

NULL METER ERROR REPORT**FINAL**

Reconcile?	N
------------	---

Safety Issue?	N
---------------	---

Thesis Report No.	
-------------------	--

1. EXECUTIVE SUMMARY

SITE NAME	Atherstone	
LDZ	WM	
START DATE (actual)	8 th February 2021	
LAST GOOD DATE		
END DATE	2 nd July 2021	
SIZE OF ERROR (No reconciliation required if under 0.1%)	0.02324% on original measured volume	
ESTIMATE – Y/N?	N	
ROOT CAUSE	Incorrect fixed factor for CO ₂ entered into the flow computer	
ANALYSIS	Calculation of flowrates using incorrect and correct CO ₂ fixed factors to determine the error using the worst case pressure and temperature.	
METER TYPE	Turbine	
AUTHOR	Damian Ray	
CHECKED BY	Simon Howard	
ACCEPTED BY CADENT NETWORK		
RECONCILIATION	Distribution	Transportation

2. BACKGROUND

Gas is supplied to part of the Cadent network at Atherstone FWACV inter LDZ site. The site metering system comprises of dual stream turbine meters.

On the 8th February 2021, an incorrectly calculated fixed factor for carbon dioxide was entered into the site flow computer configuration.

3. ERROR QUANTIFICATION AND IMPACT

Table 1 details the incorrect and correct carbon dioxide fixed factors that were entered into the flow computer. Image 1 shows the incorrect CO₂ fixed factor and image 2 shows the correct CO₂ fixed factor.

	Incorrect CO ₂ value	Correct CO ₂ value
Turbine	1.254018	0.971718

Table 1 Correct and Incorrect CO₂ fixed factors

Data Analysis Period 1 January 2020 05:00 hrs to 1 January 2021 05:00 hrs inclusive

Average composition, flow pressure and flow temperature

site	h_ref	Count	meter	Stream	c1	c2	c3	nc4	ic4	nc5	ic5	neoc5	c6	co2	n2	P	T	Calc Visc (μPoise)	Isent (index)	Average CO ₂ (mol.%) Omni 6 d.p. TR_GO.DAT
Atherstone	H9801	45838	MT1	3	90.76259642	5.10312524	1.141992598	0.18248247	0.189833463	0.035335995	0.0484515	2.14E-05	0.056955	1.254018	1.222301	27.94256	15.2391333			1.254018
Atherstone	H9801	79	MT2	3	90.76259642	5.10312524	1.141992598	0.18248247	0.189833463	0.035335995	0.0484515	2.14E-05	0.056955	1.254018	1.222301	26.49343	16.12044776			1.254018

Image 1 Incorrect CO₂ fixed factor

site	h_ref	Count	meter	Stream	c1	c2	c3	nc4	ic4	nc5	ic5	neoc5	c6	co2	n2	P	T	Calc Visc (μPoise)	Isent (index)	Average CO ₂ (mol.%) Omni 6 d.p. TR_GO.DAT
Atherstone ^{*1}	H9801	46544	MT1	3	91.283707	5.059088	0.993725	0.159876	0.153920	0.028390	0.038753	0.001850	0.043517	0.971718	1.265455	28.257918	15.322241			0.971718
Atherstone ^{*1}	H9801	335	MT2	3	91.283707	5.059088	0.993725	0.159876	0.153920	0.028390	0.038753	0.001850	0.043517	0.971718	1.265455	26.493235	16.120394			0.971718

Image 2 Correct CO₂ fixed factor

The error will be largest when the metering pressure is highest and metering temperature is lowest. Data for the period of the error was processed and the highest pressure and lowest temperature recorded. These values were used to calculate the worst case percentage error in the flowrate which is summarised in Table 2.

Percentage Error in Flowrate %	0.02324
--------------------------------	---------

Table 2 Error in Volumetric Flowrate

4. CAUSES

The error was caused by the fixed factors being incorrectly calculated due to missing data in the extracted data.

5. RECOMMENDATIONS AND LEARNING

An appropriate data validation process should be employed to ensure a complete data set is available for the fixed factor calculations.

REFERENCES

Atherstone CO2 fixed factor Error 2021.xls

VERSION HISTORY

<i>Version</i>	<i>Changes</i>	<i>Author</i>	<i>Date</i>
1	<i>First Issue</i>	Damian Ray	20/10/2021