

Report No. 1182

Waters Proficiency Testing Program

Round No. 254

- Total Recoverable Oil and Grease -

April 2020

Acknowledgments

PTA wishes to gratefully acknowledge the technical assistance provided for this program by Dr M Buckley-Smith, Global Proficiency Ltd (New Zealand). Also our thanks go to Global Proficiency Ltd (New Zealand) and to Global Proficiency Pty Ltd (Australia) for the supply and distribution of the samples.

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1. Foreword

This report summarises the results of a proficiency testing program on the determination of Total Recoverable Oil and Grease in waters. This is round 254 in a planned series of programs involving the analysis of chemical and physical parameters of waters. This program is accredited to ISO/IEC 17043:2010 "*Conformity assessment - General requirements for proficiency testing*" by International Accreditation New Zealand (IANZ).

The exercise was conducted in December 2019 by Proficiency Testing Australia (PTA). The main aim of the program was to assess laboratories' abilities to competently perform the prescribed analyses.

The Program Coordinators were Mrs D Mihaila and Dr M Li, and the Technical Adviser was Dr M Buckley-Smith, Global Proficiency Ltd (New Zealand). This report was authorised by Mrs K Cividin, PTA Quality Manager.

2. Program Features and Design

- 2.1 Each laboratory was randomly allocated a unique code number for the program to ensure confidentiality of results. Reference to each laboratory in this report is by code number only. Please note that a number of laboratories reported more than one set of results and, therefore, their code numbers (with letter) could appear several times in the same data set.
 - 2.2 Laboratories were provided with the "Instructions to Participants" and "Results Sheet" (see Appendix C). Laboratories were requested to perform the tests according to their routine methods.
 - 2.3 Participants were provided with two glass vials (labelled PTA 1 and PTA 2) for analysis of Total Recoverable Oil and Grease.
 - 2.4 A total of 20 laboratories received samples, comprising:
 - 15 Australian participants; and
 - 5 overseas participants, including:
 - Indonesia (1), Malaysia (2), Papua New Guinea (2).
- All 20 laboratories submitted results by the due date.
- 2.5 Results (as reported by participants) with corresponding summary statistics (i.e. number of results, median, normalised interquartile range, uncertainty of the median, robust coefficient of variation, minimum, maximum and range) are presented in Appendix A (for each sample and for each of the analyses performed).
 - 2.6 A robust statistical approach, using z-scores, was utilised to assess laboratories' testing performance (see Section 3). Robust z-scores and ordered z-score charts relevant to each test are presented in Appendix A.

The document entitled *Guide to Proficiency Testing Australia, 2019* (reference [1]) defines the statistical terms and details the statistical procedures referred to in this report.

- 2.7 A tabulated listing of laboratories (by code number) identified as having outlier results can be found on page 9.
- 2.8 Prior to sample distribution, a number of randomly selected samples were analysed for homogeneity and stability. Based on the results of this testing (see Appendix B) it was considered that the samples utilised for this program were homogeneous and stable. As such, any results later identified as outliers could not be attributed to any notable sample variability.

3. Statistical Format

For each test, where appropriate, the following information is given:

- a table of results and calculated z-scores;
- a list of summary statistics; and
- ordered z-score charts.

3.1 Outlier Results and Z-scores

In order to assess laboratories' testing performance, a robust statistical approach, using z-scores, was utilised. Z-scores give a measure of how far a result is from the consensus value (i.e. the median), and gives a "score" to each result relative to the other results in the group.

A z-score with an absolute value less than or equal to 2.0 is considered to be satisfactory.

Each z-score marked with a "\$" is an outlier and indicates an absolute z-score value greater than or equal to 3.0 ($|z\text{-score}| \geq 3.0$). Laboratories are also encouraged to review results which have been marked with a "?". These results have an absolute z-score value between two and three ($2.0 < |z\text{-score}| < 3.0$) and are considered to be questionable results.

In this study, results which have a z-score ≥ 3.0 and have been marked with a "‡" are considered satisfactory results; results which have a z-score value between two and three ($2.0 < z\text{-score} < 3.0$) and have been marked with a "†" are considered satisfactory results. These results are deemed to be satisfactory, as they are closer to the doping concentration for this sample/test.

Each determination was examined for outliers with all methods pooled. The table on page 9 summarises the outlier results detected.

3.2 Results Tables and Summary Statistics

The tables in Appendix A contain the results returned by each laboratory, including the code number for the method used and the robust z-score calculated for each result.

Results have been entered exactly as reported by participants. That is, laboratories which did not report results to the precision (i.e. number of decimal places) requested on the Results Sheet have not been rounded to the requested precision before being included in the statistical analysis.

A list of summary statistics appears at the bottom of each of the results tables and consists of:

- *No. of Results*: the total number of results for that test/sample;
- *Median*: the middle value of the results;
- *Normalised IQR*: the normalised interquartile range of the results;
- *Uncertainty of the Median*: a robust estimate of the standard deviation of the *Median*;
- *Robust CV*: the robust coefficient of variation expressed as a percentage, i.e. $100 \times \text{Normalised IQR} / \text{Median}$;
- *Minimum*: the lowest laboratory result;
- *Maximum*: the highest laboratory result; and
- *Range*: the difference between the *Maximum* and *Minimum*.

The median is a measure of the centre of the data.

The normalised IQR is a measure of the spread of the results. It is calculated by multiplying the interquartile range (IQR) by a correction factor, which converts the IQR to an estimate of the standard deviation. The IQR is the difference between the upper and lower quartiles (i.e. the values above and below which a quarter of the results lie, respectively).

For normally distributed data, the uncertainty of the median is approximated by:

$$\sqrt{\frac{\pi}{2}} \times \frac{\text{normIQR}}{\sqrt{n}}$$

n = number of results.

Please see reference [1] for further details on these robust summary statistics.

In this round, the robust CV values were considered inappropriate to calculate robust z-scores, therefore a target coefficient of variation (target CV) was used. The target coefficient of variation was based on historical data from previous PTA rounds. The target standard deviation (target SD) is calculated as the target CV multiplied by the median.

The robust z-score (denoted by z) for a laboratory's sample A result was calculated as:

$$z = \frac{A - \text{median}(A)}{\text{target SD}(A)}$$

where A is a sample in a testing program.

3.3 Ordered Z-score Charts

The charts in Appendix A indicate each laboratory's robust z-score, in order of magnitude, marked with its laboratory code number. From these charts, each laboratory can readily compare its performance relative to the other laboratories.

These charts contain solid lines at +3.0 and -3.0, so that outliers are clearly identifiable as those laboratories whose "bar" extends beyond these "cut-off" lines. The y-axis of these charts has been limited, so very large z-scores appear to extend beyond the chart boundary.

4. PTA and Technical Adviser's Comments

4.1 Metrological Traceability and Measurement Uncertainty of Assigned Values

Consensus values (median) derived from participants' results are used in this program. These values are not metrologically traceable to an external reference.

Sample preparation was undertaken according to Global Proficiency Ltd's Standard Operating Procedures to ensure samples were fit-for-purpose, homogeneous and stable. Weight checks were undertaken on all samples to ensure that the variability on doping concentrations was less than 3%. Dope concentrations presented in Table 1 illustrate the average oil and grease sample weight and the 95% confidence interval for weight variation at manufacturing, as $\pm 2SD$ (standard deviations).

Sample PTA 1 was prepared from high purity mineral oil and stearic acid which has a low viscosity; in distilled water. Sample PTA 2 was prepared from a mixture of vegetable oil, anhydrous milk fat (AMF) and stearic acid in distilled water. Samples were prepared as ready-to-test (500 mL) samples, packaged in PP capped amber glass bottles and preserved with acid to pH 2.

Solutions were stable and homogeneous, and medians obtained from this proficiency round indicated recoveries of 85.9% for sample PTA 1 and 77.8% for sample PTA 2, compared to the expected levels (dope concentration), as shown in Table 1. These were lower than published precision data, which indicated that laboratories should be able to yield an average recovery of 93% with the Liquid-Liquid Partition Gravimetric method (APHA 5520 B), a recovery of 87.1% - 92.5% with the Solid Phase Partition Gravimetric method (APHA 5520 B), and a recovery of 98.7% for Soxhlet Extraction method (APHA 5520 D) [2].

Table 1. Comparison of expected levels (dope concentration) and proficiency medians. The values of the calculated uncertainty of the median are also presented.

Analysis	Sample	Dope Concentration ± 2SD (mg/L)	Median (mg/L)	Uncertainty of the median (mg/L)
Total Recoverable Oil and Grease	PTA 1	66.45 ± 1.24	57.10	4.97
	PTA 2	54.5 ± 1.12	42.40	4.26

As the assigned value for each sample in this program is the median of the results submitted by the participants, the uncertainty of the median for each sample has been calculated and is also presented in the Table 1.

4.2 Analysis of Round 246 Results

4.2.1 Total Recoverable Oil and Grease

Table 2 compares the Total Recoverable Oil and Grease medians and robust CVs from this round to those obtained in previous PTA rounds. Historically, CVs have been in the vicinity of 18.6% when the levels of Oil and Grease were not too close to the limit of quantitation (~20 mg).

Table 2. Comparison of current round variability and proficiency median of Total Recoverable Oil and Grease testing with the results of the previous two rounds.

Round	Sample	Median (mg/L)	Robust CV (%)	Participants
This study	PTA 1	57.10	31.8	21
	PTA 2	42.40	36.7	21
Report 1160	PTA 1	63.30	47.1	34
	PTA 2	41.55	34.4	38
Report 1119	PTA 1	76.30	29.7	28
	PTA 2	41.80	14.2	29

Bias / Accuracy

The Total Recoverable Oil and Grease testing was successfully performed, with statistically satisfactory results ($|z\text{-score}| \leq 2.0$) falling within the criteria of 35.86 – 78.34 mg/L for sample PTA 1 and 26.63 – 58.17 mg/L for sample PTA 2.

Out of 21 results submitted for samples PTA 1 and PTA 2, two questionable results ($2.0 < |z\text{-score}| < 3.0$) were reported for sample PTA 1 (laboratory codes 335, and 421); and three questionable results were reported for sample PTA 2 (laboratory codes 232, 471 and 740). Labs low biasing with questionable results (see Figures 3 & 4) when assessed with a historical NIQR, are recommended to follow up on their testing and QC, as they are well outside the expected recoveries identified in APHA [2]. APHA 5020 B recommends QC for all Oil and Grease methods including the use of Method Blanks, Laboratory Fortified Blanks, Laboratory Fortified Matrix with Duplicates, in addition to QC practices specific to your method

Four outlier results ($|z\text{-score}| \geq 3.0$) were obtained for sample PTA 1, requiring follow-up action by laboratory codes 222, 251A, 251B and 768. Five outlier results ($|z\text{-score}| \geq 3.0$) were obtained for sample PTA 2, requiring follow-up action by laboratory codes 222, 251A, 251B, 291 and 768.

APHA 5520 A.4.b. recommends labs adhere strictly to sample drying times to standardize the gradual loss of weight due to volatilization of short-chain hydrocarbons and simple aromatics. APHA 5520 B includes special precautions regarding temperature and solvent vapour displacement to minimize the effect of oxidation of unsaturated fats and fatty acids. Low biasing results can also occur if samples form emulsions that are difficult to break. APHA 5520 B.4 recommends centrifuging the emulsion for 5 minutes at 2400 rpm, if this is a potential problem [2].

High biasing results can occur if the drying capacity of sodium sulphate is exceeded. APHA 5520A.4.d. offers recommendations for dealing with this problem when sodium sulphate crystals are visible in the flask after drying. APHA also recommends use of a desiccator during the cooling process to prevent high biasing results due to reabsorption of water from atmospheric humidity, in Partition Gravimetric methods [2].

The data sets for samples PTA 1 and PTA 2 formed approximately normal distributions (Figures 1 and 2). The method most frequently used for Total Recoverable Oil and Grease testing in this round was APHA 5520 B (Liquid-Liquid, Partition-Gravimetric Method), which was used by approximately 38% of participants for sample PTA 1 and 38% of participants for sample PTA 2 [2].

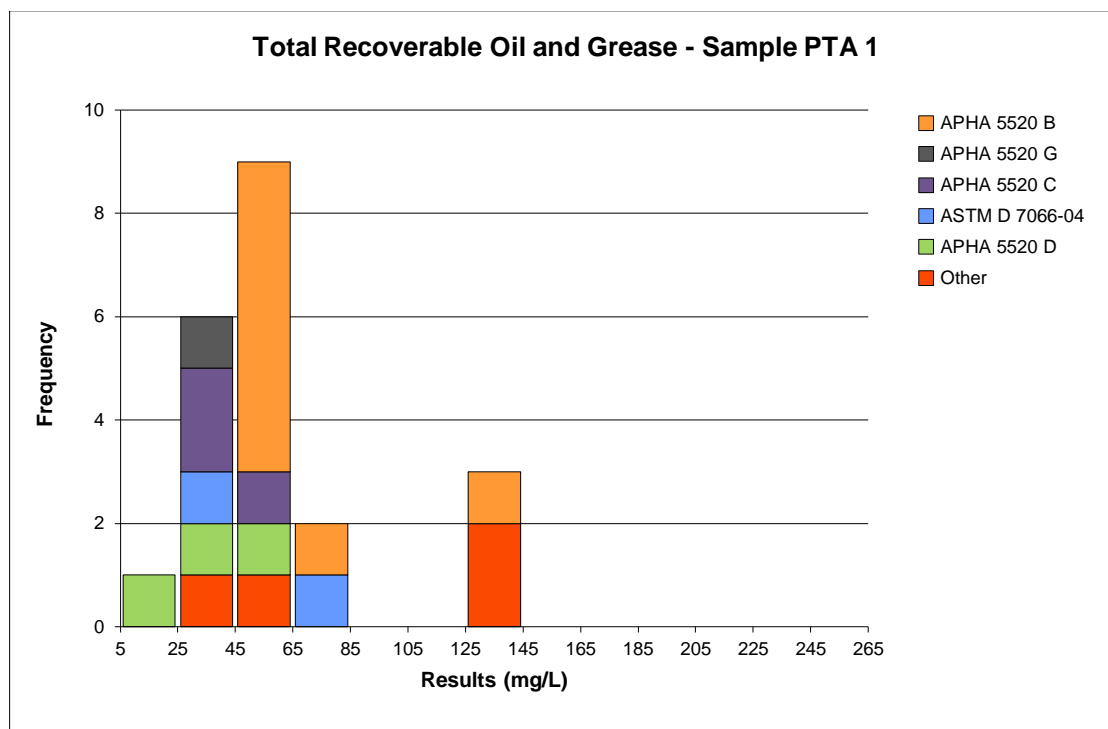


Figure 1. Spread of results for Total Recoverable Oil and Grease testing of sample PTA 1, with a median of 57.10 mg/L.

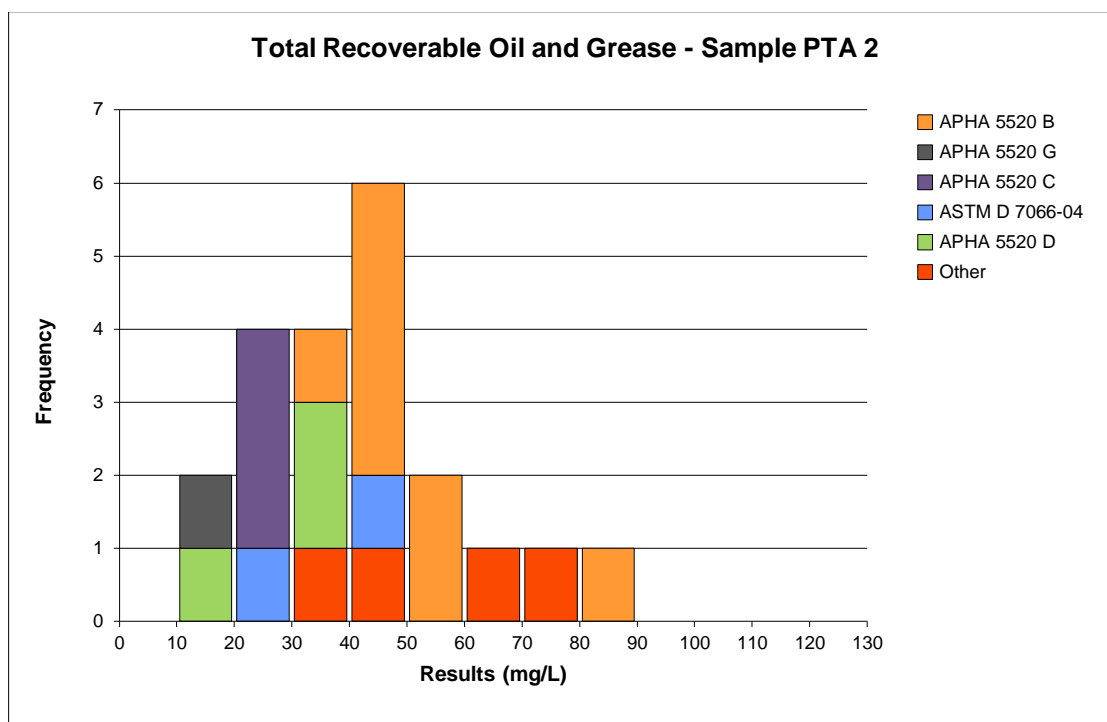


Figure 2. Spread of results for Total Recoverable Oil and Grease testing of sample PTA 2, with a median of 42.40 mg/L.

4.3 Measurement Uncertainty (MU)

The majority of participants in this round (76%) reported the measurement uncertainty (MU) associated with their results. Table 3 below presents the number and percentage of laboratories reporting the MU for each sample.

Table 3. The number and percentage of laboratories reporting a MU in round 254.

Sample	Total participants	Participants reporting MU (percentage)
PTA 1	21	16 (76%)
PTA 2	21	16 (76%)

Many of the stated MUs did not accurately reflect the difference between the median or doping concentration, and the participant's result for these proficiency samples.¹

¹ MU evaluation is based on minimum / maximum uncertainty criteria (u_{min} and u_{max}) described in ISO 13528:2015 [4]. It should be noted, however, that these are informative indicators only and cannot be solely used to validate or invalidate the MUs reported.

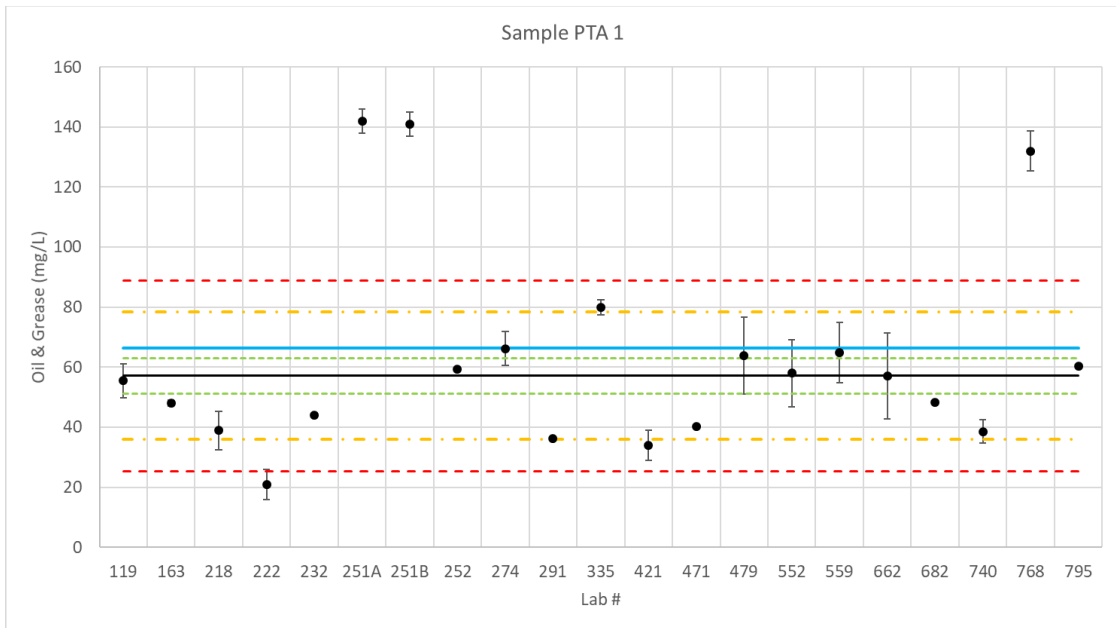


Figure 3. Spread of laboratory results (●) for Total Recoverable Oil and Grease testing of sample PTA 1, where laboratory MU show as error bars, the median is (—), the std error of median is (- - -), dope concentration is (—), 2x Historical NIQR is (- - -), and 3x Historical NIQR is (- - -).

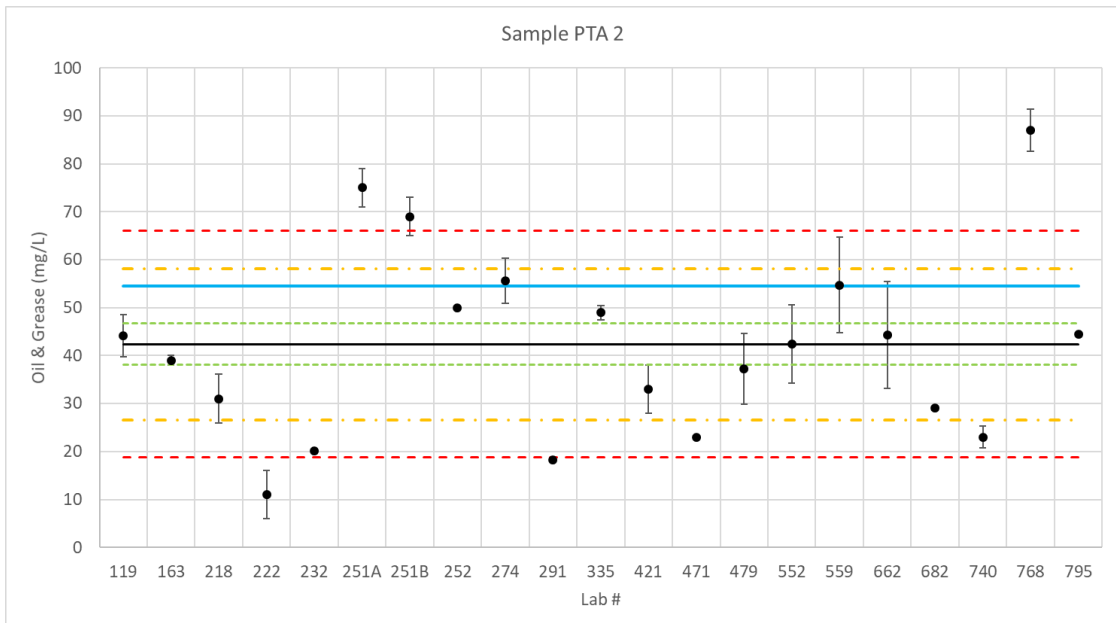


Figure 4. Spread of laboratory results (●) for Total Recoverable Oil and Grease testing of sample PTA 2, where laboratory MU show as error bars, the median is (—), the std error of median is (- - -), dope concentration is (—), 2x Historical NIQR is (- - -), and 3x Historical NIQR is (- - -).

The majority of labs indicated they believed their MU to be between 4 mg/L (2.8%) and 14.3 mg/L (20%), however those at the higher end of this range were more accurate in their prediction of their measurement uncertainty. Those labs in Figures 3 & 4, that successfully encompassed both samples Doping concentration (—) &/or the Median (—) with its uncertainty (- - -), were using APHA 5520 B Liquid-Liquid,

Partition-Gravimetric Method, APHA 5520 D Soxhlet Extraction Method, or “AN / 85” Method.

4.4 Analysis of Results by Method Groups

In order for methods to be grouped for analysis, PTA requires at least 11 sets of results from the same method group. Please note that, all methods were less than 11 results submitted for each method and reliable conclusions cannot be drawn from analysing them on this occasion.

5. Outlier Results

Laboratories reporting results that have been identified as outliers are listed in Table 5 below.

Table 5. Laboratory results identified as outliers for each sample tested.

Lab Code	Total Recoverable Oil and Grease	
	PTA 1	PTA 2
222	§	§
251A	§	§
251B	§	§
291		§
768	§	§

Note: A “§” indicates the occurrence of a z-score outlier result (i.e. those results for which $|z\text{-score}| \geq 3.0$).

6. References

- [1] *Guide to Proficiency Testing Australia*, 2019 (This document can be found on the PTA website, www.pta.asn.au)
- [2] *APHA Standard Methods for the Examination of Water and Wastewater*, 1998 - 20th Edition, 2012 - 22nd Edition, & 2017 - 23rd Edition.
- [3] *US EPA Method 1664 Revision B: n-Hexane Extractable material (HEM; Oil and Grease) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry*, February 2010. https://www.epa.gov/sites/production/files/2015-08/documents/method_1664b_2010.pdf
- [4] ISO 13528:2015 *Statistical methods for use in proficiency testing by interlaboratory comparisons*.

APPENDIX A

Results and Data Analysis

Total Recoverable Oil and Grease Sample PTA 1.....A1
Total Recoverable Oil and Grease Sample PTA 2.....A4

Total Recoverable Oil and Grease Results

Samples PTA 1 and PTA 2

Total Recoverable Oil and Grease

Results by Laboratory Code

Laboratory Code	Sample PTA 1			
	Result ± mg/L	MU ¹	Robust z-score ²	Method Code ³
119	55.5 ±	5.6	-0.15	1
163	48 ±	1	-0.86	1
218	38.9 ±	6.4	-1.71	10
222	21 ±	5	-3.40 §	9
232	44.0	#	-1.23	5
251A	142 ±	4	7.99 §	10
251B	141 ±	4	7.90 §	10
252	59.4	#	0.22	1
274	66.2 ±	5.6	0.86	1
291	36.3	#	-1.96	2
335	80.0 ±	2.5	2.16	5
421	34.0 ±	5.0	-2.18	9
471	40.3	#	-1.58	4
479	63.9 ±	12.8	0.64	9
552	58.0 ±	11.2	0.08	1
559	64.8 ±	10	0.73	1
662	57.1 ±	14.3	0.00	10
682	48.2 ±	0.41	-0.84	4
740	38.6 ±	3.9	-1.74	4
768	132 ±	6.6	7.05 §	1
795	60.4	#	0.31	1
<i>No of Results:</i>	21			
<i>Median:</i>	57.10			
<i>Normalised IQR:</i>	10.62			
<i>Uncertainty of the Median:</i>	2.90			
<i>Robust CV:</i>	31.8%			
<i>Target CV:</i>	18.6%			
<i>Minimum:</i>	21			
<i>Maximum:</i>	142			
<i>Range:</i>	121			

¹ Where reported, results are shown with their corresponding measurement uncertainty (MU).

² Each z-score marked with a "§" is an outlier and indicates an absolute z-score value $|z\text{-score}| \geq 3.0$. A target CV of 18.6% was used, based on data from previous PTA rounds

³ Please refer to Appendix C (page C3) for method code descriptions.

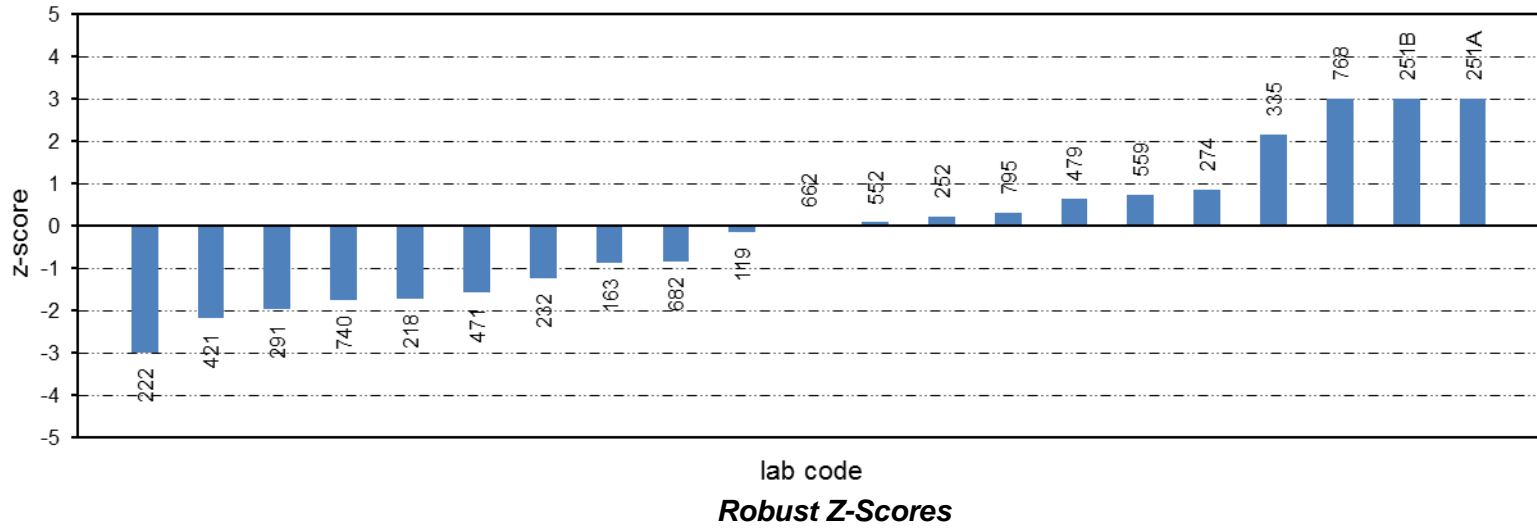
⁴ "na" indicates "not applicable".

⁵ "#" indicates that no result was returned for this sample/test.

Total Recoverable Oil and Grease - Sample PTA 1

Ordered Robust Z-Score Charts

Total Recoverable Oil and Grease - Sample PTA 1 - Robust Z-Scores



Total Recoverable Oil and Grease - cont.**Results by Laboratory Code**

Laboratory Code	Sample PTA 2			
	Result \pm mg/L	MU ¹	Robust z-score ²	Method Code ³
119	44.2 \pm	4.4	0.23	1
163	39 \pm	1	-0.43	1
218	31.0 \pm	5.1	-1.45	10
222	11 \pm	5	-3.98 §	9
232	20.1	#	-2.83	5
251A	75 \pm	4	4.13 §	10
251B	69 \pm	4	3.37 §	10
252	50.0	#	0.96	1
274	55.6 \pm	4.7	1.67	1
291	18.3	#	-3.06 §	2
335	49.0 \pm	1.5	0.84	5
421	33.0 \pm	5.0	-1.19	9
471	22.9	#	-2.47	4
479	37.2 \pm	7.4	-0.66	9
552	42.4 \pm	8.2	0.00	1
559	54.7 \pm	10	1.56	1
662	44.3 \pm	11.1	0.24	10
682	29.0 \pm	0.41	-1.70	4
740	23.0 \pm	2.3	-2.46	4
768	87.0 \pm	4.4	5.66 §	1
795	44.4	#	0.25	1

<i>No of Results:</i>	21
<i>Median:</i>	42.40
<i>Normalised IQR:</i>	7.89
<i>Uncertainty of the Median:</i>	2.16
<i>Robust CV:</i>	36.7%
<i>Target CV:</i>	18.6%
<i>Minimum:</i>	11
<i>Maximum:</i>	87.0
<i>Range:</i>	76.0

¹ Where reported, results are shown with their corresponding measurement uncertainty (MU).

² Each z-score marked with a "**§**" is an outlier and indicates an absolute z-score value $|z\text{-score}| \geq 3.0$. A target CV of 18.6% was used, based on data from previous PTA rounds

³ Please refer to Appendix C (page C3) for method code descriptions.

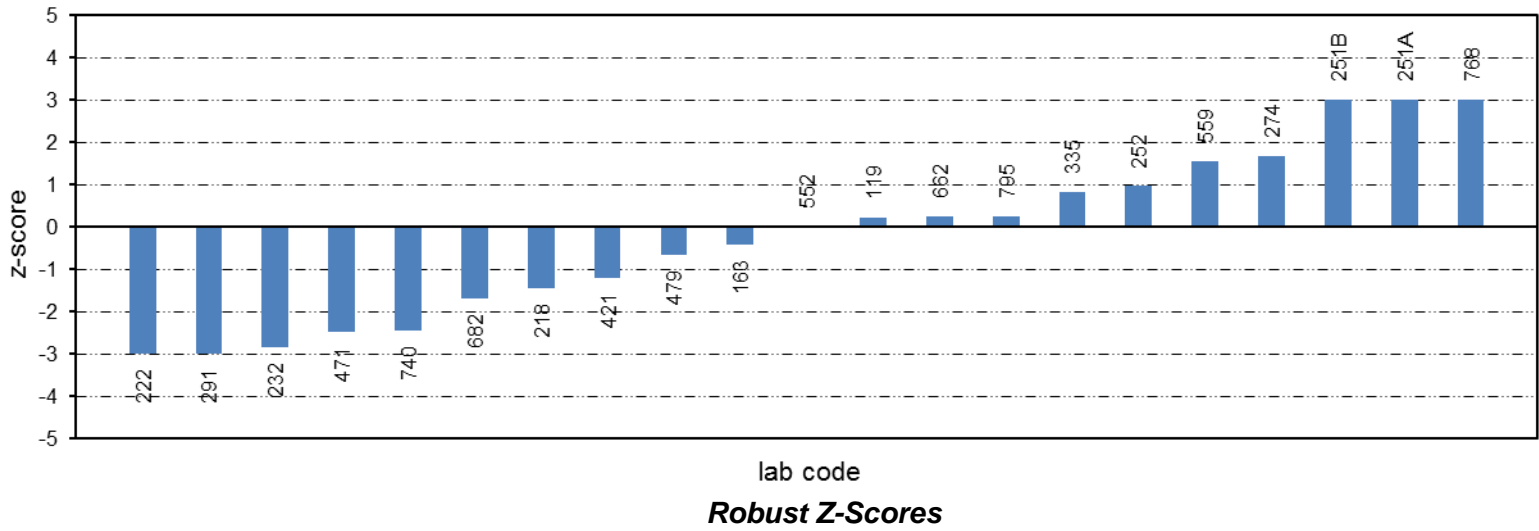
⁴ "na" indicates "not applicable".

⁵ "#" indicates that no result was returned for this sample/test.

Total Recoverable Oil and Grease - Sample PTA 2

Ordered Robust Z-Score Charts

Total Recoverable Oil and Grease - Sample PTA 2 - Robust Z-Scores



APPENDIX B

Sample Homogeneity and Stability

Homogeneity and Stability Testing B1

Homogeneity and Stability Testing

Samples for this program were obtained from Global Proficiency Ltd, New Zealand. As such, all samples are subjected to rigorous quality control and homogeneity / stability testing. Sample PTA 1 was doped with 33.22 ± 0.62 mg (95% CI) of mineral oil and stearic acid in a 500mL bottle, and sample PTA 2 was doped with 27.25 ± 0.56 mg (95% CI) of a mixture of vegetable oil, anhydrous milk fat and stearic acid. All samples were acidified to $\text{pH} < 2$ using HCl.

Samples were manufactured with QC weight checks on all samples. A random selection of ten samples was chosen from samples PTA 1 and PTA 2 for homogeneity and stability testing. Seven of these were stored chilled at 4°C and the remaining three were subjected to 35°C for three days, for an accelerated ageing stability trial. Samples were then analysed for Oil and Grease by Eurofins, New Zealand, using the Partition-Gravimetric method APHA 5520 B (modified) Online Edition.

All stability samples showed no notable differences when compared to homogeneity samples. These data combined with the recommendations in APHA 1060 C that samples should have a $\text{pH} < 2$ and temperature $< 6^{\circ}\text{C}$ to give a recommended maximum storage of 28 days.

From statistical analyses based on the results of this testing and rigorous quality control, it was considered that all samples were sufficiently homogeneous and stable, so that any results later identified as outliers should not be attributed to any notable sample variability.

The results of homogeneity and stability testing, and QC checks, are presented in Table B1 below. Please note that the mean results for these tests are not intended to be used as reference values.

Table B1. Homogeneity and stability testing of PTA 1 and PTA 2 samples.

Round PTA 254	Total Recoverable Oil and Grease (g/m^3)				
	Sample ID	Sample PTA 1		Sample PTA 2	
		Test Result	Quality Control	Test Result	Quality Control
Homogeneity	H1	70	67.0	51	53.8
	H2	67	66.8	54	54.0
	H3	58	64.4	55	54.4
	H4	63	67.4	52	54.0
	H5	63	66.6	51	53.6
	H6	63	65.4	52	55.8
	H7	62	66.2	51	54.4
Stability	S1	70	66.6	53	56.2
	S2	62	66.6	55	53.8
	S3	61	66.8	52	54.2
Median		63	66.6	52	
RSD		6.1%	1.3%	3.0%	
Recovery		95%		96%	

APPENDIX C

Documentation

Instructions to Participants..... C1
Method Codes..... C3
Results Sheet..... C4



PROFICIENCY TESTING AUSTRALIA
WATERS PROFICIENCY TESTING PROGRAM

CHEMICAL ANALYSIS ROUND 254

DECEMBER 2019

Total Recoverable Oil and Grease

INSTRUCTIONS TO PARTICIPANTS

*****Please record (on the Results Sheet) the approximate temperature of the samples upon receipt*****

Please note the following before commencing the analysis of the samples.

1. Samples

- i) Two 500 mL glass bottles, labelled PTA 1 and PTA 2, supplied by Global Proficiency Ltd. The bottles contain oil and grease (in water) in the range of 10-50 milligrams (mg). These have been acid preserved and should be refrigerated until ready to test.
- ii) The sample must be thoroughly mixed prior to analysis. Please take extra care as the sample may be strongly adhered to the glass neck and shoulder of the bottle.

Please Note: Where possible, proficiency testing samples should be treated as a routine laboratory sample.

2. Sample Preparation

Caution: Analysis must begin immediately after bottle is opened.

- i) Adjust bottle temperature to 20° C.
- ii) Record bottle ID number.
- iii) Shake the bottle prior to opening.
- iv) Each bottle is ready to test according to your normal procedures.

Note: Please treat as “unknown oil”.

3. Tests Requested

- i) Total Recoverable Oil and Grease.

If unable to perform the above please note this on your Results Sheet.

4. Safety

- i) Samples are for laboratory use only.
- ii) Participants should have sufficient experience and training to take the necessary precautions when handling the samples and reagent chemicals and during disposal.
- iii) Use of safety glasses, gloves, and fume hoods, where appropriate during the determinations, is recommended.

5. Reporting

- i) Report results using one decimal place.
- ii) Report results in milligrams per litre (mg/L).
- iii) Do not correct results for recovery.
- iv) Select the appropriate method code from the Method Code Table and record it on the Results Sheet.
- v) Calculate the measurement uncertainty (MU) for each reported result. All estimates of MU must be given as a 95% confidence interval (coverage factor $k \approx 2$) and reported in mg/L. Report MU using the same number of decimal places as for the result.

6. Testing should commence as soon as possible after receiving the samples and results reported **NO LATER THAN 20 DECEMBER 2019** to:

Delfina Mihaila
 Proficiency Testing Australia
 PO Box 7507
 SILVERWATER NSW 2128
 AUSTRALIA
Phone: +612 9736 8397
Fax: +612 9743 6664
Email: dmihaila@pta.asn.au

7. For this program your laboratory has been allocated the code number shown on the attached Results Sheet. All reference to your laboratory in reports associated with the program will be through this code number, thus ensuring the confidentiality of your results.

8. As a guide, ranges for the samples can be expected to be (in mg/L):

Analyte	Range
Total Recoverable Oil and Grease	20 – 100 mg/L

Method Codes to be used for the Results Sheet

ANALYSIS	METHOD	METHOD DESCRIPTION	CODE
Total Recoverable Oil and Grease	Partition-Gravimetric	APHA 5520 B. Liquid-Liquid, Partition-Gravimetric Method	1
		APHA 5520 G. Solid-Phase, Partition-Gravimetric Method	2
	Hexane Extraction & Gravimetry	US EPA 1664A Oil & Grease (HEM/SGT-HEM) by extraction	3
	Infrared	APHA 5520 C. Partition-Infrared Method	4
		ASTM D 7066-04 Standard Test Method for dimer/trimer of chlorotrifluoroethylene (S-316) Recoverable Oil and Grease and Nonpolar Material by Infrared Determination	5
		ASTM D 3921-96 Standard Test Method for Oil and Grease and Petroleum Hydrocarbons in Water	6
		US EPA 413.2 Oil & Grease, Total Recoverable - Spectrophotometric, Infrared)	7
		US EPA 418.1 Petroleum Hydrocarbons, Total Recoverable	8
	Soxhlet Extraction	APHA 5520 D. Soxhlet Extraction Method	9
	Other	Please specify	10

Method Reference Key

- i) **APHA** APHA "Standard Methods for the Examination of Water and Wastewater" (18, 19, 20, 21, 22, 23 Edition) (<http://www.standardmethods.org/>).
- ii) **ASTM** American Society for Testing and Materials, Annual Book of ASTM Standards, Vol. 11.01 and Vol. 11.02.
- iii) **US EPA** U.S Environmental Protection Agency. (<http://www.epa.gov/osa/>).



PROFICIENCY TESTING AUSTRALIA
WATERS PROFICIENCY TESTING PROGRAM

CHEMICAL ANALYSIS ROUND 254

Total Recoverable Oil and Grease

DECEMBER, 2019

RESULTS SHEET
(mg/L)

Laboratory
Code

*Approximate temperature of samples upon receipt:

ANALYSIS	SAMPLE PTA 1		SAMPLE PTA 2		METHOD CODE
	Result (mg/L)	±MU (mg/L)	Result (mg/L)	±MU (mg/L)	
Total Recoverable Oil and Grease					

Please note: Where possible, proficiency testing samples should be treated as a routine laboratory sample.

- i) For each sample only a single result is requested.
- ii) Report results using one decimal place.
- iii) Report results in milligrams per litre (mg/L).
- iv) Do not correct results for recovery.
- v) MU* Laboratories Measurement Uncertainty (MU) if known for the result. Please report in mg/L and use a coverage factor of k=2.

DATE: _____

SIGNATURE: _____

Return results **NO LATER THAN 20 DECEMBER 2019** to:

Delfina Mihaila
 Proficiency Testing Australia
 PO Box 7507
 SILVERWATER NSW 2128
 AUSTRALIA

Phone: +61 2 9736 8397
Fax: +61 2 9743 6664
Email: dmihaila@pta.asn.au

- End of Report -