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Test Monitoring Center

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ASTM D02.B2 Semi-Annual Report Heavy Duty Reference Oil Testing

Fall 2024

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Heavy Duty Testing

Executive Summary

▶ Test Issues

- COAT
 - COAT to EOAT equivalency process ongoing.
- T13 Oil consumption increase
 - Investigation underway
- ISBVIS test split into ISBV108 and ISBV156
 - Precision matrix complete. BOIVGRA underway
- FVTW development work continues

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Calibrated Labs and Stands*

Test	Labs	Stands		Test	Labs	Stands
1K	0	0		EOAT	1	1
1N	1	1		RFWT	1	1
1P	1	1		T-8/E	2	2
1R	0	0		T-11	2	3
C13	4	4		T-12/T-12A	1/1	1/1
COAT	2	2		T-13	4	6
ISB	3	7		DD13	3	3
ISM	3	3				
ISBV108	3	4				
ISBV156	3	4				

*As of 9/30/2024

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SCOTE 1K

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1 K Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	0
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		0

1 K Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

1 K Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

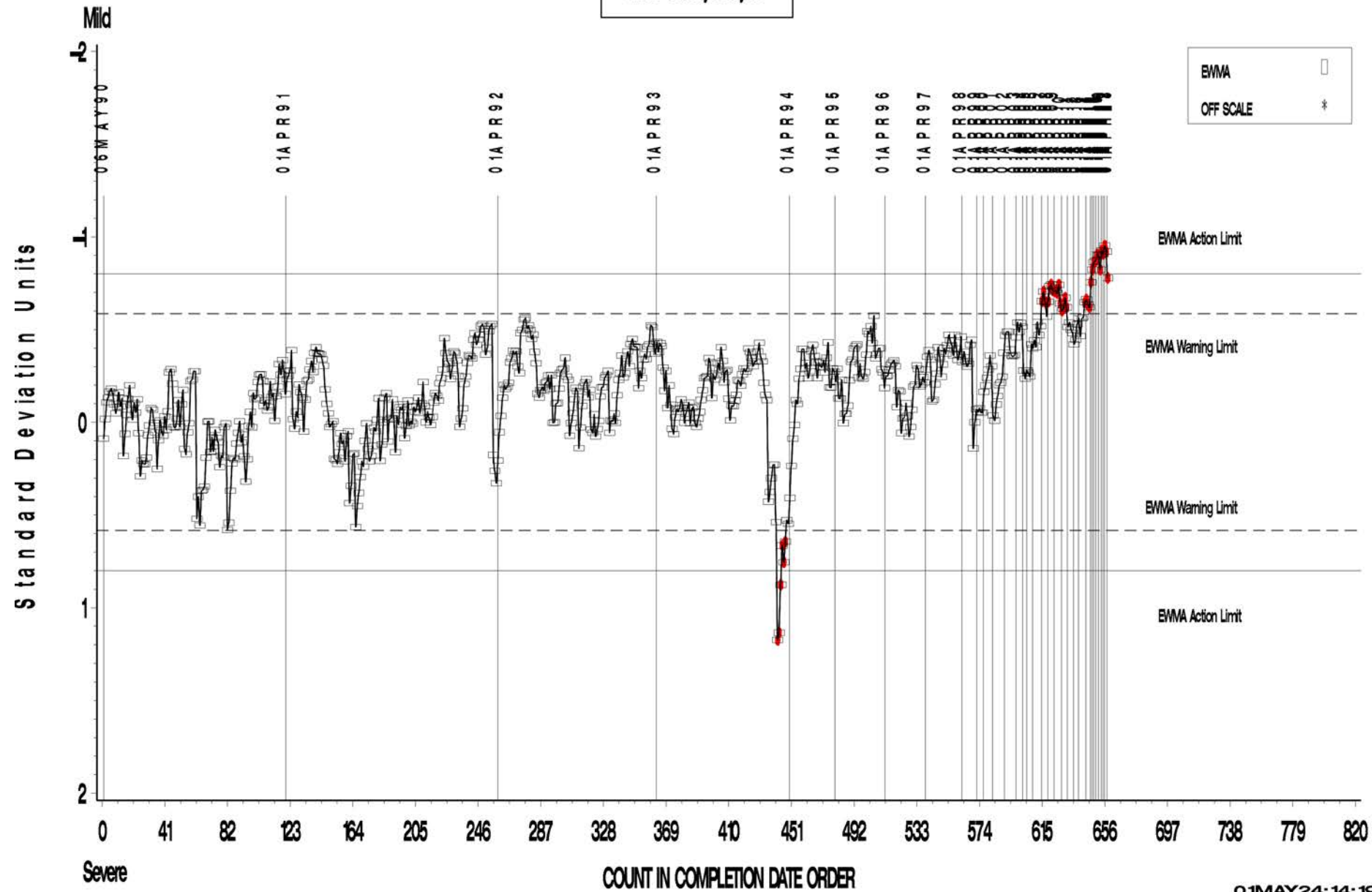
*Invalid and aborted tests

1 K Test Severity

- ▶ As no chartable 1K tests were run during this reporting period, no statement about test severity can be made.

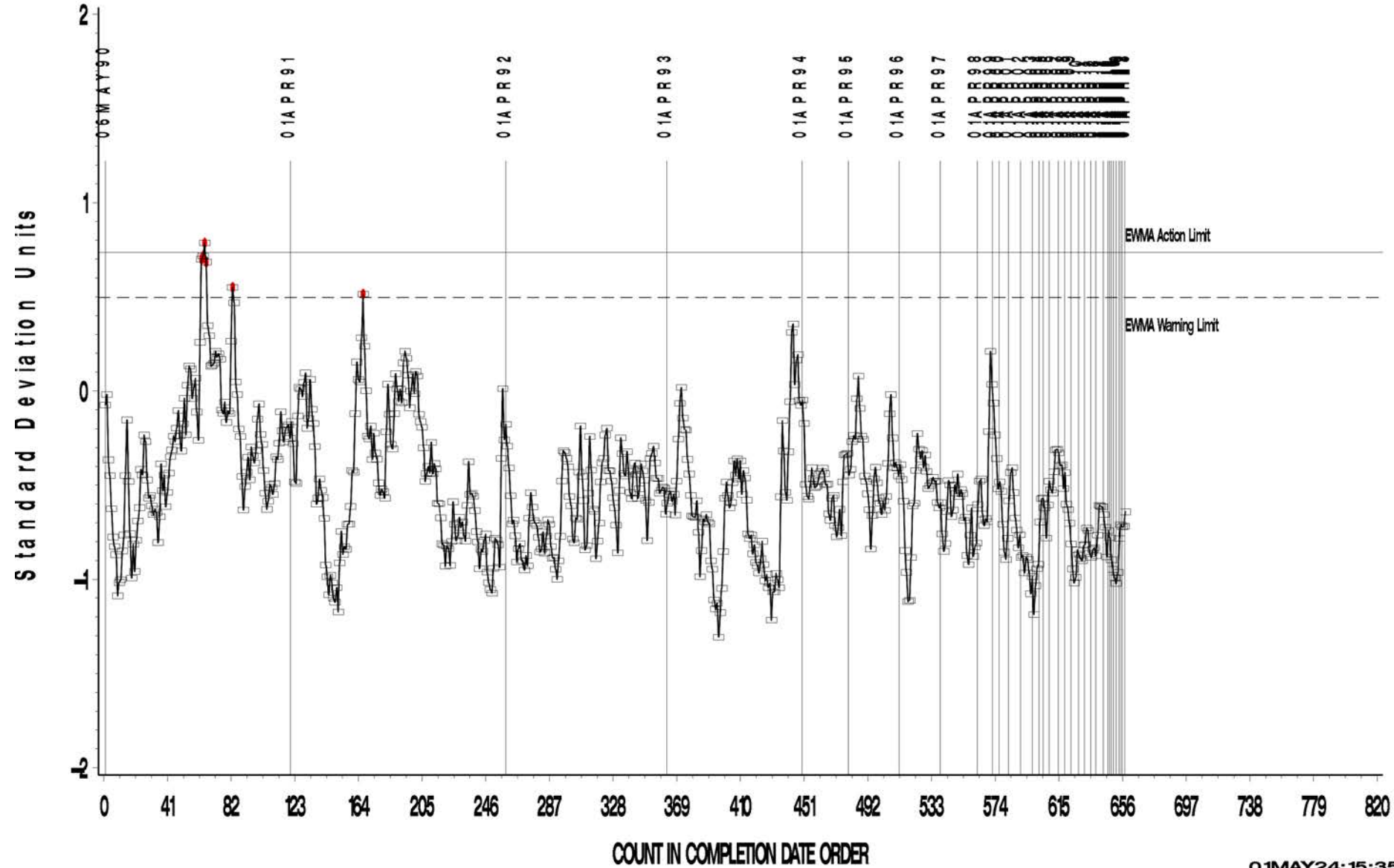
FINAL BSOC

LTMS Severity Analysis



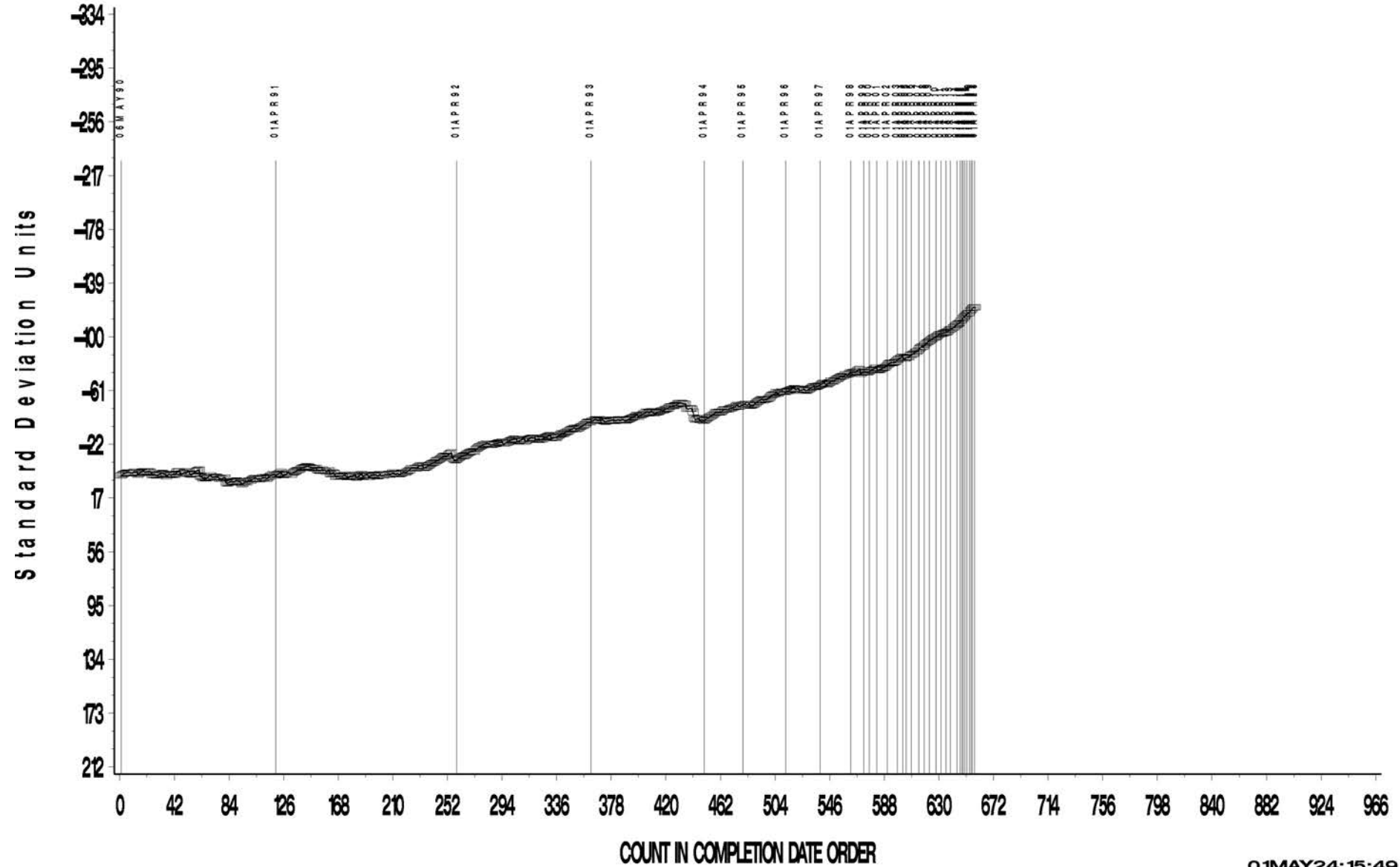
FINAL BSOC

LTMS Precision Analysis



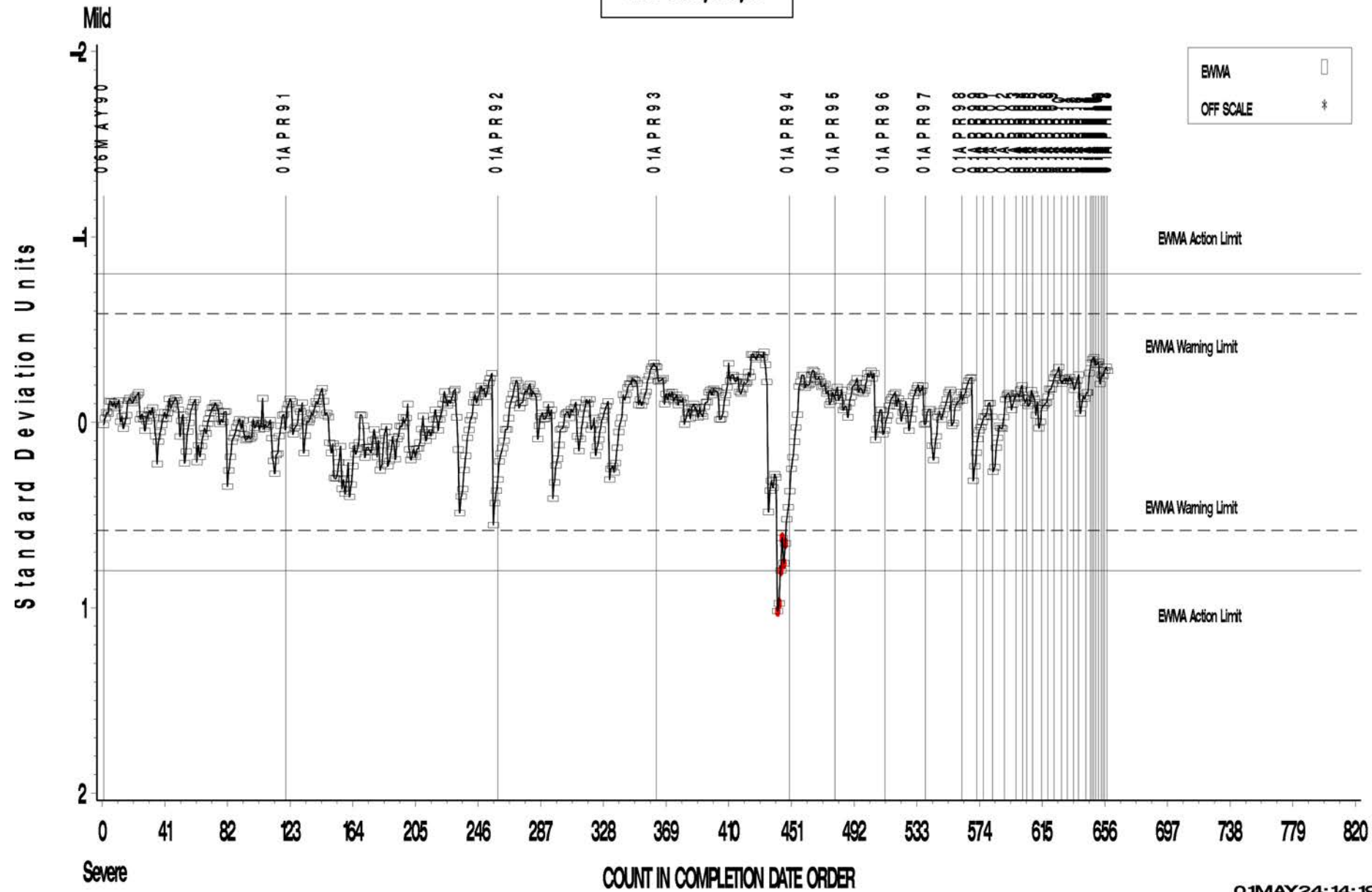
FINAL BSOC

CUSUM Severity Analysis



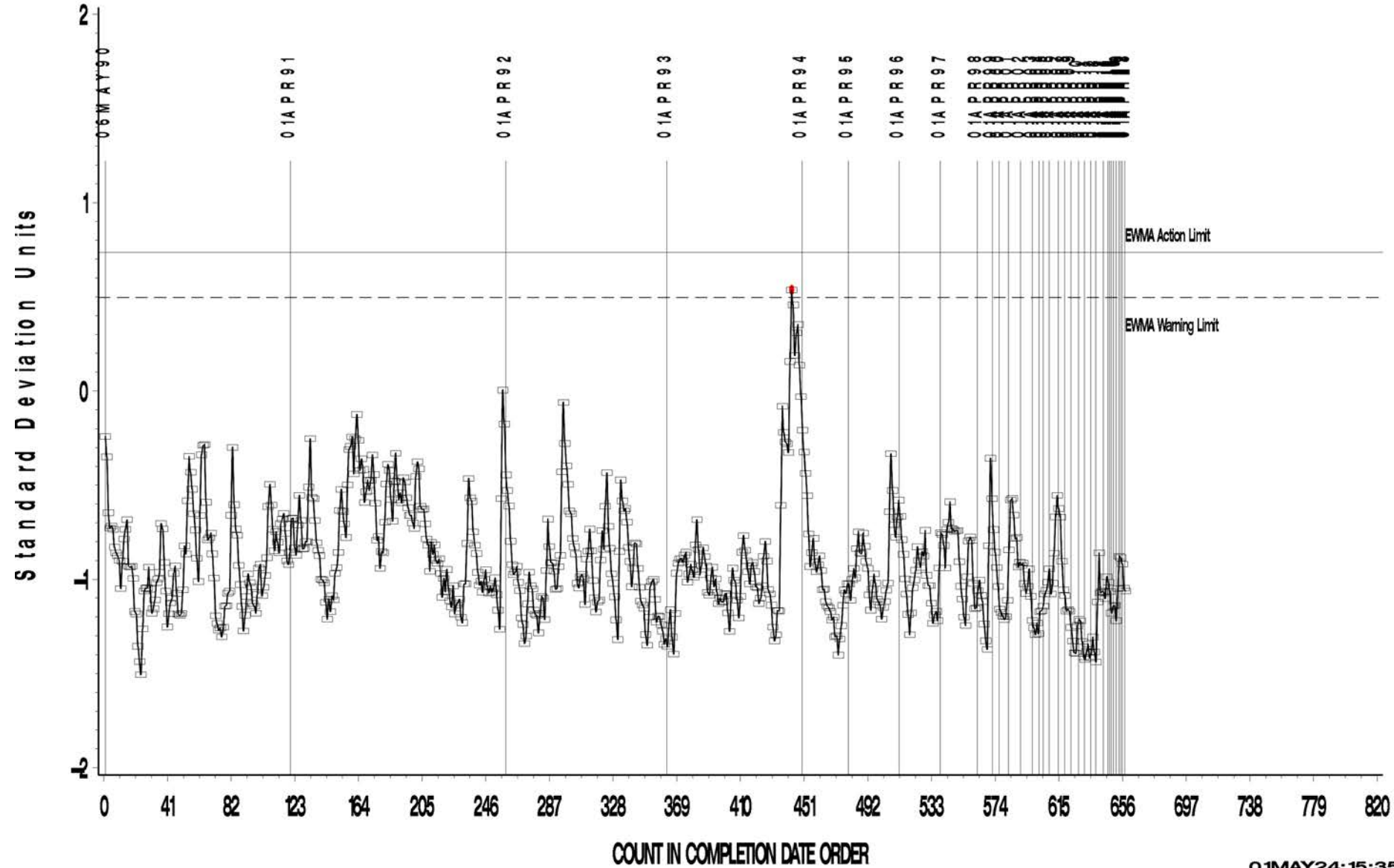
FINAL EOTOC

LTMS Severity Analysis



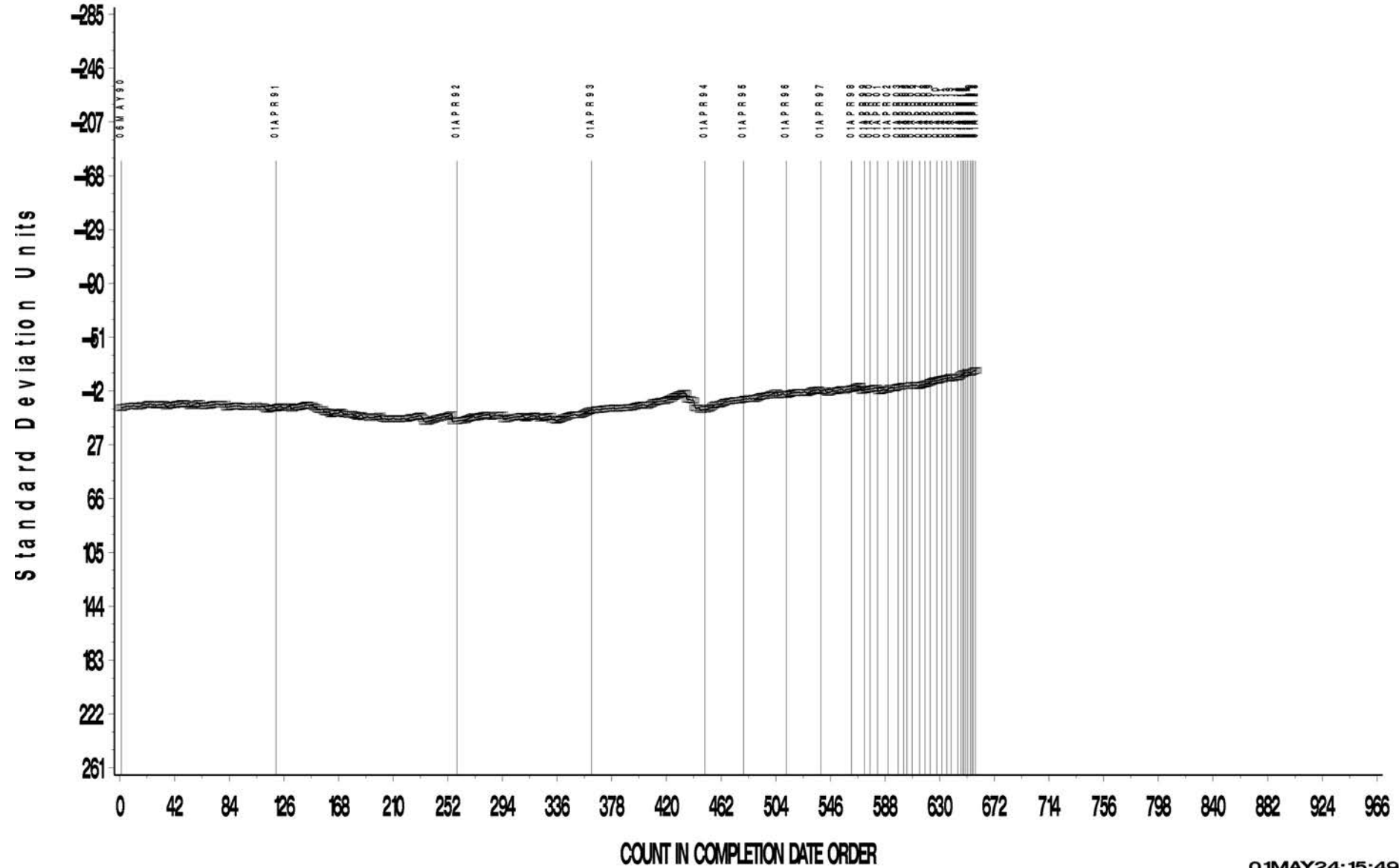
FINAL EOTOC

LTMS Precision Analysis



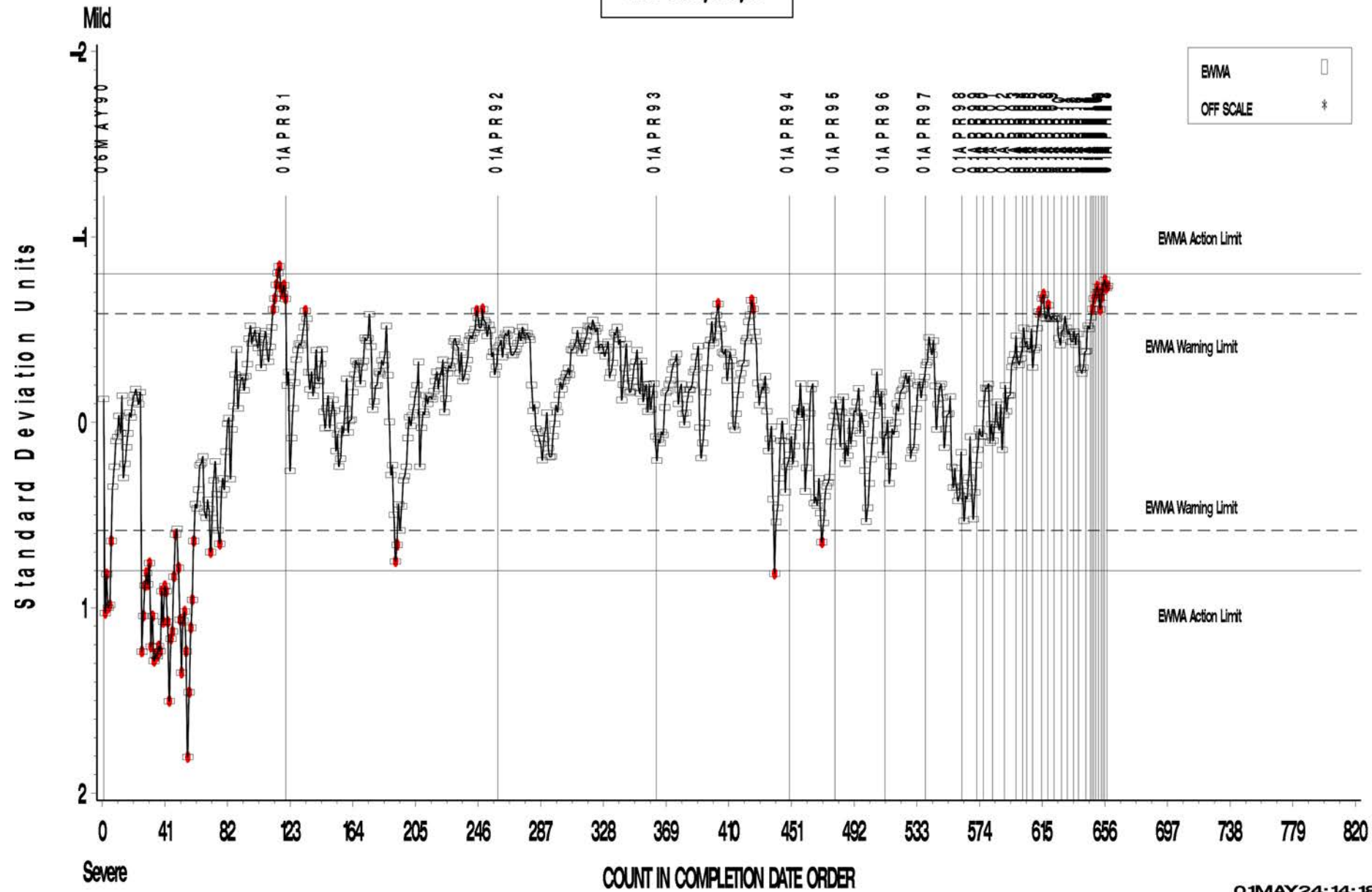
FINAL EOTOC

CUSUM Severity Analysis



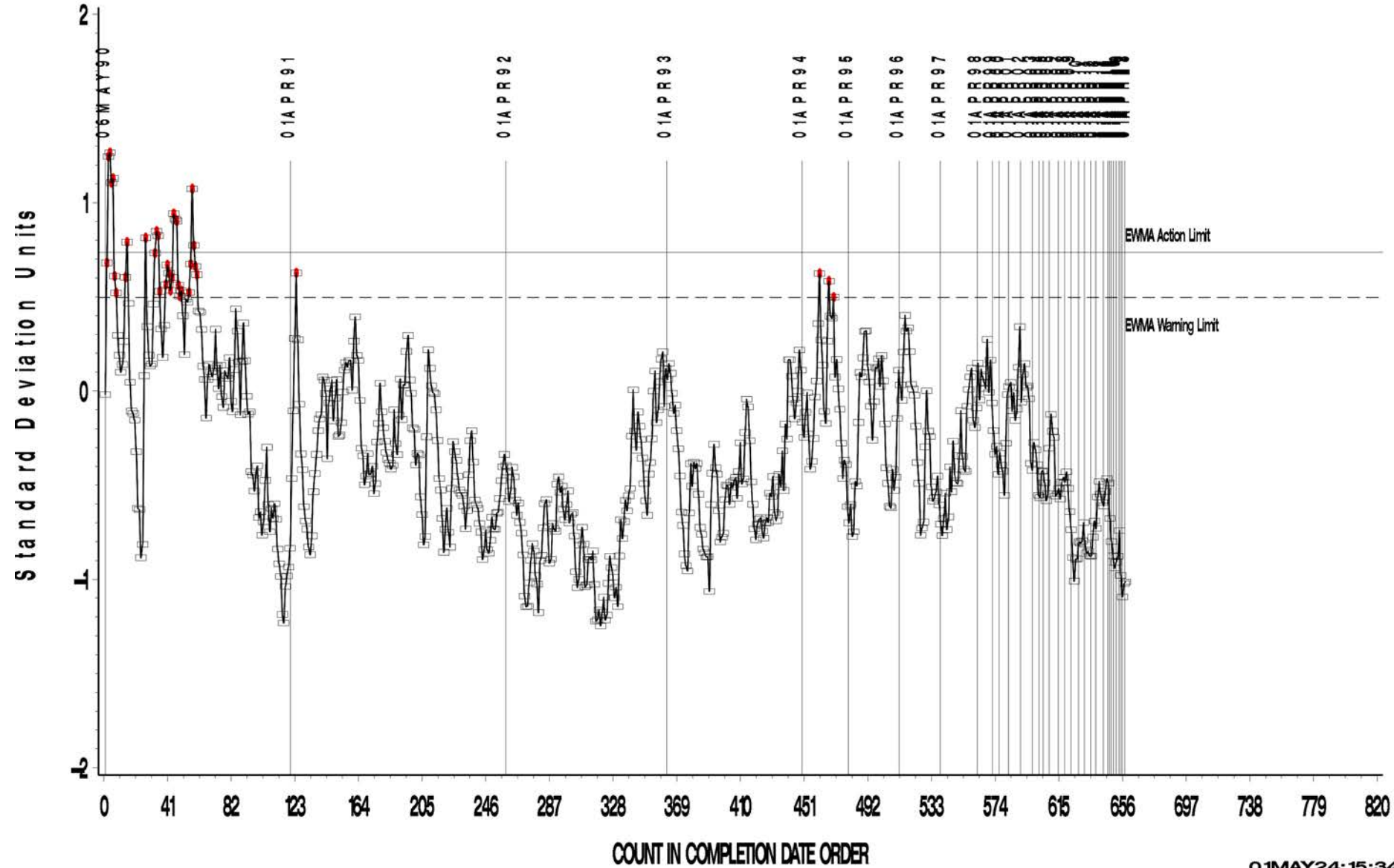
FINAL TGF

LTMS Severity Analysis



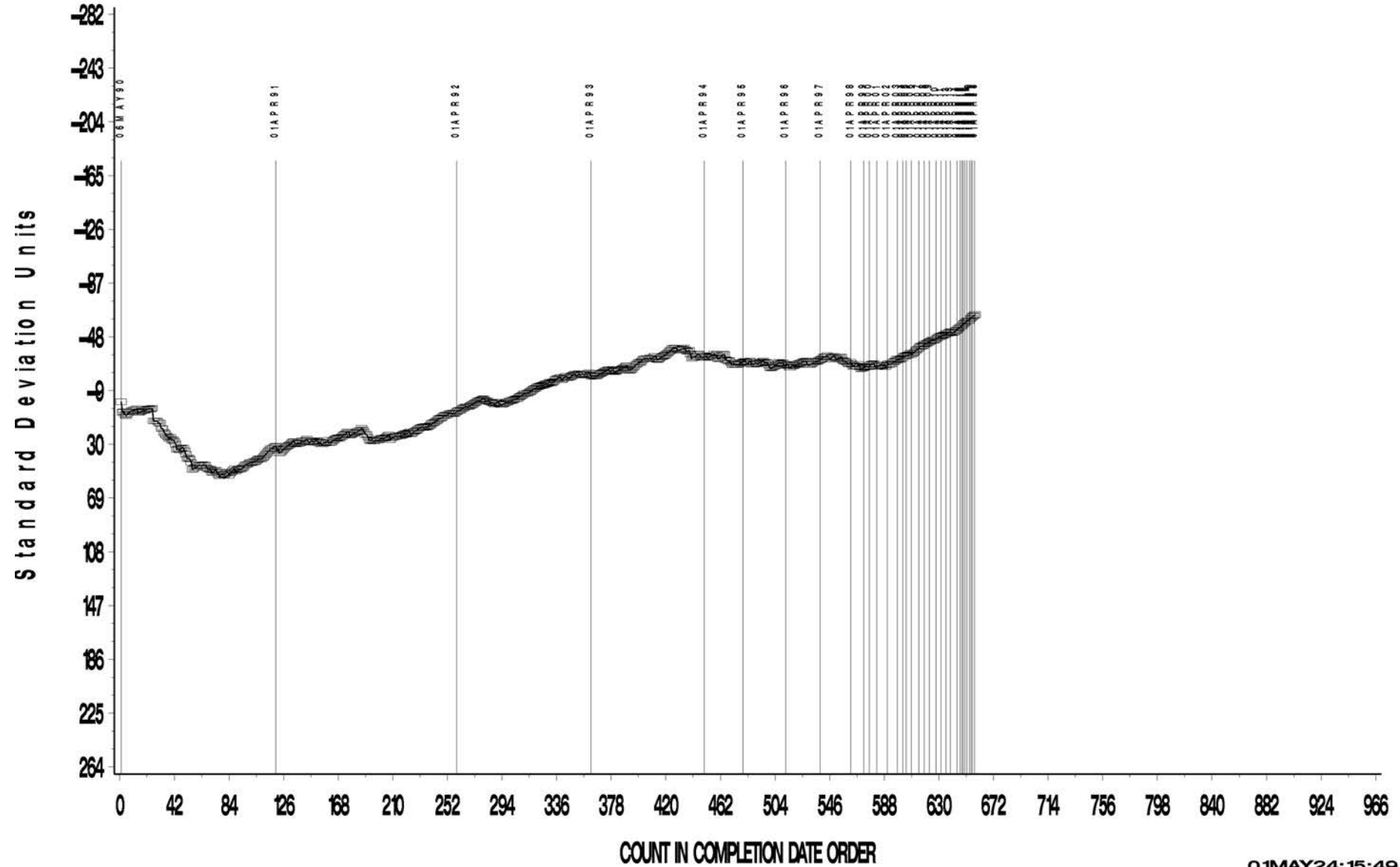
FINAL TGF

LTMS Precision Analysis



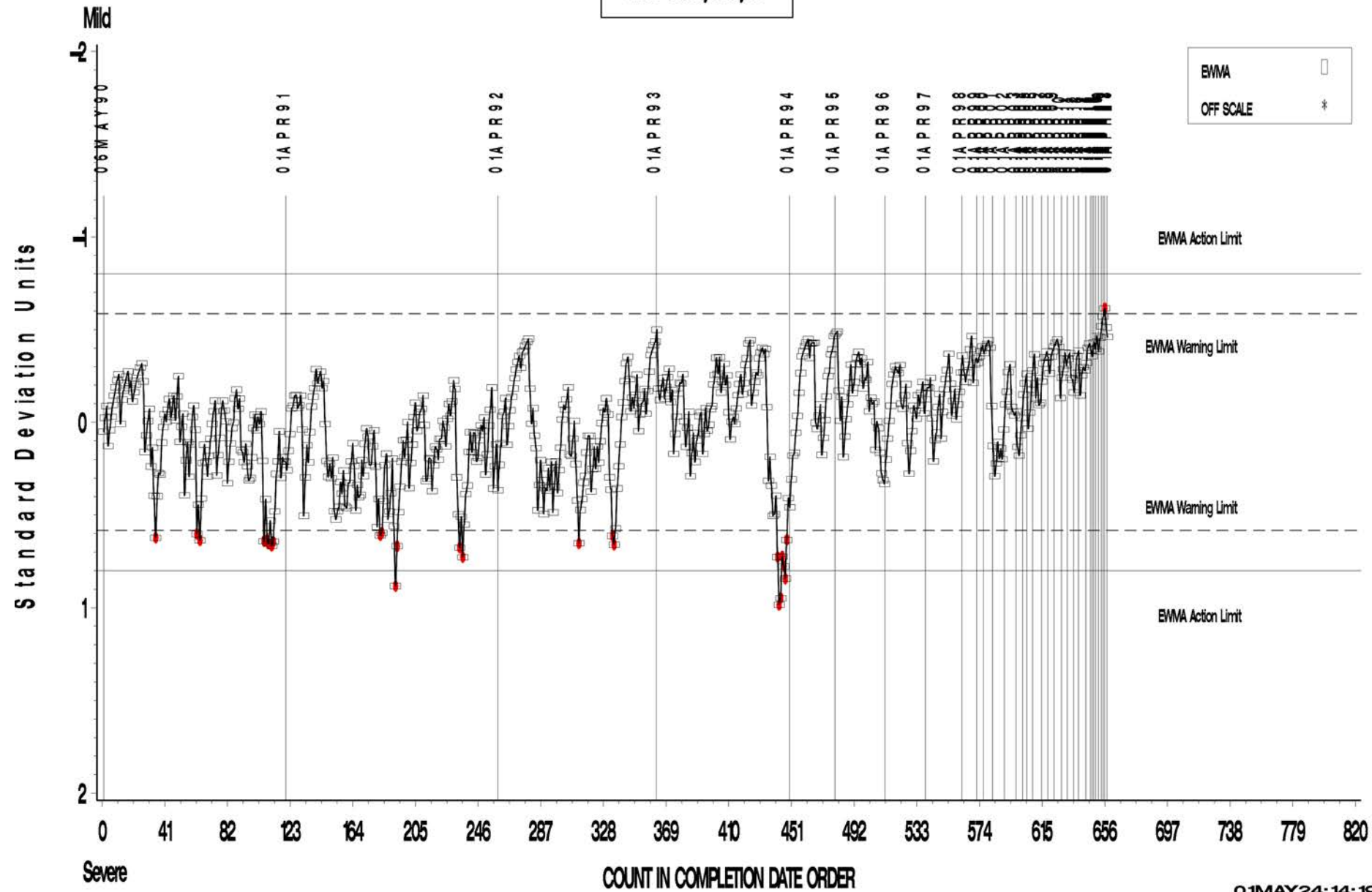
FINAL TGF

CUSUM Severity Analysis



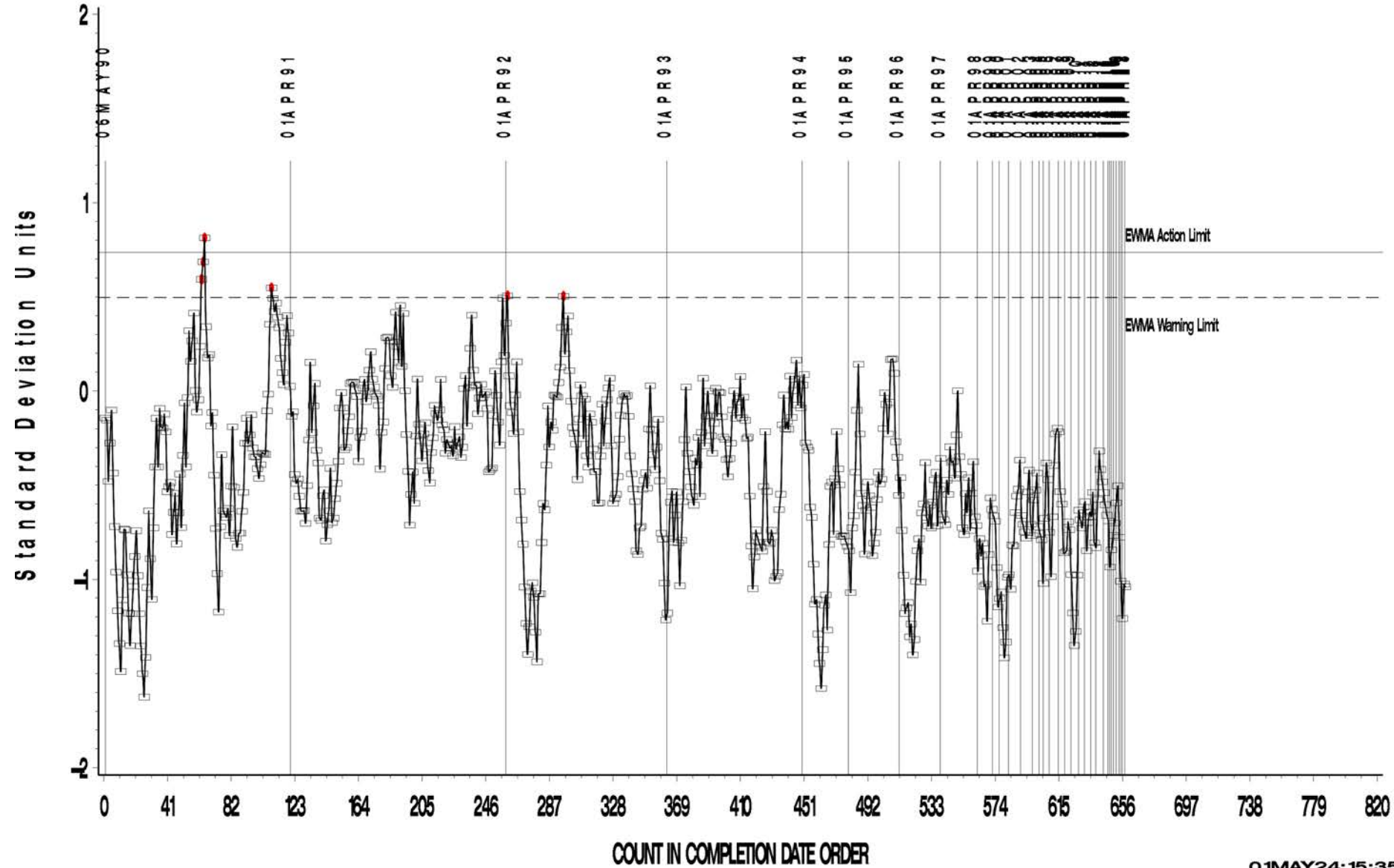
FINAL TLHC

LTMS Severity Analysis



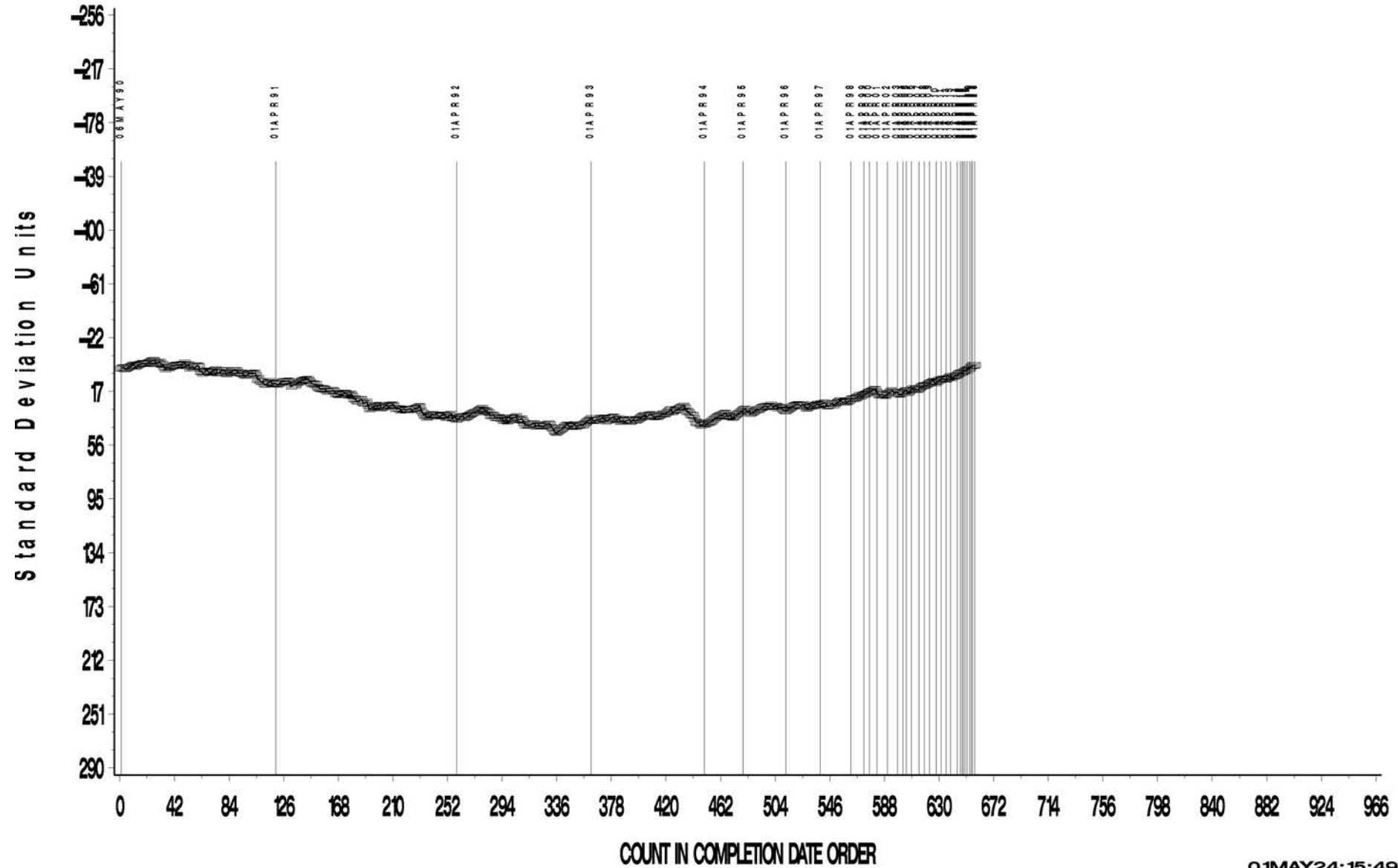
FINAL TLHC

LTMS Precision Analysis



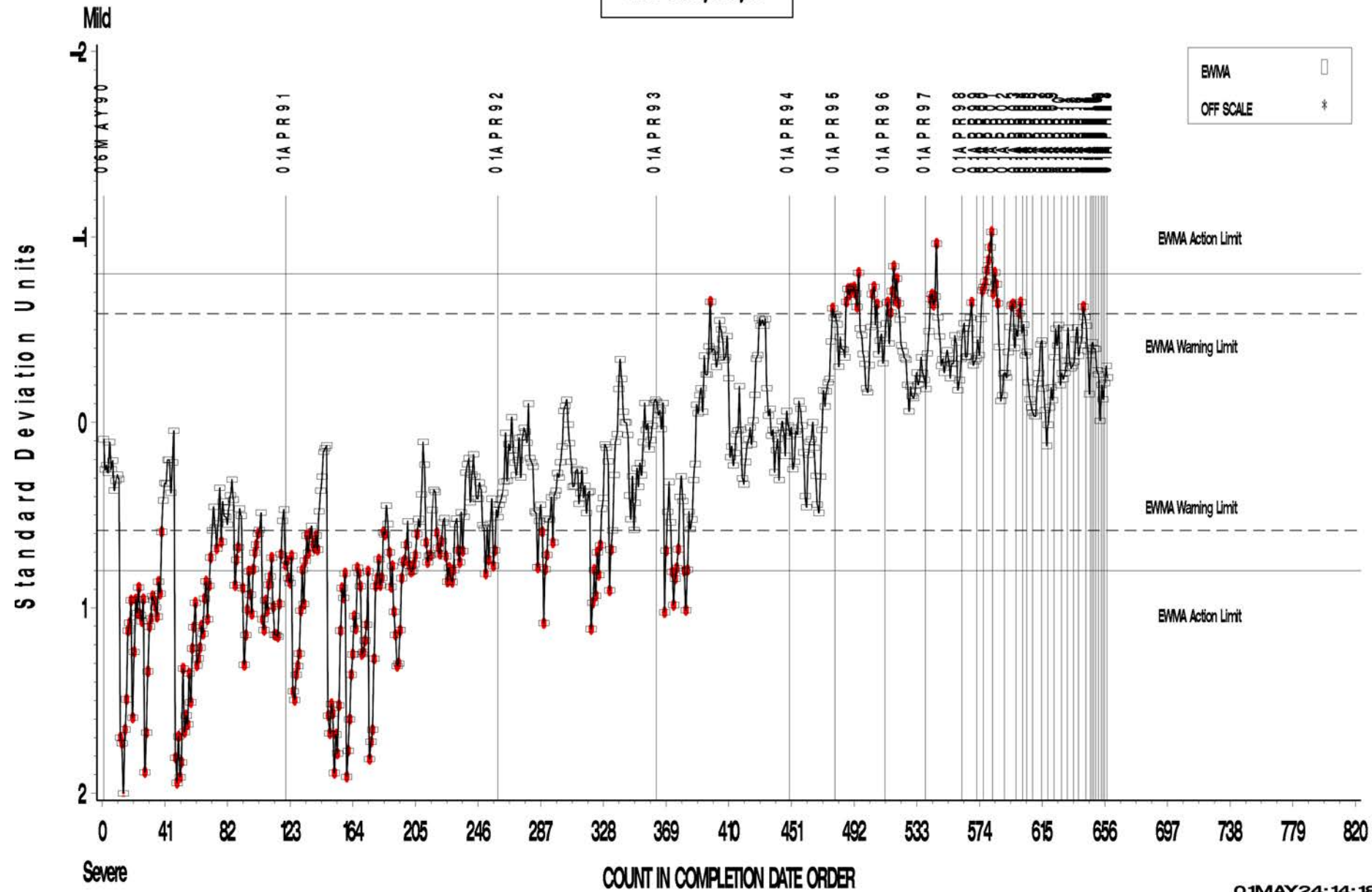
FINAL TLHC

CUSUM Severity Analysis



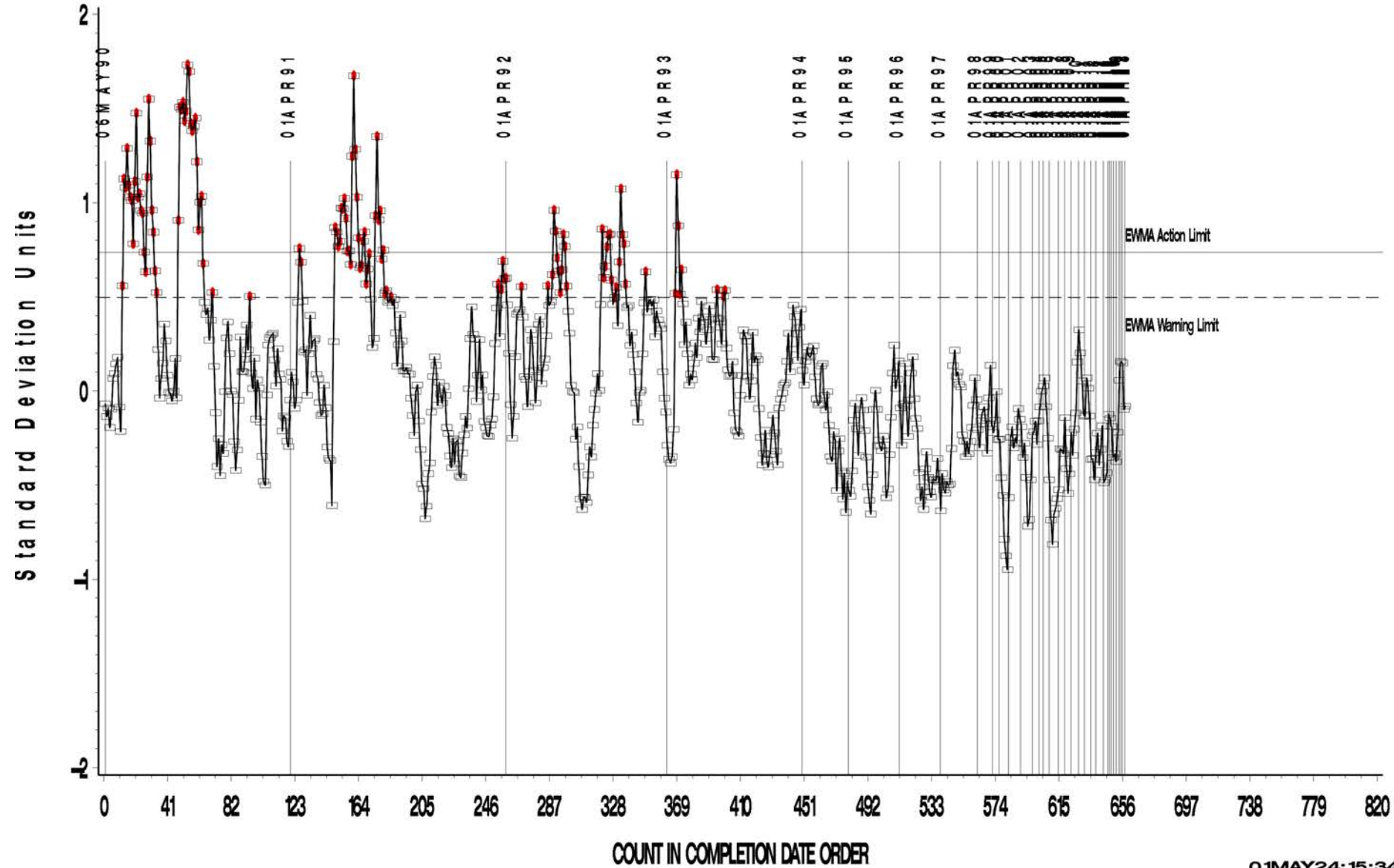
FINAL Weighted Total Demerits

LTMS Severity Analysis



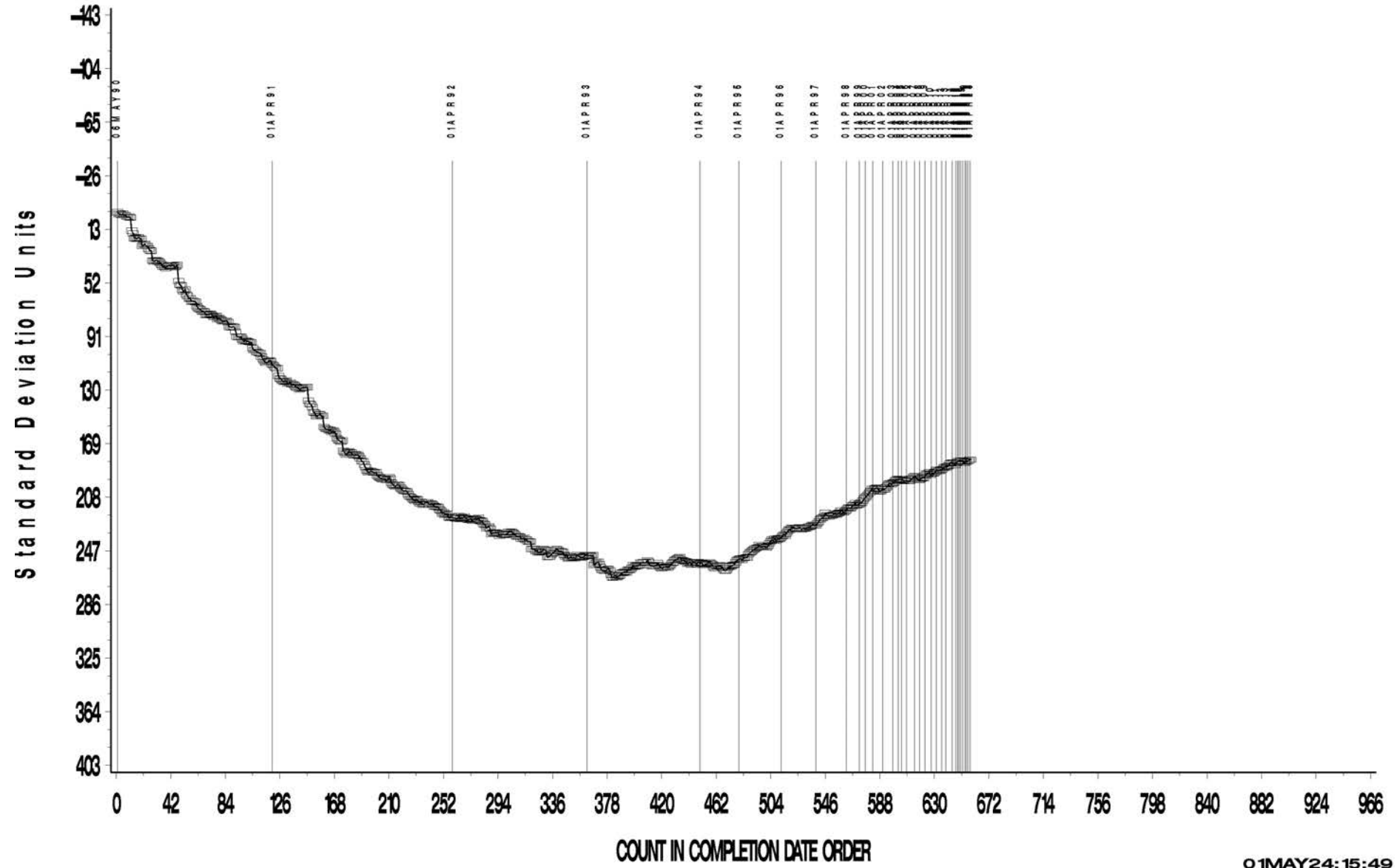
FINAL Weighted Total Demerits

LTMS Precision Analysis

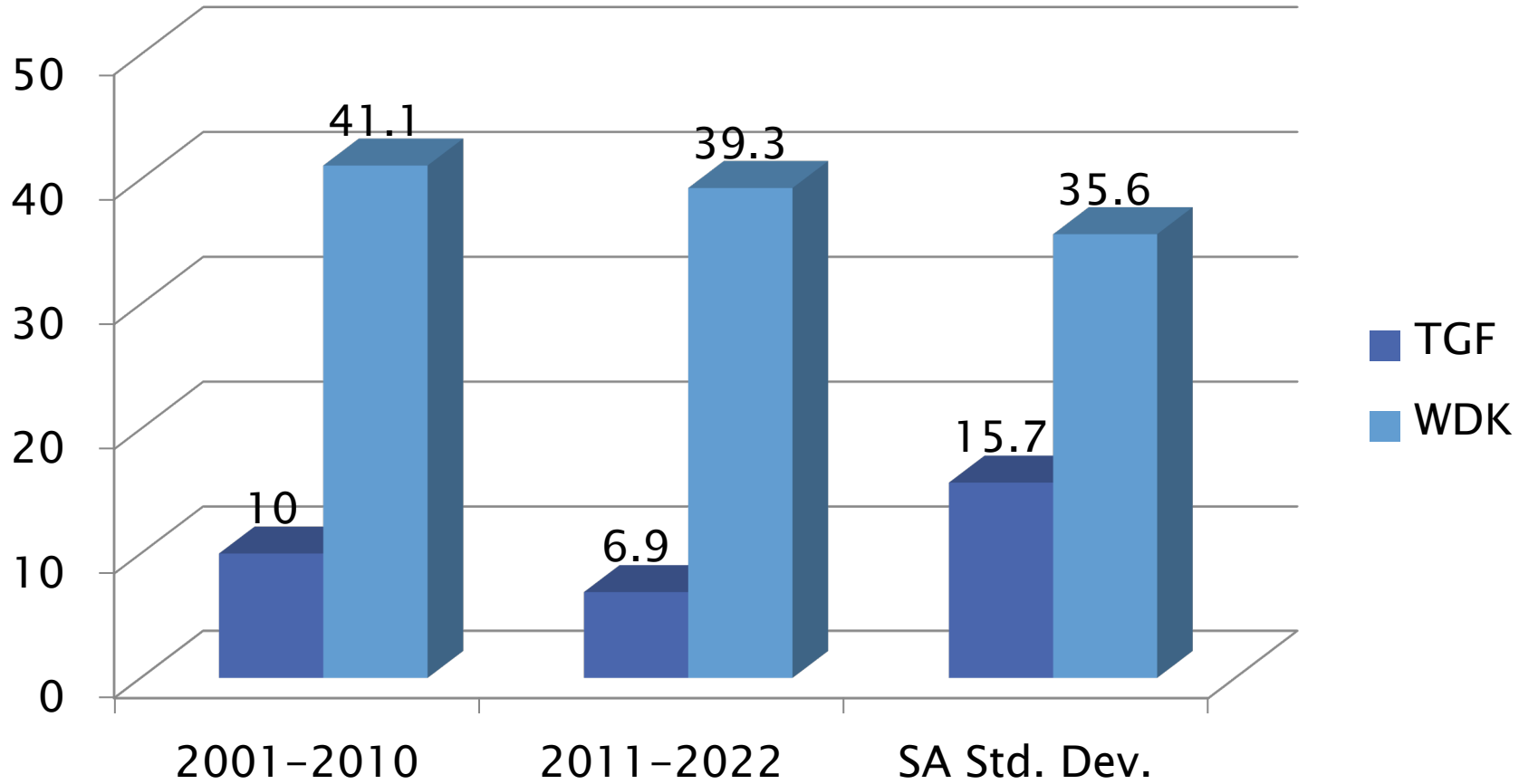


FINAL Weighted Total Demerits

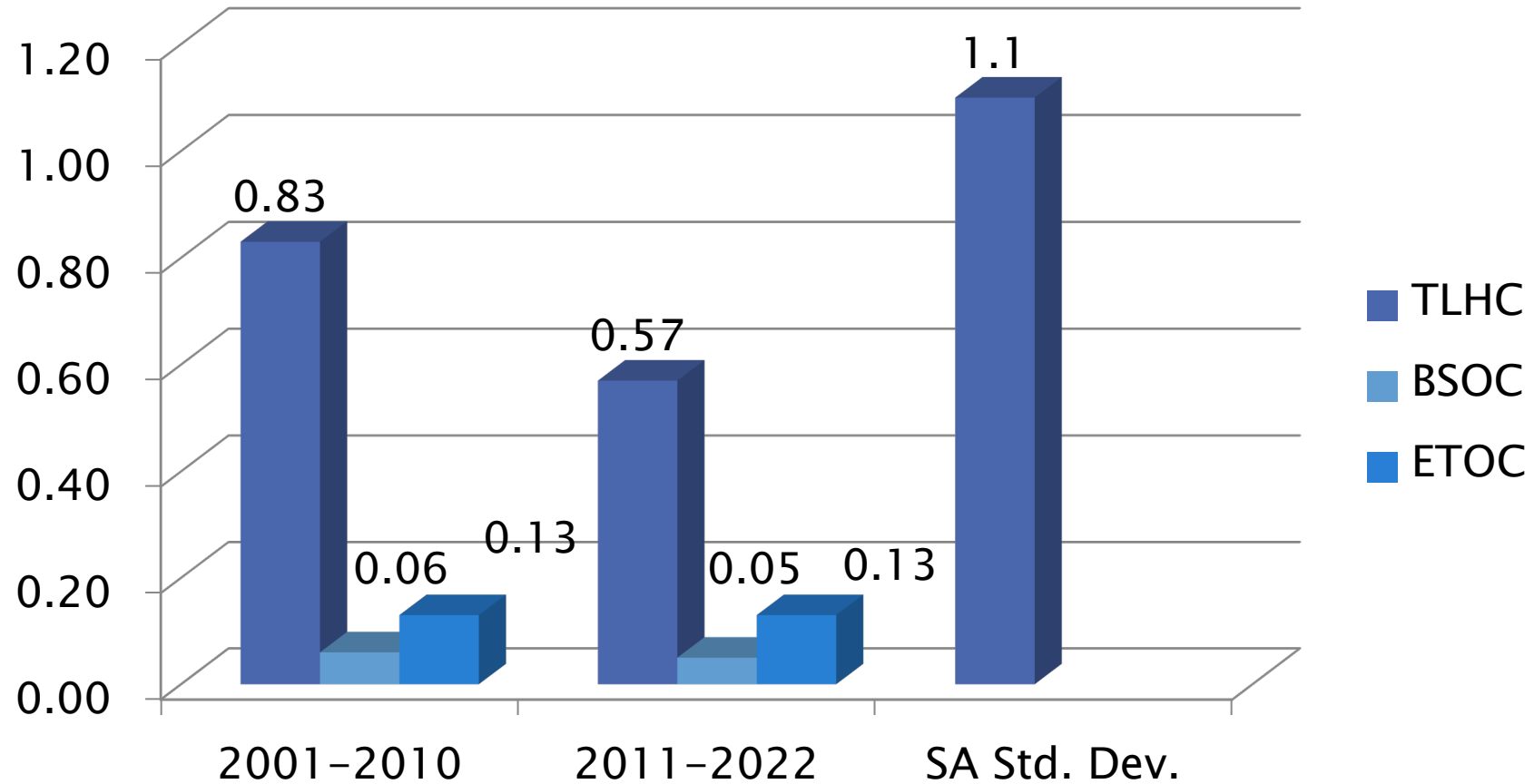
CUSUM Severity Analysis



1 K Precision Estimates



1 K Precision Estimates



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SCOTE 1N

➤➤ October 2024

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1 N Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	1
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Informational	NN	0
Total		1

1 N Failed Tests

Failed Parameter	Number of Tests
No Failed Tests	0
Total	0

1 N Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

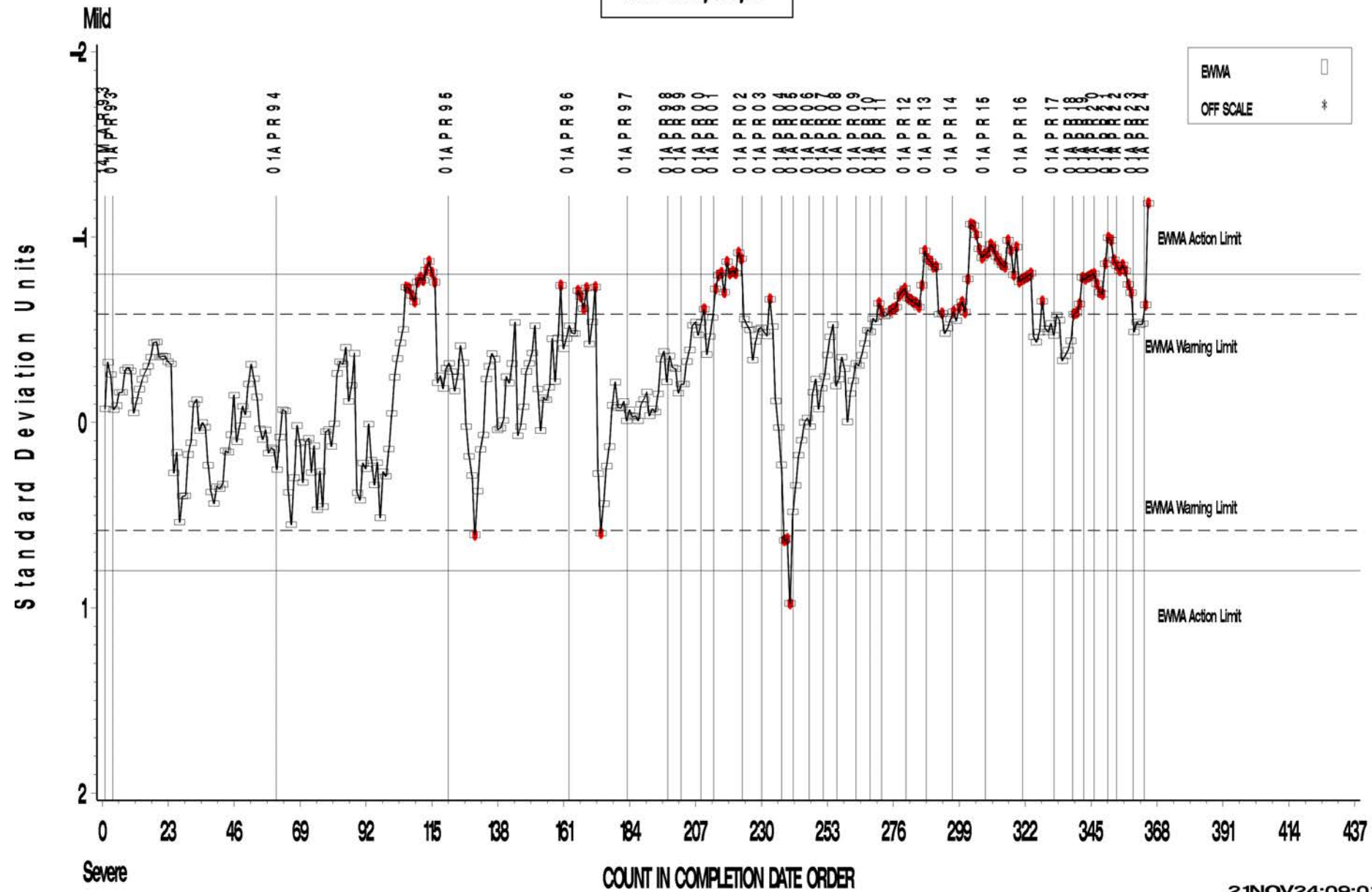
*Invalid and aborted tests

1 N Test Severity

- ▶ TGF is in precision action alarm
- ▶ BSOC in severity warning alarm in the mild direction
- ▶ All other parameters are in control

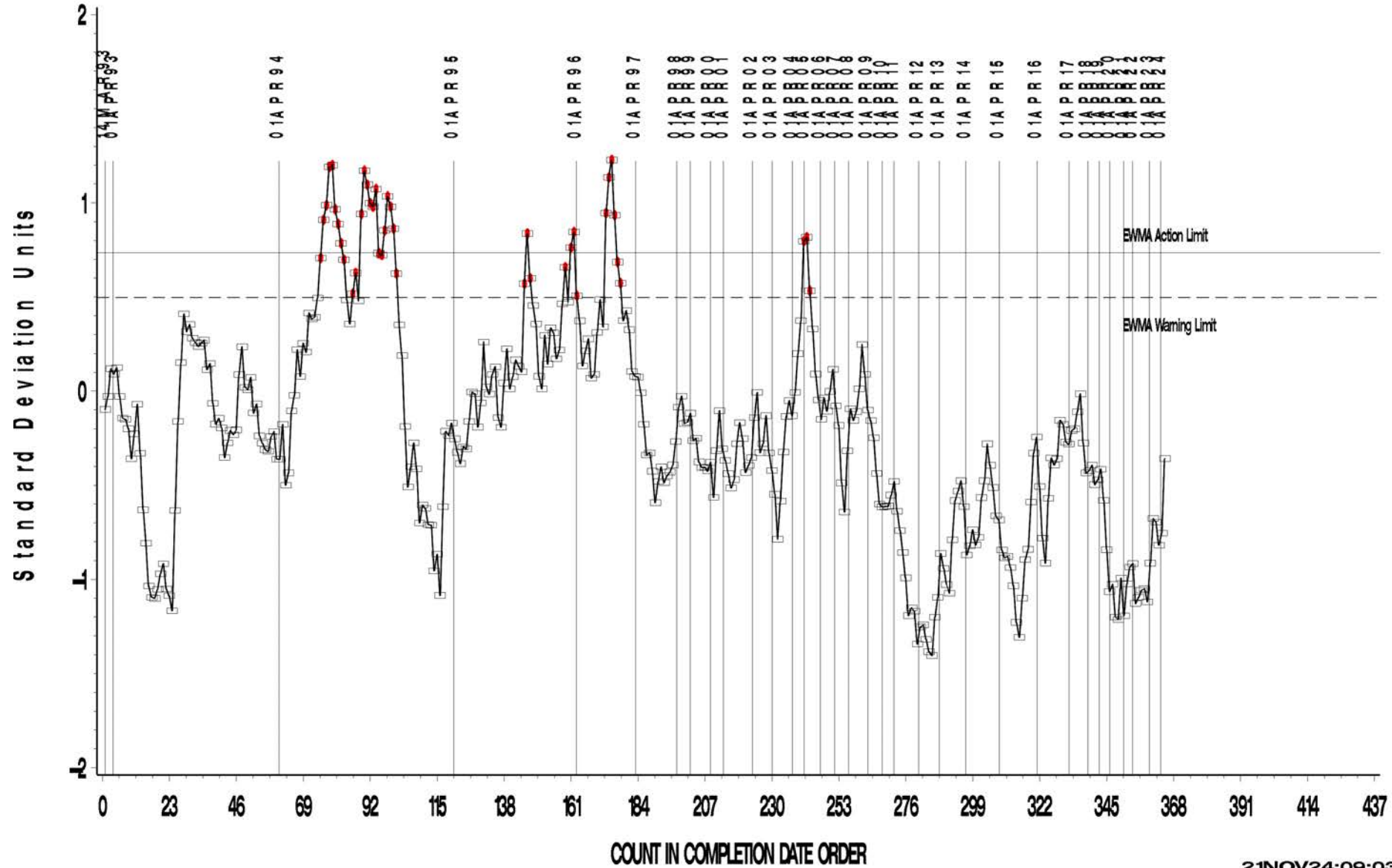
BSOC

LTMS Severity Analysis



BSOC

LTMS Precision Analysis



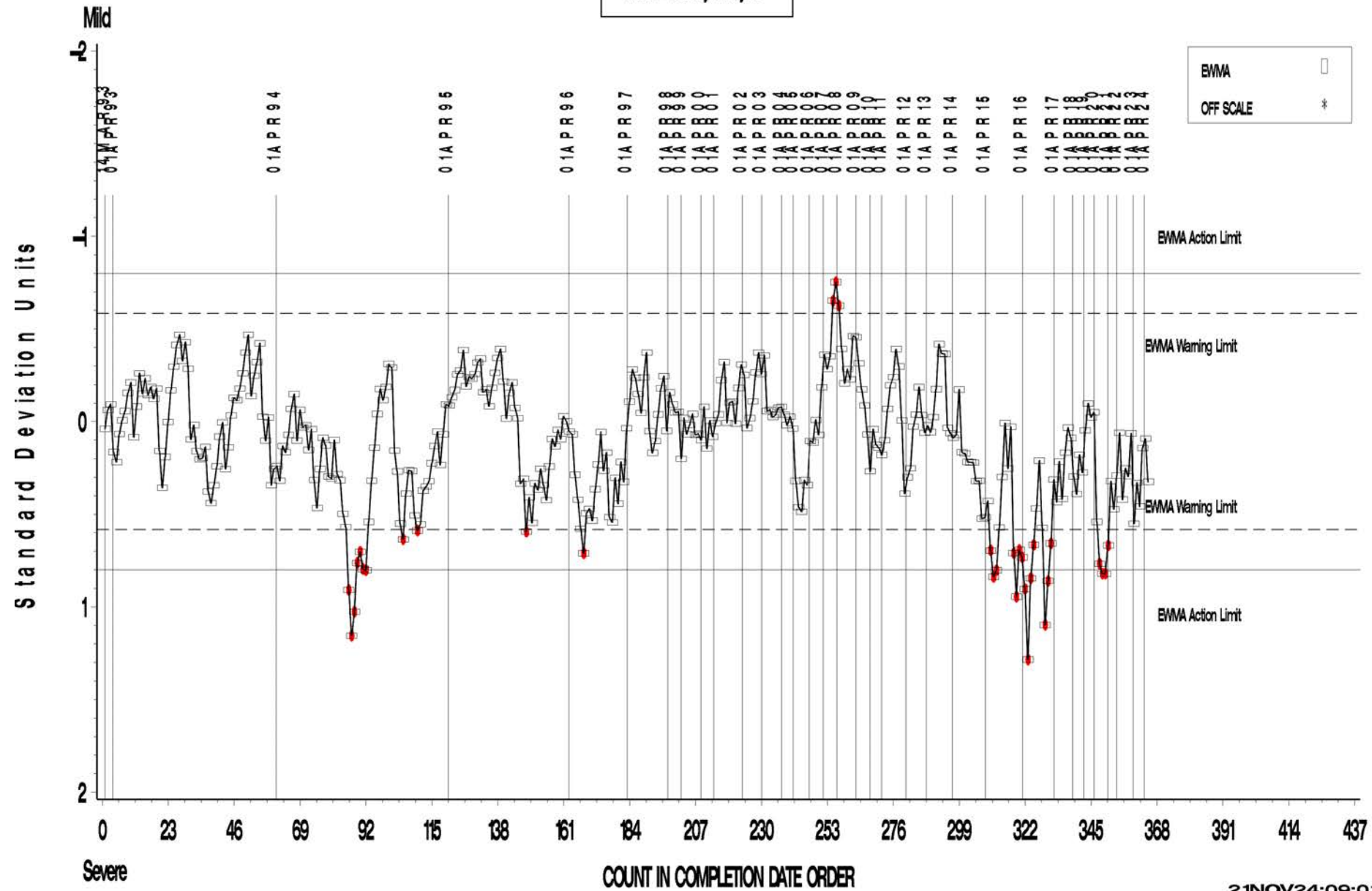
BSOC

CUSUM Severity Analysis



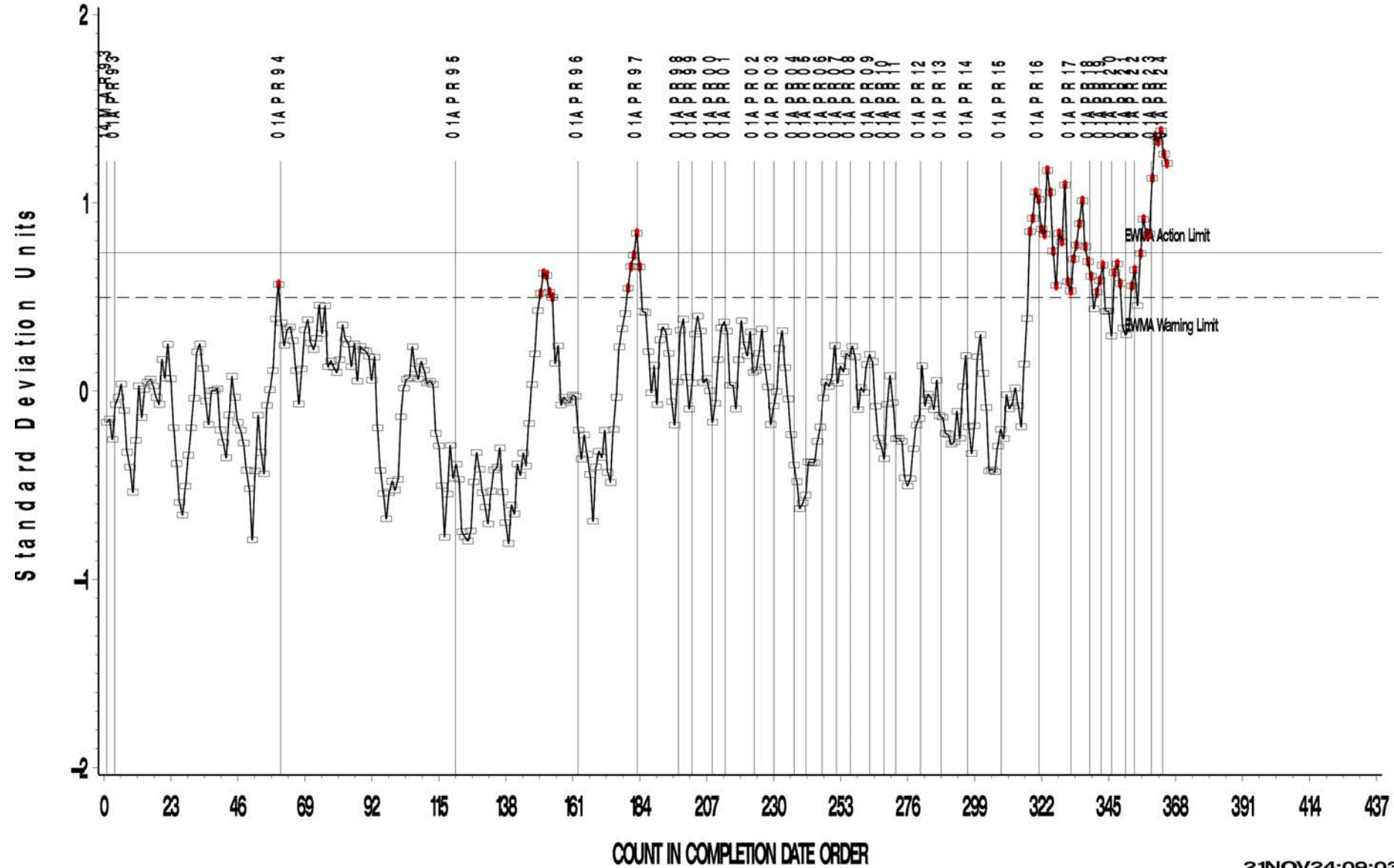
FINAL CORRECTED TGF

LTMS Severity Analysis



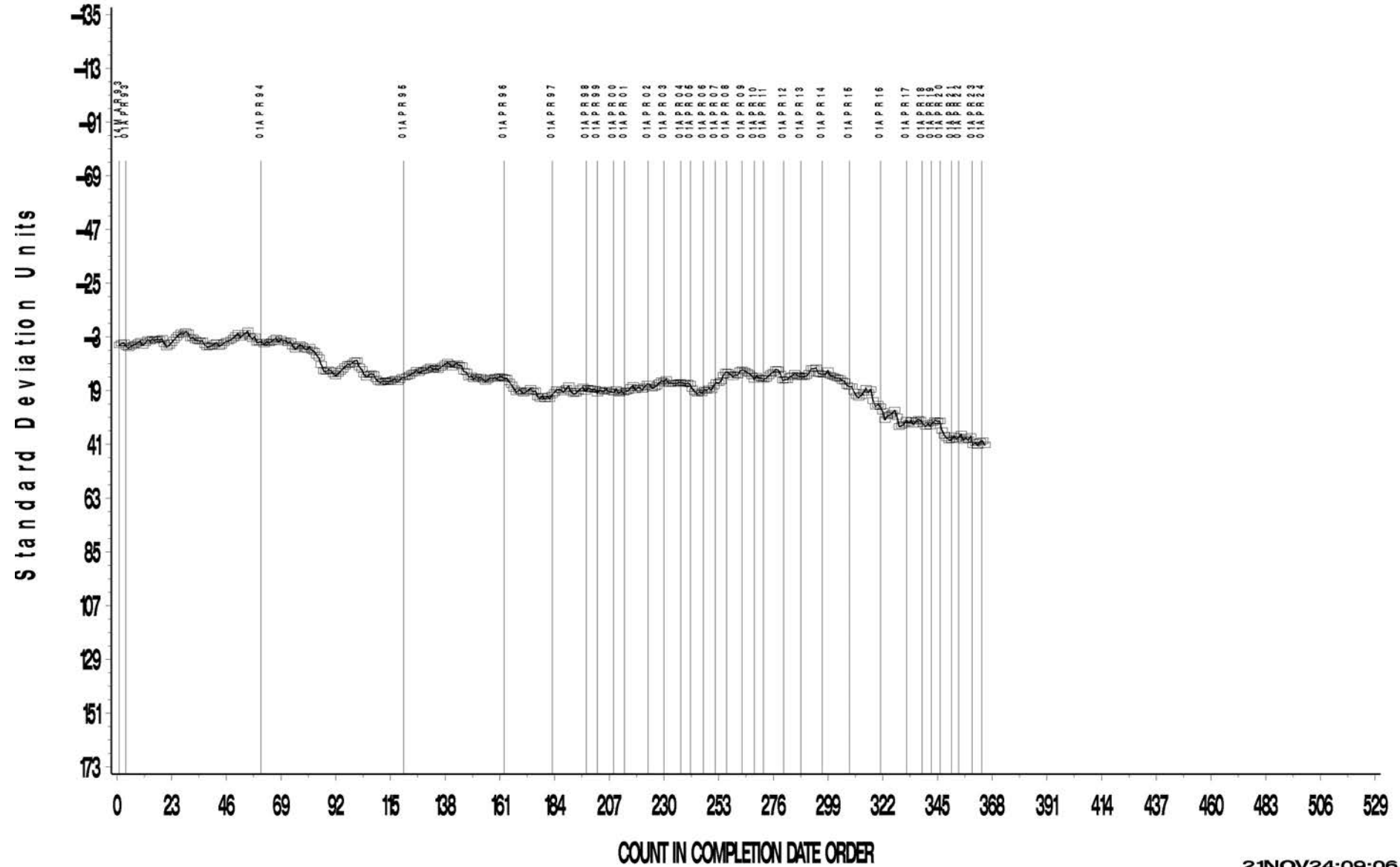
FINAL CORRECTED TGF

LTMS Precision Analysis



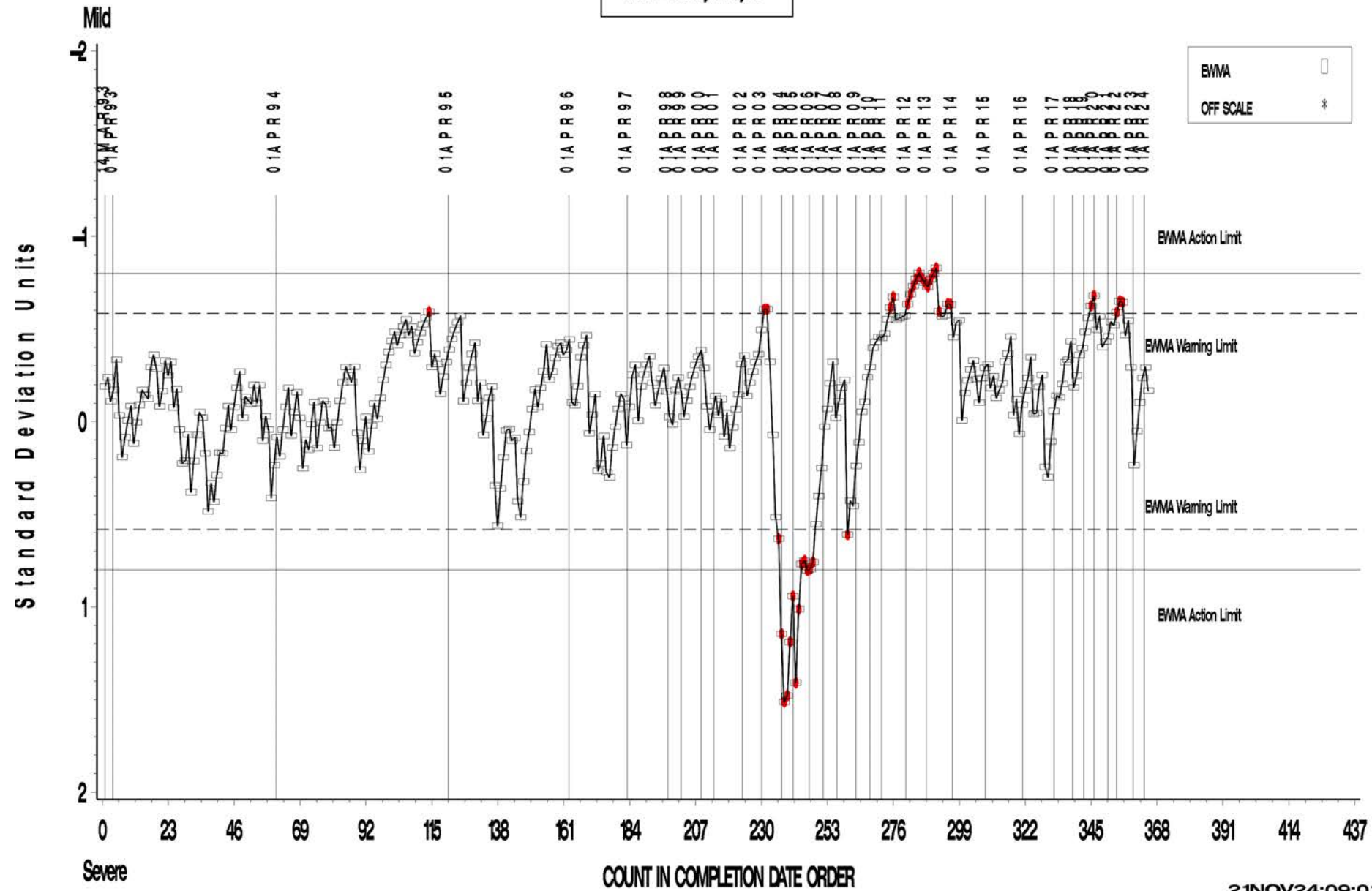
FINAL CORRECTED TGF

CUSUM Severity Analysis



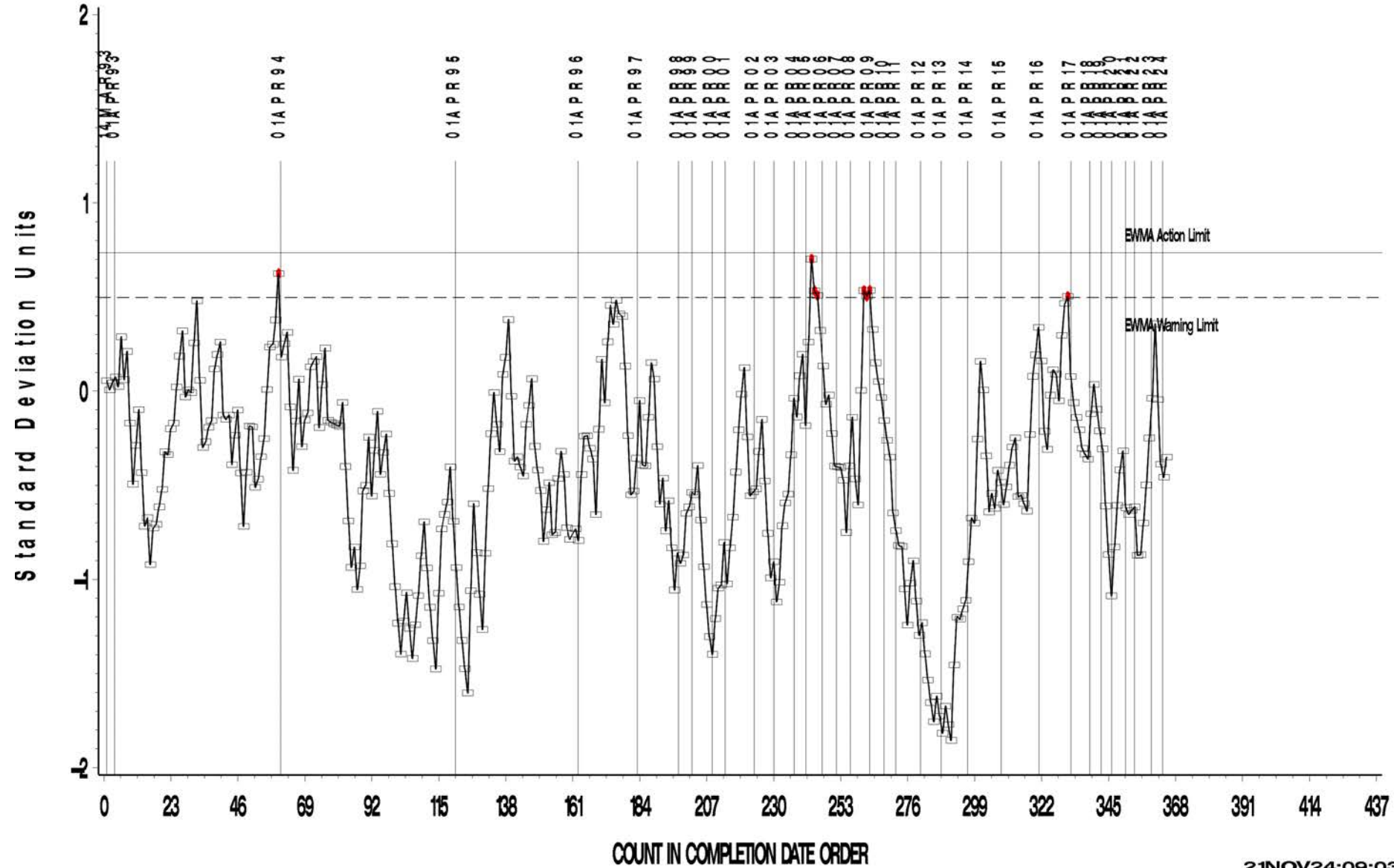
Top Land Heavy Carbon

LTMS Severity Analysis



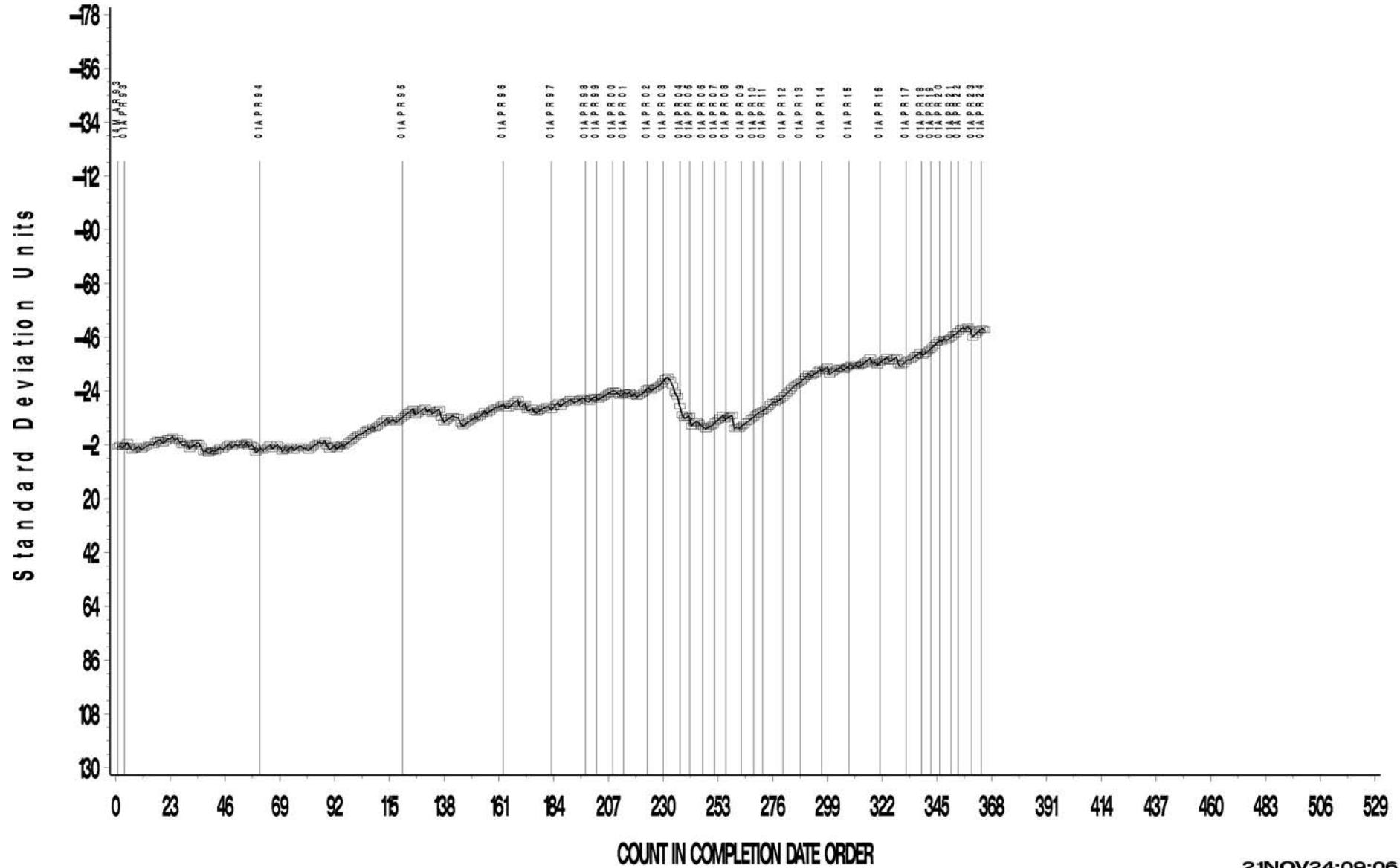
Top Land Heavy Carbon

LTMS Precision Analysis



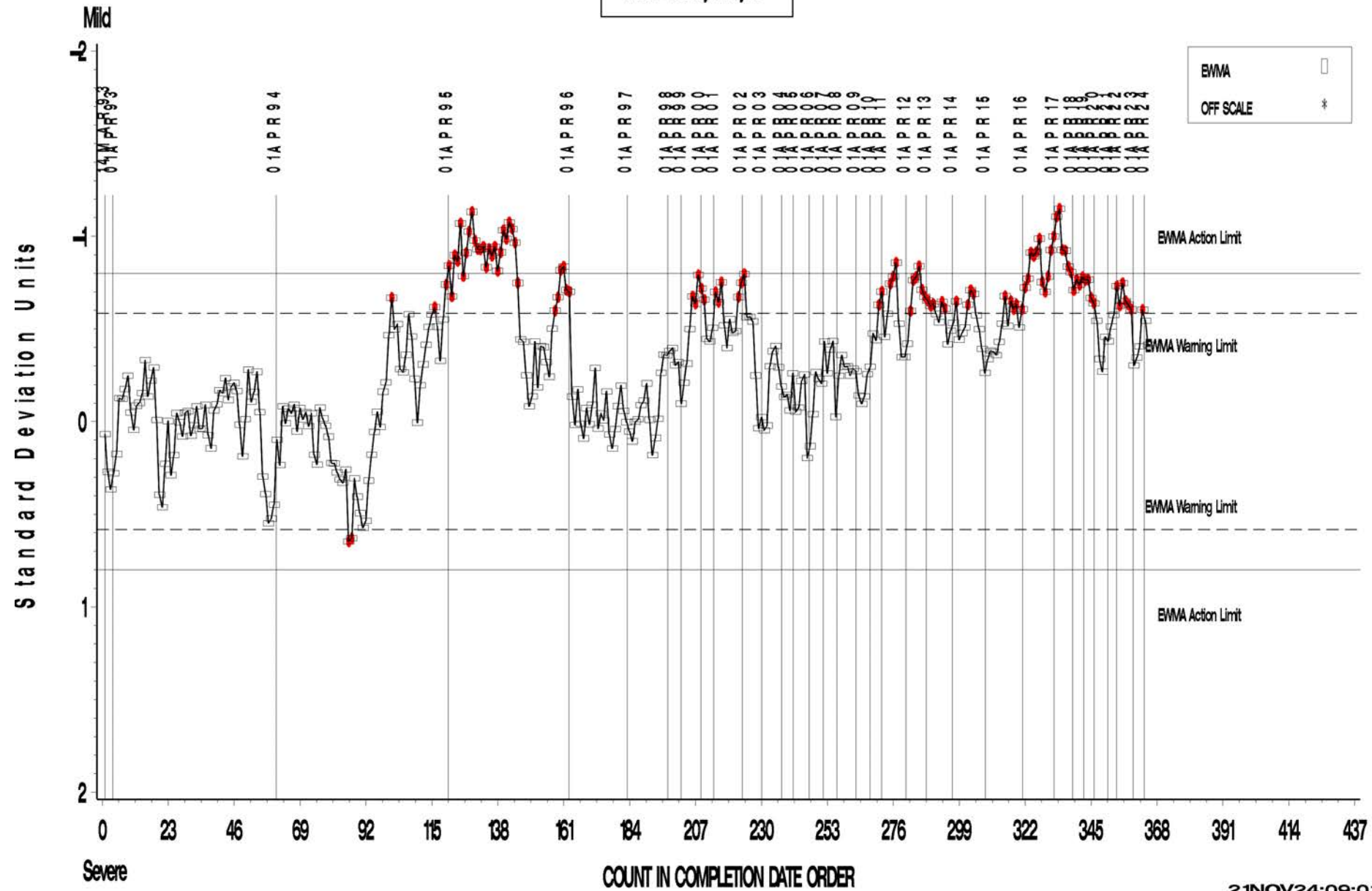
Top Land Heavy Carbon

CUSUM Severity Analysis



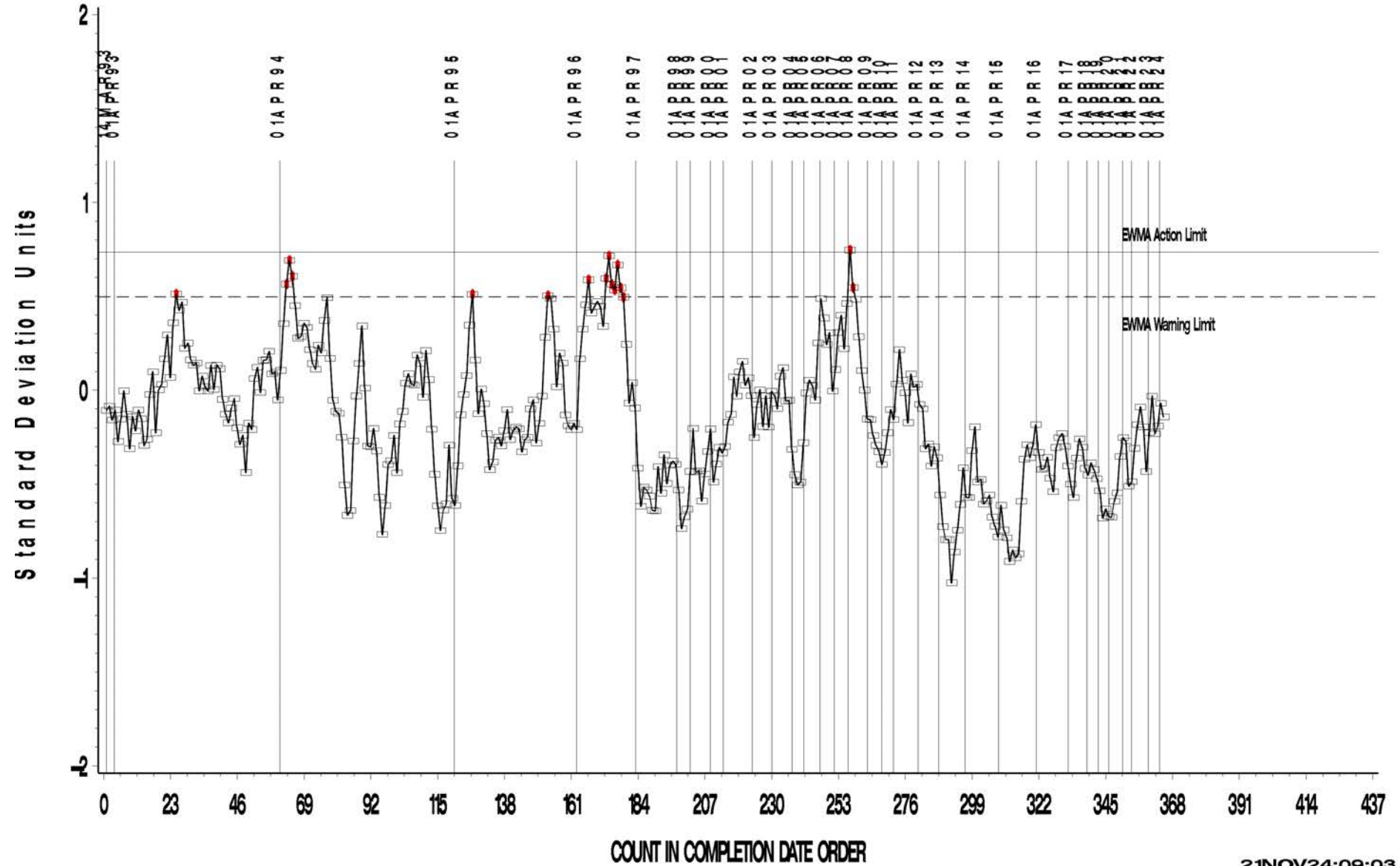
Weighted Total Demerits

LTMS Severity Analysis



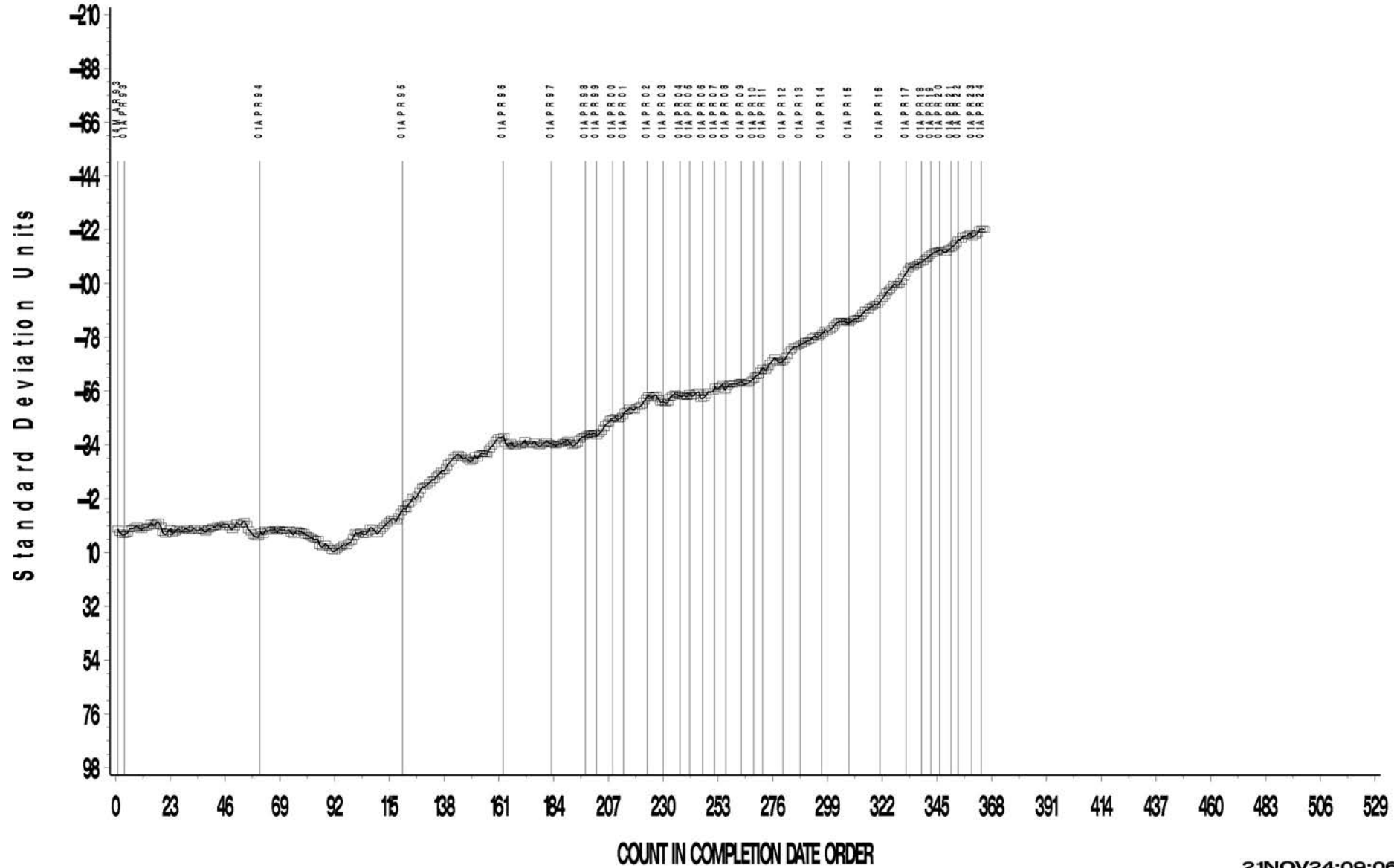
Weighted Total Demerits

LTMS Precision Analysis

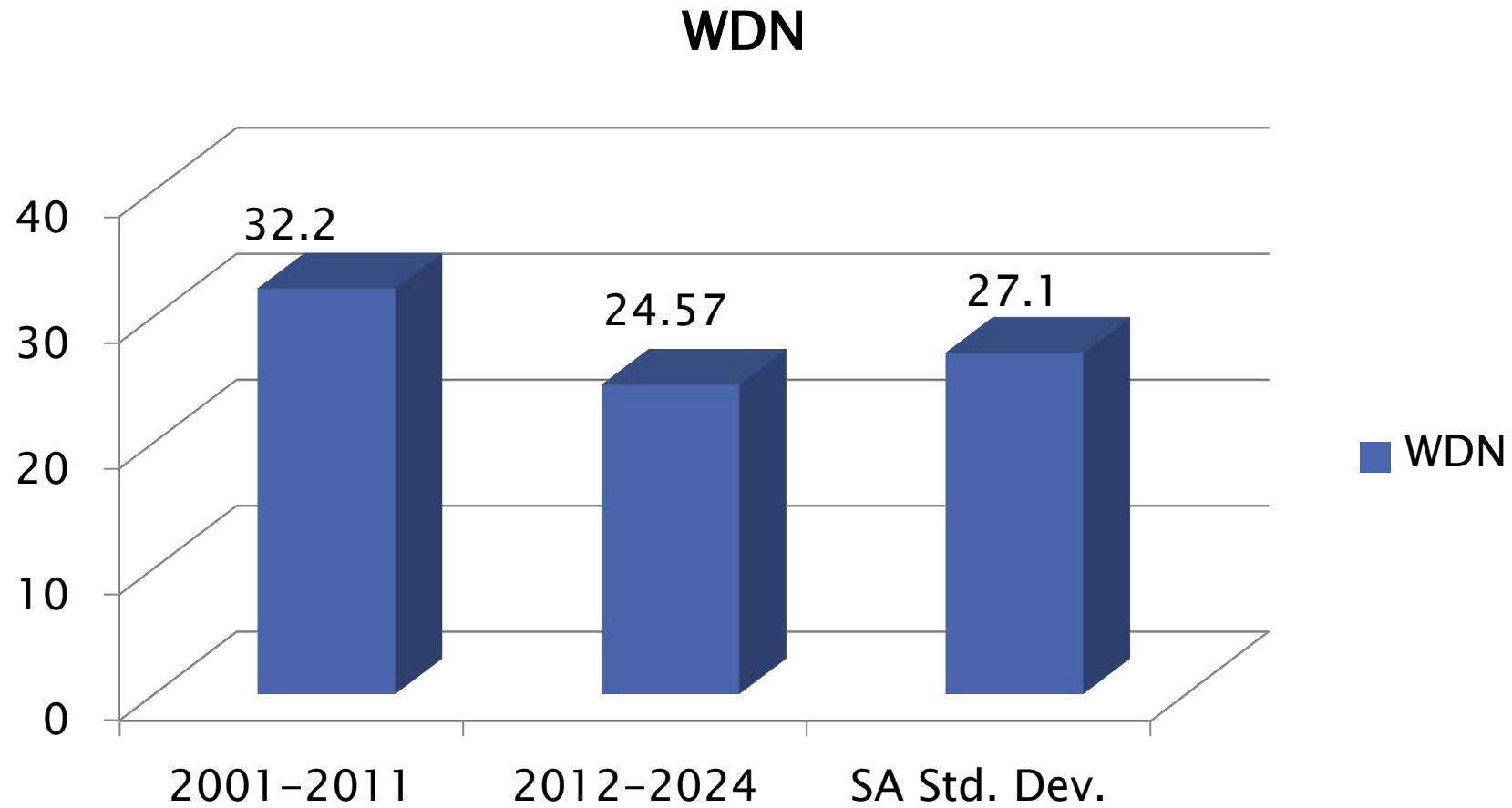


Weighted Total Demerits

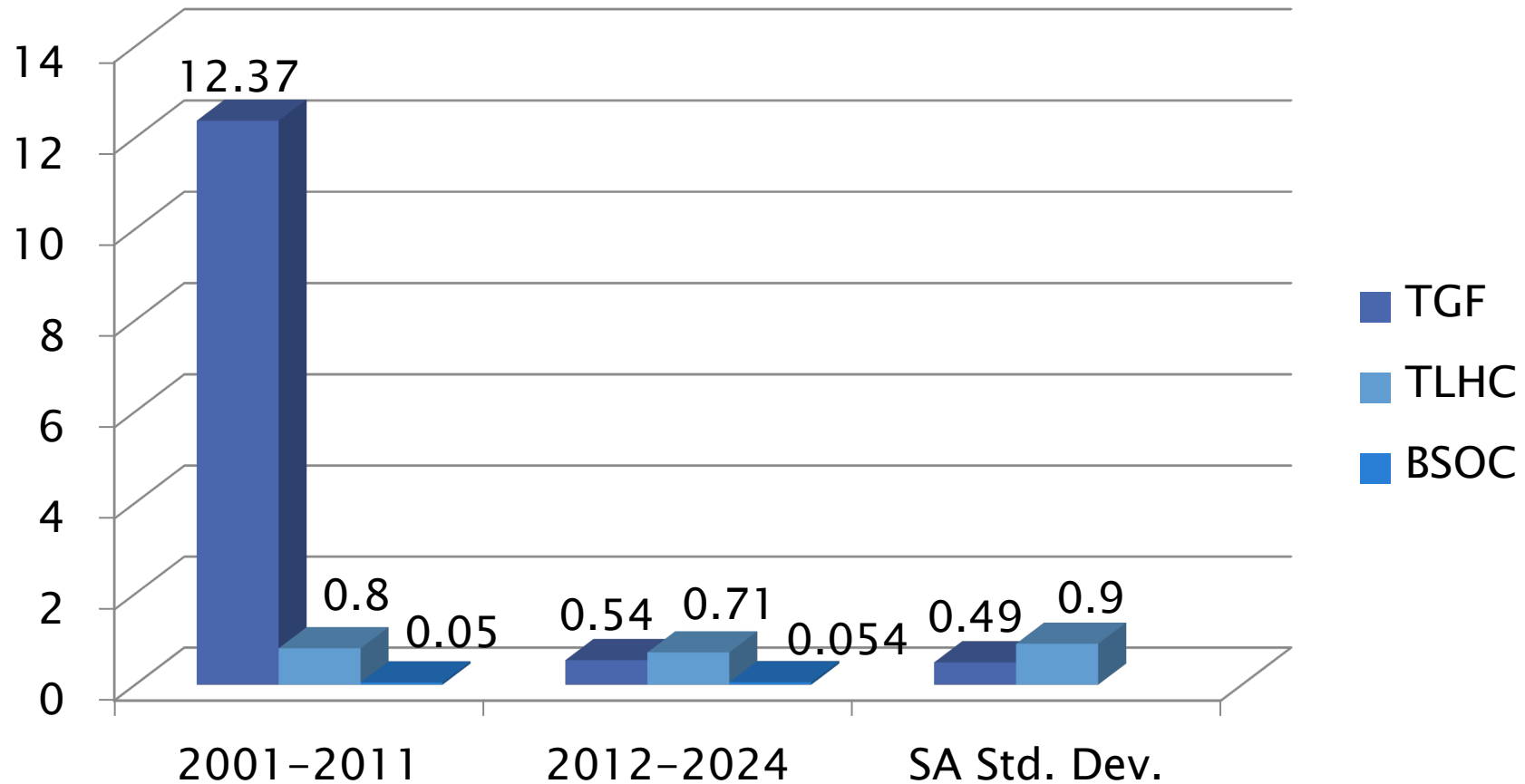
CUSUM Severity Analysis



1 N Precision Estimates



1 N Precision Estimates



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SCOTE 1P

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1 P Test Activity

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

1 P Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

1P Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

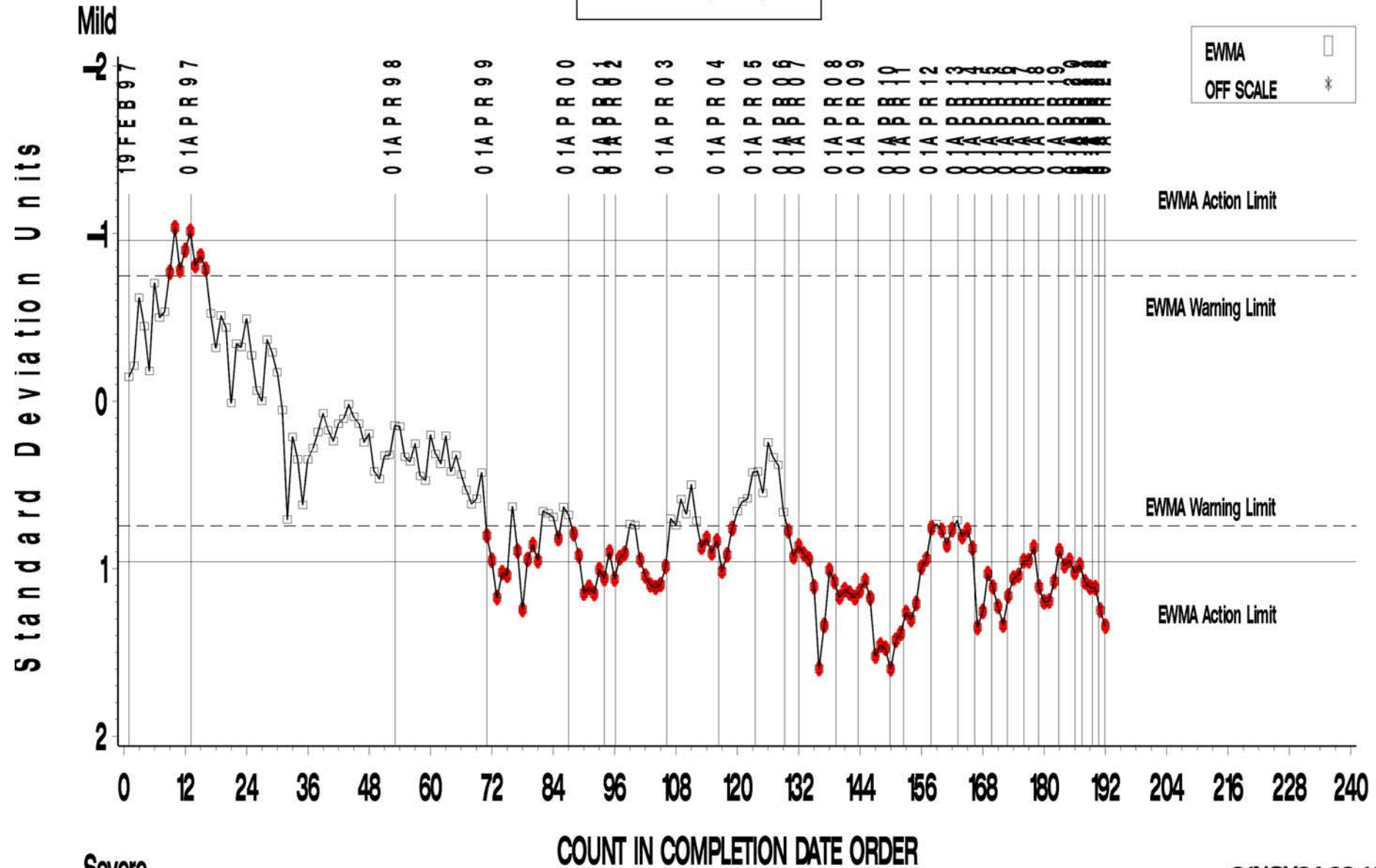
*Invalid and aborted tests

1 P Test Severity

- ▶ TGC, TLC and OC are in control.
- ▶ WD and ETOC are in severity action alarm in the severe direction.

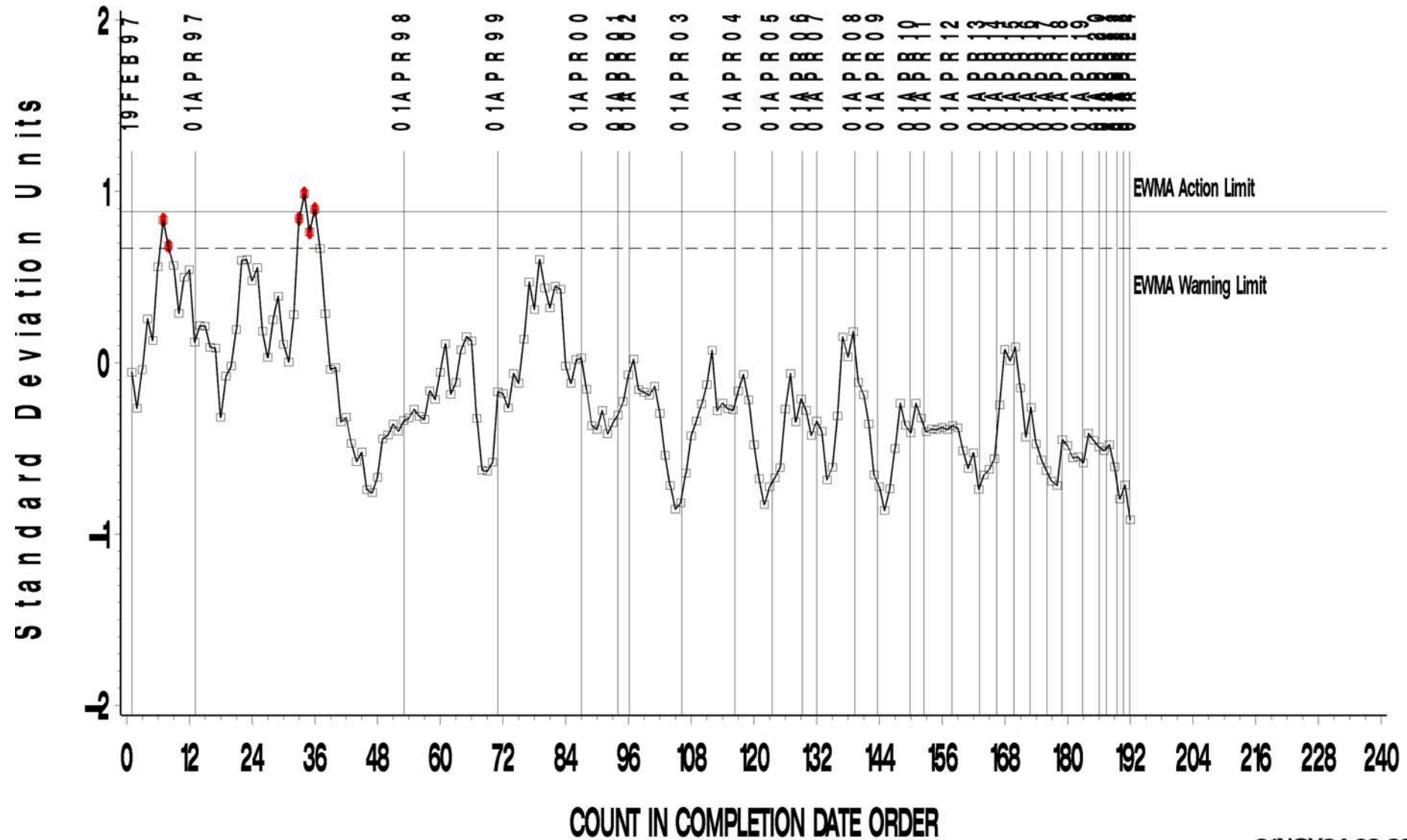
EOTOC

LTMS Severity Analysis



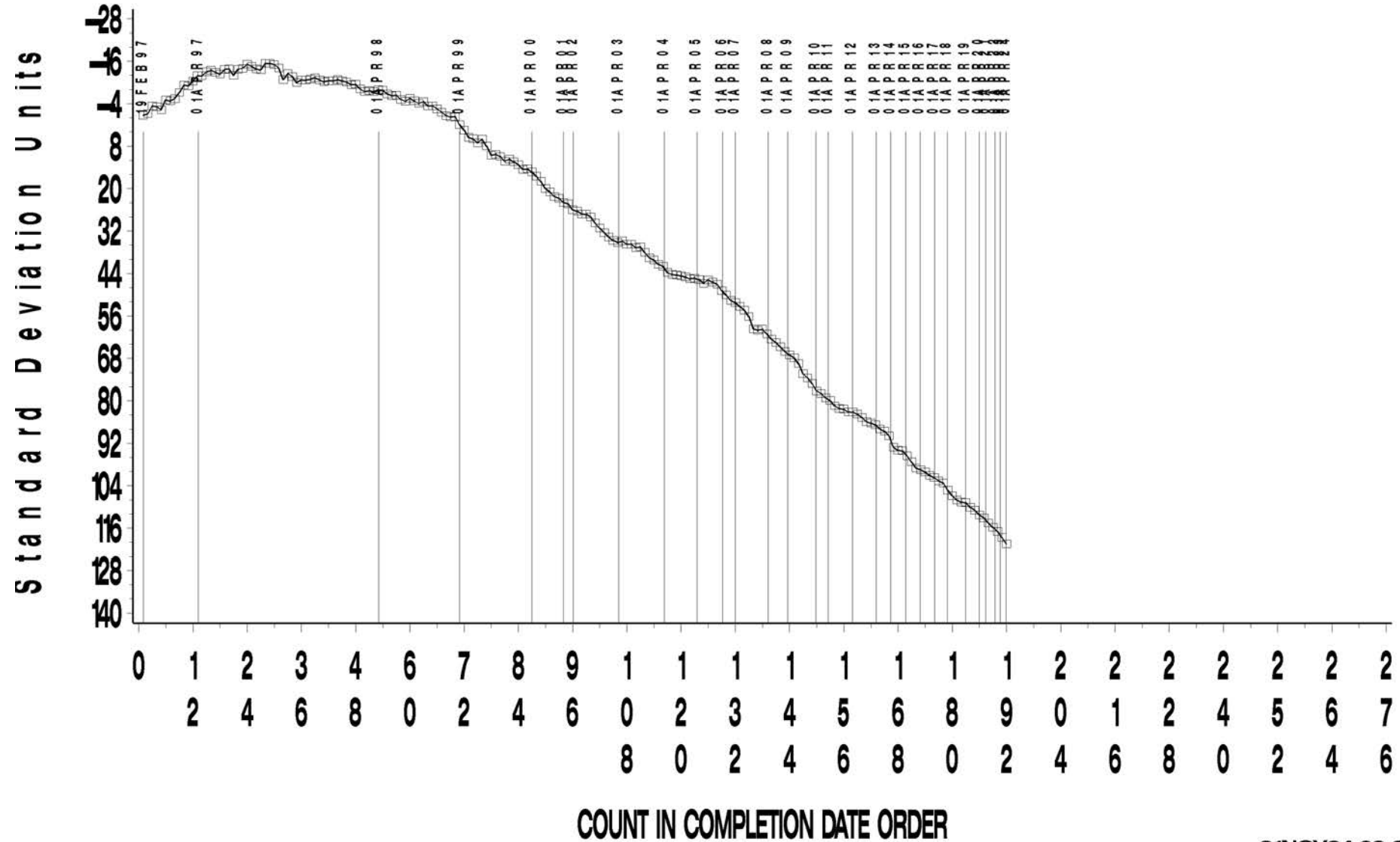
EOTOC

LTMS Precision Analysis



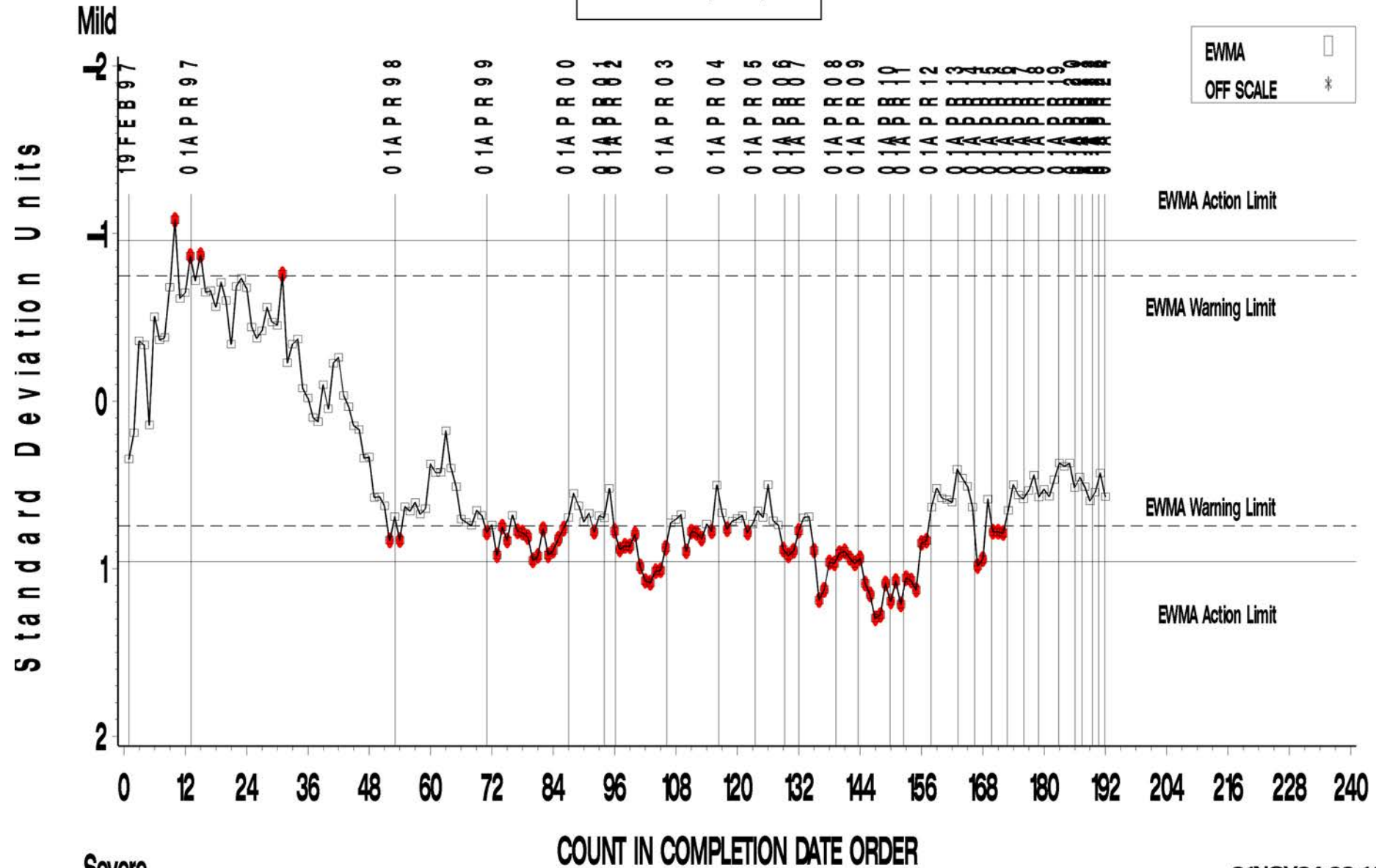
EOTOC

CUSUM Severity Analysis



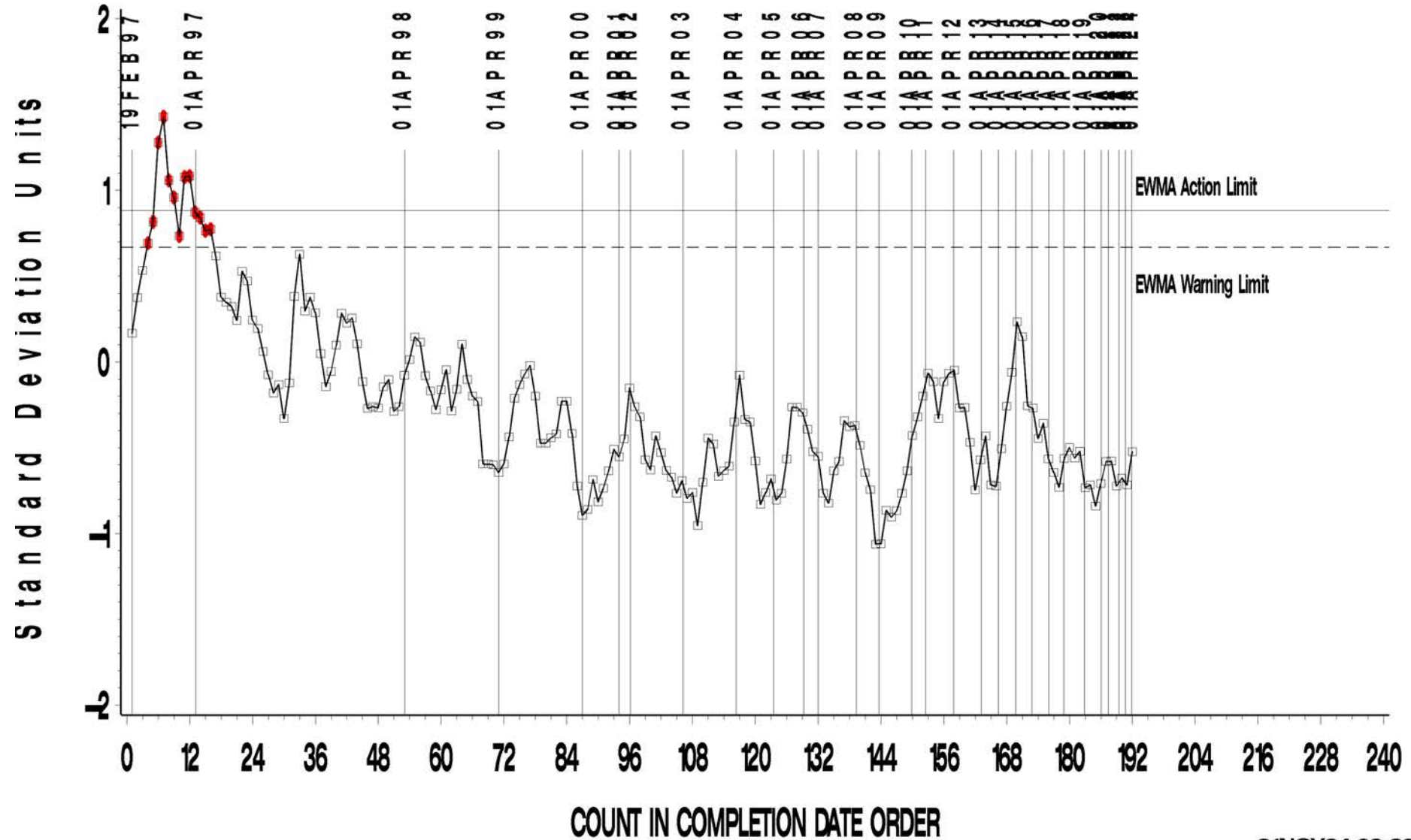
OIL CONSUMPTION

LTMS Severity Analysis



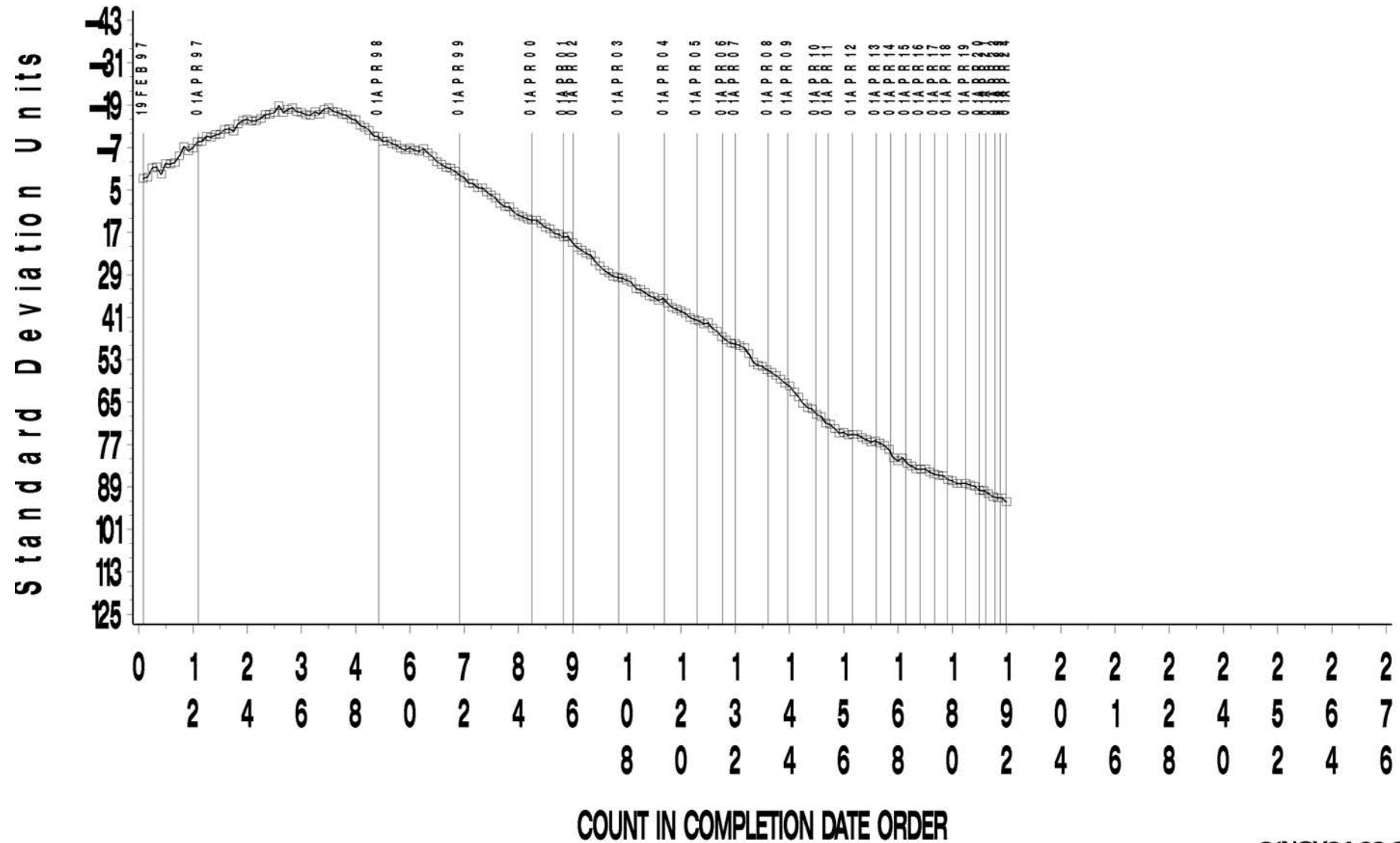
OIL CONSUMPTION

LTMS Precision Analysis



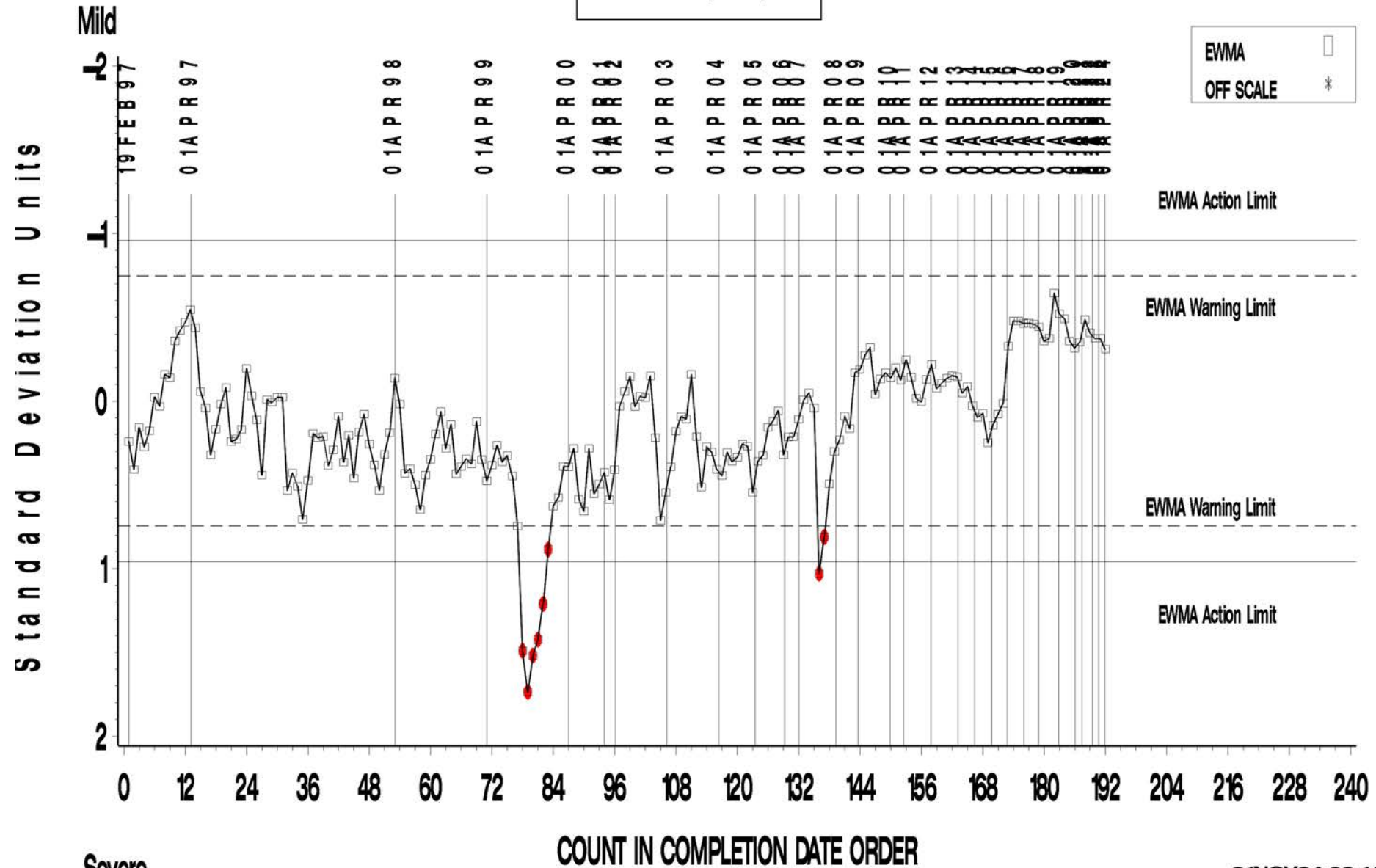
OIL CONSUMPTION

CUSUM Severity Analysis



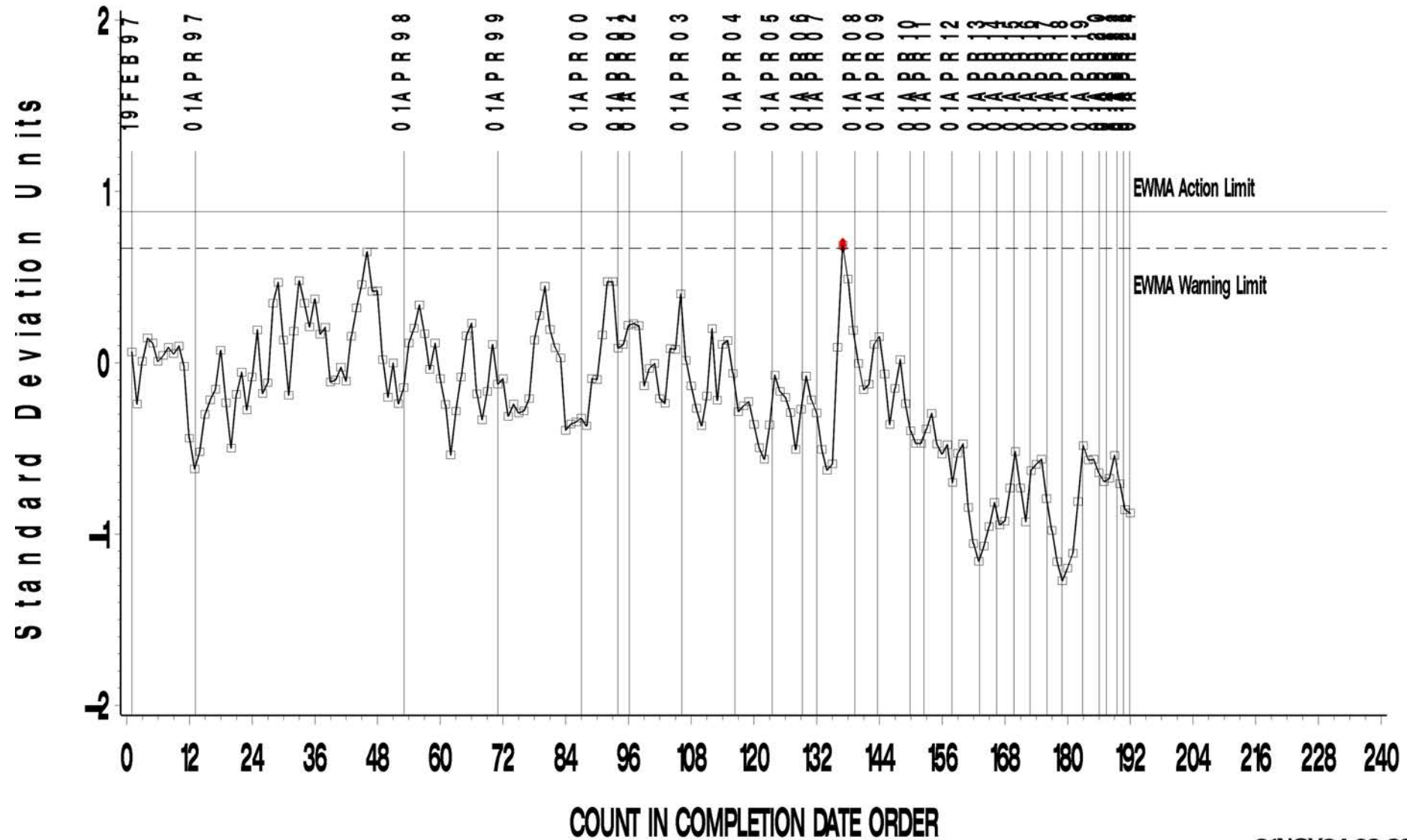
TOP GROOVE CARBON

LTMS Severity Analysis



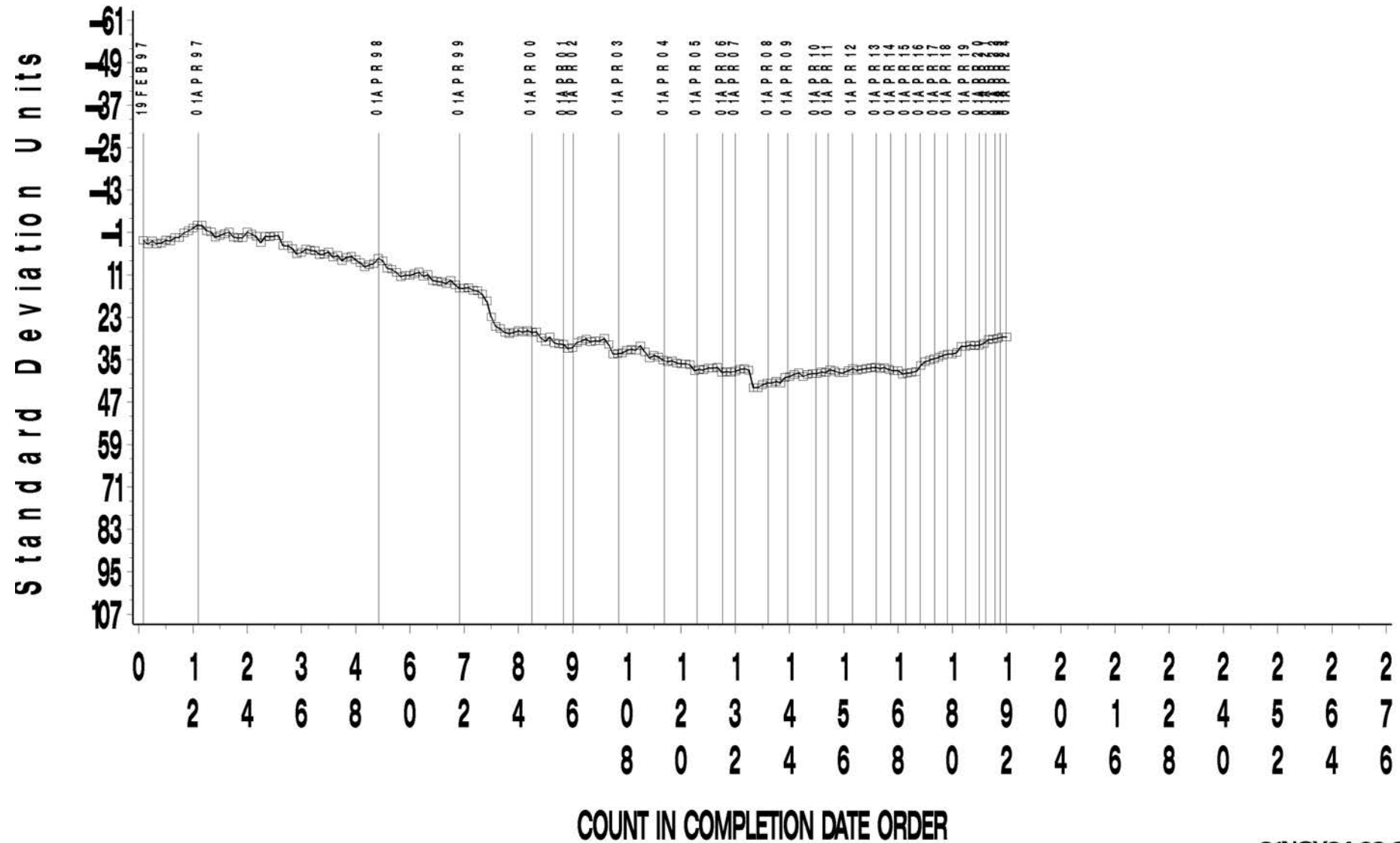
TOP GROOVE CARBON

LTMS Precision Analysis



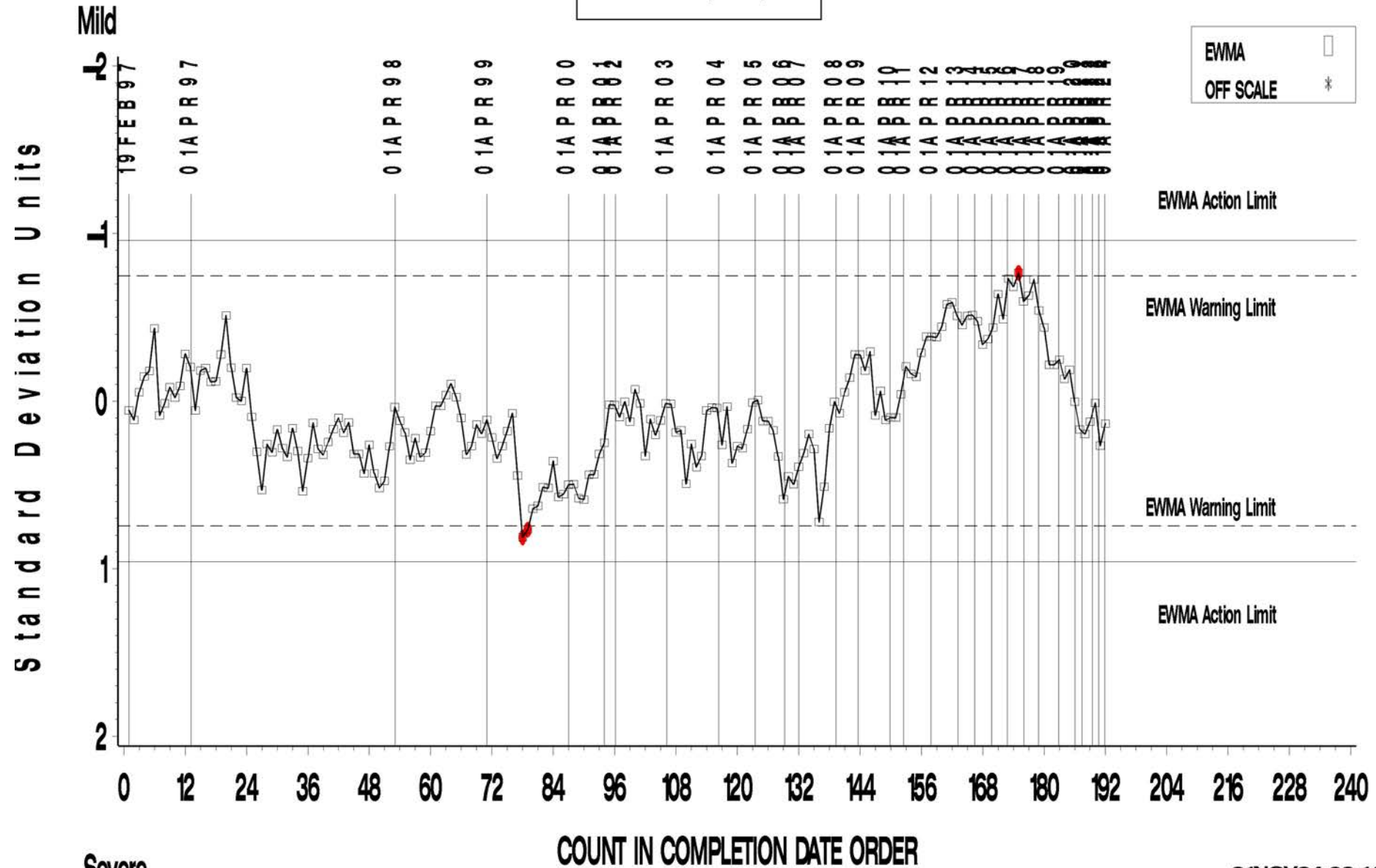
TOP GROOVE CARBON

CUSUM Severity Analysis



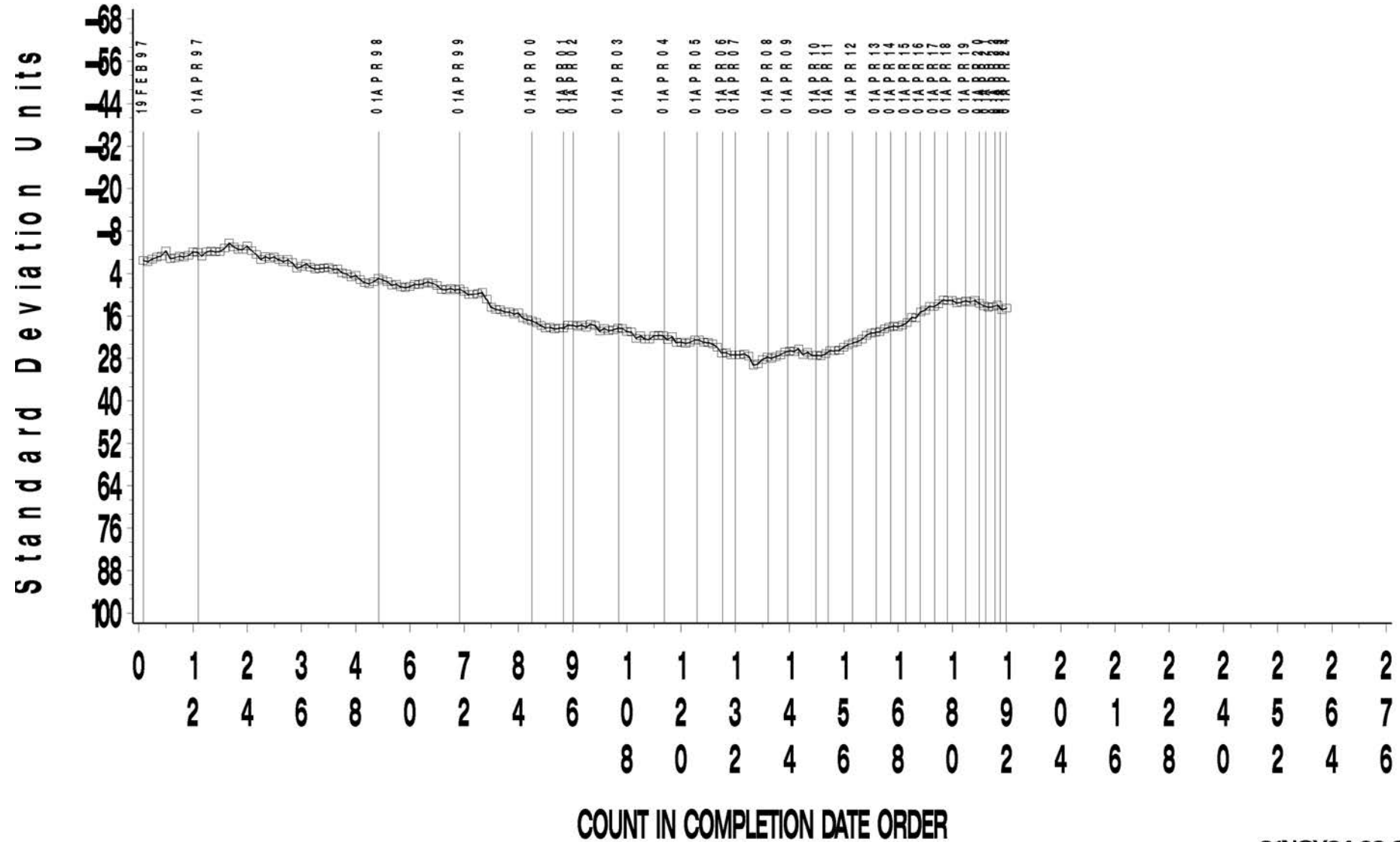
TOP LAND CARBON

LTMS Severity Analysis



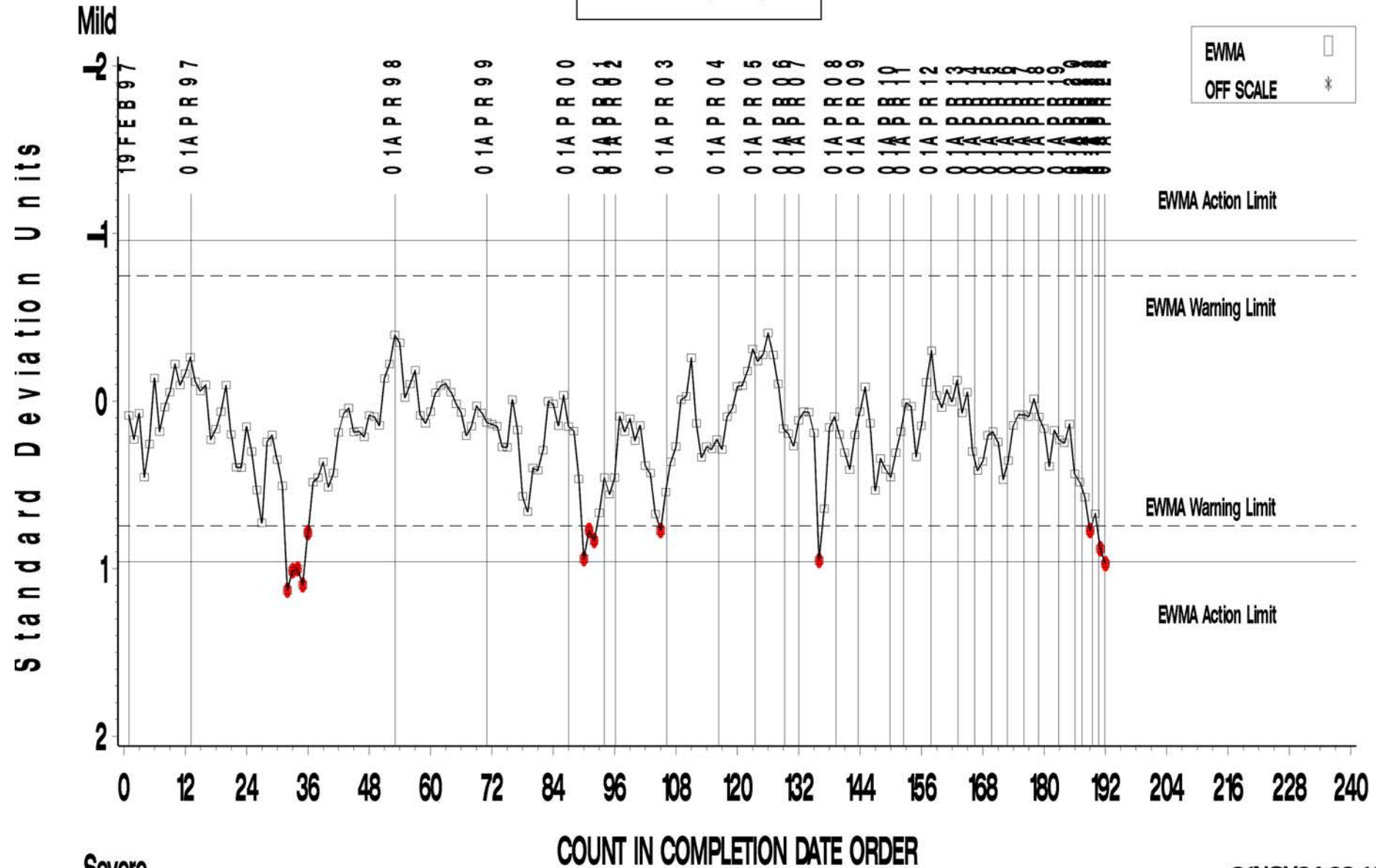
TOP LAND CARBON

CUSUM Severity Analysis



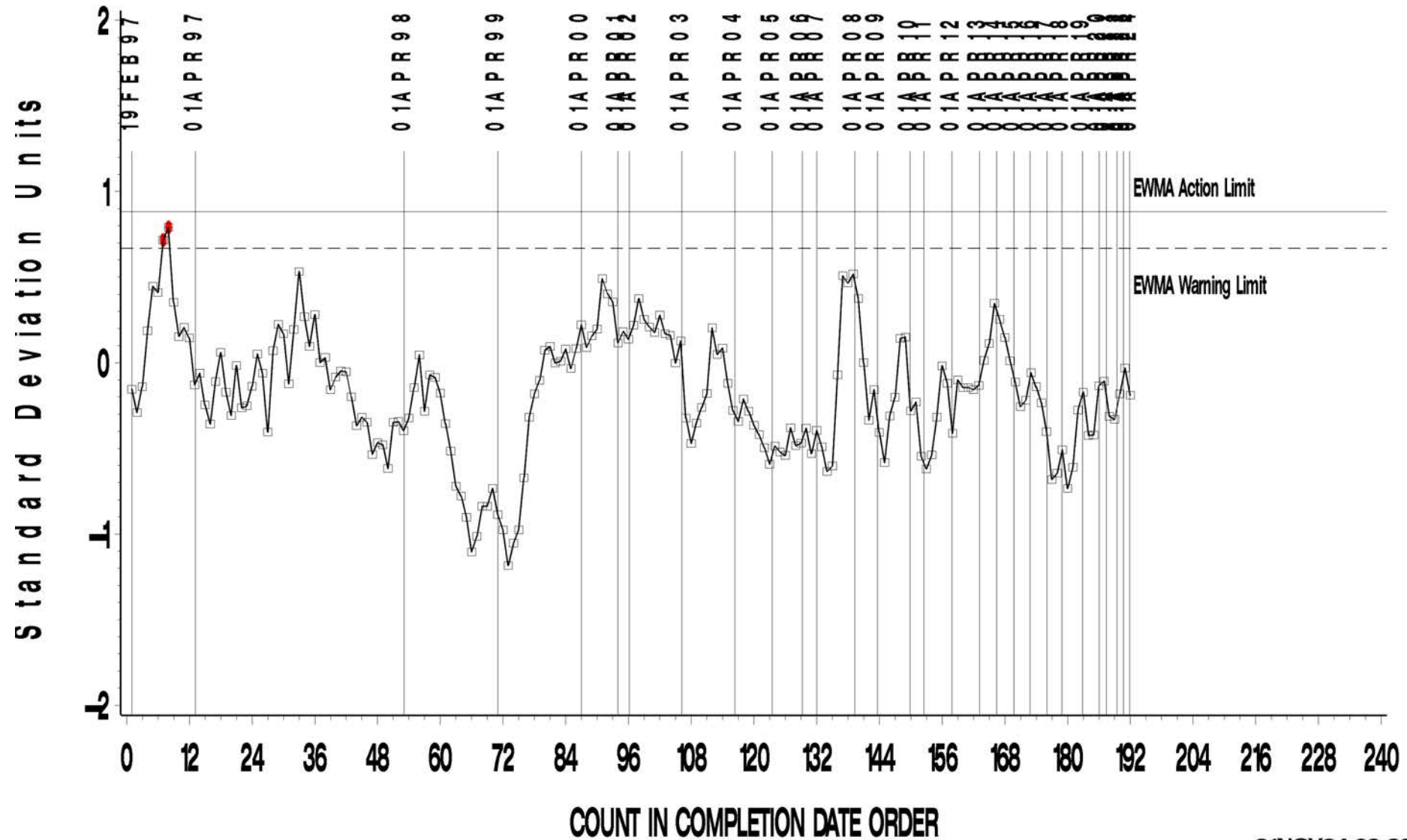
WEIGHTED TOTAL DEMERITS

LTMS Severity Analysis



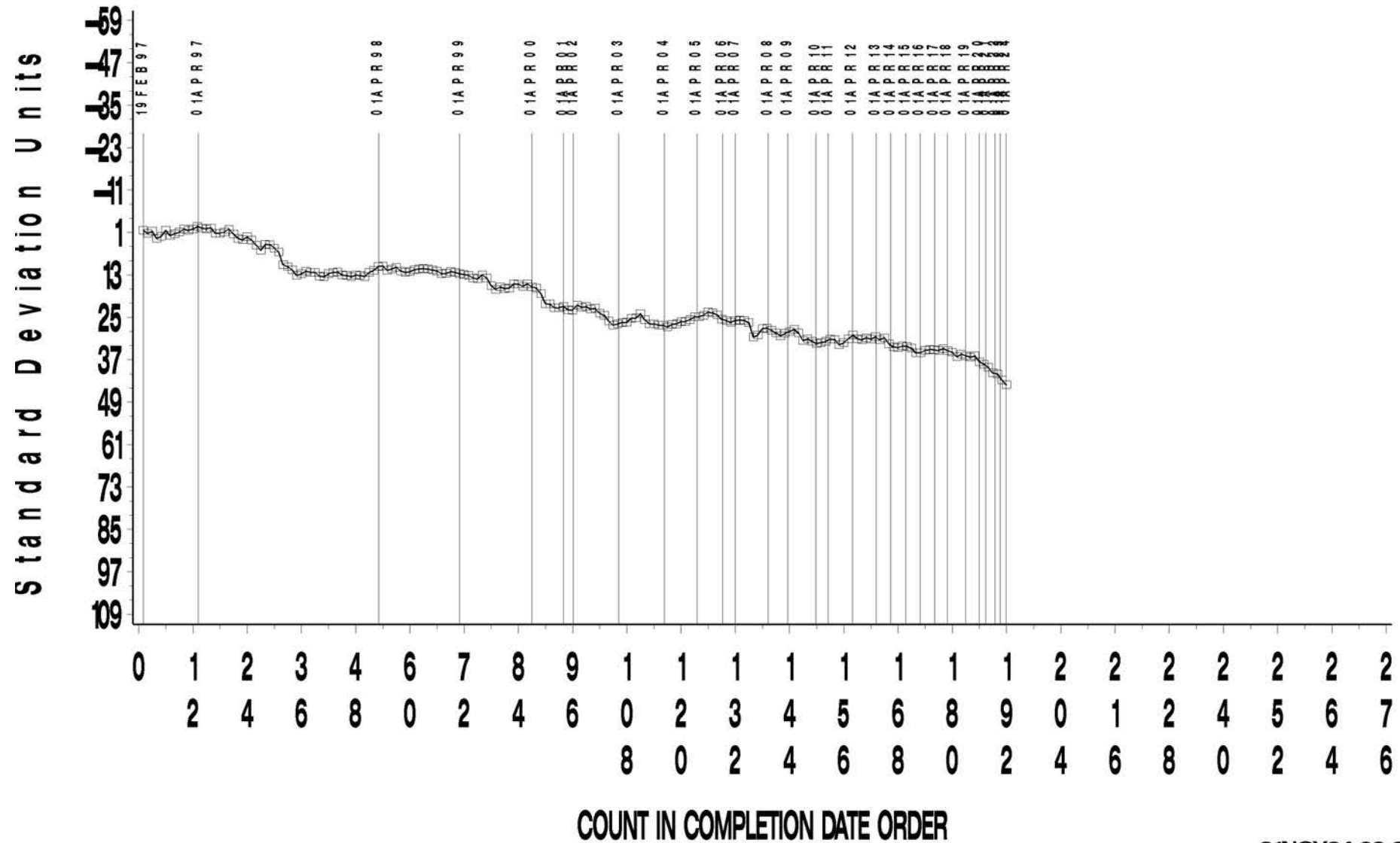
WEIGHTED TOTAL DEMERITS

LTMS Precision Analysis

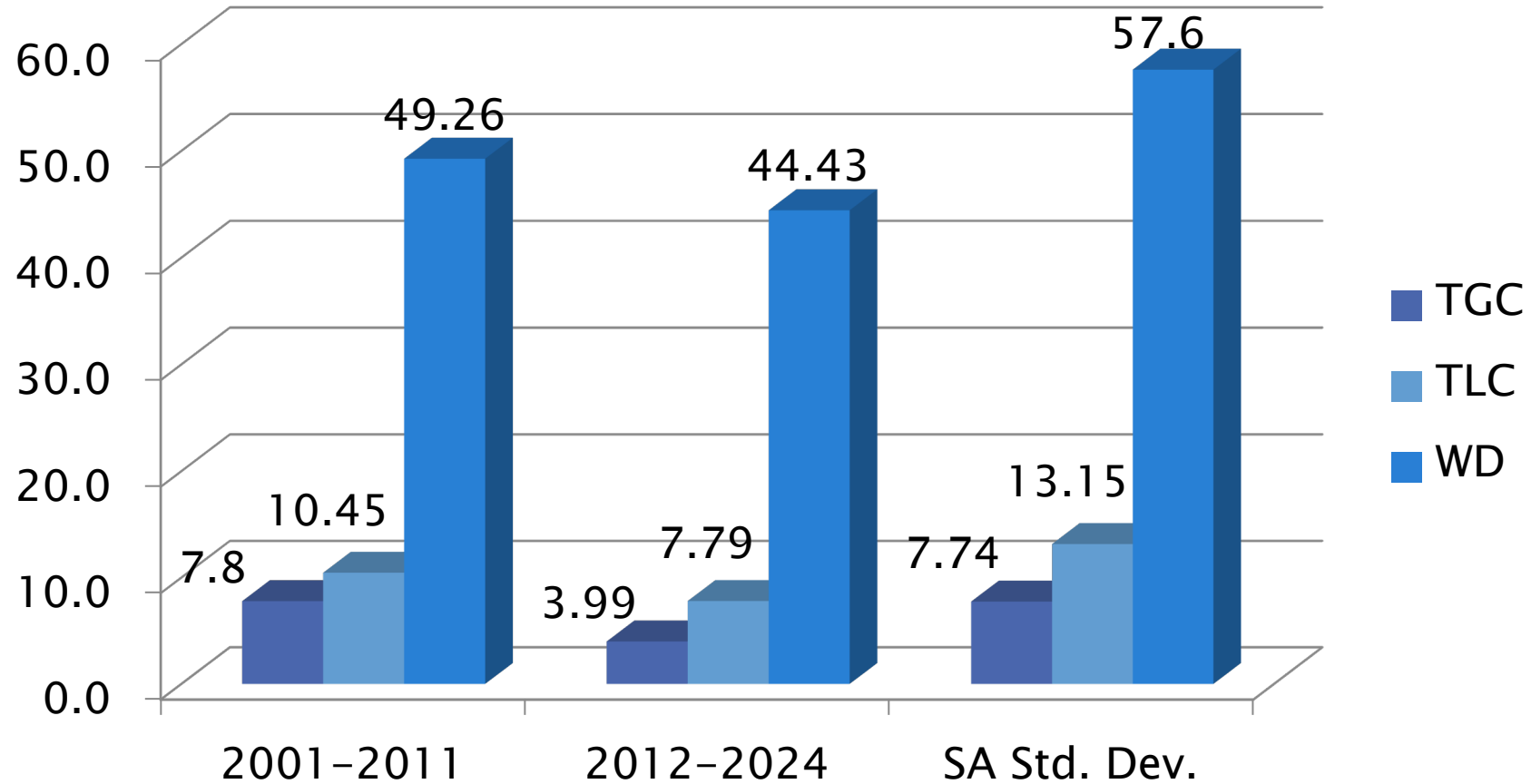


WEIGHTED TOTAL DEMERITS

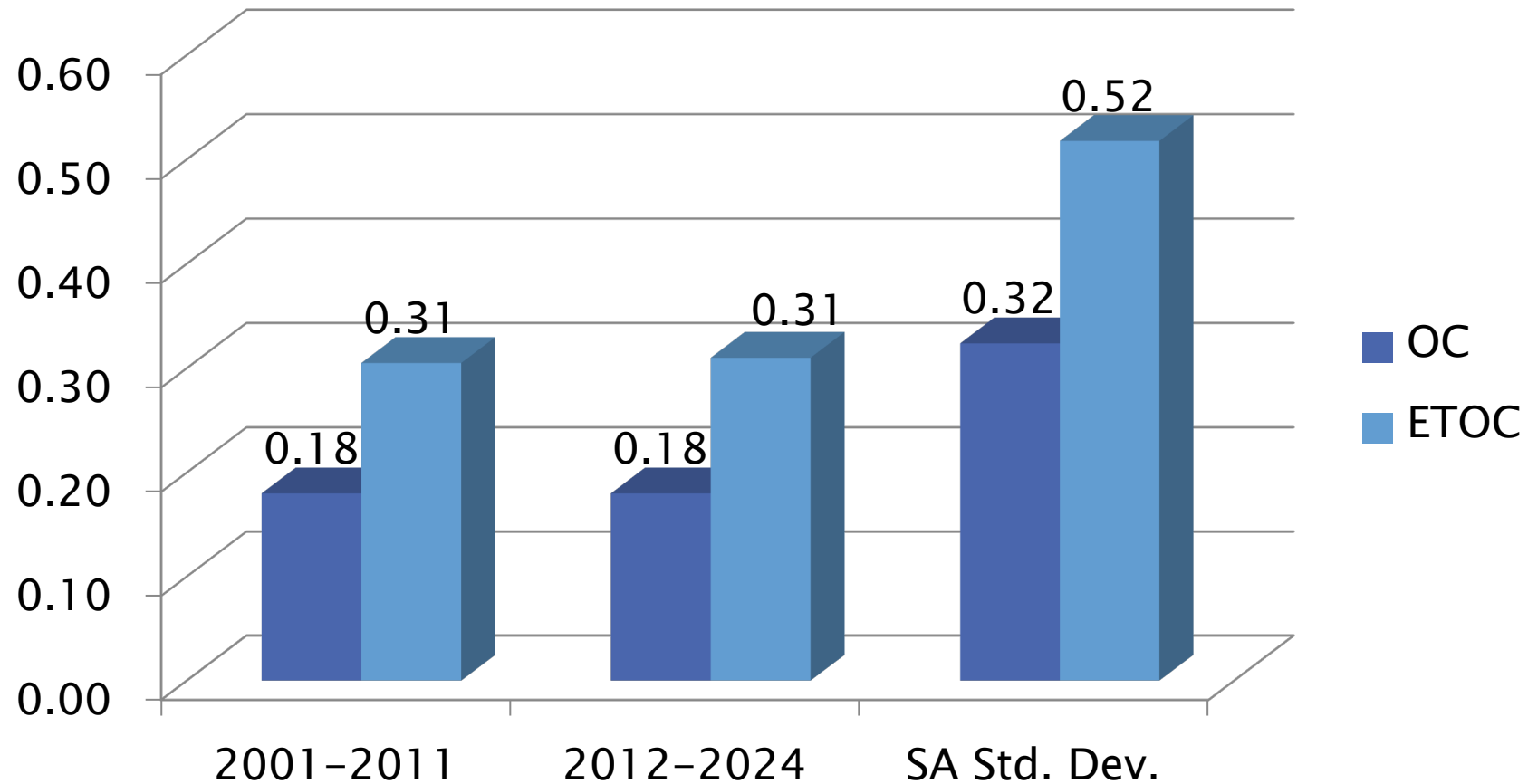
CUSUM Severity Analysis



1 P Precision Estimates



1 P Precision Estimates



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SCOTE 1 R

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1 R Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	0
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		0

1 R Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

1 R Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

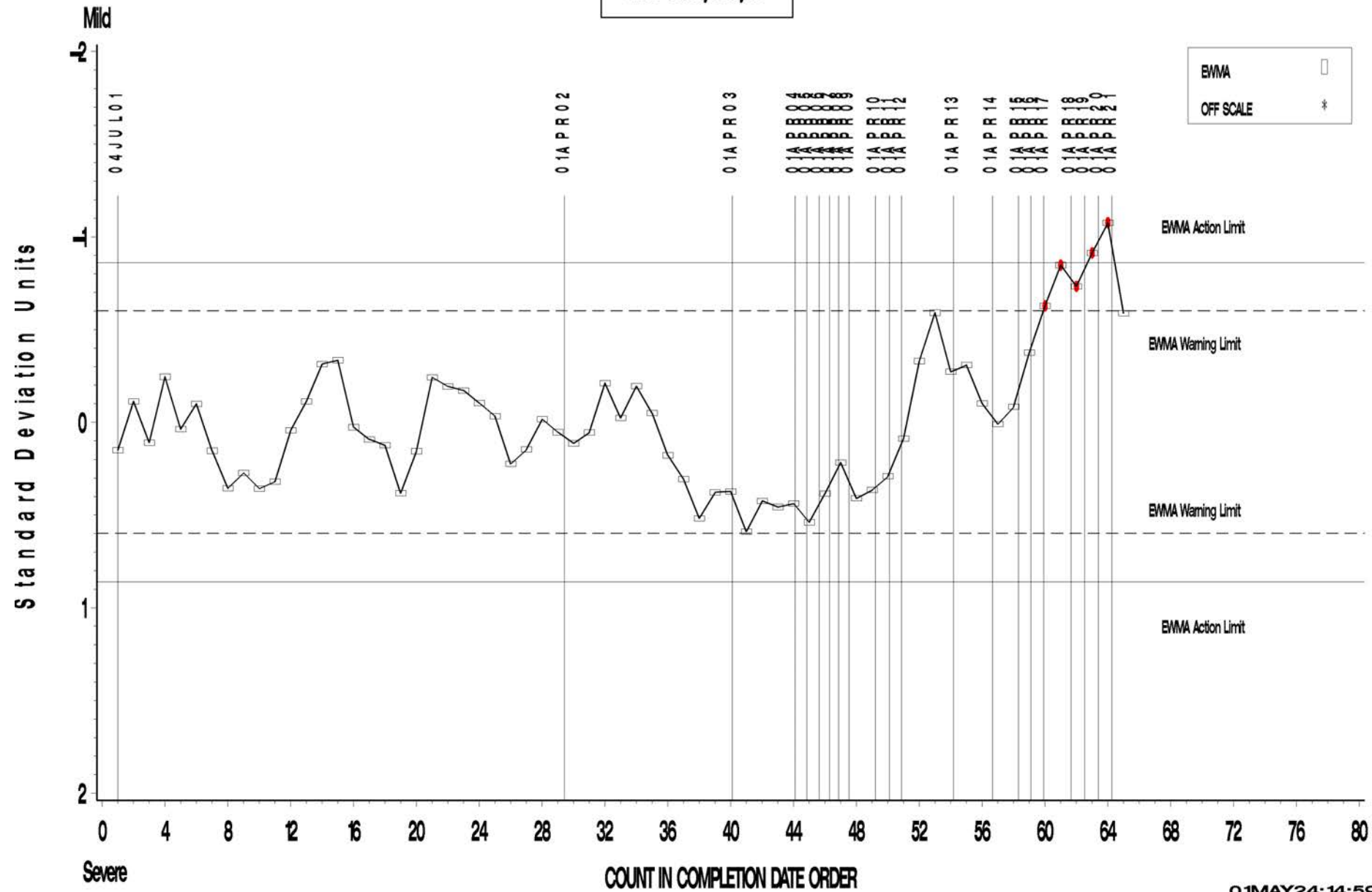
*Invalid and aborted tests

1 R Test Severity

- ▶ As no chartable 1R tests were run during this reporting period, no statement on test severity can be made.

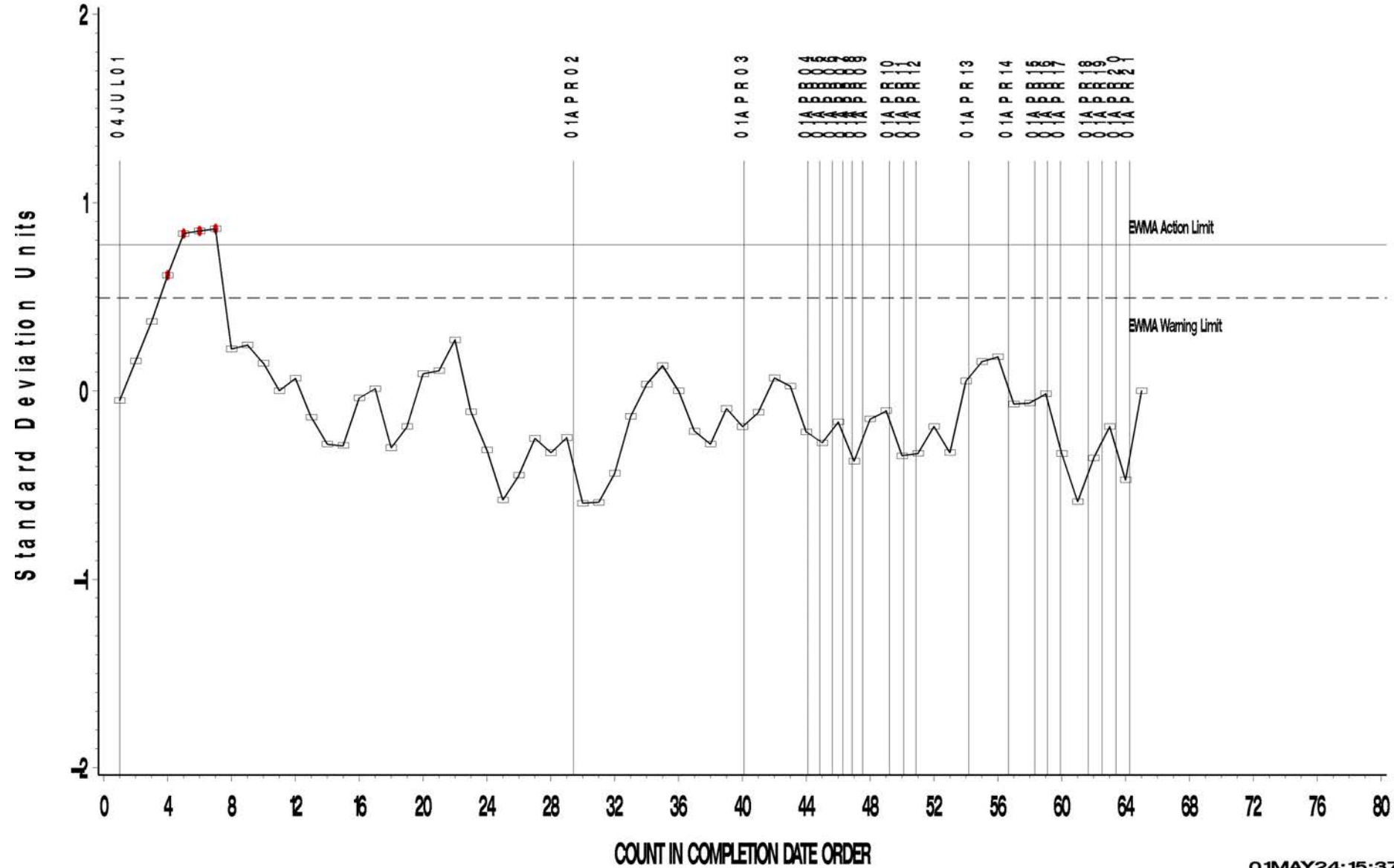
FINAL BOTOC

LTMS Severity Analysis



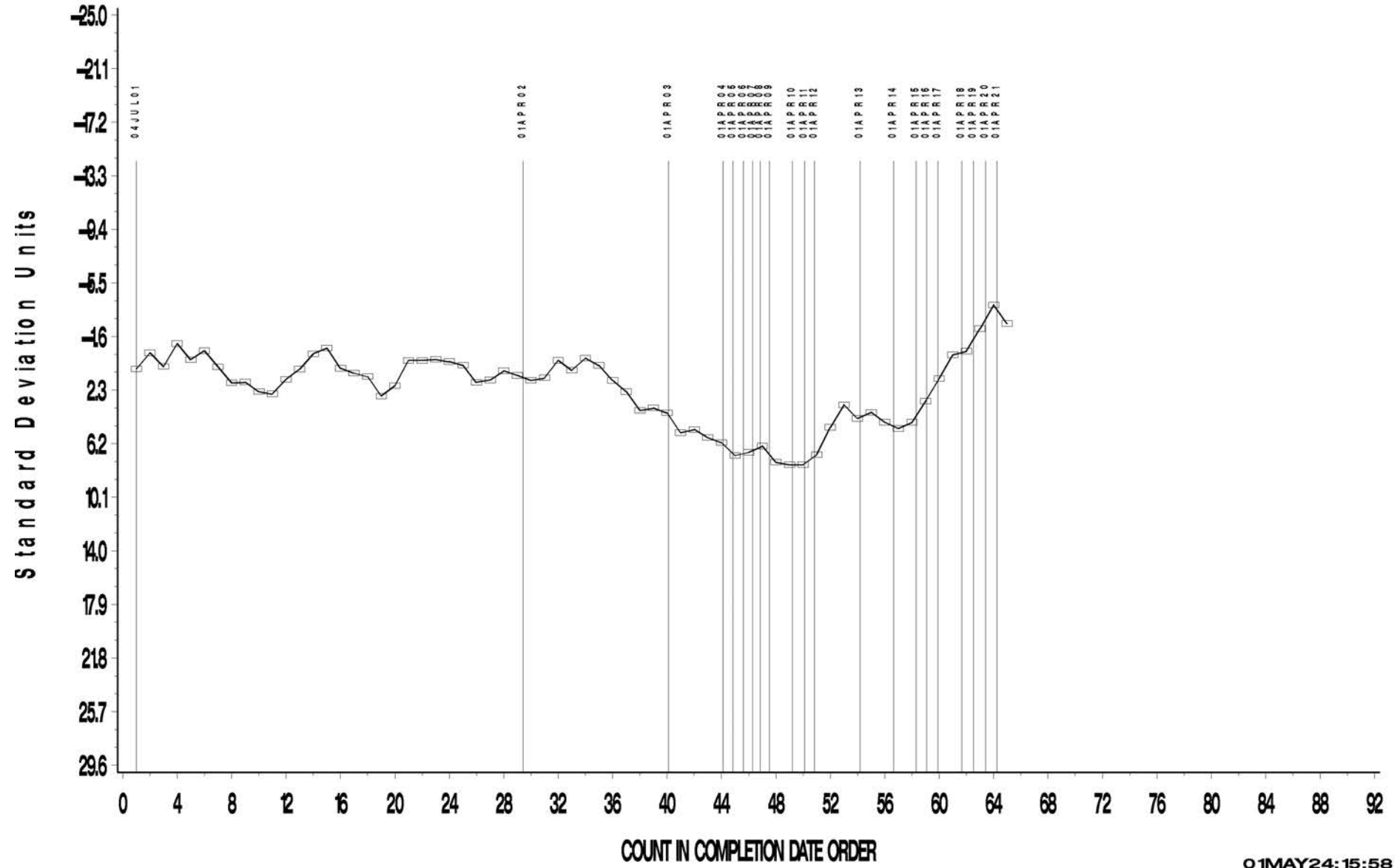
FINAL BOTOC

LTMS Precision Analysis



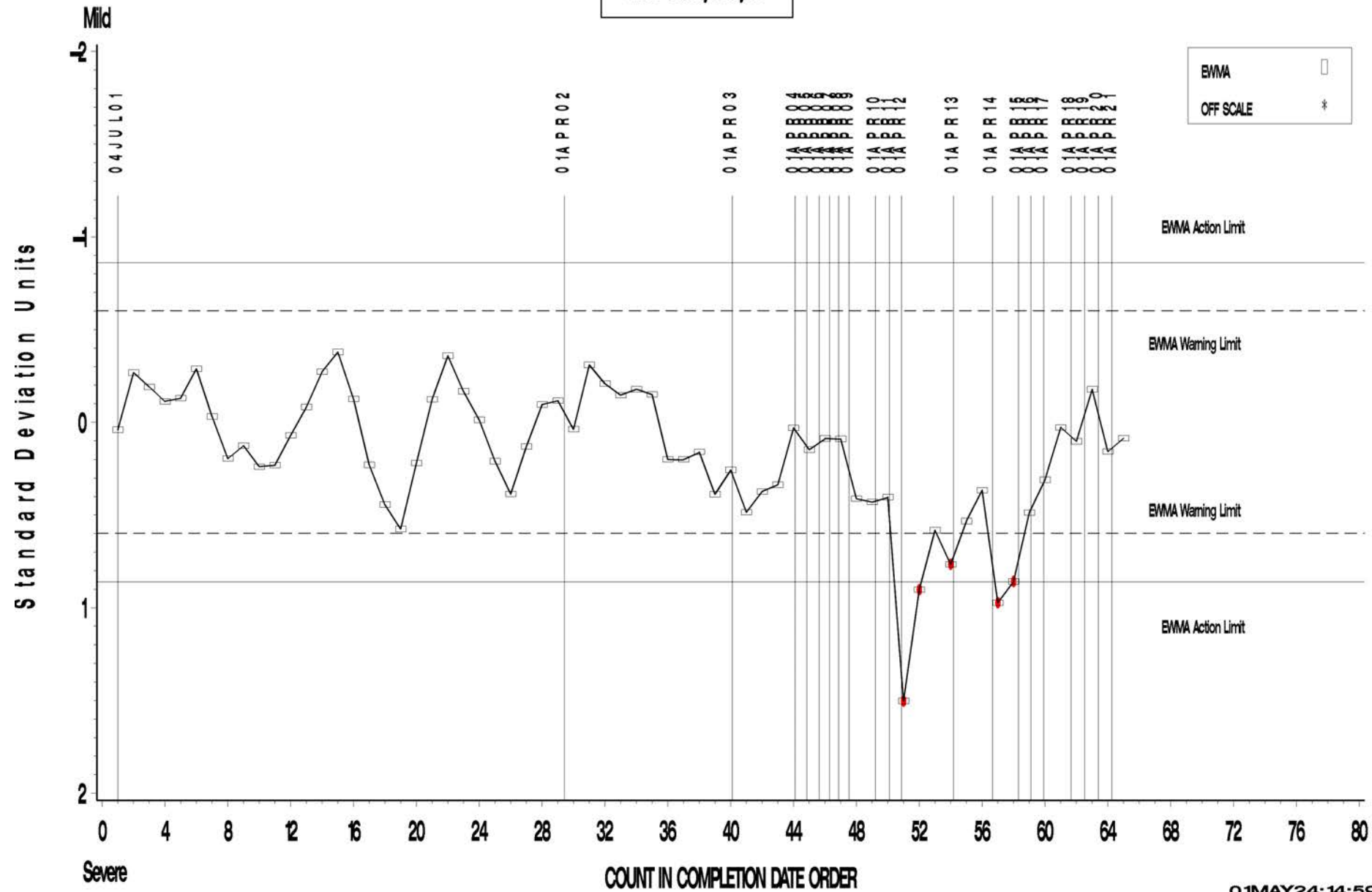
FINAL BOTOC

CUSUM Severity Analysis



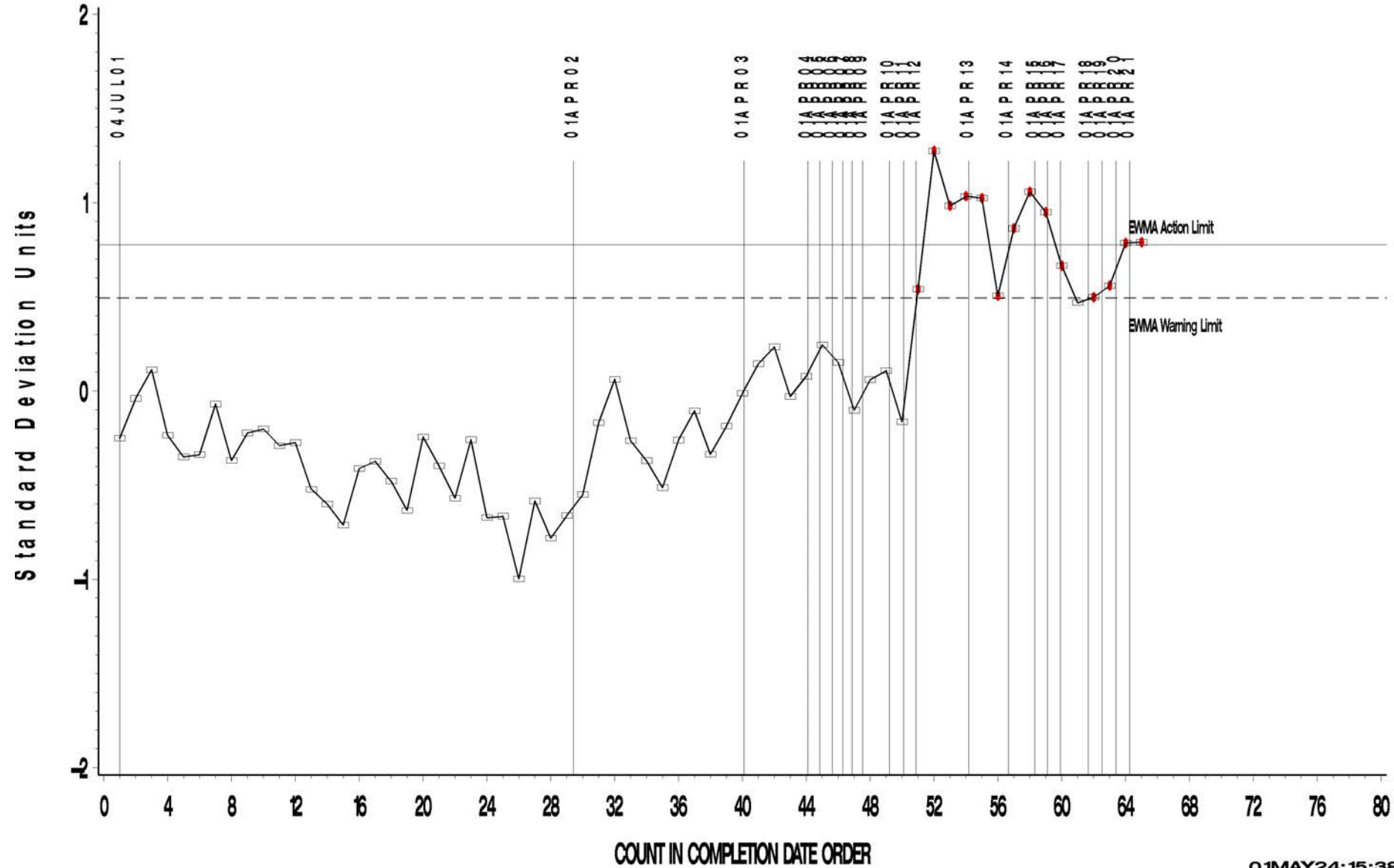
FINAL EOTOC (g/h)

LTMS Severity Analysis



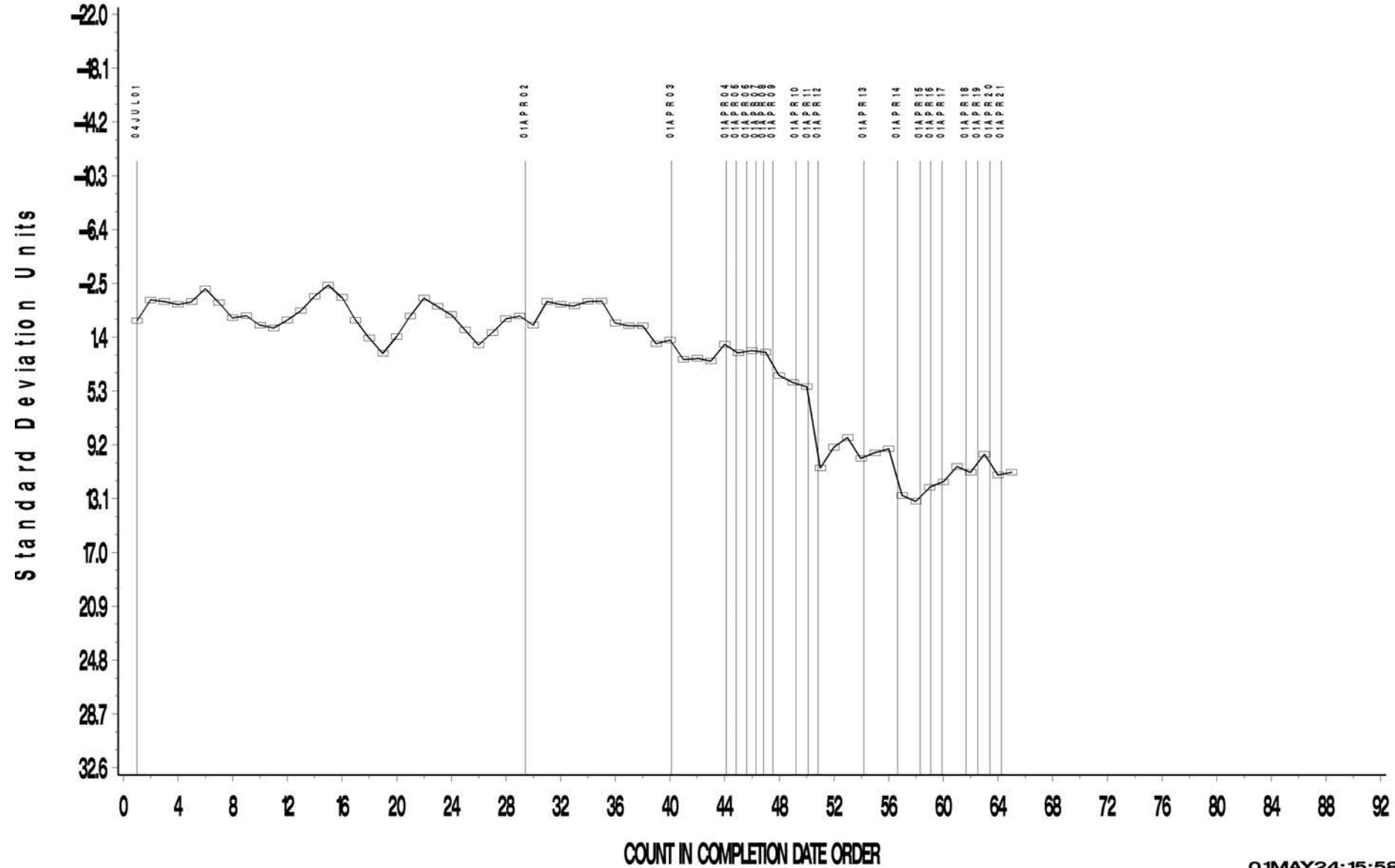
FINAL EOTOC (g/h)

LTMS Precision Analysis



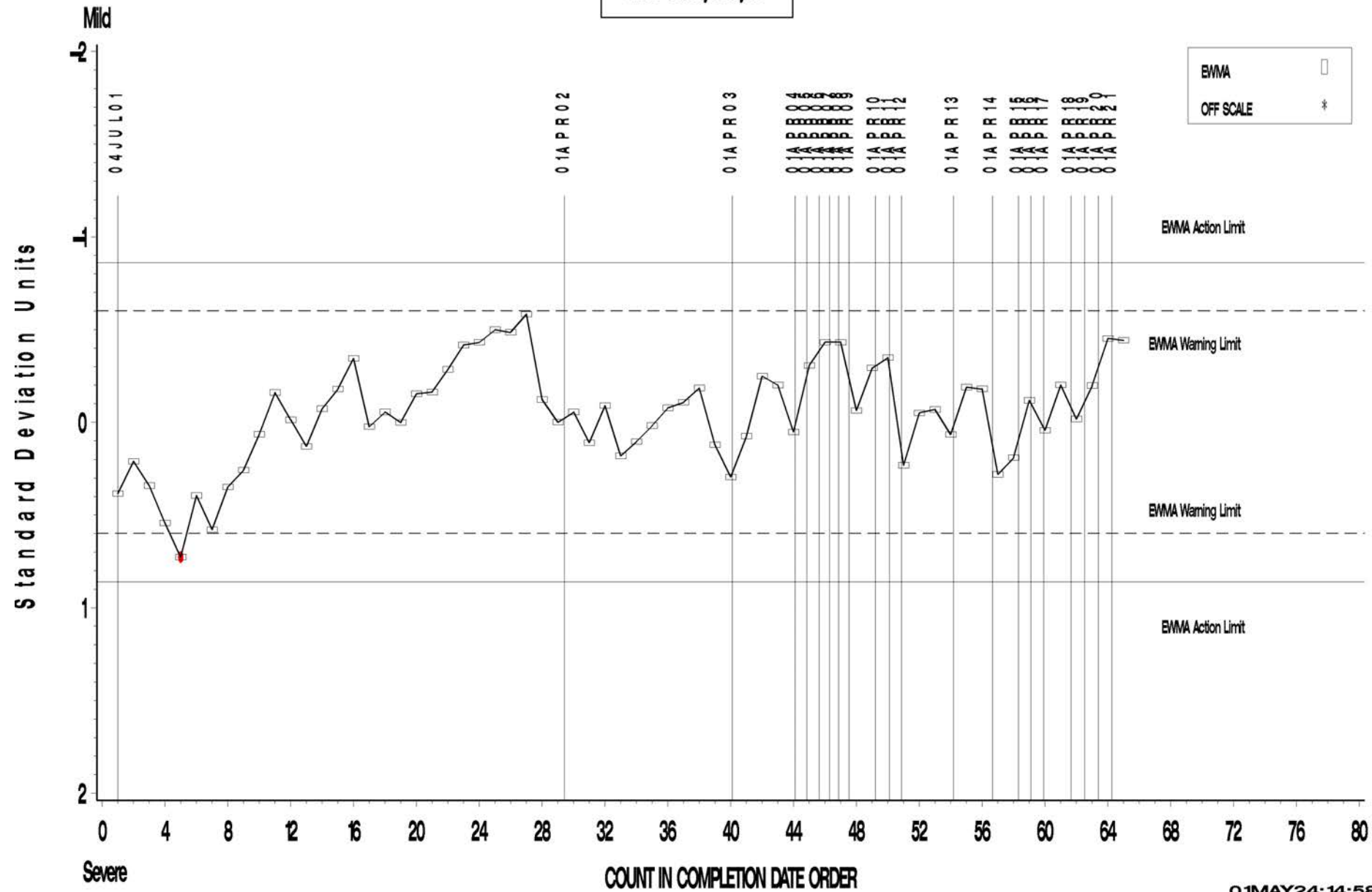
FINAL EOTOC (g/h)

CUSUM Severity Analysis



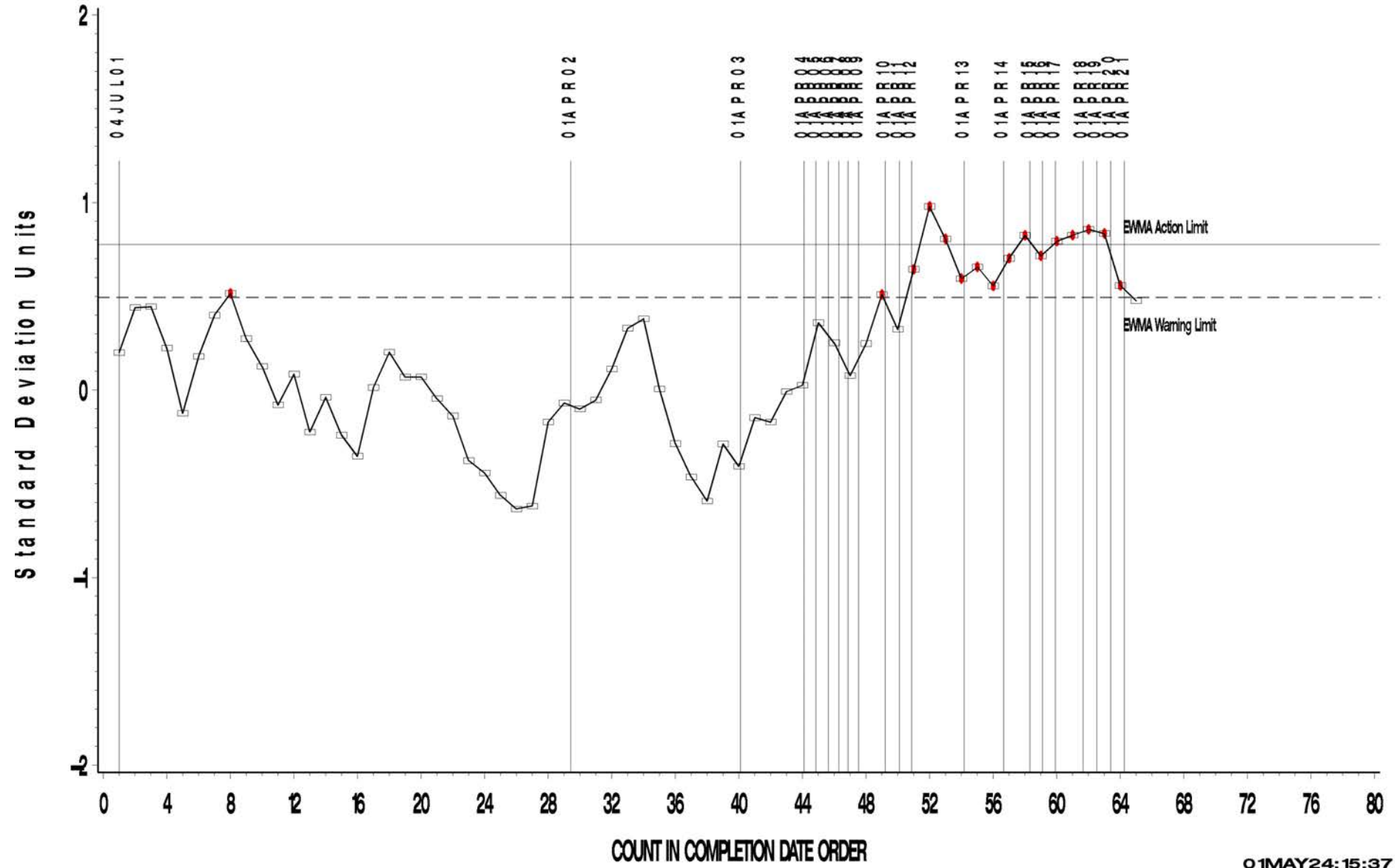
FINAL TOP GROOVE CARBON (DEMERITS)

LTMS Severity Analysis



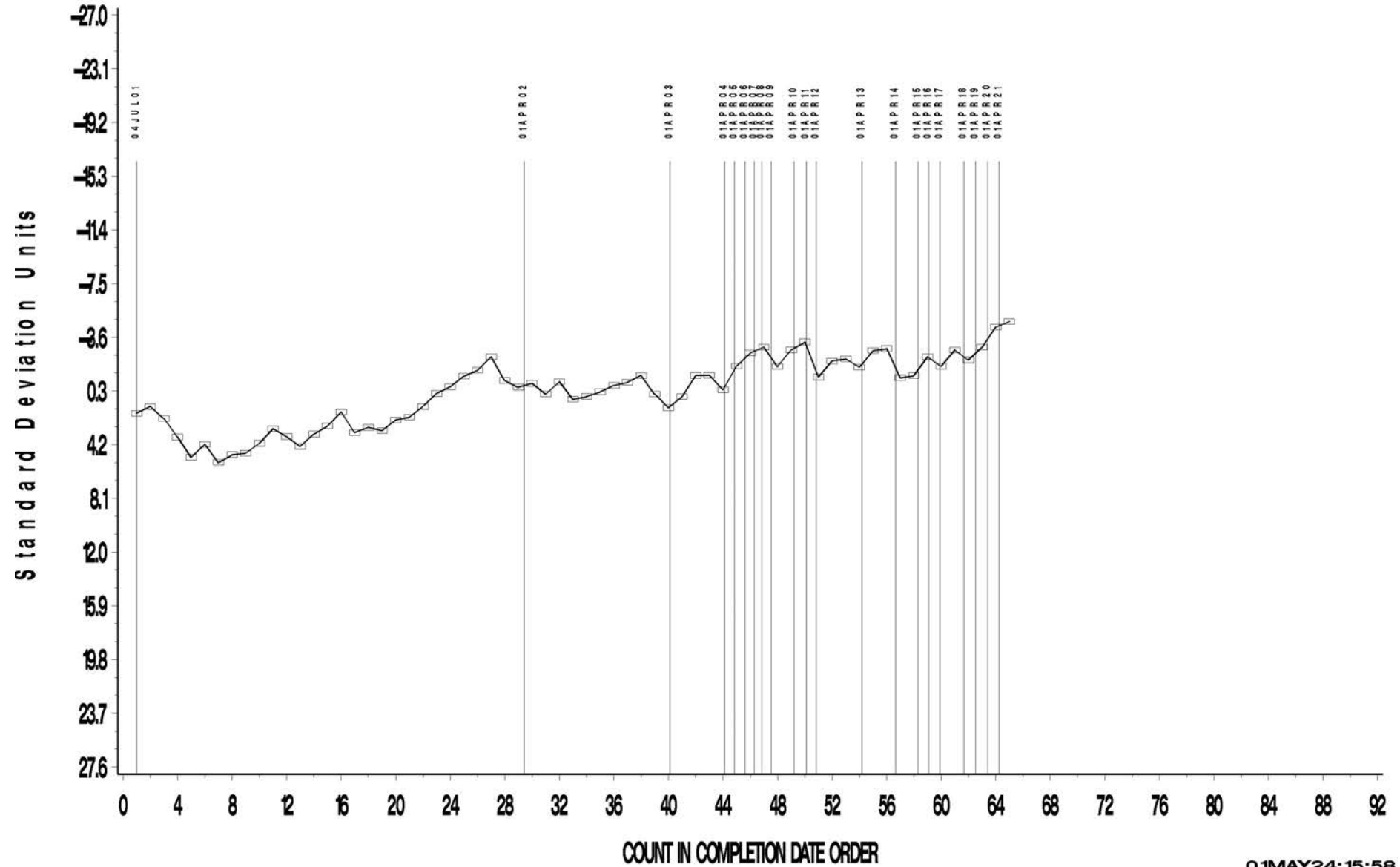
FINAL TOP GROOVE CARBON (DEMERITS)

LTMS Precision Analysis



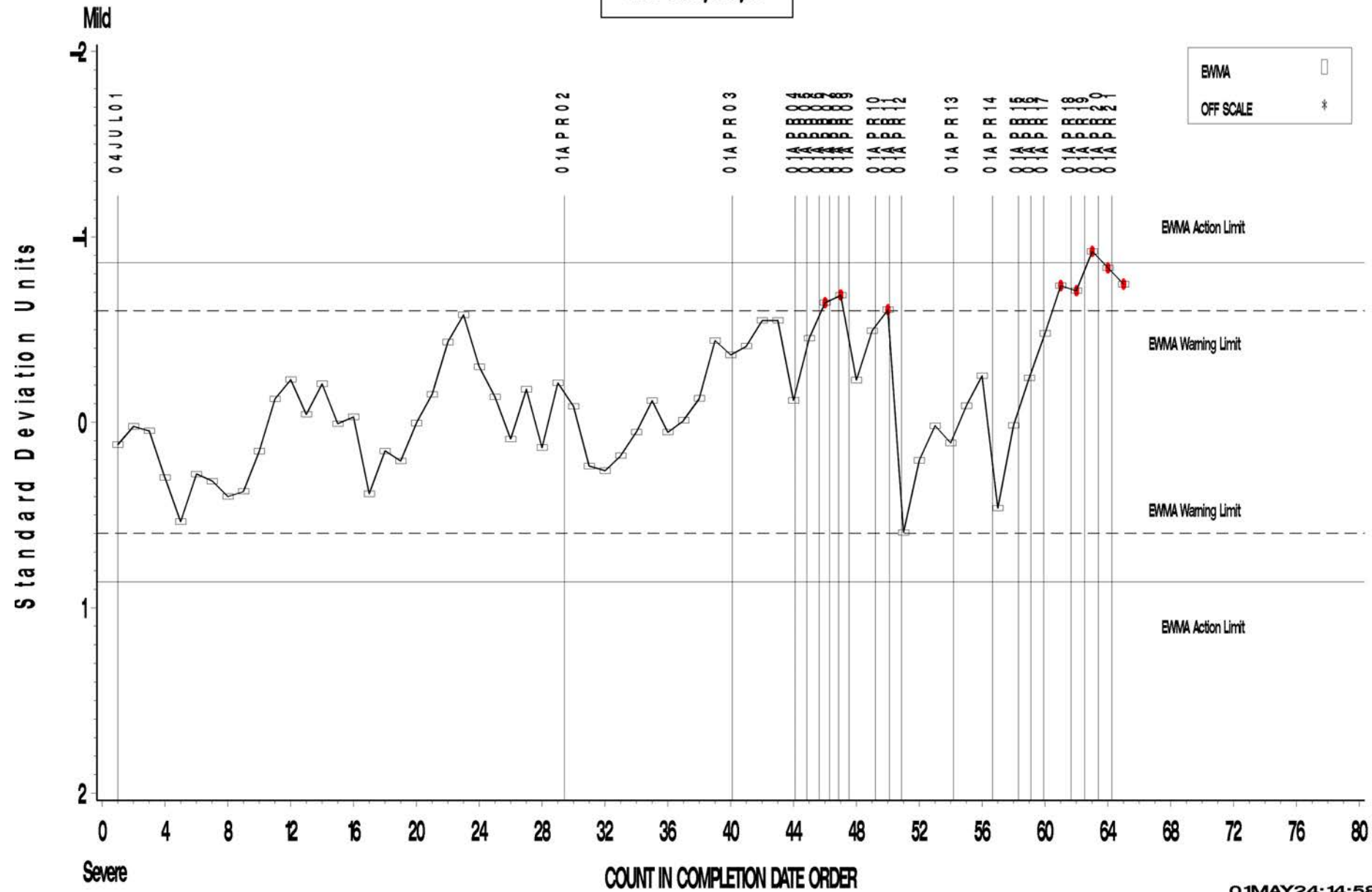
FINAL TOP GROOVE CARBON (DEMERITS)

CUSUM Severity Analysis



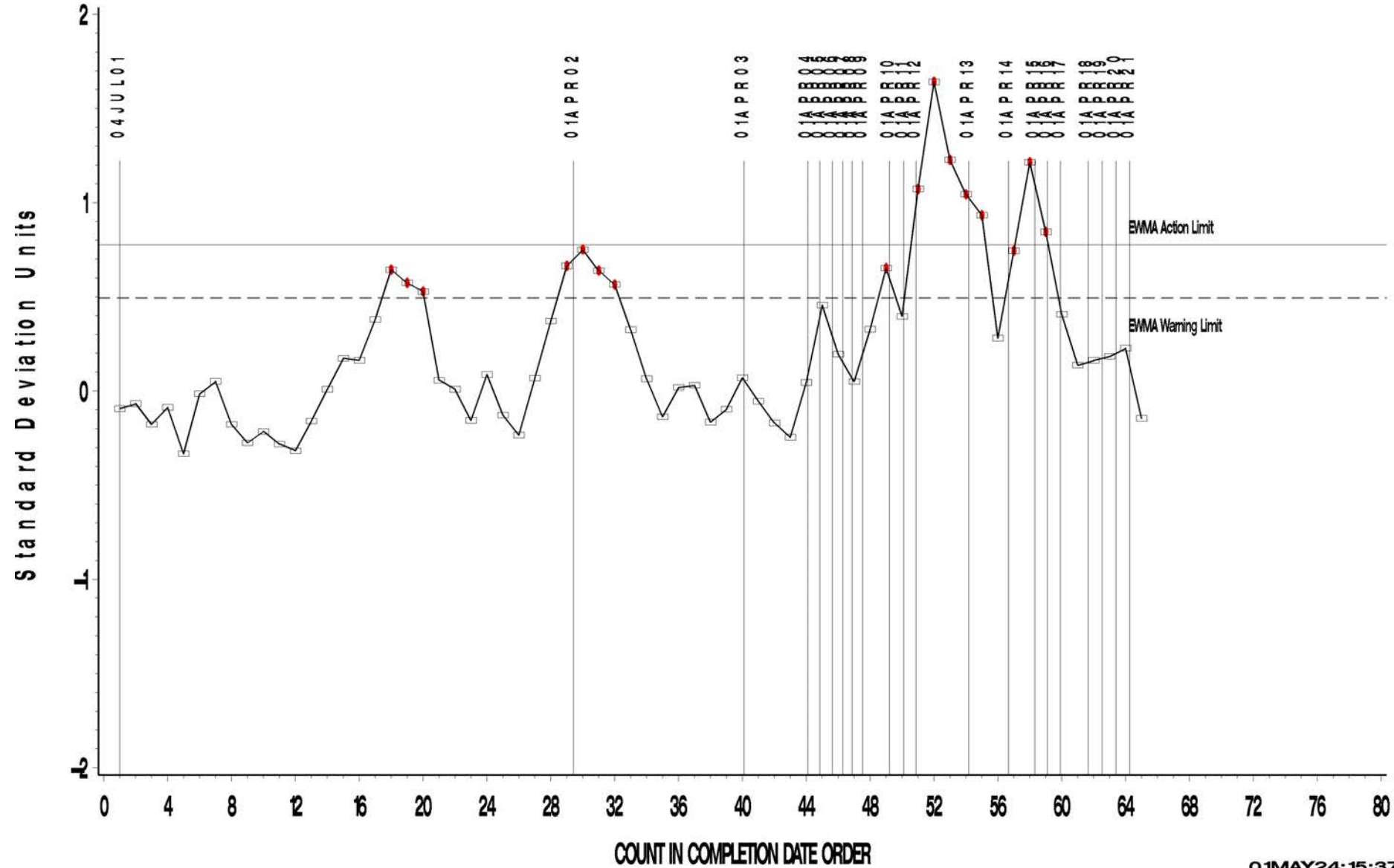
FINAL TOP LAND CARBON (DEMERITS)

LTMS Severity Analysis



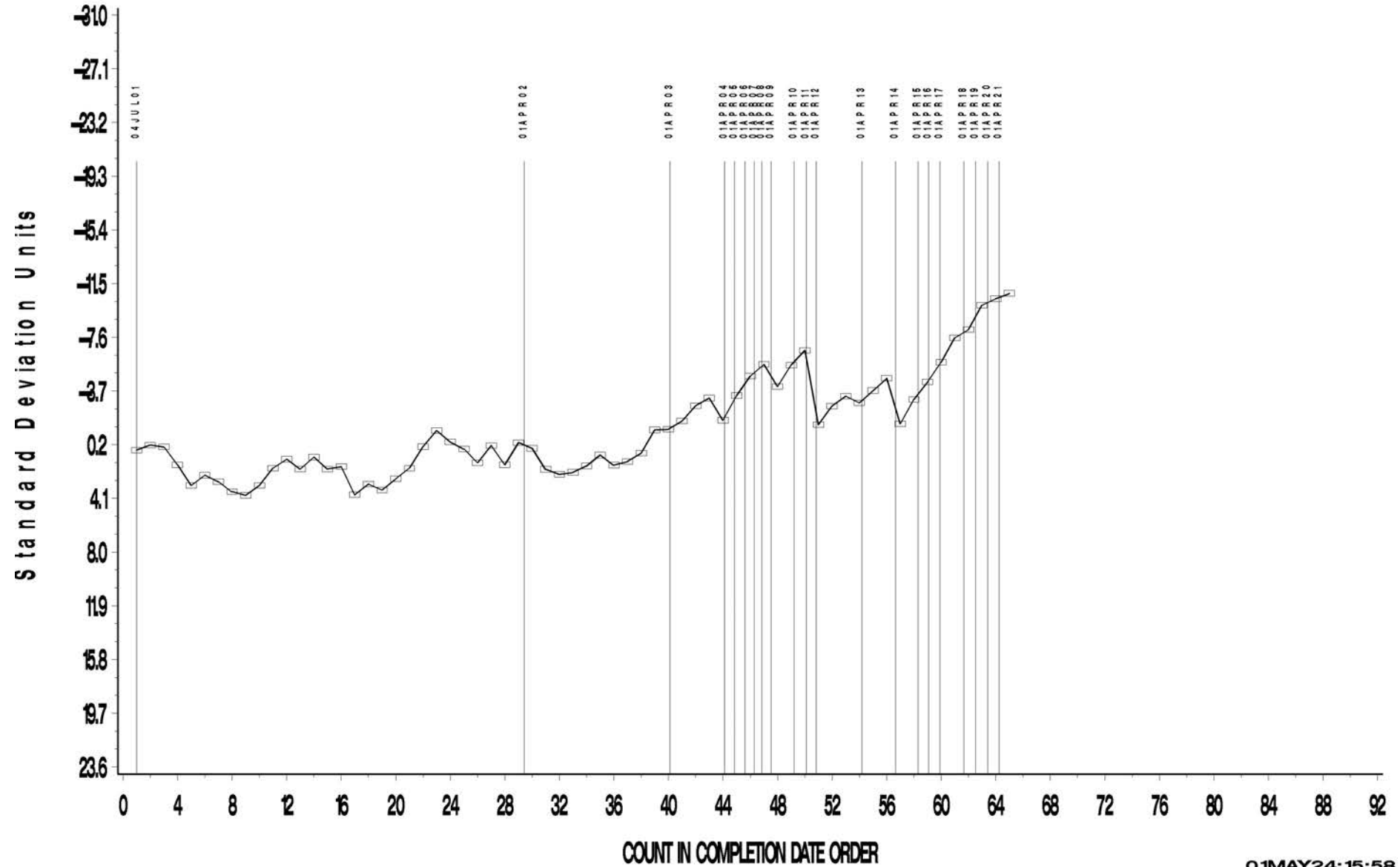
FINAL TOP LAND CARBON (DEMERITS)

LTMS Precision Analysis

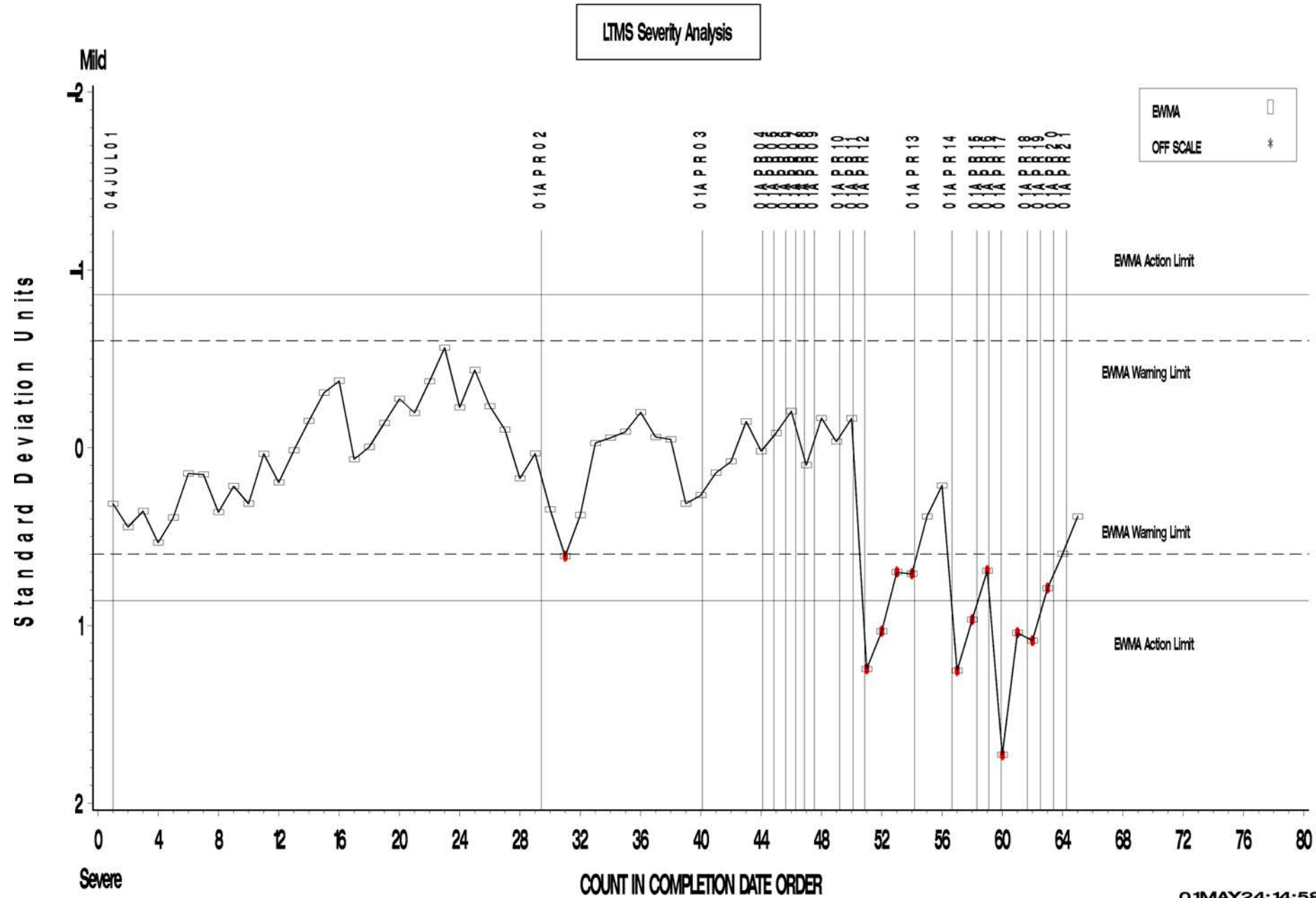


FINAL TOP LAND CARBON (DEMERITS)

CUSUM Severity Analysis

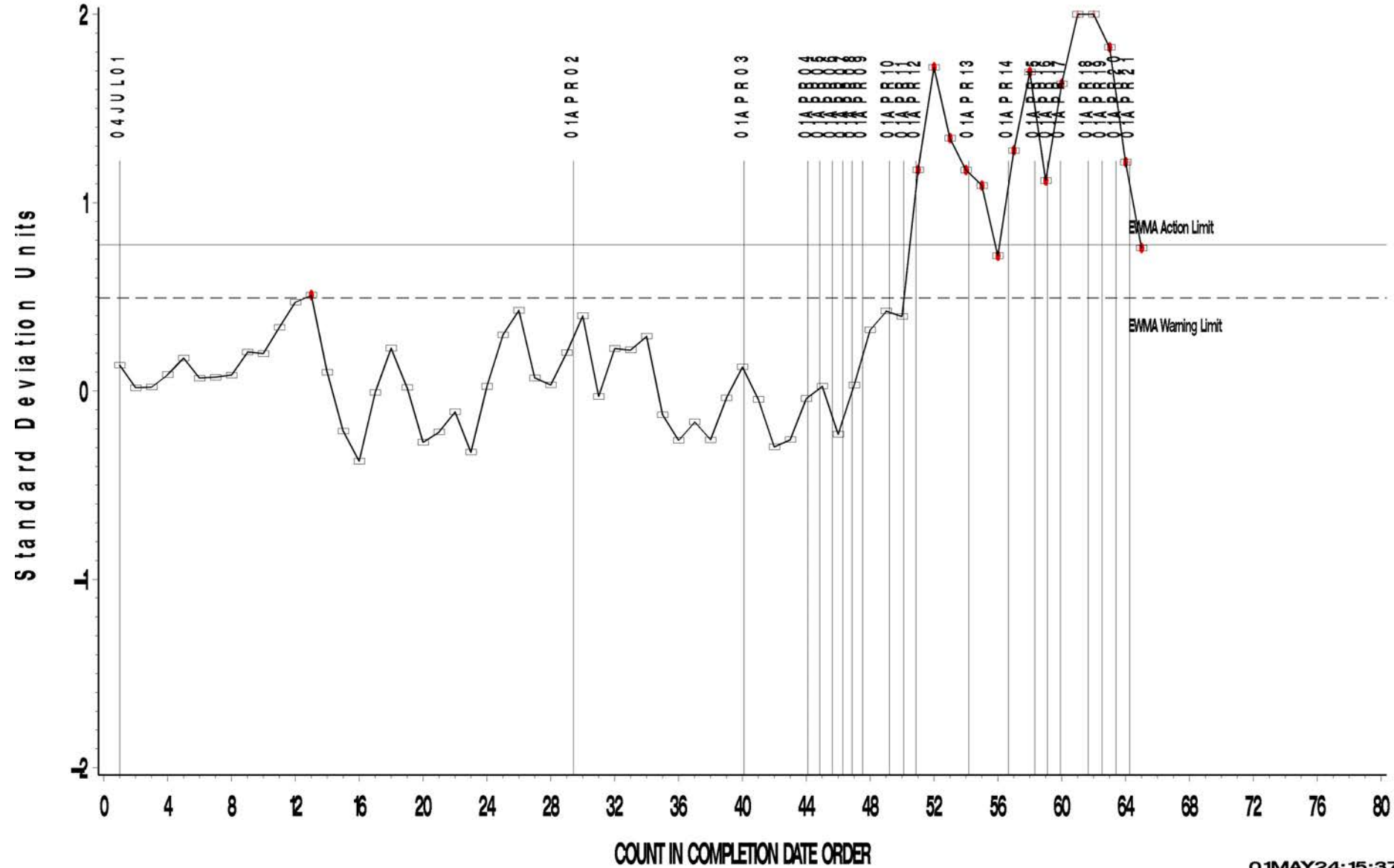


FINAL WEIGHTED TOTAL DEMERITS (DEMERITS)



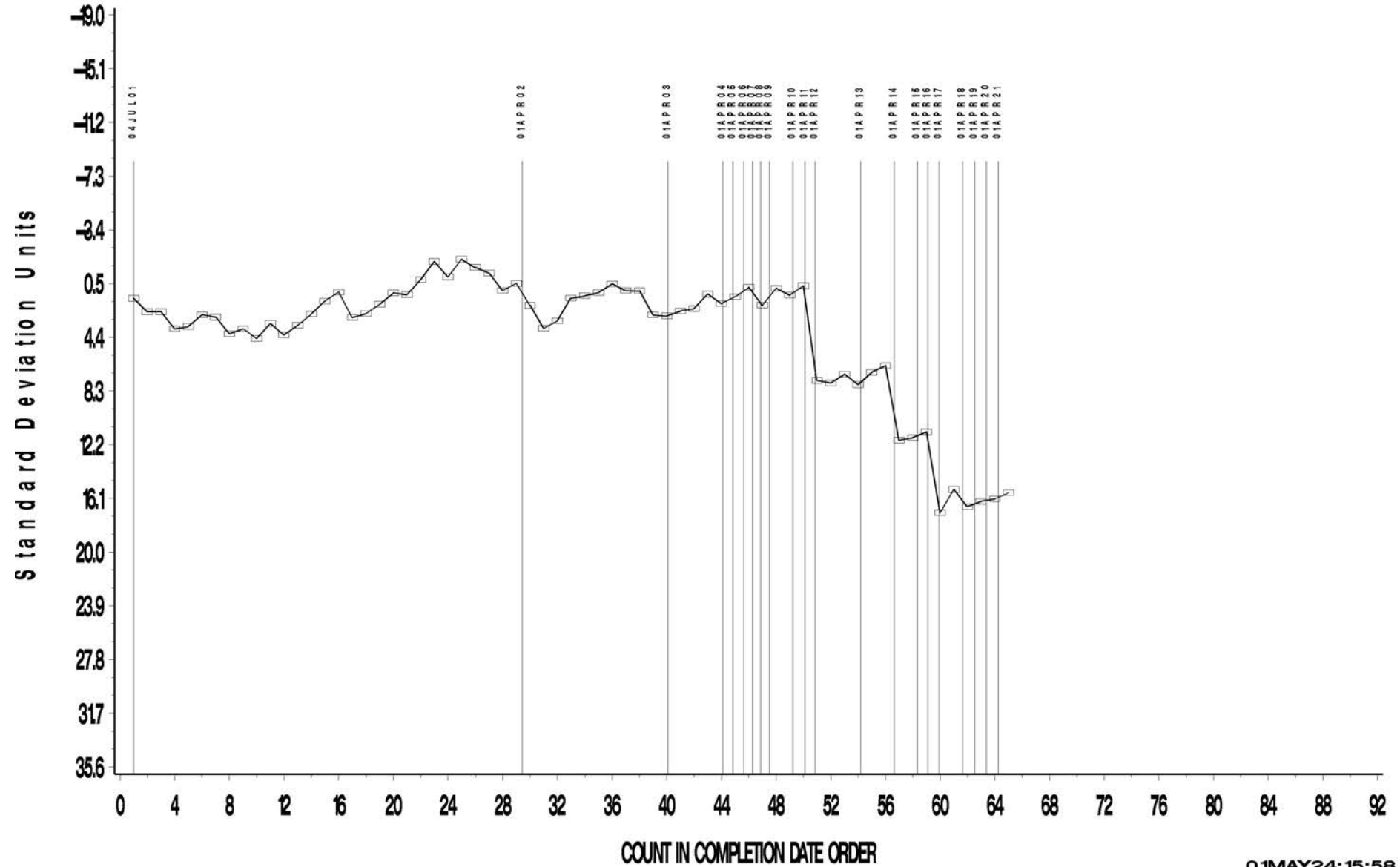
FINAL WEIGHTED TOTAL DEMERITS (DEMERITS)

LTMS Precision Analysis

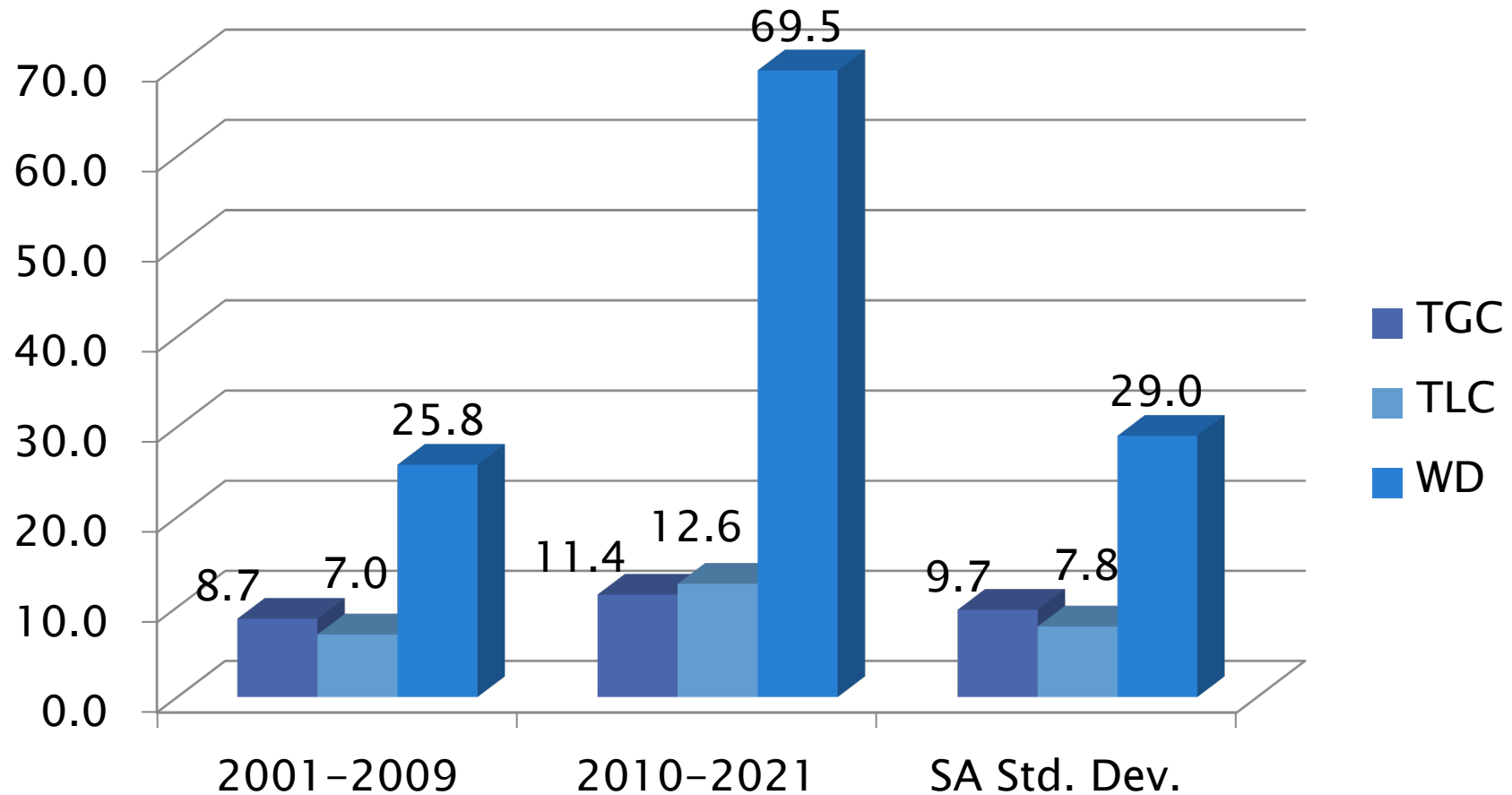


FINAL WEIGHTED TOTAL DEMERITS (DEMERITS)

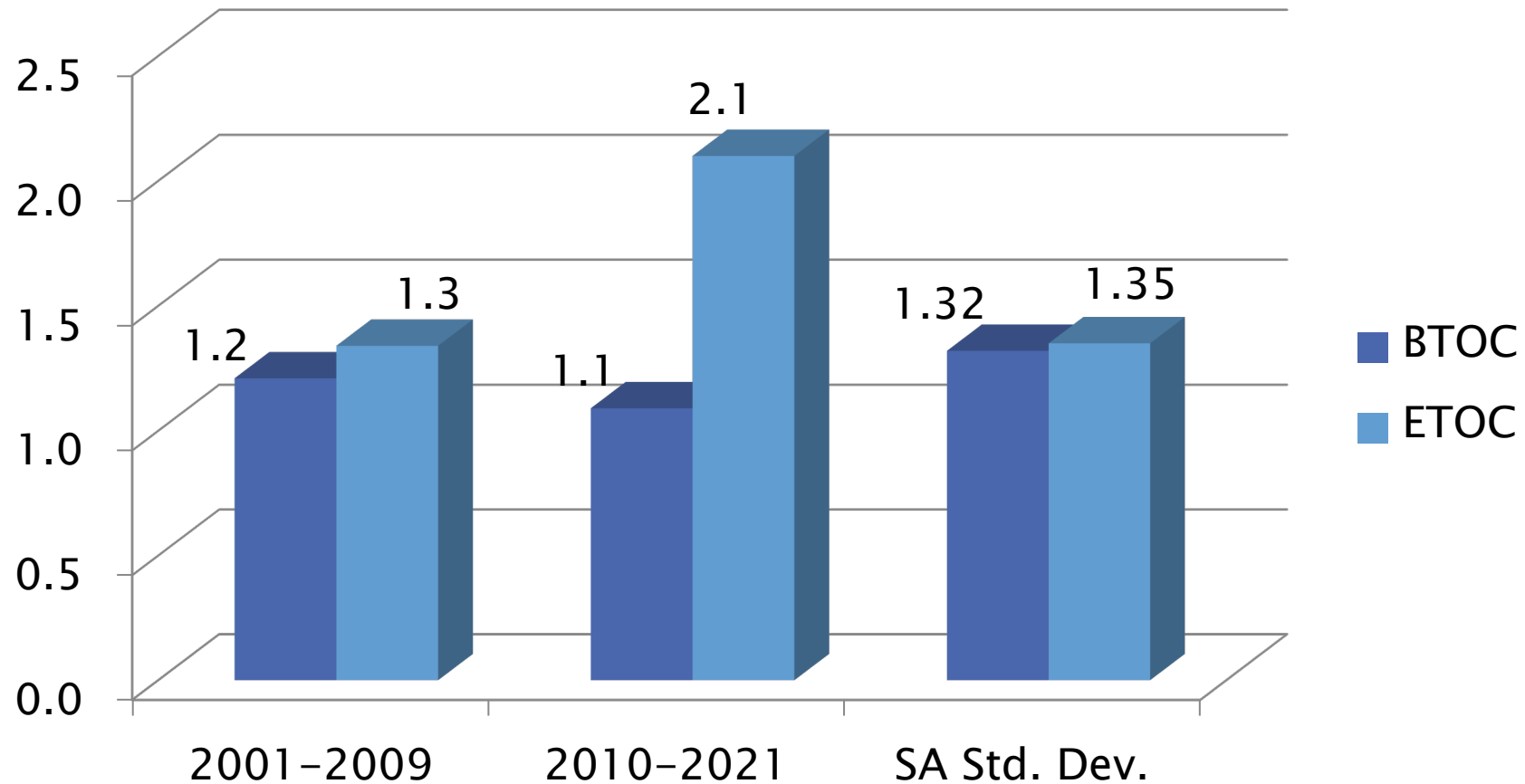
CUSUM Severity Analysis



1 R Precision Estimates



1 R Precision Estimates



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CAT C13

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C13 Test Activity

Test Status	Validity Code	C13
Acceptable Calibration Test	AC	2
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	1
Total		3

C13 Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

C13 Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	Driveline failure	1
Total		1

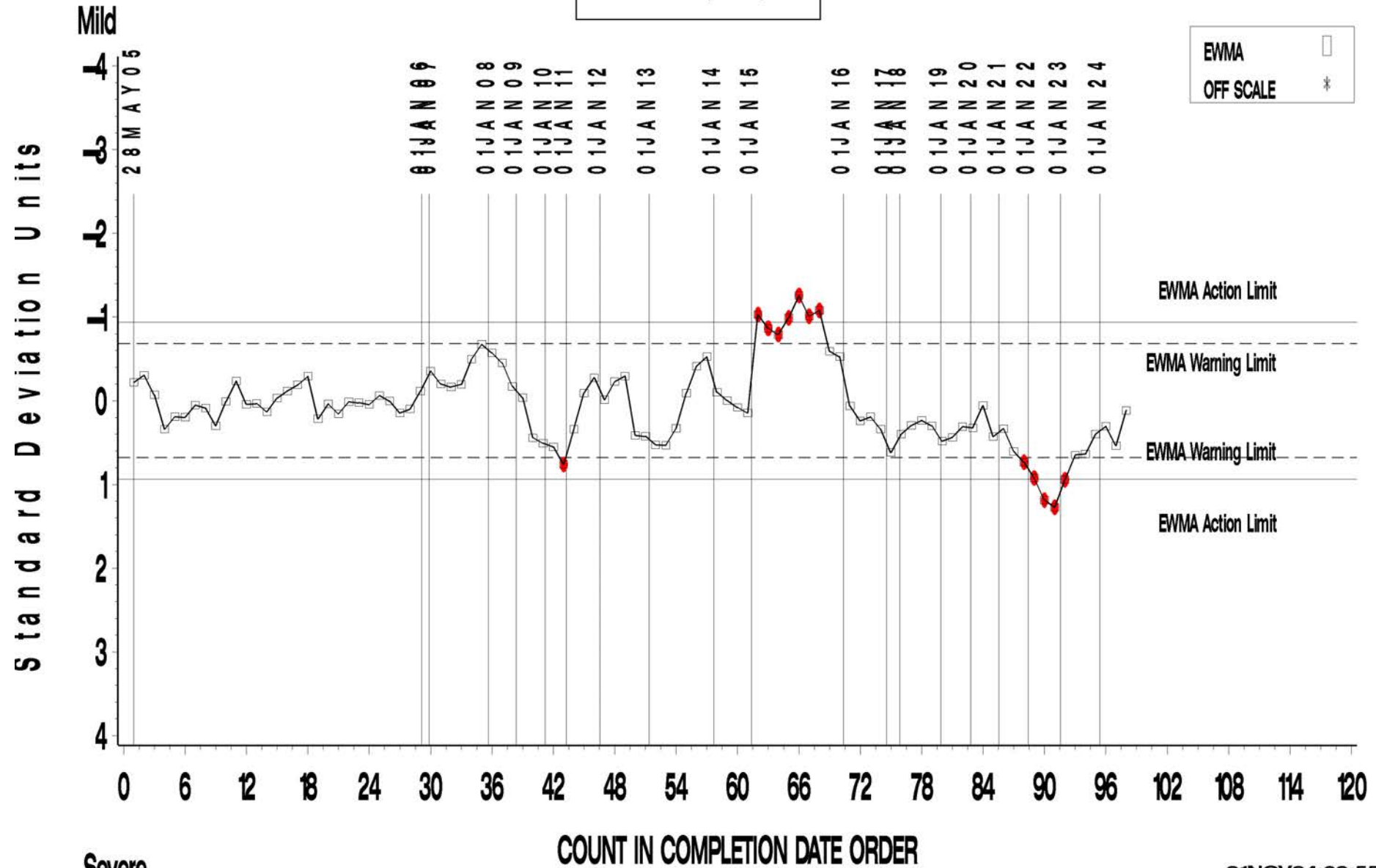
*Invalid and aborted tests

C13 Test Severity

- ▶ TLC is in severity warning alarm in the mild direction. Near action alarm.
- ▶ 2RTC is in severity action alarm in severe direction.
- ▶ All other parameters are in control

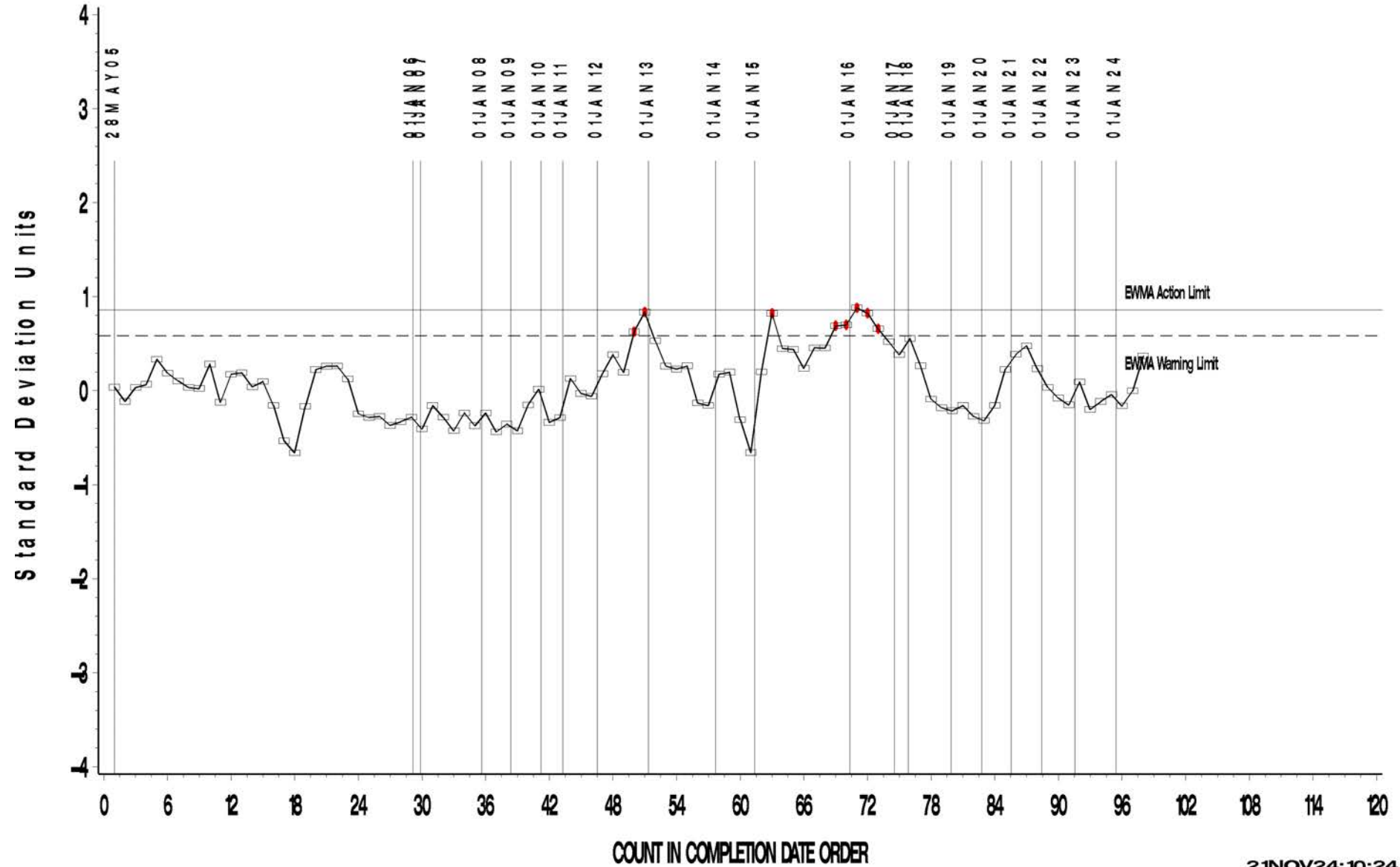
OIL CONS. DELTA — FINAL RESULT

LTMS Severity Analysis



OIL CONS. DELTA — FINAL RESULT

LTMS Precision Analysis



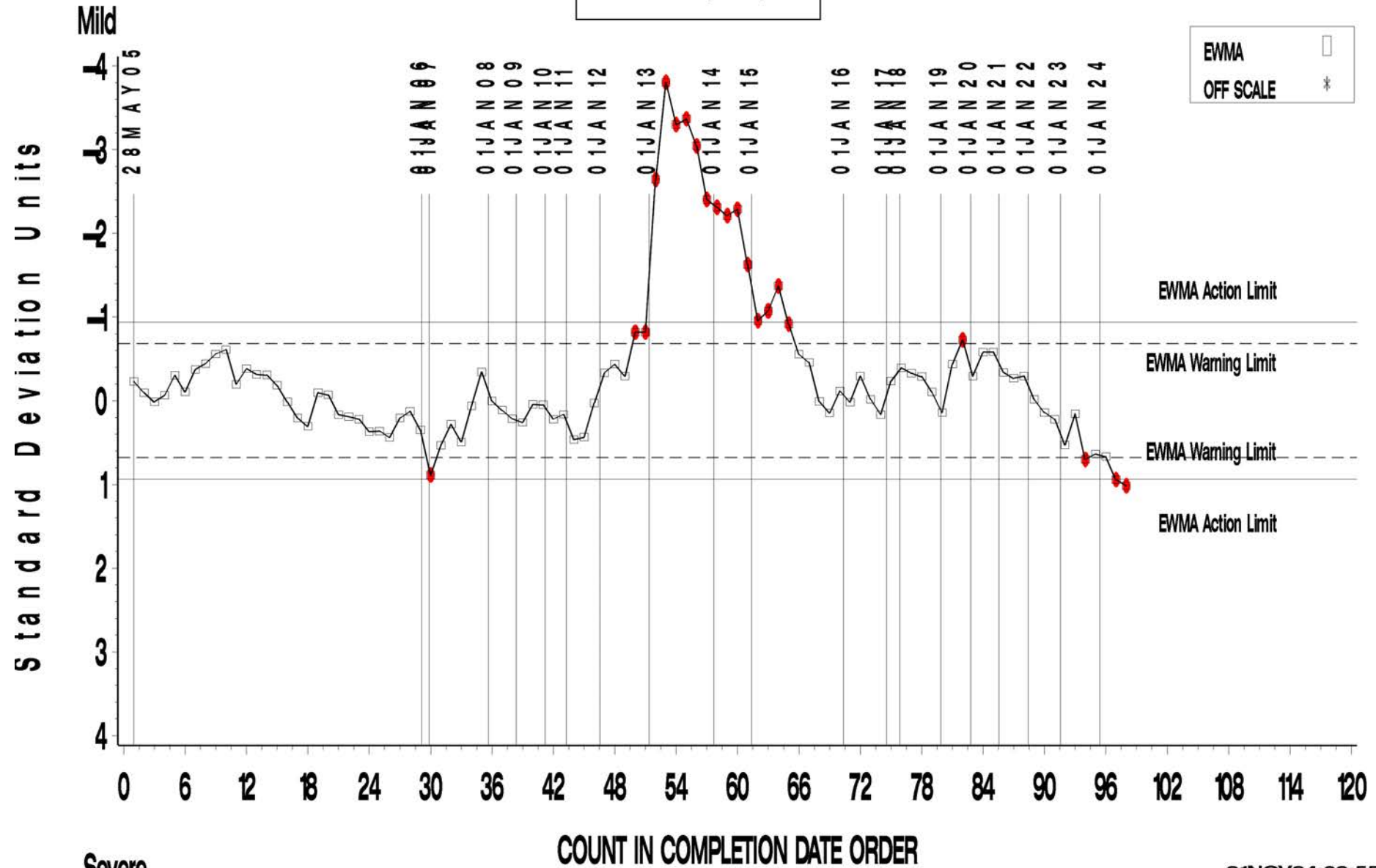
OIL CONS. DELTA — FINAL RESULT

CUSUM Severity Analysis



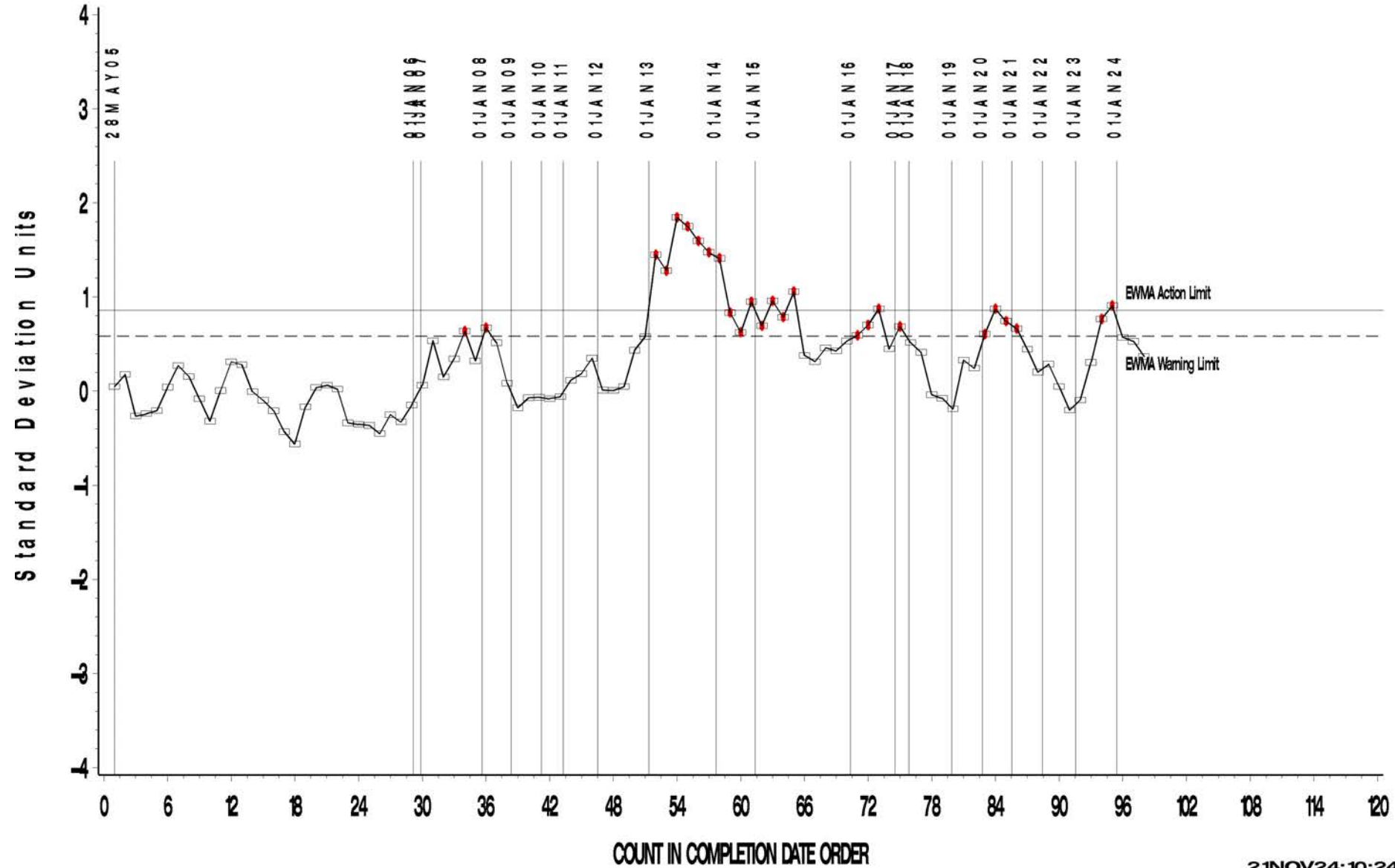
2ND RING TOP CARBON AVG. — FINAL RESULT

LTMS Severity Analysis



2ND RING TOP CARBON AVG. — FINAL RESULT

LTMS Precision Analysis



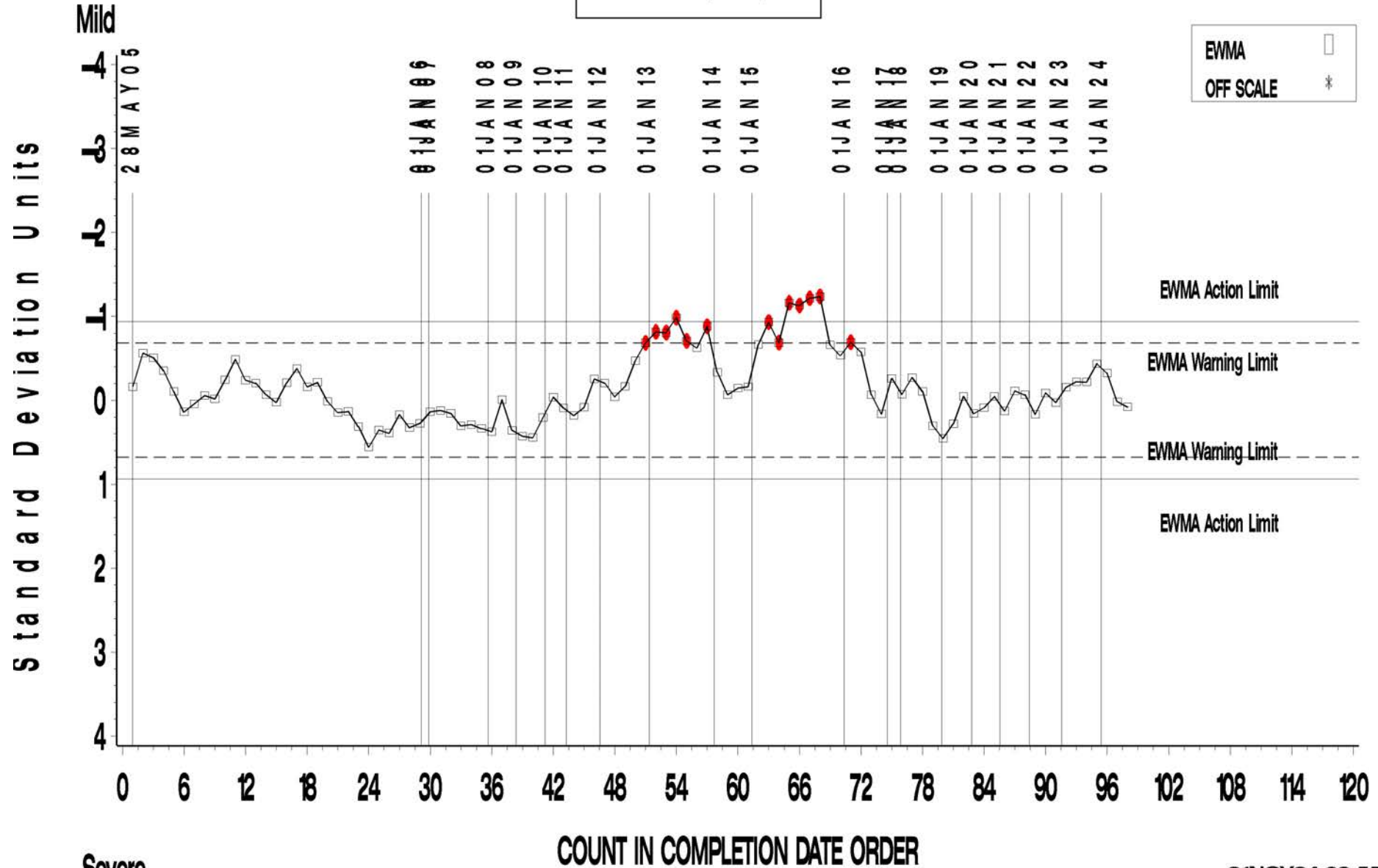
2ND RING TOP CARBON AVG. — FINAL RESULT

CUSUM Severity Analysis



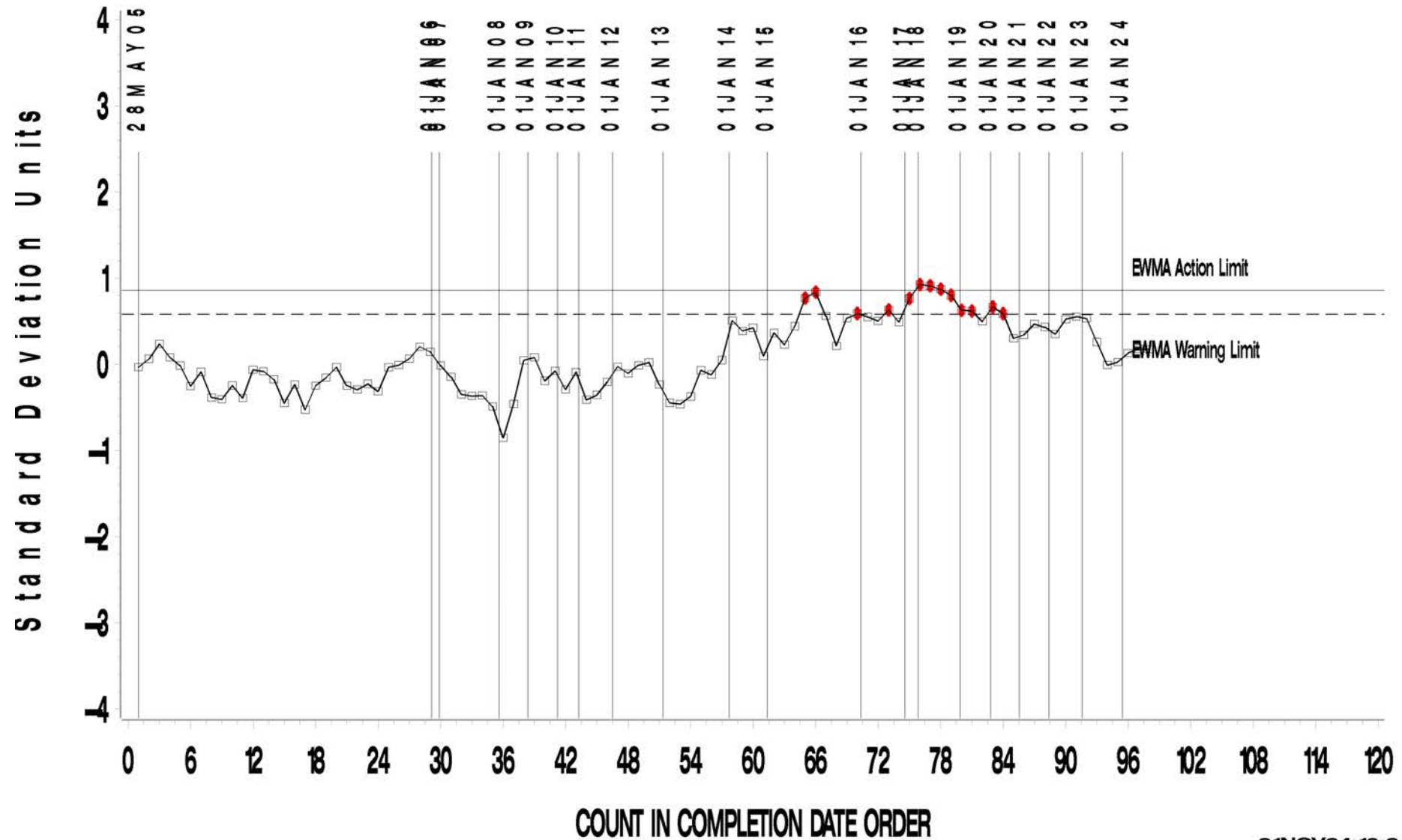
TOP GROOVE CARBON AVG — FINAL RESULT

LTMS Severity Analysis



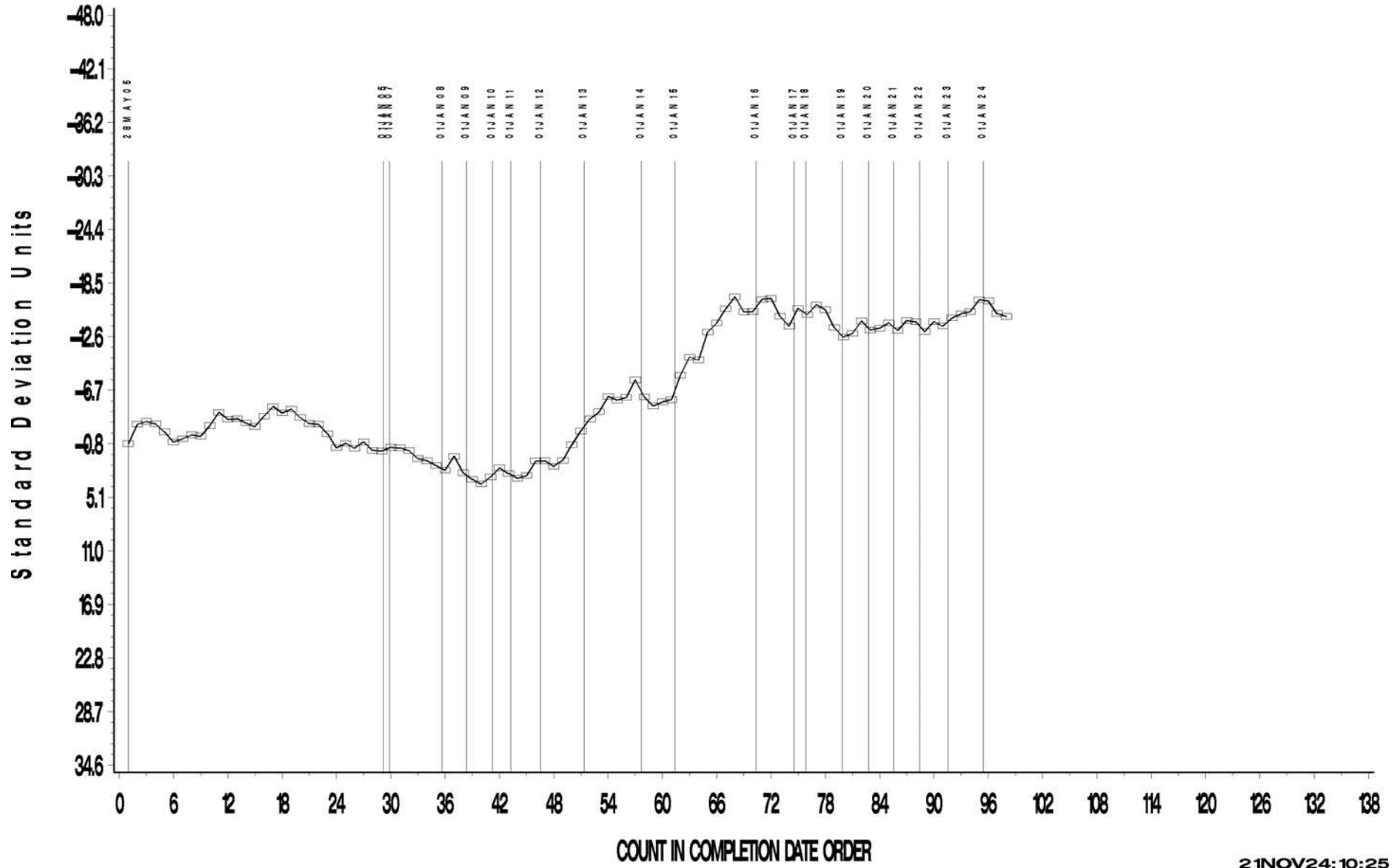
TOP GROOVE CARBON AVG — FINAL RESULT

LTMS Precision Analysis



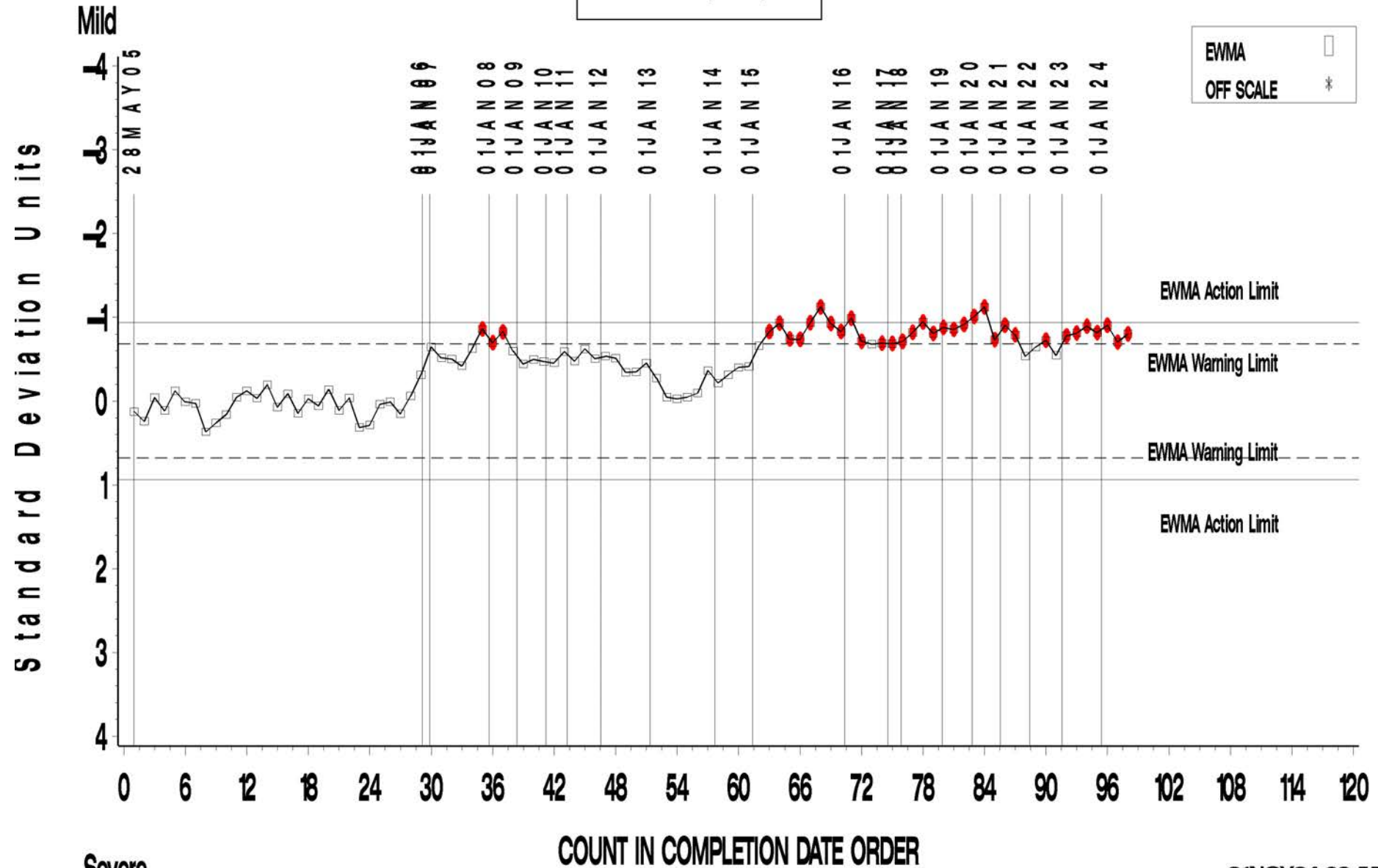
TOP GROOVE CARBON AVG — FINAL RESULT

CUSUM Severity Analysis



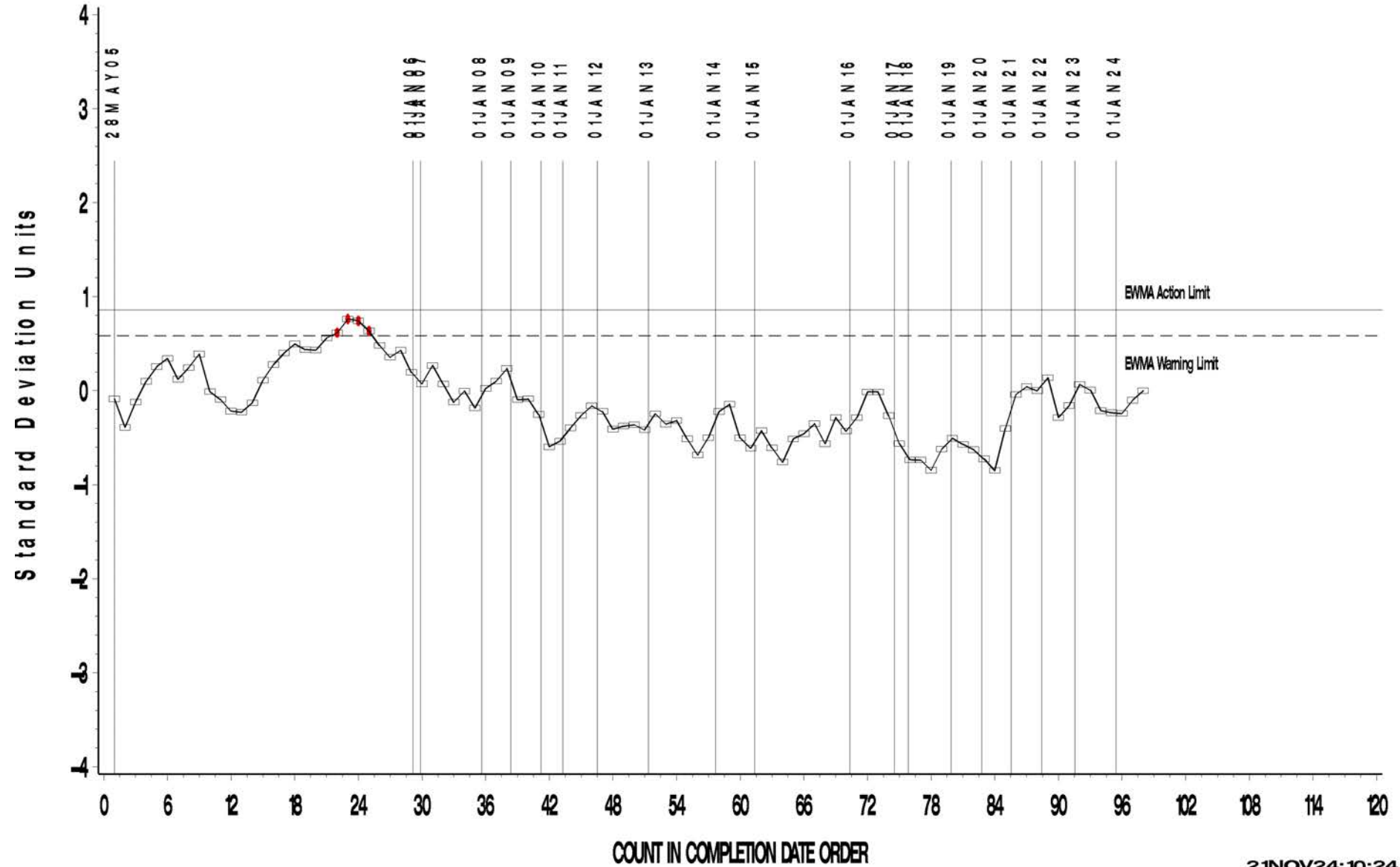
TOP LAND CARBON AVG. — FINAL RESULT

LTMS Severity Analysis



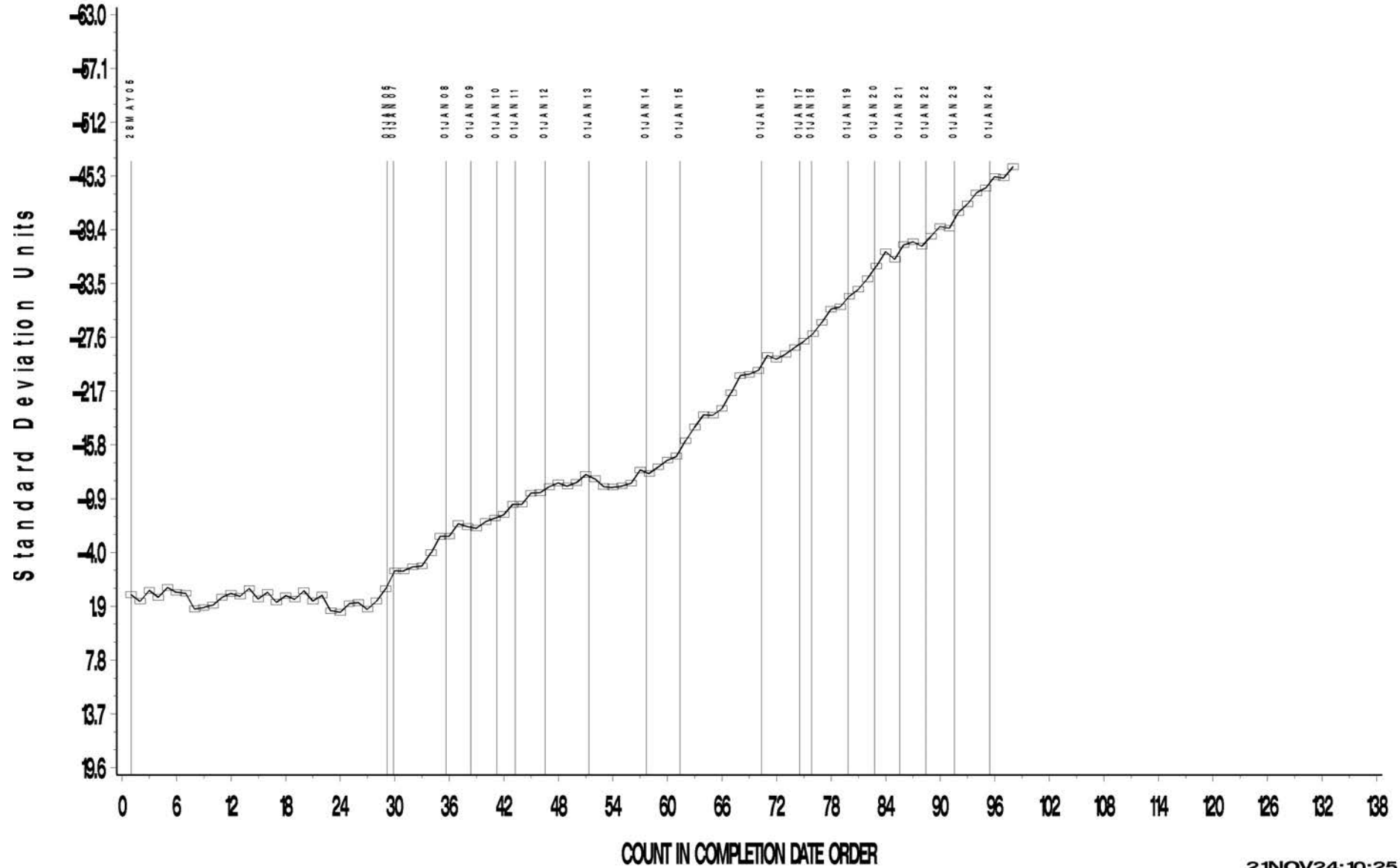
TOP LAND CARBON AVG. — FINAL RESULT

LTMS Precision Analysis

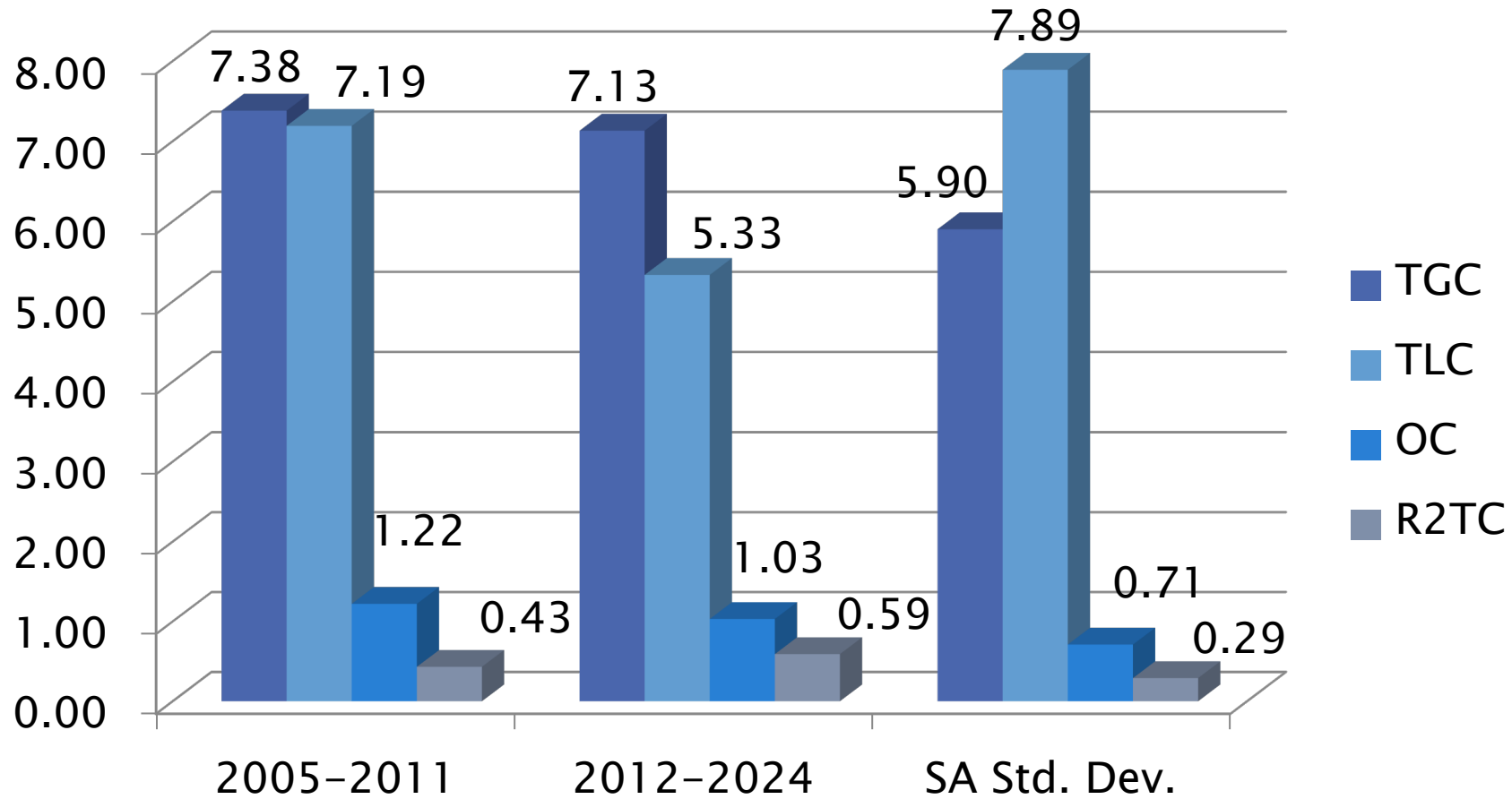


TOP LAND CARBON AVG. — FINAL RESULT

CUSUM Severity Analysis



C13 Precision Estimates



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Test Monitoring Center
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C13 Oil Aeration (COAT)

»» October 2024

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



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COAT Test Activity

Test Status	Validity Code	COAT
Acceptable Calibration Test	AC	2
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Informational	NN	2
Total		4

COAT Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

COAT Lost Tests*

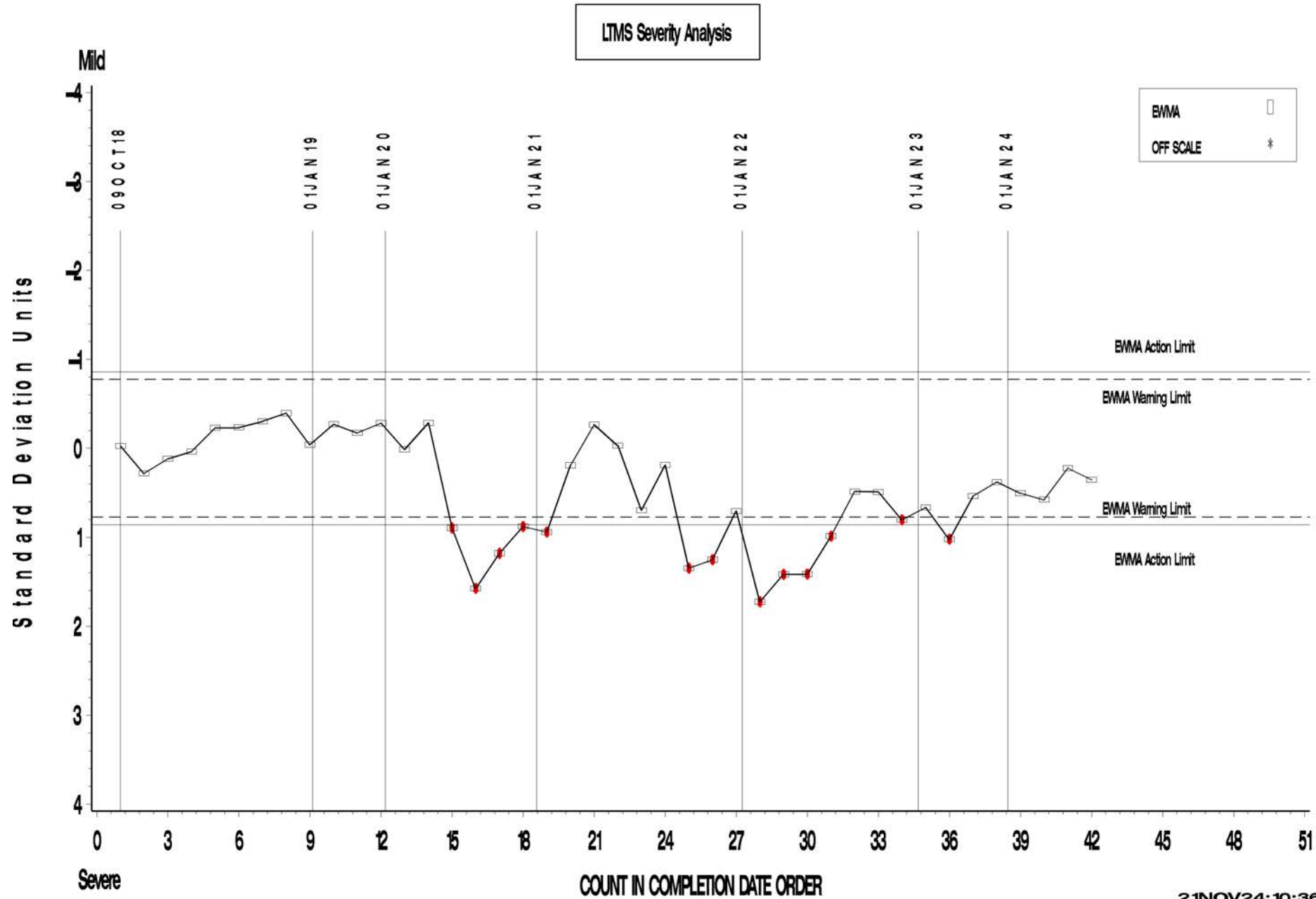
Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

*Invalid and aborted tests

COAT Test Severity

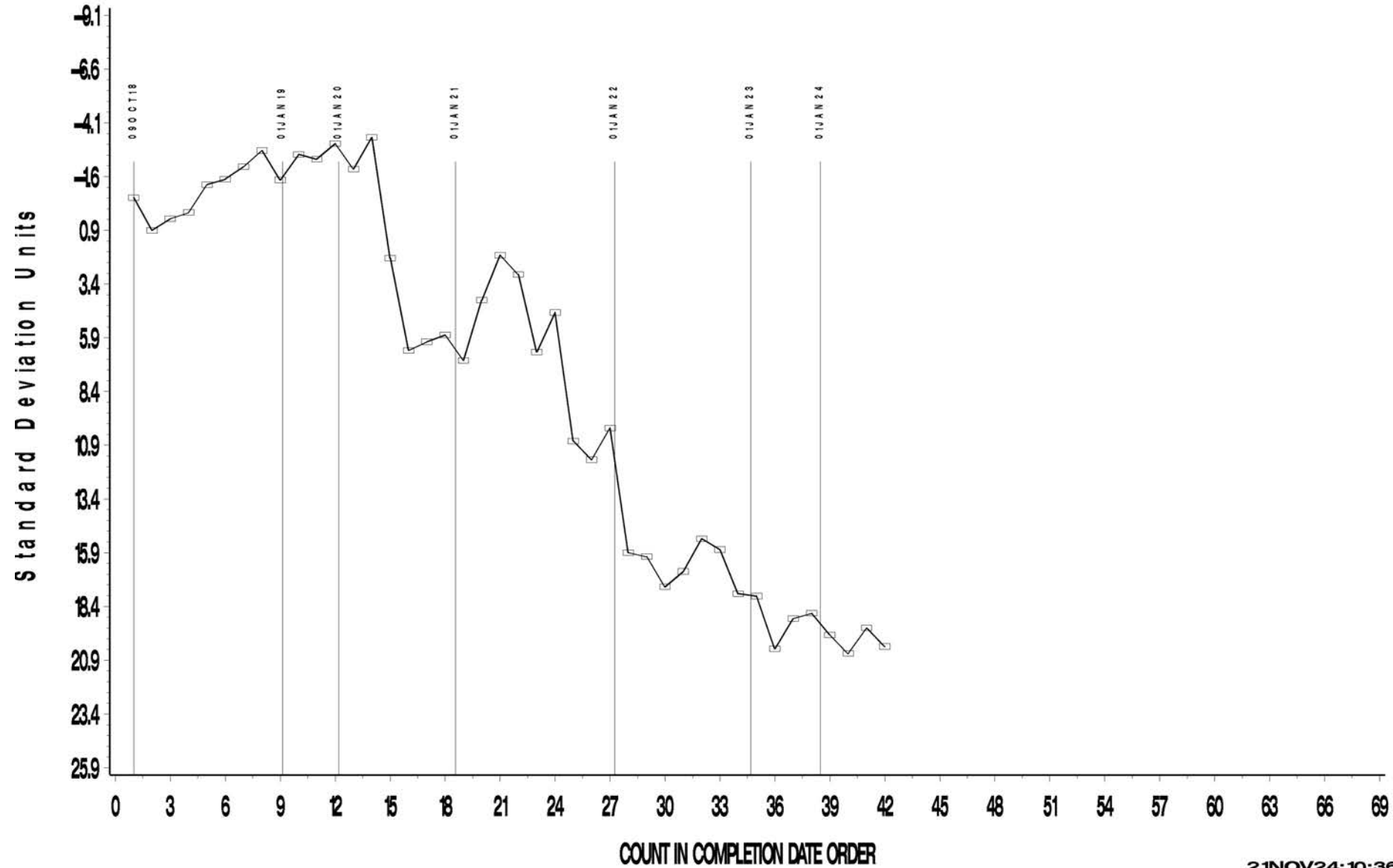
- ▶ AAVE is in control

CORRECTED AVERAGE OIL AERATION OVER TEST HOURS 40 —50



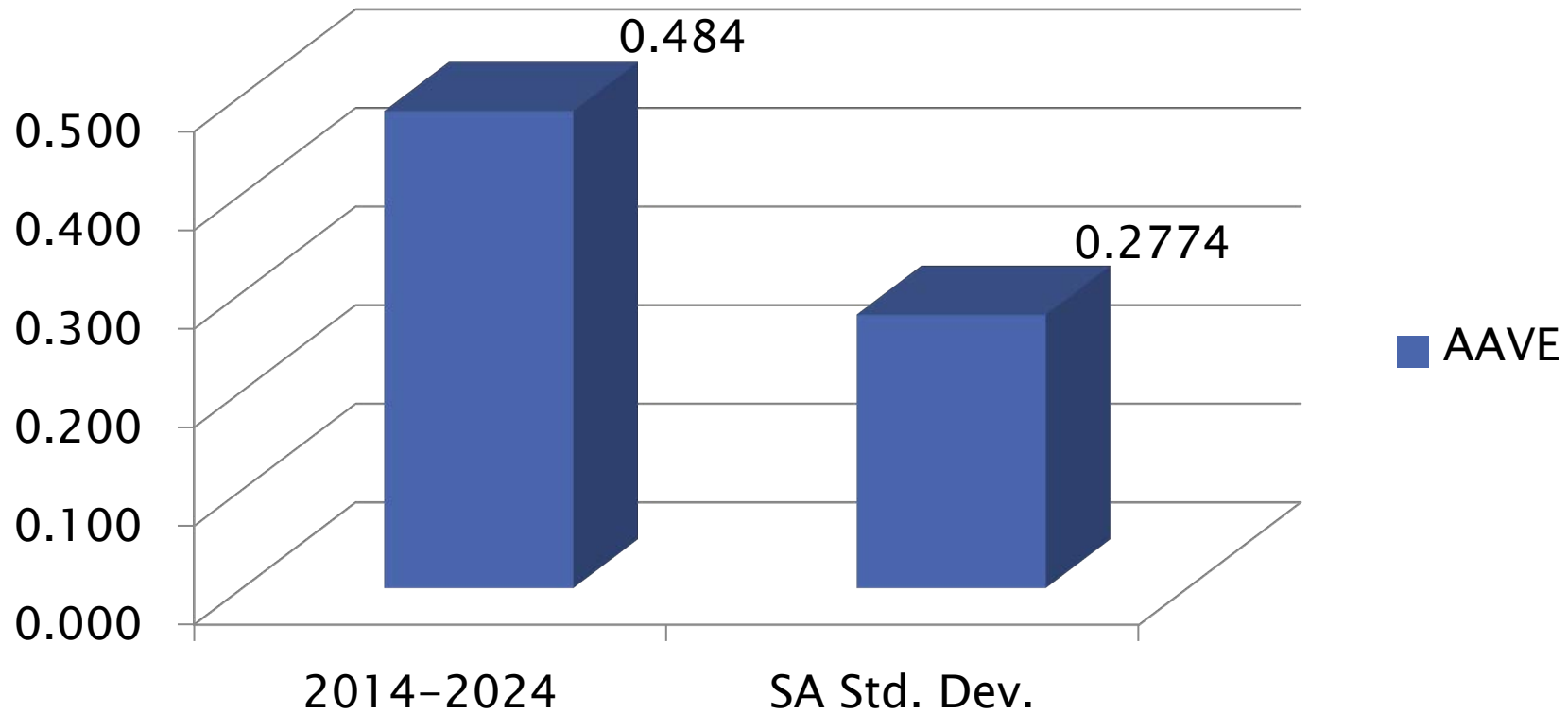
CORRECTED AVERAGE OIL AERATION OVER TEST HOURS 40 — 50

CUSUM Severity Analysis



COAT Precision Estimates

AAVE



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Daimler DD13 Scuffing Test

»» October 2024

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



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DD13 Test Activity

Test Status	Validity Code	COAT
Acceptable Calibration Test	AC	3
Failed Calibration Test	OC	1
Operationally Invalid	LC	1
Aborted	XC	0
Valid Matrix Test	AM	7
Aborted Matrix Test	XM	1
Total		13

DD13 Failed Tests

Failed Parameter	Number of Tests
HRS2 Mild	1
Total	1

DD13 Lost Tests*

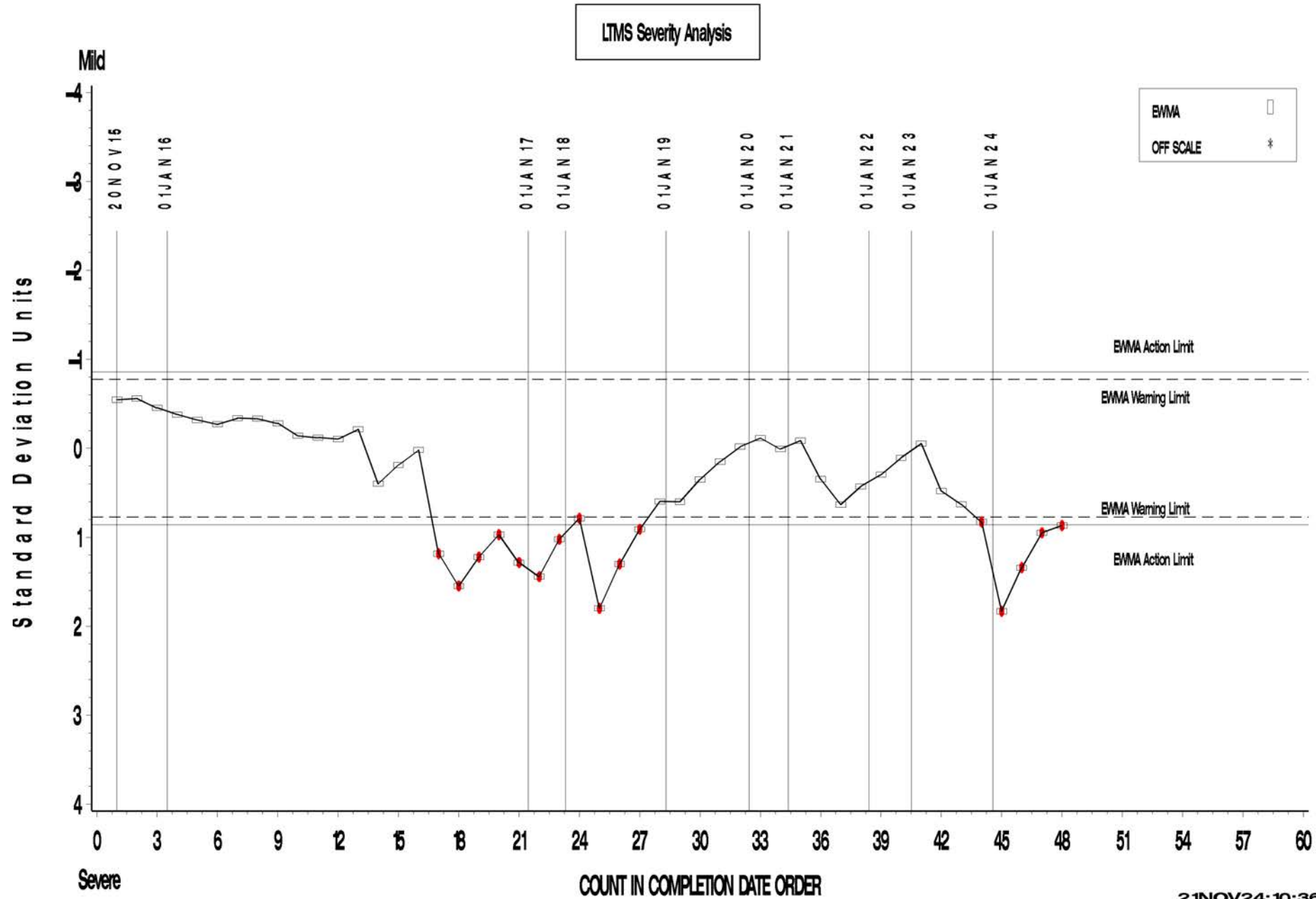
Status	Cause	#
Invalid	Scuff before 30 Hrs	1
Aborted	Matrix test – Injector failure during break-in	1
Total		2

*Invalid and aborted tests

DD13 Test Severity

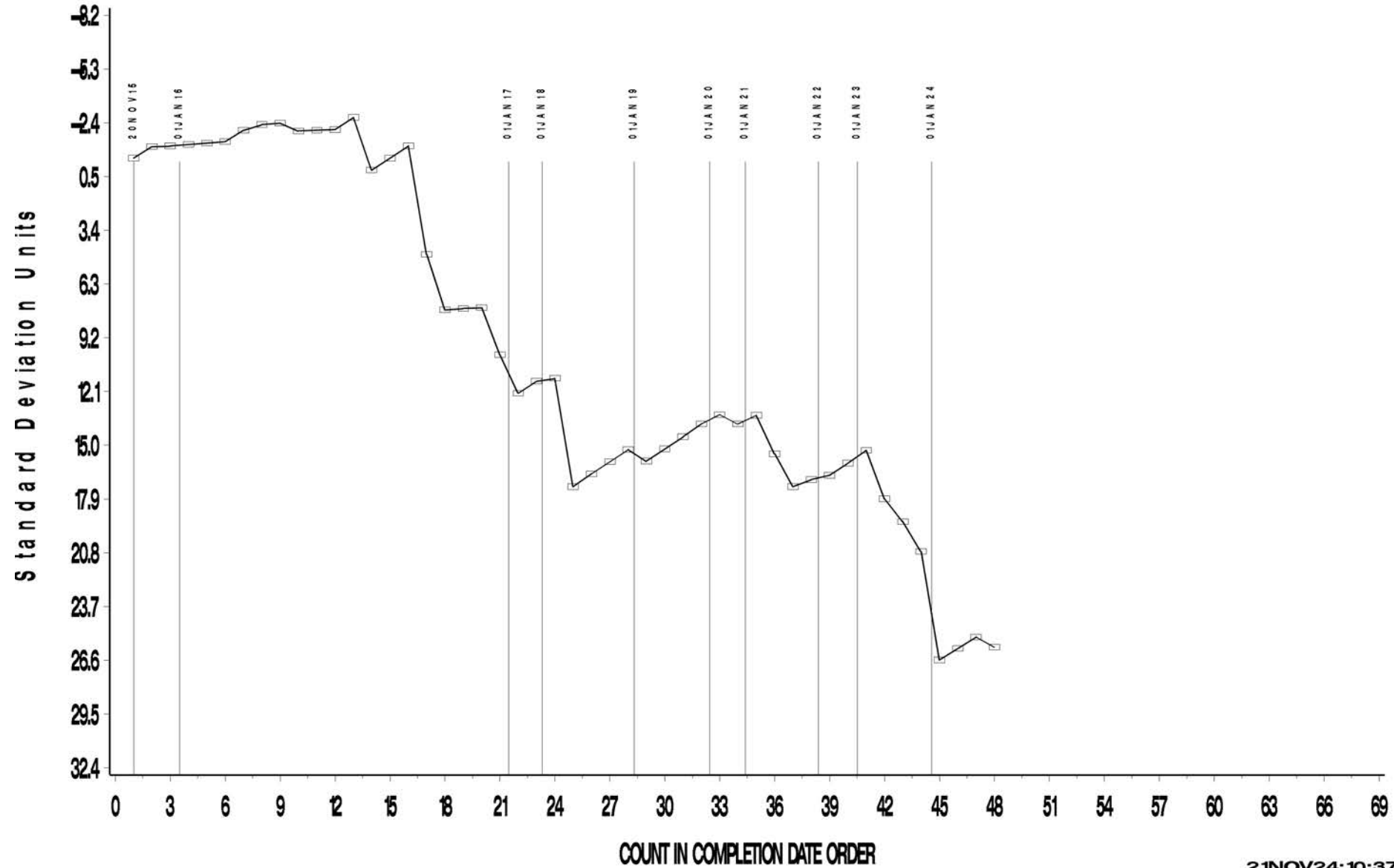
- ▶ HRS2 is in level 2 Zi alarm in the severe direction.

FNL. ORIG. UNIT HOURS TO SCUFF



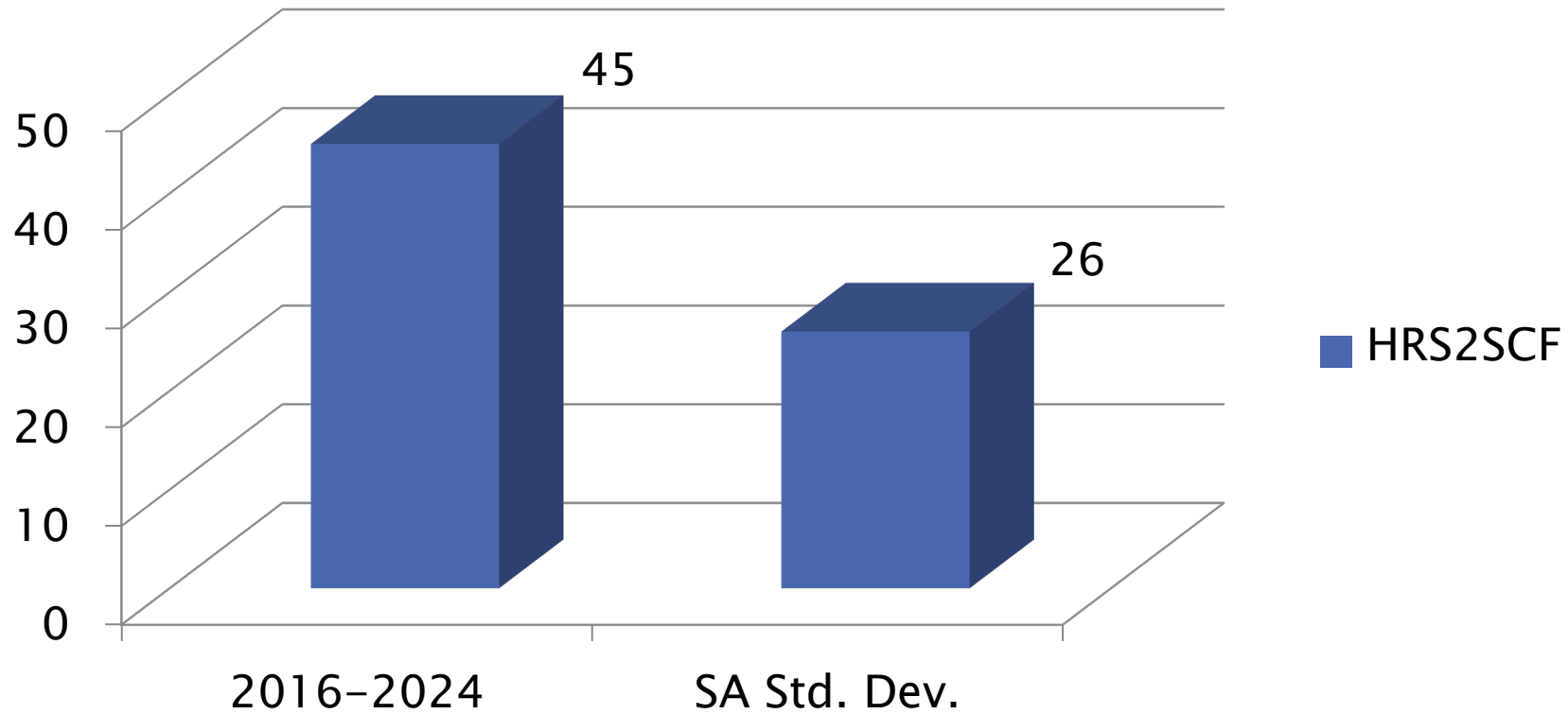
FNL. ORIG. UNIT HOURS TO SCUFF

CUSUM Severity Analysis



DD13 Precision Estimates

HRS2SCF



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Test Monitoring Center
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EOAT

»» October 2024

Test Monitoring Center
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EOAT Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	0
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		0

EOAT Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

EOAT Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

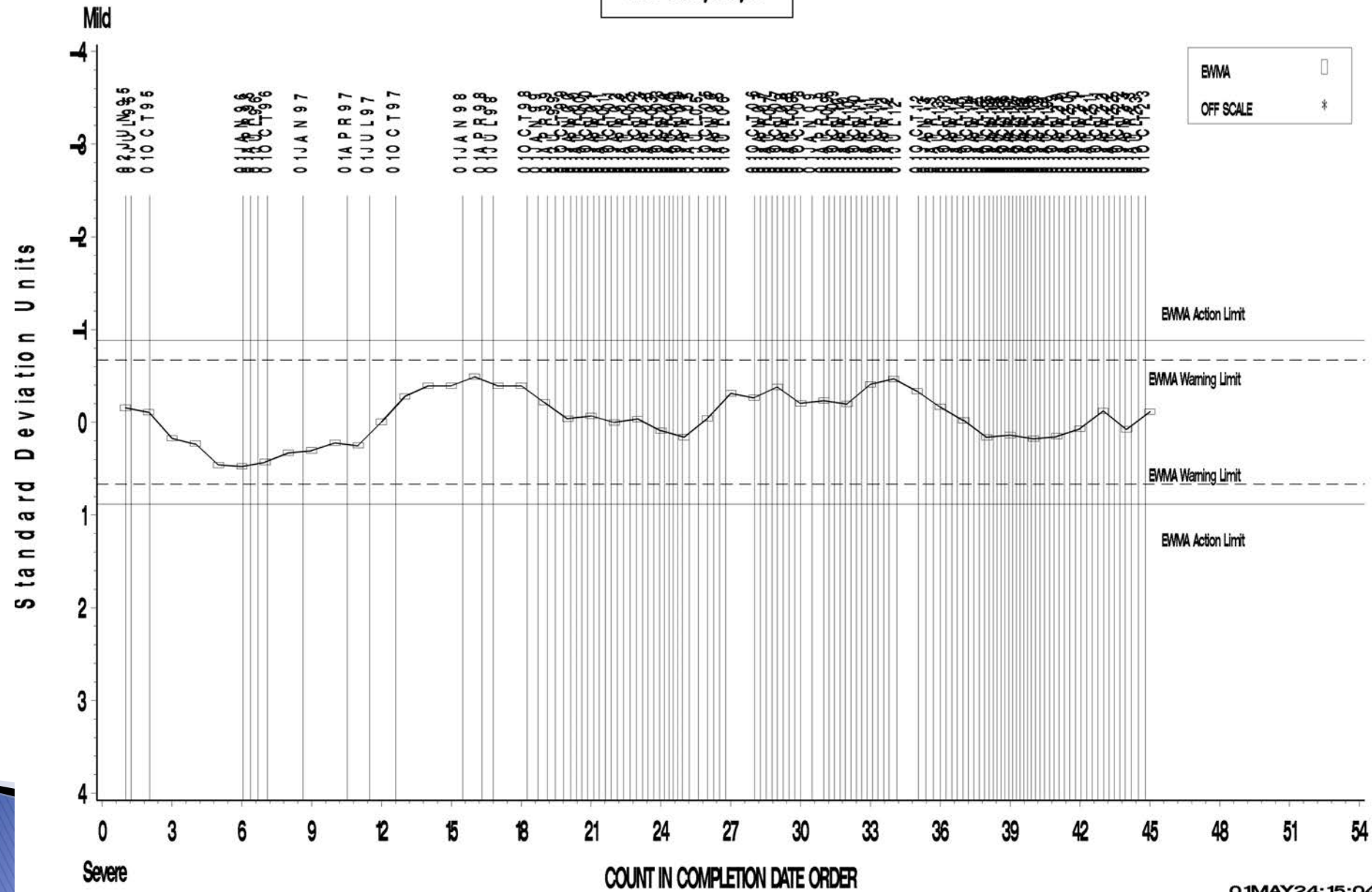
*Invalid and aborted tests

EOAT Test Severity

- ▶ As no chartable EOAT tests were run during this reporting period, no statement about test severity can be made.

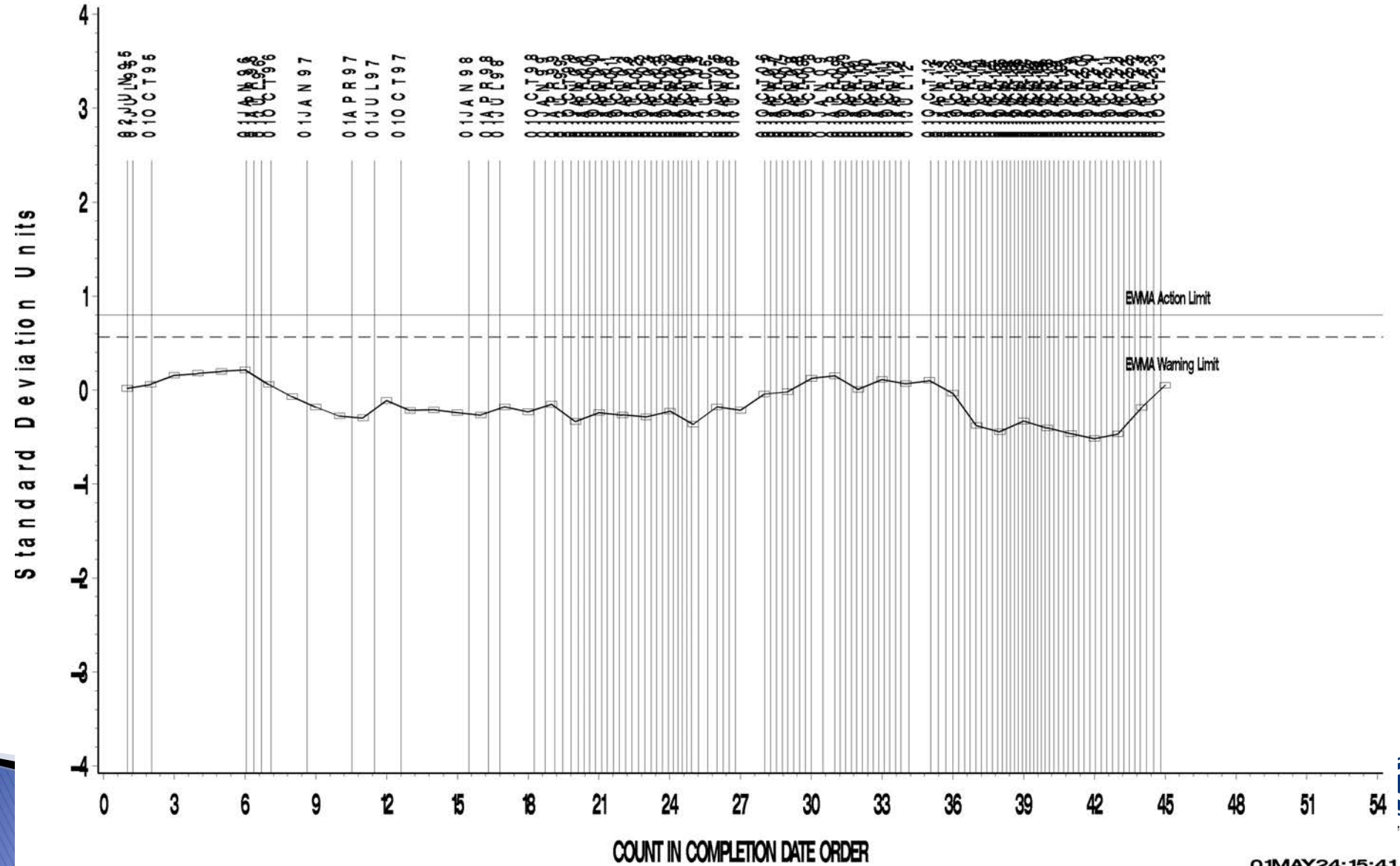
ENGINE OIL AERATION

LTMS Severity Analysis



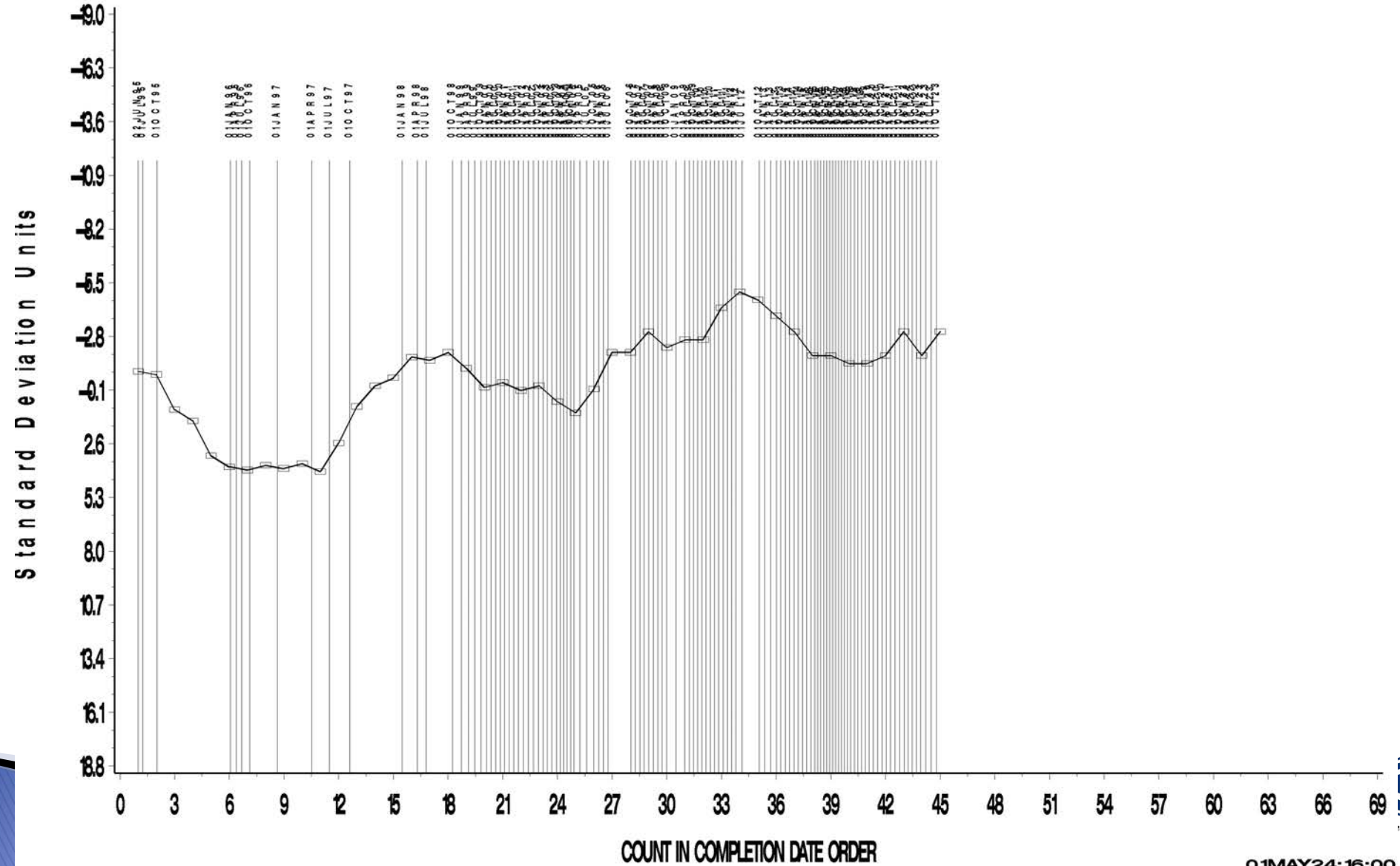
ENGINE OIL AERATION

LTMS Precision Analysis

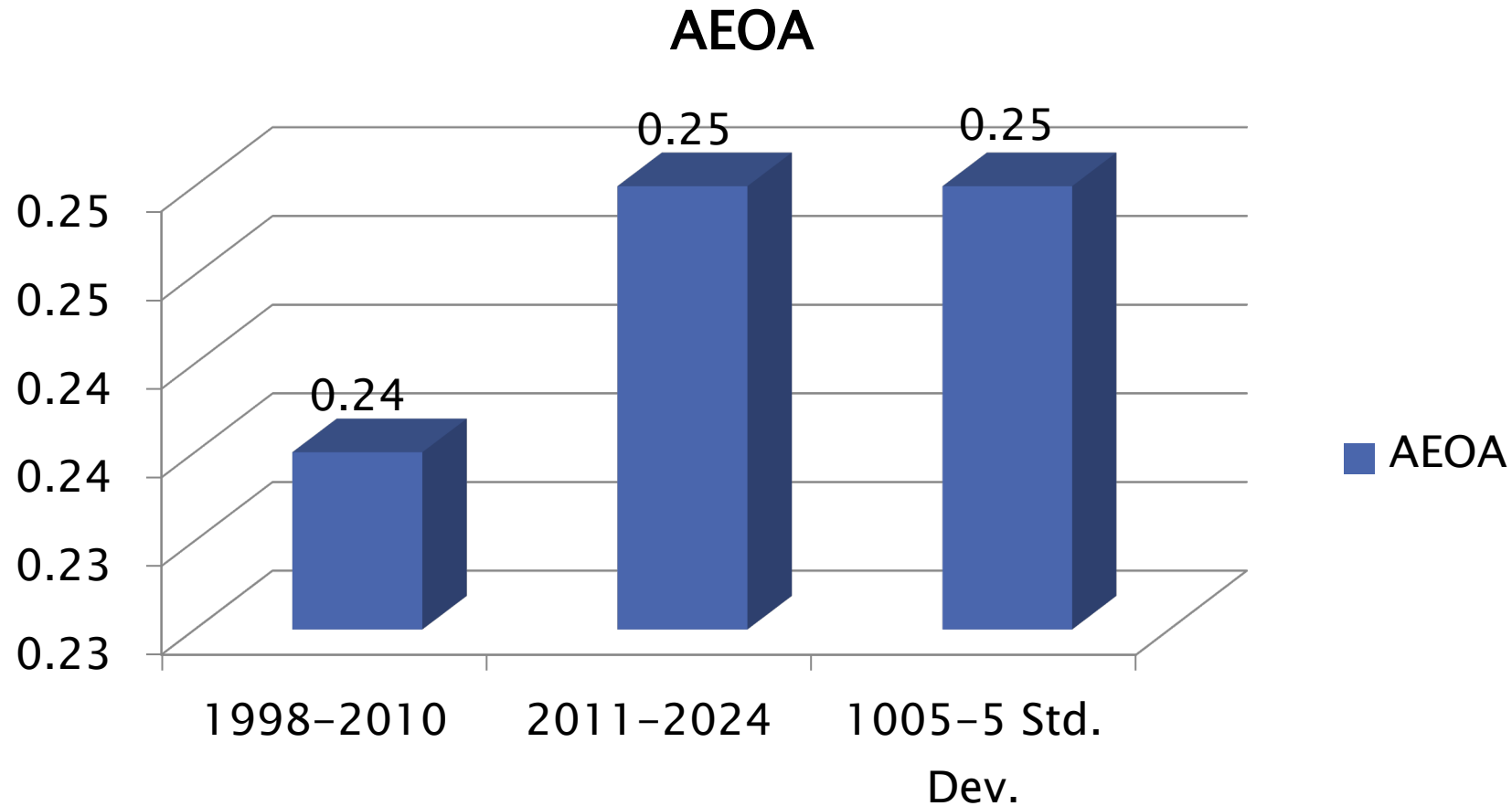


ENGINE OIL AERATION

CUSUM Severity Analysis



EOAT Precision Estimates



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Test Monitoring Center
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Cummins ISB

»» October 2024

Test Monitoring Center
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ISB Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	4
Failed Calibration Test	OC	3
Operationally Invalid	LC	0
Aborted	XC	0
Informational	NN	1
Total		8

ISB Failed Tests

Failed Parameter	Number of Tests
ACSW Ei Mild	1
ACSW Ei Severe	1
ATWL Ei Severe	1
Total	1

ISB Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

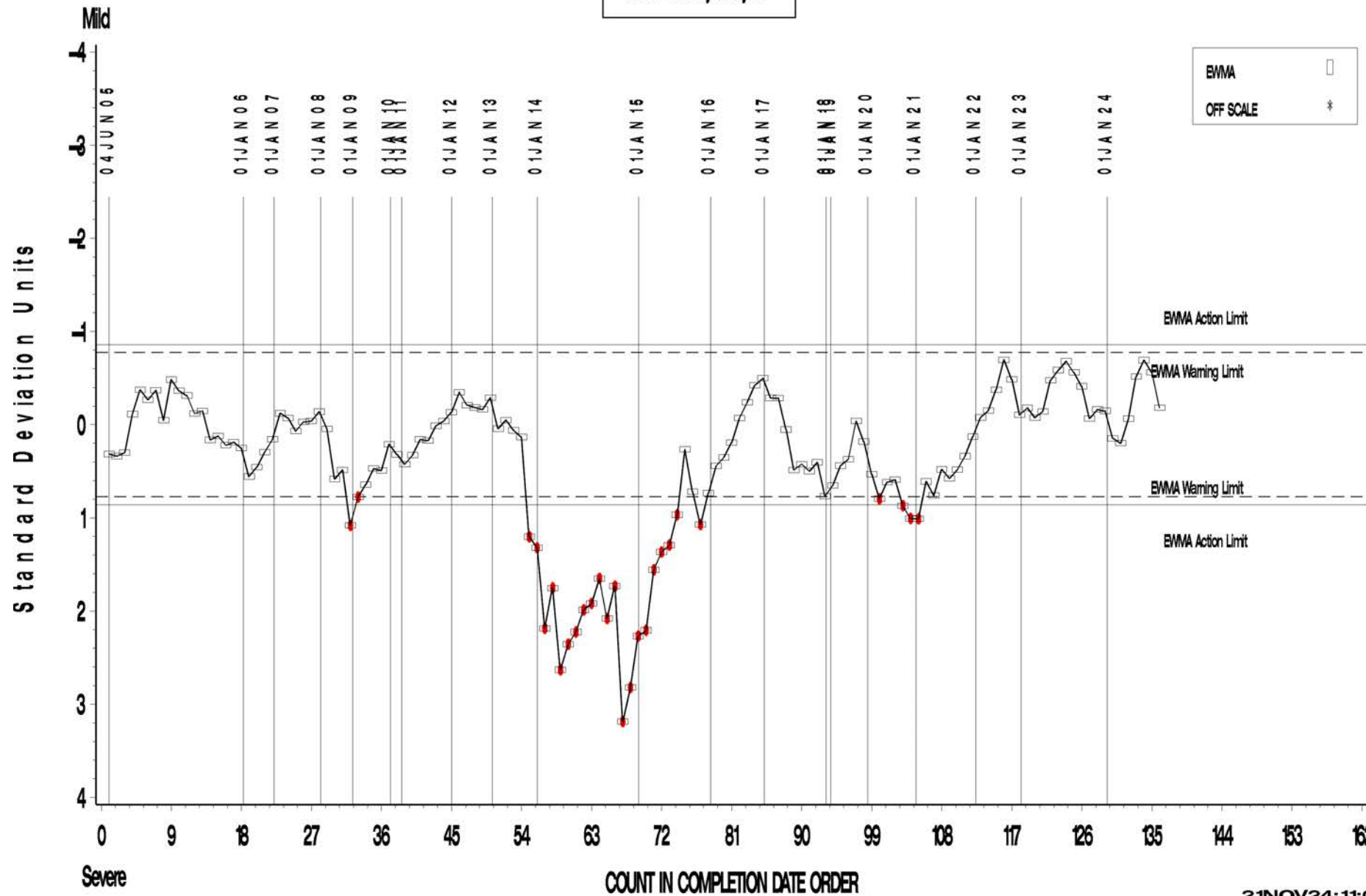
*Invalid and aborted tests

ISB Test Severity

- ▶ ACSW and ATWL are in control.

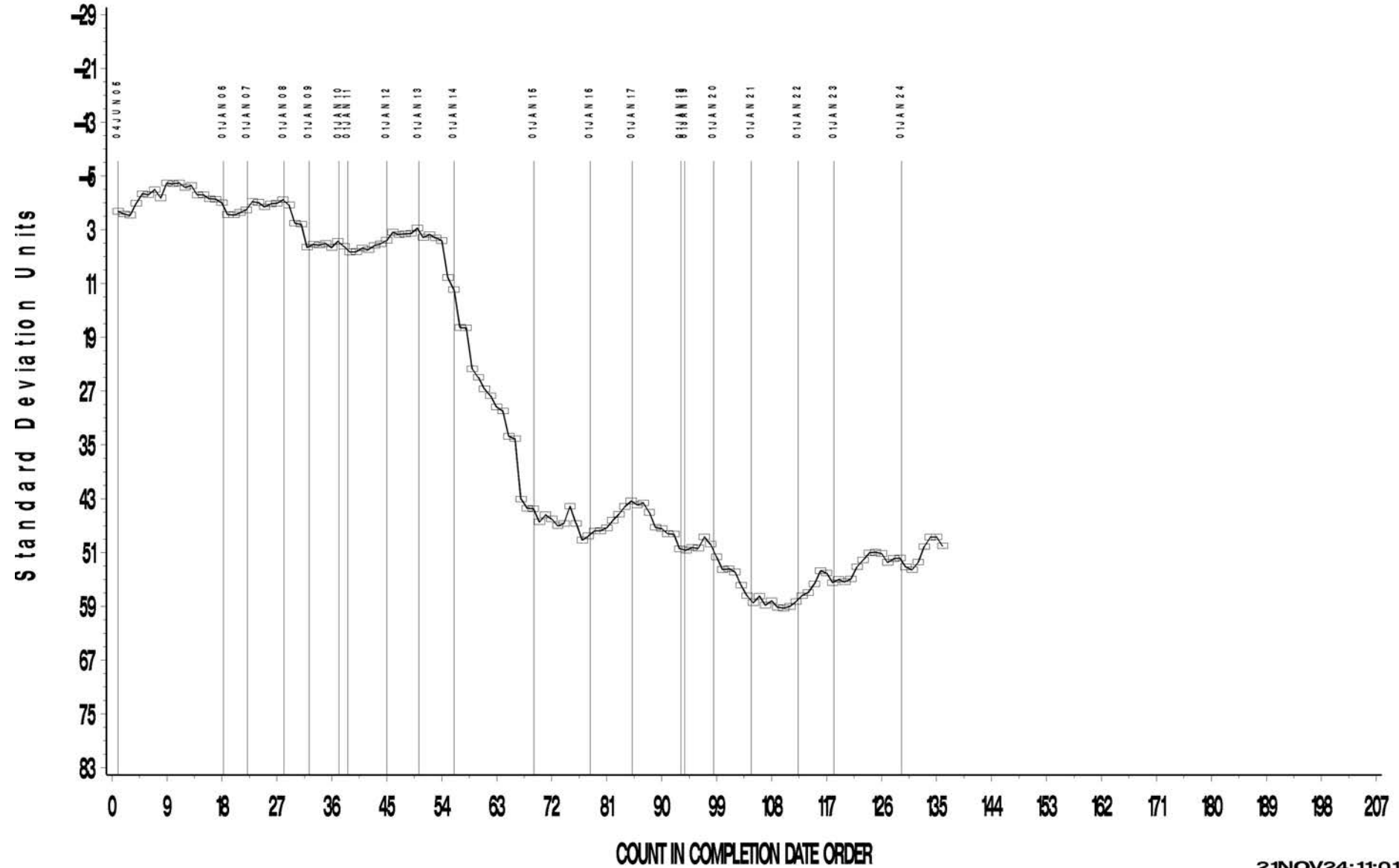
AVERAGE CAMSHAFT WEAR

LTMS Severity Analysis

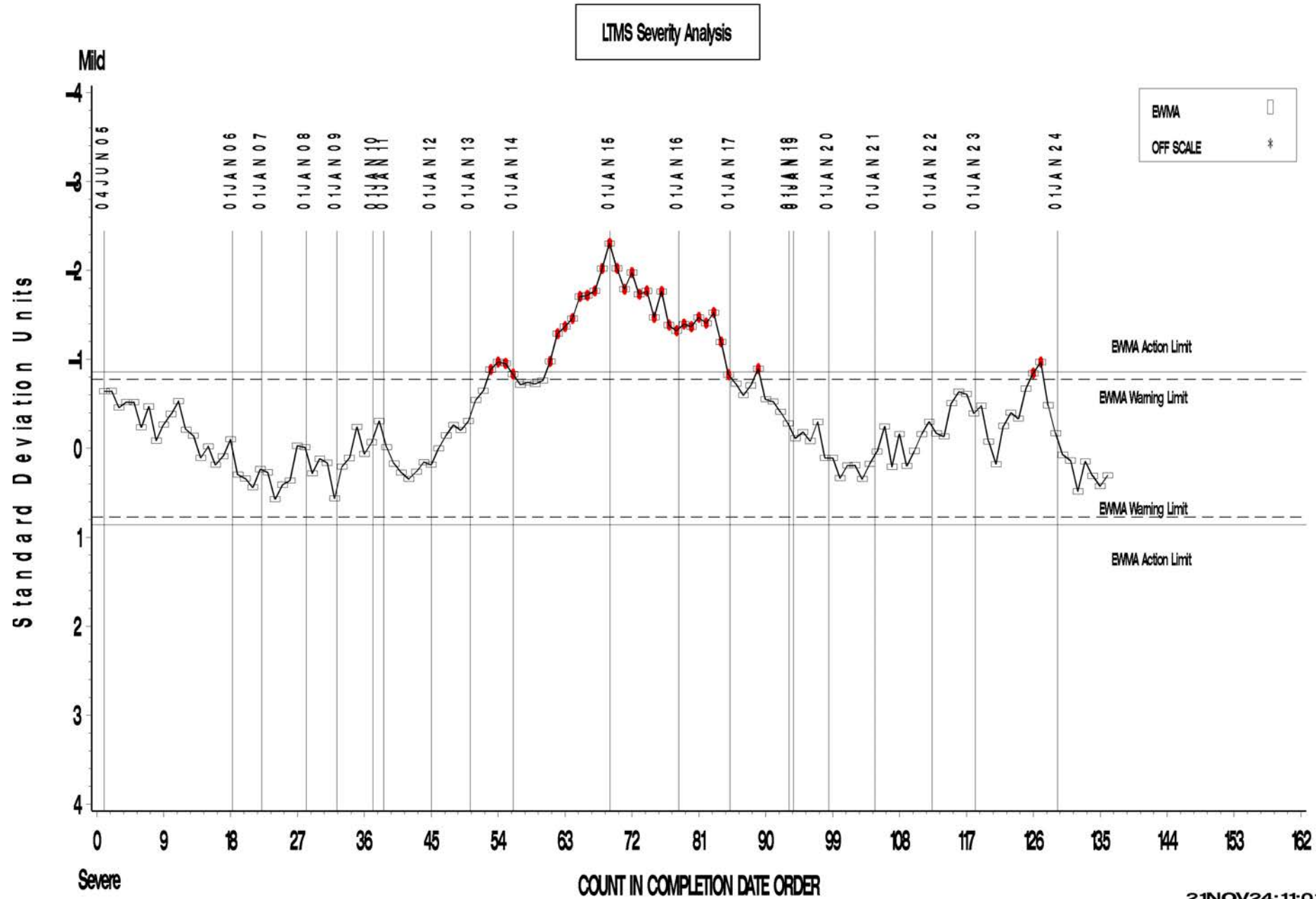


AVERAGE CAMSHAFT WEAR

CUSUM Severity Analysis

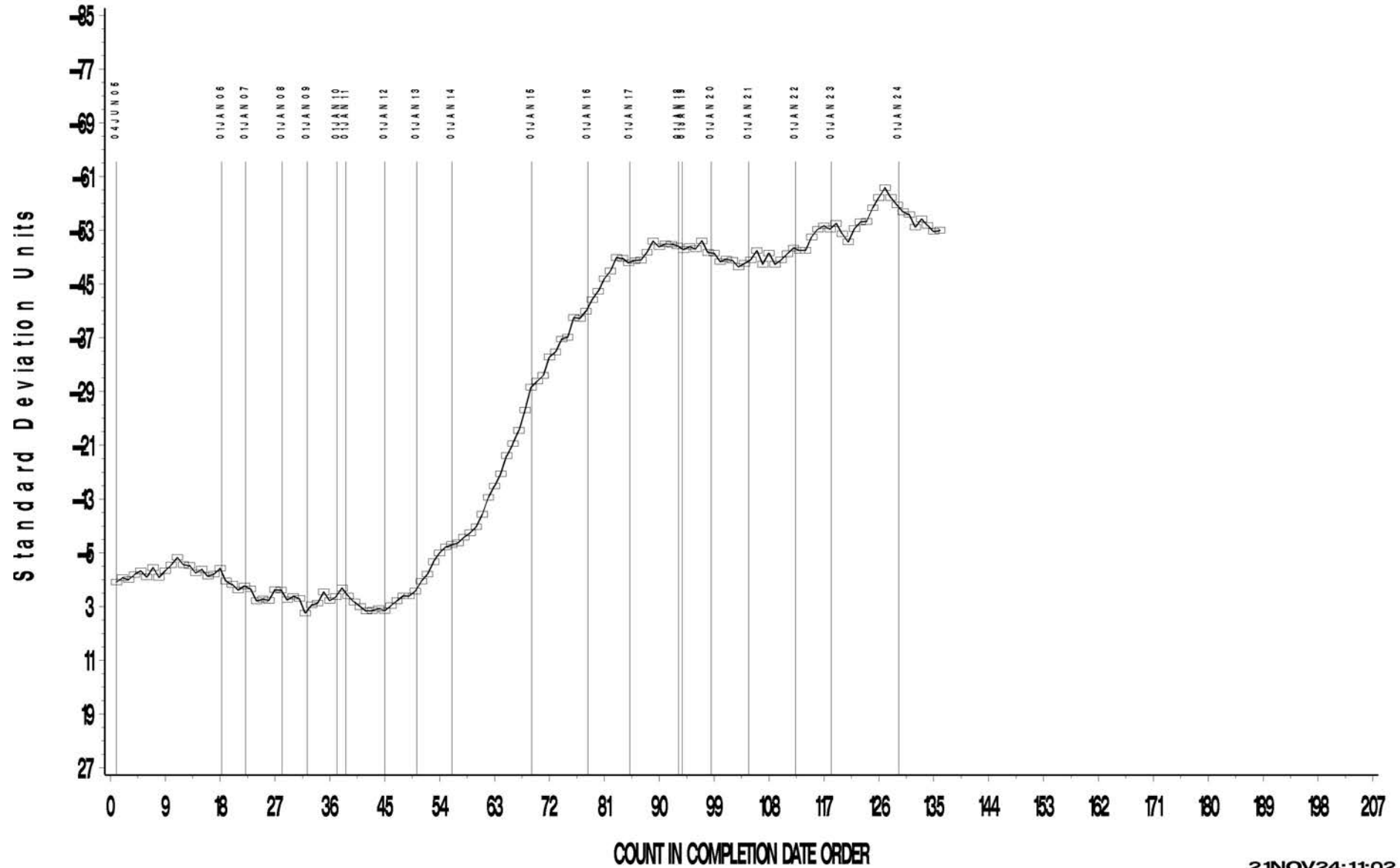


AVERAGE TAPPET WEIGHT LOSS

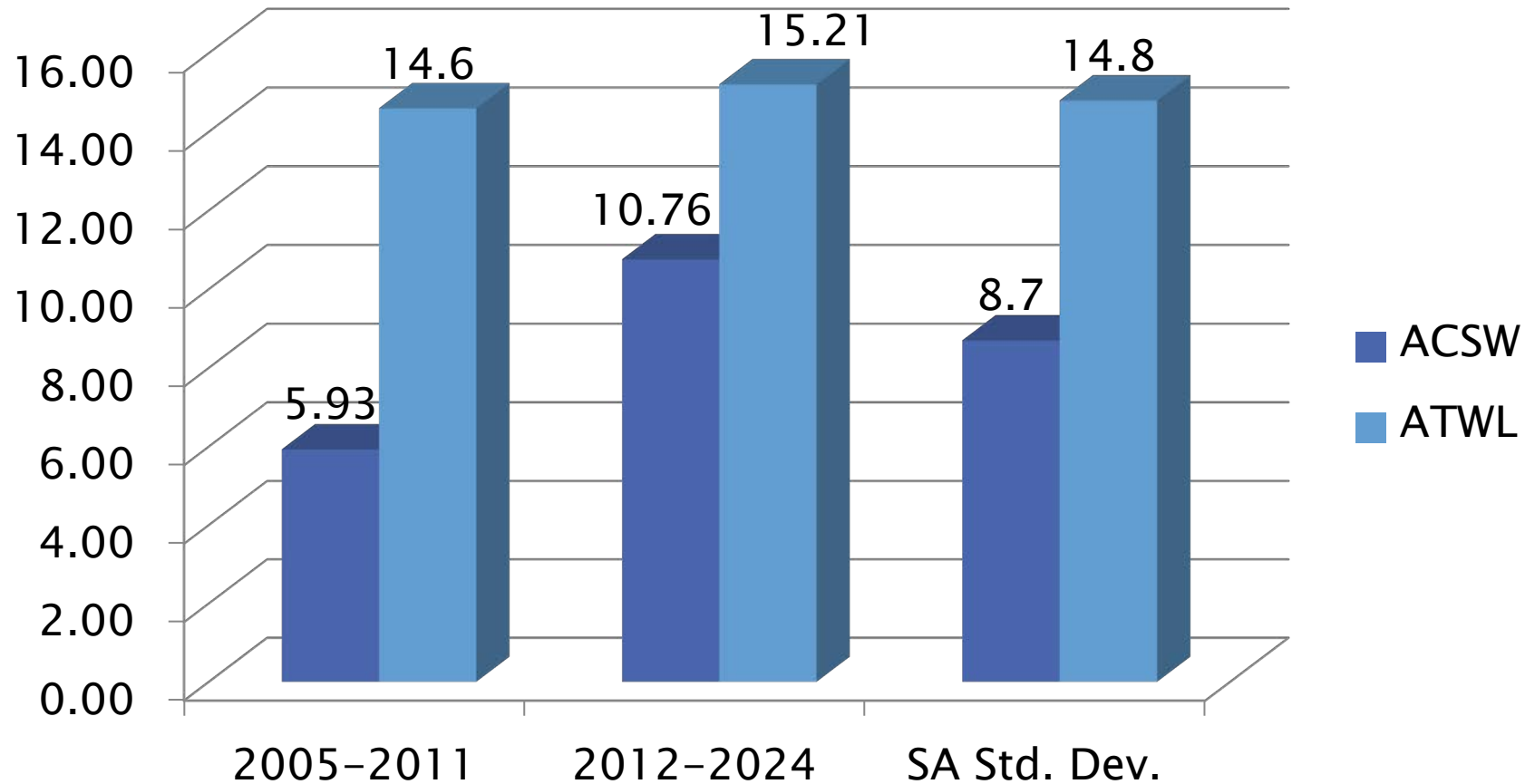


AVERAGE TAPPET WEIGHT LOSS

CUSUM Severity Analysis



ISB Precision Estimates



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Cummins ISM

»» October 2024

Test Monitoring Center
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ISM Test Activity

Test Status	Validity Code	#
Acceptable Calibration	AC	3
Failed Calibration	OC	1
Operationally Invalid	LC	0
Aborted	XC	0
Total		4

ISM Failed Tests

Failed Parameter	Number of Tests
ASR Mild	1
Total	1

ISM Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

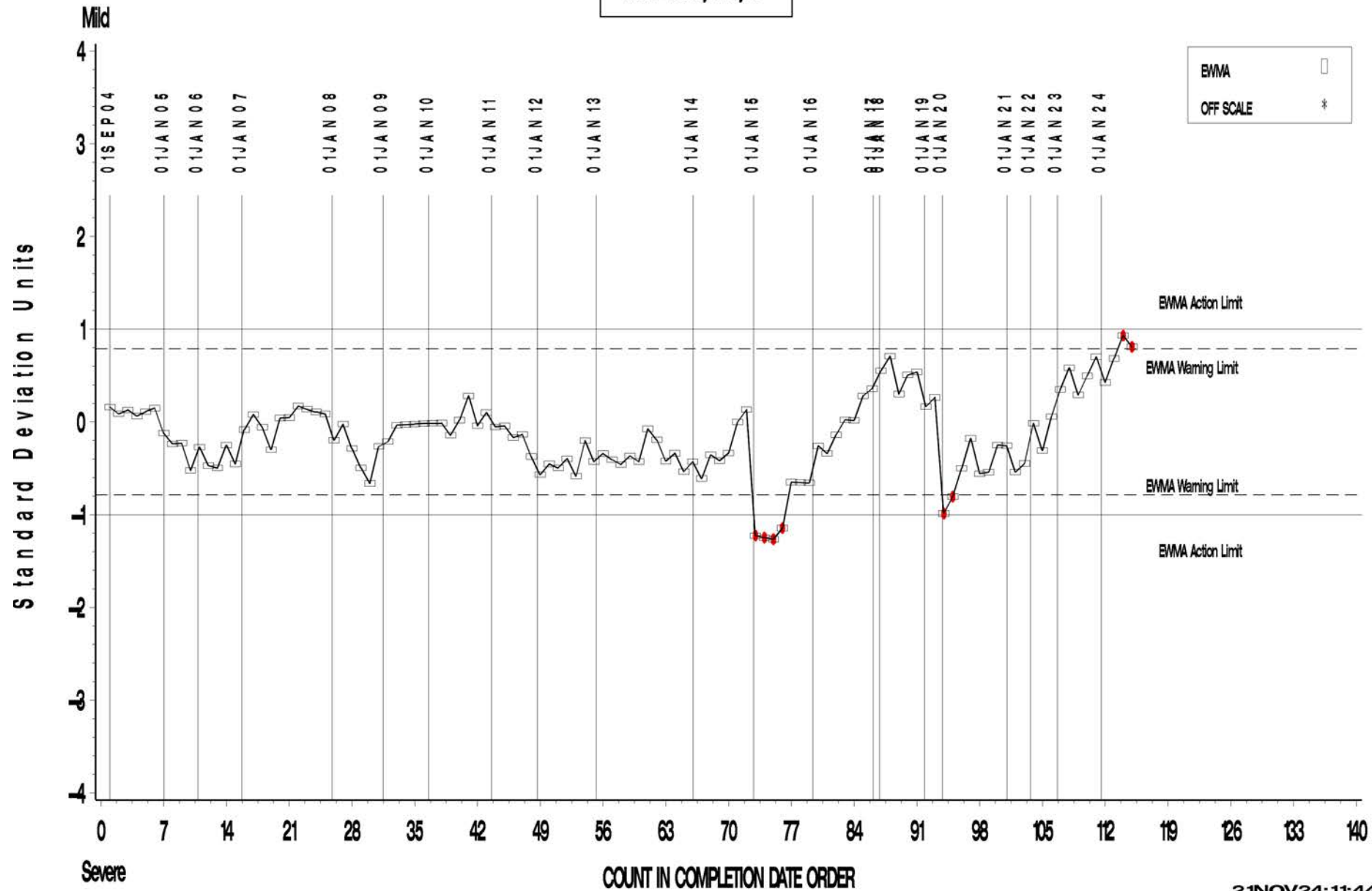
*Invalid and aborted tests

ISM Test Severity

- ▶ ASR is in severity warning alarm in the mild direction.
- ▶ IAS is in severity action alarm in the severe direction.
- ▶ IAS in in precision warning alarm.
- ▶ CWL and FPD are in control.

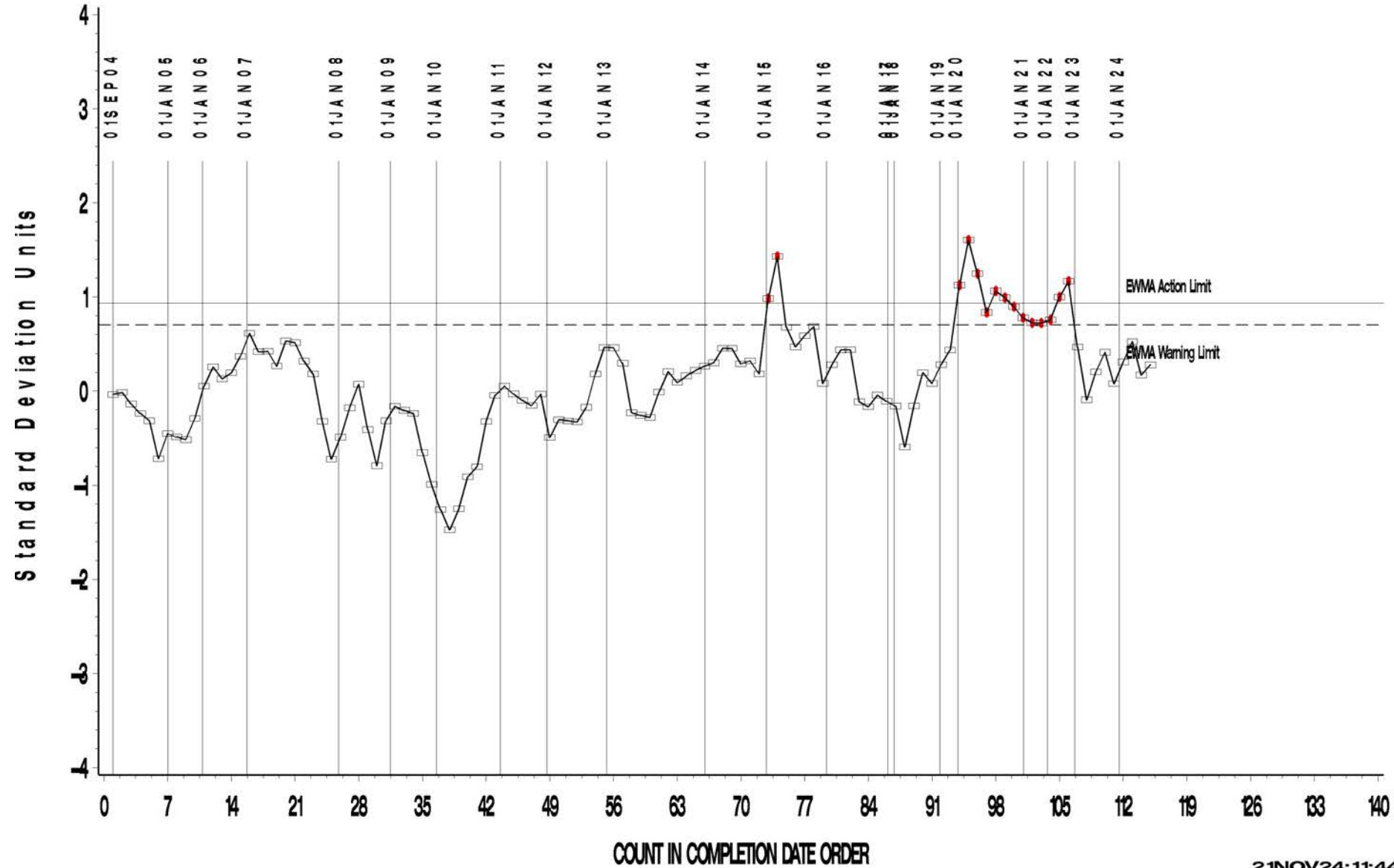
AVERAGE SLUDGE RATING

LTMS Severity Analysis



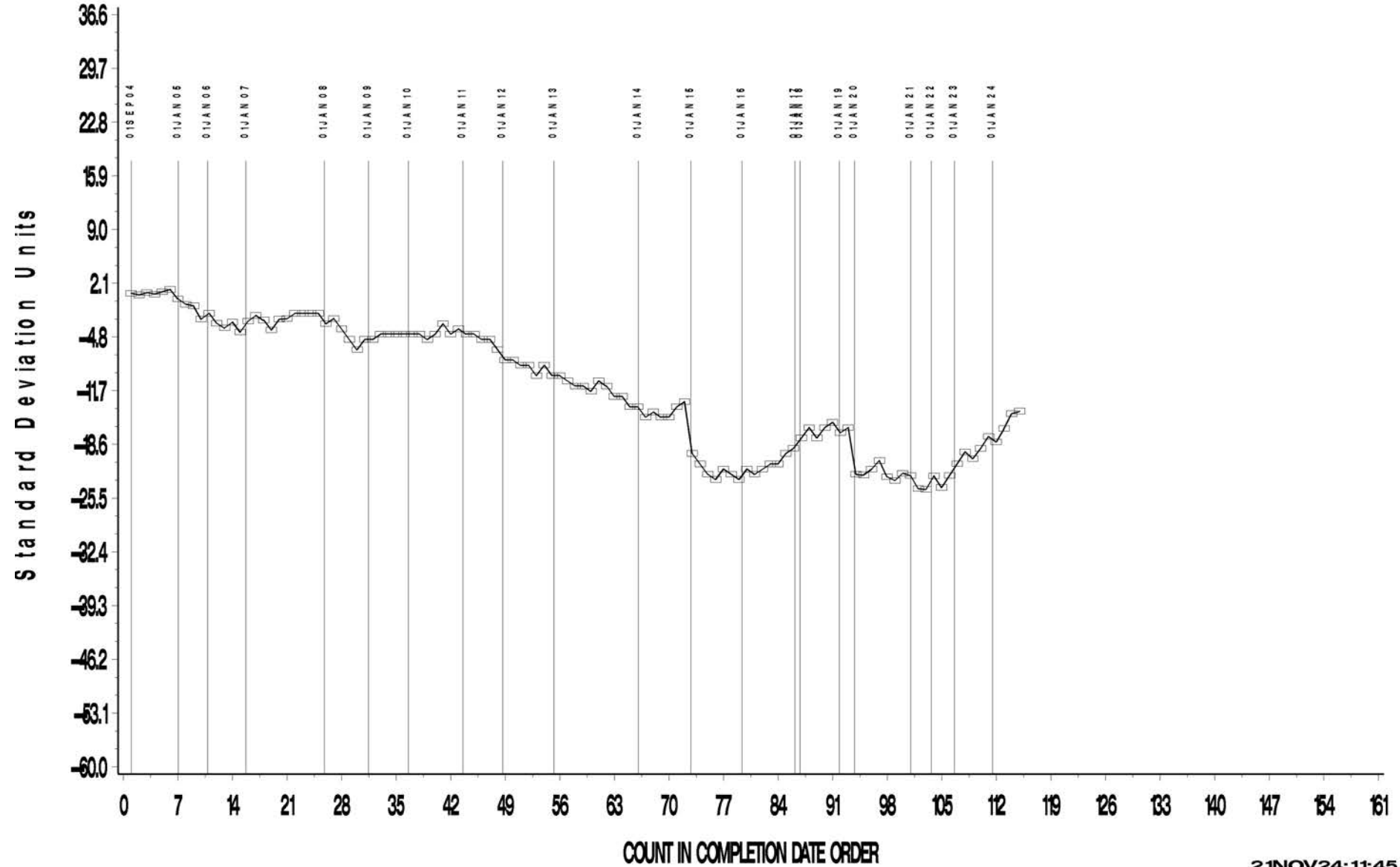
AVERAGE SLUDGE RATING

LTMS Precision Analysis



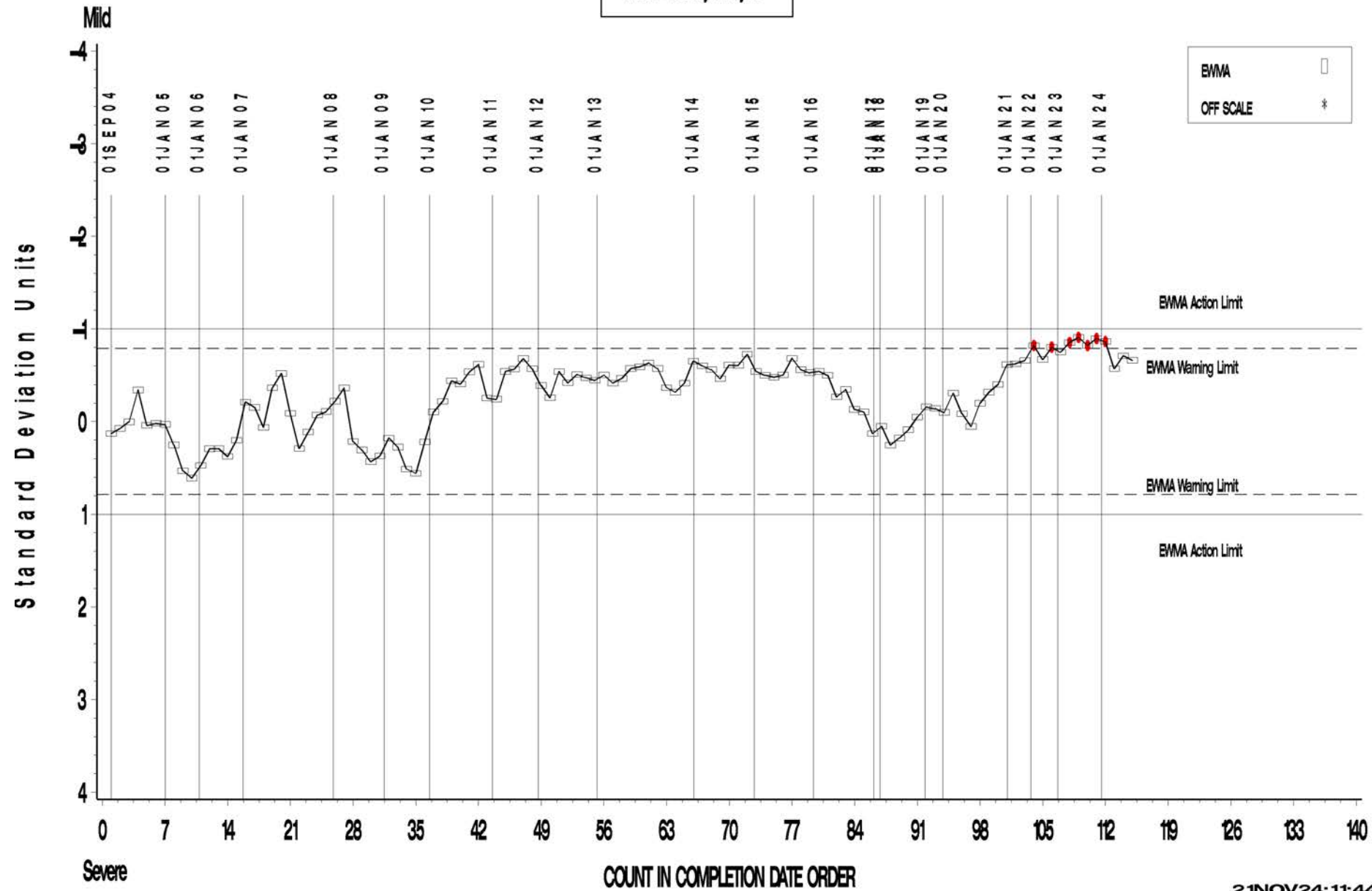
AVERAGE SLUDGE RATING

CUSUM Severity Analysis



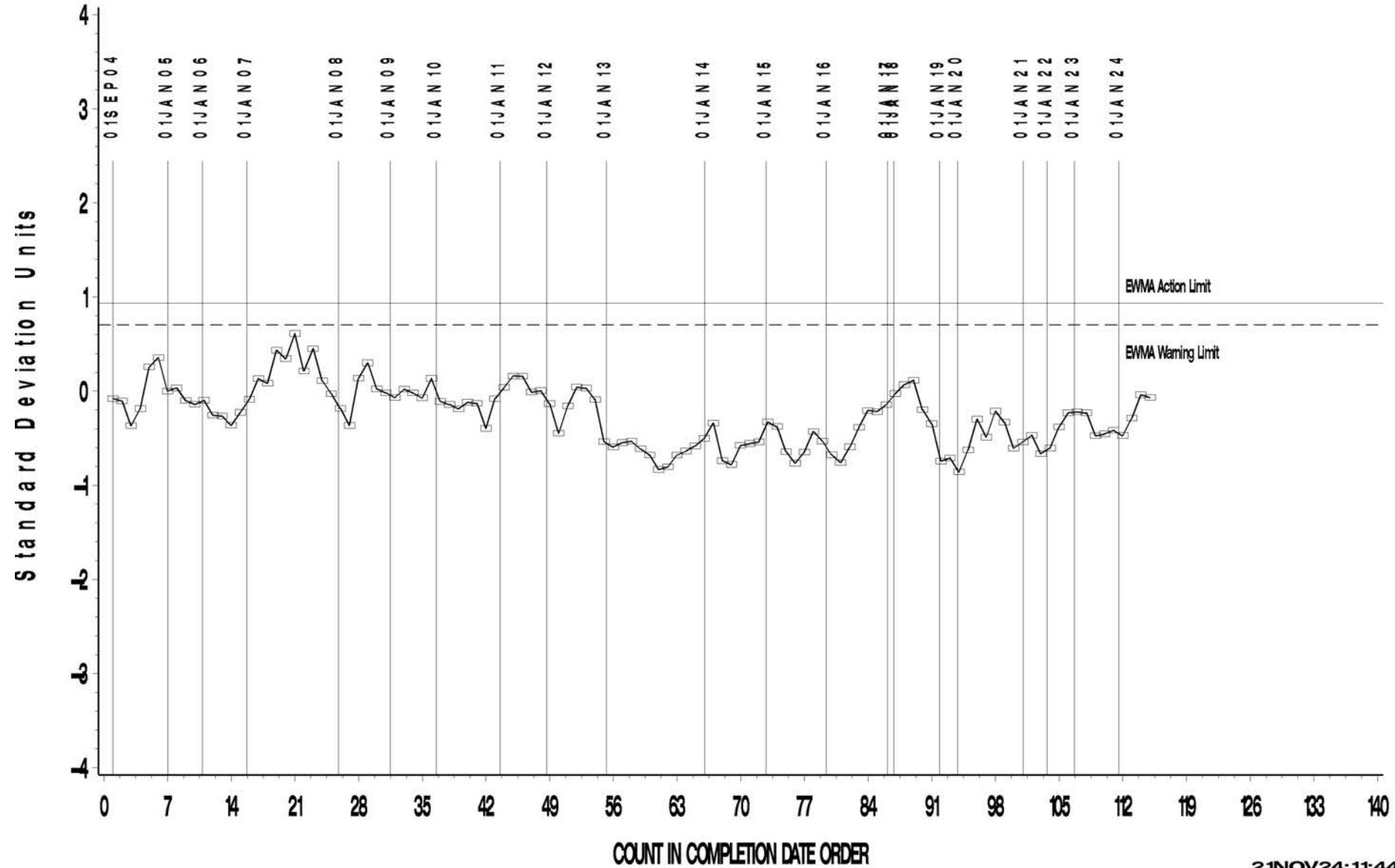
CROSSHEAD WEIGHT LOSS ADJUSTED TO 3.9 % SOOT

LTMS Severity Analysis



CROSSHEAD WEIGHT LOSS ADJUSTED TO 3.9 % SOOT

LTMS Precision Analysis



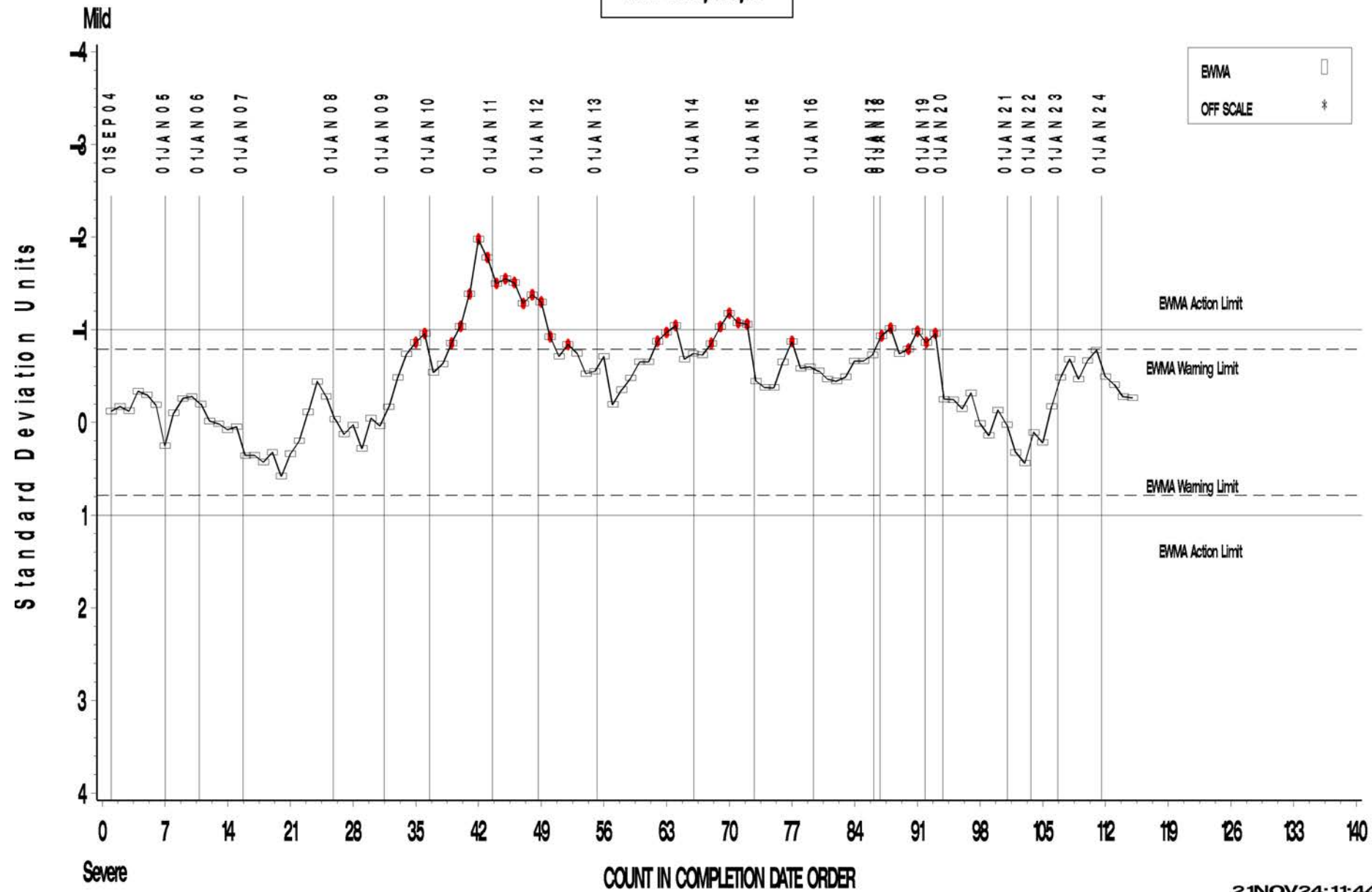
CROSSHEAD WEIGHT LOSS ADJUSTED TO 3.9 % SOOT

CUSUM Severity Analysis



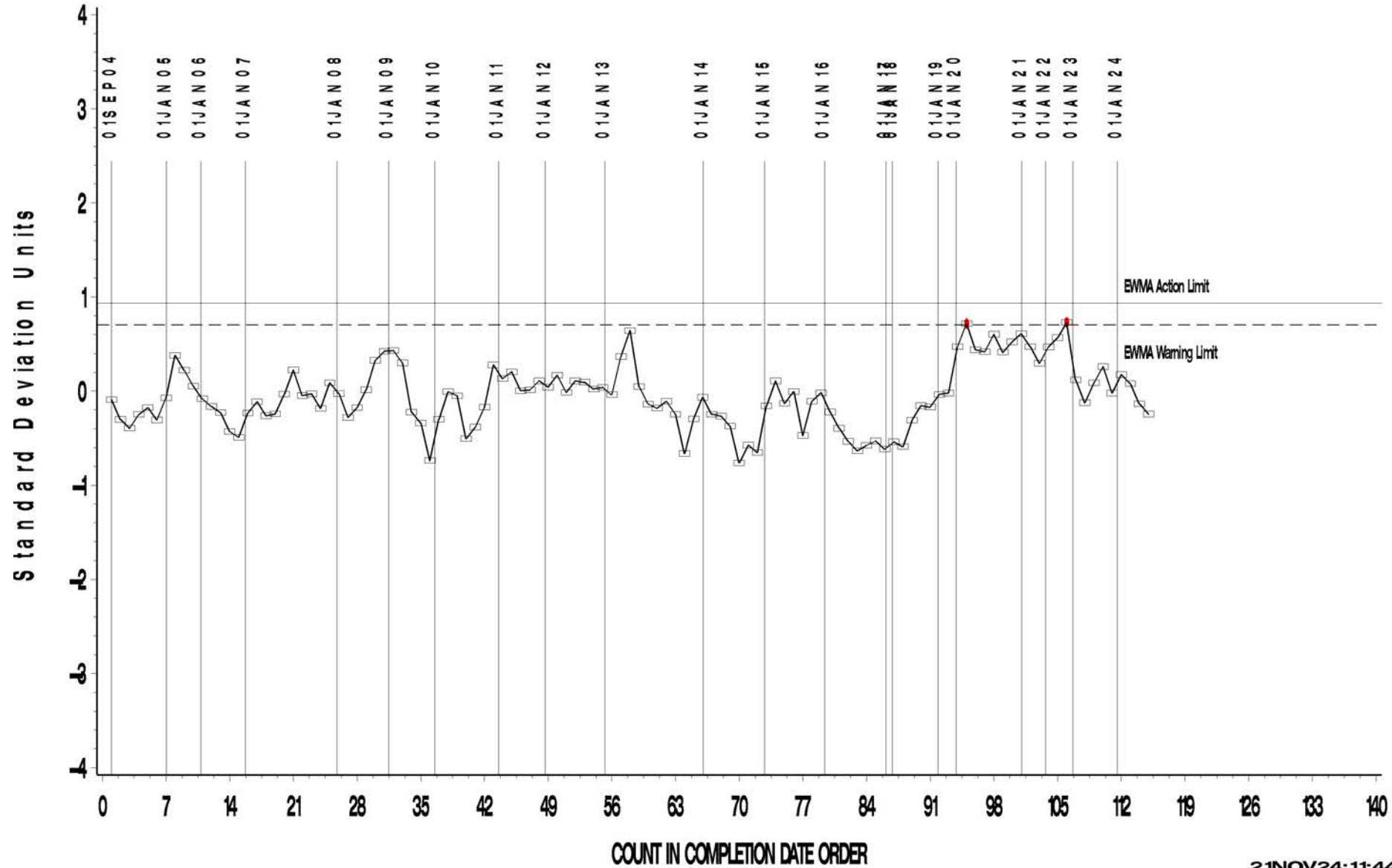
OIL FILTER DELTA PRESSURE

LTMS Severity Analysis



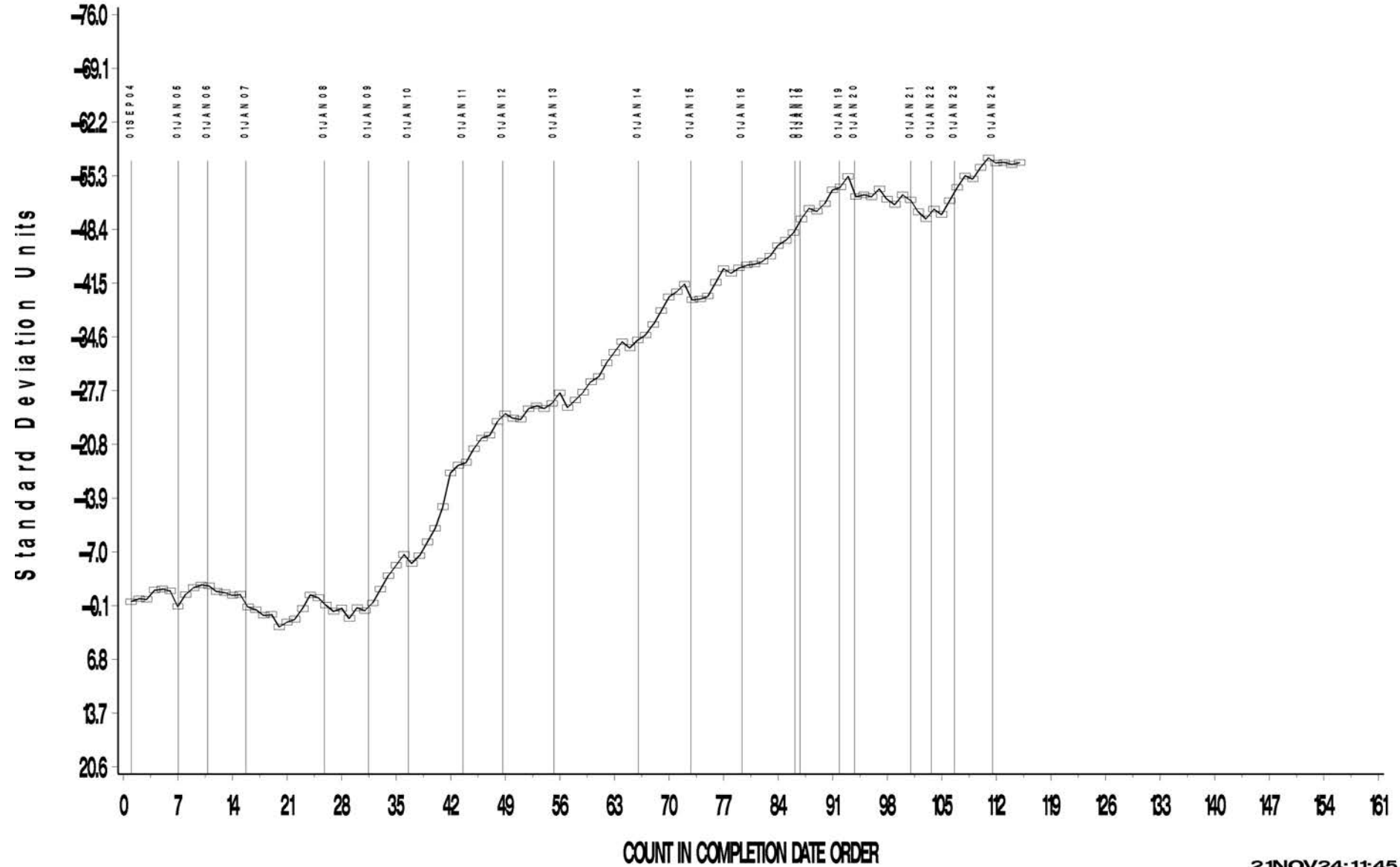
OIL FILTER DELTA PRESSURE

LTMS Precision Analysis



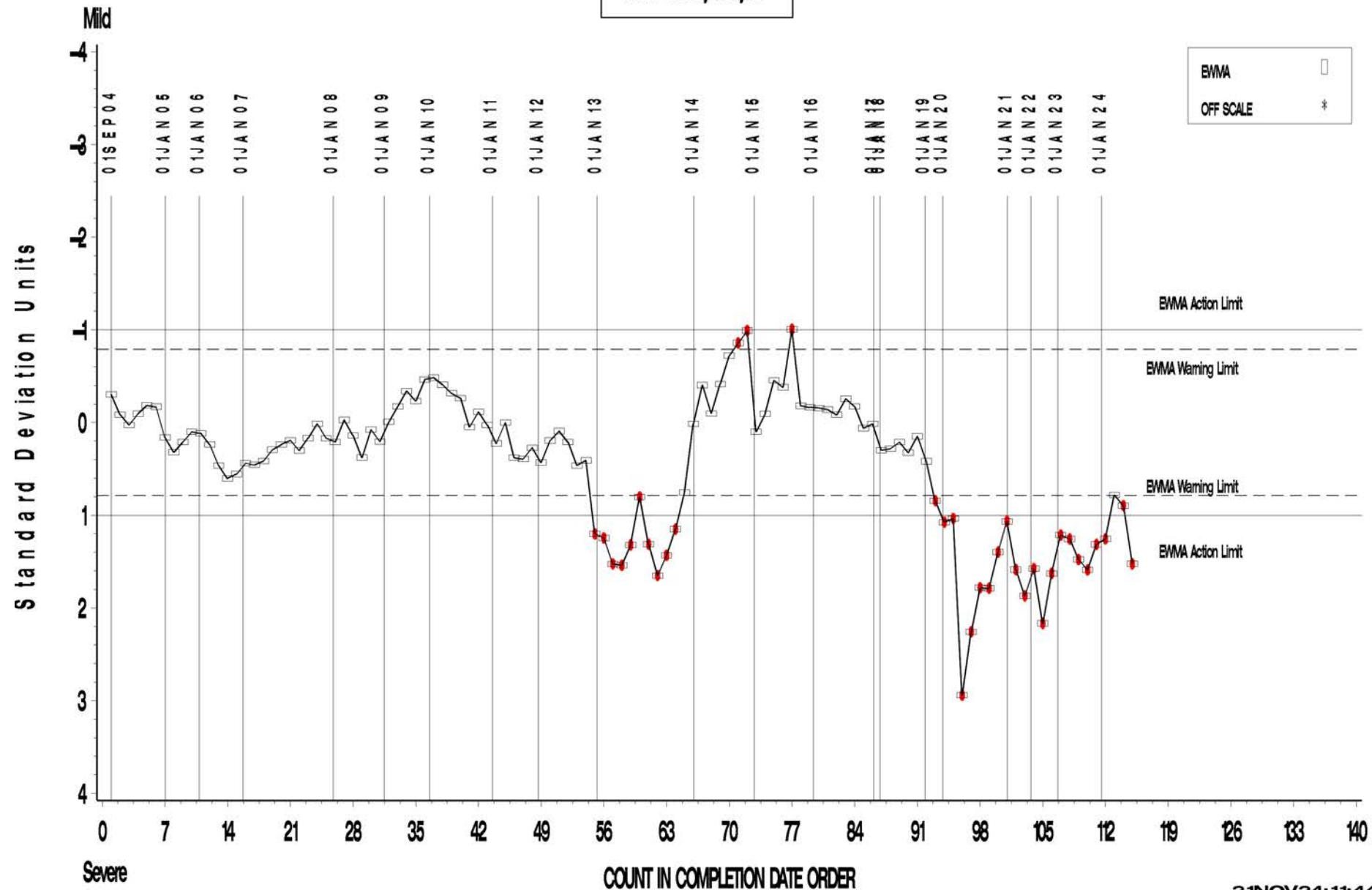
OIL FILTER DELTA PRESSURE

CUSUM Severity Analysis



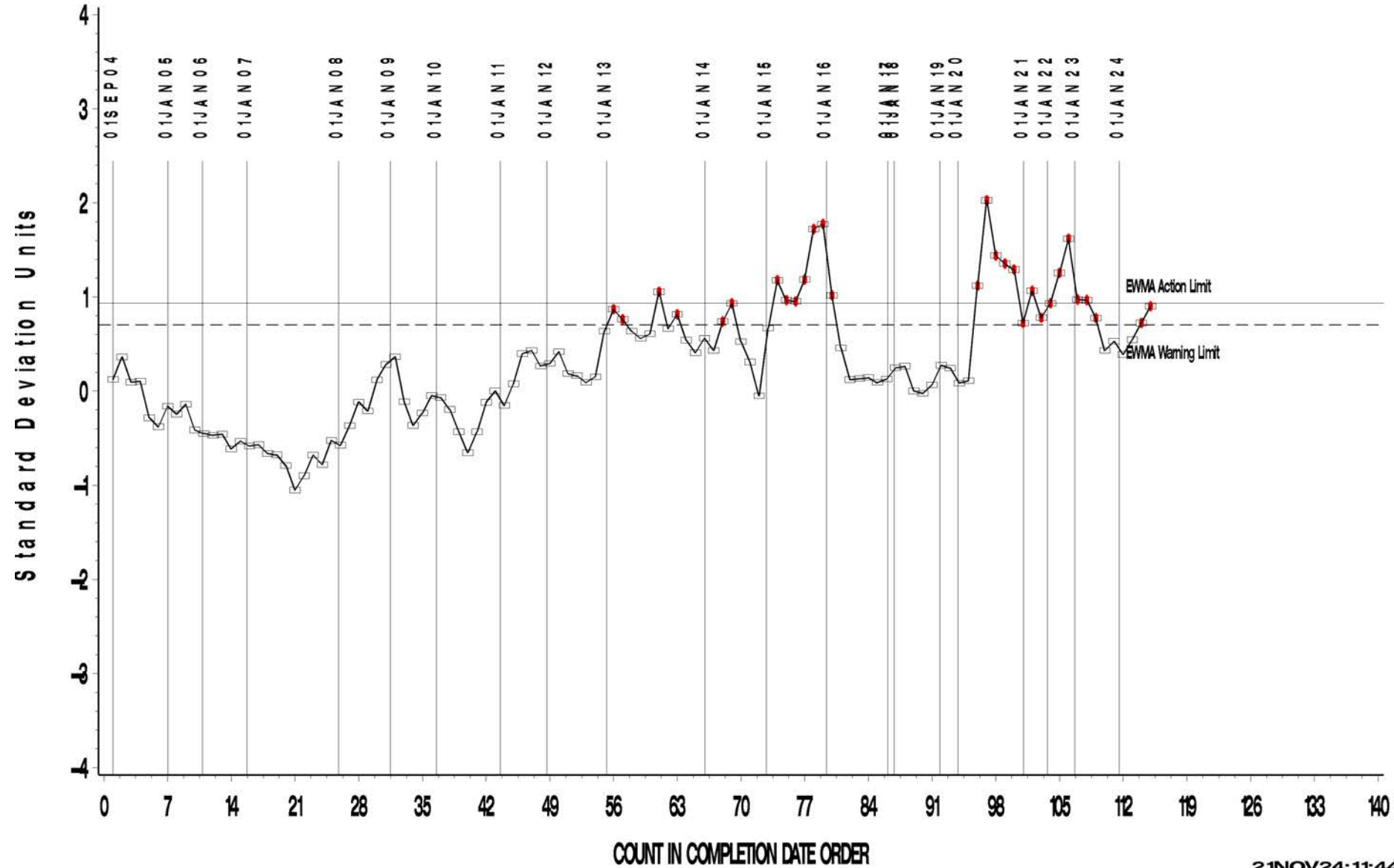
INJECTOR SCREW WEIGHT LOSS ADJUSTED TO 3.9% SOOT

LTMS Severity Analysis



INJECTOR SCREW WEIGHT LOSS ADJUSTED TO 3.9% SOOT

LTMS Precision Analysis

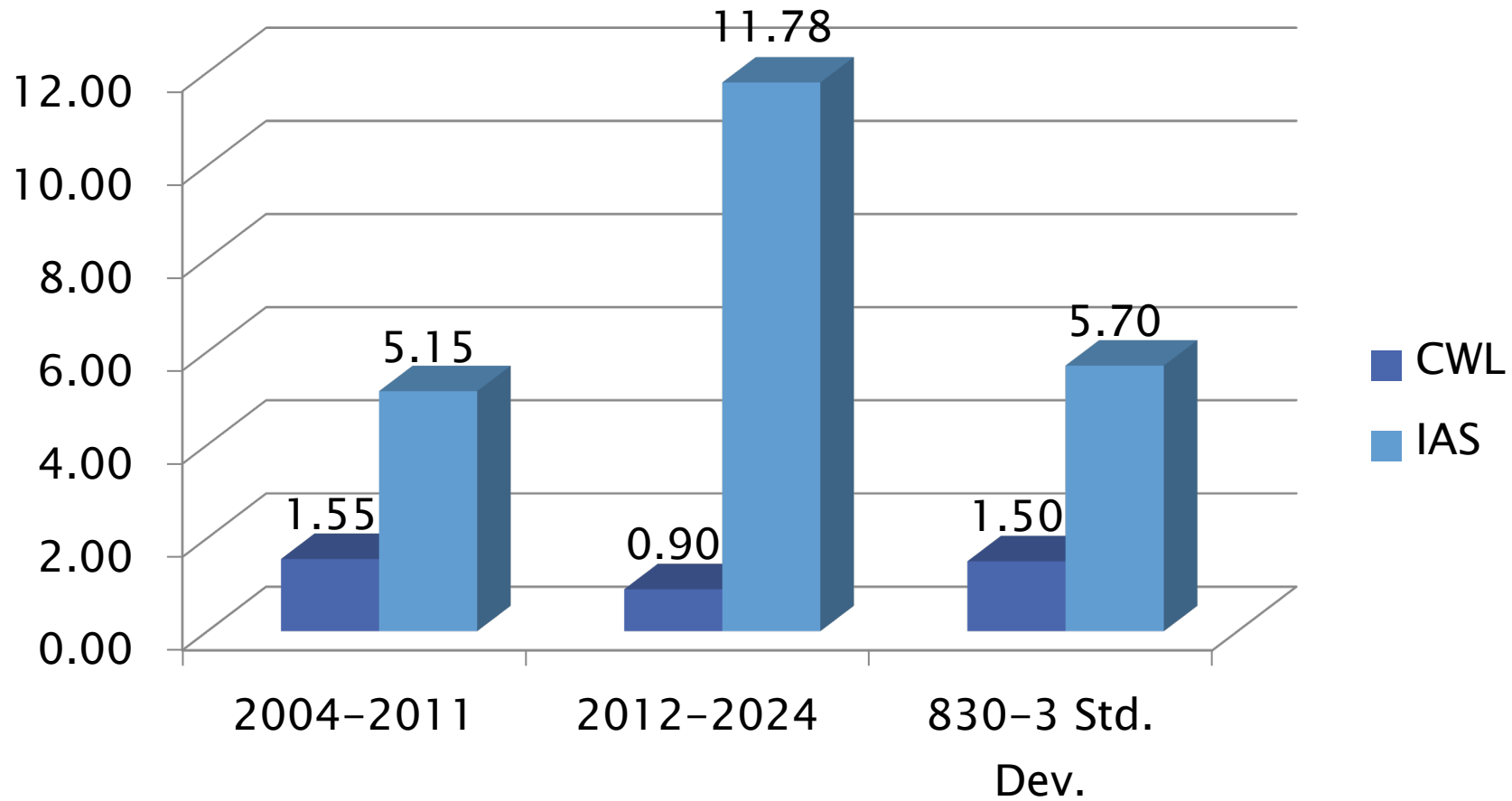


INJECTOR SCREW WEIGHT LOSS ADJUSTED TO 3.9% SOOT

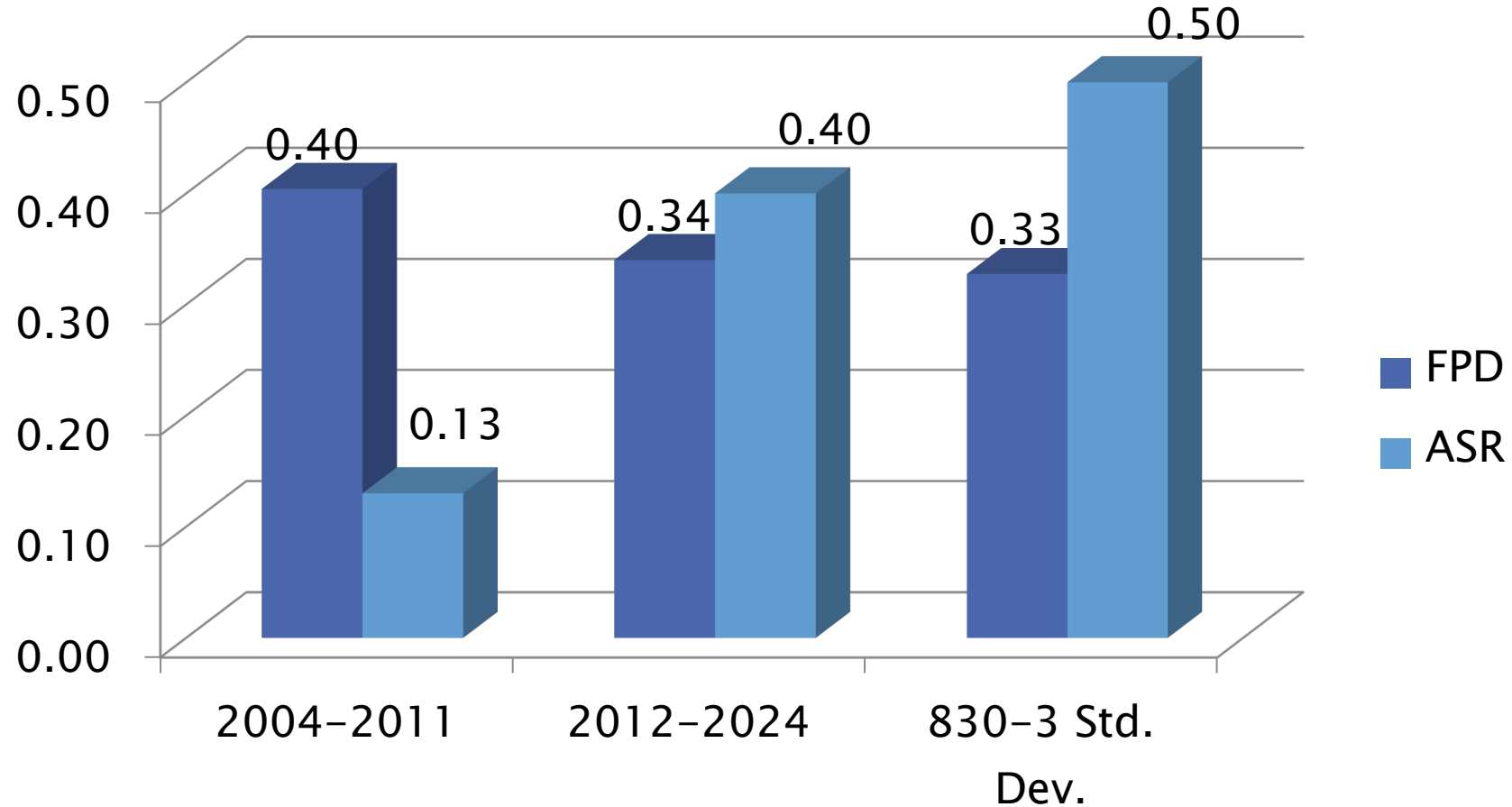
CUSUM Severity Analysis



ISM Precision Estimates



ISM Precision Estimates



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Cummins ISBV108

➤➤ October 2024

Test Monitoring Center
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ISBV108 Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	12
Failed Calibration Test	OC	2
Operationally Invalid	LC	2
Aborted	XC	0
Total		16

ISBV108 Failed Tests

Failed Parameter	Number of Tests
SOOT Ei Mild	1
SOOT Zi Level 2	1
Total	2

ISBV108 Lost Tests*

Status	Cause	#
Invalid	Missed soot window	1
Invalid	Did not reach 15 cSt	1
Aborted	No aborted tests	0
Total		2

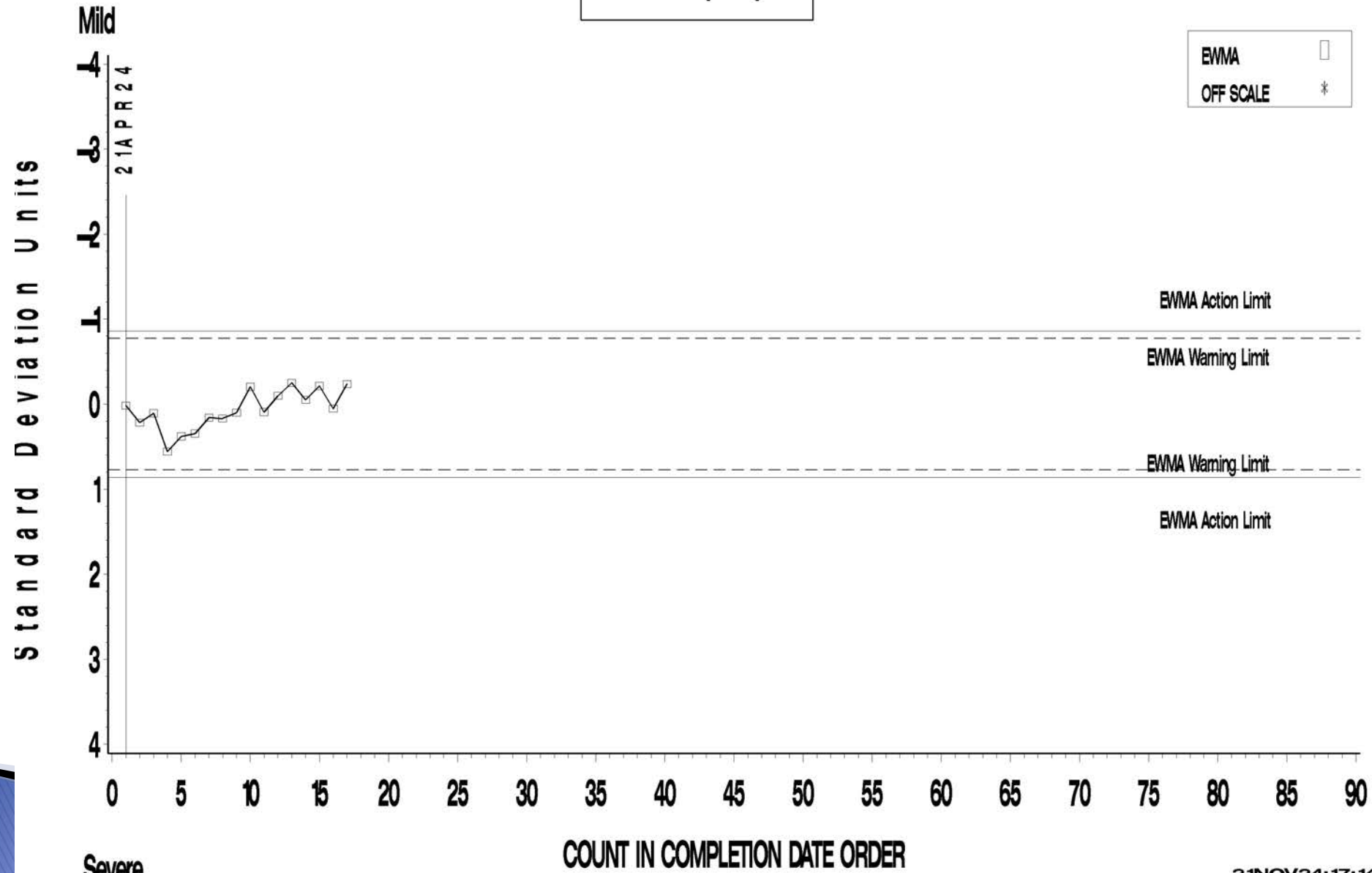
*Invalid and aborted tests

ISBV108 Test Severity

- ▶ All parameters are in control

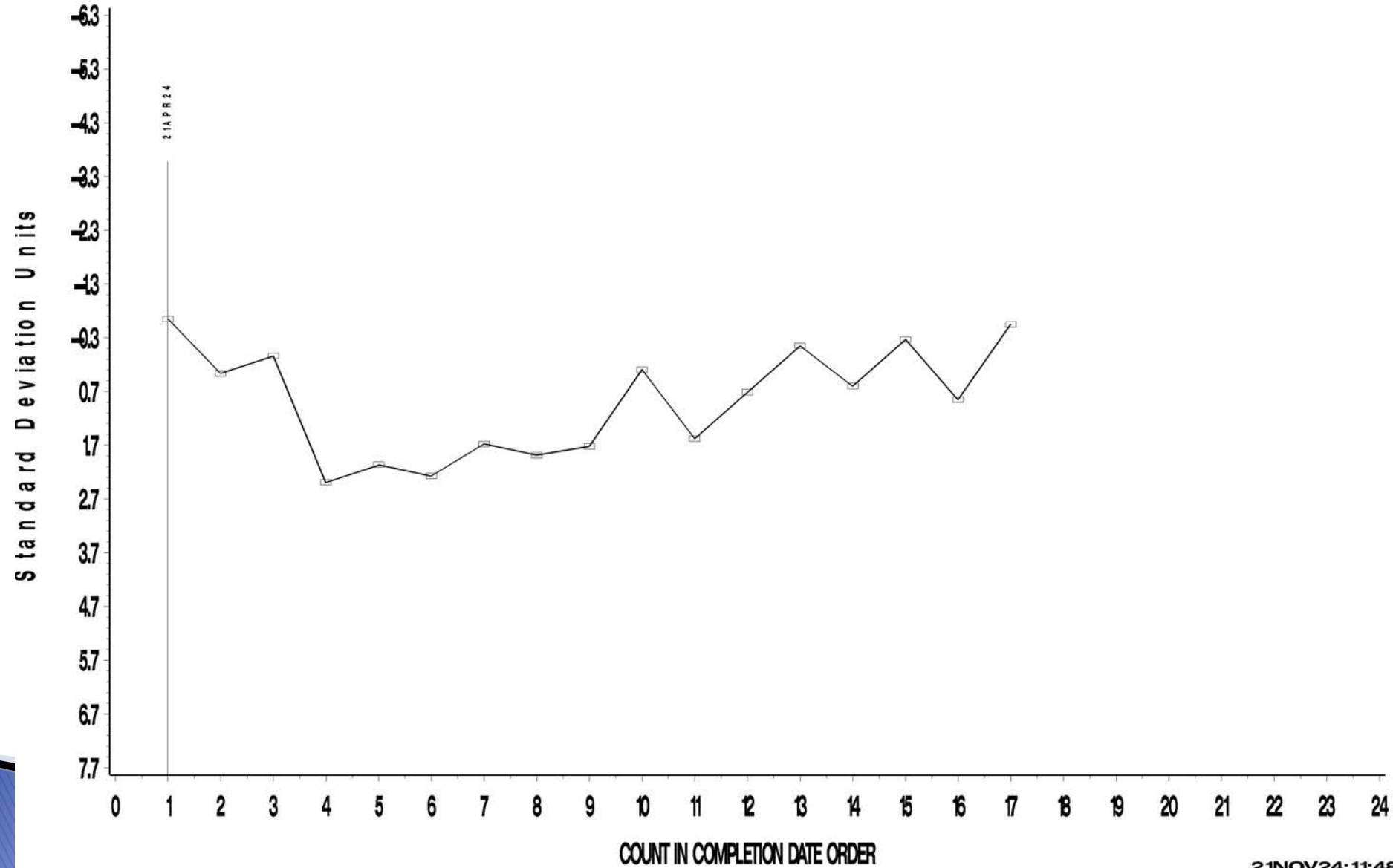
FINAL MRV VISCOSITY [NM, SOLID, FROZEN, <, >]

LTMS Severity Analysis



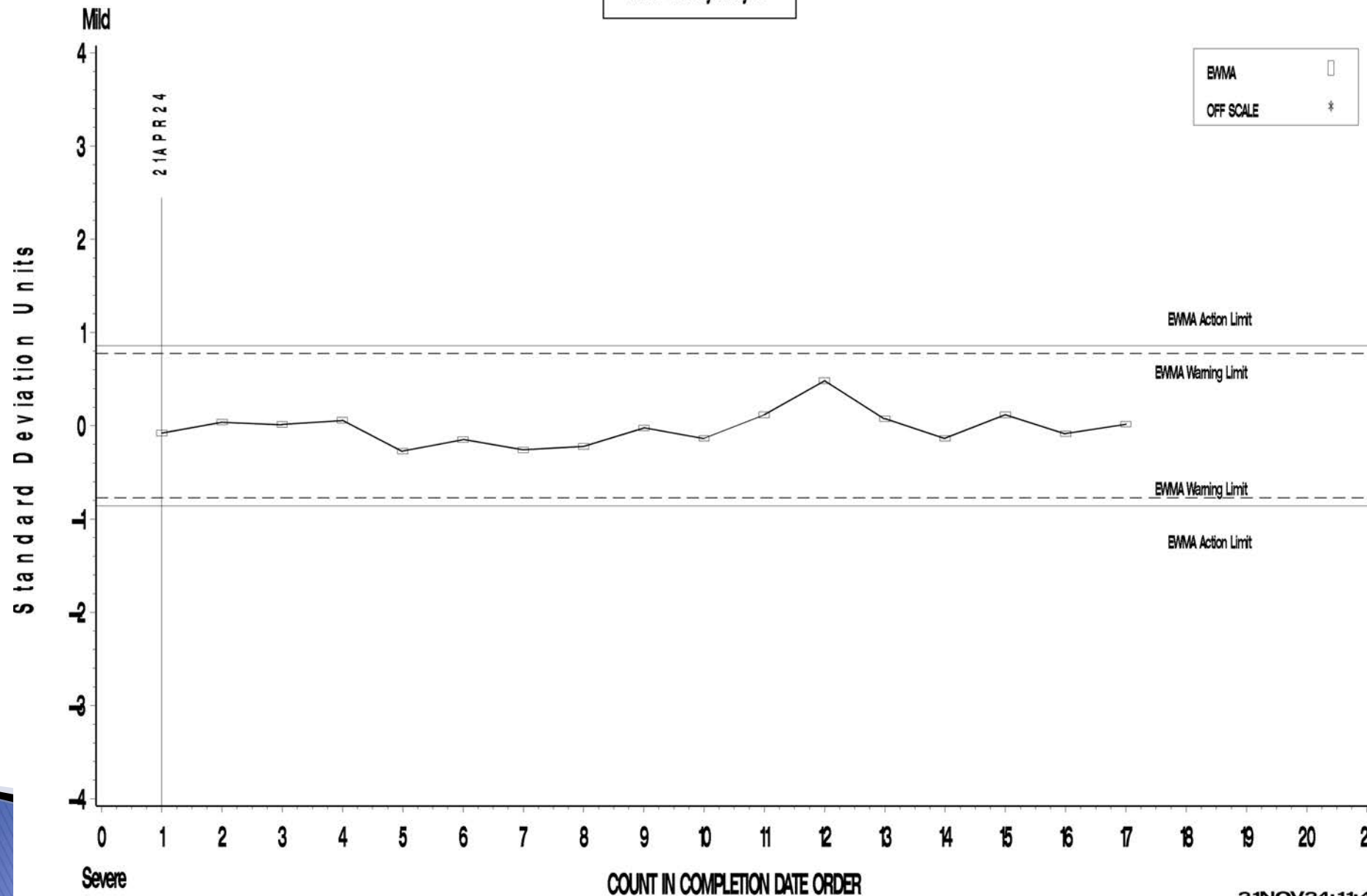
FINAL MRV VISCOSITY [NM, SOLID, FROZEN, <, >]

CUSUM Severity Analysis



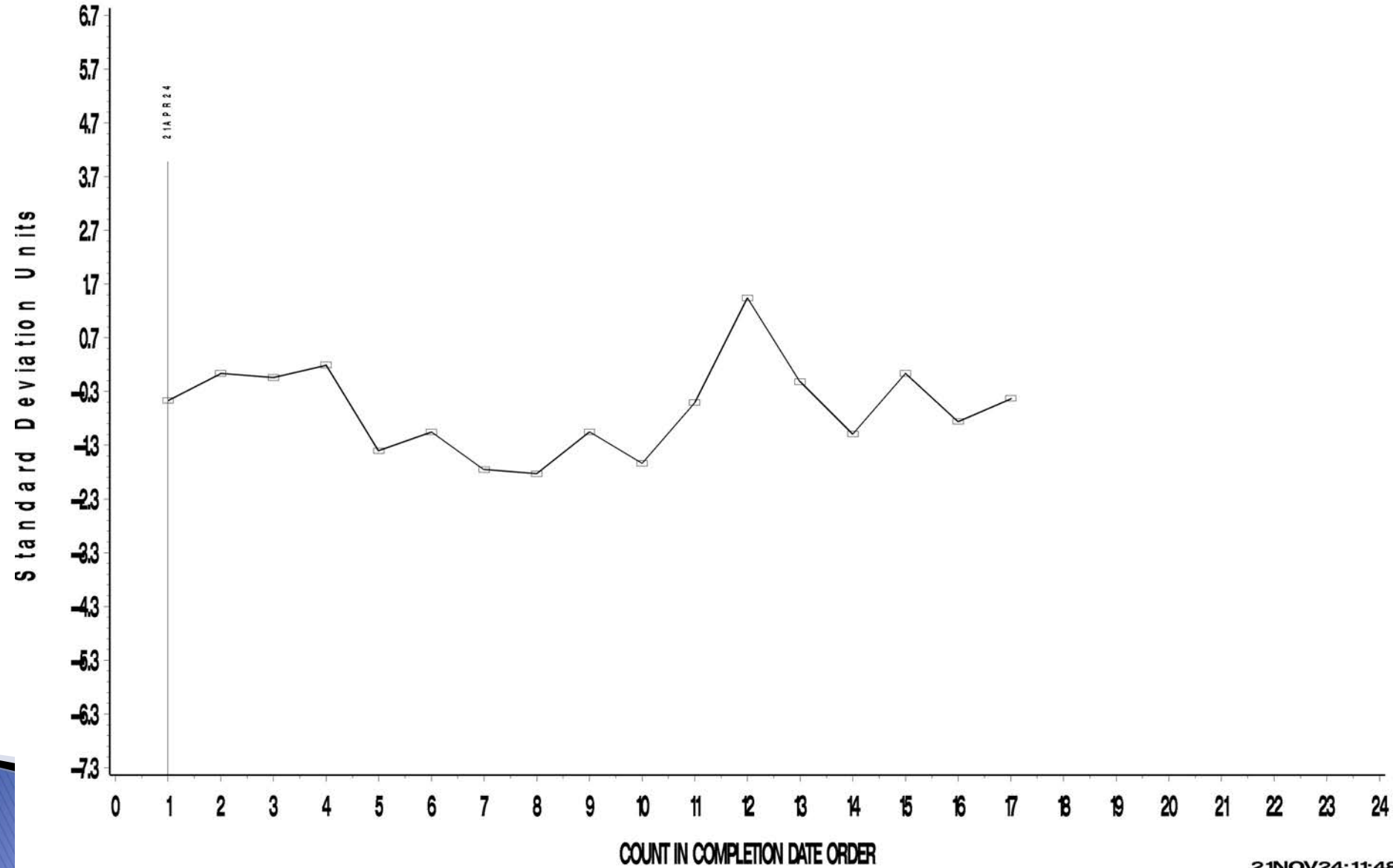
FINAL SOOT % AT 12 cSt [>]

LTMS Severity Analysis



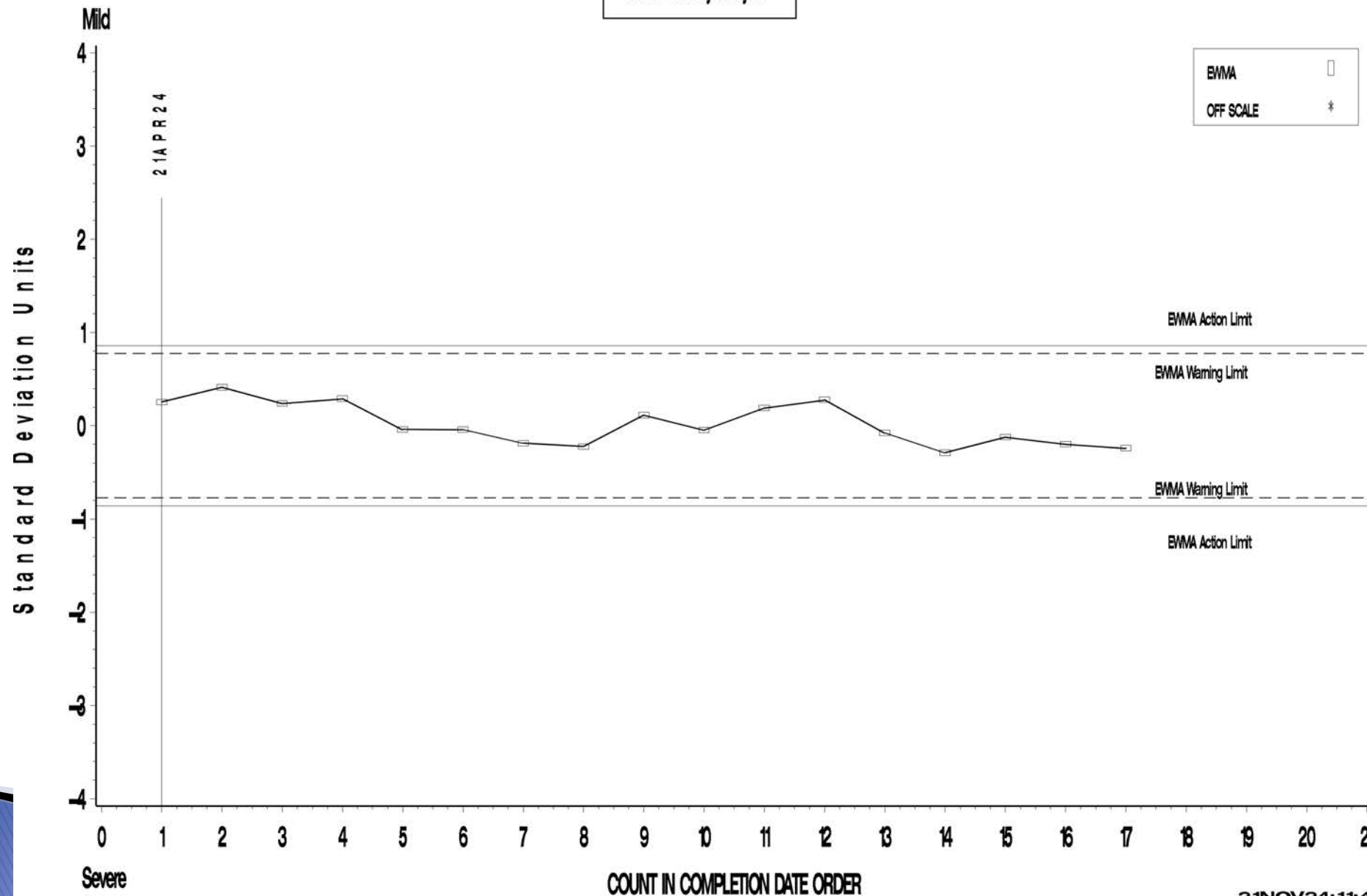
FINAL SOOT % AT 12 cSt [>]

CUSUM Severity Analysis



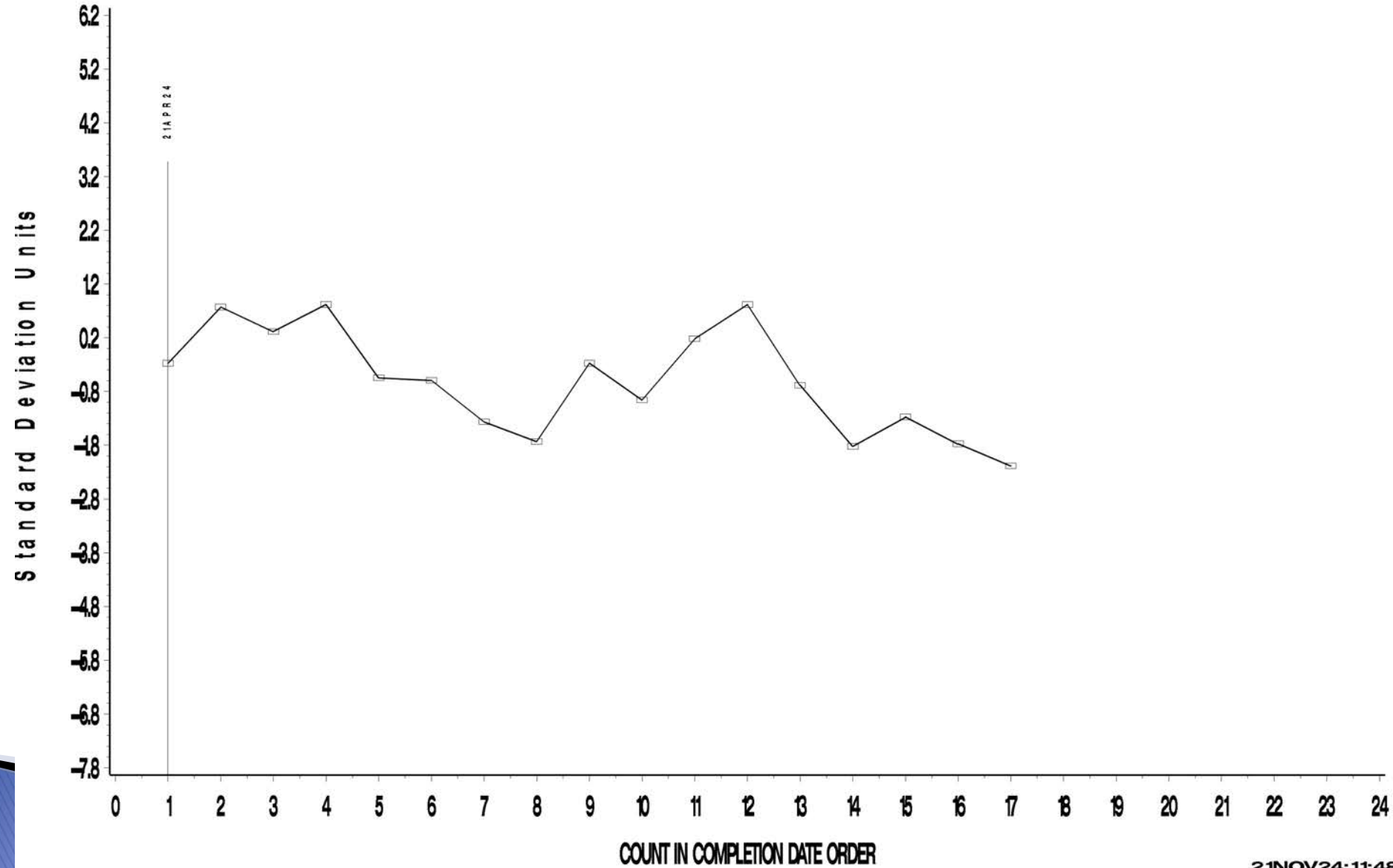
FINAL SOOT % AT 4 cSt [>]

LTMS Severity Analysis



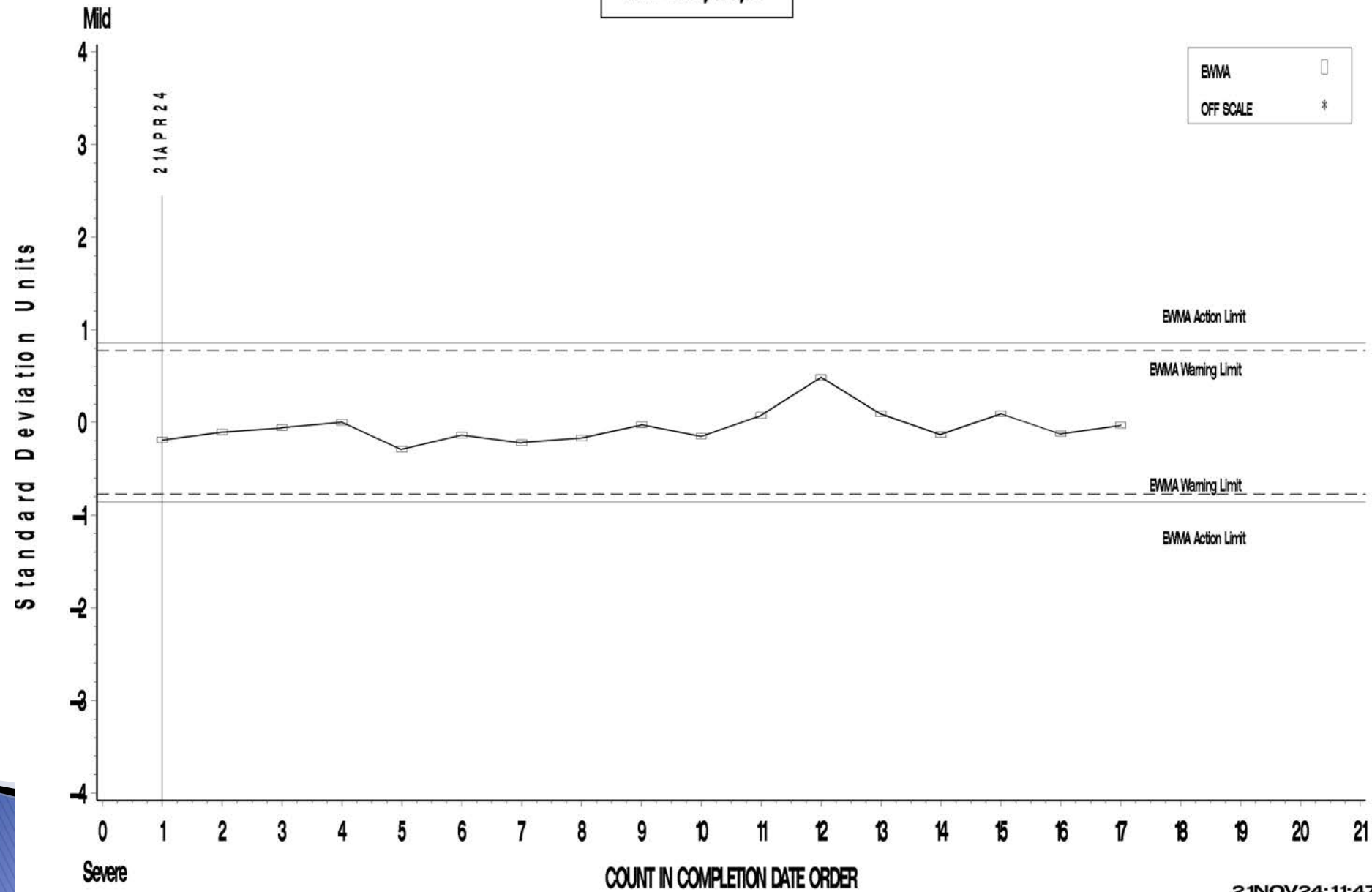
FINAL SOOT % AT 4 cSt [$>$]

CUSUM Severity Analysis



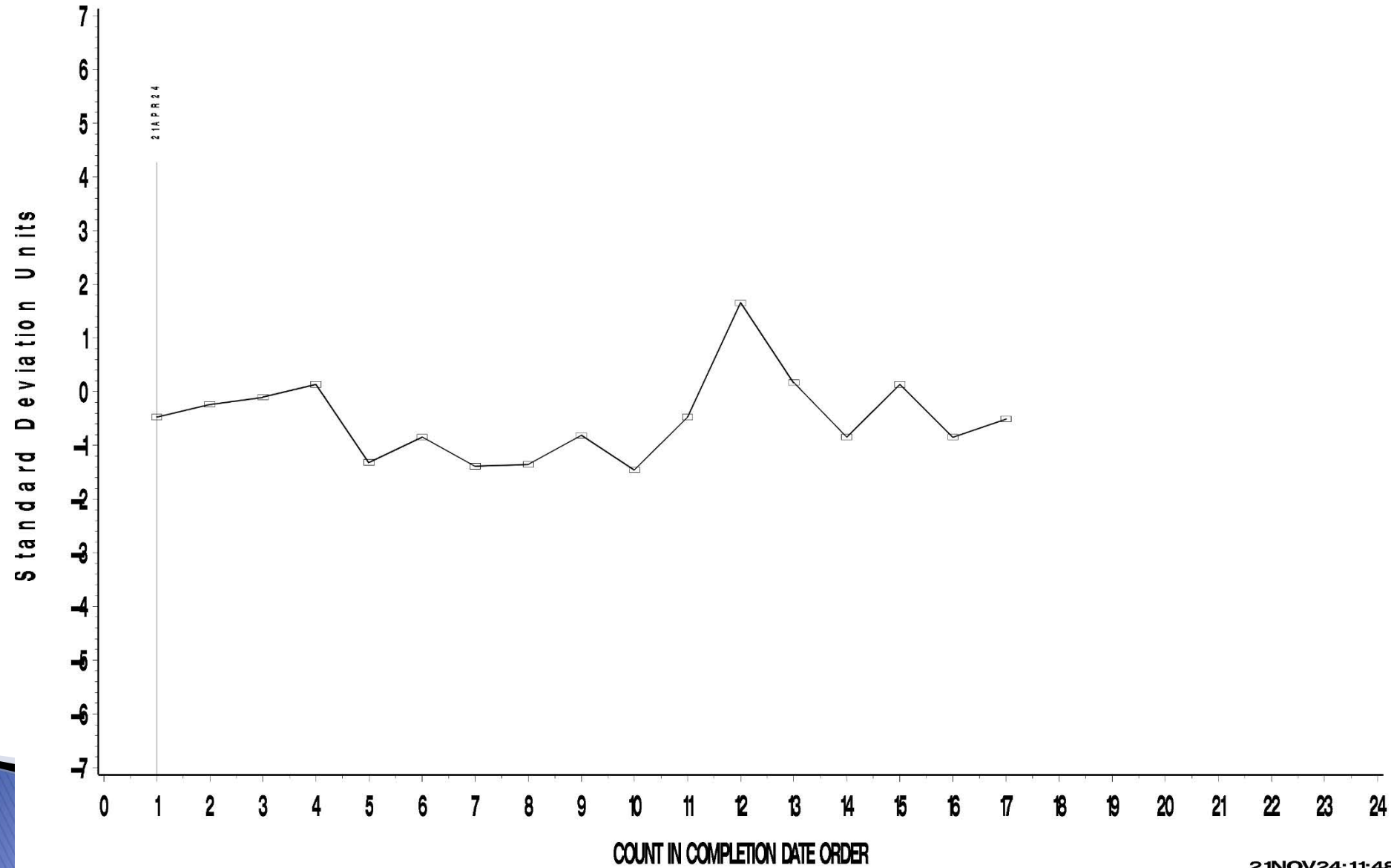
FINAL SOOT % AT 15 cSt [$>$]

LTMS Severity Analysis

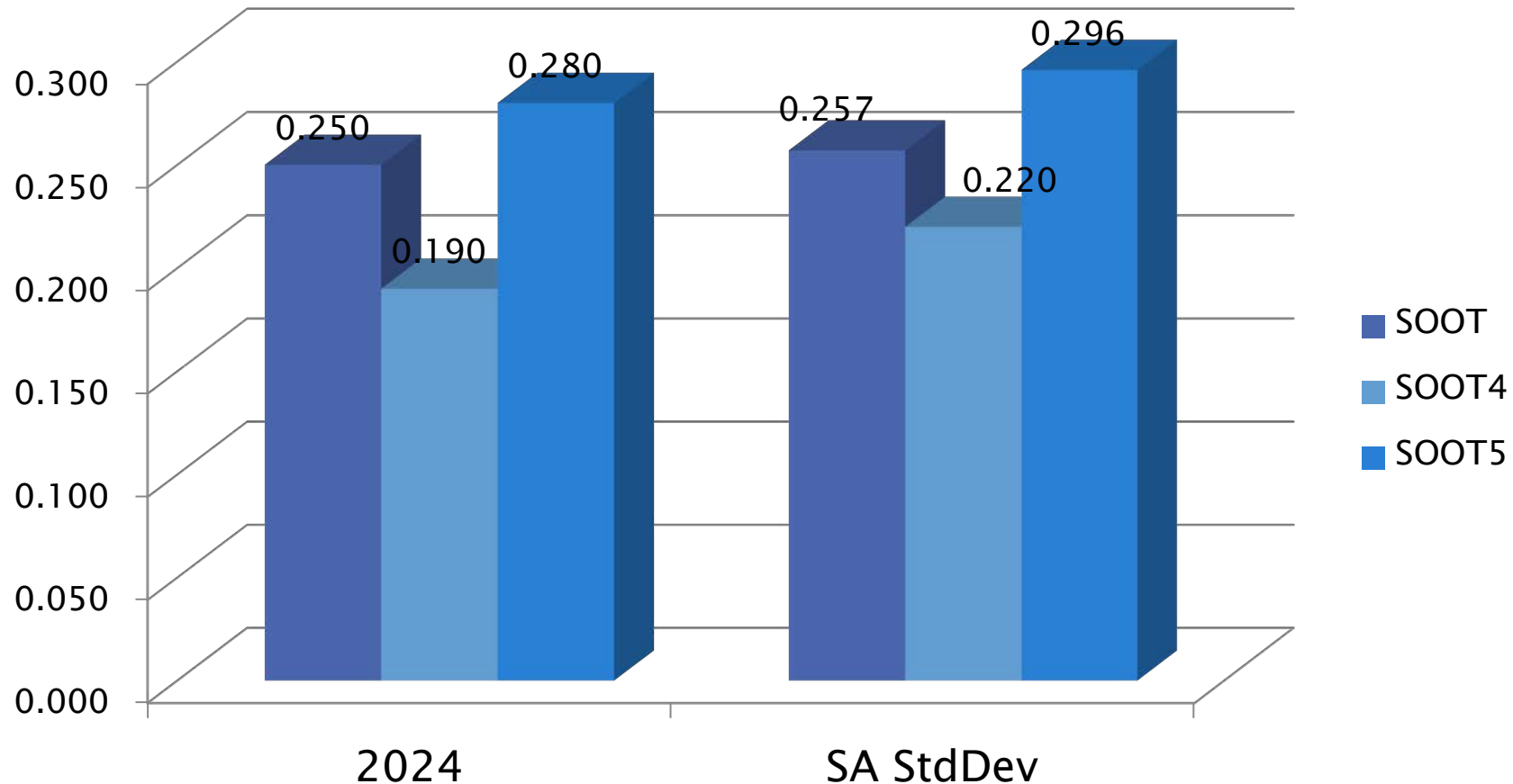


FINAL SOOT % AT 15 cSt [$>$]

CUSUM Severity Analysis



ISBV108 Precision Estimates



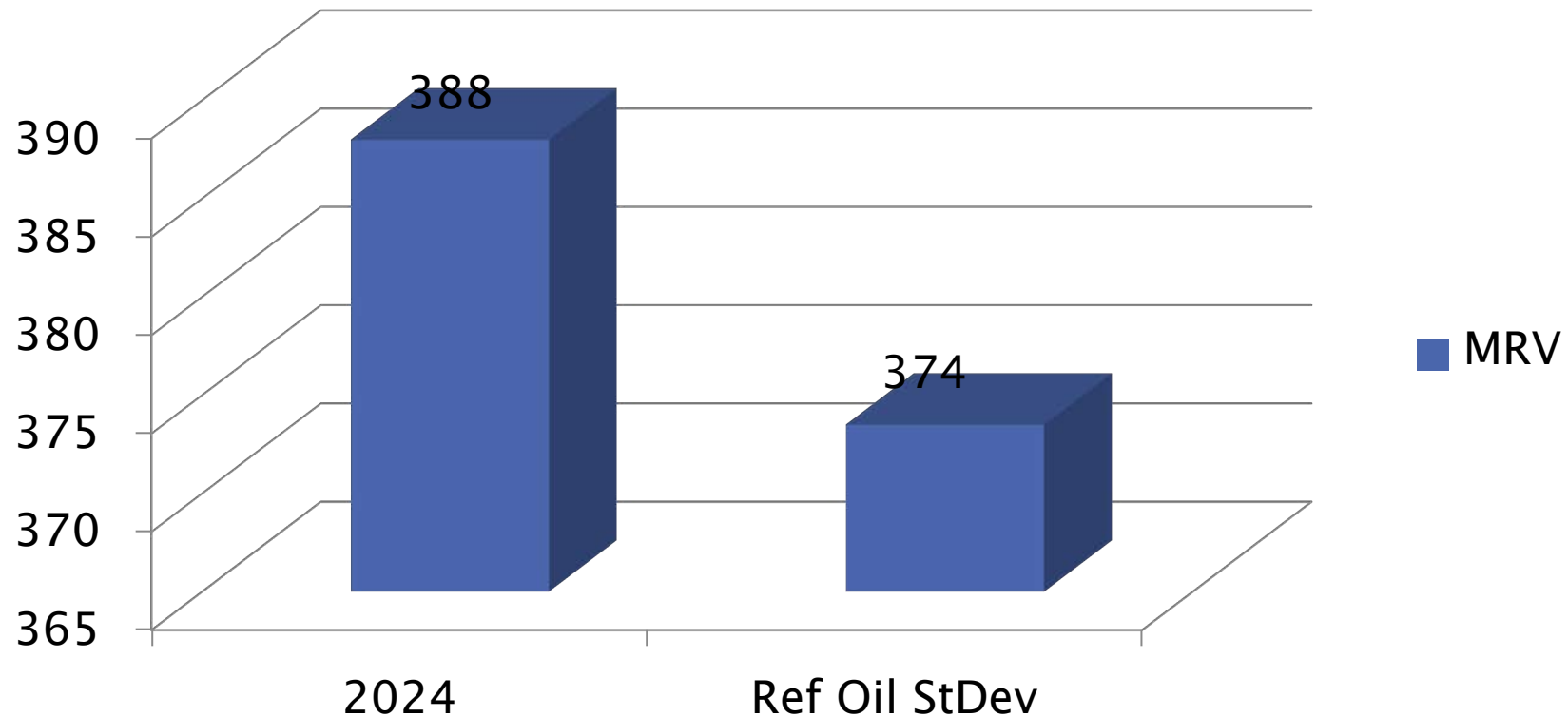
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ISBV108 Precision Estimates

MRV



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Cummins ISBV156

➤➤ October 2024

Test Monitoring Center
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ISBV1 56 Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	13
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		13

ISBV1 56 Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

ISBV1 56 Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

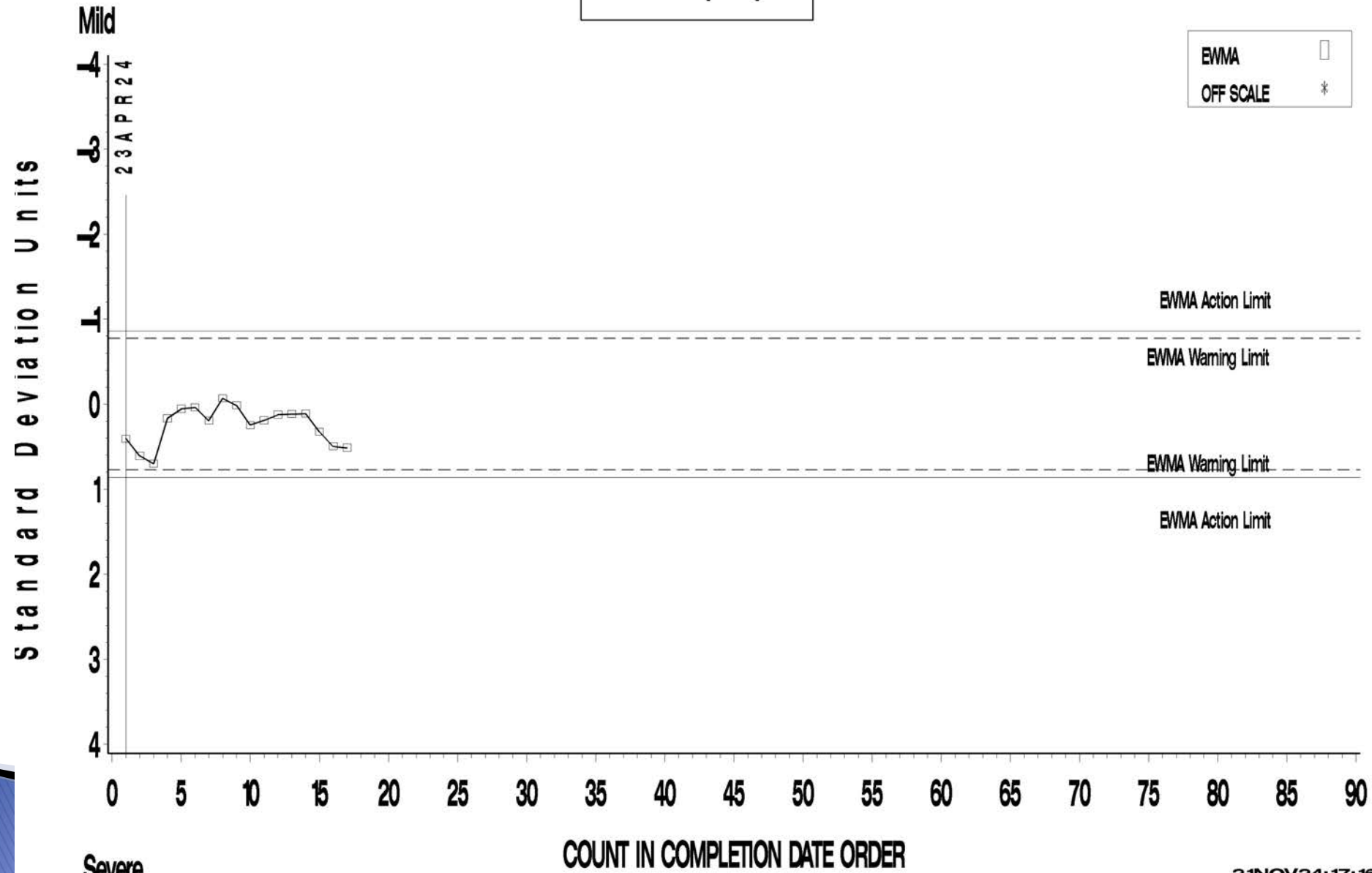
*Invalid and aborted tests

ISBV1 56 Test Severity

- ▶ All parameters are in control

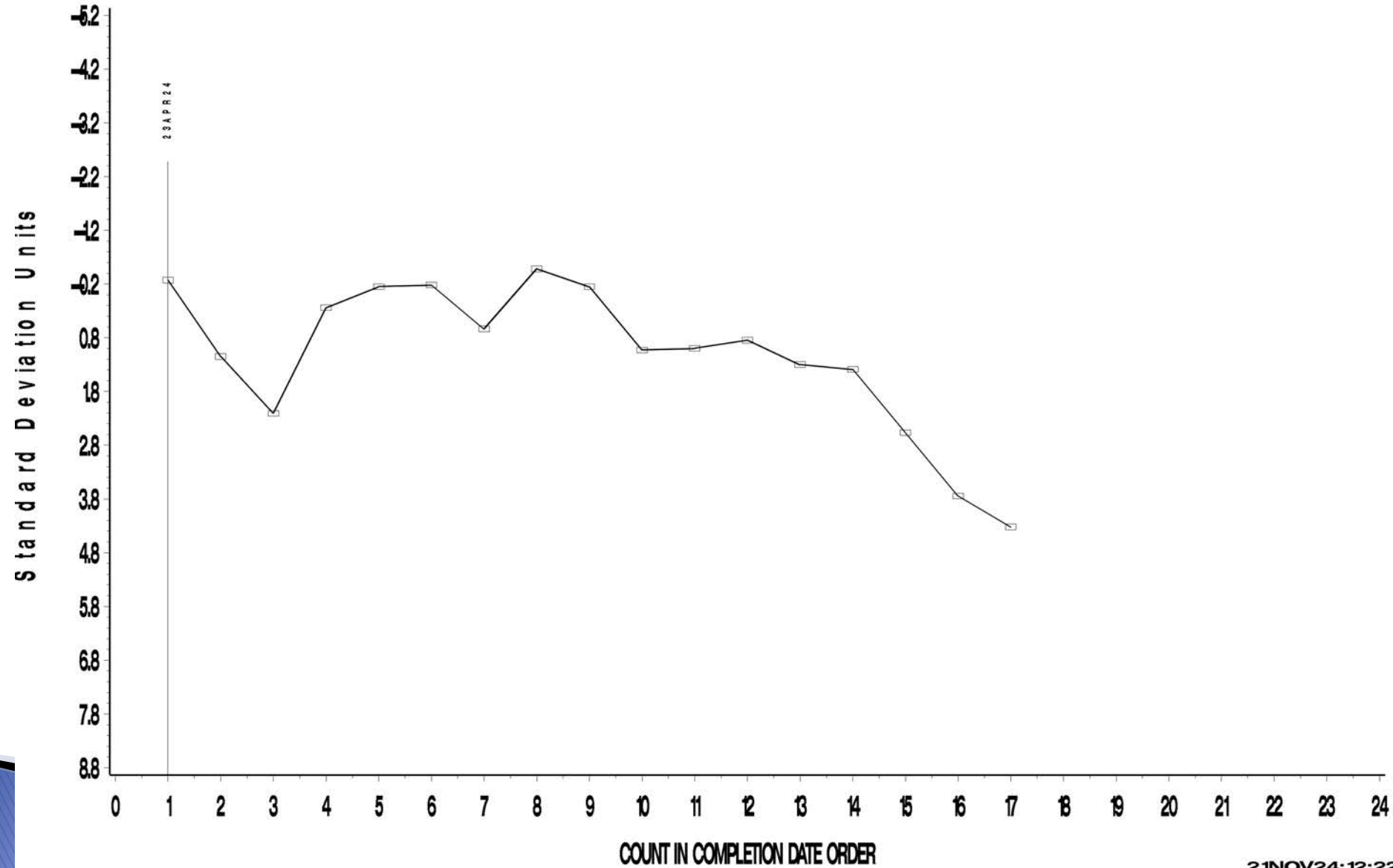
FINAL MRV VISCOSITY [NM, SOLID, FROZEN, <, >]

LTMS Severity Analysis



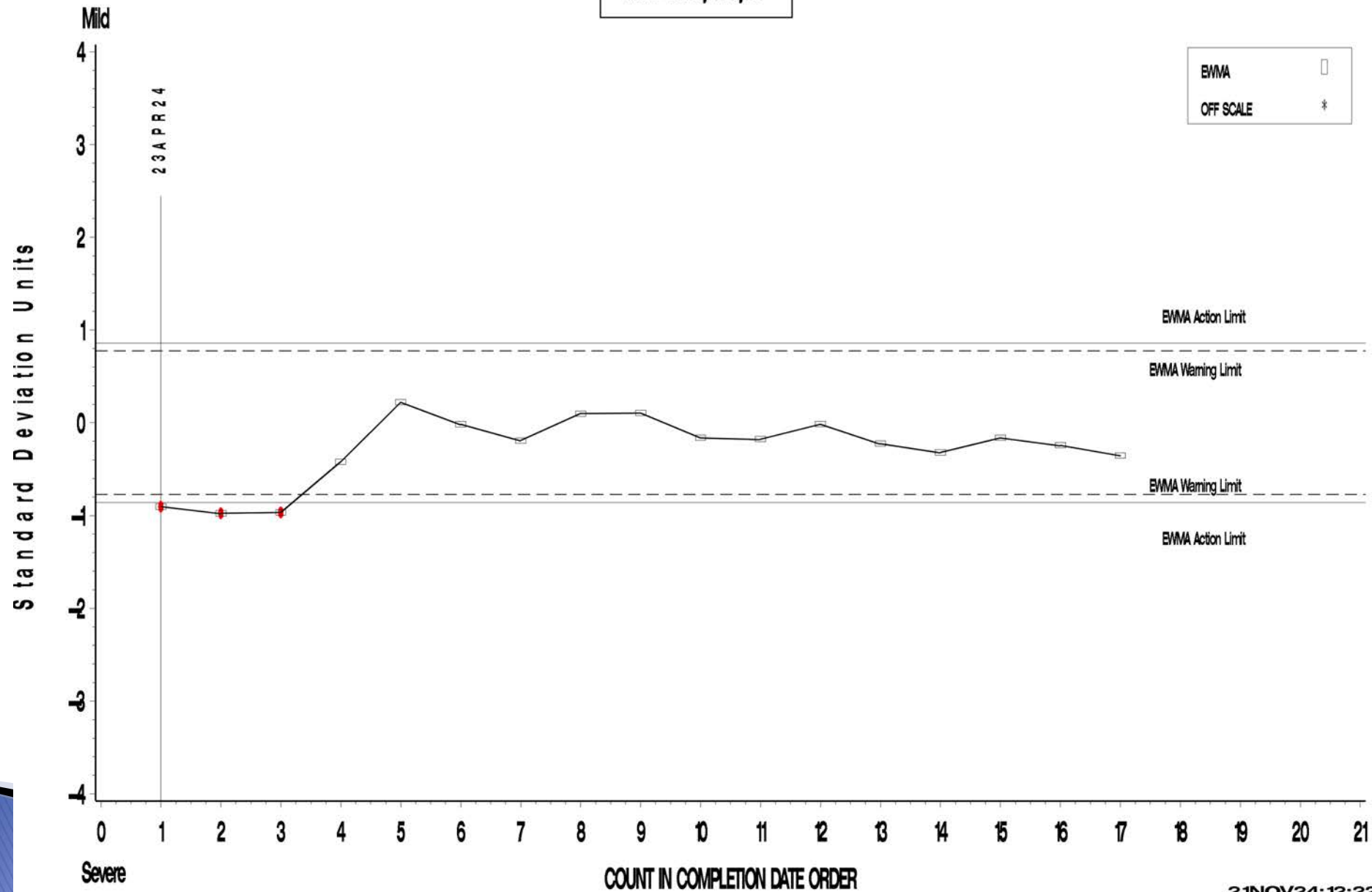
FINAL MRV VISCOSITY [NM, SOLID, FROZEN, <, >]

CUSUM Severity Analysis



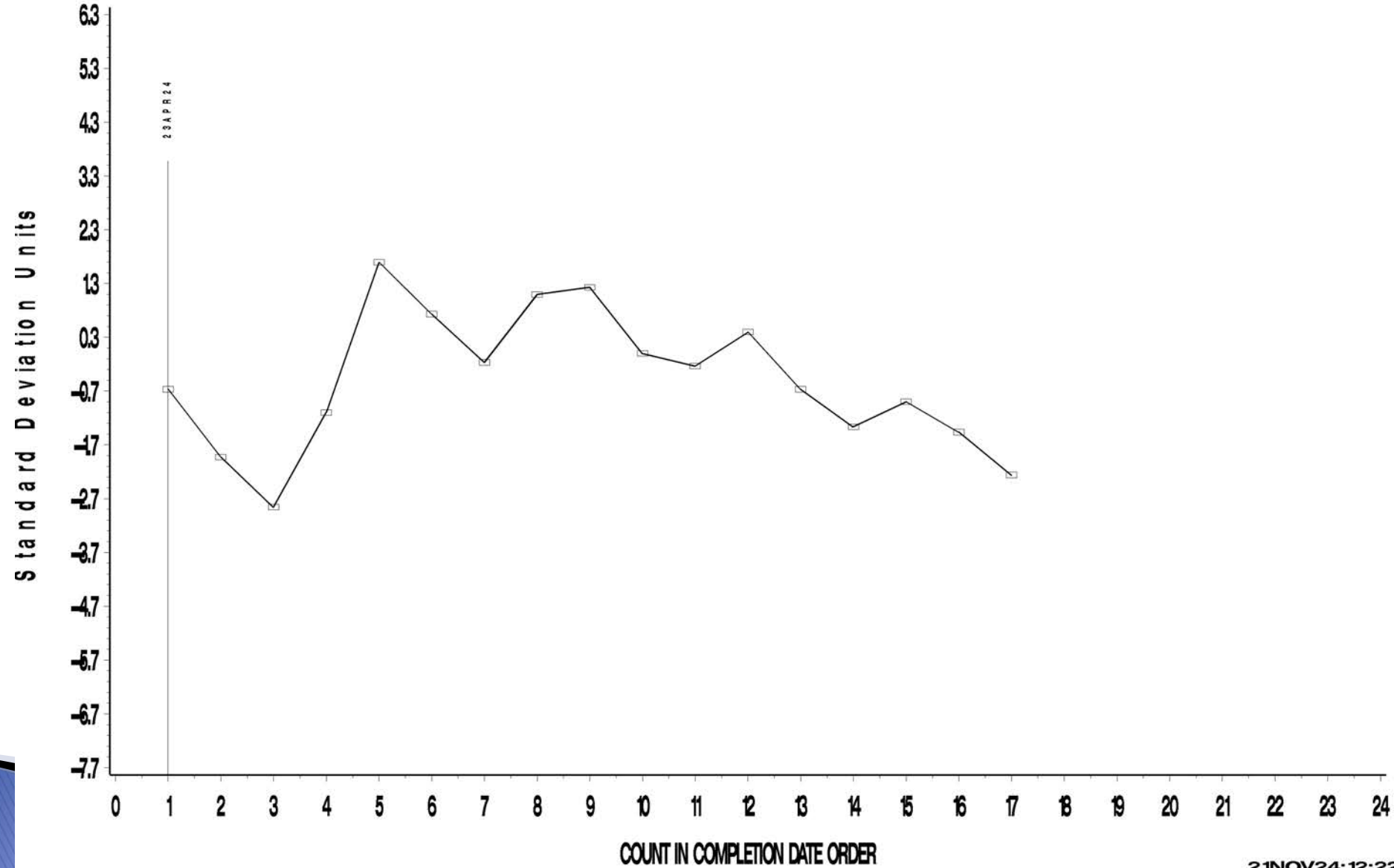
FINAL SOOT % AT 12 cSt [$>$]

LTMS Severity Analysis



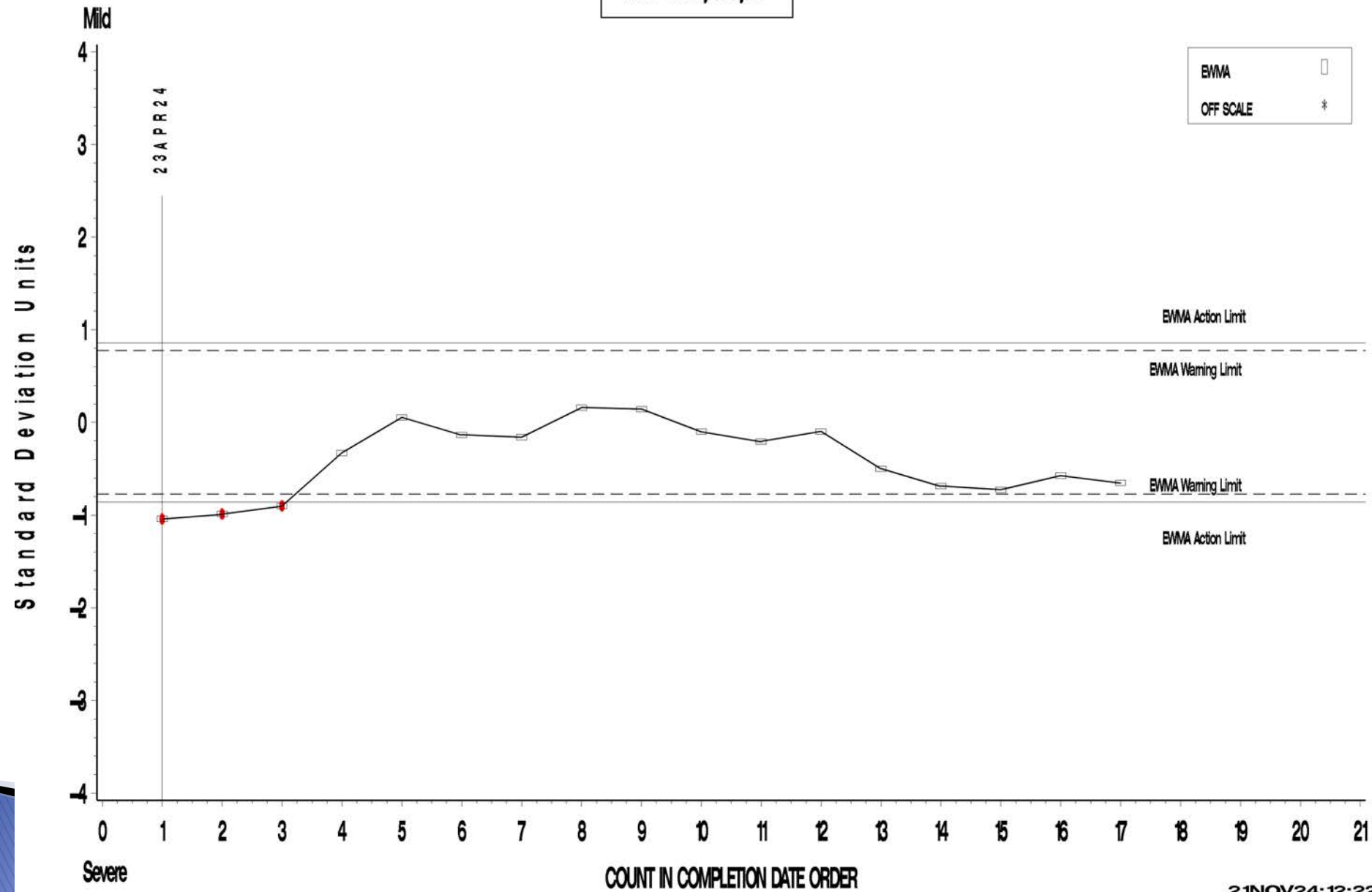
FINAL SOOT % AT 12 cSt [>]

CUSUM Severity Analysis



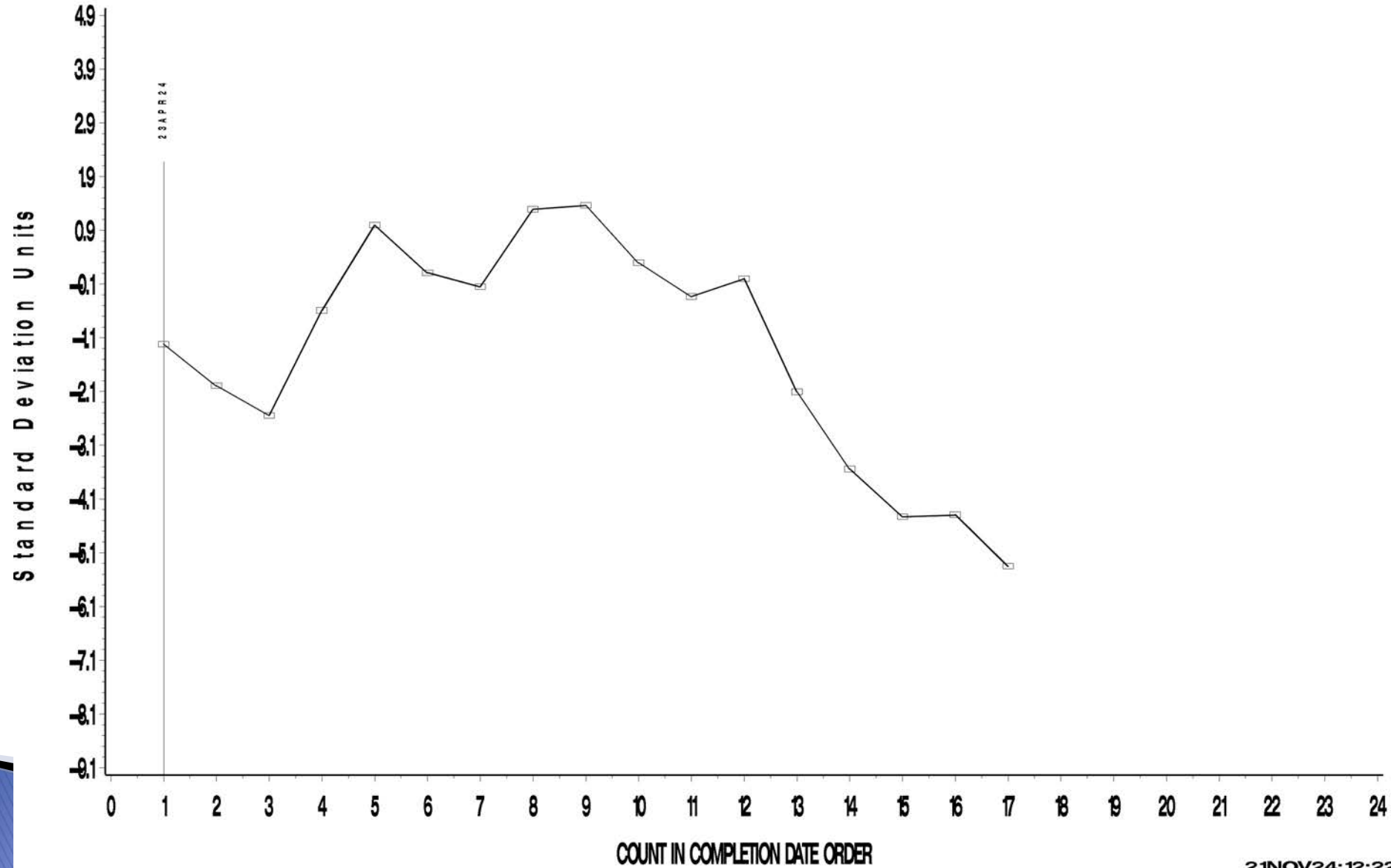
FINAL SOOT % AT 4 cSt [>]

LTMS Severity Analysis



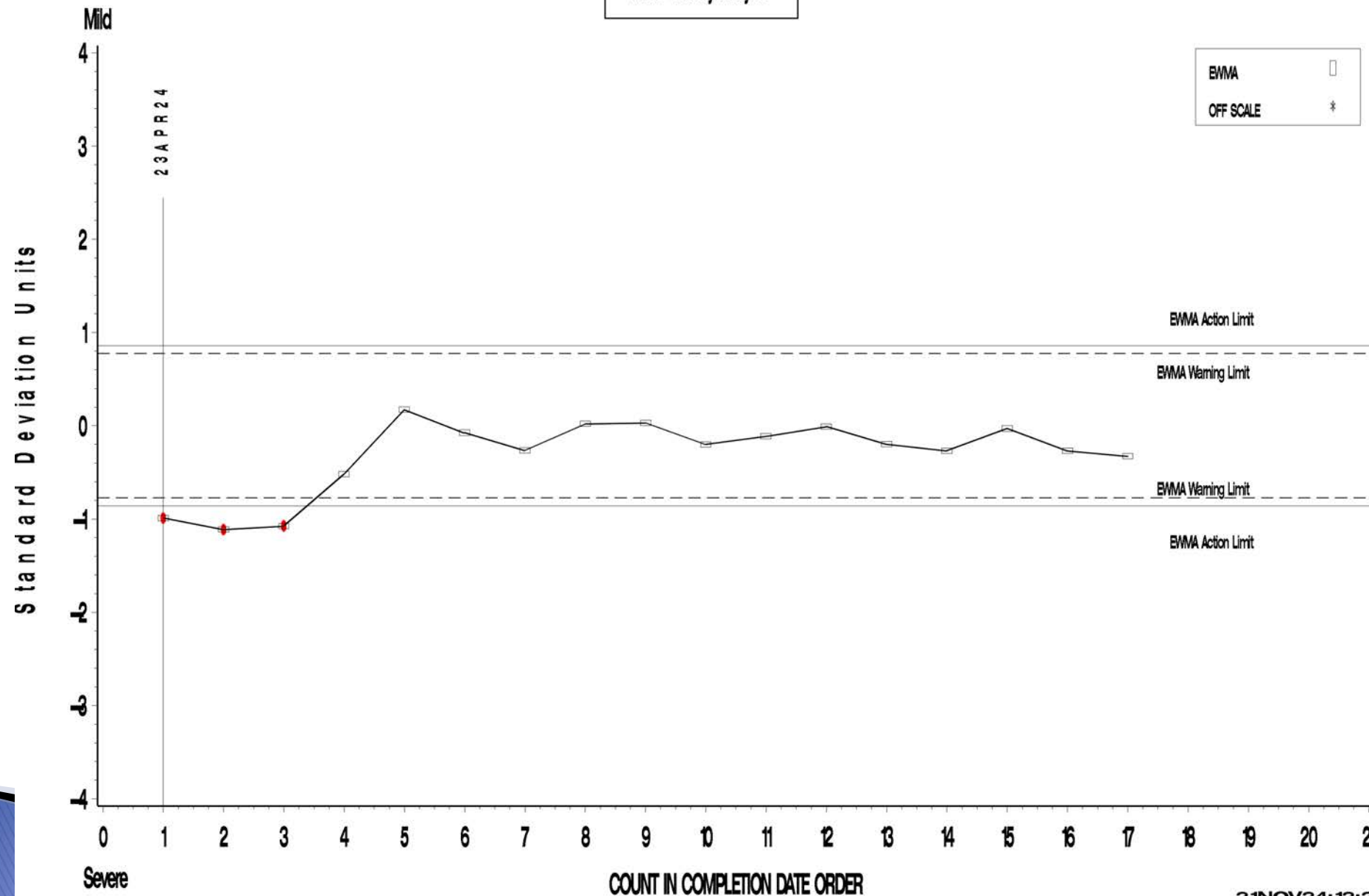
FINAL SOOT % AT 4 cSt [$>$]

CUSUM Severity Analysis



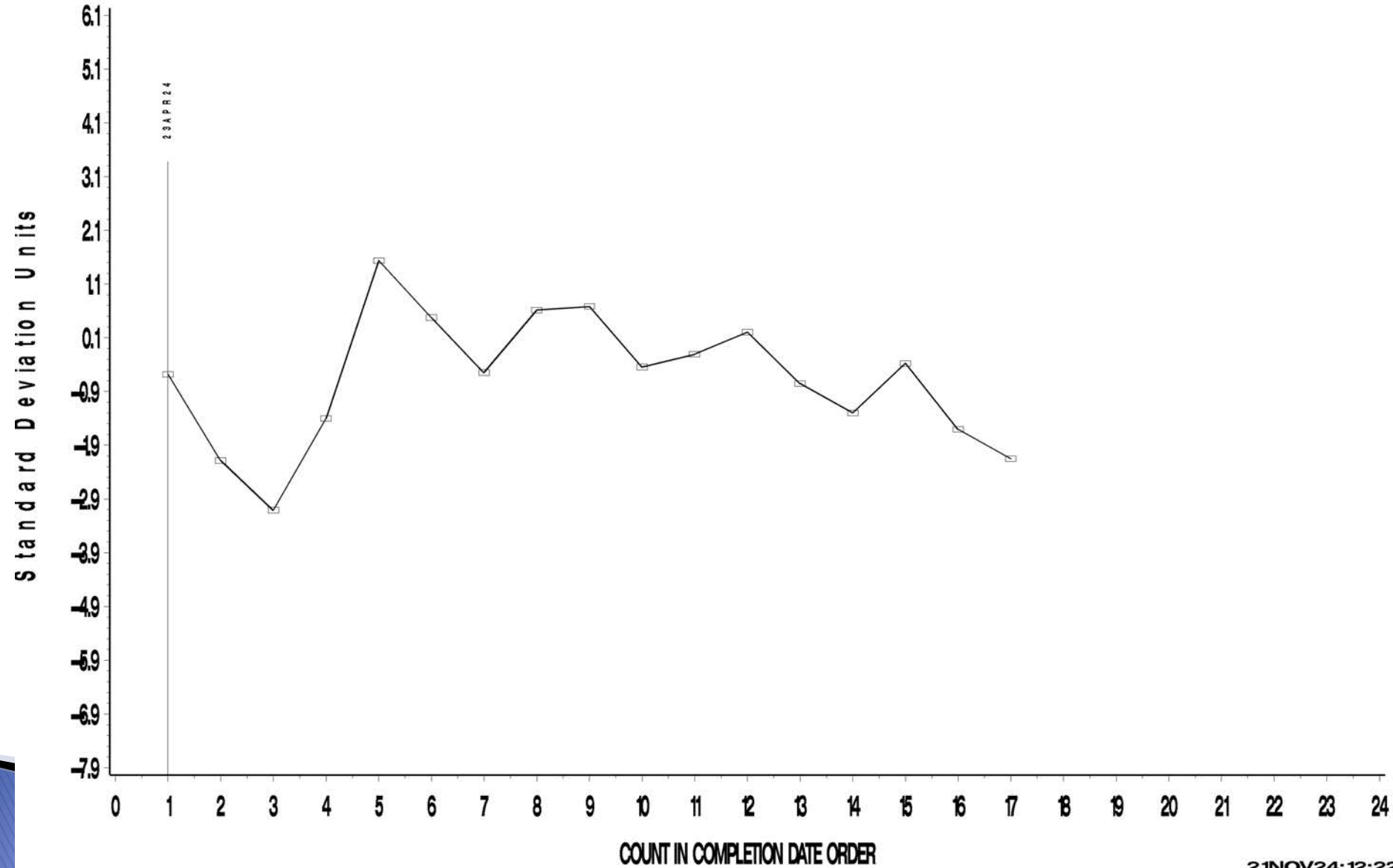
FINAL SOOT % AT 15 cSt [$>$]

LTMS Severity Analysis

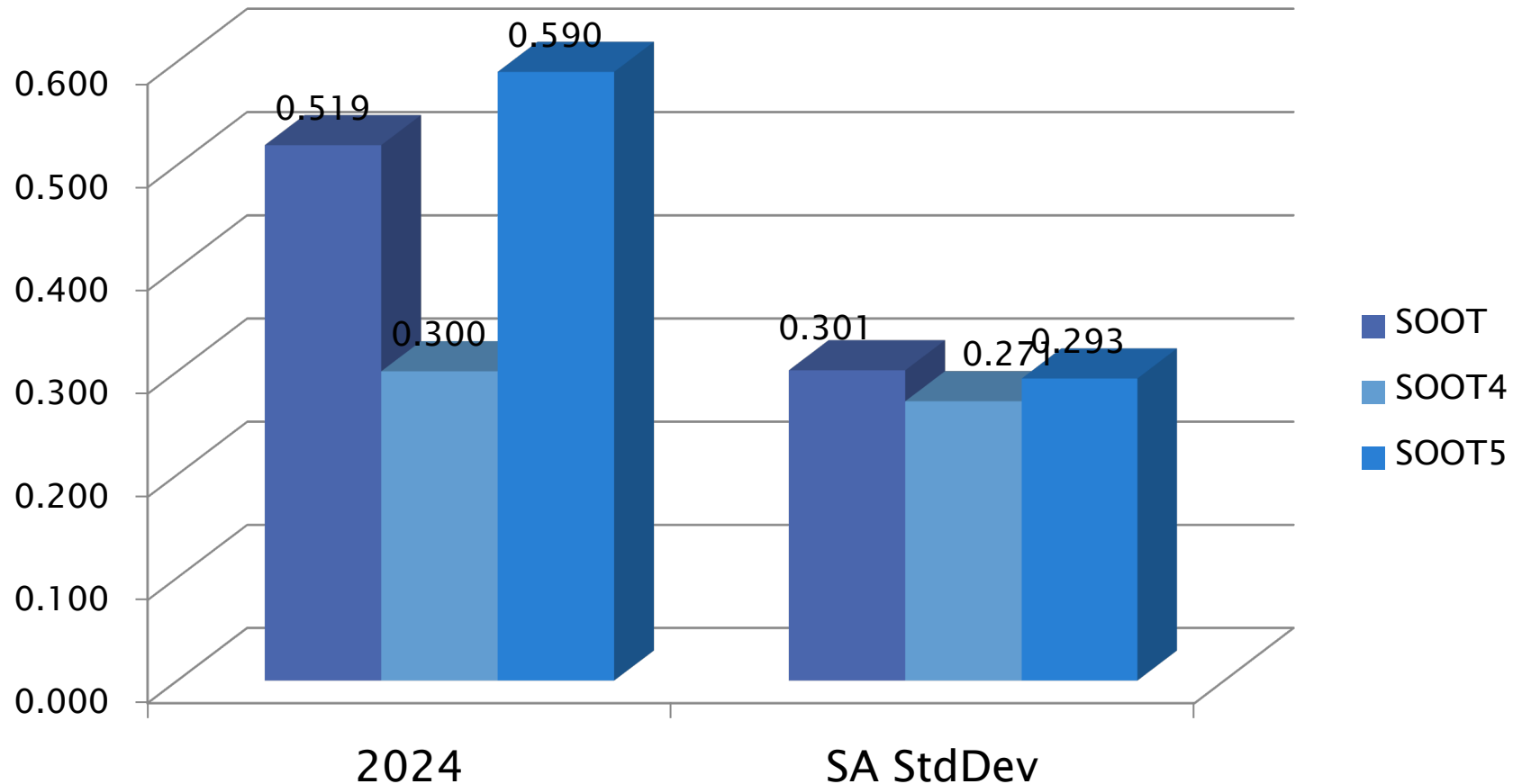


FINAL SOOT % AT 15 cSt [$>$]

CUSUM Severity Analysis

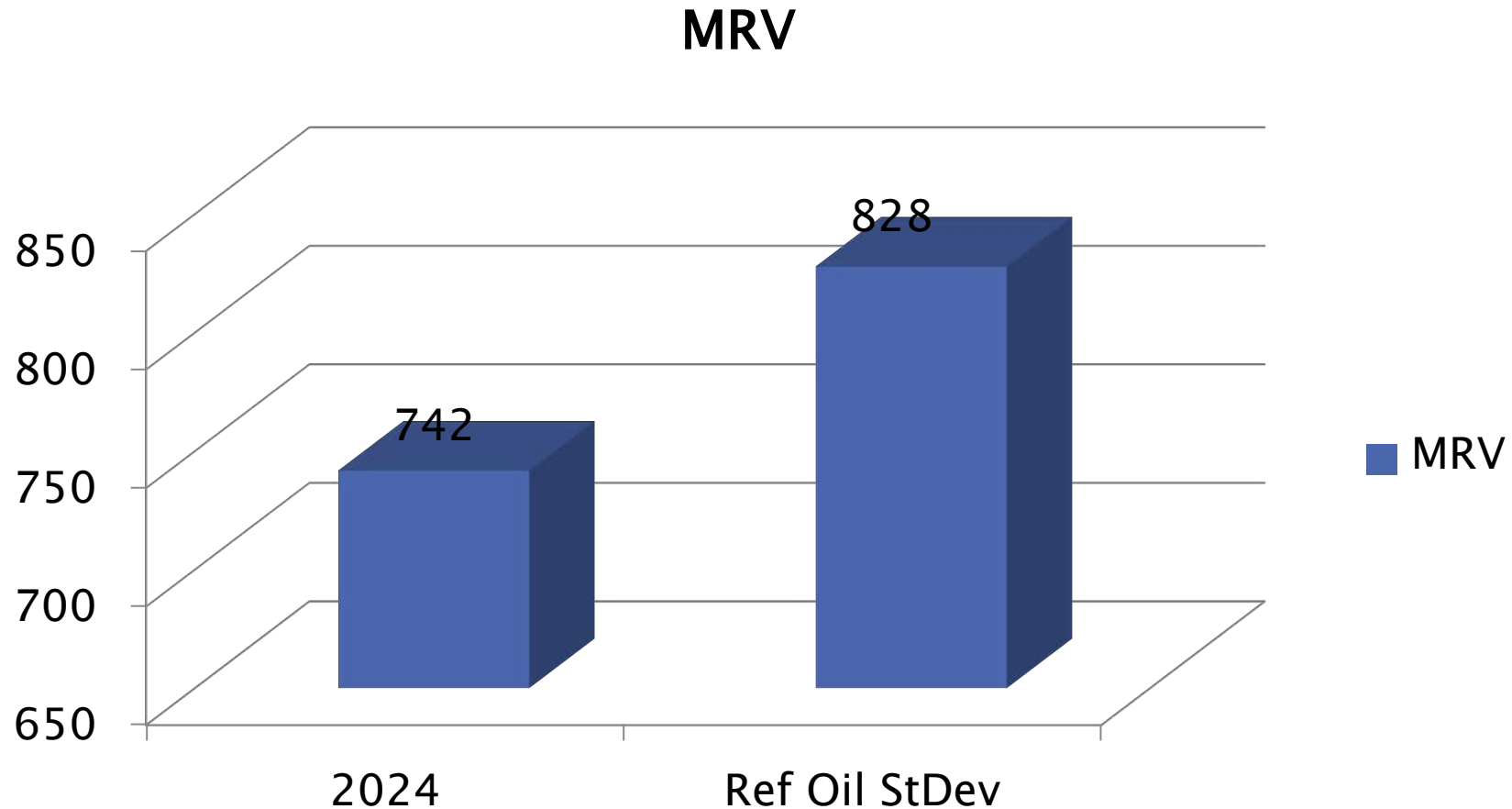


ISBV1 56 Precision Estimates



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ISBV1 56 Precision Estimates



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Test Monitoring Center
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RFWT

»» October 2024

Test Monitoring Center
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RFWT Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	0
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	0
Total		0

RFWT Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

RFWT Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

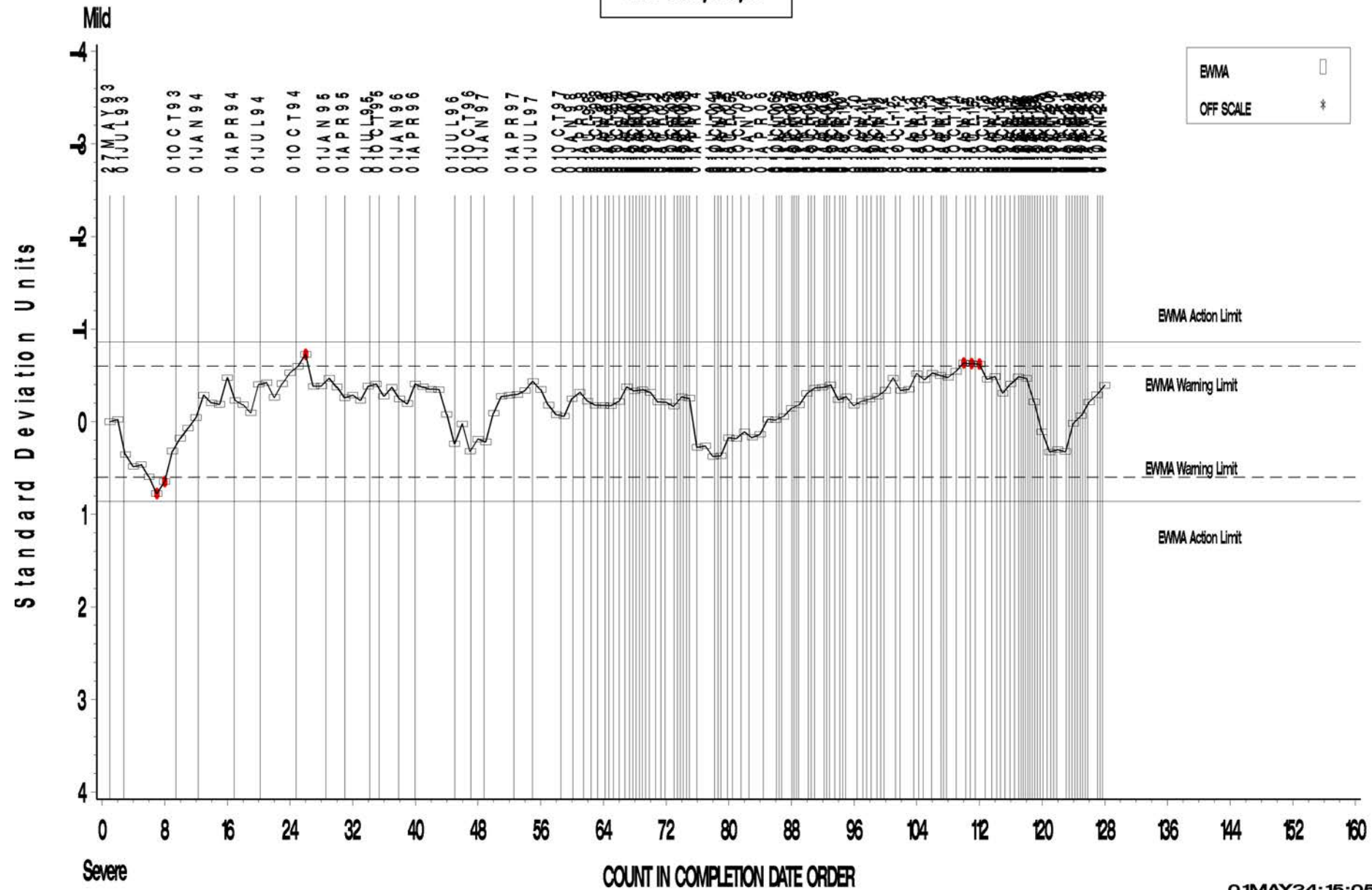
*Invalid and aborted tests

RFWT Test Severity

- ▶ As no chartable RFWT tests were run during this reporting period, no statement about test severity can be made.

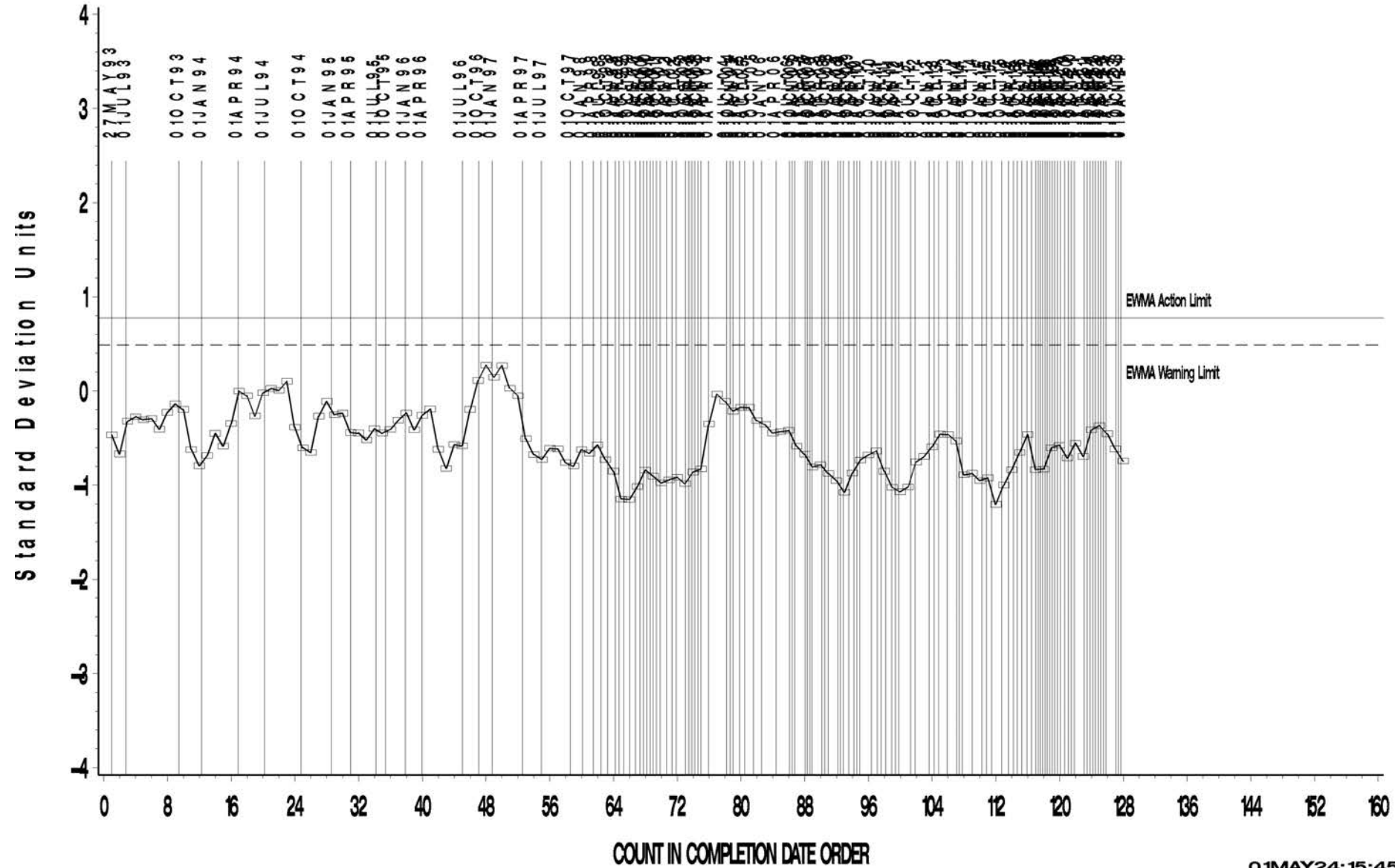
Average Follower Wear

LTMS Severity Analysis



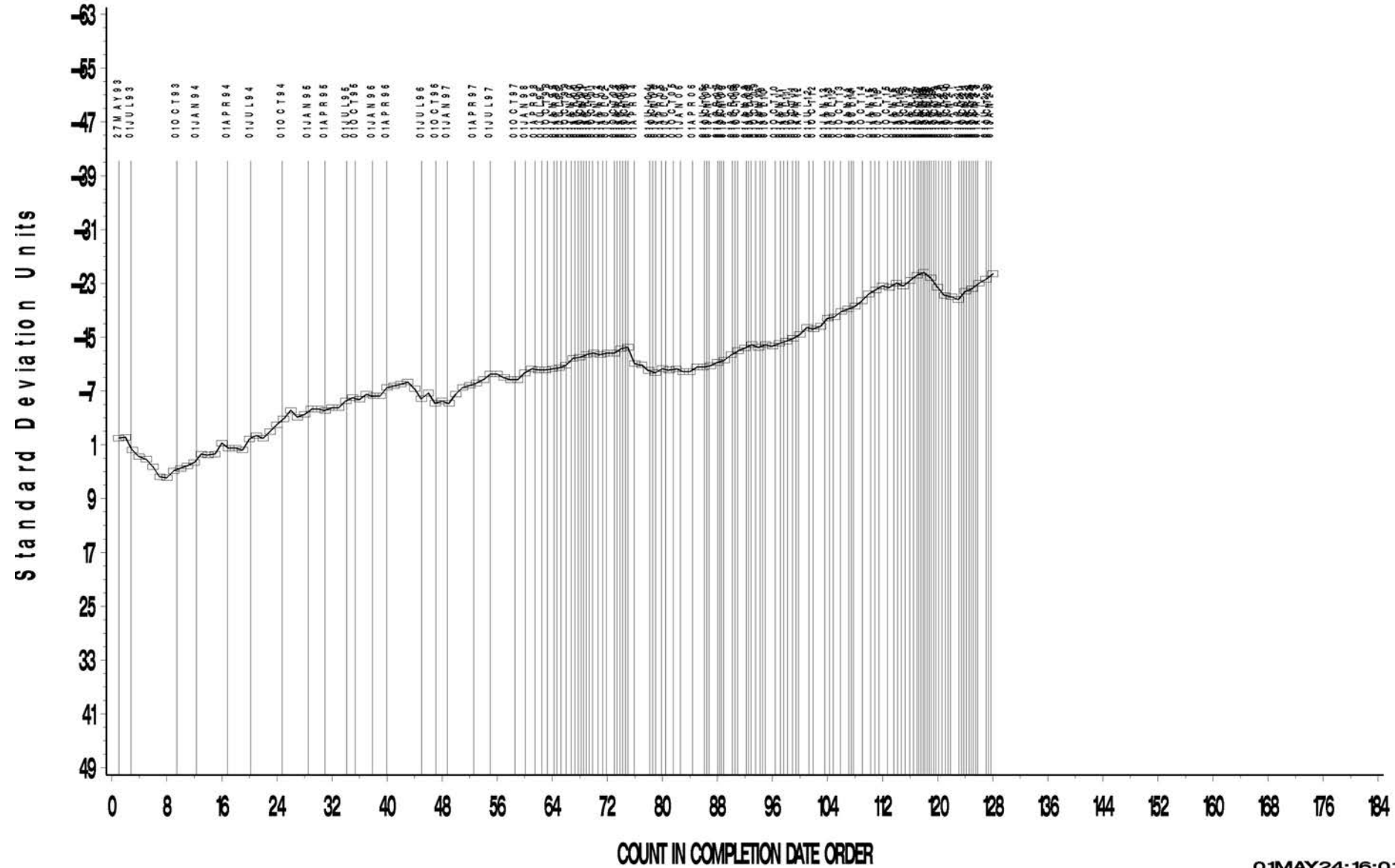
Average Follower Wear

LTMS Precision Analysis



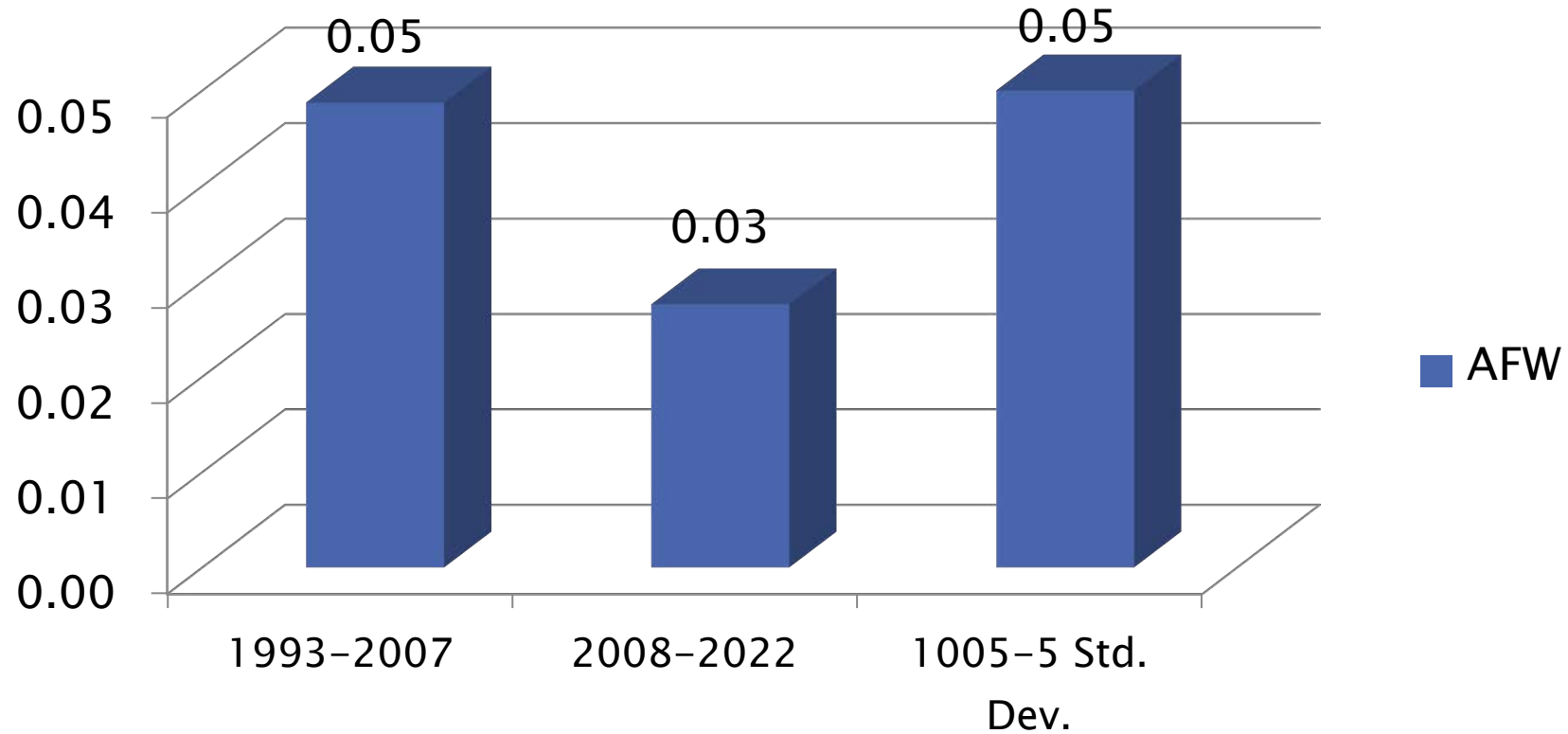
Average Follower Wear

CUSUM Severity Analysis



RFWT Precision Estimates

AFW



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Test Monitoring Center
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Mack T-8/T-8E

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<https://www.astmtmc.org>



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T-8/T-8E Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	2
Failed Calibration Test	OC	1
Operationally Invalid	LC	0
Aborted	XC	1
Total		4

T-8/T8-E Failed Tests

Failed Parameter	Number of Tests
Mild all parameters	1
Total	1

T-8/T8-E Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	High OC	1
Total		1

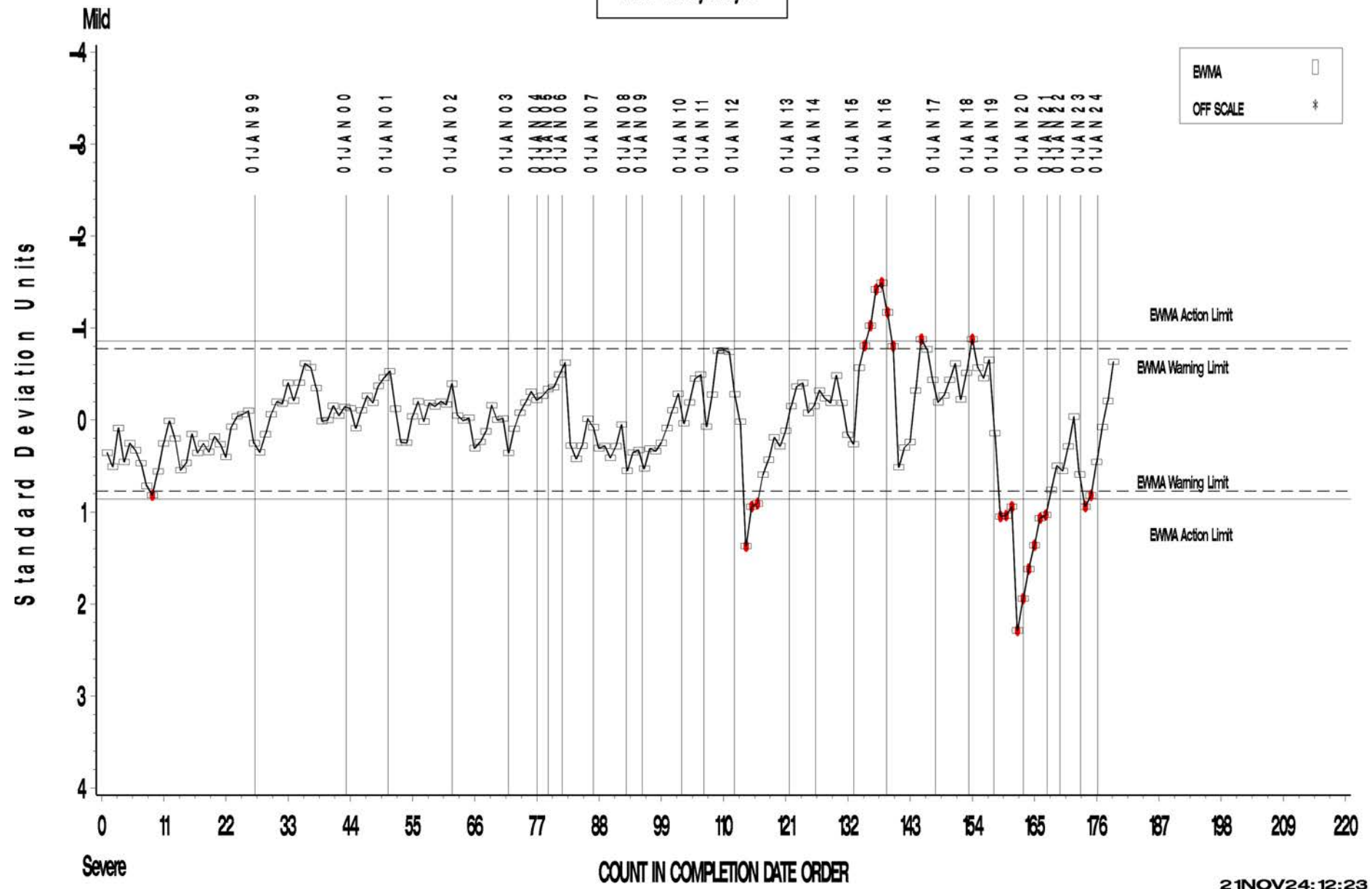
*Invalid and aborted tests

T-8/T-8E Test Severity

- ▶ VI38 is in level 2 Zi alarm in mild direction.
- ▶ RV2 and RV48 are in control.

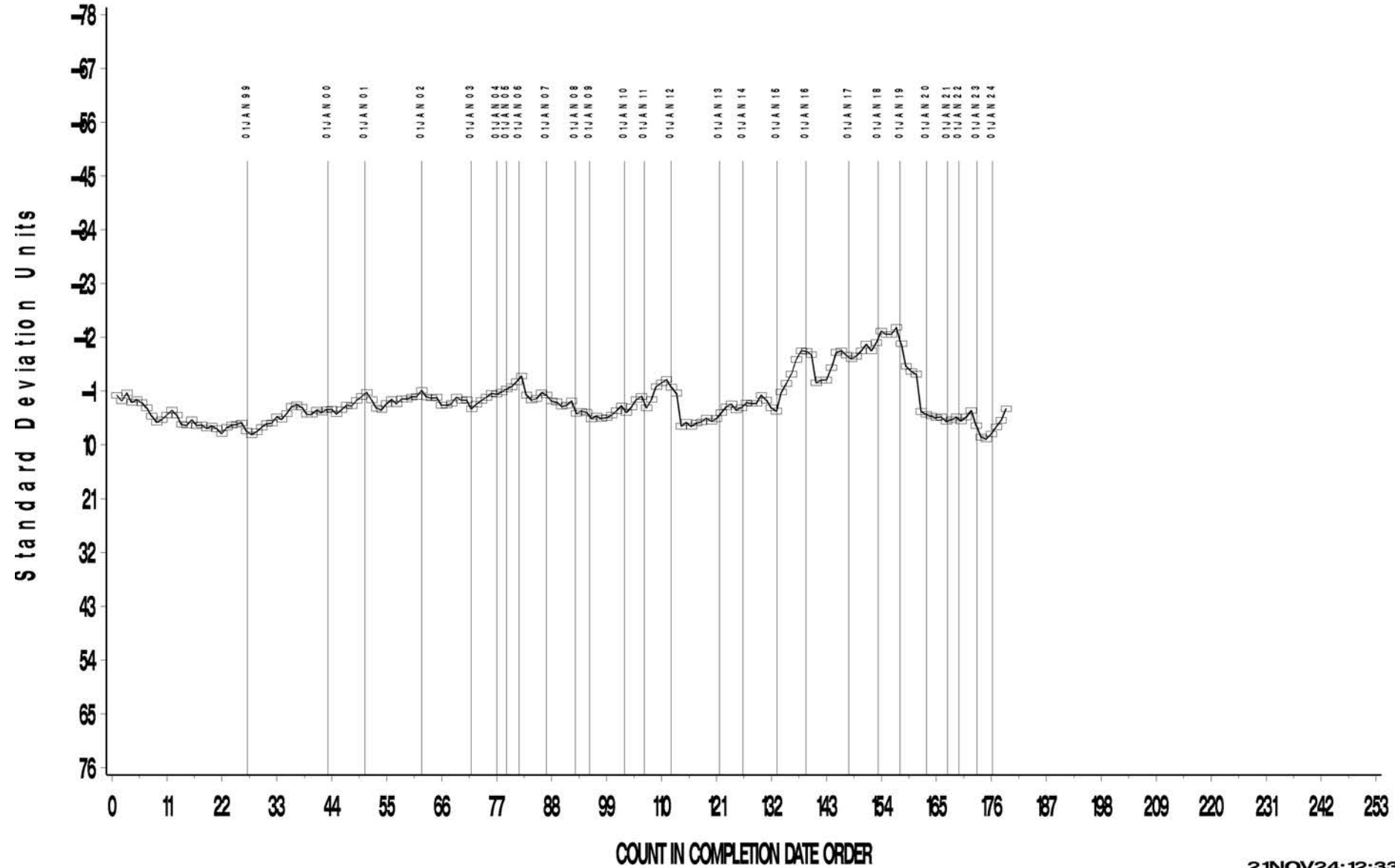
RELATIVE VISCOSITY @ 4.8% (100% LOSS)

LTMS Severity Analysis



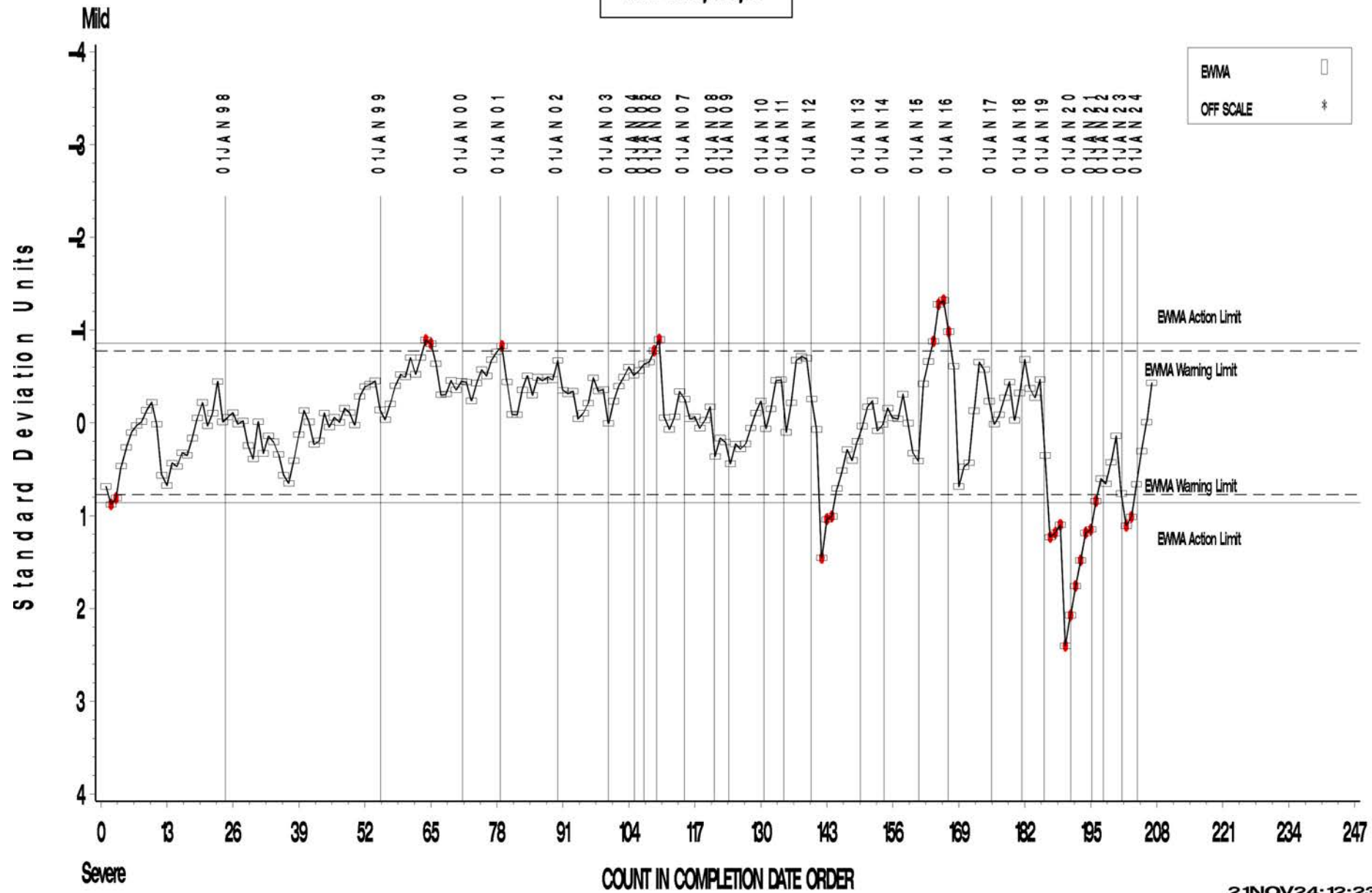
RELATIVE VISCOSITY @ 4.8% (100% LOSS)

CUSUM Severity Analysis



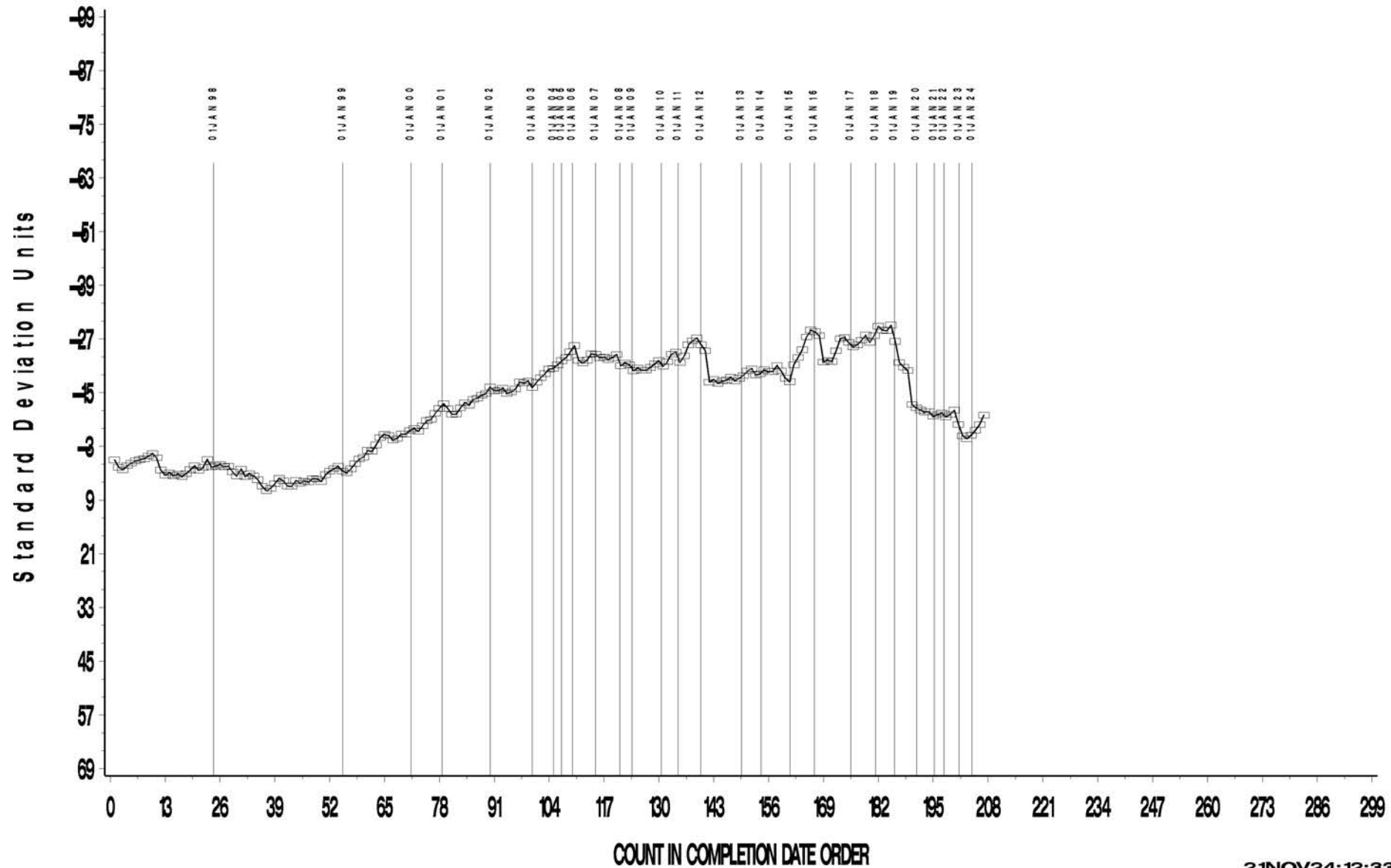
RELATIVE VISCOSITY @ 4.8% (50% LOSS)

LTMS Severity Analysis



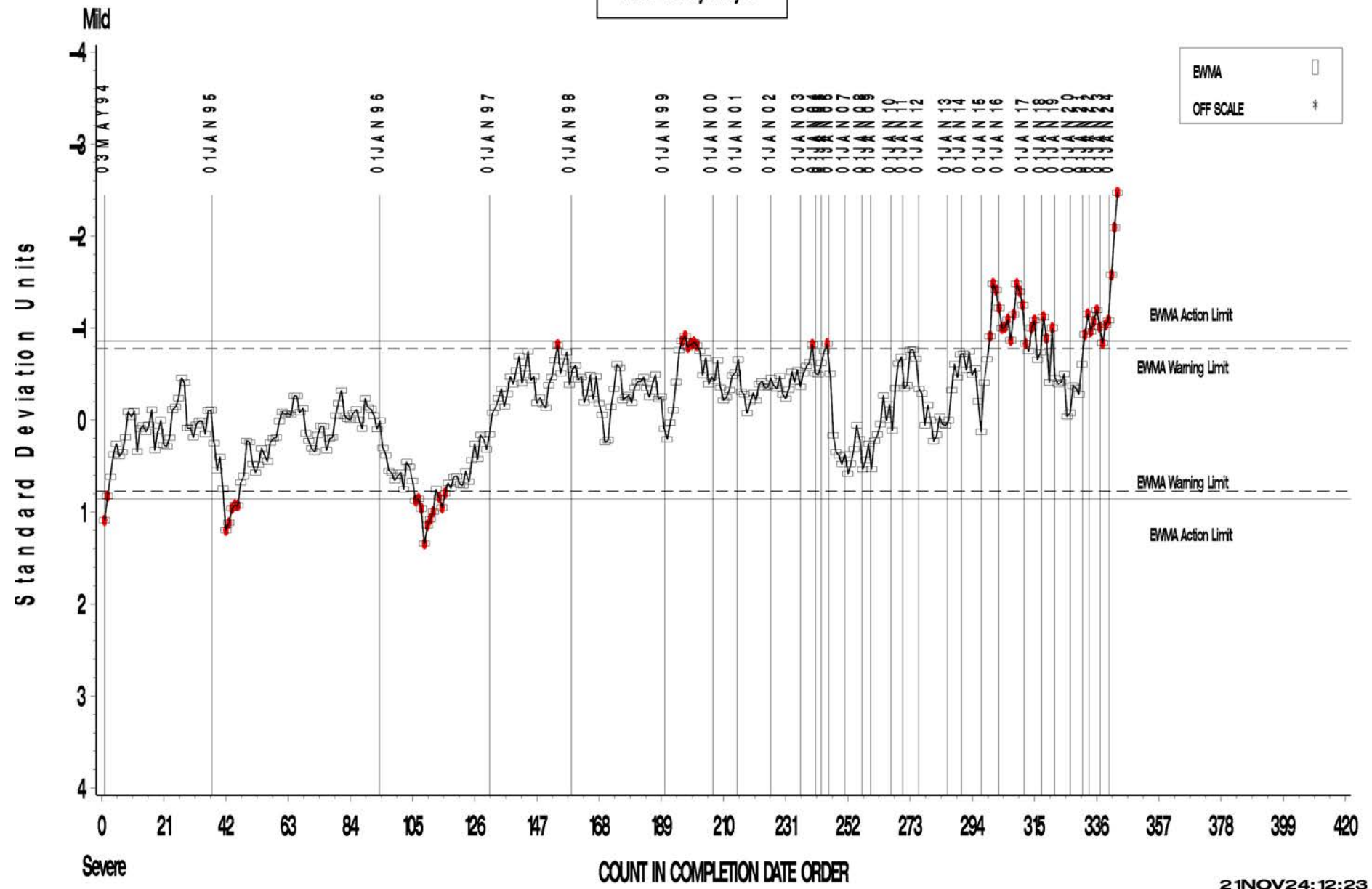
RELATIVE VISCOSITY @ 4.8% (50% LOSS)

CUSUM Severity Analysis



VISCOSITY INCR @ 3.8% SOOT

LTMS Severity Analysis

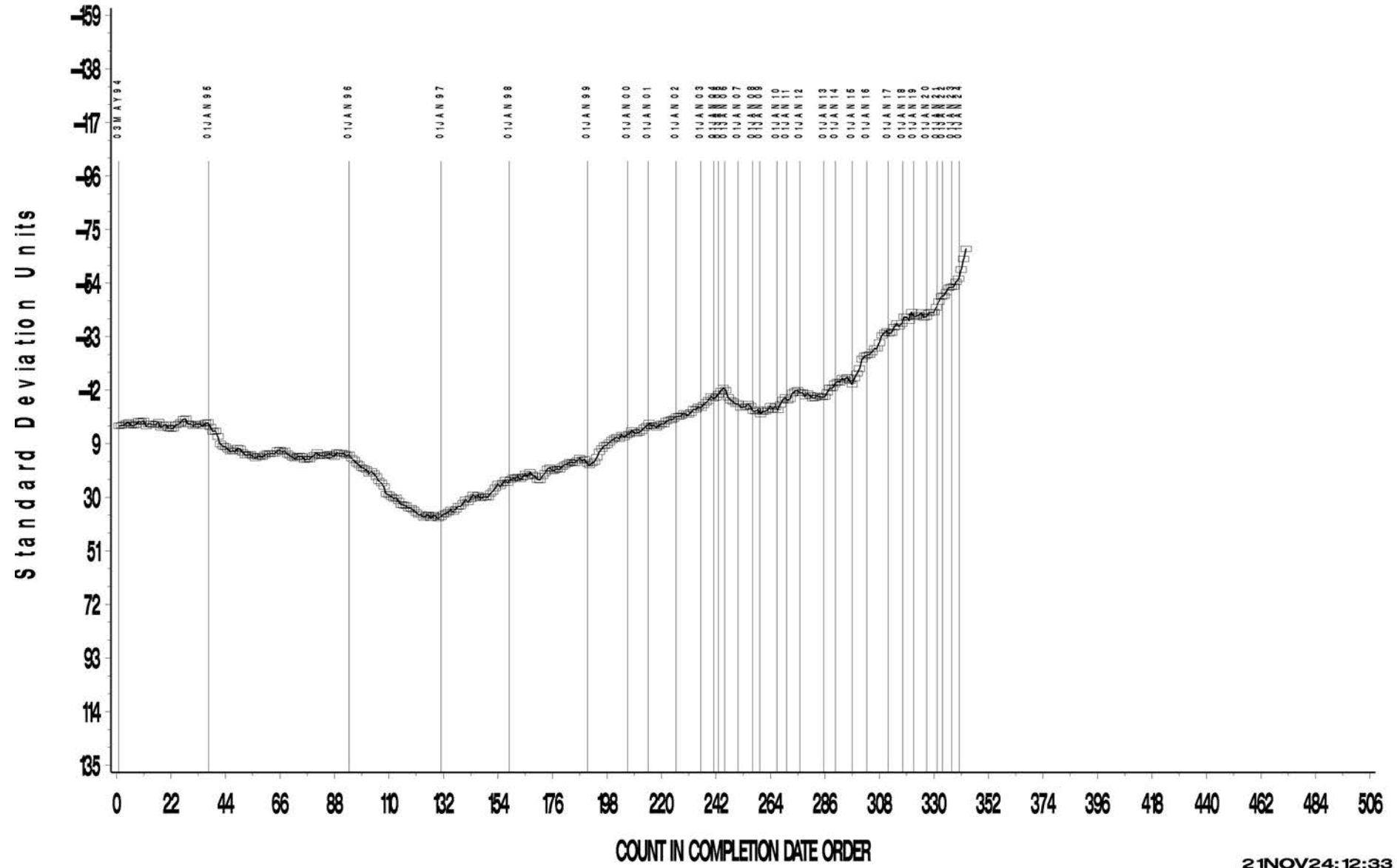


EWMA □
OFF SCALE *

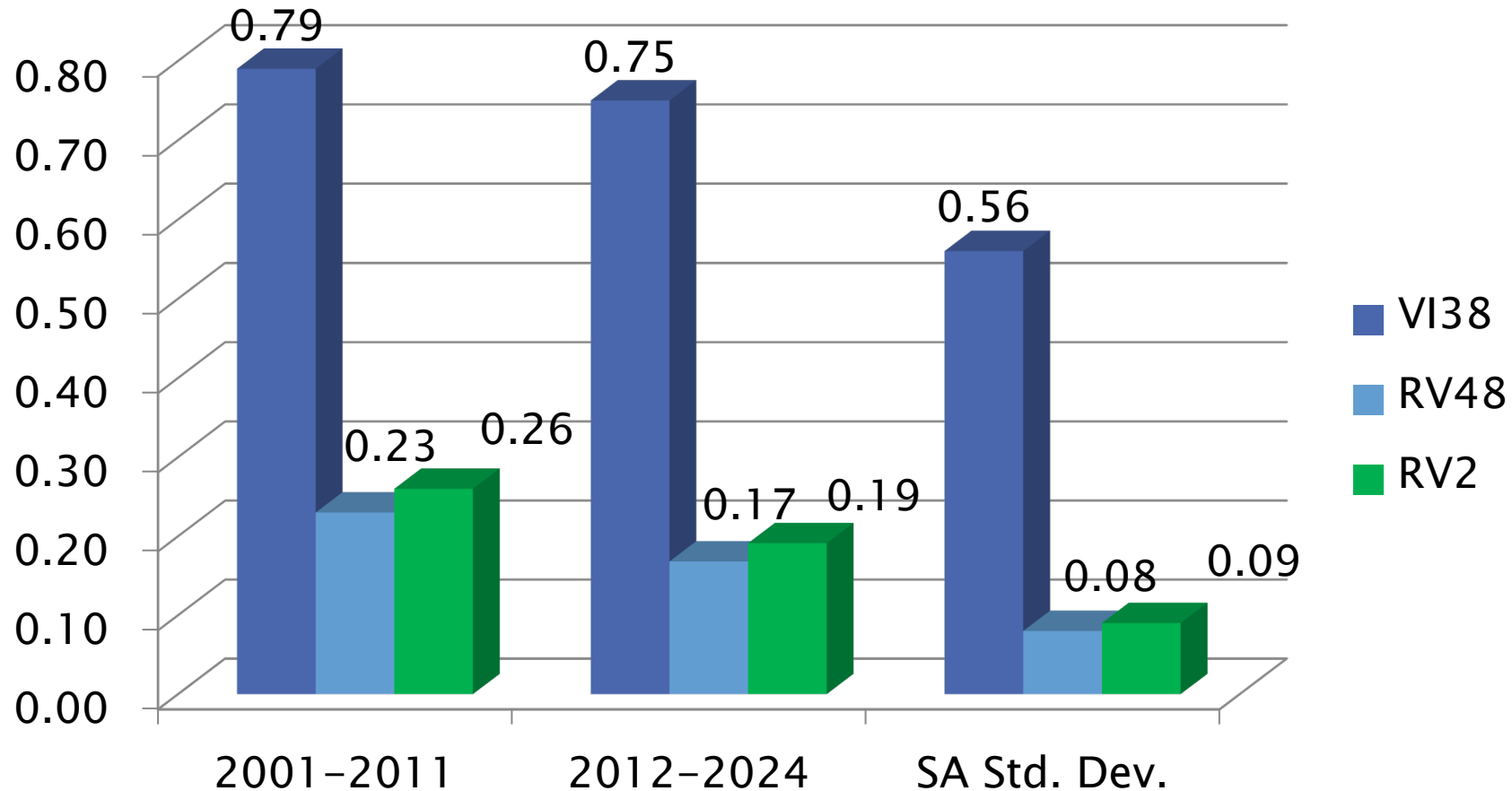
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit

VISCOSITY INCR @ 3.8% SOOT

CUSUM Severity Analysis



T-8/E Precision Estimates



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Test Monitoring Center
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Mack T-11

»» October 2024

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



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T-11 Test Activity

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

T-11 Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

T-11 Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	No aborted tests	0
Total		0

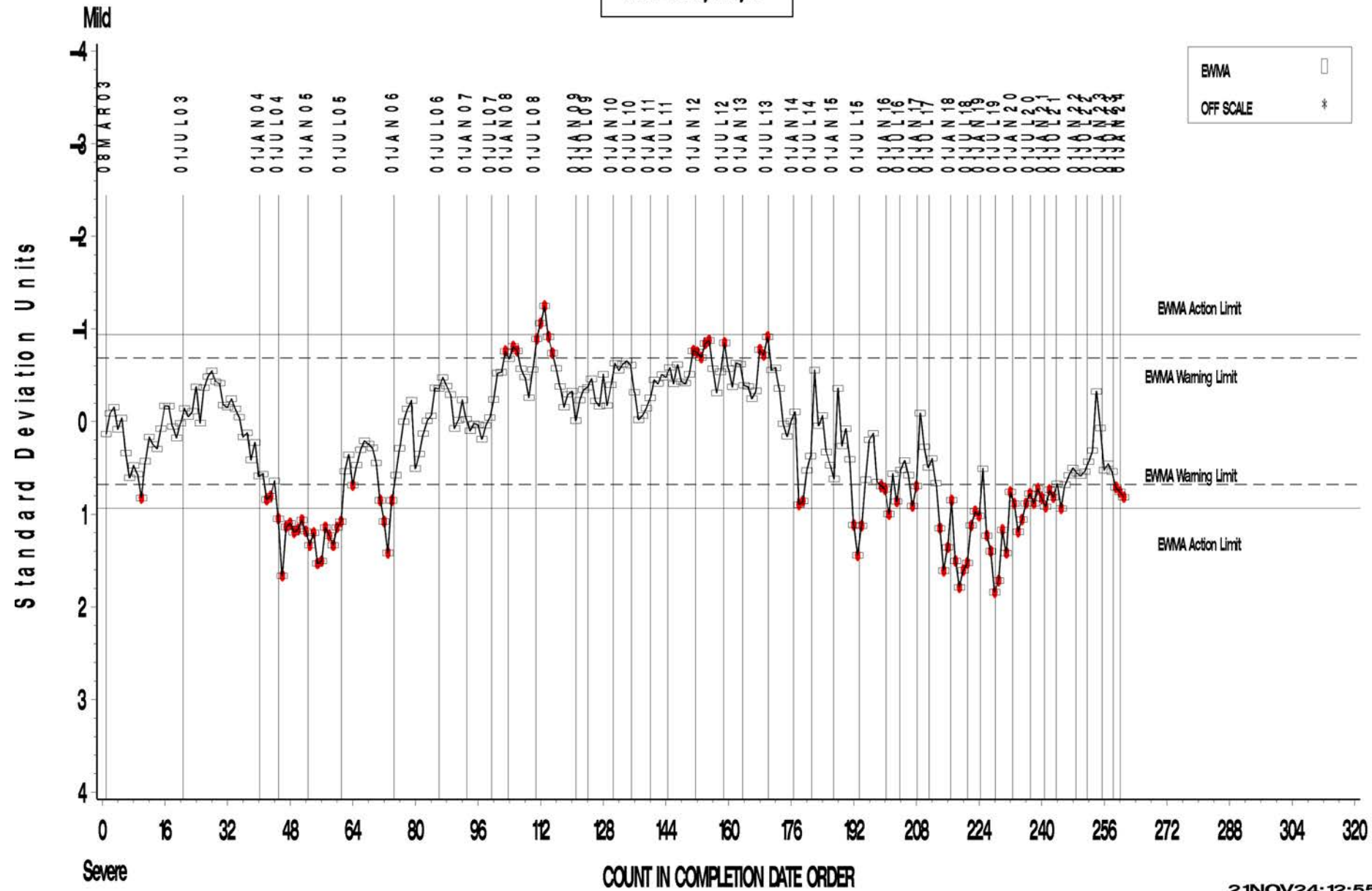
*Invalid and aborted tests

T-11 Test Severity

- ▶ SOOT and SOOT5 are in control.
- ▶ SOOT4 is in severity action alarm in the severe direction. SOOT4 also in precision action alarm.
- ▶ MRV is in severity warning alarm in the severe direction.

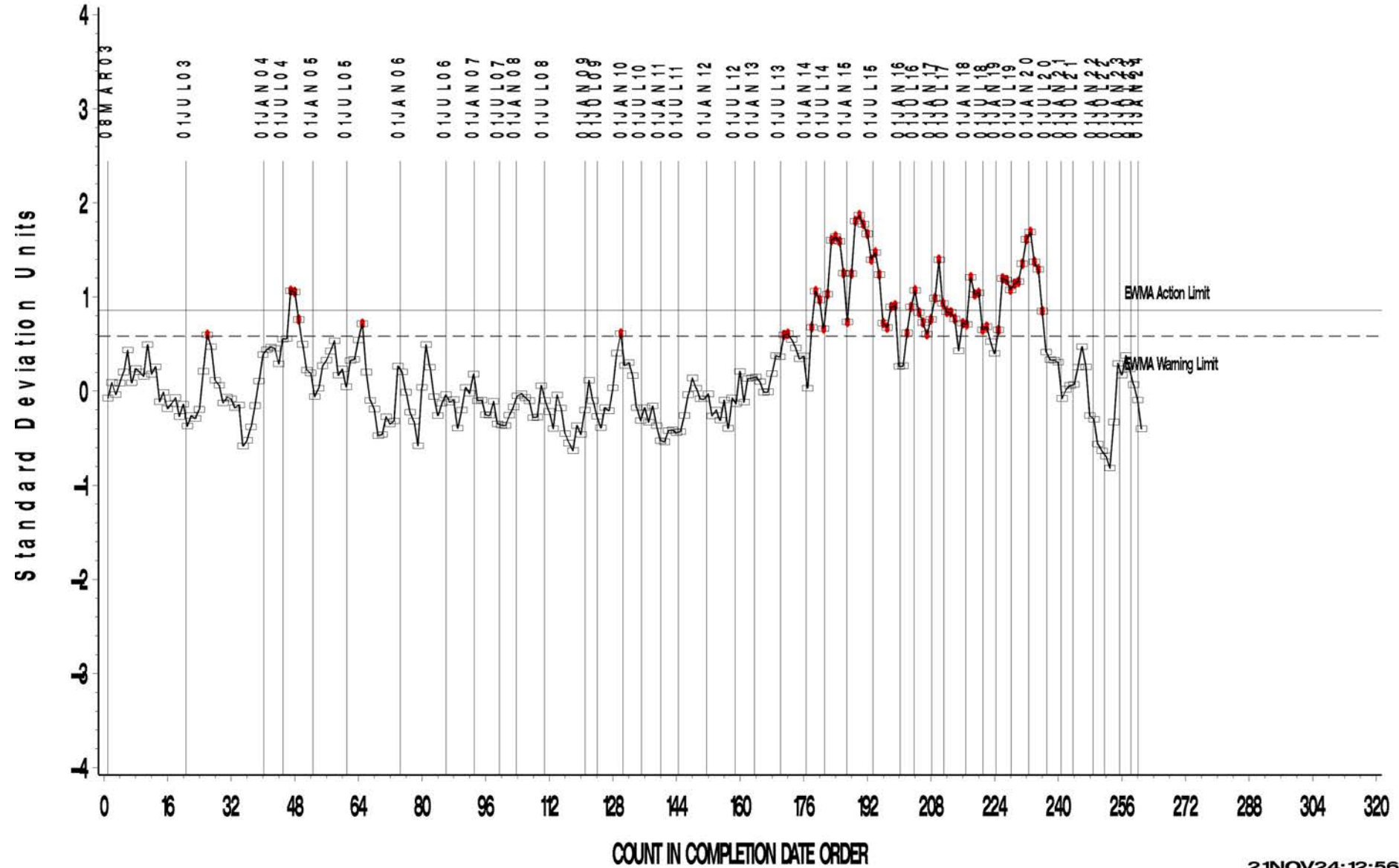
MRV VISCOSITY

LTMS Severity Analysis



MRV VISCOSITY

LTMS Precision Analysis



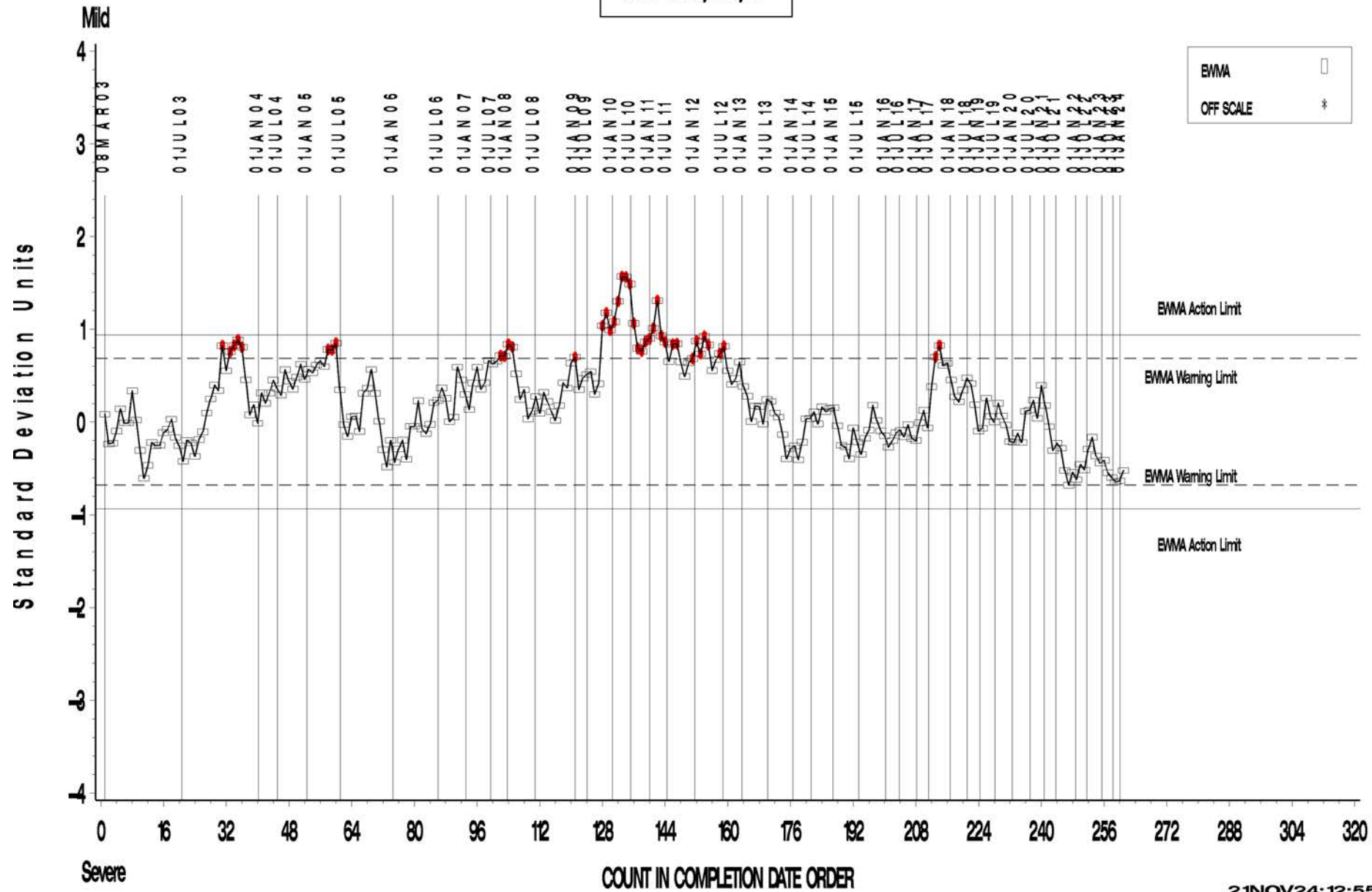
MRV VISCOSITY

CUSUM Severity Analysis



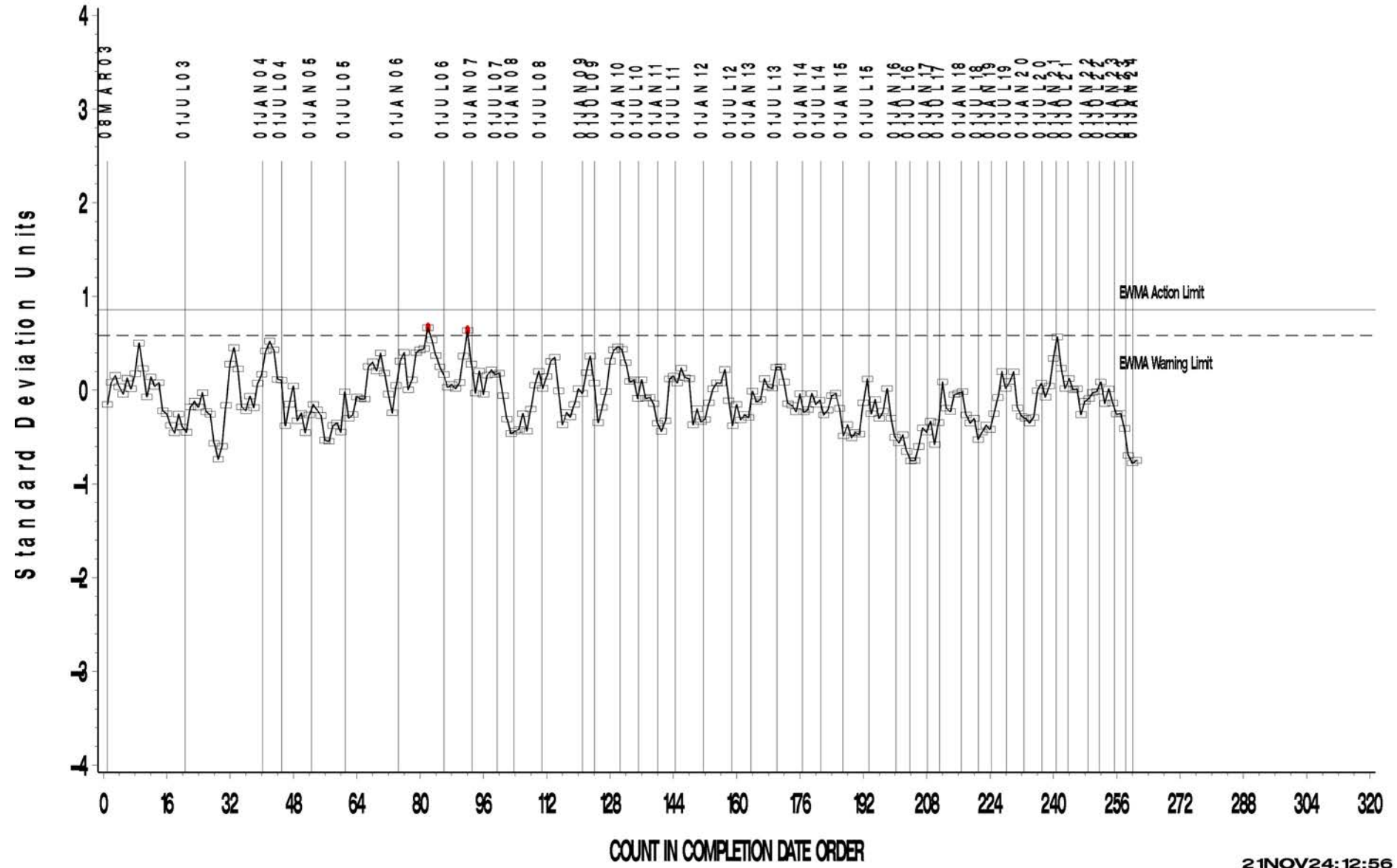
SOOT AT 12 cSt

LTMS Severity Analysis



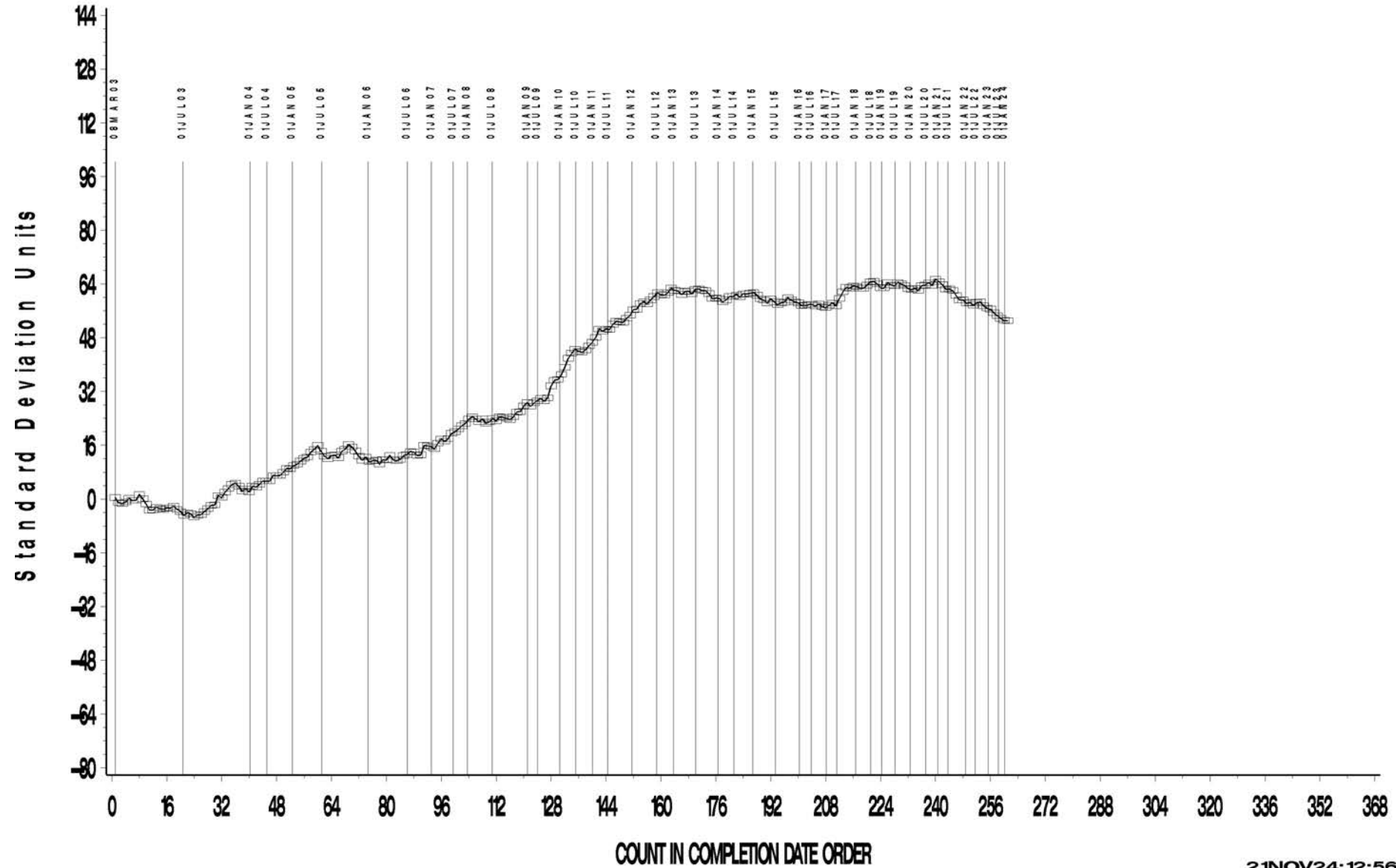
SOOT AT 12 cSt

LTMS Precision Analysis



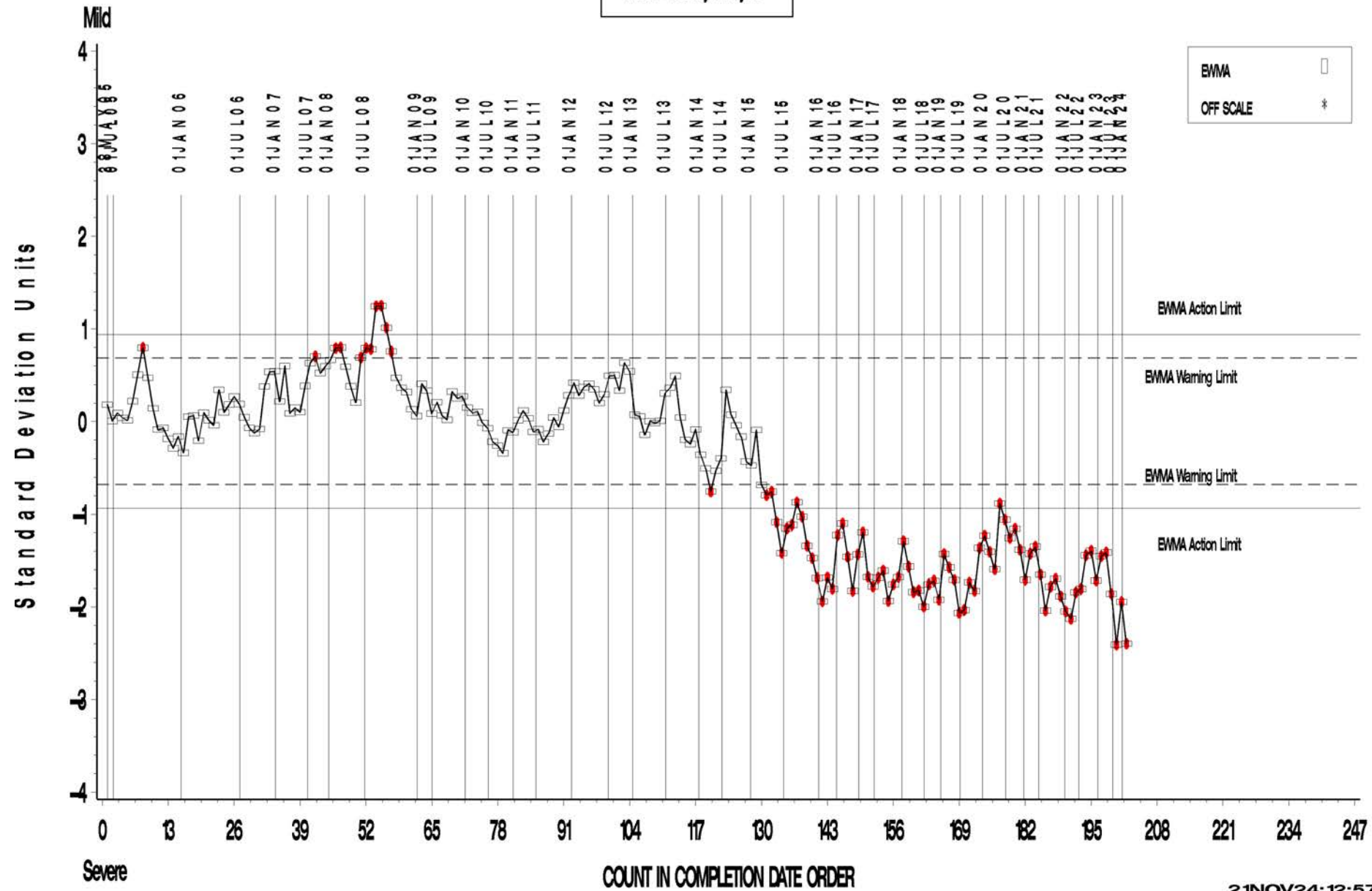
SOOT AT 12 cSt

CUSUM Severity Analysis



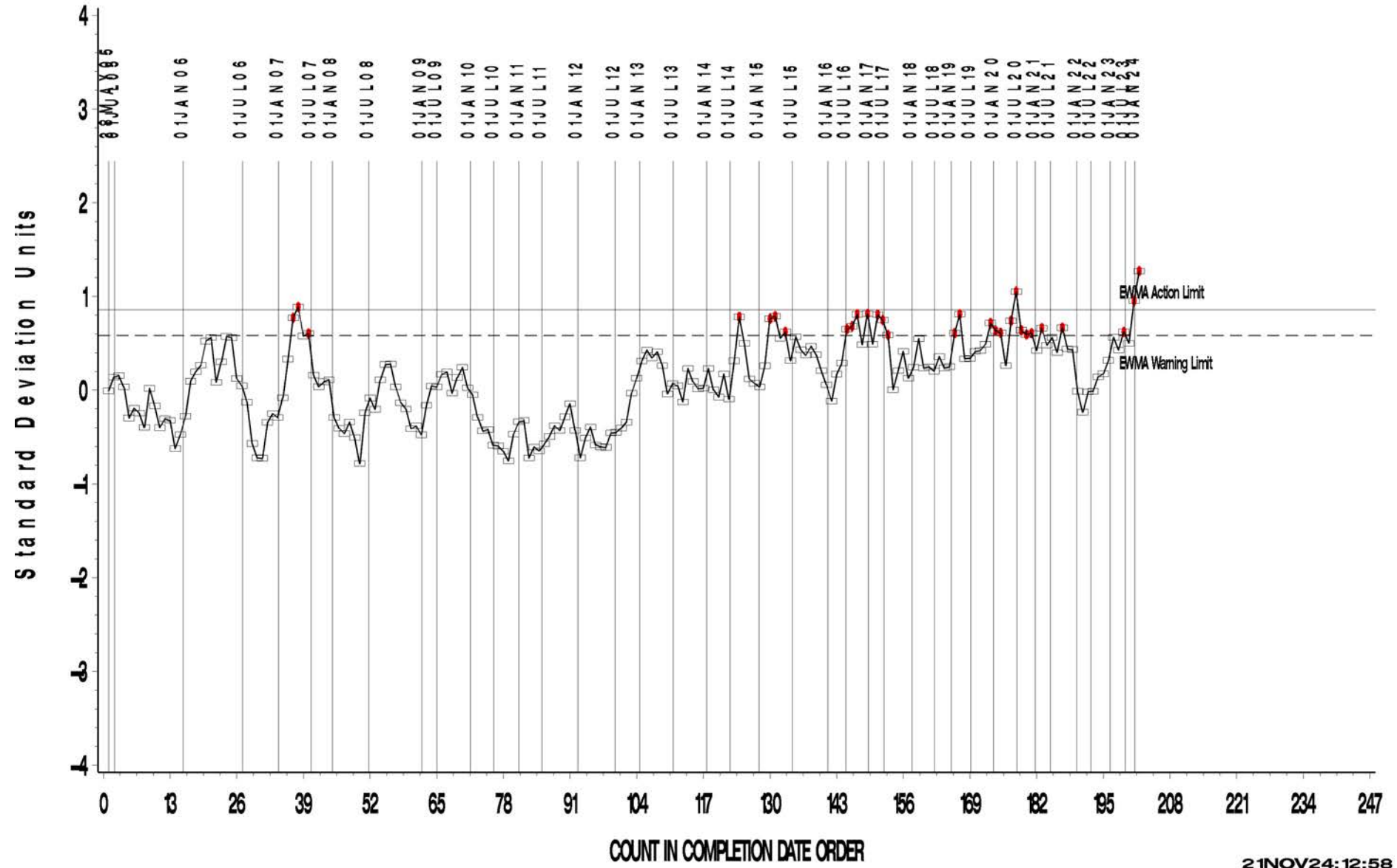
SOOT @ 4 cSt — FINAL RESULT

LTMS Severity Analysis



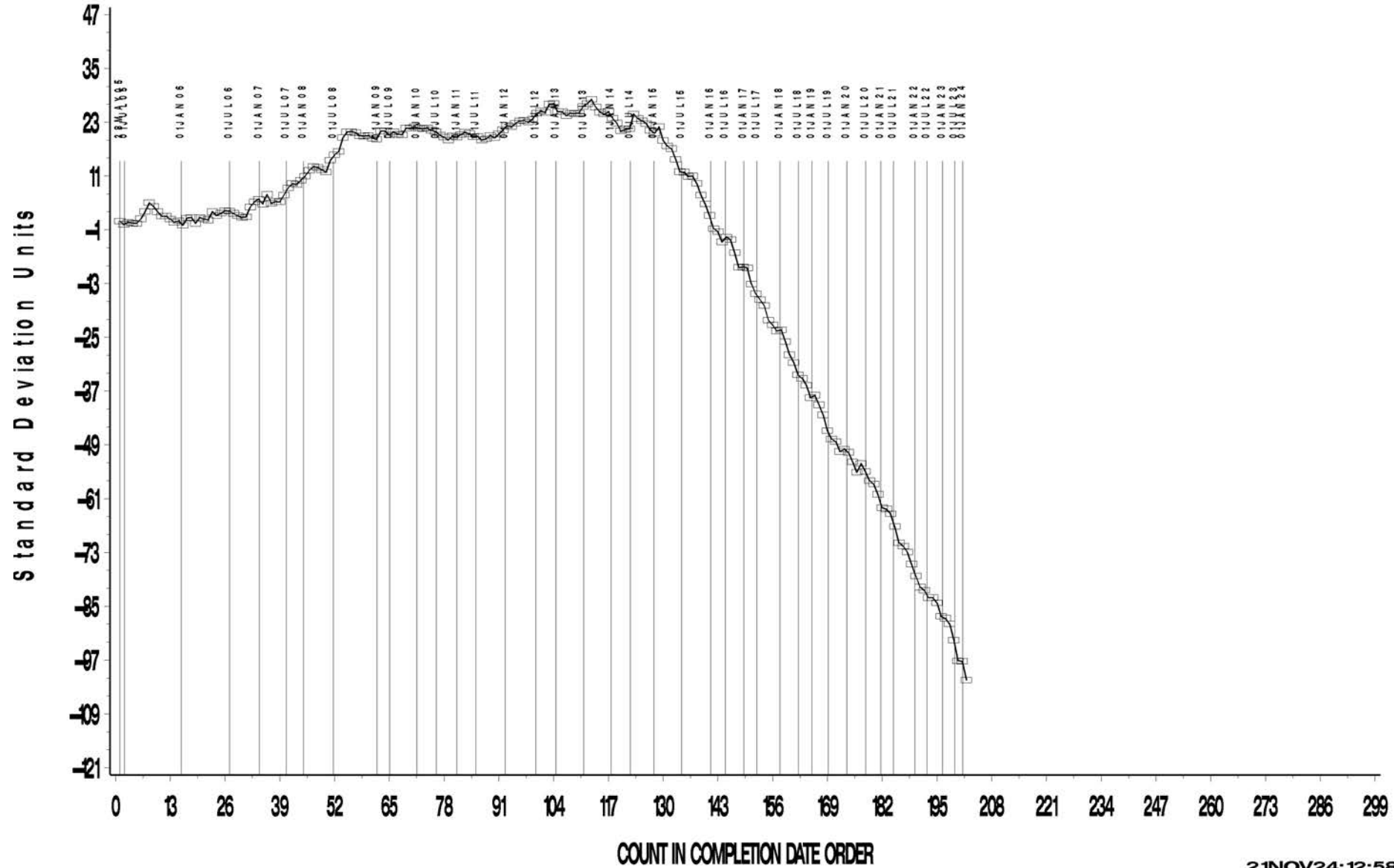
SOOT @ 4 cSt — FINAL RESULT

LTMS Precision Analysis



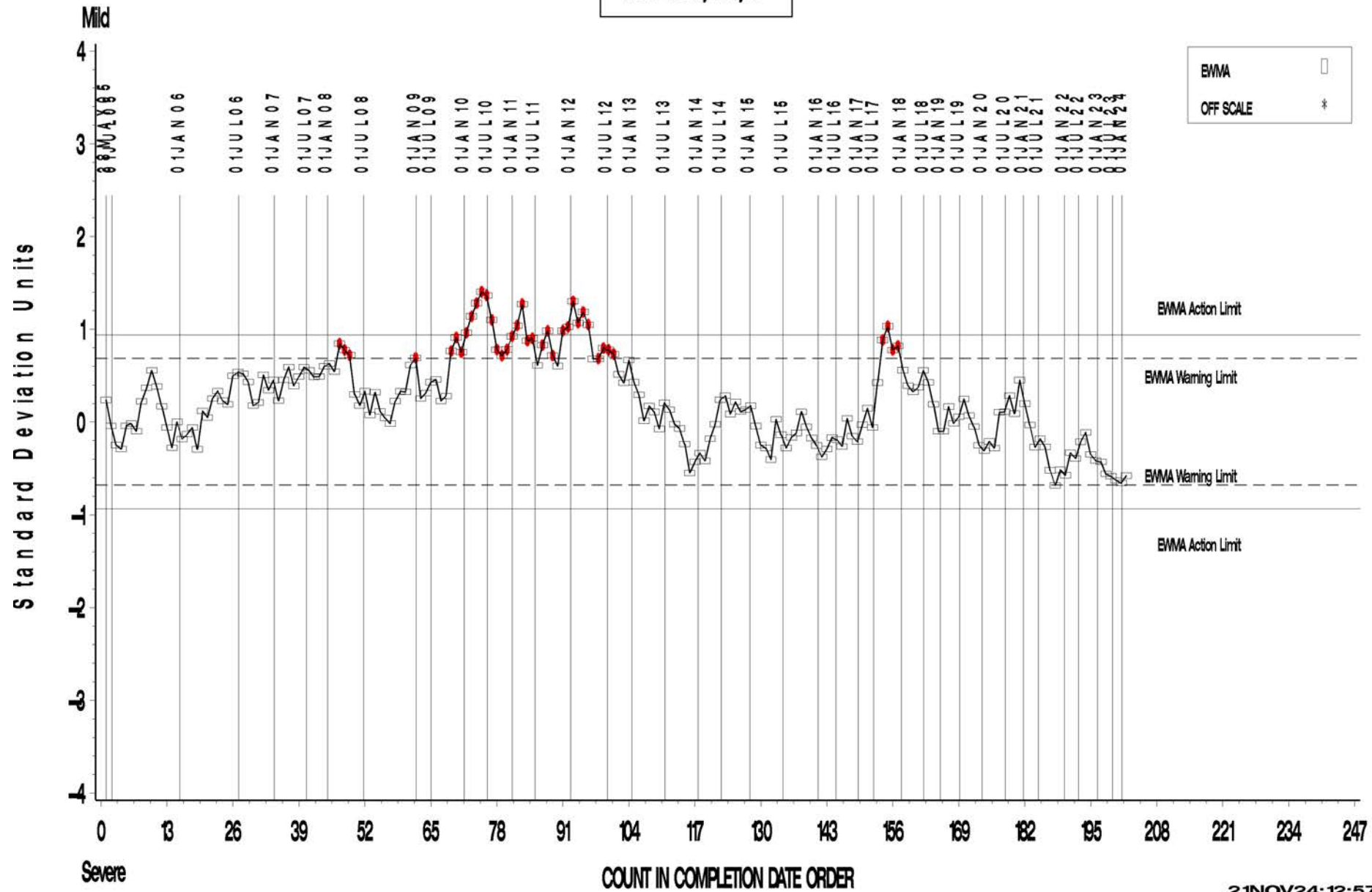
SOOT @ 4 cSt — FINAL RESULT

CUSUM Severity Analysis



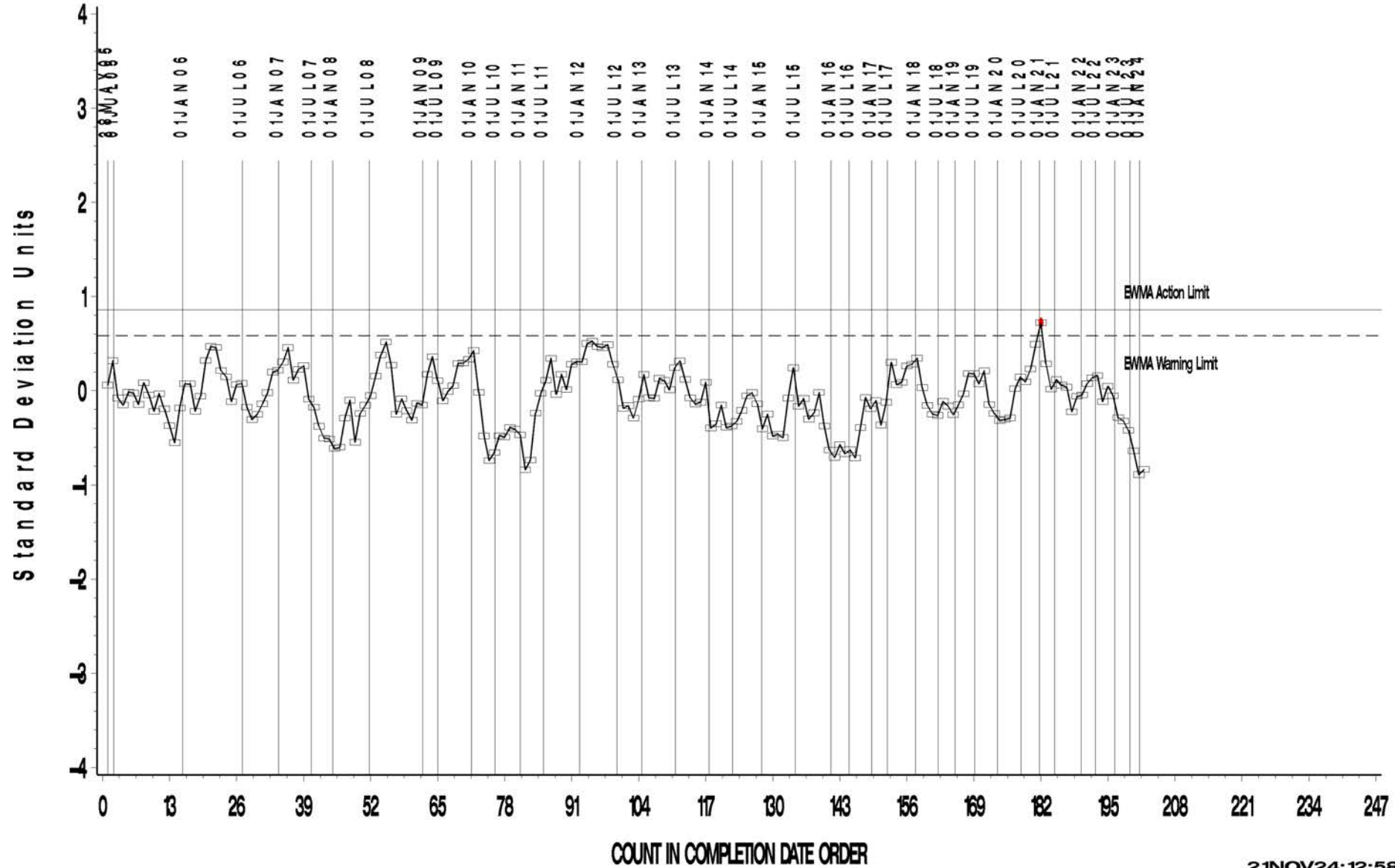
SOOT @ 15 cSt — FINAL RESULT

LTMS Severity Analysis



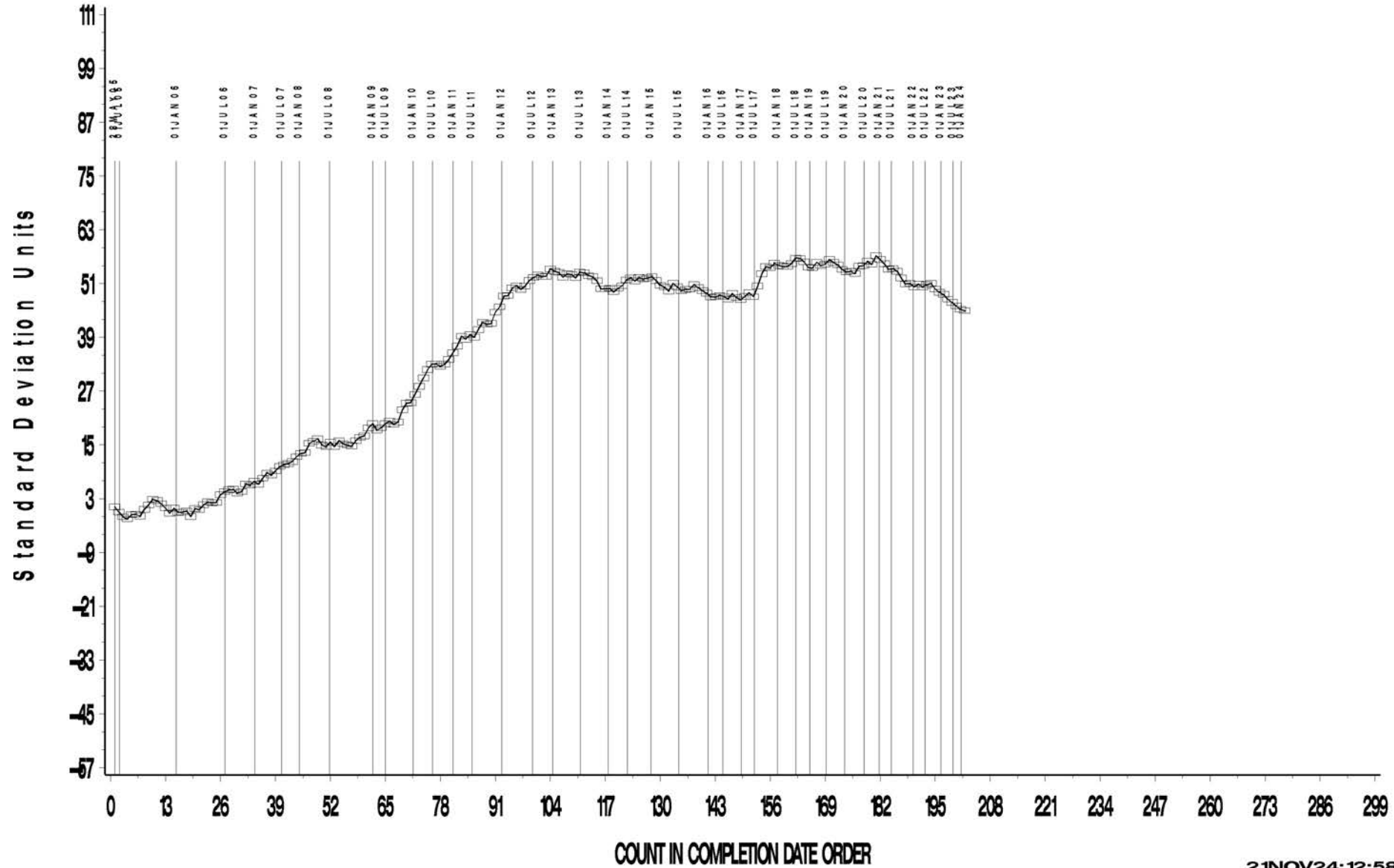
SOOT @ 15 cSt — FINAL RESULT

LTMS Precision Analysis

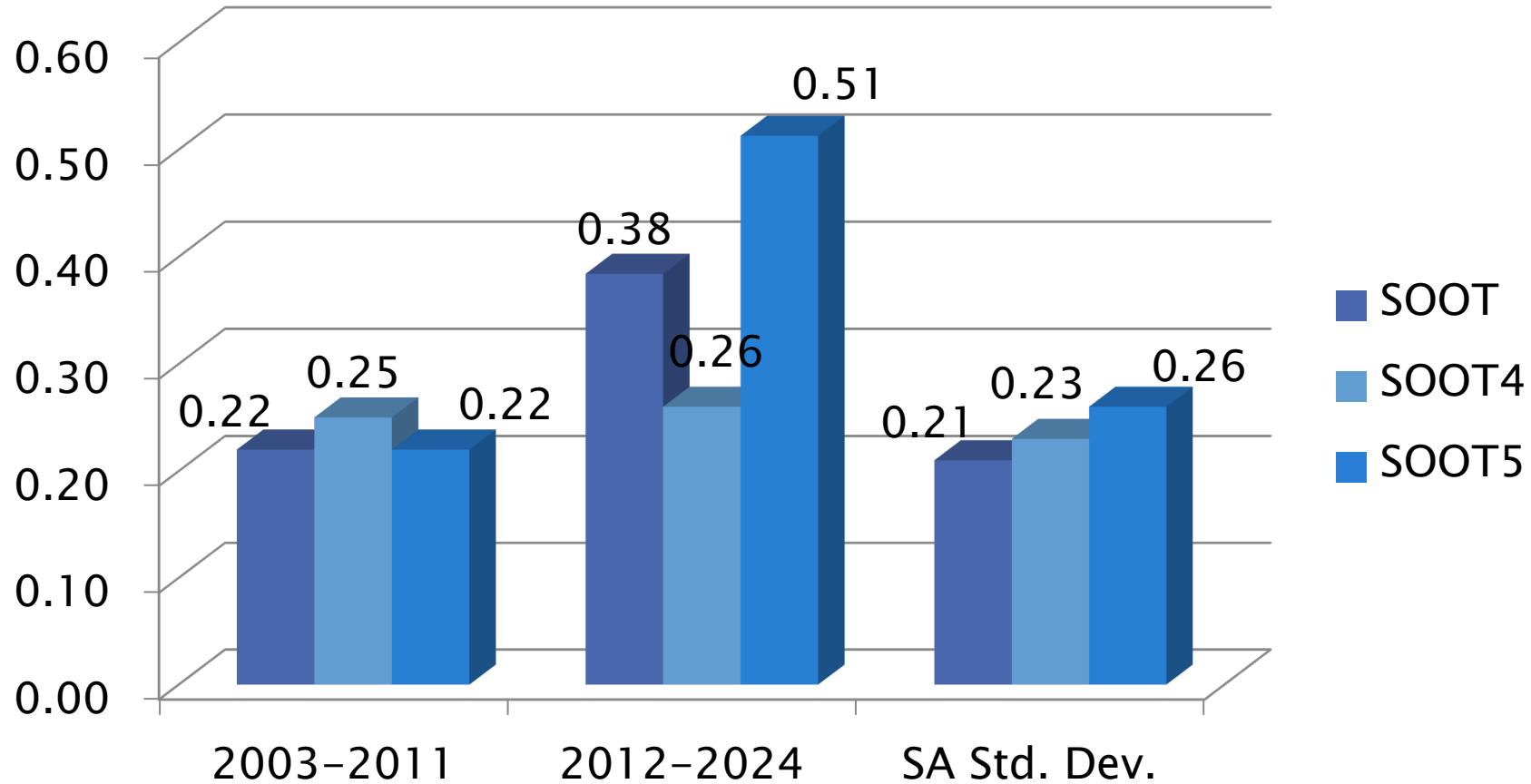


SOOT @ 15 cSt — FINAL RESULT

CUSUM Severity Analysis

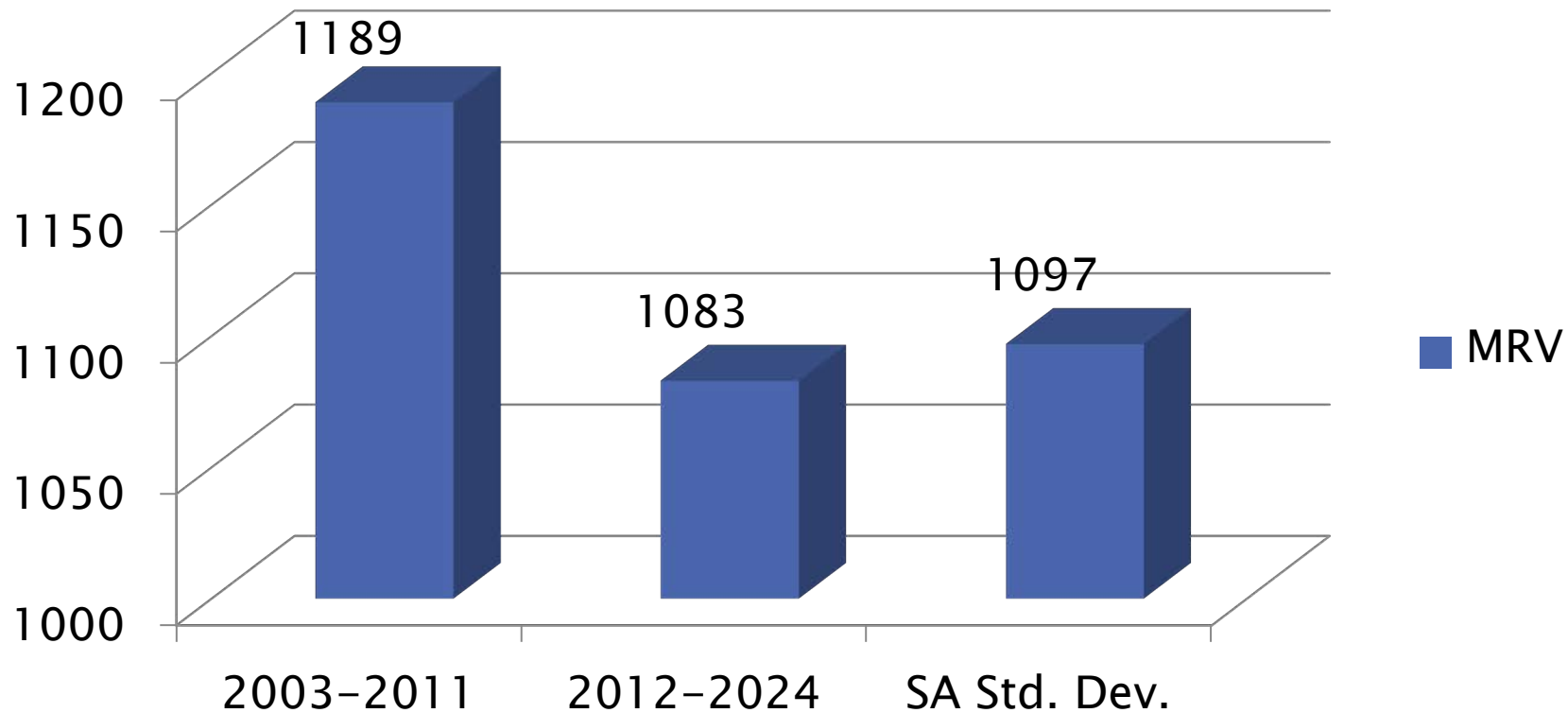


T-11 Precision Estimates



T-11 Precision Estimates

MRV



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Mack T-12

➤➤ October 2024

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T-12 Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	1
Failed Calibration Test	OC	1
Operationally Invalid	LC	0
Aborted	XC	2
Total		4

T-12 Failed Tests

Failed Parameter	Number of Tests
Pb Mild	1
Total	1

T-12 Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	Fuel dilution	1
Aborted	Low oil volume	1
Total		2

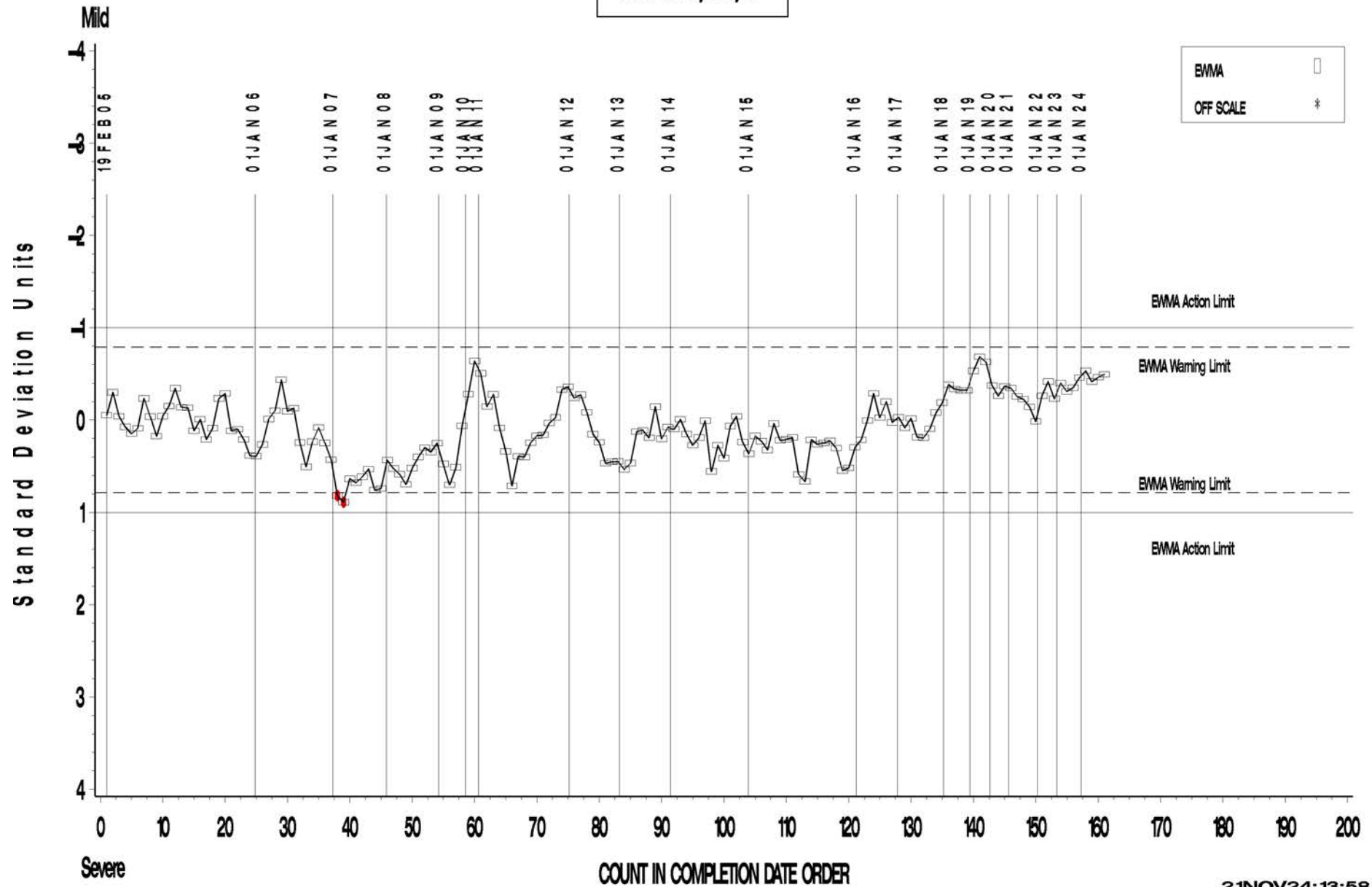
*Invalid and aborted tests

T-12 Test Severity

- ▶ PB and PB2 are in severity action alarm in the mild direction.
- ▶ All other parameters are in control.

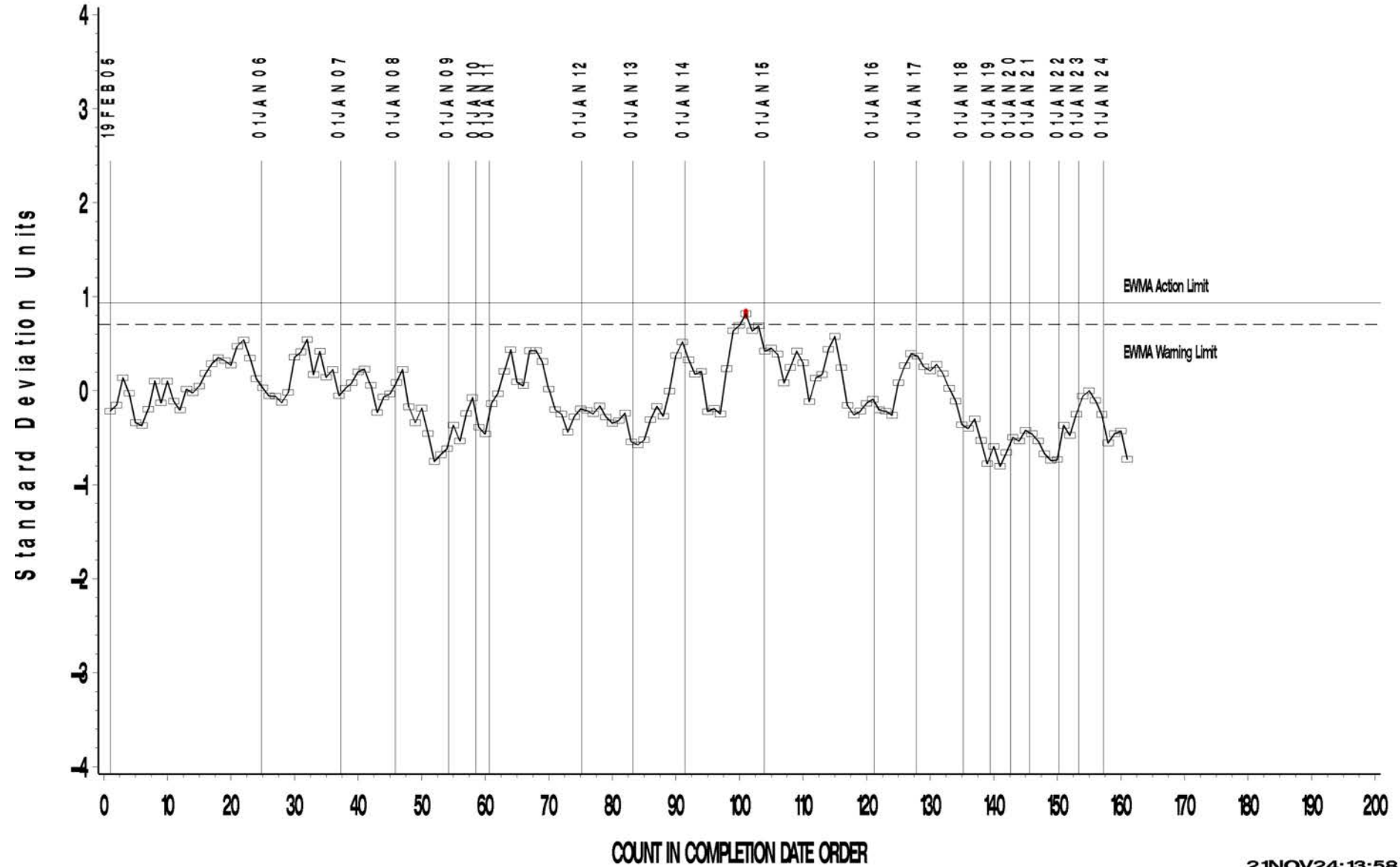
AVG. CYLINDER LINER WEAR (CLW)

LTMS Severity Analysis



AVG. CYLINDER LINER WEAR (CLW)

LTMS Precision Analysis



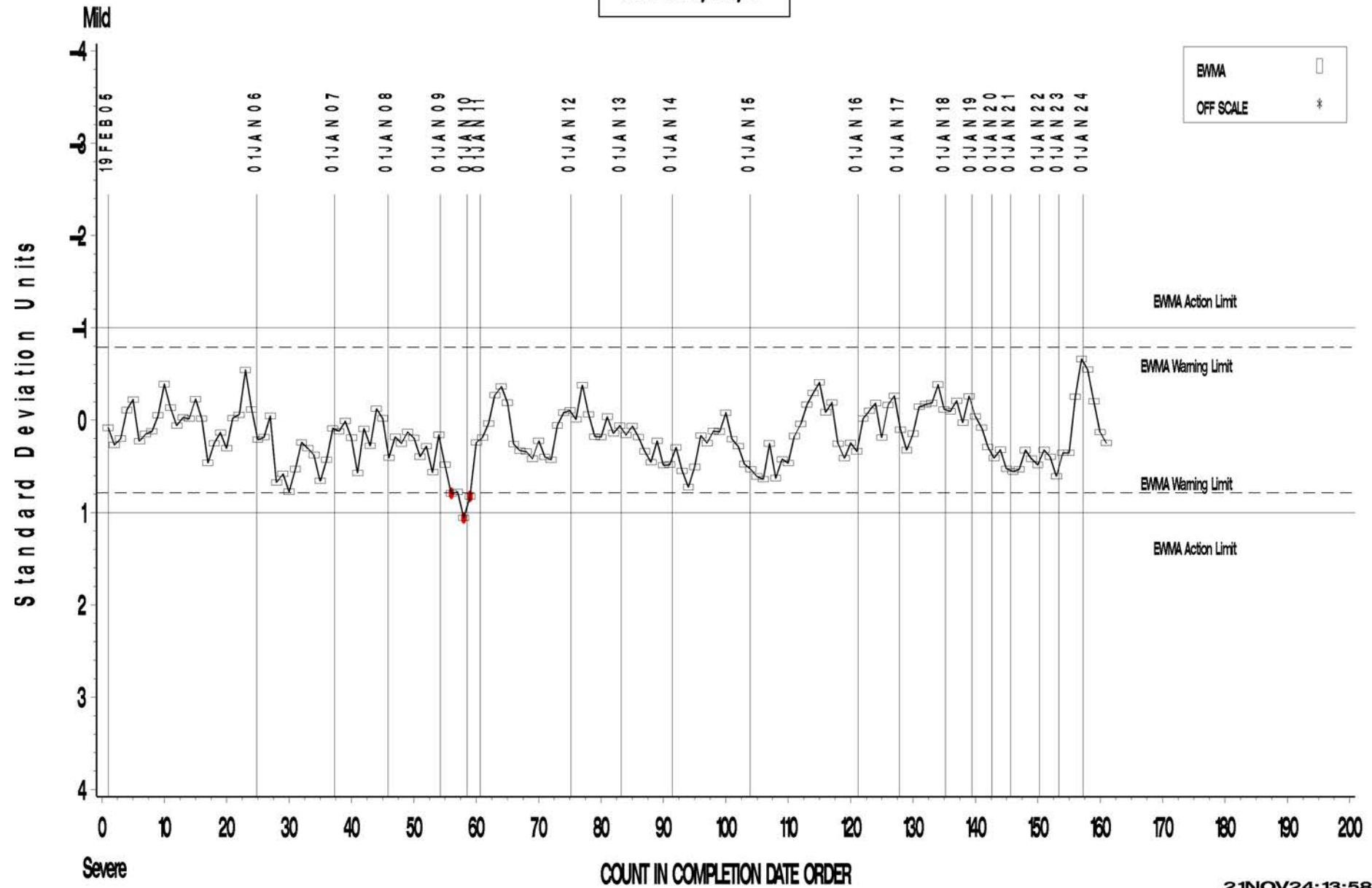
AVG. CYLINDER LINER WEAR (CLW)

CUSUM Severity Analysis



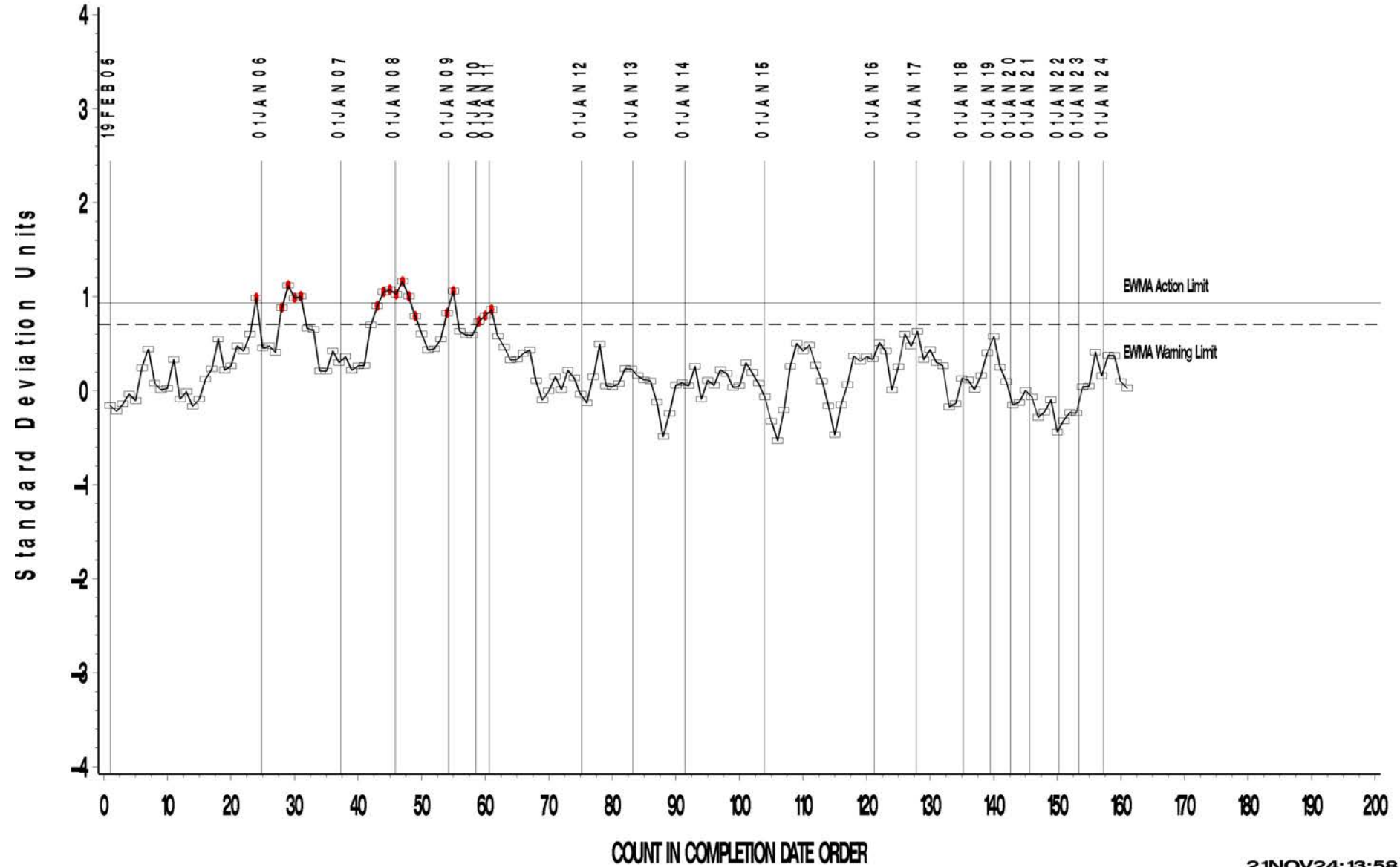
FINAL TRANS. RES. OIL CONSUMPTION

LTMS Severity Analysis



FINAL TRANS. RES. OIL CONSUMPTION

LTMS Precision Analysis



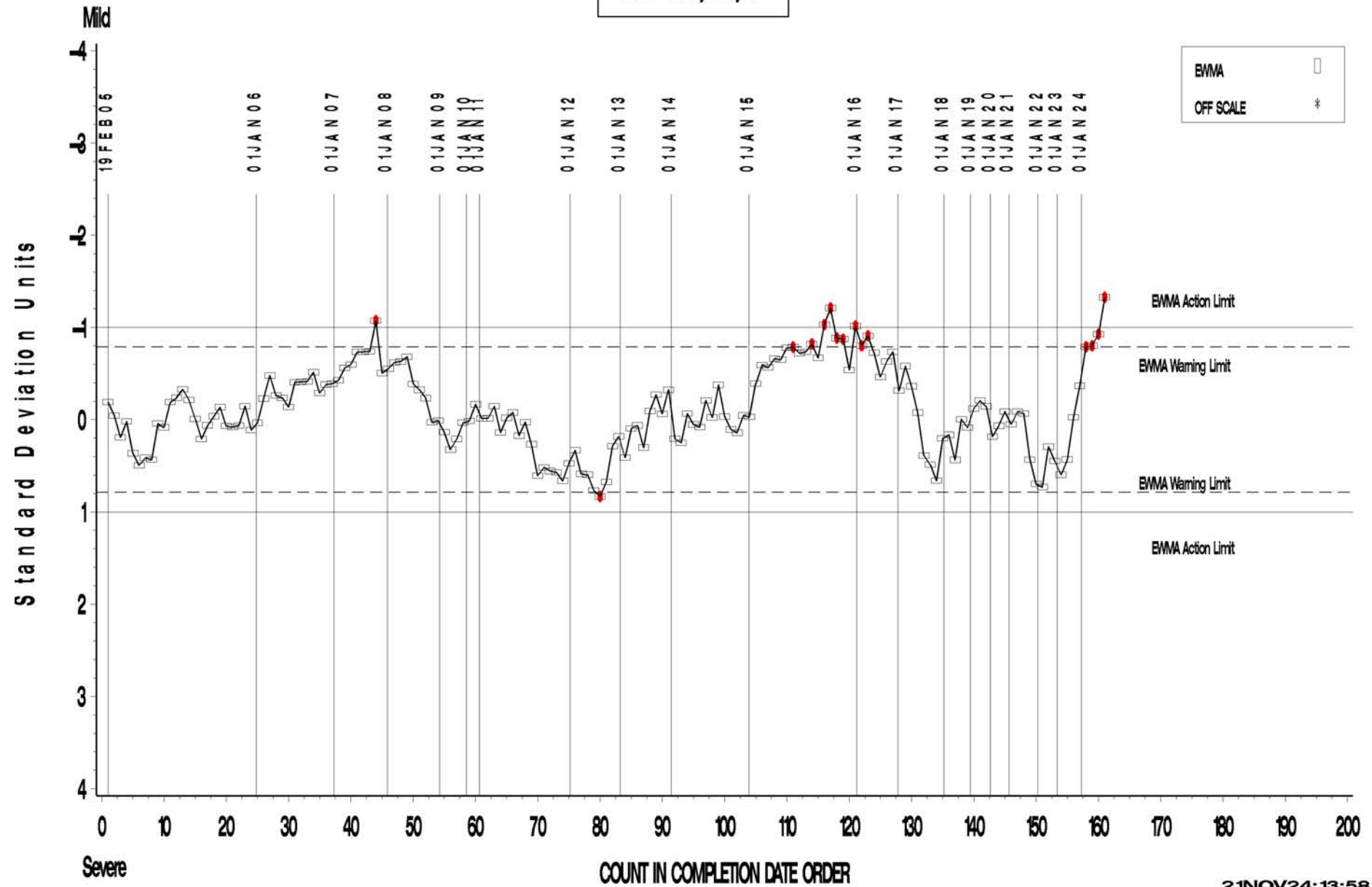
FINAL TRANS. RES. OIL CONSUMPTION

CUSUM Severity Analysis



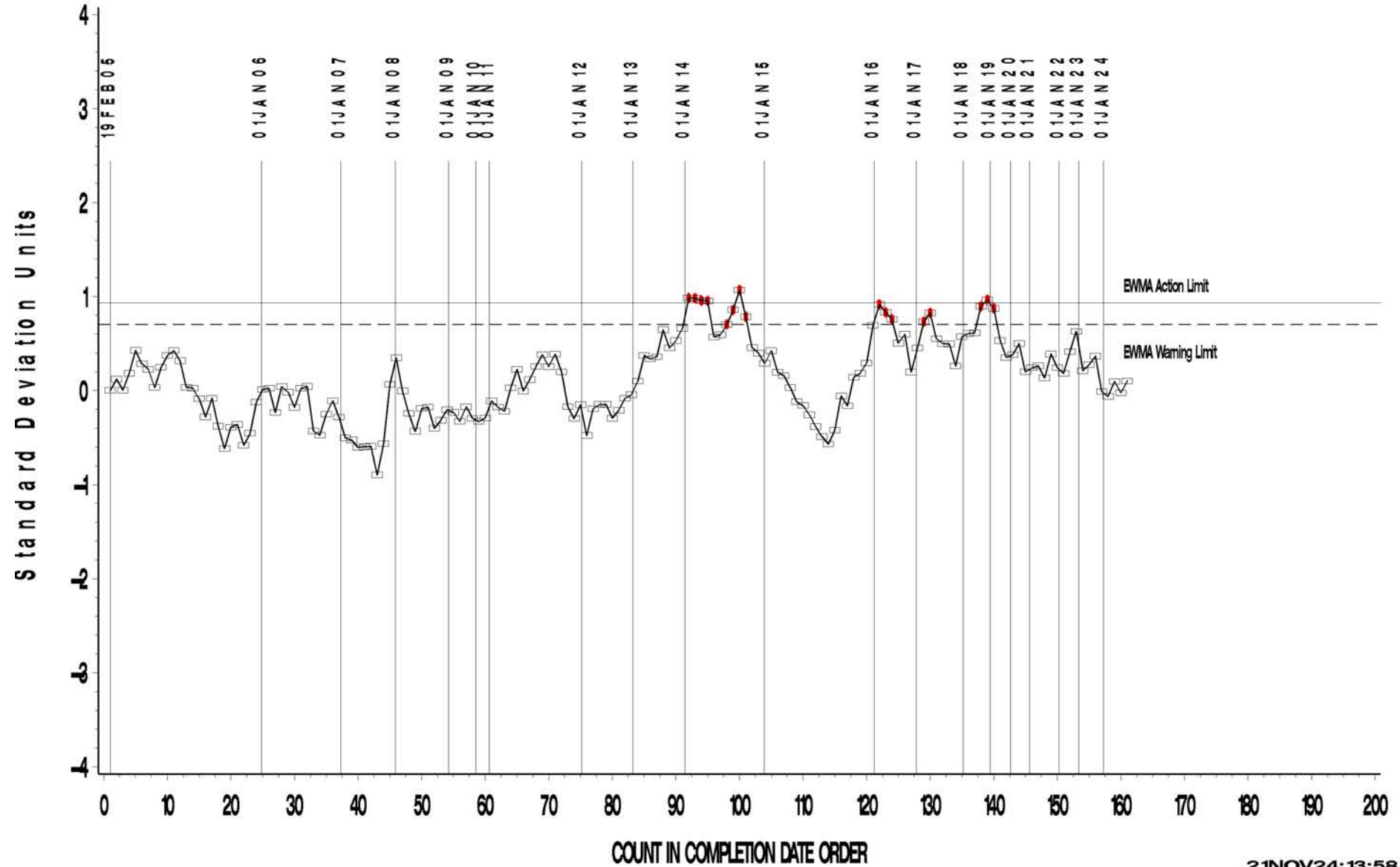
FINAL TRANS. RES. DELTA PB @ EOT

LTMS Severity Analysis



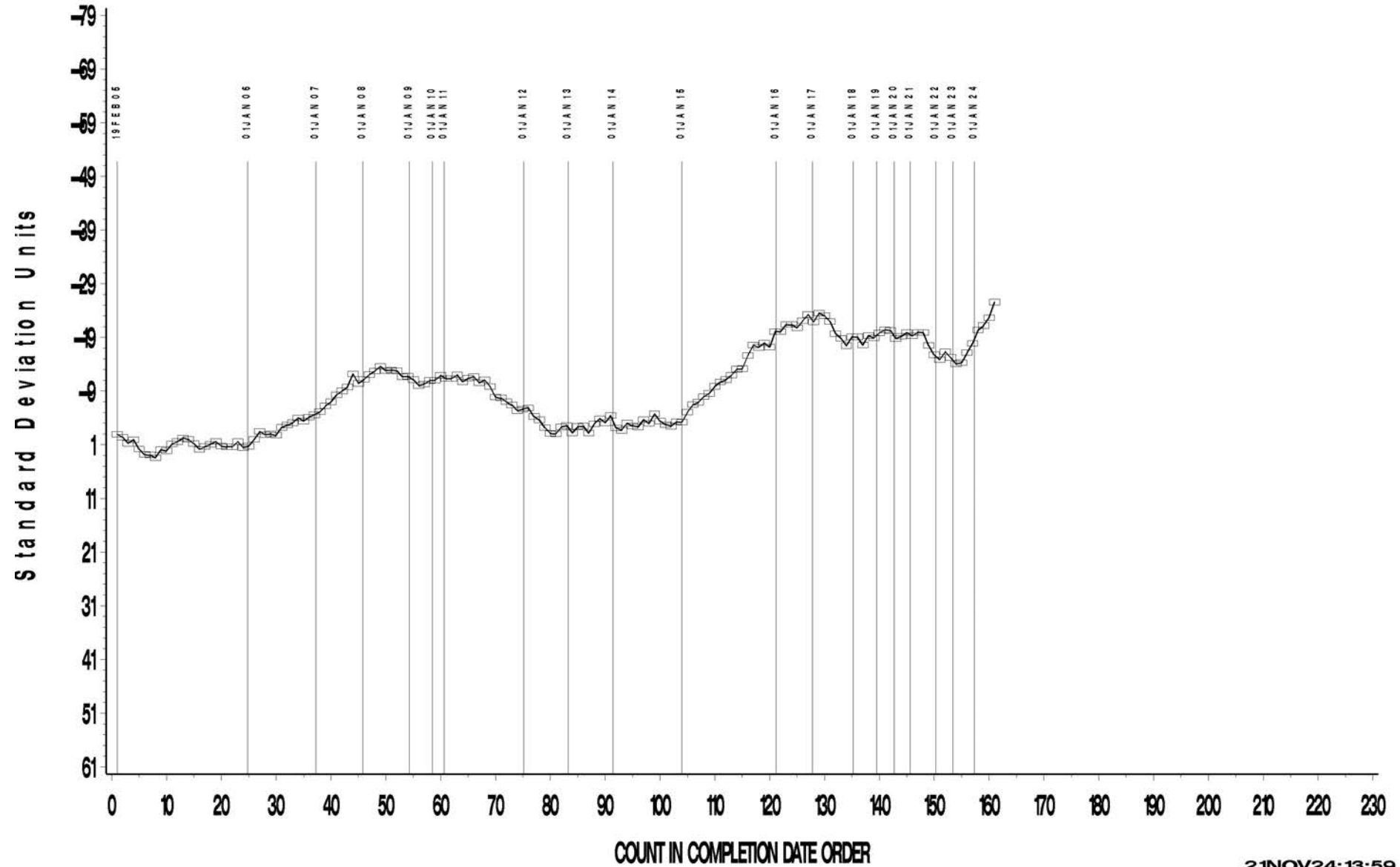
FINAL TRANS. RES. DELTA PB @ EOT

LTMS Precision Analysis



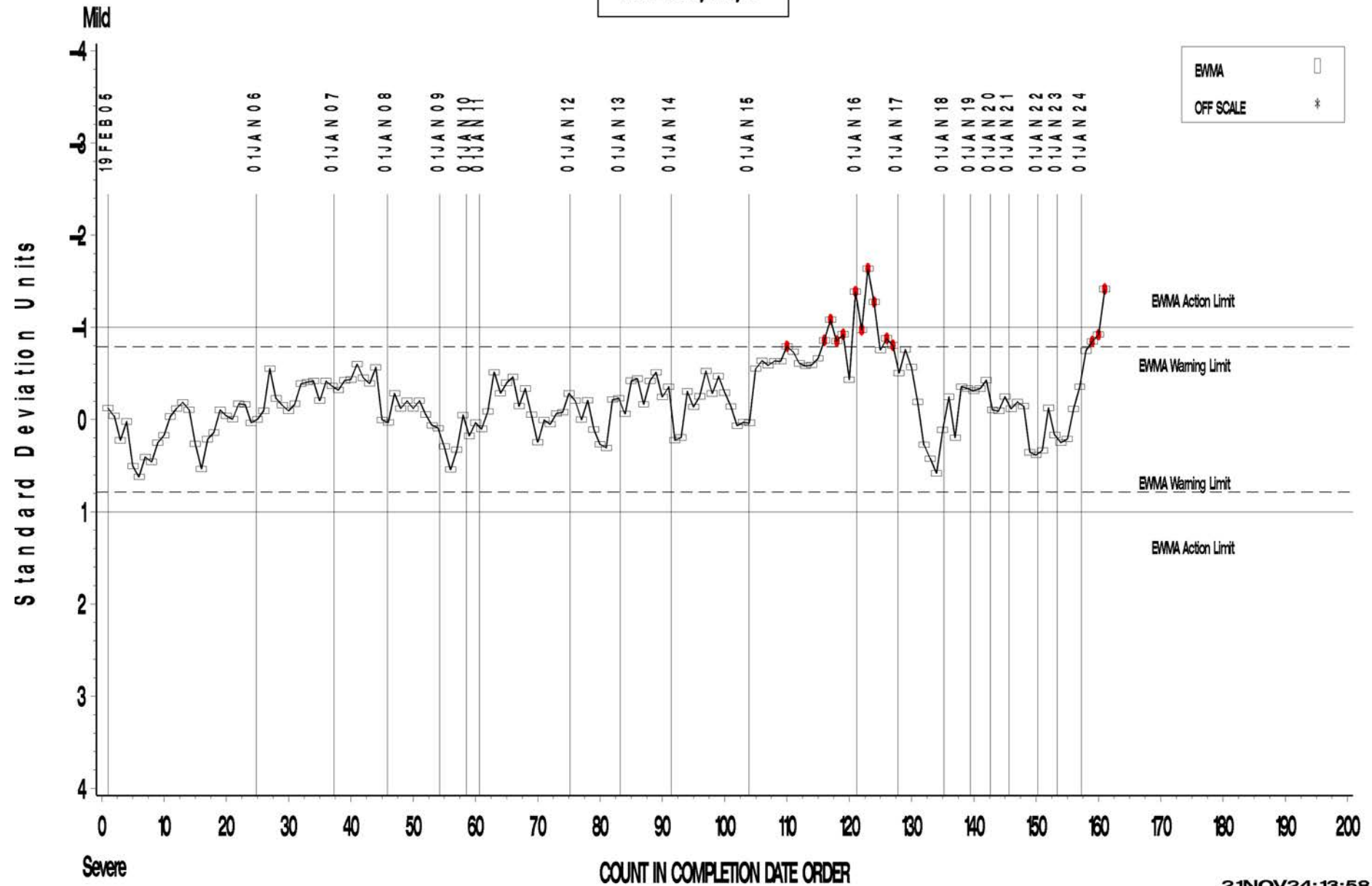
FINAL TRANS. RES. DELTA PB @ EOT

CUSUM Severity Analysis



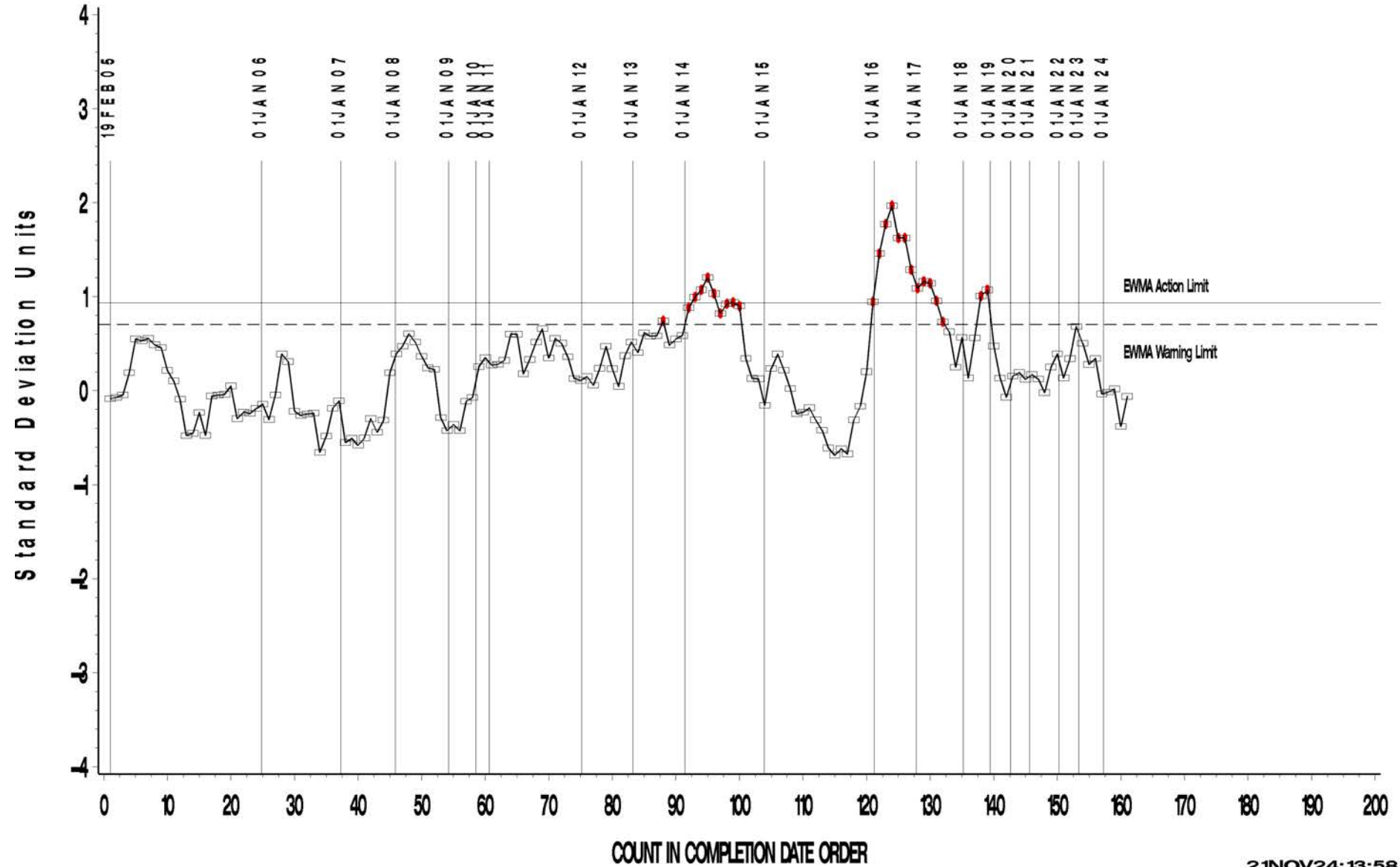
FINAL TRANS. RES. DELTA PB 250-300H

LTMS Severity Analysis



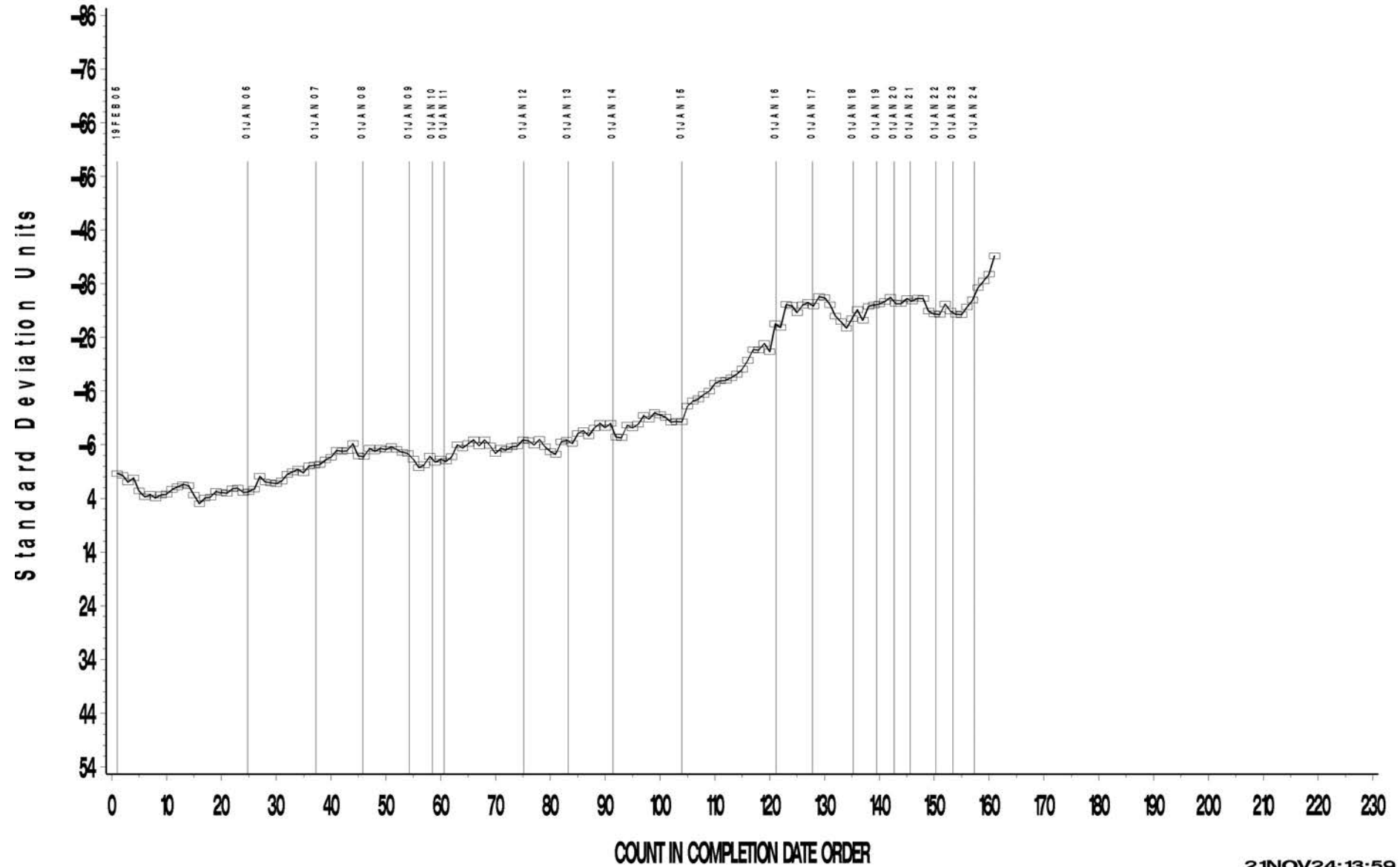
FINAL TRANS. RES. DELTA PB 250-300H

LTMS Precision Analysis



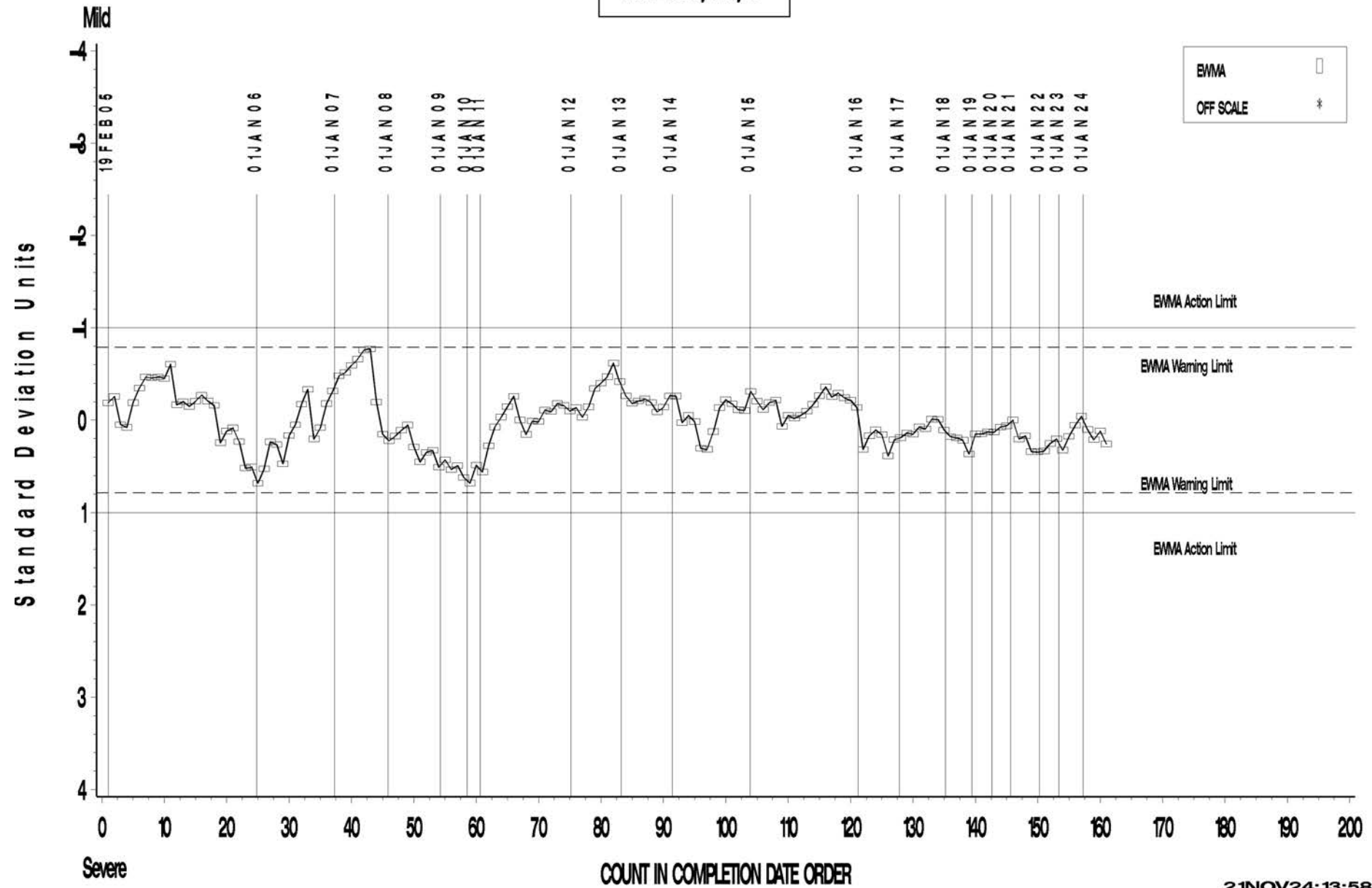
FINAL TRANS. RES. DELTA PB 250-300H

CUSUM Severity Analysis



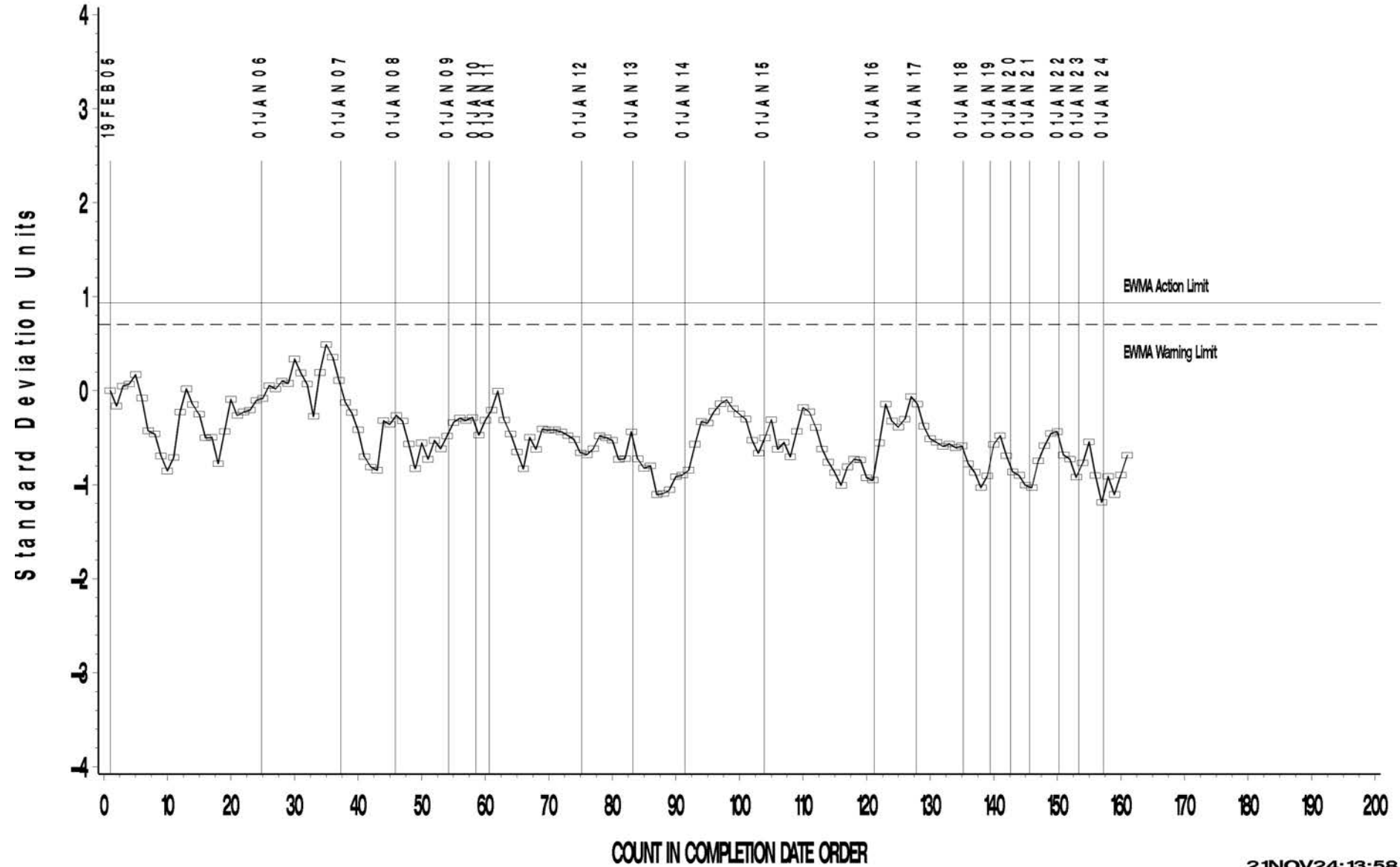
AVG. TOP RING WEIGHT LOSS (TRWL)

LTMS Severity Analysis



AVG. TOP RING WEIGHT LOSS (TRWL)

LTMS Precision Analysis

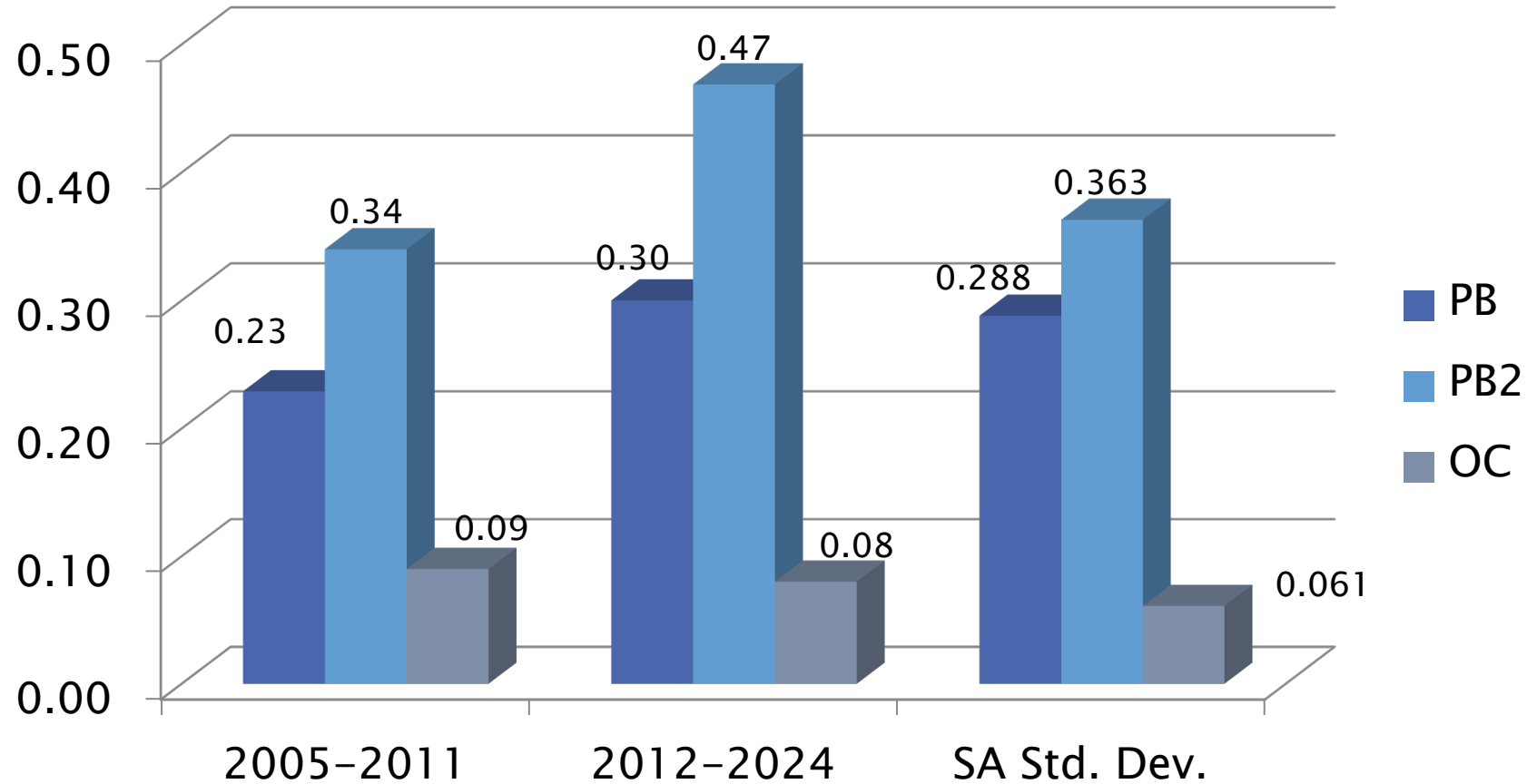


AVG. TOP RING WEIGHT LOSS (TRWL)

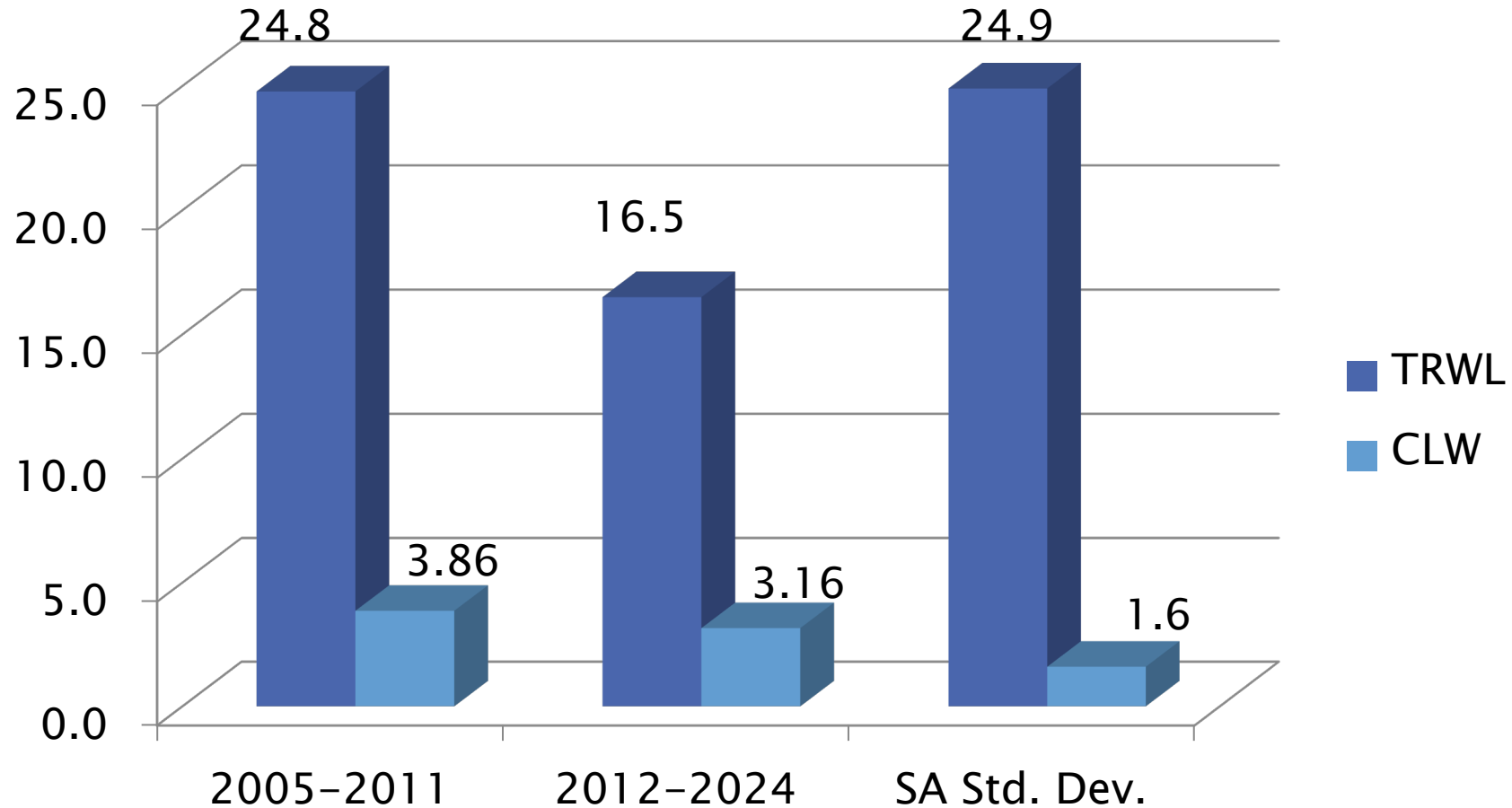
CUSUM Severity Analysis



T-12 Precision Estimates



T-12 Precision Estimates



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Mack T-12A

»» October 2024

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<https://www.astmtmc.org>



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T-12A Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	2
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	2
Total		4

T-12A Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

T-12A Lost Tests*

Status	Cause	#
Invalid	No invalid tests	0
Aborted	Fuel dilution	1
Aborted	Low oil volume	1
Total		2

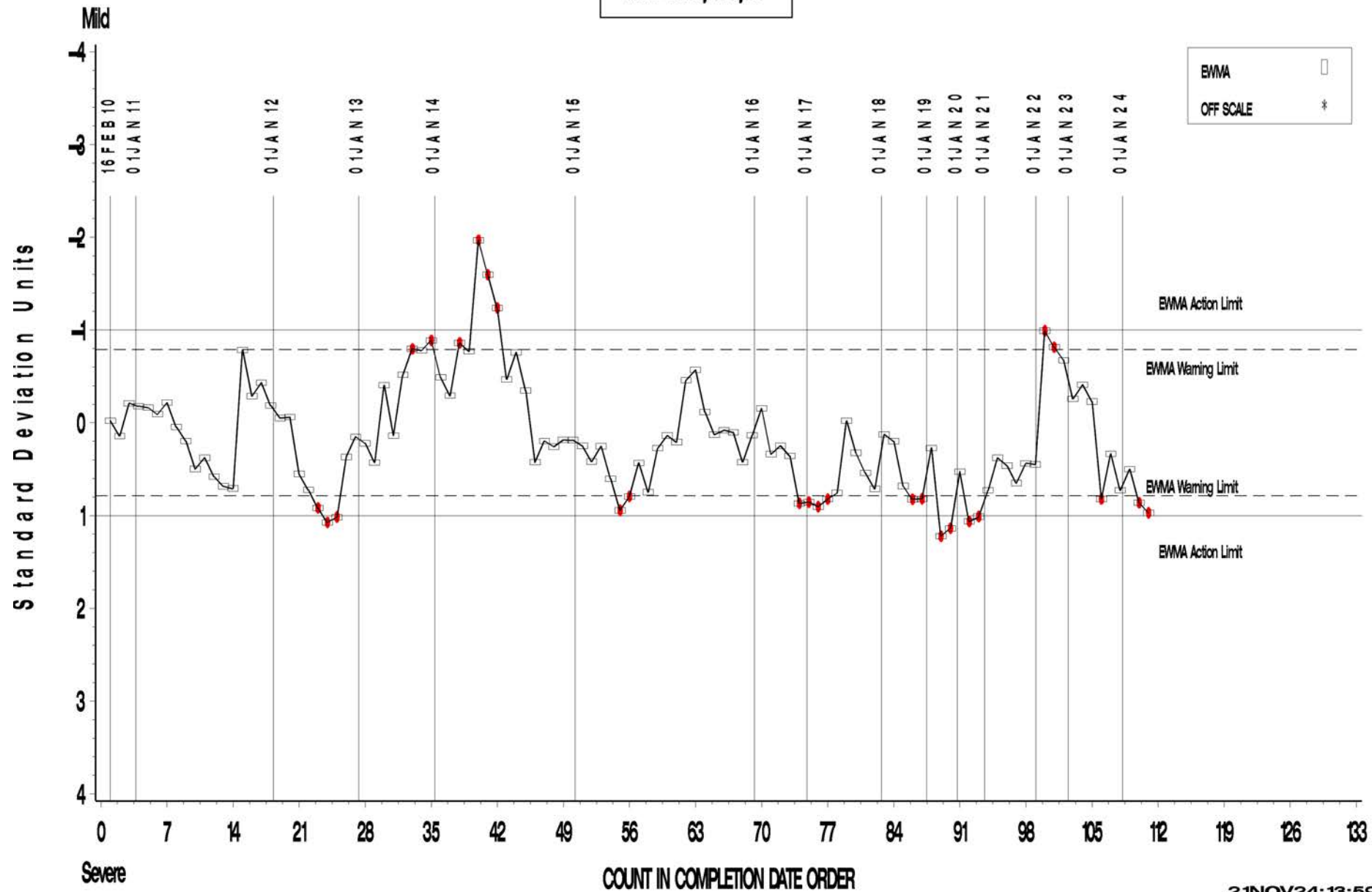
*Invalid and aborted tests

T-12A Test Severity

- ▶ MRV is in severity warning alarm in the severe direction.
- ▶ MRV is also in precision action alarm.

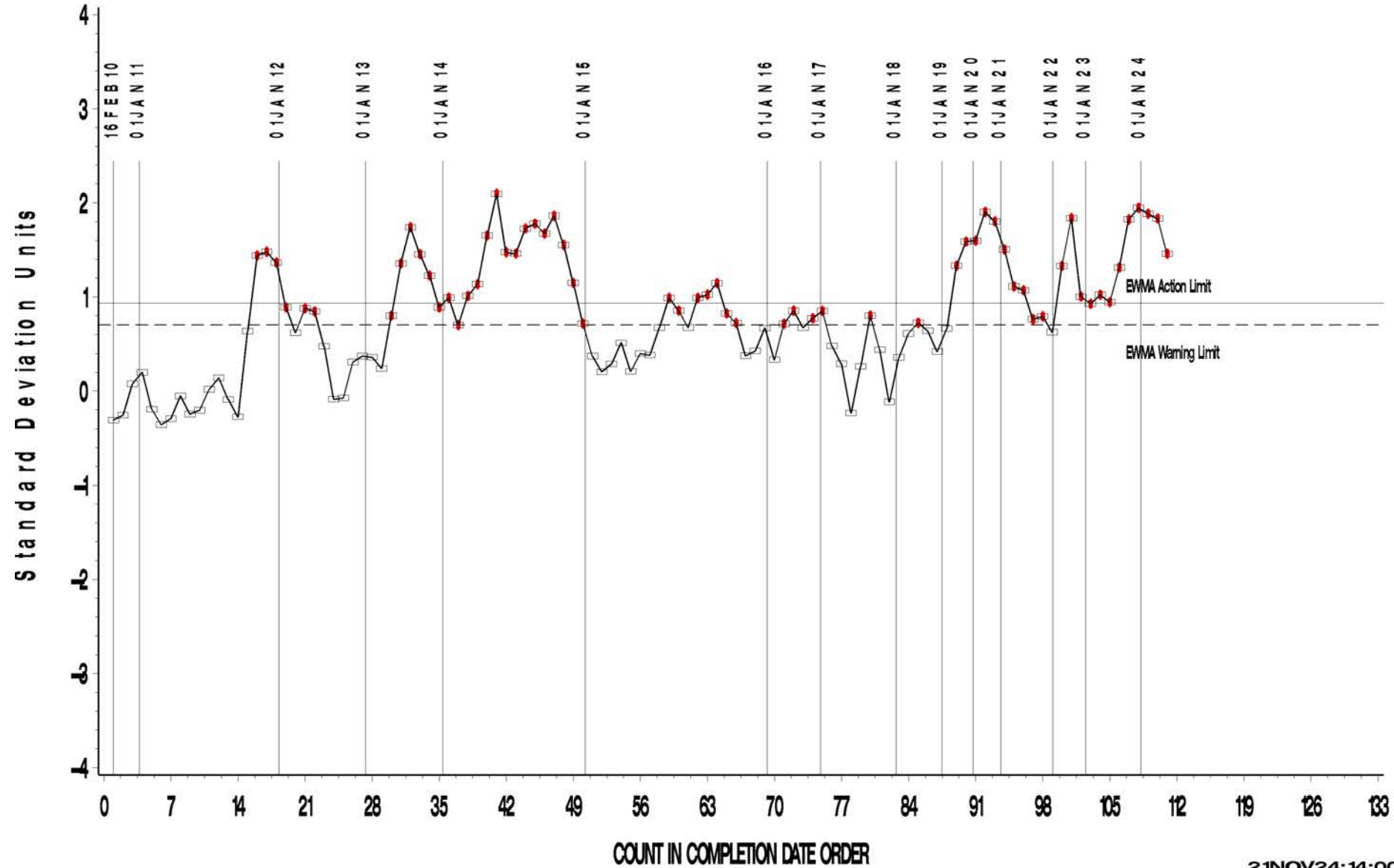
FINAL ORIGINAL UNIT MRV VISCOSITY [NM, SOLID, FROZEN, <, >]

LTMS Severity Analysis



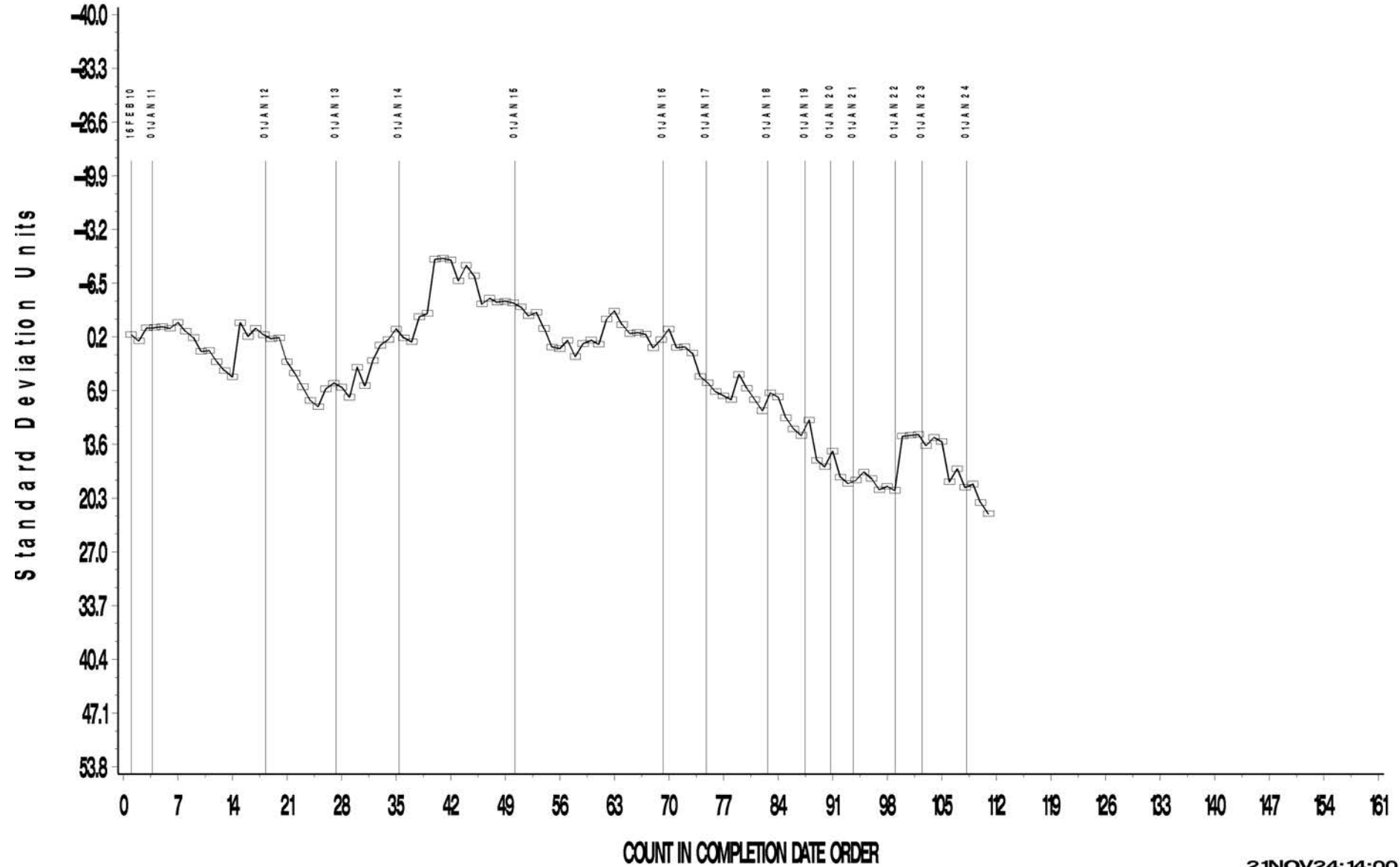
FINAL ORIGINAL UNIT MRV VISCOSITY [NM, SOLID, FROZEN, <, >]

LTMS Precision Analysis



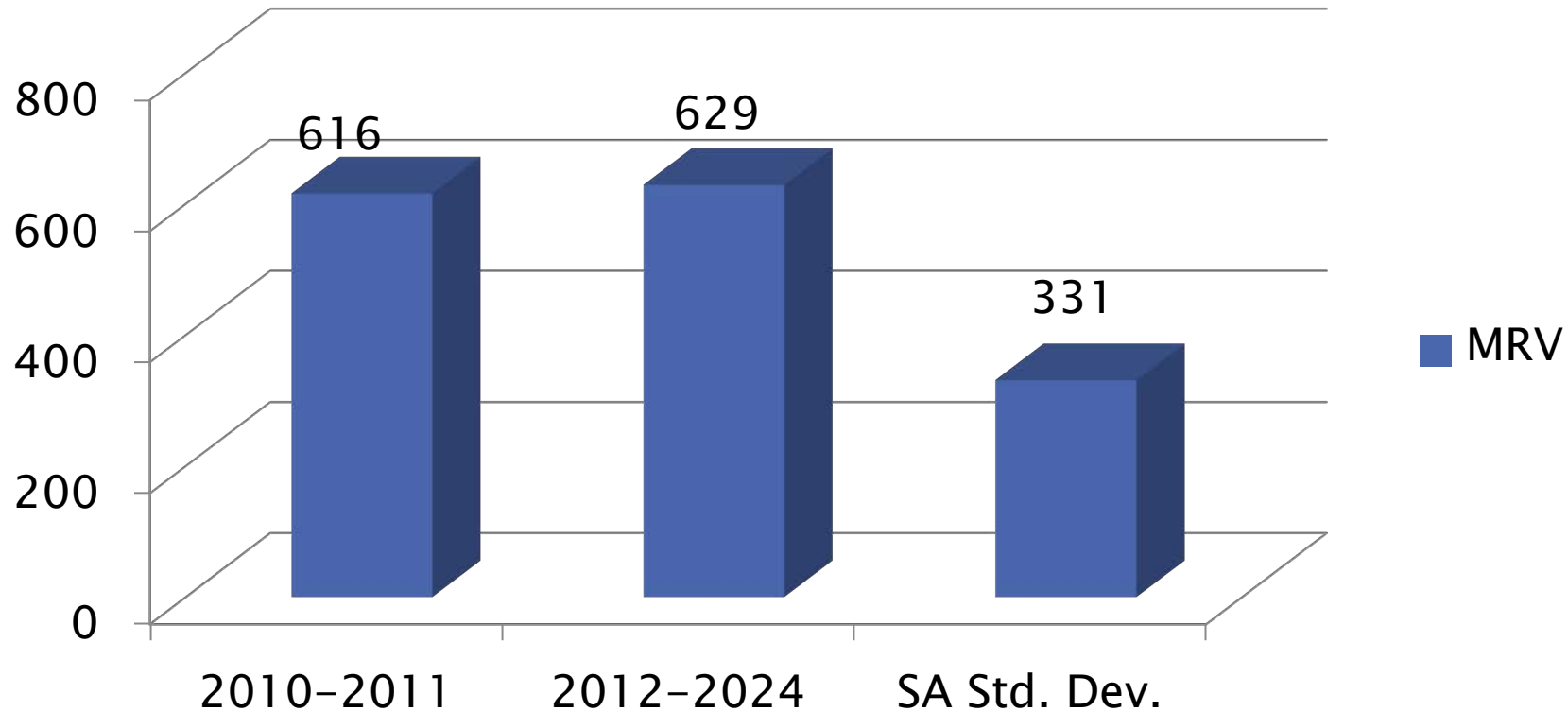
FINAL ORIGINAL UNIT MRV VISCOSITY [NM, SOLID, FROZEN, <, >]

CUSUM Severity Analysis



T-12A Precision Estimates

MRV



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Mack T-13

»» October 2024

T-13 Test Activity

Test Status	Validity Code	#
Acceptable Calibration Test	AC	4
Failed Calibration Test	OC	0
Operationally Invalid	LC	0
Aborted	XC	1
Informational	NN	0
Total		5

T-13 Failed Tests

Failed Parameter	Number of Tests
No failed tests	0
Total	0

T-13 Lost Tests*

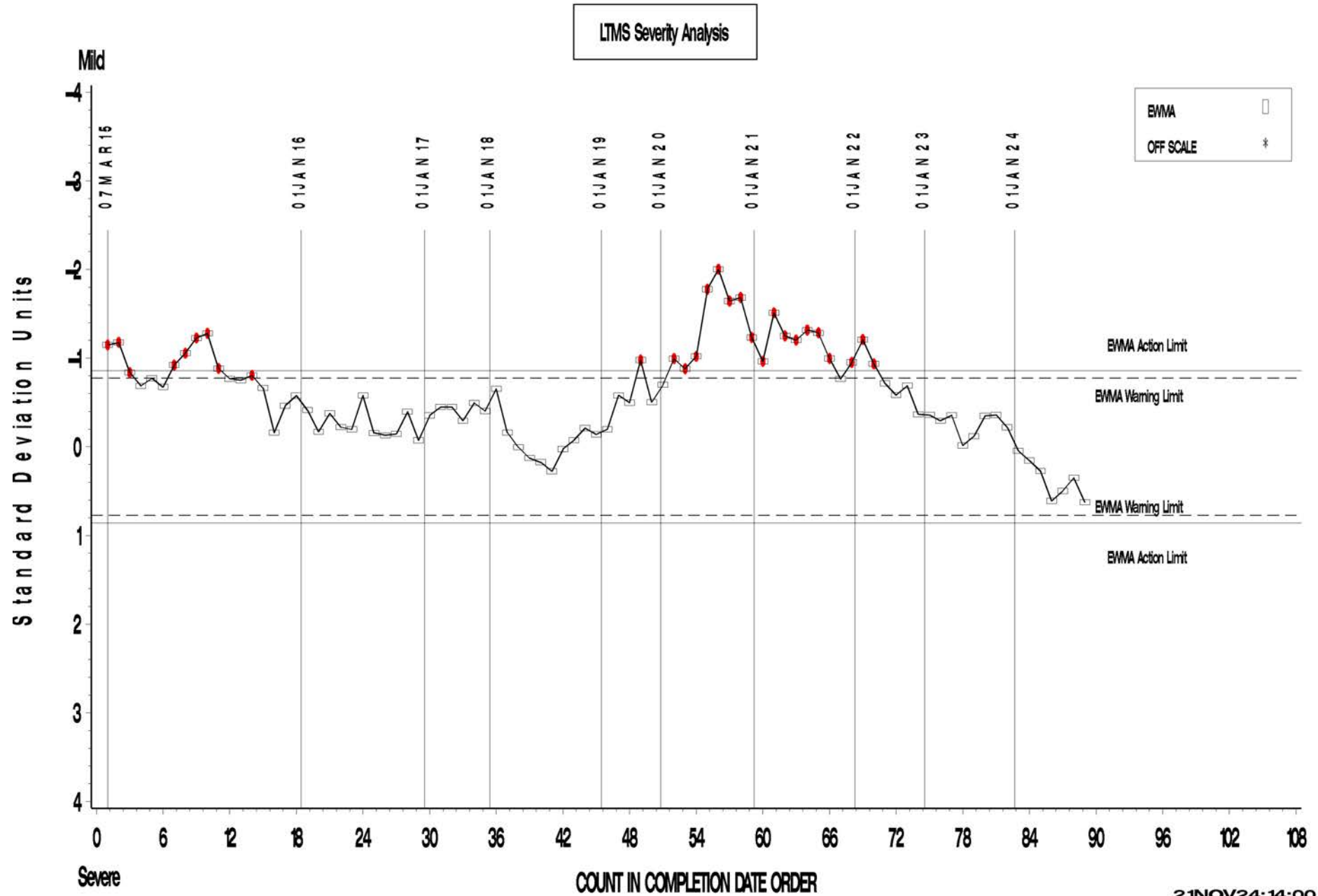
Status	Cause	#
Invalid	No invalid tests	0
Aborted	Fuel contamination	1
Total		1

*Invalid and aborted tests

T-13 Test Severity

- ▶ IRPH and KV40 are in control

FINAL ORIGINAL PEAK HEIGHT IR AT EOT

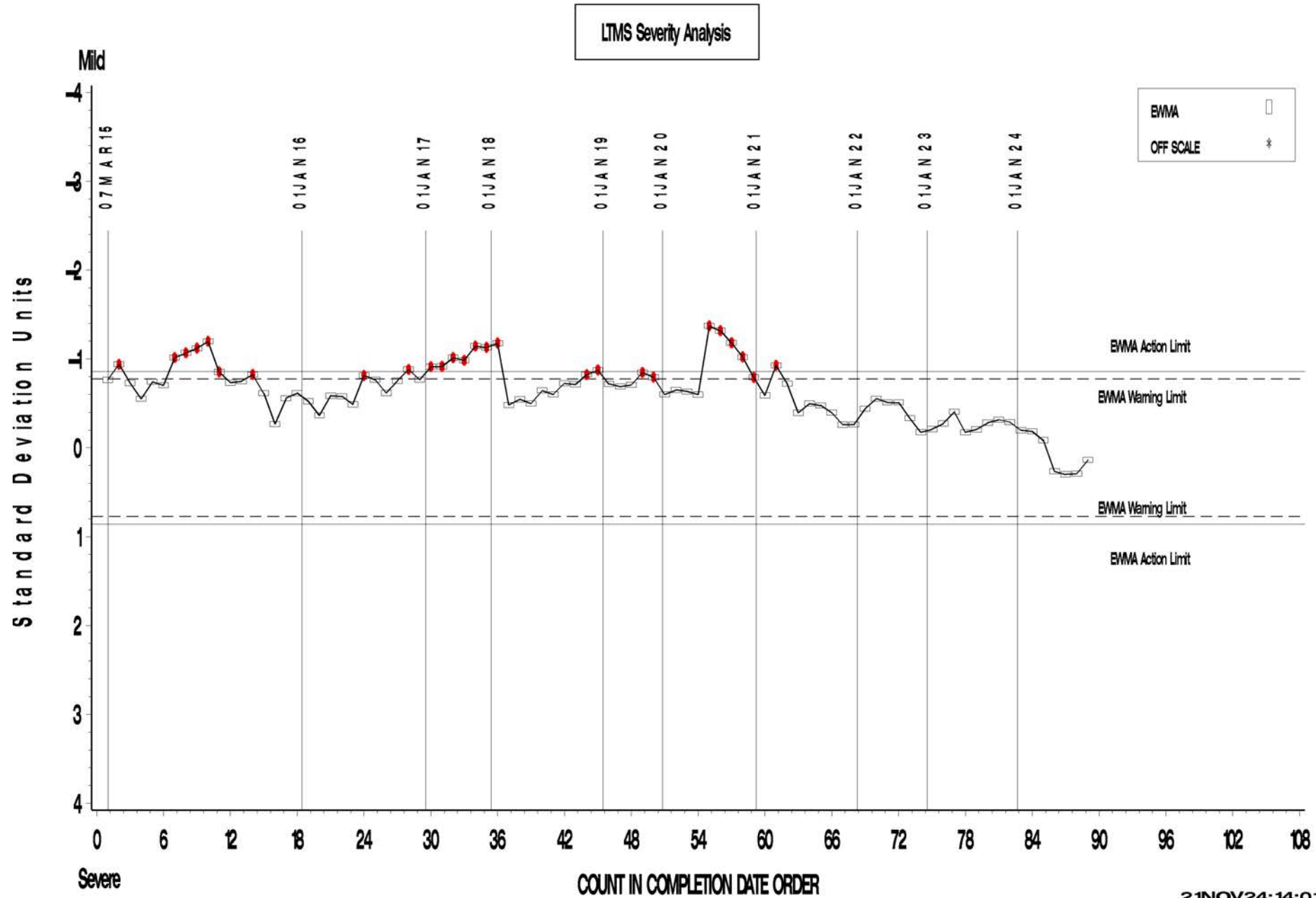


FINAL ORIGINAL PEAK HEIGHT IR AT EOT

CUSUM Severity Analysis

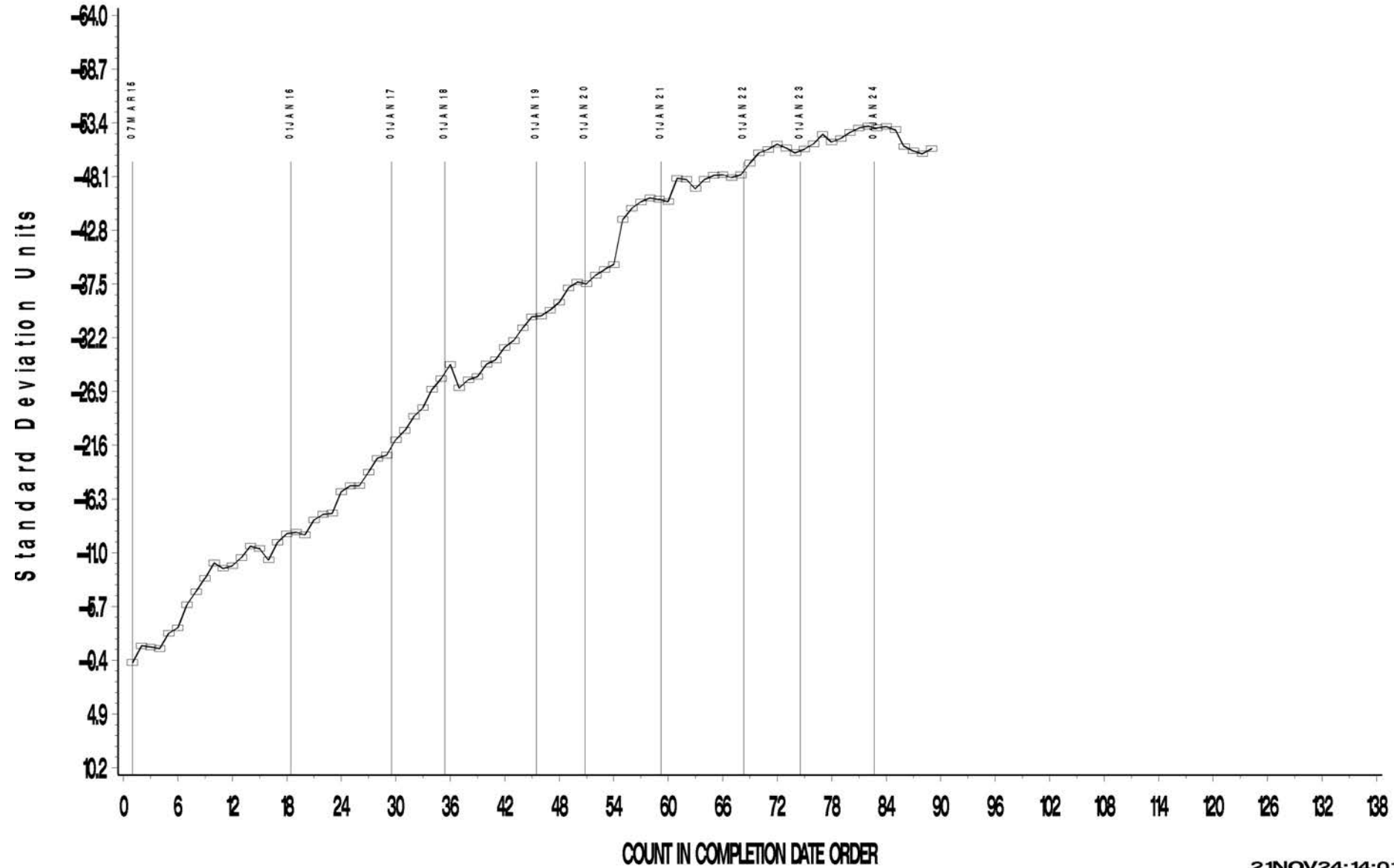


FNL. ORIG. UNIT KINEMATIC VISCOSITY AT 40 DEG C % CHANGE 300-360 HRS

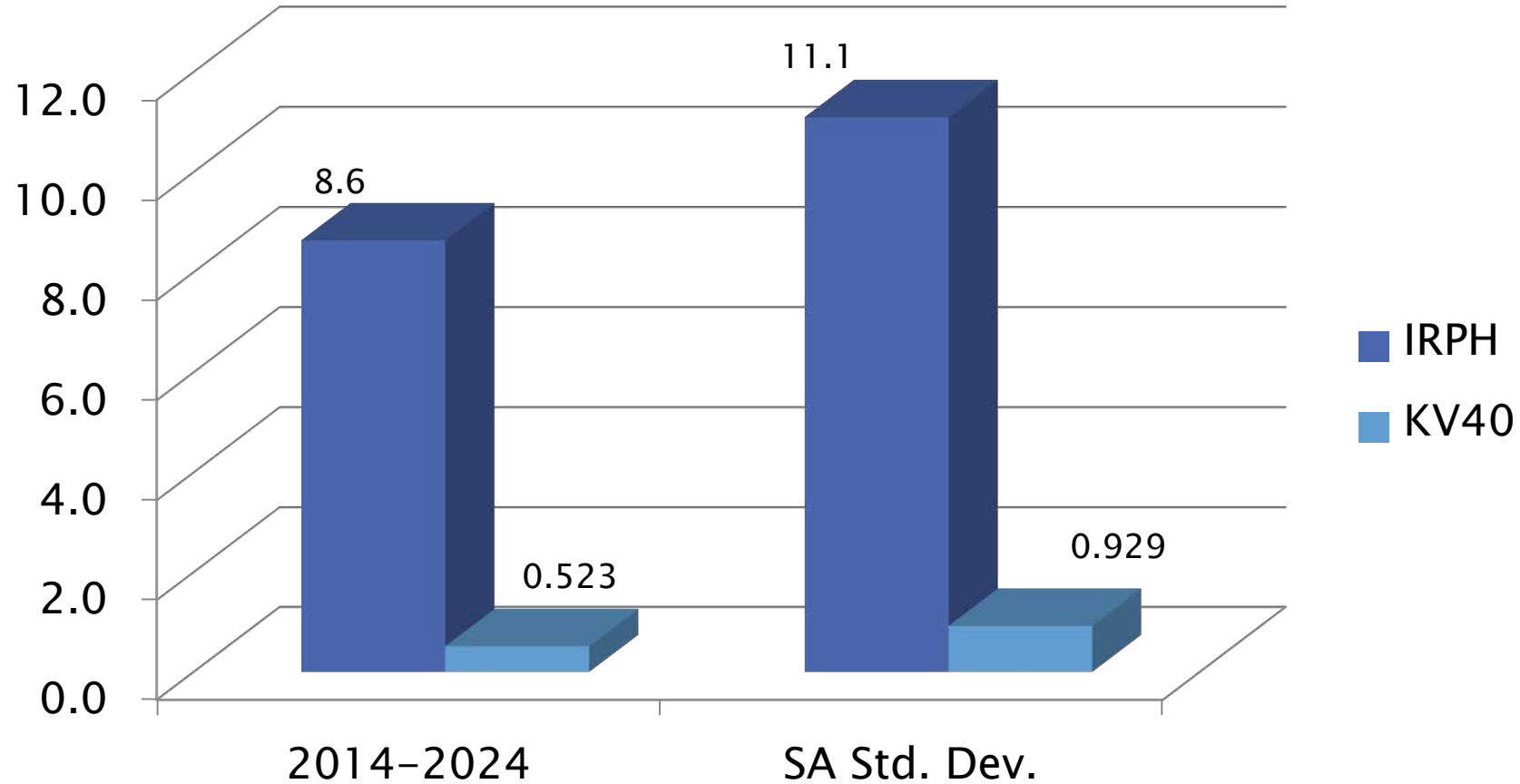


FNL. ORIG. UNIT KINEMATIC VISCOSITY AT 40 DEG C % CHANGE 300-360 HRS

CUSUM Severity Analysis



T-13 Precision Estimates



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Test Monitoring Center
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Information Letters

➤➤ April 1, 2024 – September 30, 2024

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Information Letters*

Test	Date	IL	Topic
C13	4/25/24	24-1	Addition of Top Ring Mass Loss to C13 Procedure

*Available from TMC Website

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



Memos

➤➤ April 1, 2024 – September 30, 2024

Memos*

Date	Number	Topic
N/A	N/A	No memos were issued during the period

*Available from TMC Website

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



Reference Oil Inventory



Actions, Re-blends, Inventories
and Estimated Life

Reference Oil Reblends

- ▶ Re-blend of 831 (831-5) received. Introduction has not yet occurred.

Reference Oil Inventory Estimated Life

<u>Original Blend</u>	<u>Oil</u>	<u>Tests</u>	<u>Year</u>	<u>Blend Quantity</u>	<u>TMC Inventory</u>	<u>Estimated Life</u>
809	809-1	1K, 1N	1991	9134	1856	> 5
811	811-2	1K, 1N	1995	1732	710	> 5
821	821-4	T-12	2013	4495	1874	> 5
822	822-2	1R, T-11	2013	4386	664	2
823	823-1	T-13	2021	1421	1007	> 5
824	824	T-13	2024	881	724	> 5
830	830-3	ISM	2016	2891	2083	> 5
831	831-4	C13, ISB	2017	1699	82	2.5
831	831-5	C13, ISB	2024	1884	1872	> 5
832	832-1	COAT	2018	1951	1214	> 5
832	832-2	COAT	2022	734	513.5	> 5
833	833-1	COAT	2022	1248	138	1
833	833-2	COAT	2022	1078	911	> 5
834	834	ISB Soot	2023	764	0	0
834	834-1	ISB Soot	2024	1499	1499	>5
864	864-1	DD13	2016	1576	337	3
864	864-2	DD13	2023	1475	1475	> 5
1005	1005-5	1P, 1R, EOAT, RFWT, T-8E	2015	3826	311	1

LTMS Deviations

»» April 1, 2024 – September 30, 2024

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



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LTMS Deviations

- No LTMS Deviations in Current Period

Historical Count of HD LTMS Deviations

Test	LTMS Deviations
1M-PC	2
1N	2
T-8/E	2
T-10A	1
T-12	1

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Quality Index Deviations

»» April 1, 2024 – September 30, 2024

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Quality Index Deviations

- ▶ No Qi deviations were issued this period

Quality Index Deviations

Historical Count of HD Quality Index Deviations

Test	Qi Deviations
1P	15
1R	1
ISM	3
C13	2
T-10A	1
T-11	3
T-12	8
T-13	3
COAT	5

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TMC Laboratory Visits

➤➤ April 1, 2024 – September 30, 2024

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TMC Lab Visits

- ▶ No HD lab visits were conducted during this reporting period.

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Test Area Timelines

➤➤ April 1, 2024 – September 30, 2024

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Test Area Timeline Additions*

Test	Date	IL/Memo	Topic
C13	4/25/24	24-1	Addition of Top Ring Mass Loss to Procedure
T13	9/26/24	N/A	RINGS TO BE PURCHASED FROM MAHLE BRAZIL INSTEAD OF PORTUGAL

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*As of 3/31/24

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



Rating Workshop Data



2023 Standardized Testing Deposit
Rating Workshop

Rating Workshop Data

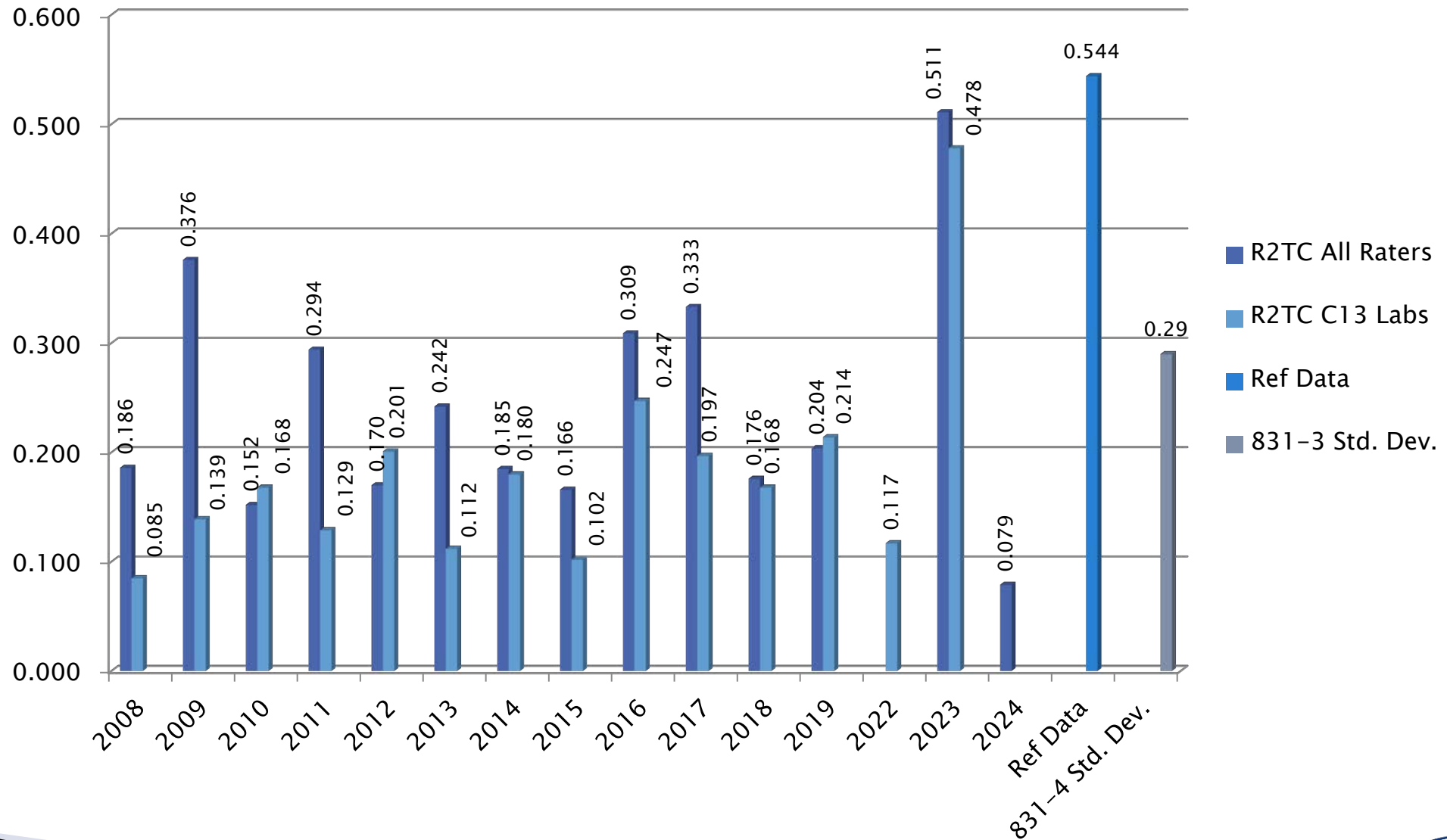
- ▶ The 2024 Standardized Testing Deposit Rating Workshop was held in March 2024 in San Antonio. The heavy-duty rating data is presented here.

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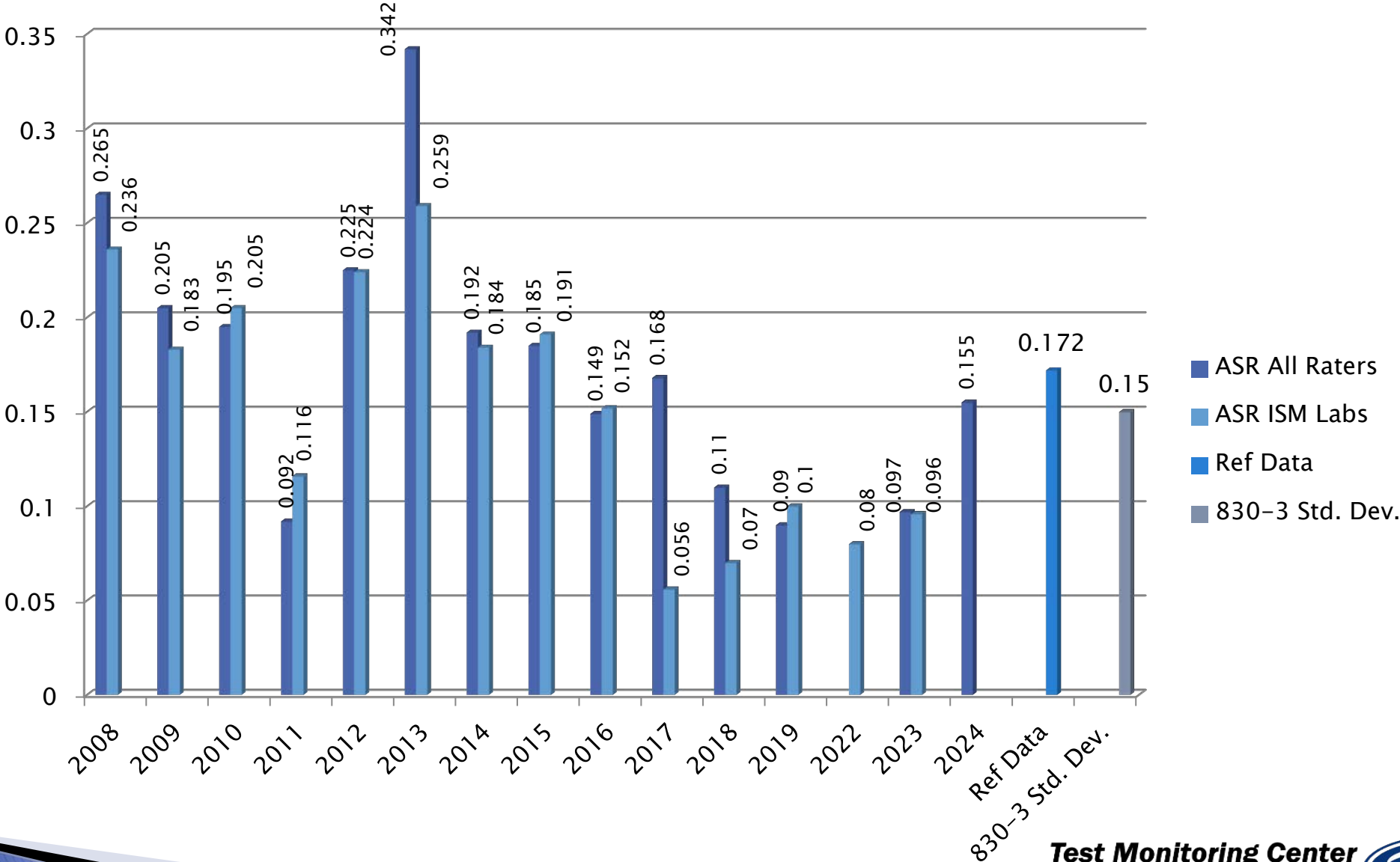
Test Monitoring Center
<https://www.astmtmc.org>



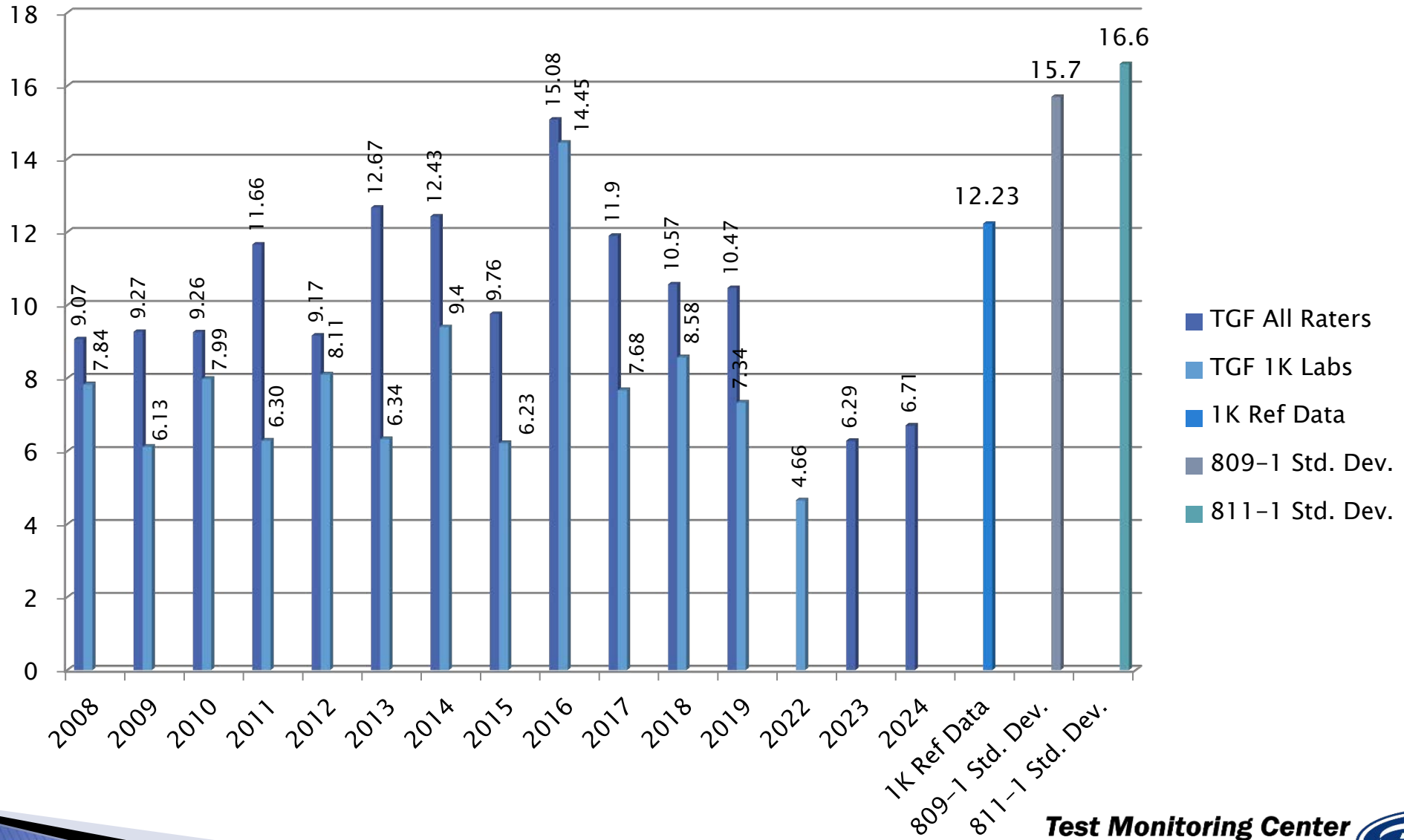
C13 2nd Ring Carbon Precision – Rating Workshop Data



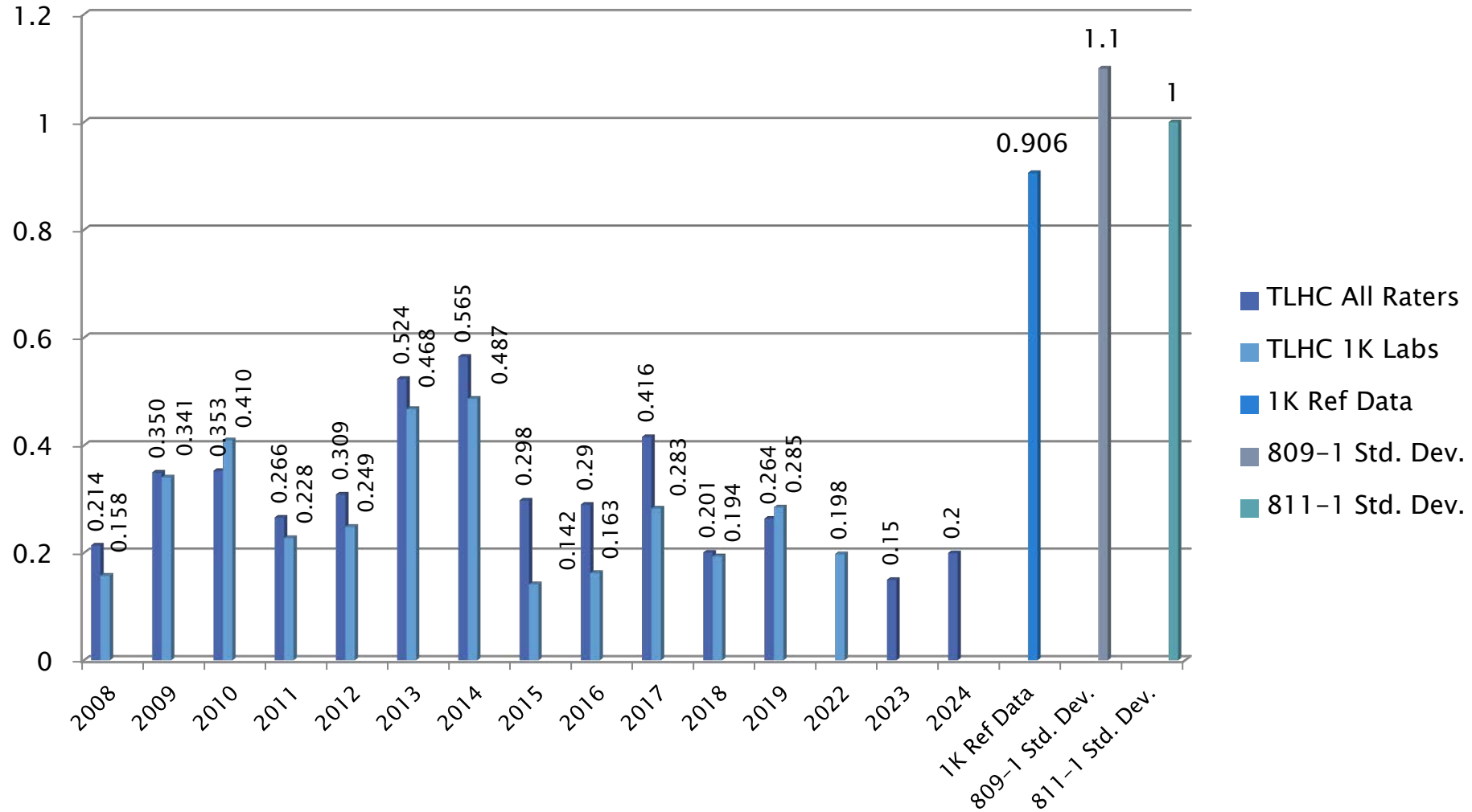
ISM Sludge Rating Precision - Rating Workshop Data



Deposit Rating Precision - Rating Workshop Data



Deposit Rating Precision – Rating Workshop Data



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Miscellaneous Information

- ▶ Available on TMC Website:
 - Oil Assignment Request and Test File Upload
 - Live Reference Test Data Bases
 - Surveillance Panel Meeting Minutes
 - Test Area Alarm Logs
 - Complete Test Area Timelines
 - LTMS Manual
- ▶ <https://www.astmtmc.org>

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