

## National Milk Laboratories Limited (NML) Performance in Proficiency Test Schemes and Ring trials

This report covers NML performance in proficiency test schemes (PTS) and ring trials (April 2017- March 2018).

For quantitative tests, the criteria used to assess laboratory performance in PTS are based on standardised scores. These Z-scores are a measure of how many standard deviations below or above the population mean a raw score is. In some PTS, when appropriate, a Z'-score is used. The Z'-score is calculated from an estimate of the population standard deviation that is derived in a different way to the Z-score. The Z'-score is comparable with the Z-score.

The acceptance criteria for both Z-score and Z'-score is:-

$\geq -2$  and  $\leq 2$  Performance is Satisfactory

$< -2$ ,  $\geq -3$  and  $> 2$ ,  $\leq 3$  Performance is Questionable

$< -3$  and  $> 3$  Performance is Unsatisfactory

Where available, Z-scores/Z'-scores have been plotted for PTS provider and laboratory site against the PTS assigned value. As a certain minimum number of test results are required to calculate a Z/Z'-score, there may be no Z/Z'-score reported for some PT rounds. Additionally, the differences between the laboratory mean result and the PTS assigned result have also been plotted against the PTS assigned result.

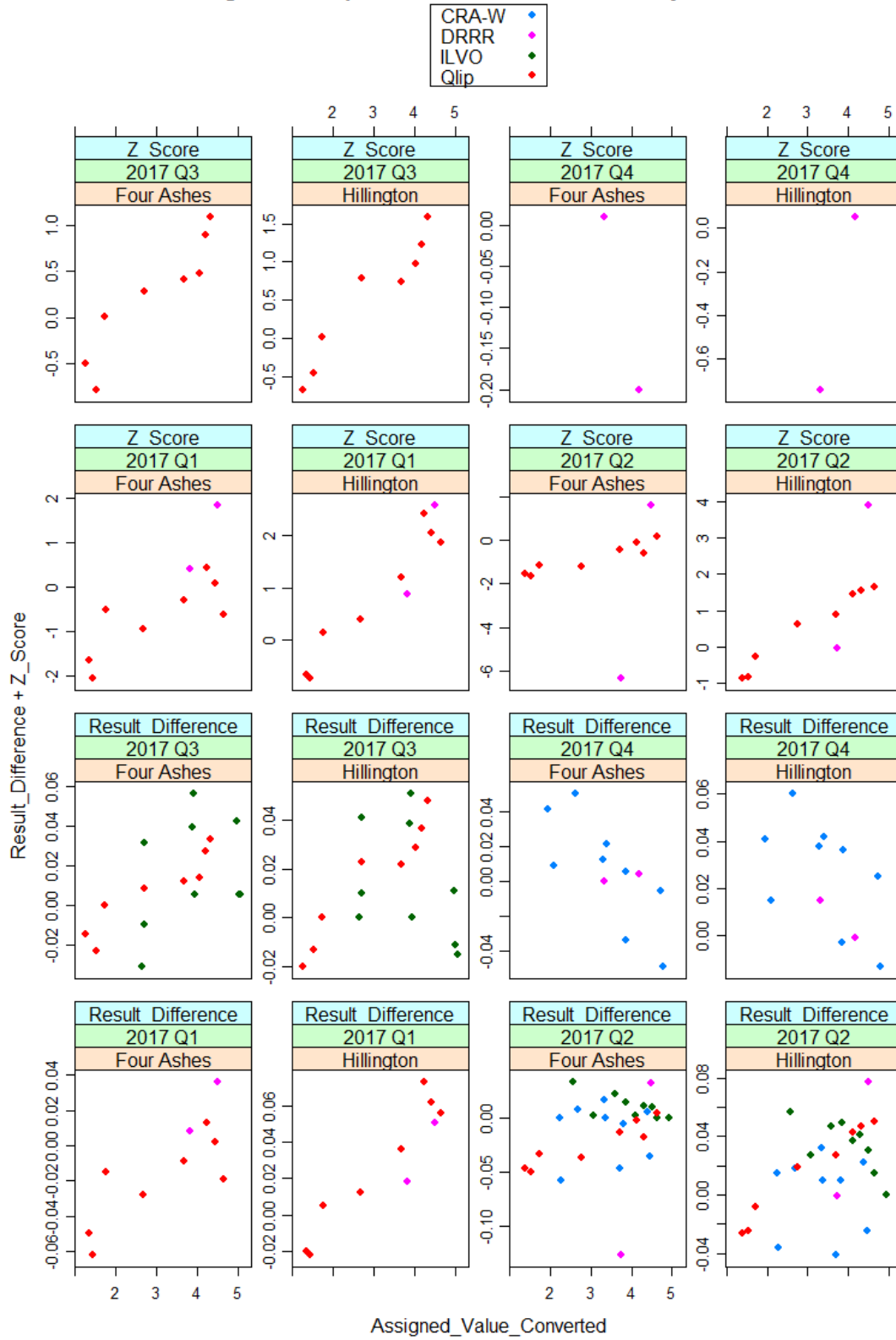
For qualitative tests, the criteria used to assess laboratory performance in PTS are based on the number of correctly classified test results as compared to the PTS assigned result interpretation.

### Test parameter: Fat

NML participated in five proficiency testing schemes (PTS) for Fat. These schemes were provided by German company 'Deutsches Referenzbüro für Ringversuche und Referenzmaterialien' (DRRR), German company 'Landeskontrollverband für Leistungs- und qualitätsprüfung mecklenburg-vorpommern e.v (LKV-MV) Dutch company 'Qlip', Belgium organisations 'Institute for Agricultural and Fisheries Research' (ILVO) 'Walloon Agricultural Research Centre' (CRA-W). The DRRR and Qlip schemes have three rounds per year and the Fat results are reported in units of g/100g milk. The LKV-MV scheme has four rounds per year with fat results reported as g/100ml milk. The ILVO and CRA-W schemes have two rounds per year and the Fat results are reported in units of g/100ml milk. For ease of interpretation, all the Fat results used in this report have been converted to units of g/100g milk.

In the last quarter there has been two rounds of PTS for Fat, the January 2018 Qlip PTS, this PTS uses 8 samples. For this round there were 39 submissions with both the NML lab sites results classified as satisfactory and March 2018 LKV-MV PTS this has 5 samples with both the NML lab sites results classified as satisfactory. (see Figure 1).

Figure 1 - Coplots of Fat PTS over the last year



The performance trend of the PTS Fat results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean Result\_Difference of -0.003 [95% confidence interval (-0.01, 0.005), n=66] for Four Ashes and a mean Result\_Difference of 0.02 [95% confidence interval (0.013, 0.026), n=66] for Hillington covering the period from January 2017 - December 2017 and including all PTS.

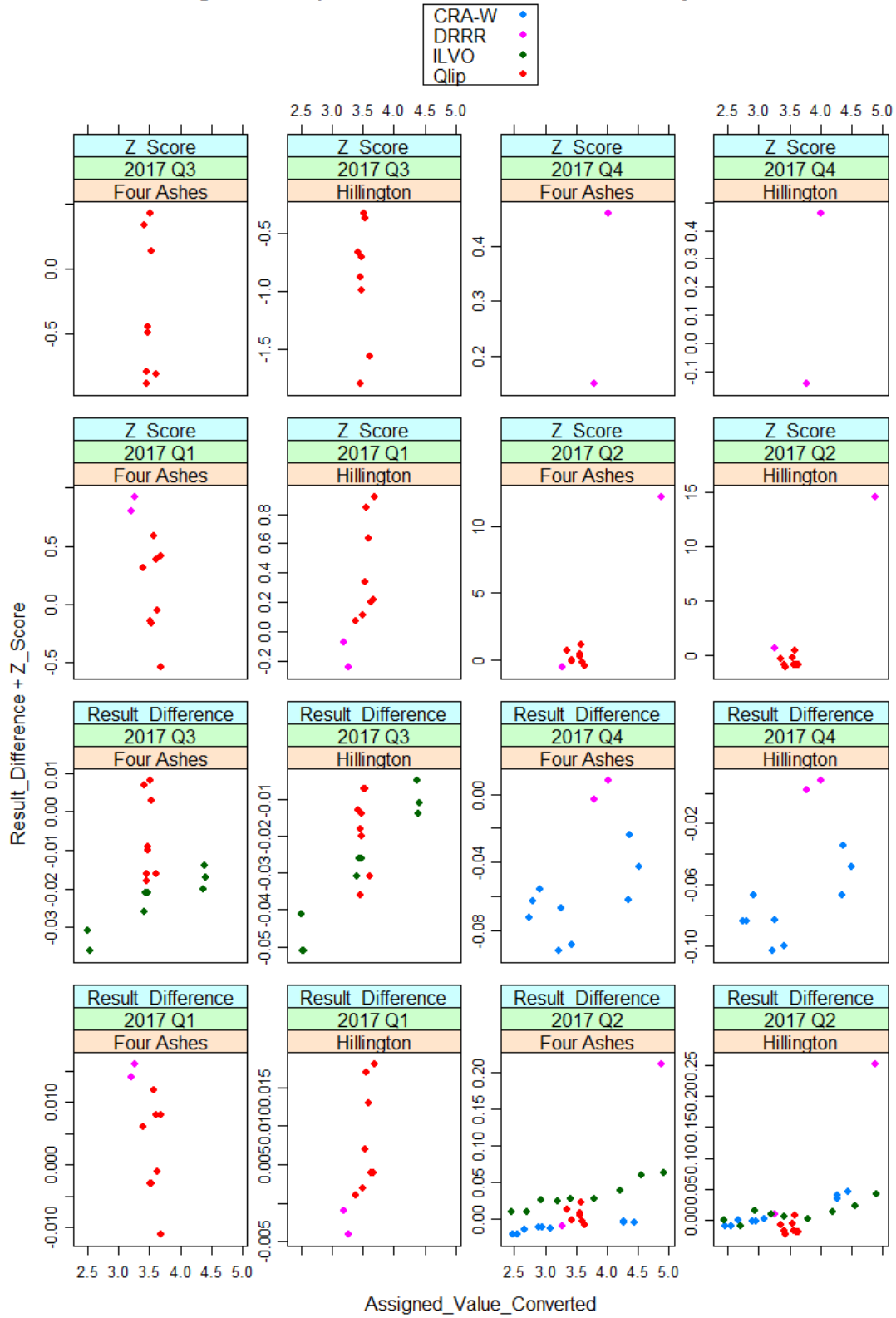
## Test parameter: Protein

NML participated in five proficiency testing schemes (PTS) for Protein. These schemes were provided by German company 'Deutsches Referenzbüro für Ringversuche und Referenzmaterialien' (DRRR), German company 'Landeskontrollverband für Leistungs- und qualitätsprüfung mecklenburg-vorpommern e.v (LKV-MV), Dutch company 'Qlip', Belgium organisations 'Institute for Agricultural and Fisheries Research' (ILVO) and 'Walloon Agricultural Research Centre' (CRA-W). The DRRR and Qlip schemes have three rounds per year and the Protein results are reported in units of g/100g milk. The ILVO and CRA-W schemes have two rounds per year and the Protein results are reported in units of g/100ml milk. The LKV-MV scheme has four rounds per year and results are reported in units of g/100g. For ease of interpretation, all the Protein results used in this report have been converted to units of g/100g milk.

In the last quarter there has been two round of PTS for Protein, the January 2018 Qlip PTS. This PTS uses 8 samples. For this round there were 49 submissions with both the NML lab sites results classified as satisfactory (see Figure 2). The other was March 2018 LKV-MV PTS this has 5 samples with both the NML lab sites results classified as satisfactory.

The performance trend of the PTS Protein results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean Result\_Difference of -0.006 [95% confidence interval (-0.016, 0.004), n=66] for Four Ashes and a mean Result\_Difference of -0.01 [95% confidence interval (-0.021, 0.002), n=66] for Hillington covering the period from January 2017 - December 2017 and including all PTS.

Figure 2 - Coplots of Protein PTS over the last year



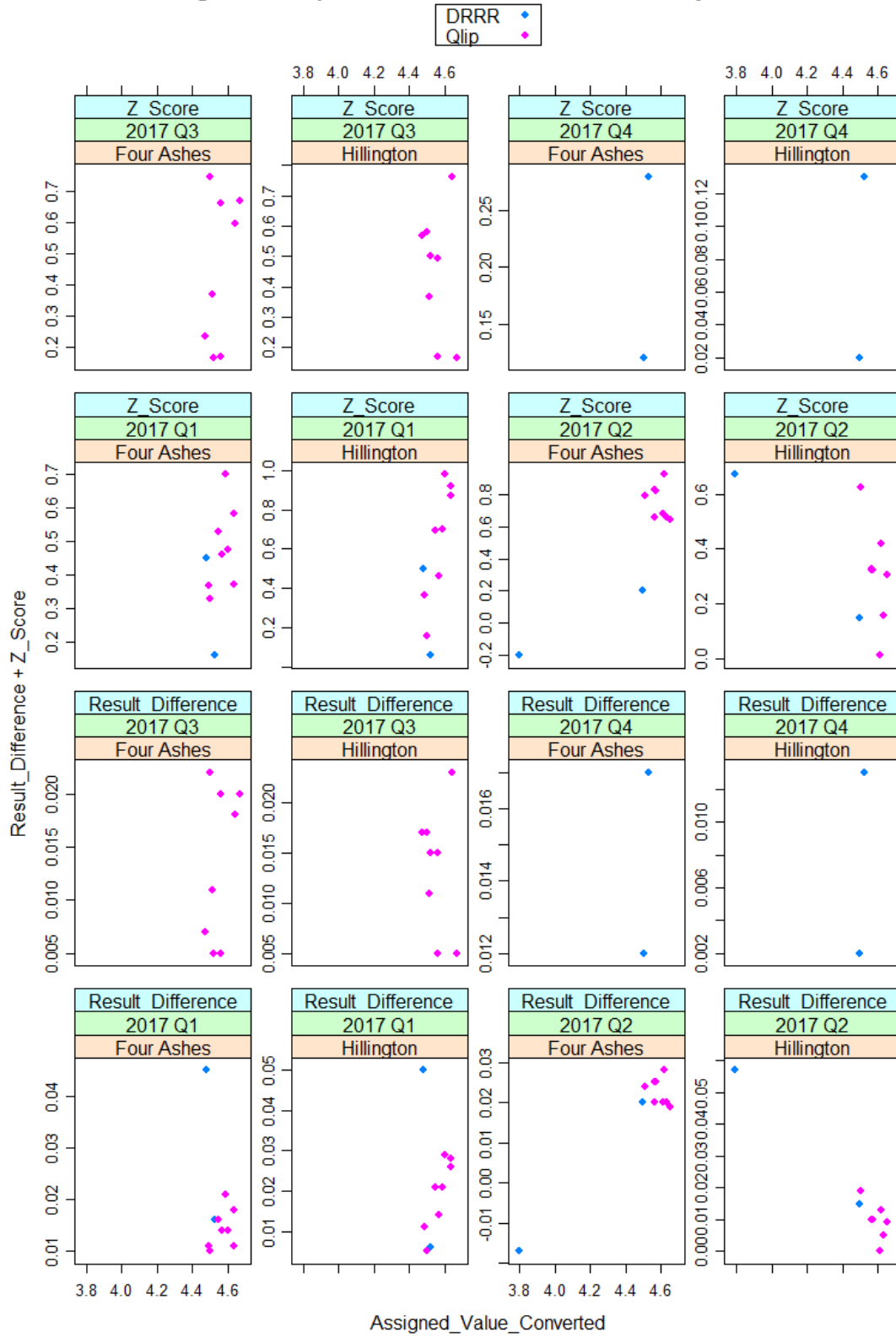
## Test parameter: Lactose

NML participated in two proficiency testing schemes (PTS) for Lactose. These schemes were provided by German company 'Deutsches Referenzbüro für Ringversuche und Referenzmaterialien' (DRRR) and Dutch company 'Qlip'. Both schemes have three rounds per year. The DRRR PTS uses Lactose Monohydrate and the Qlip PTS uses Anhydrous Lactose. For ease of interpretation, all the Lactose results used in this report have been converted to Anhydrous Lactose in units of g/100g milk.

In the last quarter there has been one round of PTS for Lactose, the January 2018 Qlip PTS. This PTS uses 8 samples. For this round there were 41 submissions with both the NML lab sites results classified as satisfactory (see Figure 3).

The performance trend of the PTS Lactose results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean Result\_Difference of 0.017 [95% confidence interval (0.013, 0.02), n=30] for Four Ashes and a mean Result\_Difference of 0.016 [95% confidence interval (0.011, 0.021), n=30] for Hillington covering the period from January 2017 - December 2017 and including all PTS.

Figure 3 - Coplots of Lactose PTS over the last year



## Test parameter: Freezing Point

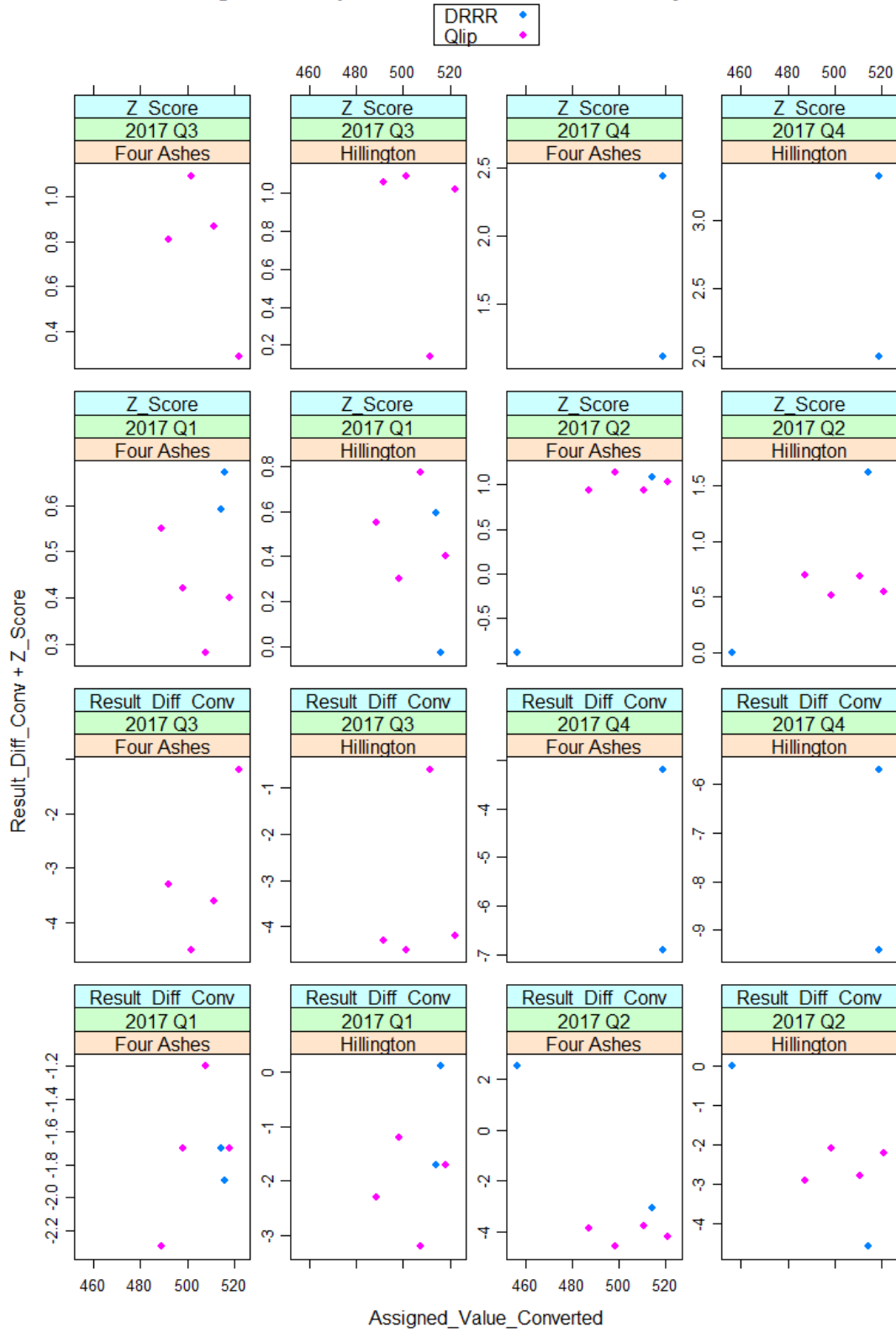
NML participated in two proficiency testing schemes (PTS) for Freezing Point (FP). These schemes were provided by German company 'Deutsches Referenzbüro für Ringversuche und Referenzmaterialien' (DRRR) and Dutch company 'Qlip'. Both schemes have three rounds per year. For ease of interpretation, all the Freezing Point results have been converted to Freezing Point Depression (FPD) values and are reported in units of milli degrees Celsius.

In the last quarter there has been one round of PTS for Freezing Point, the February 2018 Qlip PTS. This PTS uses 4 samples. For this round there were 32 submissions. with both the NML lab sites results classified as satisfactory (see Figure 4).

The performance trend of the PTS Freezing Point Depression results over a 12 month period for both labs is satisfactory, showing a small bias with a mean Result\_Difference of -2.8 [95% confidence interval (-3.8, -1.8), n=18] for Four Ashes and a mean Result\_Difference of -3 [95% confidence interval (-4.1, -1.8), n=18] for Hillington covering the period from January 2017 - December 2017 and including all PTS.



Figure 4 - Coplots of FPD PTS over the last year



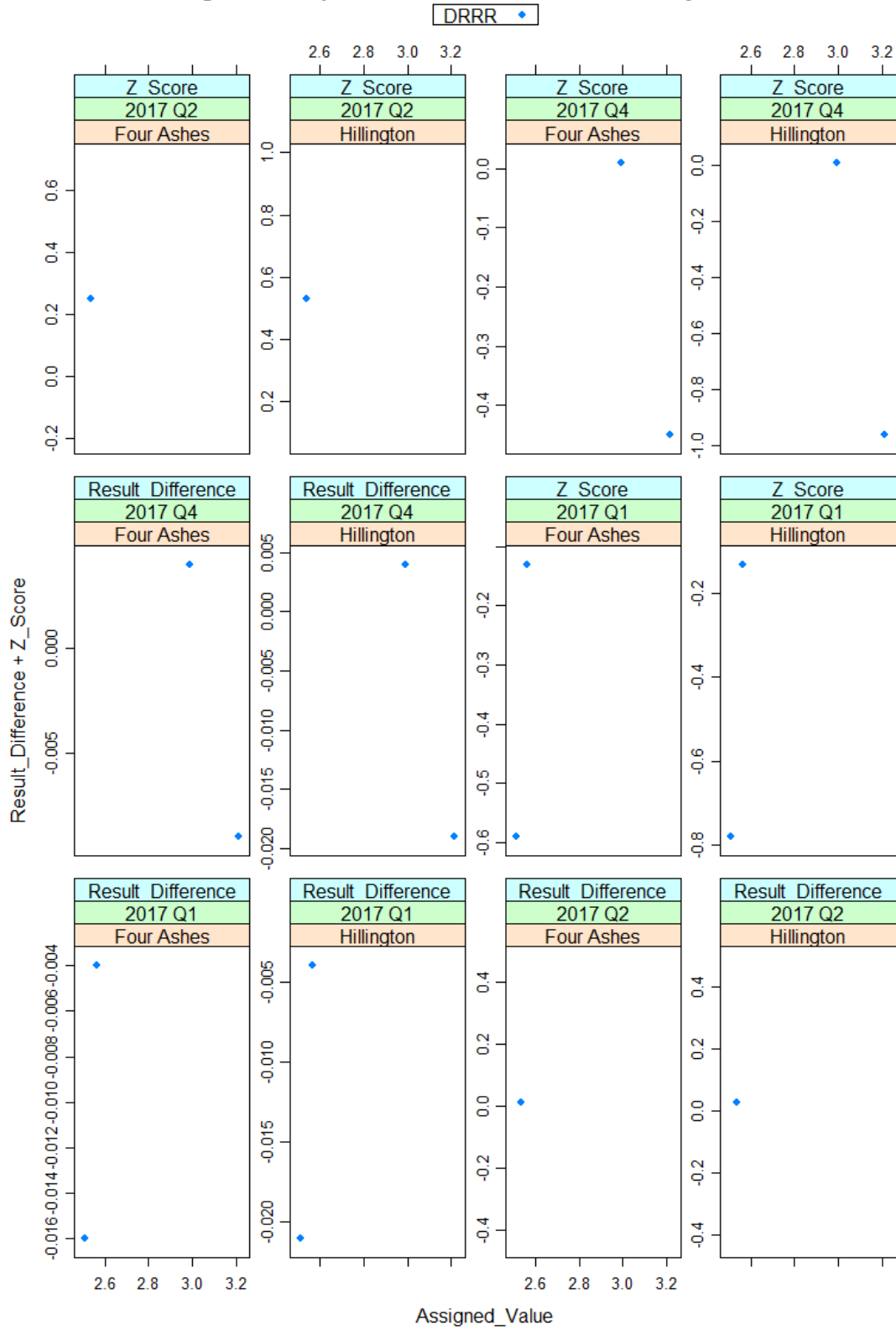
## Test parameter: Casein

NML currently participate in two proficiency testing scheme (PTS) for Casein. The scheme is provided by German company 'Deutsches Referenzbüro für Ringversuche und Referenzmaterialien' (DRRR). This PTS has three rounds per year and the Casein results are reported in units of g/100g milk. The other provider is UK company DairyQC and also has three rounds per year.

In the last quarter there has not been a PTS for Casein.

The performance trend of the PTS Casein results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean Result\_Difference of -0.002 [95% confidence interval (-0.016, 0.012), n=5] for Four Ashes and a mean Result\_Difference of -0.002 [95% confidence interval (-0.027, 0.022), n=5] for Hillington covering the period from January 2017 - December 2017 and including all PTS.

Figure 5 - Coplots of Casein PTS over the last year



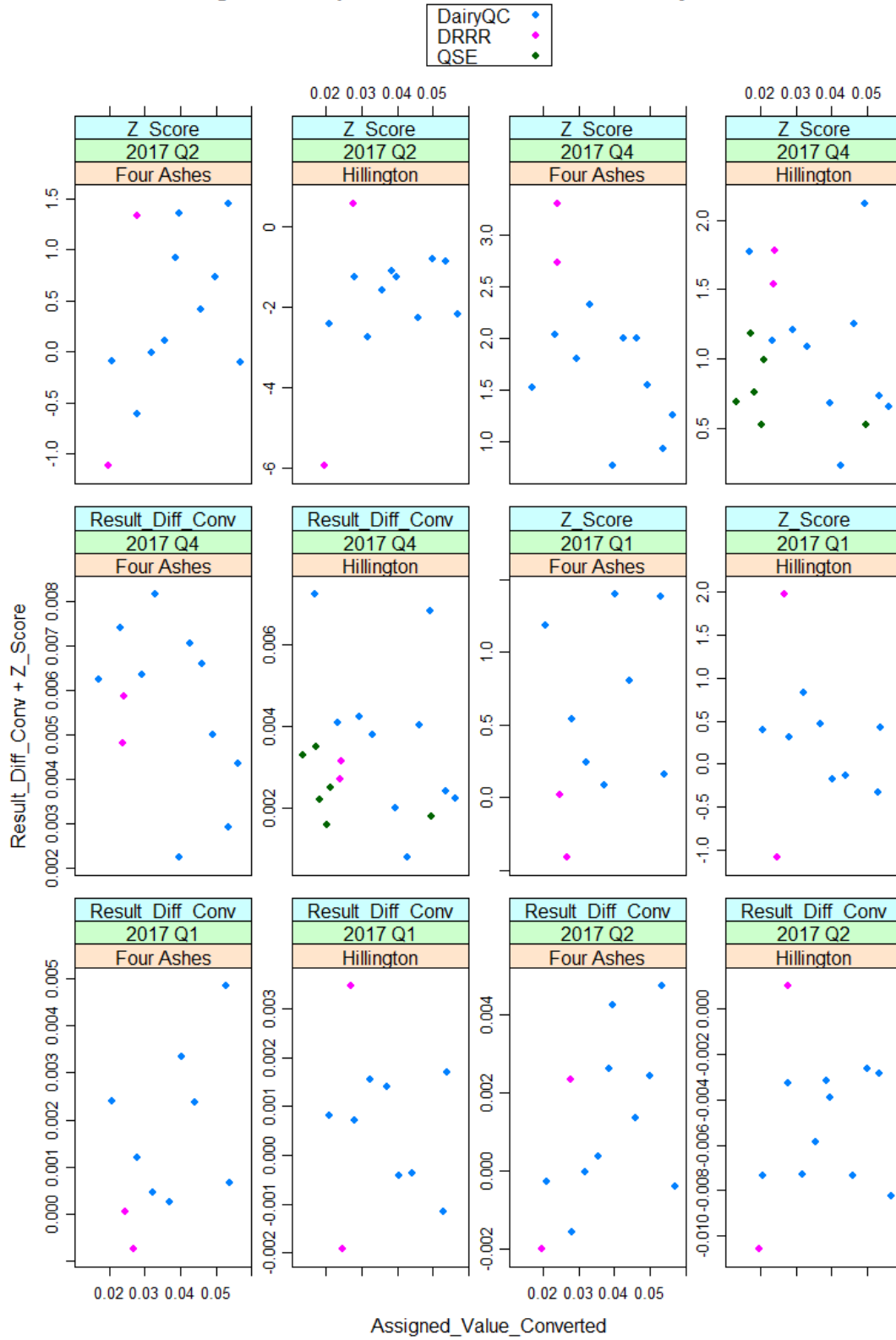
## Test parameter: Urea

NML currently routinely participate in two proficiency testing schemes (PTS) for Urea. These schemes are provided by German company 'Deutsches Referenzbüro für Ringversuche und Referenzmaterialien' (DRRR) and UK company DairyQC. Both schemes have three rounds per year. The reported units for the DRRR PTS and DairyQC PTS are mg/l and mg/dl respectively. In addition NML Hillington have also participated in a PTS run by another German company 'QSE GmbH'. For ease of interpretation, all the Urea results used in this report are in units of g/100ml milk.

In the last quarter there has been one round of PTS for Urea, the March 2018 DairyQC PTS. The DairyQC PTS uses 10 samples with 34 submissions. Three of the NML Hillington samples tested had Z-scores of 2.498, 2.243 and 2.269 (differences of 9.23, 9.44 and 9.28 from the assigned values of 44.81, 51.28 and 54.12 respectively), which were classified as Questionable with the remaining 7 samples returning a satisfactory result. For NML Four Ashes, three of the samples tested had Z-scores of 2.431, 2.220 and 2.318 (differences of 2.88, 3.95 and 4.09 from the assigned values of 44.81, 51.28 and 54.12 respectively), which was classified as questionable with the remaining 7 samples returning a satisfactory result. (see Figure 6).

The performance trend of the PTS Urea results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean Result\_Difference of 0.003 [95% confidence interval (0.002, 0.004), n=34] for Four Ashes and a mean Result\_Difference of 0 [95% confidence interval (-0.001, 0.001), n=40] for Hillington covering the period from January 2017 - December 2017 and including all PTS.

Figure 6 - Coplots of Urea PTS over the last year



## Test parameter: Somatic Cell Count

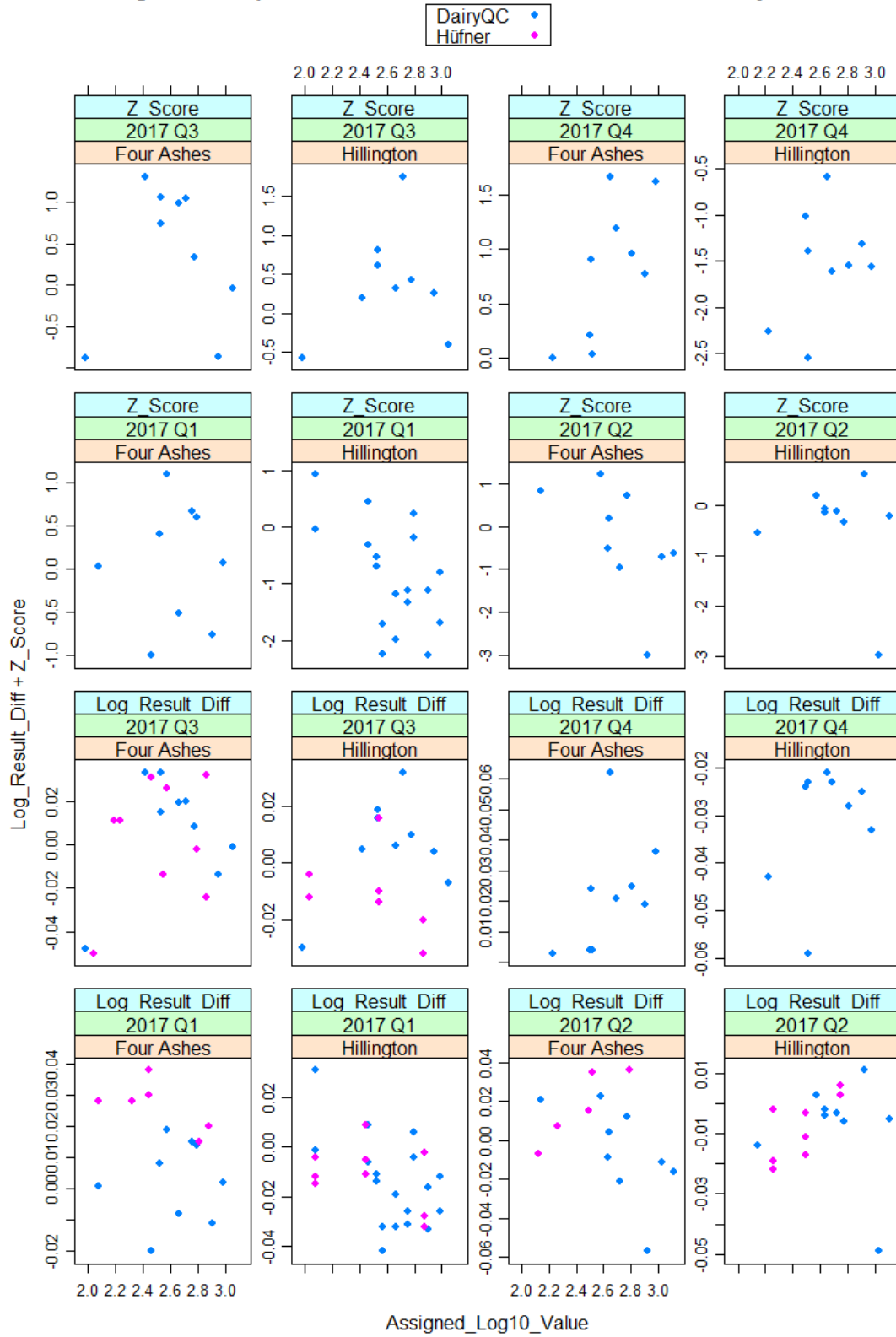
NML currently participate in two proficiency testing scheme (PTS) and a ring trial for Somatic Cell Count. The PT schemes are provided by UK company 'DairyQC' and there are four rounds per year, German company 'Landeskontrollverband für Leistungs- und qualitätsprüfung mecklenburg-vorpommern e.v (LKV-MV) of which there are four rounds per year, and The ring trial is provided by German company 'Milchwirtschaftliches Institut Dr. Huefner'. It is possible to submit samples on a monthly basis. The Somatic Cell Count results in this report are in the units of x1000/ml milk.

In the last quarter there has been two rounds of PTS for Somatic Cell Count, the February 2018 Qlip PTS. The Qlip PTS uses 5 samples. For this round there were 26 submissions. All Z-scores sites were classified as satisfactory. The LKV-MV PTS uses 5 samples, all results were satisfactory at both sites no Z-scores are calculated for this PTS.

No Z-scores are calculated for the Hüfner ring trial (see Figure 7).

The performance trend of the PTS Somatic Cell Count results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean Log\_Result\_Difference of 0.009 [95% confidence interval (0.003, 0.015), n=56] for Four Ashes and a mean Log\_Result\_Difference of -0.012 [95% confidence interval (-0.016, -0.007), n=70] for Hillington covering the period from January 2017 - December 2017 and including all PTS.

Figure 7 - Coplots of Somatic Cell Count PTS over the last year



## Test parameter: Individual Bacterial Count

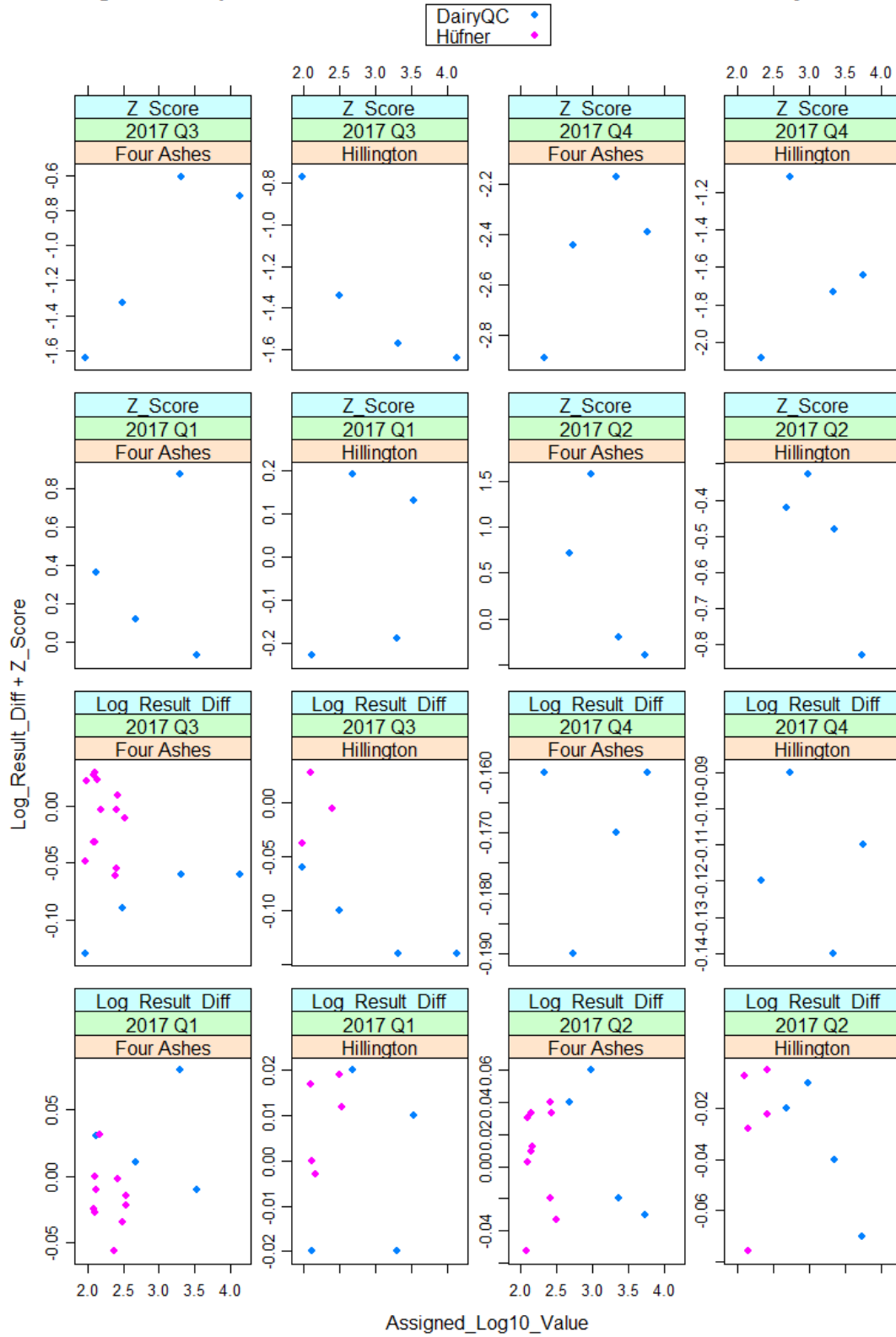
NML currently participate in two proficiency testing scheme (PTS) and a ring trial for Individual Bacterial Count. The PT schemes are provided by UK company 'DairyQC' and there are four rounds per year and ACTALIA (Bentley) which has four rounds per year. The ring trial is provided by German company 'Milchwirtschaftliches Institut Dr. Huefner'. It is possible to submit samples on a monthly basis. The Individual Bacterial Count results in this report are in the units of x1000/ml milk and  $\text{Log}_{10}(\text{x1000/ml milk})$ .

In the last quarter there has been one round of PTS for Individual Bacterial Count, the March 2018 ACTALIA PTS. The PTS uses 10 samples. For this round there were 50 submissions. The Z-scores for all ACTALIA samples at both NML sites were satisfactory.

No Z-scores are calculated for the Hüfner ring trial (see Figure 8).



**Figure 8 - Coplots of Individual Bacterial Count PTS over the last year**

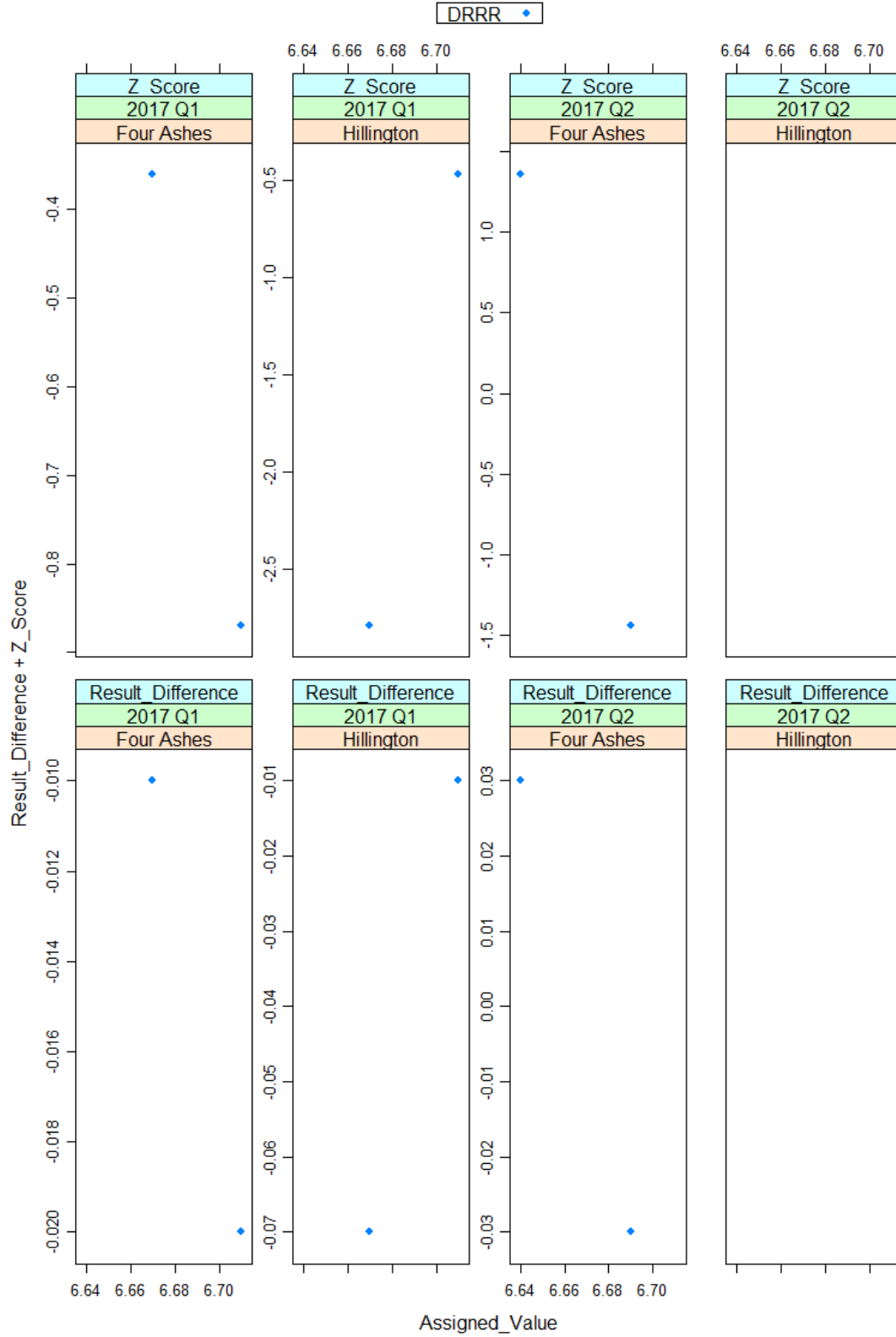


## Test parameter: pH

NML currently participate in one proficiency testing schemes (PTS) for pH. This scheme is provided by German company 'Deutsches Referenzbüro für Ringversuche und Referenzmaterialien' (DRRR). The DRRR scheme has two rounds per year that include pH. The pH results have no units. There was no result submission required for pH in the DRRR PTS during the last quarter (see Figure 9).

The performance trend of the PTS pH results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean Result\_Difference of -0.008 [95% confidence interval (-0.049, 0.034), n=4] for Four Ashes and a mean Result\_Difference of -0.04 [95% confidence interval (-0.421, 0.341), n=2] for Hillington covering the period from January 2017 - December 2017 and including all PTS.

Figure 9 - Coplots of pH PTS over the last year



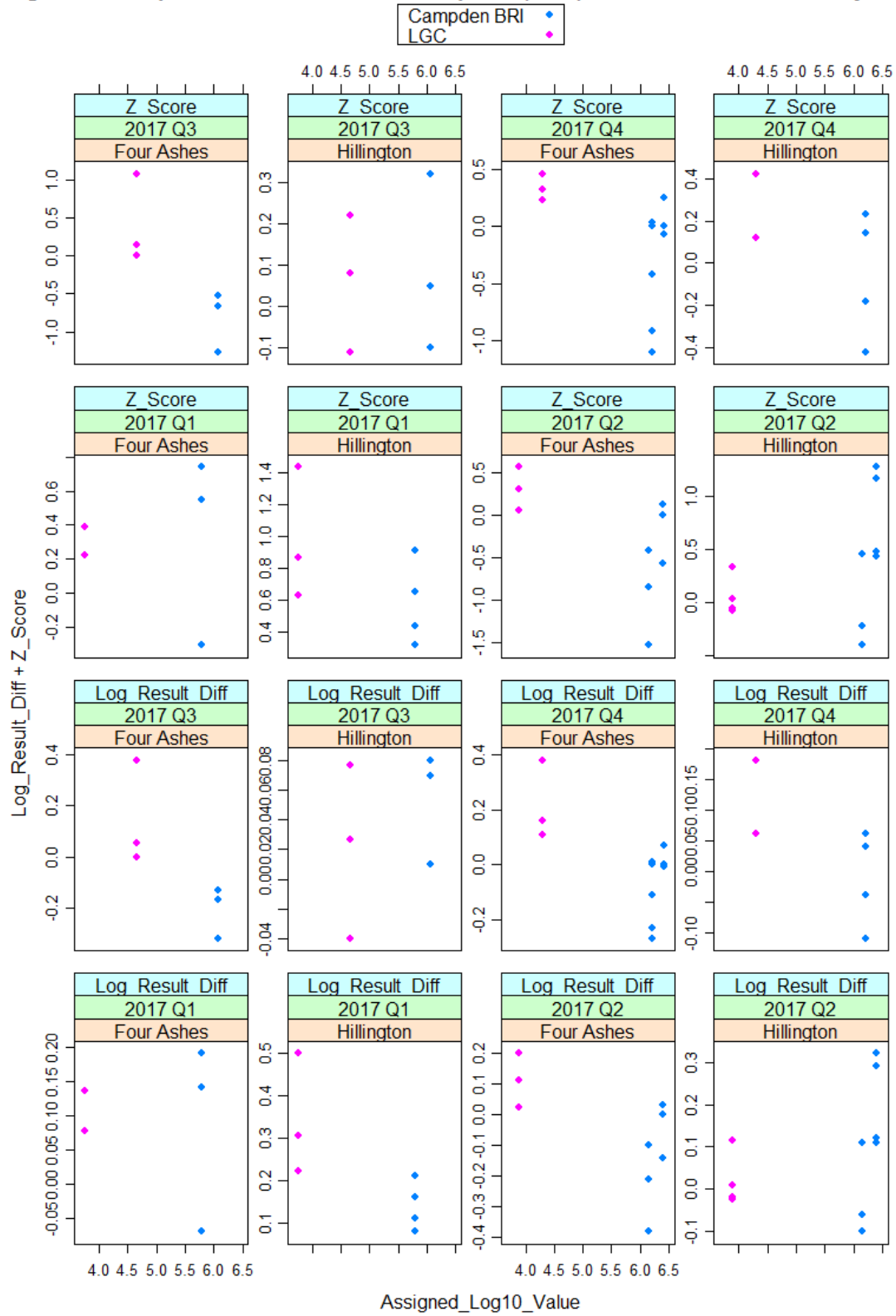
## Test parameter: Total Aerobic Mesophilic (TVC) Count

NML currently participate in two proficiency testing schemes (PTS) for TVC. These schemes are provided by UK companies 'LGC' and 'Campden BRI'. The TVC results in this report are in the units of x1000/ml milk and  $\text{Log}_{10}(\text{TVC})$  x1000/ml milk.

In the last quarter there have been two rounds of PTS for TVC, the January 2018 LGC PTS and the February 2018 Campden BRI PTS. Results for NML for LGC PTS Four Ashes were all satisfactory, results for NML Hillington were all Unsatisfactory with Z-scores of 4.42, 4.33 and 4.25. The February 2018 Campden BRI scheme saw satisfactory results at all sites. (Figure 10).

The performance trend of the PTS Total Aerobic Mesophilic (TVC) Count results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean  $\text{Log\_Result\_Difference}$  of 0.002 [95% confidence interval (-0.055, 0.06), n=36] for Four Ashes and a mean  $\text{Log\_Result\_Difference}$  of 0.09 [95% confidence interval (0.044, 0.136), n=33] for Hillington covering the period from January 2017 - December 2017 and including all PTS.

Figure 10 - Coplots of Total Aerobic Mesophilic (TVC) Count PTS over the last year



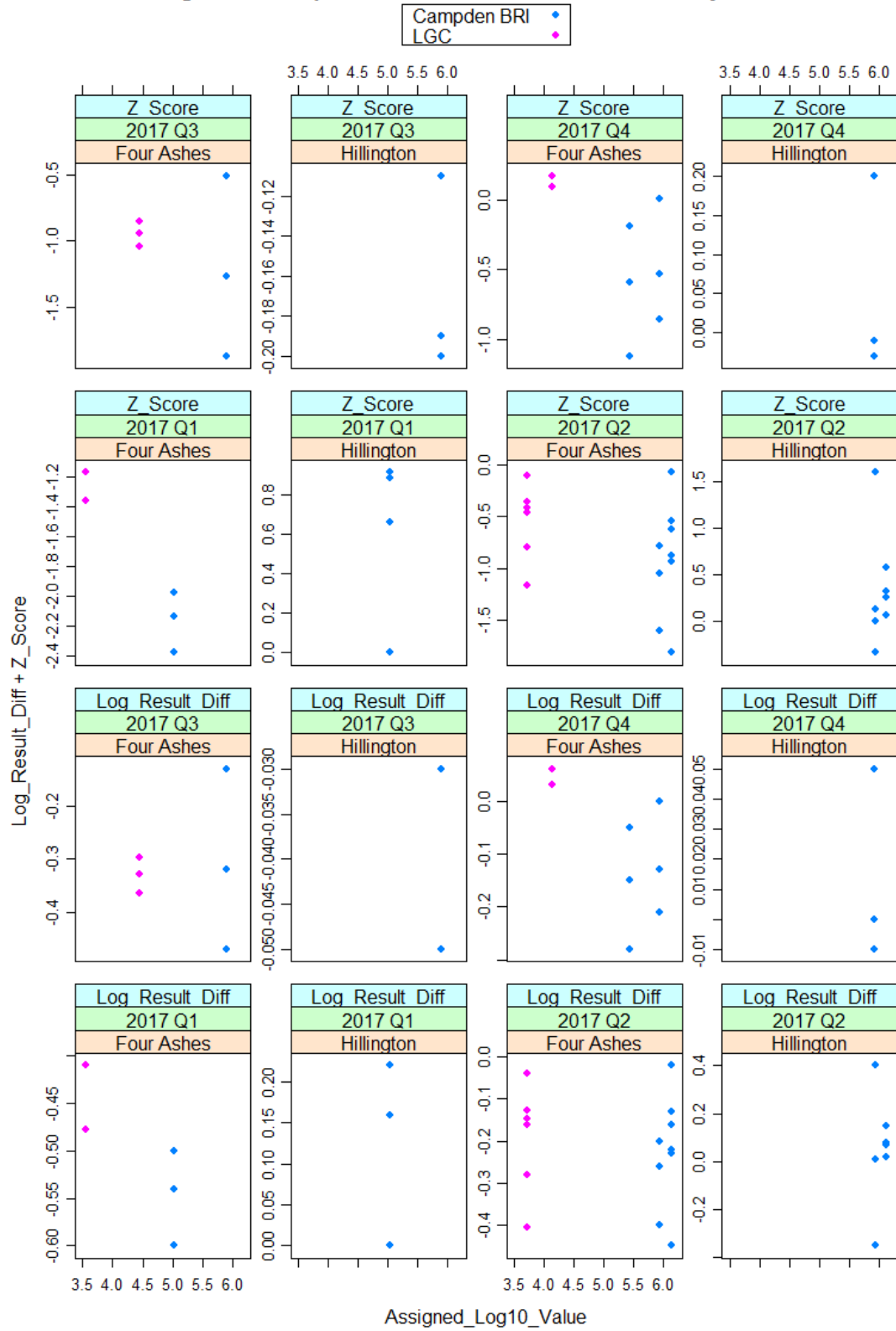
## Test parameter: Coliforms

NML currently participate in two proficiency testing schemes (PTS) for Coliforms. These schemes are provided by UK companies 'LGC' and 'Campden BRI'. The Coliform results in this report are in the units of x1000/ml milk and  $\text{Log}_{10}(\text{Coliform}) \times 1000/\text{ml}$  milk.

In the last quarter there have been two rounds of PTS for TVC, the January 2018 LGC PTS and the February 2018 Campden BRI PTS. Each round of the LGC PTS and Campden BRI PTS has one sample. For all three rounds of PTS, the NML Four Ashes and NML Hillington samples had Z-scores that were classified as satisfactory (see Figure 11).

The performance trend of the PTS Coliforms results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean  $\text{Log\_Result\_Difference}$  of -0.229 [95% confidence interval (-0.286, -0.171), n=39] for Four Ashes and a mean  $\text{Log\_Result\_Difference}$  of 0.031 [95% confidence interval (-0.054, 0.116), n=19] for Hillington covering the period from January 2017 - December 2017 and including all PTS.

Figure 11 - Coplots of Coliforms PTS over the last year



## Test parameter: Thermoduric Count

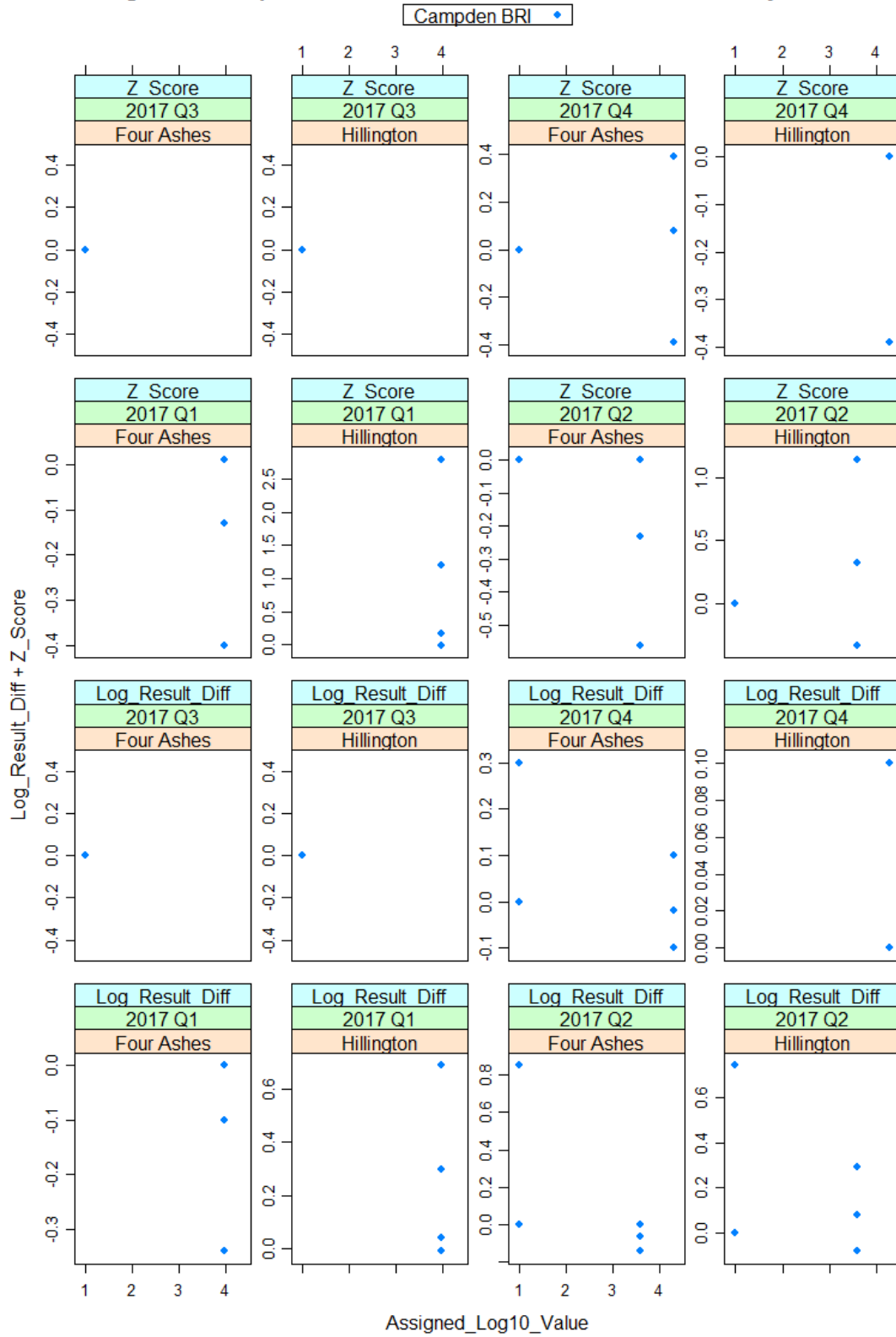
NML currently participate in a single proficiency testing scheme (PTS) for Therms. This scheme is provided by UK company 'Campden BRI'. The Therms results in this report are in the units of x1000/ml milk and  $\text{Log}_{10}(\text{Therms}) \times 1000/\text{ml milk}$ .

In the last quarter there have been one round of PTS for Therms, the February 2018 Campden BRI PTS. NML Four Ashes and NML Hillington samples had Z-scores that were classified as satisfactory (see Figure 12).

The performance trend of the PTS Thermoduric Count results over a 12 month period for both labs is satisfactory, effectively showing no overall bias with a mean  $\text{Log\_Result\_Difference}$  of 0.027 [95% confidence interval (-0.091, 0.146), n=18] for Four Ashes and a mean  $\text{Log\_Result\_Difference}$  of 0.113 [95% confidence interval (0.001, 0.226), n=19] for Hillington covering the period from January 2017 - December 2017 and including all PTS.



Figure 12 - Coplots of Thermoduric Count PTS over the last year



## Test parameter: Antibiotics

NML currently participate in three proficiency testing schemes (PTS) for Antibiotics. These schemes are provided by French company 'Cecalait', Dutch company 'Qlip' and ILVO. The Cecalait scheme has three rounds per year, the Qlip scheme also has three rounds per year.

There are 10 samples per round for both 'Cecalait' and 'Qlip' PTS and 6 samples per round of 'ILVO'. A number of antibiotic types are used in all schemes including Cefapirin, Penicillin, Cloxacillin, Neomycin, Erythromycin, Ceftiofur, Oxytetracycline, Ampicillin and a blank sample.

In the last quarter there has been three rounds of PTS for Antibiotics, the January 2018 ILVO PTS the March 2018 Qlip PTS and the ILVO March 2018 PTS. The 6 results for the January ILVO PTS and the 10 results for the March Qlip PTS were correctly identified as Positive or Negative by both NML labs, The March ILVO had 6 samples all of which were correctly identified by the Hillington site with the four Ashes site returning one incorrect result. (see Figure 13).

The performance trend of the PTS Antibiotics results over a 12 month period for both labs is satisfactory, with all samples correctly identified as Positive or Negative (see Figure 14).

**Figure 13**

Antibiotics by Delvo T method		Assigned Interpretation		
		Positive	Negative	Total
Hillington Interpretation (ILVO- Milk)	Correct	10	2	<b>12</b>
	Incorrect	0	0	<b>0</b>
	<b>Total</b>	<b>10</b>	<b>2</b>	<b>12</b>
Four Ashes Interpretation (ILVO - Milk)	Correct	9	1	<b>12</b>
	Incorrect	1	1	<b>0</b>
	<b>Total</b>	<b>10</b>	<b>2</b>	<b>12</b>

**Figure 14**

Antibiotics by Delvo SP-NT/T method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation (Qlip - Milk)	Correct	16	4	20
	Incorrect	0	0	0
	<b>Total</b>	<b>16</b>	<b>4</b>	<b>20</b>
Hillington Interpretation (Qlip- Milk)	Correct	16	4	20
	Incorrect	0	0	0
	<b>Total</b>	<b>16</b>	<b>4</b>	<b>20</b>
Hillington Interpretation (Cecalait- Milk)	Correct	24	6	30
	Incorrect	0	0	0
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>30</b>
Four Ashes Interpretation (Cecalait - Milk)	Correct	24	6	30
	Incorrect	0	0	0
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>30</b>

### Test parameter: *Leptospira hardjo* antibodies

NML currently participate in a single proficiency testing scheme (PTS) for *Leptospira hardjo* (Lepto) antibodies in milk. This scheme is provided by UK company 'Animal and Plant Health Agency (APHA)'. The APHA scheme has four rounds per year with five samples per round. Each sample is classified as either Positive or Negative.

In the last quarter there has been one round of PTS for Lepto, the Feb 2018 APHA PTS. The 5 results for the APHA PTS were correctly identified as Positive or Negative by the Four Ashes lab (see Figure 15).

The performance trend of the PTS Lepto results over a 12 month period from January 2017 – December 2017 for NML Four Ashes lab is satisfactory, with all samples correctly identified as Positive or Negative (see Figure 16).

**Figure 15**

Leptospira hardjo antibody ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation (APHA - Milk)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>

**Figure 16**

Leptospira hardjo antibody ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation (APHA - Milk)	Positive	15	0	15
	Negative	0	5	5
	<b>Total</b>	<b>15</b>	<b>5</b>	<b>20</b>

### Test parameter: Infectious Bovine Rhinotracheitis (IBR) antibodies

NML currently participate in two proficiency testing schemes (PTS) for IBR antibodies (PTS for milk and PTS for serum). These schemes are provided by UK company 'Animal and Plant Health Agency (APHA)'. The APHA schemes have four rounds per year with five samples per round for each PTS. Each sample is classified as either Positive or Negative.

In the last quarter there have been two rounds of PTS for IBR, the Feb 2018 APHA milk PTS and the March 2018 APHA serum PTS. The 5 results for the milk PTS were correctly identified as Positive or Negative by both NML labs and the 5 of the 6 results for the serum were correctly identified by the Four Ashes site PTS (see Figure 17).

The performance trend of the PTS IBR results over a 12 month period for both NML labs is satisfactory, with all samples correctly identified as Positive or Negative (see Figure 18).

**Figure 17**

Infectious Bovine Rhinotracheitis (IBR) antibody ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation (APHA - Milk)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>
Four Ashes Interpretation (APHA - Serum)	Positive	5	0	5
	Negative	0	1	1
	<b>Total</b>	<b>5</b>	<b>1</b>	<b>6</b>

**Figure 18**

Infectious Bovine Rhinotracheitis (IBR) antibody ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation (APHA - Milk)	Positive	16	0	16
	Negative	0	4	4
	<b>Total</b>	<b>16</b>	<b>4</b>	<b>20</b>
Four Ashes Interpretation (APHA - Serum)	Positive	21	0	21
	Negative	0	5	5
	<b>Total</b>	<b>21</b>	<b>5</b>	<b>26</b>

### Test parameter: *Mycobacterium avium* subspecies *paratuberculosis* (Map) antibodies

NML currently participate in two proficiency testing schemes (PTS) for Map antibodies (PTS for milk and PTS for serum). These schemes are provided by Dutch company 'GD Deventer'. The GD Deventer schemes have one round per year with eight samples per round for each PTS. Each sample is classified as either Positive or Negative.

In the last quarter there have been no rounds of PTS for Map. The most recent PTS was in March 2017 for the serum and milk PTS. The 8 results in each of the GD Deventer PTS were correctly identified as Positive or Negative by both NML labs (see Figure 19).

The performance trend of the PTS Map results over a 12 month period for both NML labs is satisfactory, with all samples correctly identified as Positive or Negative.

**Figure 19**

Mycobacterium avium subspecies paratuberculosis (Map) antibody ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation (GD Deventer - Milk)	Positive	6	0	6
	Negative	0	2	2
	<b>Total</b>	<b>6</b>	<b>2</b>	<b>8</b>
Hillington Interpretation (GD Deventer- Milk)	Positive	6	0	6
	Negative	0	2	2
	<b>Total</b>	<b>6</b>	<b>2</b>	<b>8</b>
Four Ashes Interpretation (GD Deventer - Serum)	Positive	7	0	7
	Negative	0	1	1
	<b>Total</b>	<b>7</b>	<b>1</b>	<b>8</b>
Hillington Interpretation (GD Deventer- Serum)	Positive	7	0	7
	Negative	0	1	1
	<b>Total</b>	<b>7</b>	<b>1</b>	<b>8</b>

### Test parameter: Fasciola hepatica (Liver Fluke) antibodies

NML currently participate in a single proficiency testing scheme (PTS) for Fasciola hepatica (Fasc) antibodies in milk. This scheme is provided by UK company 'Animal and Plant Health Agency (APHA)'. The APHA scheme has two rounds per year with five samples per round. Each sample is classified as either Positive or Negative.

In the last quarter there has been one round of PTS for Fasc, the Round had 5 samples and all were correctly identified by the Four Ashes site.

The performance trend of the PTS Fasc results over a 12 month period from April 2017 – March 2018 for NML Four Ashes lab is satisfactory, with all samples correctly identified as Positive or Negative (see Figure 20).

**Figure 20**

Fasciola hepatica antibody ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation (APHA - Milk)	Positive	7	0	7
	Negative	0	3	3
	<b>Total</b>	<b>7</b>	<b>3</b>	<b>10</b>

### Test parameter: Pregnancy Associated Glycoprotein (PAG)

NML currently participate in a single proficiency testing scheme (PTS) for Pregnancy Associated Glycoprotein (PAG) in milk. This scheme is provided by German company 'QSE GmbH'. The QSE scheme has two rounds per year with six samples per round. Each sample is classified as either Pregnant or Not Pregnant.

In the last quarter there have been no rounds of PAG PTS.

The performance trend of the PTS PAG results over a 12 month period from April 2017 – March 2018 for NML Four Ashes lab is satisfactory, with all samples correctly identified as Pregnant or Not Pregnant (see Figure 22).

**Figure 21**

Pregnancy Associated Glycoprotein		Assigned Interpretation		
		Pregnant	Not Pregnant	Total
Four Ashes Interpretation (QSE – Milk)	Pregnant	4	0	4
	Not Pregnant	0	2	2
	<b>Total</b>	<b>4</b>	<b>2</b>	<b>6</b>
Hillington Interpretation (QSE – Milk)	Pregnant	4	0	4
	Not Pregnant	0	2	2
	<b>Total</b>	<b>4</b>	<b>2</b>	<b>6</b>

**Figure 22**

Pregnancy Associated Glycoprotein		Assigned Interpretation		
		Pregnant	Not Pregnant	Total
Four Ashes Interpretation (QSE – Milk)	Pregnant	8	0	8
	Not Pregnant	0	4	4
	<b>Total</b>	<b>8</b>	<b>4</b>	<b>12</b>
Hillington Interpretation (QSE – Milk)	Pregnant	8	0	8
	Not Pregnant	0	4	4
	<b>Total</b>	<b>8</b>	<b>4</b>	<b>12</b>

### Test parameter: Bovine Viral Diarrhoea (BVD) antibodies

NML currently participate in two proficiency testing schemes (PTS) for BVD antibodies (PTS for milk and PTS for serum). These schemes are provided by UK company 'Animal and Plant Health Agency (APHA)'. The APHA schemes have four rounds per year with five samples per round for each PTS. Each sample is classified as either Positive or Negative.

In the last quarter there has been one round of PTS for BVD, the APHA serum PTS. This PTS had 5 results all were correctly identified as Positive or Negative by both NML labs (see Figure 23).

The performance trend of the PTS BVD results over a 12 month period for both labs is satisfactory, with all samples correctly identified as Positive or Negative (see Figure 24)



**Figure 23**

Bovine Viral Diarrhoea (BVD) antibody ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation (APHA - Milk)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>
Hillington Interpretation (APHA - Milk)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>
Four Ashes Interpretation (APHA - Serum)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>
Hillington Interpretation (APHA - Serum)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>

**Figure 24**

Bovine Viral Diarrhoea (BVD) antibody ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation (APHA - Milk)	Positive	11	0	11
	Negative	0	4	4
	<b>Total</b>	<b>11</b>	<b>4</b>	<b>15</b>
Hillington Interpretation (APHA - Milk)	Positive	11	0	11
	Negative	0	4	4
	<b>Total</b>	<b>11</b>	<b>4</b>	<b>15</b>
Four Ashes Interpretation (APHA - Serum)	Positive	16	0	16
	Negative	0	4	4
	<b>Total</b>	<b>16</b>	<b>4</b>	<b>20</b>
Hillington Interpretation (APHA - Serum)	Positive	12	0	13
	Negative	0	3	3
	<b>Total</b>	<b>12</b>	<b>3</b>	<b>15</b>

## Test parameter: Bovine Viral Diarrhoea Virus (BVDV) PCR

NML currently participate in four proficiency testing schemes (PTS) for detection of BVDV by PCR (PTS for ear tissue, bulk milk and blood/sera). These schemes are provided by UK company 'Animal and Plant Health Agency (APHA)' and Dutch company 'GD Animal Health'. The APHA schemes have two rounds per year with five samples per round for each PTS and the GD Deventer scheme has one round per year with ten samples. Each sample is classified as either Positive or Negative (Figure 25).

In the last quarter there has been two rounds of PCR PTS for BVDV, the January 2018 APHA PCR Ear Tissue PTS. The 6 results in the PTS were correctly identified as Positive or Negative by Four Ashes lab. The February 2018 APHA PCR bulk milk PTS, 4 out of the 5 samples were correctly identified with one unsatisfactory result.

The performance trend of the PTS BVD PCR results over a 12 month period from January 2017 – December 2017 for NML Four Ashes lab is satisfactory (see Figure 26).

**Figure 25**

Bovine Viral Diarrhoea Virus PCR method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation ( APHA – Ear Tissue)	Positive	5	0	5
	Negative	1	0	1
	<b>Total</b>	<b>6</b>	<b>0</b>	<b>6</b>
Four Ashes Interpretation (APHA – Milk)	Positive	4	1	5
	Negative	0	0	0
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>

**Figure 26**

Bovine Viral Diarrhoea Virus PCR method		Assigned Interpretation		
		Positive	Negative	Total
Four Ashes Interpretation ( APHA – Bulk Milk)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>
Four Ashes Interpretation ( APHA – Ear Tissue)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>
Four Ashes Interpretation ( APHA – Blood)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>
Four Ashes Interpretation (GD Animal Health – serum and tissue)	Positive	7	1	8
	Negative	1	1	2
	<b>Total</b>	<b>8</b>	<b>2</b>	<b>10</b>

### Test parameter: Bovine Viral Diarrhoea Virus (BVDV) antigen

NML currently participate in three proficiency testing schemes (PTS) for BVDV antigen (PTS for ear tissue, PTS for heparin blood and PTS with mixed sample types Ear tissue, serum, EDTA blood and spleen suspension). These schemes are provided by UK company 'Animal and Plant Health Agency (APHA)' and Dutch company 'GD Deventer'. The APHA schemes have two rounds per year with five samples per round for each PTS and the GD Deventer scheme has one round per year with ten samples. Each sample is classified as either Positive or Negative.

In the last quarter there have been no rounds of PTS for BVDV antigen.

The performance trend of the PTS BVDV Antigen ELISA results over a 12 month period for both NML labs is satisfactory (see Figure 28).

**Figure 27**

Bovine Viral Diarrhoea Virus Antigen ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Hillington Interpretation (APHA - Ear Tissue)	Positive	2	0	2
	Negative	0	3	3
	<b>Total</b>	<b>2</b>	<b>3</b>	<b>5</b>
Four Ashes Interpretation (APHA - Blood)	Positive	4	0	4
	Negative	0	1	1
	<b>Total</b>	<b>4</b>	<b>1</b>	<b>5</b>

**Figure 28**

Bovine Viral Diarrhoea Virus Antigen ELISA method		Assigned Interpretation		
		Positive	Negative	Total
Hillington Interpretation (APHA - Ear Tissue)	Positive	5	0	5
	Negative	0	5	5
	<b>Total</b>	<b>5</b>	<b>5</b>	<b>10</b>
Four Ashes Interpretation (APHA - Blood)	Positive	8	0	8
	Negative	0	2	2
	<b>Total</b>	<b>8</b>	<b>2</b>	<b>10</b>
Hillington Interpretation (GD Deventer – serum and tissue)	Positive	7	0	7
	Negative	0	3	3
	<b>Total</b>	<b>7</b>	<b>3</b>	<b>10</b>
Four Ashes Interpretation (GD Deventer – serum and tissue)	Positive	6	0	6
	Negative	0	2	2
	<b>Total</b>	<b>6</b>	<b>2</b>	<b>8</b>

## Test parameter: Bovine Mastitis Pathogens PCR

NML currently participate in one ring trial for Bovine Mastitis Pathogens PCR in milk. This ring trial is provided by 'ThermoFisher Scientific'. The ring trial has one round per year with five samples in a round. Each sample is classified as either Positive or Negative.

The most recent ring trial was in July 2017. From the 5 samples, 9 out of 10 of the expected pathogens were detected, with the *Klebsiella* spp. pathogen in sample 2 not being detected (see Figure 29).

**Figure 29**

Provider	Ring Trial	Sample_ID	Assigned	NML Result	Interpretation
Thermo Fisher Scientific	FZD-4200 PathoProof PCR Control Set Lot 10	1	Beta-lactamase gene	Beta-lactamase gene	Correct
			Corynebacterium bovis	Corynebacterium bovis	Correct
			Staphylococcus aureus	Staphylococcus aureus	Correct
			Staphylococcus sp.	Staphylococcus sp.	Correct
		2	Klebsiella spp.	Not Detected	Incorrect
			Enterococcus spp.	Enterococcus spp.	Correct
		3	Enterococcus spp.	Enterococcus spp.	Correct
			Trueperella pyogenes ans P. indolicus	Trueperella pyogenes ans P. indolicus	Correct
		4	Streptococcus uberis	Streptococcus uberis	Correct
		5	Serratia marcescens	Serratia marcescens	Correct