



A Program of ASTM International

Test Monitoring Center

<https://www.astmtmc.org>

GM Reference Test Activity

Reference tests completed 10/1/2022 – 3/31/2023

Table of Contents

Section	Topic
Executive Summary	
	<u>Summary Items</u>
	<u>Calibrated Labs and Stands</u>
Test Area Status Summaries	
	<u>GMAER</u>
	<u>GMOD</u>
	<u>GMOEE</u>
	<u>GMSP13</u>
	<u>GMTC</u>
	<u>Lab Visits</u>
	<u>Reference Oil</u>

Summary of Tests

- GMAER - Aeration continues to trend mild at about the same level since 2019
- GMOD – PVIS in control after sounding Severity Alarm, all other parameters in control. Reblends available for GMOD01 and GMOD02
- GMOEE - Severity trending at or near historic levels
- GMSPI3 – Test activity lower this period with severity near historic levels
- GMTTC – Continued to trend mild this period (with limited test results)

[Return to Table of Contents](#)

Calibrated Labs and Stands*

Test	Labs	Stands
GMOD	4	5
GMAER	2	3
GMOEE	2	5
GMSP13	1	2
GMTC	1	1

[Return to Table of Contents](#)

*As of 3/31/2023

Test Monitoring Center
<https://www.astmtmc.org>





A Program of ASTM International

Test Monitoring Center

<https://www.astmtmc.org>

GMAER

March 2023

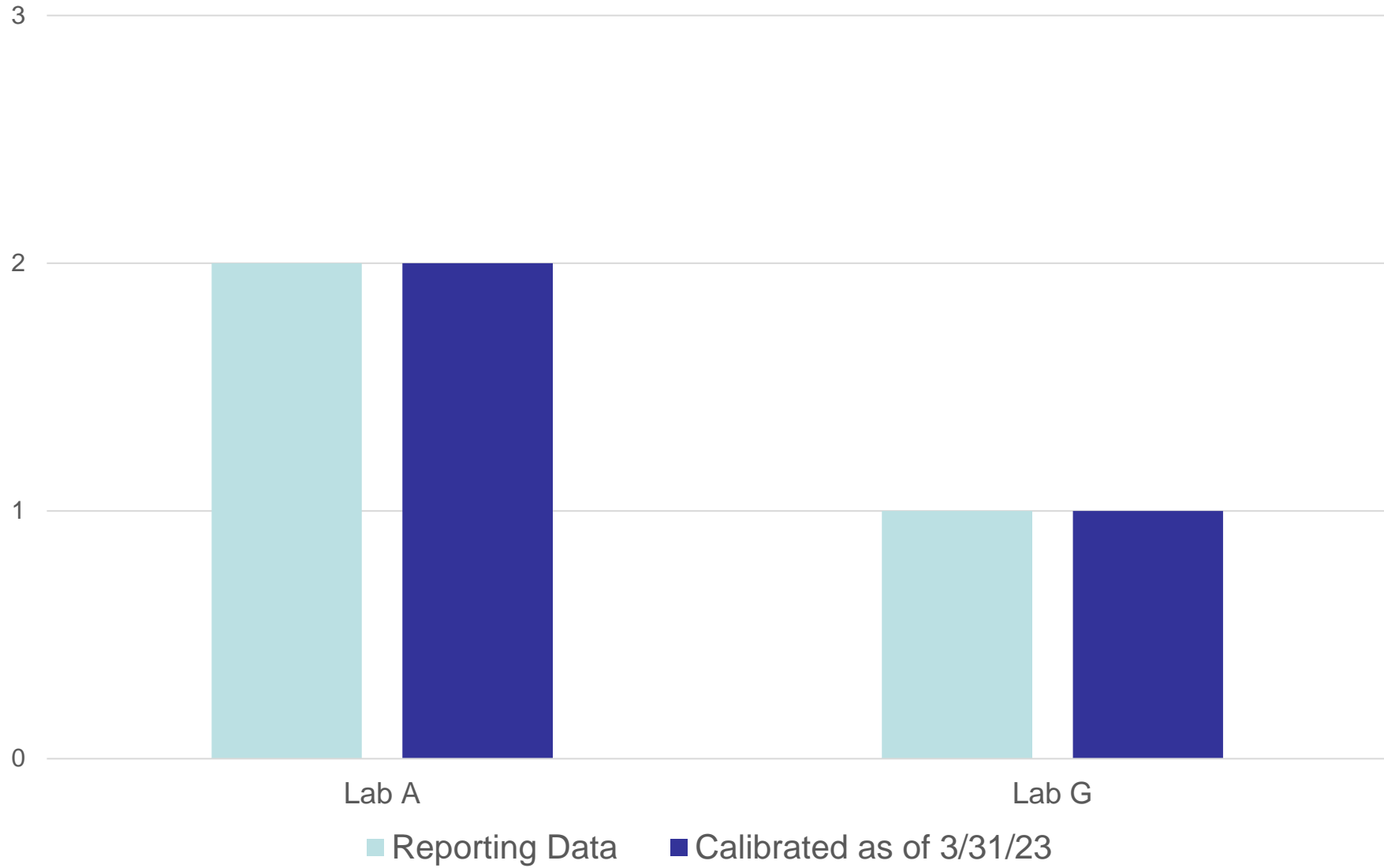
Summary of Activity

- Three calibrated stands in two laboratories
- Aeration continues to trend mild at about the same level since 2019

GMAER Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	4
Operationally Invalid Calibration Test	LC	1
Total		5

Calibrated Labs and Stands



GMAER - Failed Tests

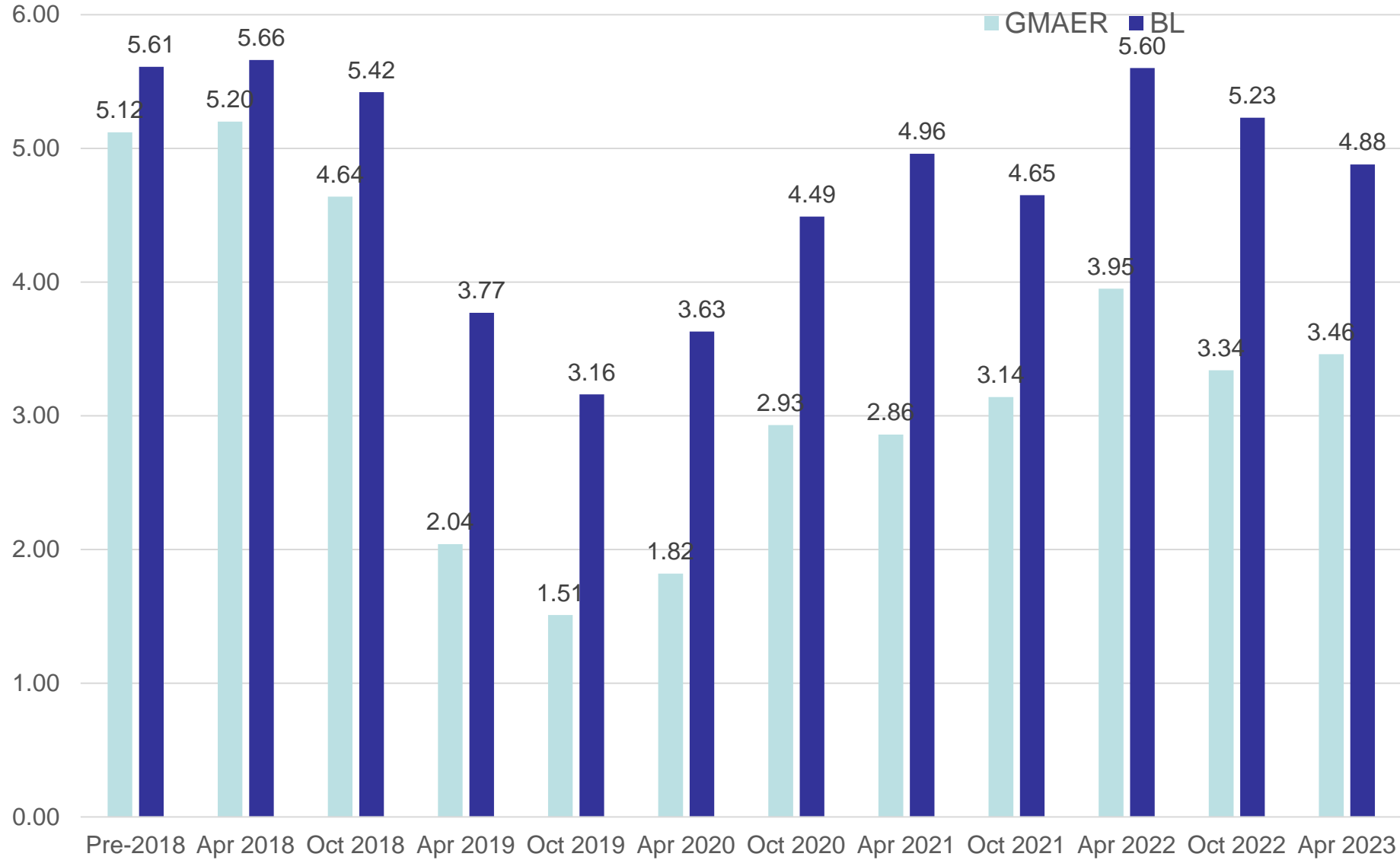
Test Status	#
No failed tests	-
Totals	0

GMAER - Lost Tests*

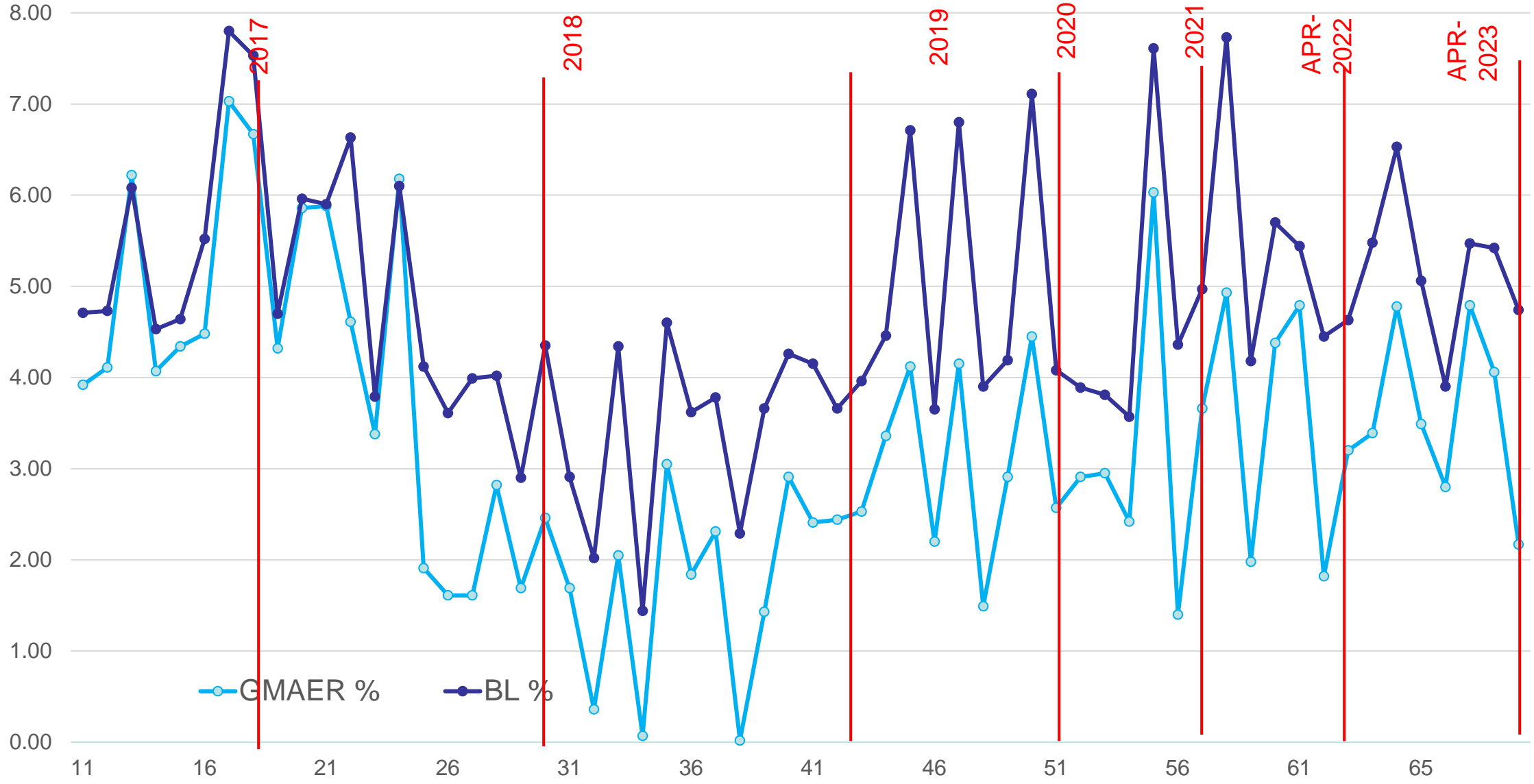
Test Status	#
Unexpected Shutdown @ Test Hour 25	1
Totals	1

*Invalid and aborted tests

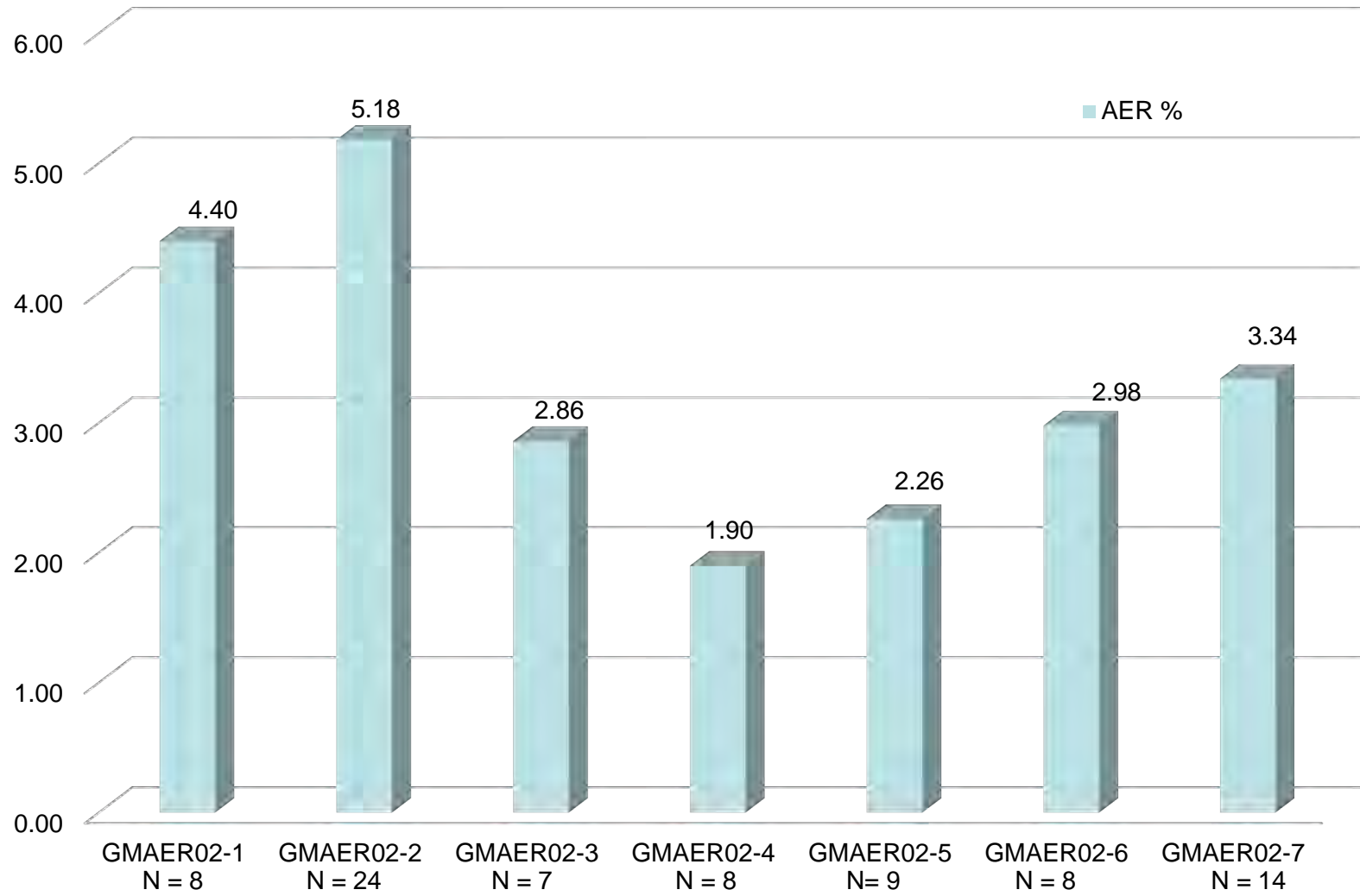
Average Aeration by Report Period



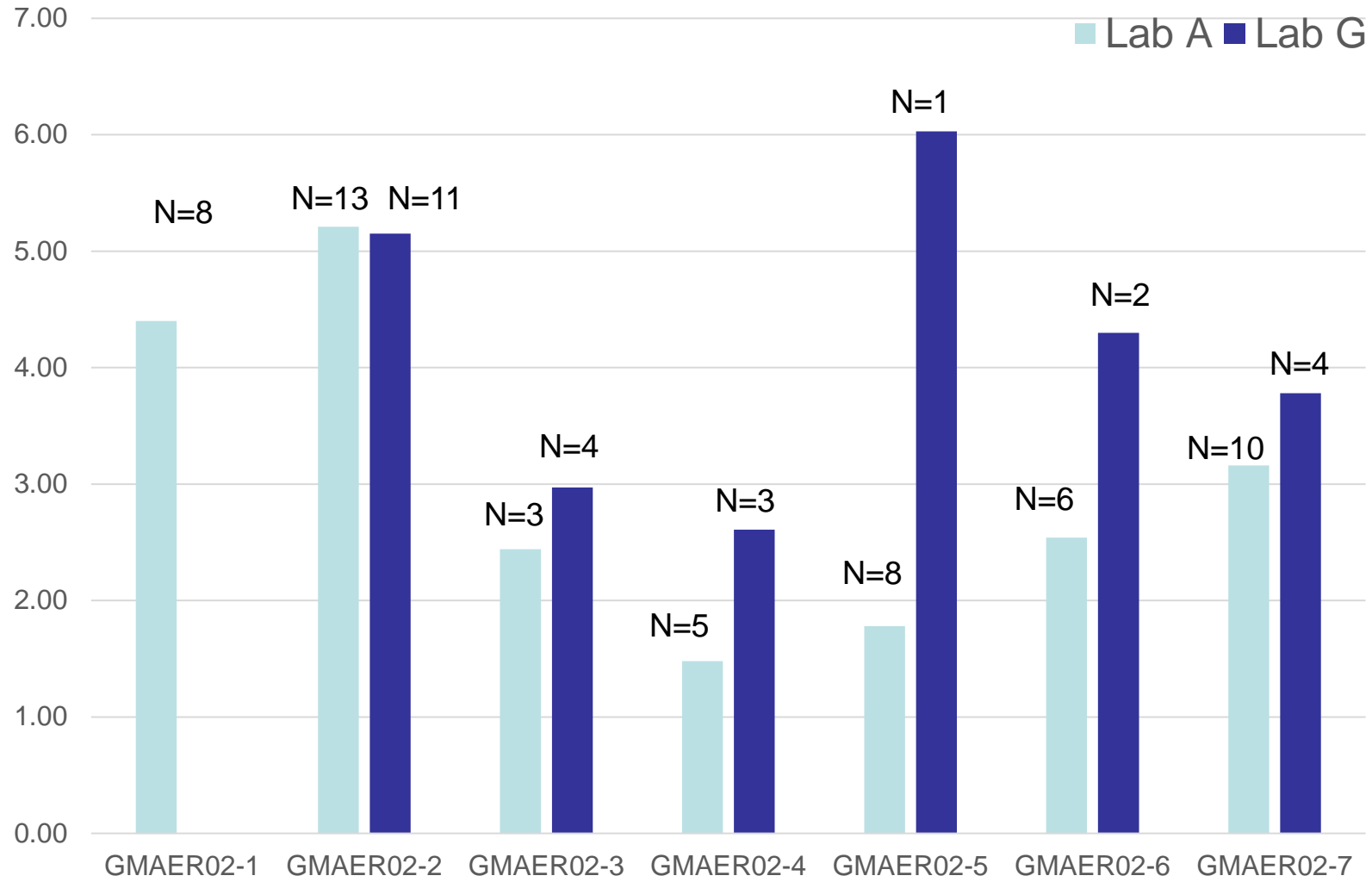
GMAER02 and GMAERBL Reference Test Results



Average AER by Reference Oil Batch



Average Aeration by Lab and Reference Oil Blend



[Return to Table of Contents](#)



A Program of ASTM International

Test Monitoring Center

<https://www.astmtmc.org>

GMOD

March 2023

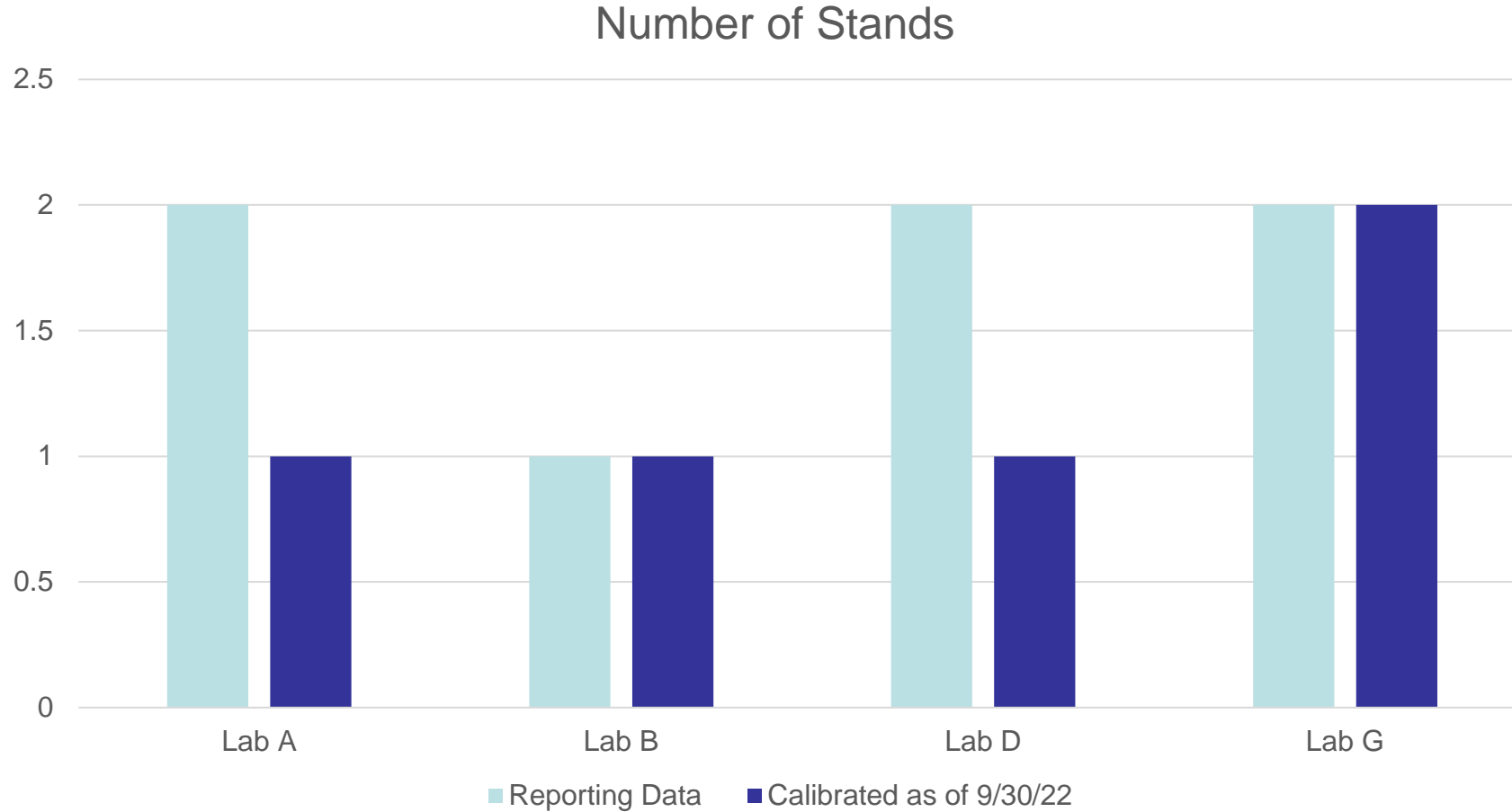
Summary of Activity

- Five calibrated stands in four laboratories
- Reference oil
 - Less than a year supply of GMOD01-1 and approximately a year supply of GMOD02-1 at TMC with reblends of both oils available from TMC
 - RO 434-3 being introduced.
 - GMOD Test Team agreed to new targets for Reference Oil 434-3. LTMS document updated to allow use with new targets. Two tests completed on this oil.
- All parameters in control for severity and precision

GMOD Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	8
Terminated Calibration Tests	XC	3
Result Removed from Chart	MC	1
Total		12

GMOD Test Stands



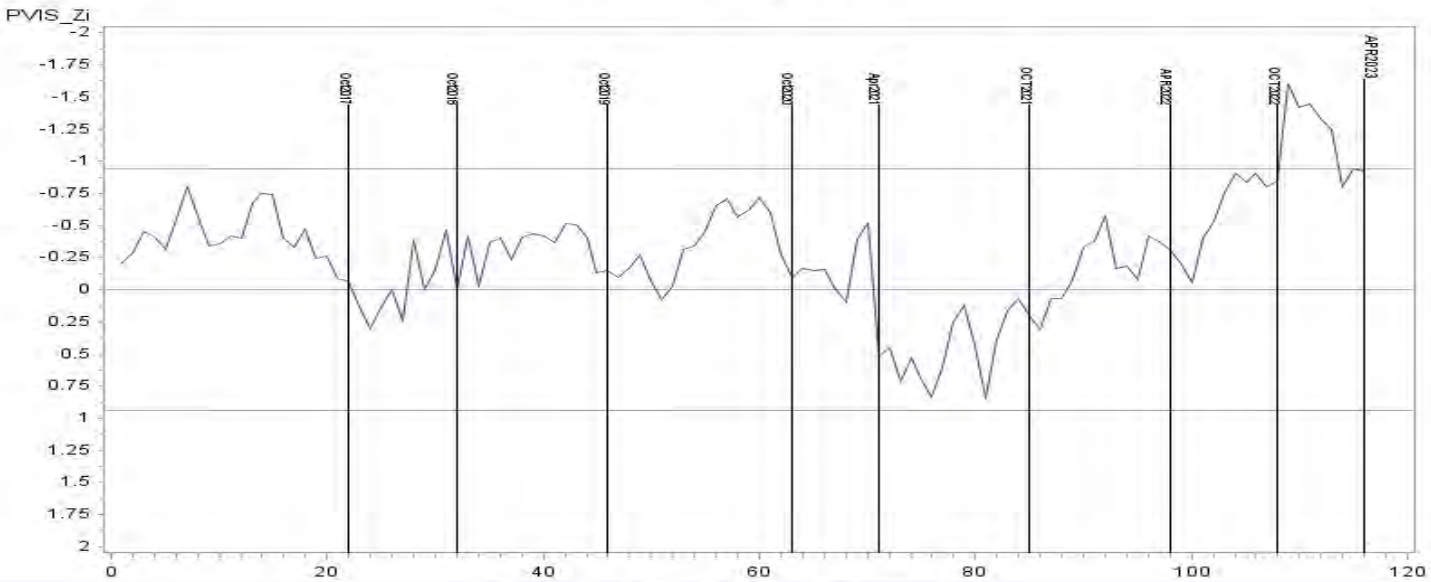
GMOD - Failed Tests

Test Status	#
Mild PVIS	1
Total	1

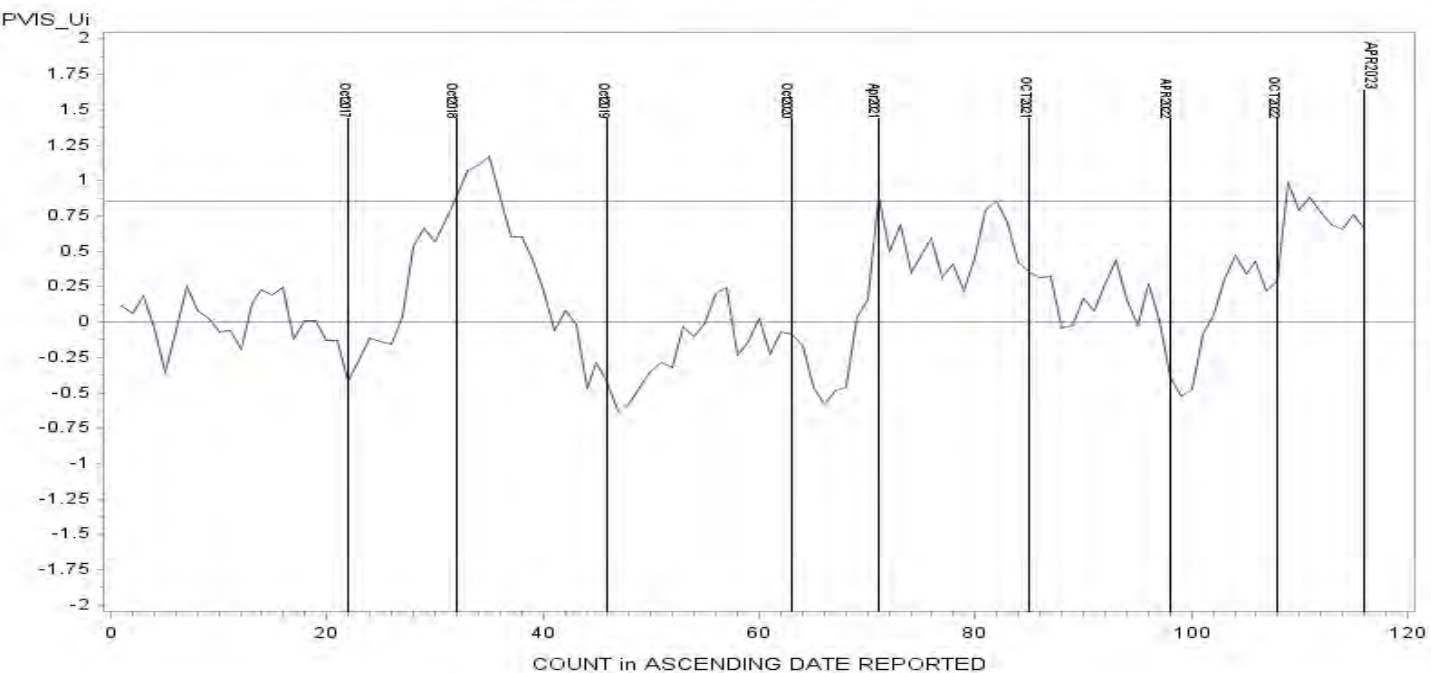
GMOD – Lost Tests

Test Status	Validity	#
Terminated Calibration Test, high oil consumption	XC	1
Terminated Calibration Test, oil leak	XC	1
Operationally Invalid Calibration Test, coolant temperature control issues	LC	1
Total		3

GM Oxidation and Deposit Test
PVIS LTMS Severity Analysis



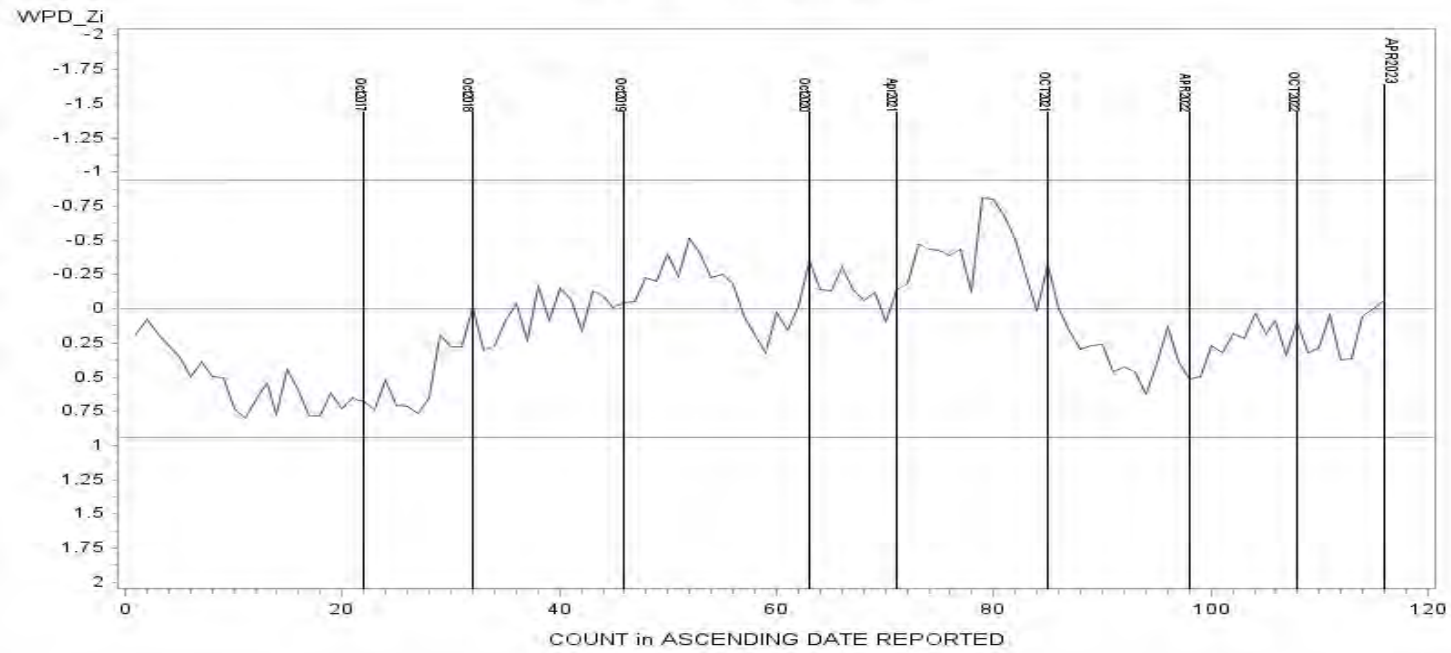
GM Oxidation and Deposit Test
PVIS LTMS Precision Analysis



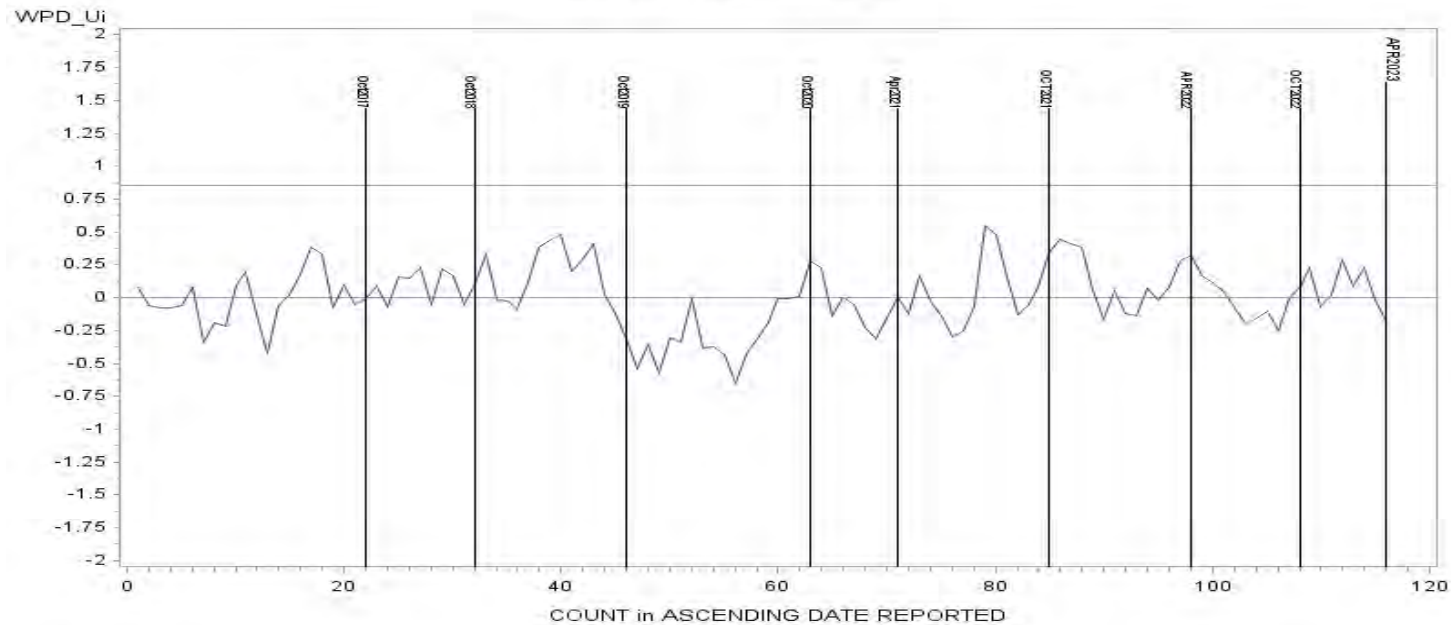
PVIS Severity / Precision

- PVIS sounded both severity and precision alarms during the period, but returned to in control at the end of the period
- Severity is trending mild relative to precision matrix targets

GM Oxidation and Deposit Test
WPD LTMS Severity Analysis



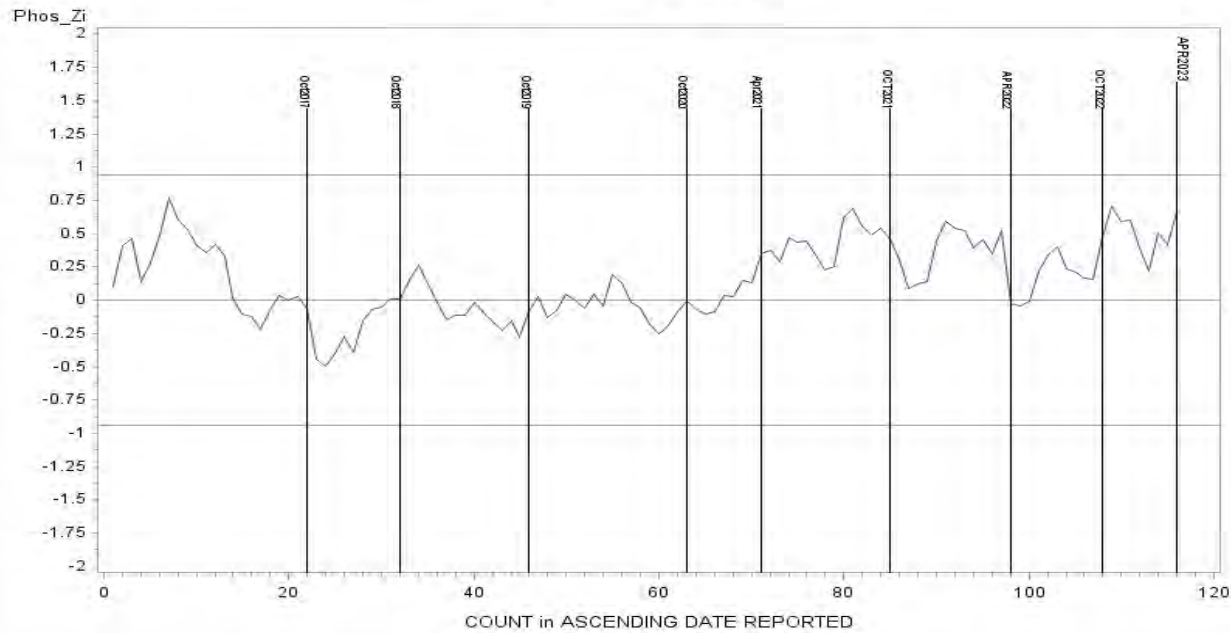
GM Oxidation and Deposit Test
WPD LTMS Precision Analysis



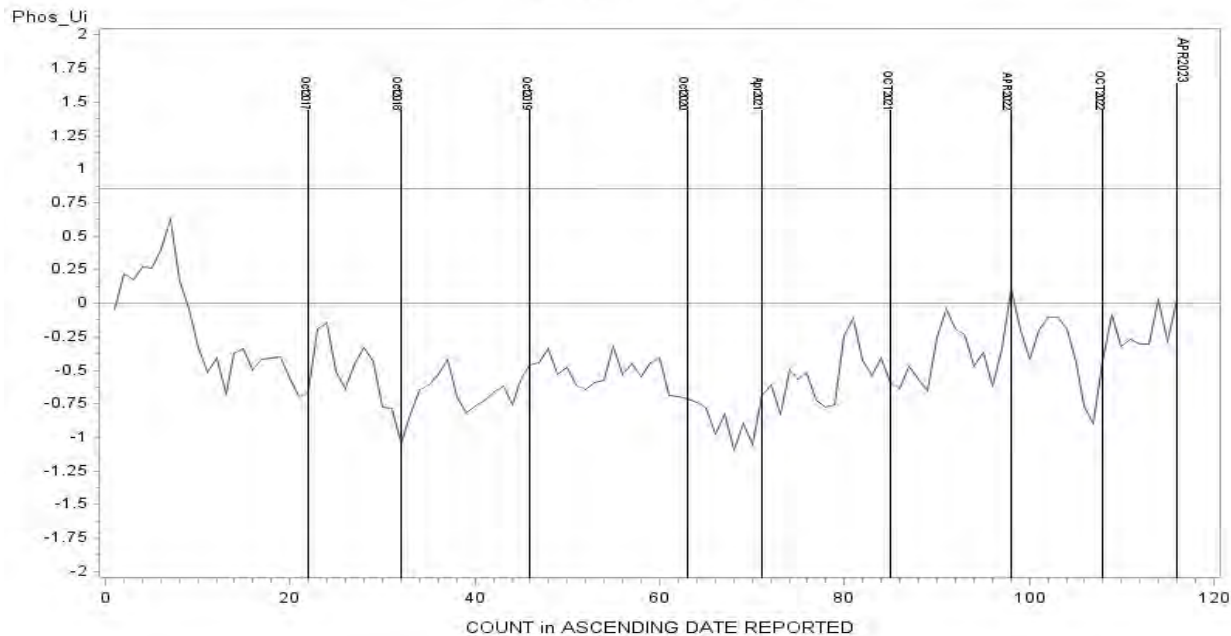
WPD Severity / Precision

- WPD is in control for severity and precision
- Severity is on or near target relative to precision matrix targets

GM Oxidation and Deposit Test
Phos LTMS Severity Analysis



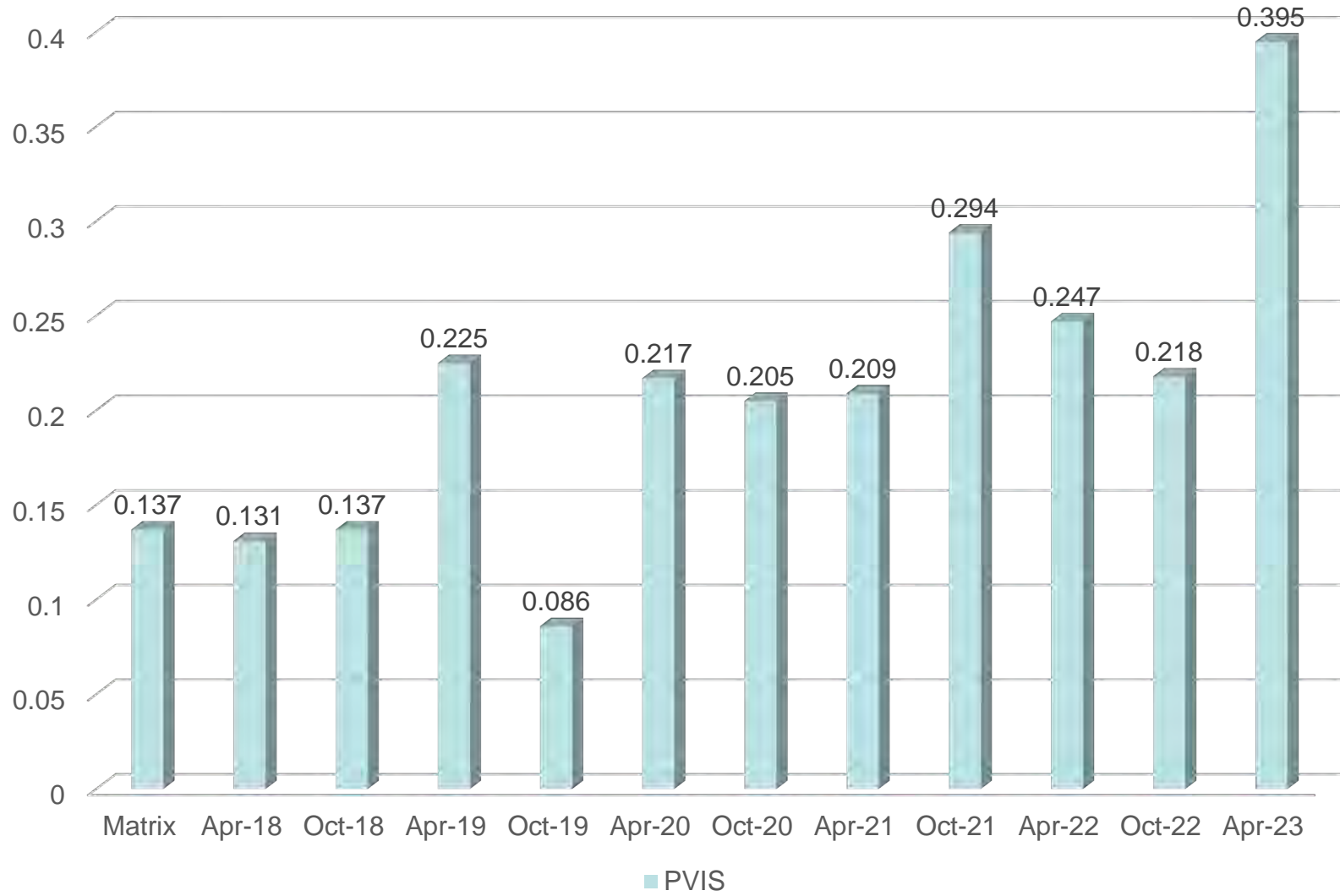
GM Oxidation and Deposit Test
Phos LTMS Precision Analysis



PHOS Severity / Precision

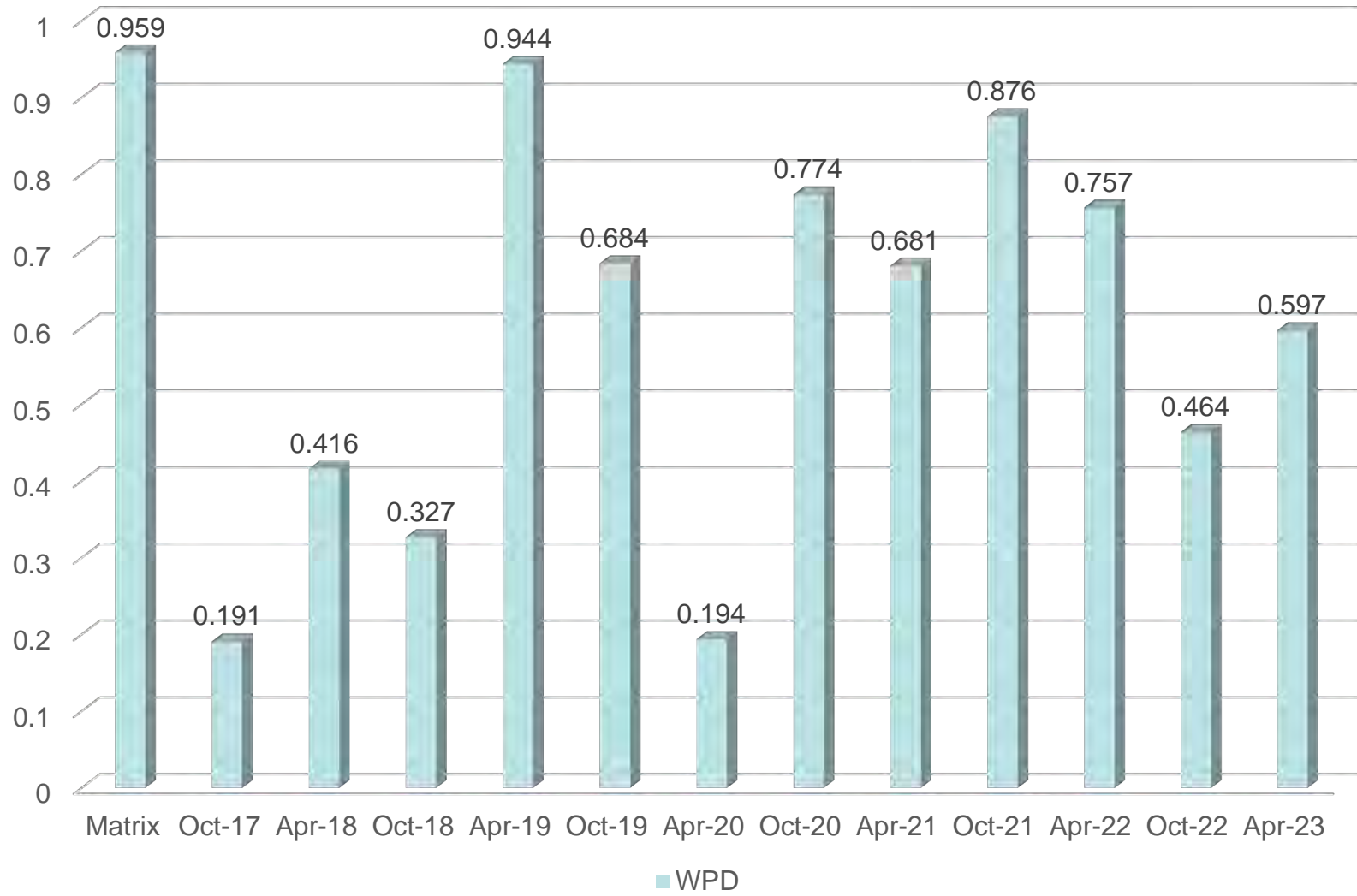
- PHOS is in control for severity and precision
- Appears to be trending mild relative to precision matrix targets (not a calibration criteria)

PVIS – Pooled s Values by Report Period

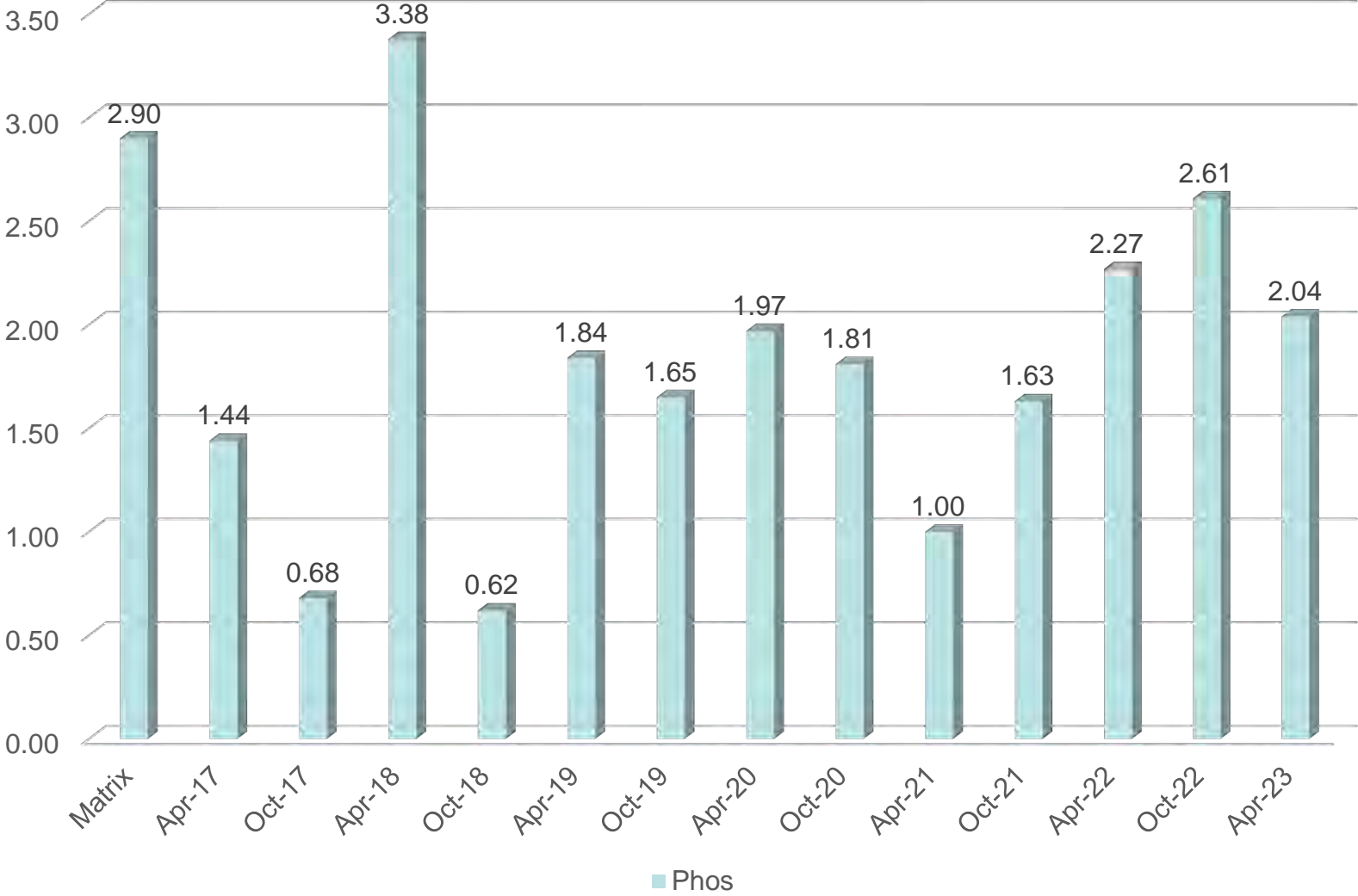


PVIS estimates calculated in transformed units

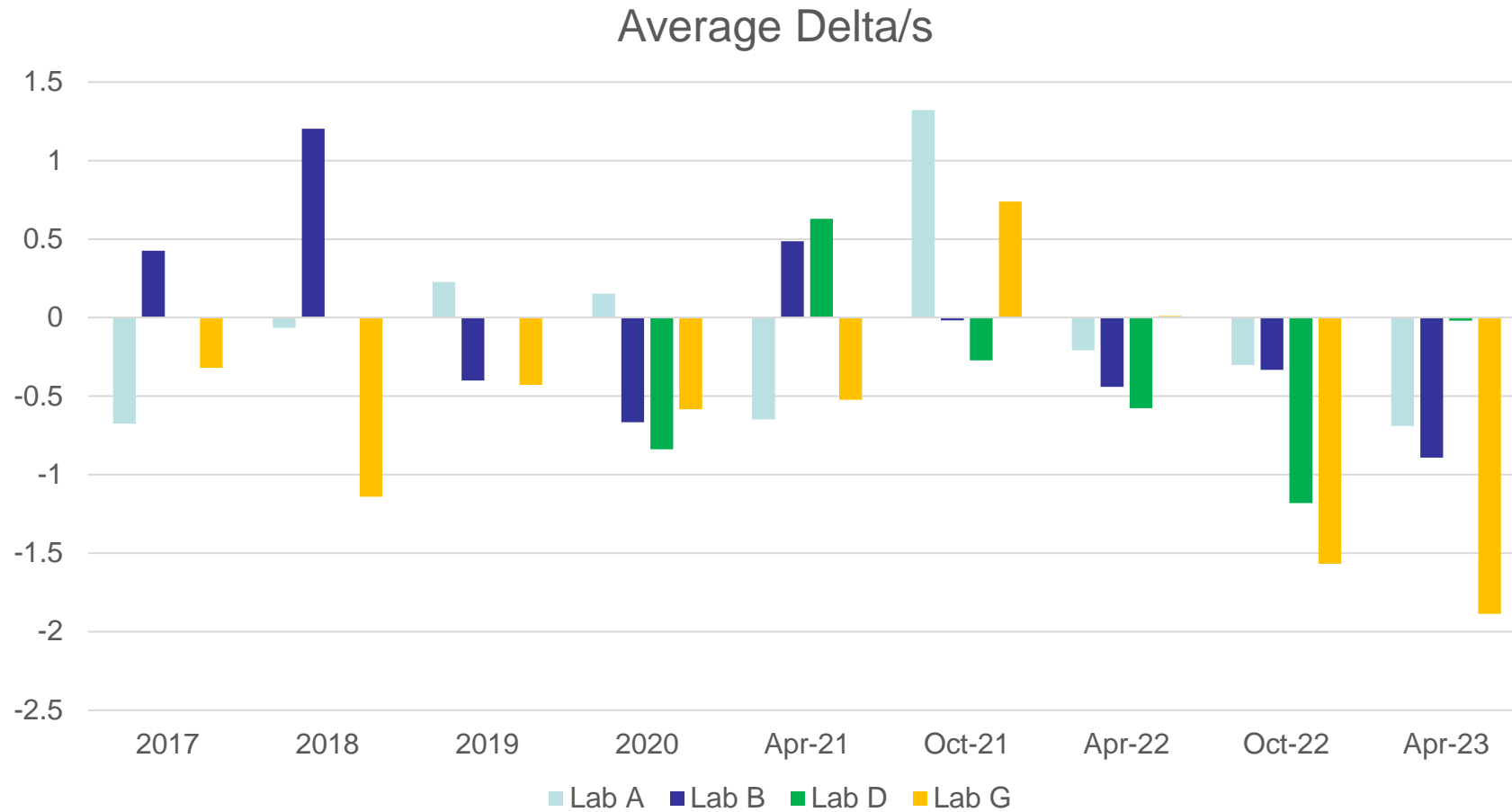
WPD – Pooled s Values by Report Period



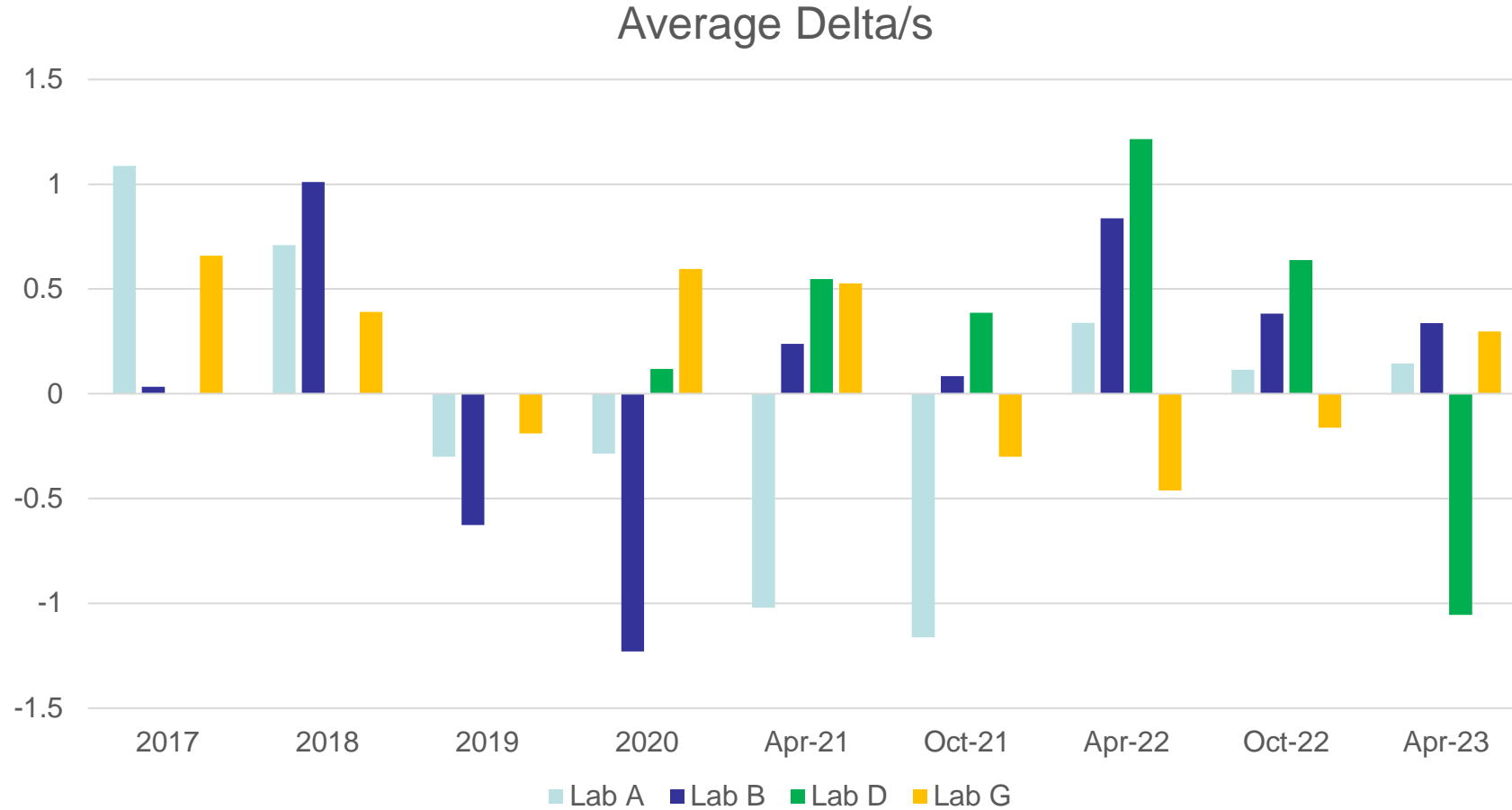
PHOS – Pooled s Values by Report Period



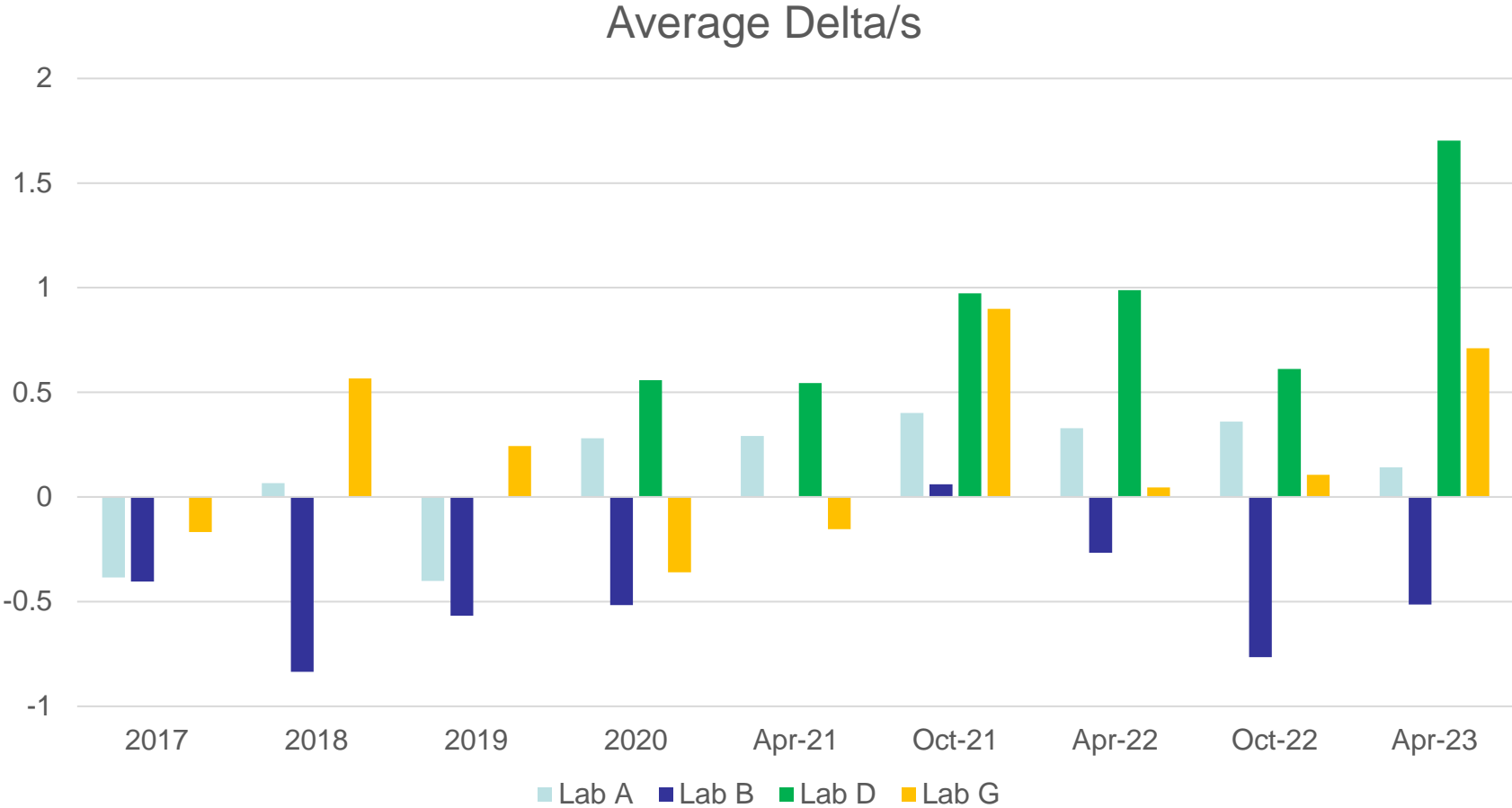
Average delta/s by Lab % Viscosity Increase



Average delta/s by Lab Weighted Piston Deposits



Average delta/s by Lab % Phosphorus Retention



[Return to Table of Contents](#)



A Program of ASTM International

Test Monitoring Center

<https://www.astmtmc.org>

GMOEE

March 2023

Summary of Activity

- 5 calibrated stands in 2 laboratories
- Severity remains stable at about the same level as the previous two periods.

GMOEE Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	5
Statistically Unacceptable Calibration Test	OC	0
Total		5

Calibrated Labs and Stands



GMOEE - Failed Tests

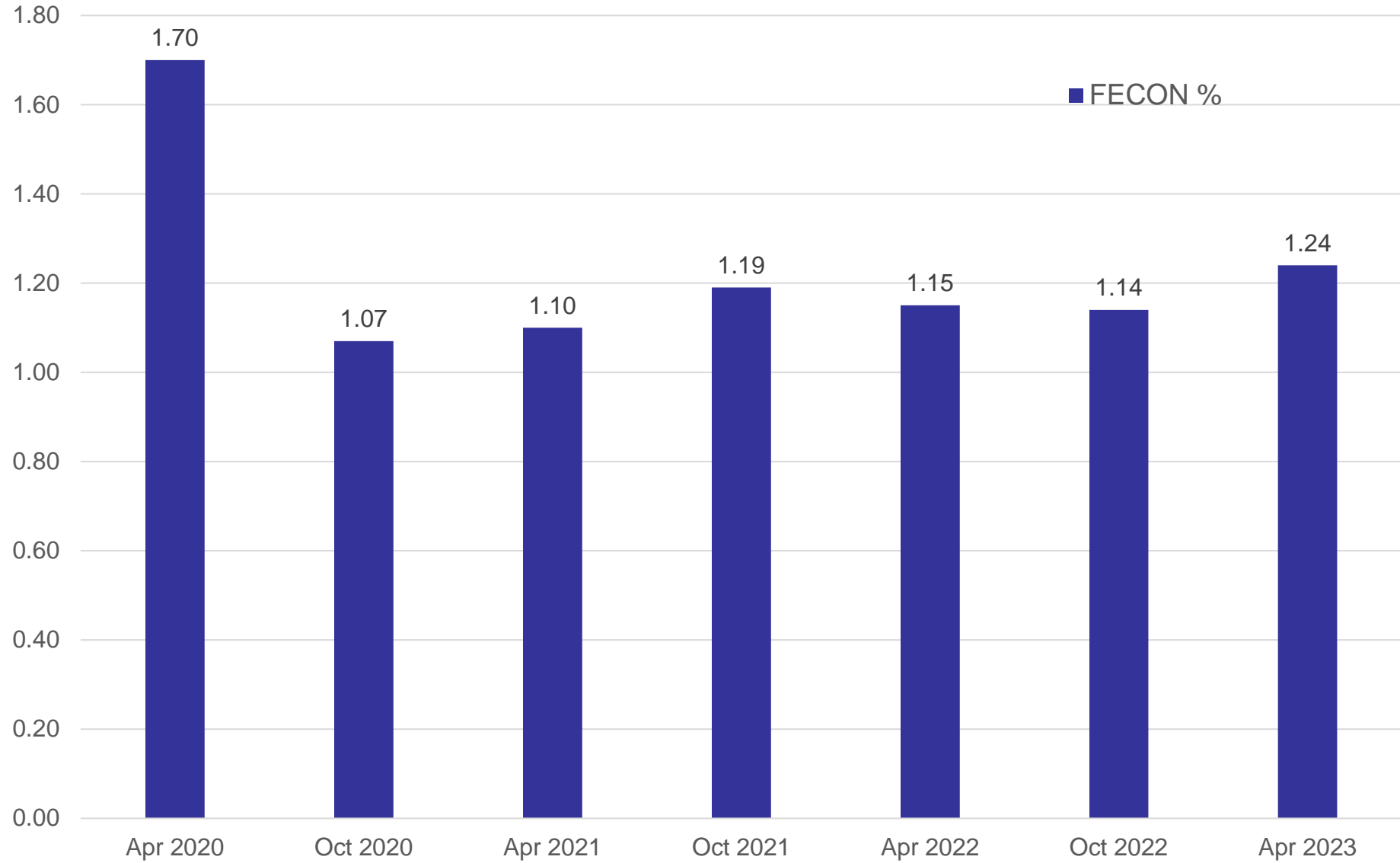
Test Status	#
No failed test	-
Totals	0

GMOEE - Lost Tests*

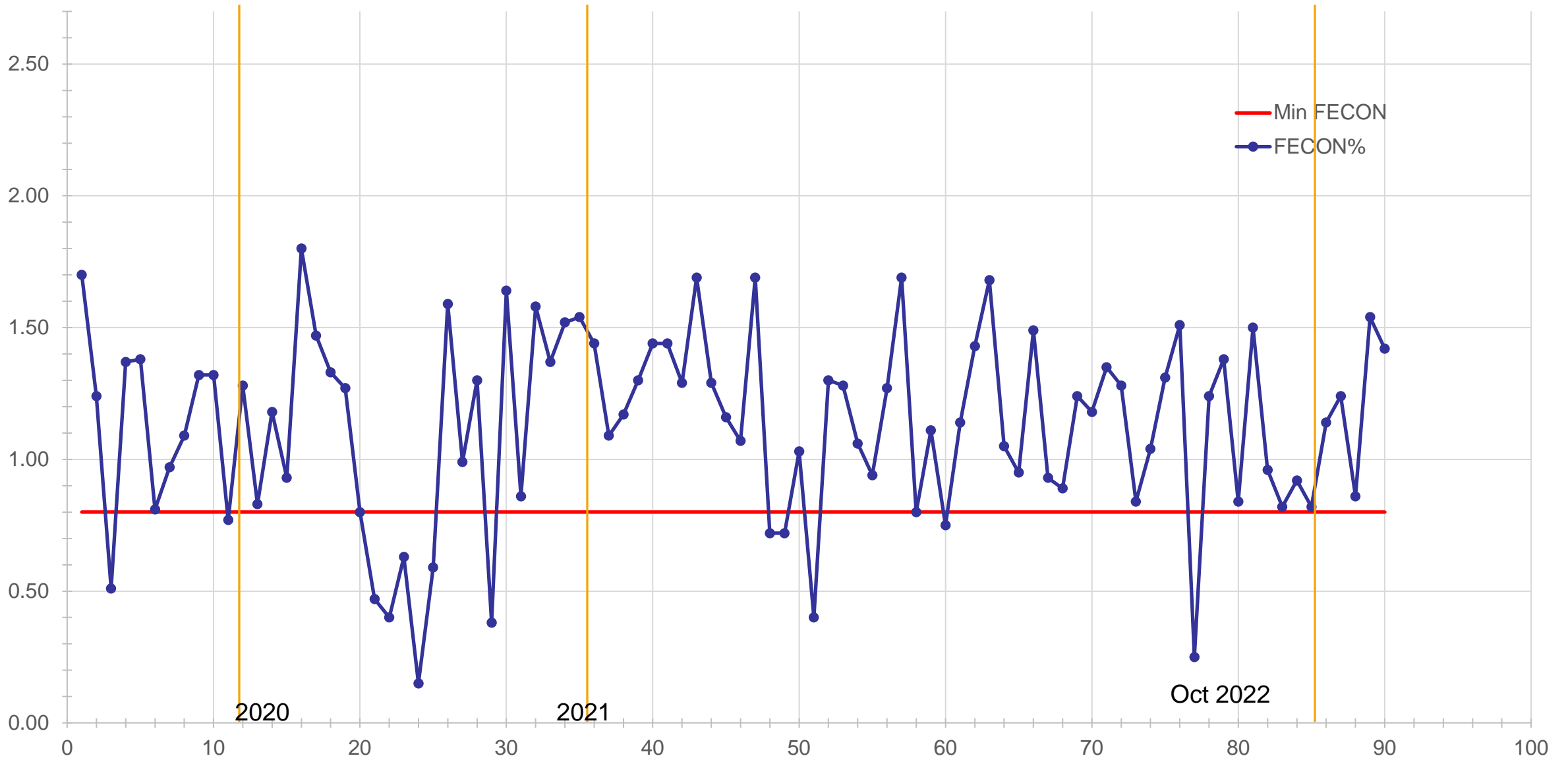
Test Status	#
No lost tests	-
Totals	0

*Invalid and aborted calibration tests

Average FECON by Report Period



GMOEE Reference Test Results



[Return to Table of Contents](#)



A Program of ASTM International

Test Monitoring Center

<https://www.astmtmc.org>

GMSP13

March 2023

Summary of Activity

- Reference test activity was somewhat lower for this period and the previous period when compared to the previous year
- Severity and precision levels have been steady for 2022 and first quarter of 2023

GMSPi3 Activity

Test Status	Validity Code	#
Acceptable Calibration Test*	AC	42
Statistically Unacceptable Calibration Test	OC	12
Invalid Calibration Test	LC	1
Terminated Early Calibration Test	XC	1
Total		56

GMSPi3 - Failed Tests

Test Status	#
Pre-Ignition Events - Mild	12
Totals	12

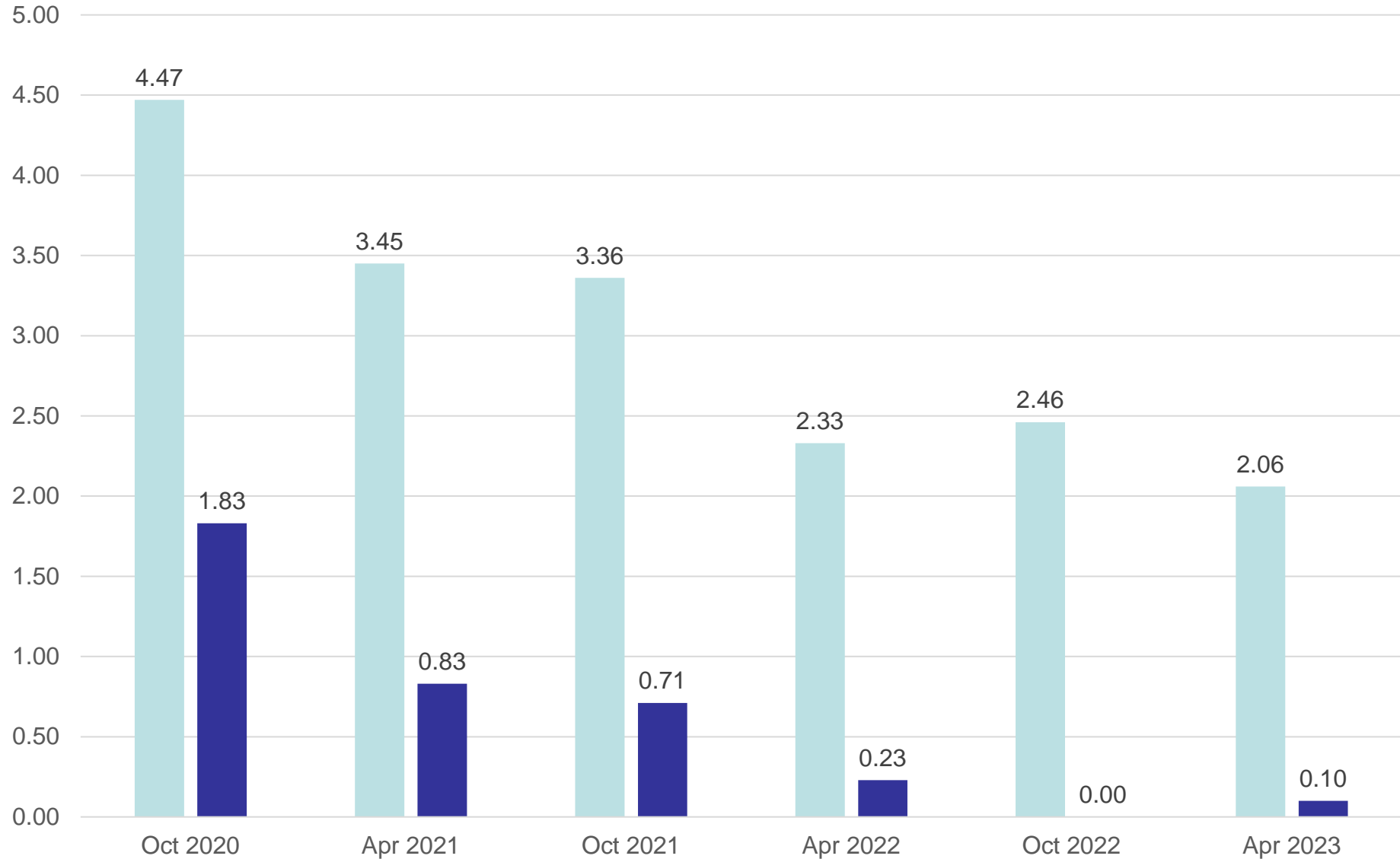
GMSPi3 - Lost Tests*

Test Status	#
Exceeded down time limit	2
Totals	2

*Invalid and aborted tests

Average TPICBEVT by Report Period

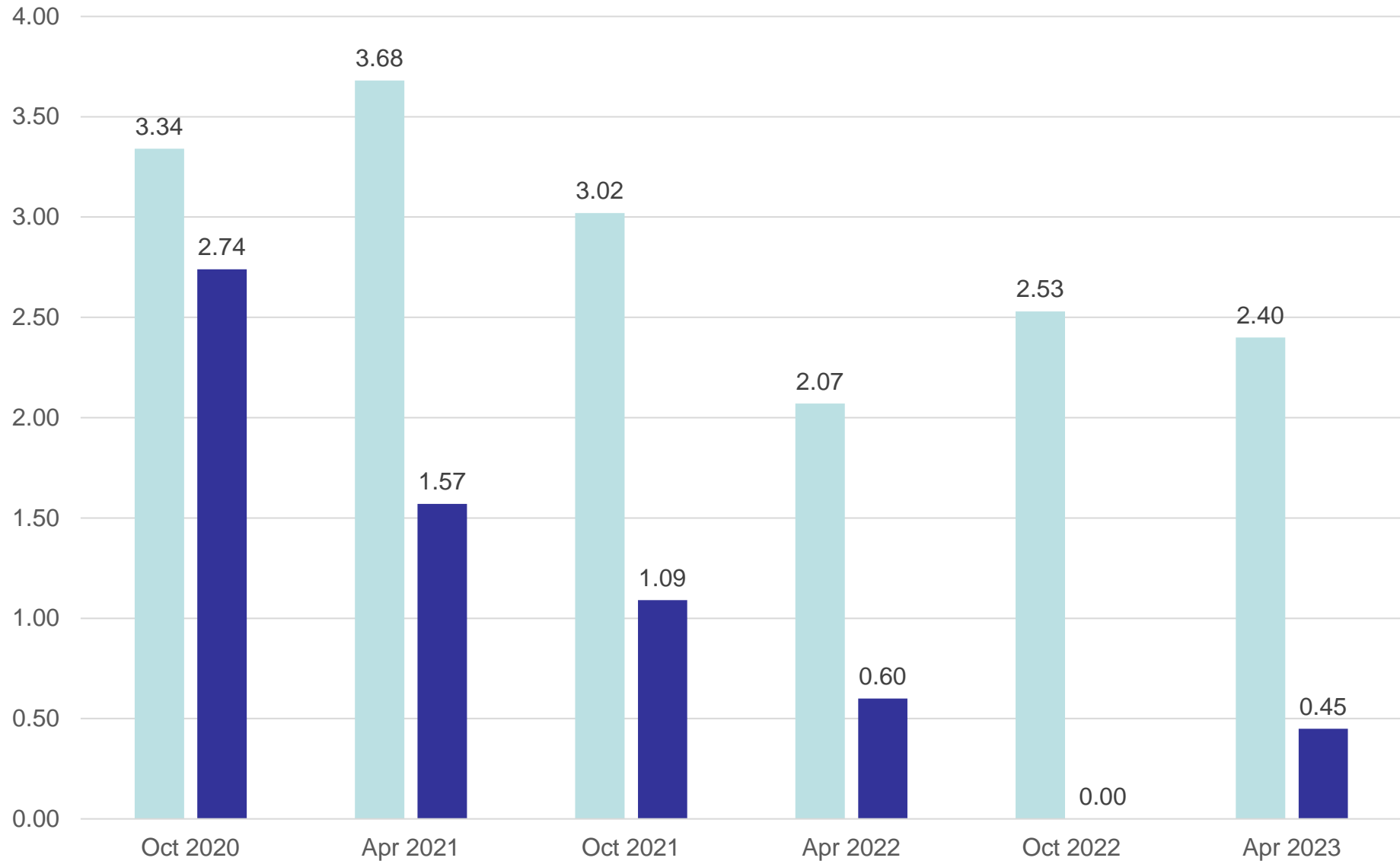
GMPI01 GMPI02



Oct 2020 averages include non-blind development tests

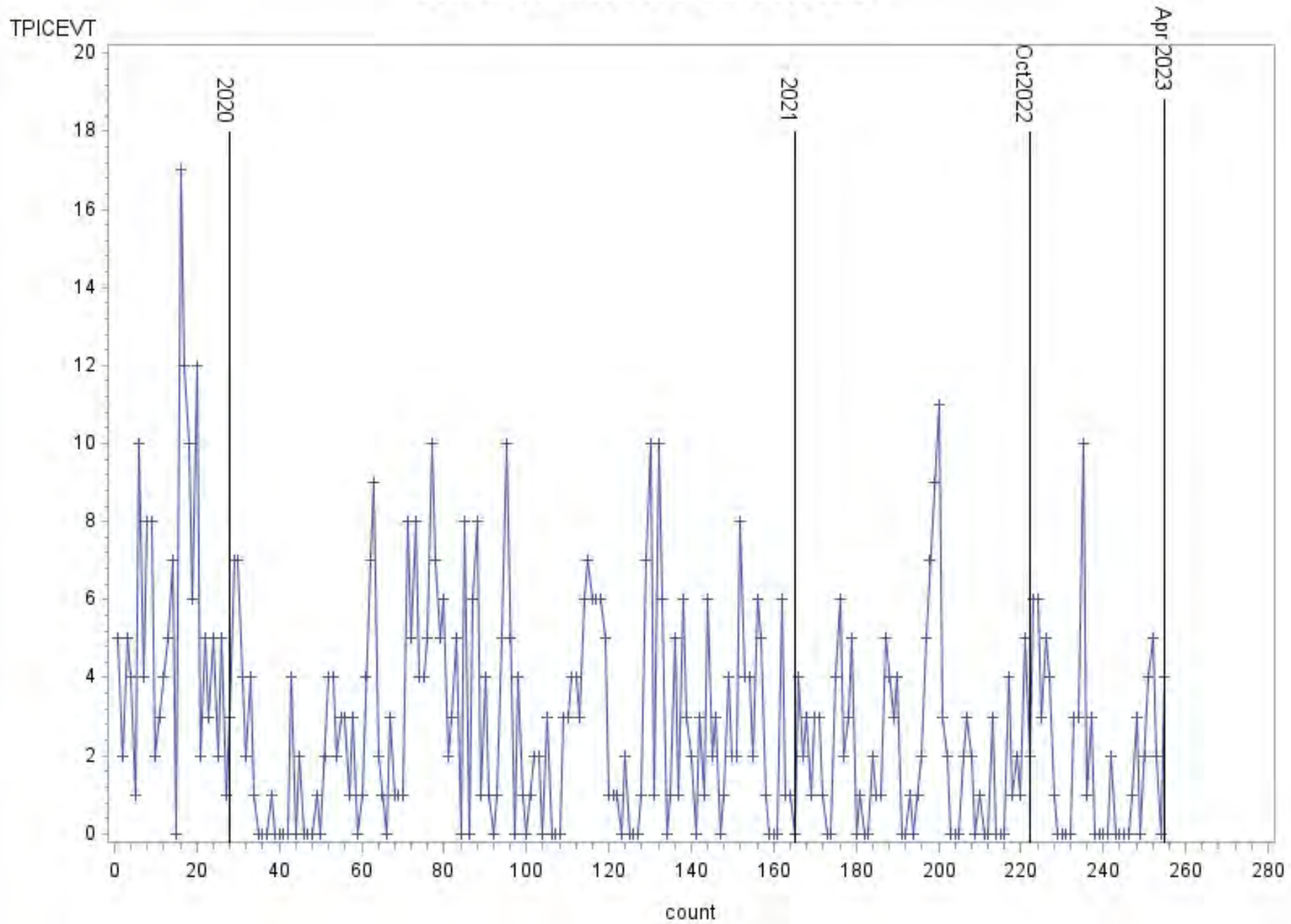
Standard Deviation of TPICBEVT by Report Period

GMPI01 GMPI02

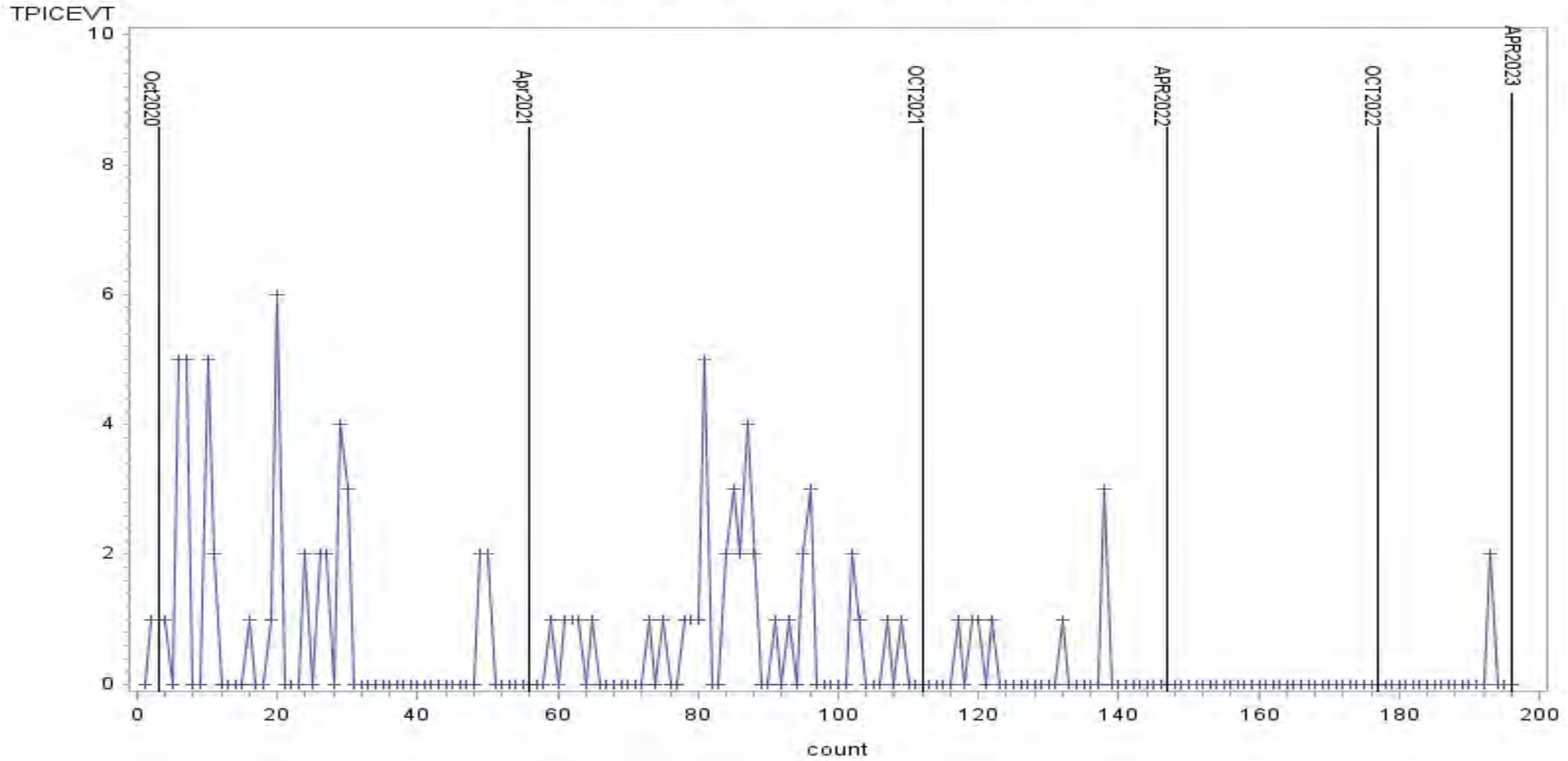


Oct 2020 standard deviations include non-blind development tests

GMPI01 Reference Test Results



GMPI02 Reference Test Results



[Return to Table of Contents](#)



A Program of ASTM International

Test Monitoring Center

<https://www.astmtmc.org>

GMTC

March 2023

Summary of Activity

- One reference test reported this period
 - Successfully calibrated the test stand
 - TCOC1800 was somewhat severe this period, based on one result

GMTC Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	1
Statistically Unacceptable Calibration Test	OC	0
Aborted Calibration Test	XC	0
Invalid Calibration Test	LC	0
Total		1

GMTC - Failed Tests

Test Status	#
No failed tests	-
Totals	0

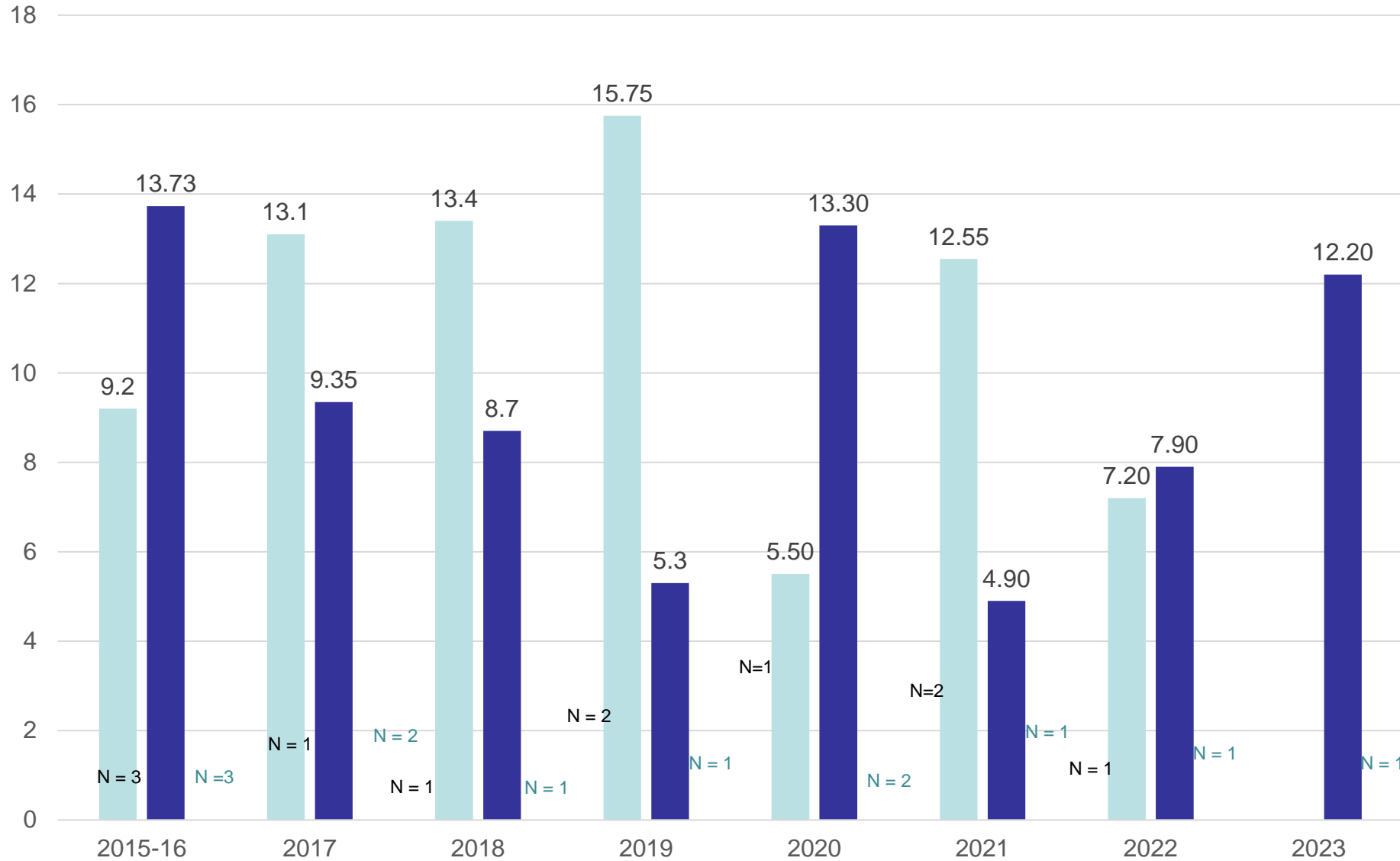
GMTC - Lost Tests*

Test Status	#
No lost tests	-
Totals	0

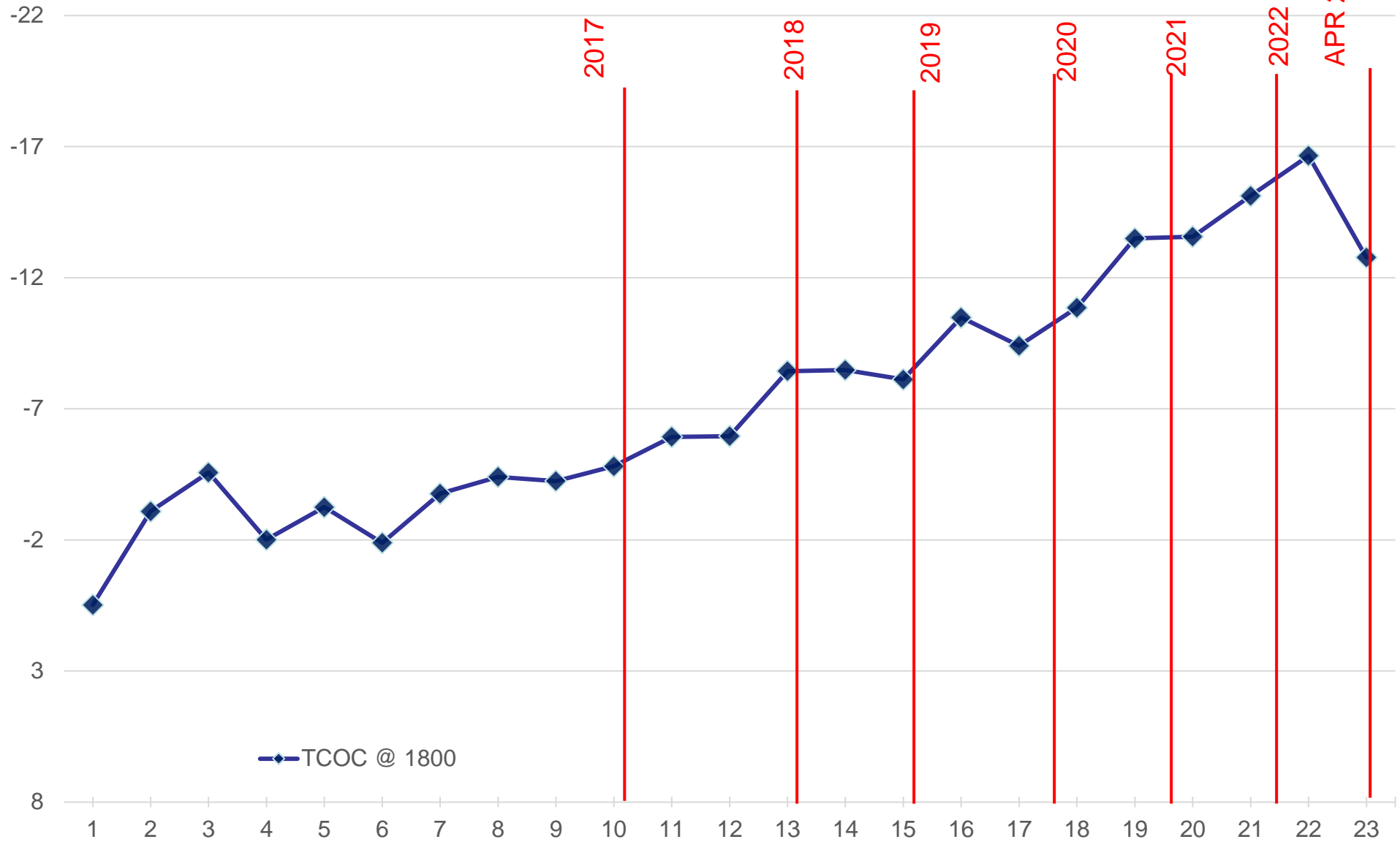
*Invalid and aborted tests

Average TCOC1800 by Report Period

GMTC01 GMTC02



TCOC1800 Reference Test Results – CuSum Chart



[Return to Table of Contents](#)



A Program of ASTM International

Test Monitoring Center

<https://www.astmtmc.org>

Lab Visits

March 2023

TMC/GM Lab Visits

Test	Number of Labs Visited
GMAER	0
GMOD	0
GMOEE	0
GMSPi3	0
GMTc	0

No GMOD visits were conducted this period due to travel restrictions. TMC will proceed resume visits during next report period.

Lab Visit Issues

No visits conducted this period

[Return to Table of Contents](#)

Test Monitoring Center
<https://www.astmtmc.org>





A Program of ASTM International

Test Monitoring Center

<https://www.astmtmc.org>

Oil Inventory

March 2023

Reference Oil Inventory Estimated Life

Oil	Tests	Original Blend Amount (gallons)	TMC Inventory (gallons)	Lab Inventory (samples)	Estimated Life
GMOD01-1	GMOD	320	5	5	~1 year
GMOD01-2	GMOD	315	307	3	5 Years
GMOD02-1	GMOD	320	48	7	1.5 years
434-2	IIIH/GMOD	550	0	2	depleted
434-3*	IIIH/GMOD	980	631	6	5+ years
GMAER02-7	GMAER	103	<1	5	~1 year
GMAER02-8	GMAER	160	151	2	~1 year

* The inventory of 434-3 should last considerably longer as IIH has decreased quantity shipped from 4 gallons to 2.5 gallons.

Reference Oil Inventory Estimated Life

Oil	Tests	Original Blend Amount (gallons)	TMC Inventory (gallons)	Lab Inventory (samples)	Estimated Life
GMPI02-3	GMSPi3	526	76	28	~1.5 year
GMPI01-4	GMSPi3	529	369	4	~5 years
GMTC01-1	GMTC	110	30	2	~ 5 Years
GMTC02-1	GMTC	144	67	2	~ 5 Years
GMVFEBL02-2	GMOEE	3402	1620	-	2 years
GMVFEHR01-1	GMOEE	1080	0	8	~ 6 months
GMVFEHR01-2	GMOEE	2120	1958	4	5 Years

[Return to Table of Contents](#)

Test Monitoring Center
<https://www.astmtmc.org>





A Program of ASTM International