mar-13	0.998900
26-Mar-13	0.998908
27-Mar-13	0.998886
28-Mar-13	0.998929
29-Mar-13	0.999012
30-Mar-13	0.998918
31-Mar-13	0.998886
01-Apr-13	0.998880

Gas Day	Daily Correction Factor
02-Apr-13	0.998879
03-Apr-13	0.998876
04-Apr-13	0.998887
05-Apr-13	0.998890
06-Apr-13	0.998893
07-Apr-13	0.998906
08-Apr-13	0.998931
09-Apr-13	0.998893
10-Apr-13	0.998889
11-Apr-13	0.998884
12-Apr-13	0.998922
13-Apr-13	0.998982
14-Apr-13	0.998931
15-Apr-13	0.998989
16-Apr-13	0.998951
17-Apr-13	0.998910
18-Apr-13	0.998882
19-Apr-13	0.998892
20-Apr-13	0.998865
21-Apr-13	0.998871
22-Apr-13	0.998877
23-Apr-13	0.998893
24-Apr-13	0.998939
25-Apr-13	0.998901
26-Apr-13	0.998898
27-Apr-13	0.998883
28-Apr-13	0.998896
29-Apr-13	0.998873
30-Apr-13	0.998880
01-May-13	0.998956
02-May-13	0.998865
03-May-13	0.998946
04-May-13	0.998868
05-May-13	0.998916
06-May-13	0.998884
07-May-13	0.998879
08-May-13	0.998923
09-May-13	0.998922
10-May-13	0.998969
11-May-13	0.998922
12-May-13	0.998966
13-May-13	0.998894
14-May-13	0.998946
15-May-13	0.998942
16-May-13	0.998902
17-May-13	0.998916
18-May-13	0.998949
19-May-13	0.998848
20-May-13	0.998917
21-May-13	0.998883



<b>Gas Day</b>	<b>Daily Correction Factor</b>
22-May-13	0.998896
23-May-13	0.998896
24-May-13	0.998876
25-May-13	0.998868
26-May-13	0.998852
27-May-13	0.998840
28-May-13	0.998866
29-May-13	0.998883
30-May-13	0.998850
31-May-13	0.998858
01-Jun-13	0.998849
02-Jun-13	0.998853
03-Jun-13	0.998904
04-Jun-13	0.998840
05-Jun-13	0.998831
06-Jun-13	0.998833
07-Jun-13	0.998837
08-Jun-13	0.998896
09-Jun-13	0.998852
10-Jun-13	0.998851
11-Jun-13	0.998830
12-Jun-13	0.998846
13-Jun-13	0.998833
14-Jun-13	0.998840
15-Jun-13	0.998832
16-Jun-13	0.998848
17-Jun-13	0.998852
18-Jun-13	0.998842
19-Jun-13	0.998841
20-Jun-13	0.998834
21-Jun-13	0.998830
22-Jun-13	0.998830
23-Jun-13	0.998834
24-Jun-13	0.999643