



WMSC Commissioner Brief: W-0073 – Red Signal Overrun – Greenbelt Yard – November 23, 2020

Prepared for Washington Metrorail Safety Commission meeting on April 13, 2021

Safety event summary:

A Train Operator moved a non-revenue train past a red signal at the end of a third absolute block that had been granted by the Greenbelt Rail Yard Interlocking Operator.

In an interview, the Train Operator stated that as they approached the E99-98 signal they were thinking that they had an absolute block to the E99-198 signal (which was the initial repeat back prior to an Interlocking Operator correction that the Train Operator acknowledged), so they had looked down at the console to check the train speed. When the train operator belatedly tried to stop on seeing the red signal, the train did not stop in time. The Train Operator initiated braking shortly before passing the signal, passing the signal at 12.4 mph. The train stopped approximately 46 feet beyond the signal.

The train was then moved after the event nearly simultaneously with notification to WMATA's Safety Department of this event.

Probable Cause:

The probable cause of this event was a loss of situational awareness.

Corrective Actions:

Metrorail provided additional training to the Train Operator.

Metrorail also developed a lessons learned document focused on this event and other red signal overruns, and has since included red signal overrun issues as part of a safety standdown.

WMSC staff observations:

The complex nature of successive absolute blocks including some permissions to pass red signals can place a cognitive load on train operators, particularly train operators without sufficient territory familiarization and related training. Metrorail could factor these cognitive loads into future rule and procedure updates.

This event also demonstrates the importance of Metrorail training personnel on proper safety event protocols, as outlined in the WMSC's October 20, 2020 finding regarding investigation evidence and integrity.

Staff recommendation: Adopt final report.



Washington Metro Area Transit Authority

Department of Safety and Environmental
Management (SAFE)

FINAL REPORT OF INVESTIGATION A&I E20453

Date of Event:	11/23/2020
Type of Event:	Red Signal Overrun
Incident Time:	05:35 hrs.
Location:	Greenbelt Yard, Track 1
Time and How received by SAFE:	06:06 hrs. SAFE On-Call Phone
WMSC Notification Time:	07:22 hrs.
Responding Safety Officers:	WMATA SAFE: Yes WMSC: No Other: N/A
Rail Vehicle:	L7232.7233 X 7123.7122T
Injuries:	None
Damage:	None
Emergency Responders:	RTRA, CMNT, SAFE

Greenbelt Yard – Red Signal Overrun

Date: 11/23/2020 Time: 05:35 hrs.
Final Report Rev.1 – Red Signal Overrun
E20453

Rev.1 Drafted By: SAFE 703 – 03/31/2021
Rev.1 Reviewed By: SAFE 704 – 03/31/2021
Rev.1 Approved By: SAFE 2 – 03/31/2021

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November 23, 2020

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Abbreviations and Acronyms

ATCM	Automatic Train Control Maintenance
ARS	Audio Recording Service
CENV	Vehicle Program Services
CMNT	Car Maintenance
MSRPH	Metrorail Safety Rules and Procedures Handbook
NOAA	National Oceanic Atmospheric Administration
ROCC	Rail Operations Control Center
RTRA	Office of Rail Transportation
SMS I/A	Safety Measurement System Incidents/Accidents
TWC	Train Wayside Communication

Washington Metropolitan Area Transit Authority

Department of Safety & Environmental Management

Executive Summary

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On Monday, November 23, 2020, at approximately 05:20 hrs., a Train Operator operating a Non-Revenue train [Train ID 805 consist **L7232-7233.7123.7122T**] contacted Greenbelt Interlocking Operator and reported that they were standing by E99-44 signal and requesting permission to enter Greenbelt Yard. The Interlocking Operator acknowledged Train ID 805 request and instructed the Operator to standby for further instructions. At 05:23 hrs., the Interlocking Operator gave the Train Operator an absolute block to E99-66 signal verifying a lunar at E99-44 signal. At 05:25 hrs., the Interlocking Operator gave the Train Operator an absolute block to E99-156 signal red, verifying a lunar and correct rail alignment at E99-66 signal.

At approximately 05:27 hrs., the Interlocking Operator gave the Train Operator an absolute block to E99-98 signal red with permission to pass E99-170 signal red verifying a lunar at E99-156 signal. The Train Operator gave a repeat back of an absolute block to E99-198 signal, the Interlocking Operator repeated their instruction correcting the signal to E99-98 signal red; the Train Operator repeated E99-98 signal to the Interlocking Operator acknowledging the absolute block. At approximately 05:35 hrs., the Train Operator contacted the Interlocking Operator and reported that their lead car 7232 passed E99-98 signal red. The Interlocking Operator dispatched Automatic Train Control Maintenance (ATCM) to inspect the interlocking status and report any damage that may have occurred in the switch at any point. The Interlocking Operator also dispatched a Rail Transportation (RTRA) Supervisor and Car Maintenance (CMNT).

At 05:58 hrs., ATCM personnel arrived on the scene to inspect the E99-99 switch for any damage. At 06:07 hrs., ATCM reported that the E99-99 switch was clamped in reverse and requested that Train ID 805 be removed from the occupying track. The Interlocking Operator instructed the Train Operator to move their Train northbound on an absolute block to E99-85 signal red verifying E99-99 switch is clamped in reverse. At 06:12 hrs., ATCM reported that the E99-99 switch was unclamped and continued to inspect the area. At Approximately 06:20 hrs., ATCM cleared the roadway, reported no structural damage at any switch points, and placed the tracks back in a revenue status.

The Rail Operations Control Center (ROCC) removed the Train Operator from service and transported for Post-Incident Testing. ROCC removed the incident train from revenue service pending a Post-Incident inspection. There are no reported injuries as a result of this incident.

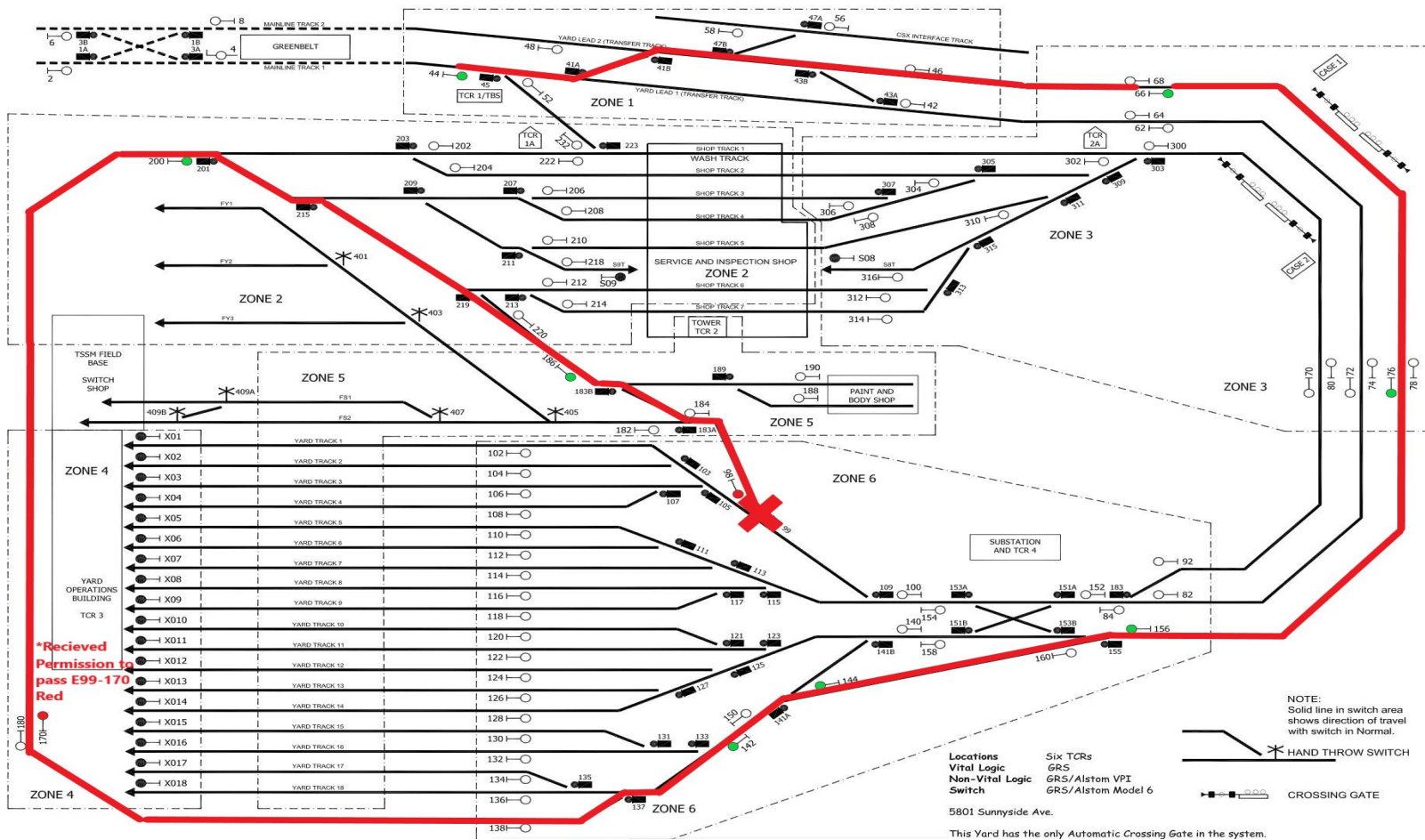
SAFE determined the probable cause of the Red Signal overrun event at Greenbelt Yard on November 23, 2020, was that the Train Operator loss situational awareness.

As a result of this investigation, SAFE makes the following safety recommendations:

To RTRA, Train Operator should undergo re-training, emphasizing train movement procedures when traversing a rail yard and uncoupling class 1 vehicles rules and procedures.

To RTRA, provide lessons learned to discuss the event and findings to include previous red signal overrun events involving RTRA personnel.

Incident Site



Purpose and Scope

The purpose of this incident investigation and candid self-evaluation is to collect and analyze available facts, determine the probable cause(s) of the incident, identify contributing factors, and make recommendations to prevent a recurrence.

Investigation Process and Methods

Upon receiving notification of the Red Signal Overrun in Greenbelt Yard on November 23, 2020, SAFE dispatched a cross-functional team to assess the scene and conduct the subsequent investigation. SAFE team members worked with relevant WMATA subject matter experts to review the incident's facts and data.

Investigation Methods

The final investigative methodologies included the following:

- Physical Site Assessment
- Formal Interviews – SAFE interviewed two (2) individual(s) as part of this investigation. Interviews will include persons present during and/or after the incident and those directly involved.

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SAFE interviewed the following individuals:

- Interlocking Operator
- Train Operator
- Informal Interviews – Collected through conversations with individuals during the course of the investigation to provide background and supporting information
- Documentation Review – A collection of relevant work history information and process documentation contained in Metro systems of record. These records include:
 - Employee Training Procedures & Records
 - Certifications
 - The 30-Day work history review
 - MSRPH
 - National Oceanic Atmospheric Administration (NOAA) data review
- System Data Recording Review – A collection of information contained in Metro Data Recording Systems. This data includes:
 - Audio Recording System (ARS) playback [Radio and Phone Communications]
 - Vehicles Program Services (CENV)
 - Office of Car Maintenance (CMNT)

Investigation

On Monday, November 23, 2020, at approximately 05:20 hrs., a Train Operator operating Non-Revenue Train ID 805 notified Greenbelt Yard Interlocking Operator that they were standing by the E99-44 signal and requested permission to enter the rail yard. The Interlocking Operator acknowledged the request and instructed the Train Operator to hold their location for further instruction. At approximately 05:23 hrs., the Interlocking Operator instructed the Train Operator to verify a lunar at E99-44 signal and given an absolute block to E99-66 signal red. At approximately 05:25 hrs., the Interlocking Operator gave the Train Operator an additional absolute block to E99-156 signal red, verifying a lunar and correct rail alignment at E99-66 signal.

At approximately 05:27 hrs., the Interlocking Operator gave the Train Operator a third absolute block to E99-98 signal red with permission to pass E99-170 signal red, verifying a lunar at E99-156 signal. The Train Operator acknowledged the request with an improper repeat back of E99-198; the Interlocking Operator repeated the instruction to the Train Operator stating that the absolute block is to E99-98 signal red; the Train Operator repeated the absolute block to E99-98 signal red. At approximately 05:35 hrs. The Train Operator contacted the Interlocking Operator and reported that their lead car 7232 passed E99-98 signal red. The Interlocking Operator notified ATCM personnel at 05:35 hrs. to have ATCM personnel inspect the interlocking switch for any structural damages. At 05:41 hrs., the Interlocking Operator dispatched an RTRA Supervisor to assist the Train Operator at the E99-98 signal. At 05:42 hrs., the Interlocking Operator contacted the Rail Operations Control Center (ROCC) and notified the Button Rail Traffic Controller of the incident. The Interlocking Operator also notified CMNT personnel.

At 05:58 hrs., ATCM personnel arrived on the scene to inspect the E99-99 switch for any damage. At 06:07 hrs., ATCM reported that the E99-99 switch was clamped in reverse and requested that Train ID 805 be removed from the occupying track. The Interlocking Operator verified all personnel were standing clear of train movement and instructed the Train Operator to move their Train northbound on an absolute block to E99-85 signal red, verifying E99-99 switch is clamped in reverse. At 06:12 hrs., ATCM reported that the E99-99 switch was unclamped and continued to inspect the area. At Approximately 06:20 hrs., ATCM cleared the roadway, with a report of no structural damage at any switch points. ATCM placed the tracks back in revenue service. SAFE investigations from the ARS include Greenbelt Yard OPS 2..

ROCC subsequently removed the Train Operator from service for Post-Incident Testing. ROCC removed the incident Train from revenue service pending a Post-Incident Inspection. There are no reported injuries as a result of this incident.

SAFE investigations from the ARS include Greenbelt Yard OPS 2.

Chronological Event Timeline

A review of ARS playback, i.e., phone and radio communications, revealed the following timeline:

05:20:36 hrs.	Non-Revenue Train ID 805 contacted Greenbelt Interlocking Operator requesting permission to enter the railyard. Standing by E99-44 signal. [Radio]
05:23:46 hrs.	Greenbelt Interlocking Operator instructed the Train Operator to move on an absolute block to E99-66 signal red. Train Operator acknowledged the request. [Radio]
05:25:34 hrs.	Greenbelt Interlocking Operator gave the Train Operator another absolute block to the E99-156 signal. [Radio]
05:27:47 hrs.	The Interlocking Operator gave the Train Operator a third absolute block to E99-98 signal red with permission to pass E99-170 signal red, verifying a lunar at E99-156 signal. [Radio]
05:35:13 hrs.	the Train Operator contacted the Interlocking Operator and reported that their lead car 7232 passed the E99-98 signal red. [Radio]
05:35:32 hrs.	Greenbelt Interlocking Operator notified ATCM personnel and requested their assistance in inspecting the E99-98 switch for damage. [Ambient]
05:41:40 hrs.	Greenbelt Interlocking Operator dispatched an RTRA Supervisor to assist the Train Operator at E99-98 signal. [Ambient]
05:42:12 hrs.	The Greenbelt Interlocking Operator notified the Button RTC of the incident. [Phone]
06:07:17 hrs.	ATCM personnel requested the incident train be removed from the occupying track. Greenbelt Interlocking Operator gave the Train Operator an absolute block to E99-85 signal. [Radio]

06:20:05 hrs.	ATCM reported no structural damage to the E99-99 switch and placed the track back in revenue service. [Radio]
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Office of Car Maintenance

CMNT personnel performed an exterior and interior inspection of the affected consist and found no damage. Additionally, the Master Controller operation was checked and found to be working correctly.

Vehicles Program Services (CENV)

ER Data Graph/Sequence of Events

Based on CENV analysis of the downloaded VMDS and ER, details from the data analysis are as follows:

05:32:38 hrs.	Lead car 7232 stop at Vehicle crossover heading north.
05:33:06 hrs.	Lead car 7232 passed E99-186 signal Lunar (train speed 11.84 MPH) Master Controller Position "Coast." Distance from E99-98 approximately 413 Ft.
05:33:29 hrs.	Lead car 7232 passed RED SIGNAL at E99-98 (Train speed at 12.40. Master Controller Position "B5").
05:33:35 hrs.	Car stop and Master Controller is placed in "B5" (Distance travel Approx. 46 Ft. Past red signal).

NOTE: CENV reported that no propulsion/brake faults were observed during data analysis or in the fault logs and confirmed Train Wayside Communication Coil (TWC) was working correctly.

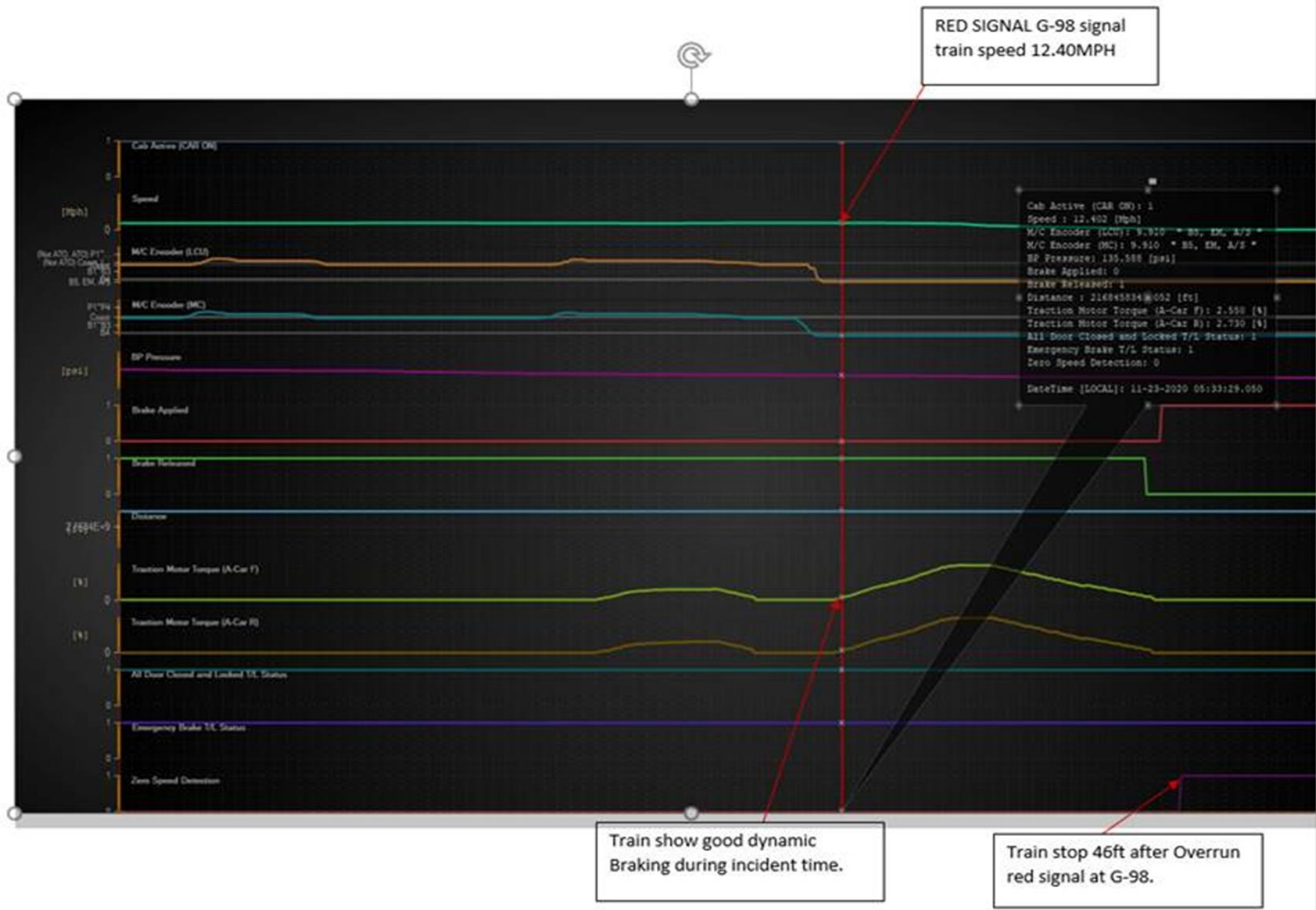


Diagram 1- ER Graphical Analysis

Findings

- Lead car 7232 passes RED SIGNAL at E99-98 (Train speed at 12.40. Master Controller Position "B5").
- The Train Operator overran the E99-98 signal by Approx. 46 Ft.

Weather

At the time of the incident, the temperature was 48° F and there was slight precipitation. SAFE has concluded that weather was not a contributing factor in this incident (Weather source: NOAA) – Location: Greenbelt, MD.)

Human Factors

Fatigue

Based on SAFE interview question related to Fatigue Factors and a review of the Interlocking Operator and the Train Operator's 30-day work history, SAFE determined, the employees' hours of service were in accordance with WMATA's Fatigue Risk Management Policy 10.6 and Hours of Service Limitations for Prevention of Fatigue Policy 10.7

Post-Incident Toxicology Testing

After reviewing Interlocking Operator and the Train Operator's post-incident testing results, SAFE determined that the employees involved were not violating the Drug and Alcohol Policy and Testing Program 7.7

Probable Cause Statement

The probable cause of the Red Signal overrun event at Greenbelt Yard on November 23, 2020, was that the Train Operator loss situational awareness.

SAFE Recommendations

The following are the recommendations and corrective actions identified as a result of this investigation. These recommendations and corrective actions are tracked using WMATA's Safety Measurement System Incidents/Accidents (SMS I/A) Module and are verified by SAFE upon completion. The responsible department is identified in the corrective action code. Refer to the SMS I/A module for additional information:

Corrective Action Code	Description
90353_SAFECAPS_RTRA_001	Enroll the Train Operator in re-training, emphasizing train movement procedures when traversing a rail yard
90353_SAFECAPS_RTRA_002	Develop lesson learned to discuss the event and findings to include previous red signal overrun events involving RTRA personnel. This can include information on any succeeding red signal violations.

Appendix A - Interview Summaries

Interview Details

Office of Rail Transportation (RTRA)

Interlocking Operator

The Interlocking Operator is a WMATA employee with two (3) years of experience as an Interlocking Operator and (13) years of service in various positions as Bus Operator, Train Operator, and RTRA Supervisor.

Based on the SAFE interview, the Interlocking Operator stated that they received notification from the Terminal Supervisor that a 4-car 7K consist would be entering the railyard with the intention to couple to another 4-car consist to make an 8-car consist for revenue service. The Interlocking Operator reported that the Train Operator on the non-revenue train contacted them on the radio they instructed the Train Operator to stand by to allow a revenue train to enter Greenbelt platform. The Interlocking Operator stated that once the revenue train was on Greenbelt platform, they gave the Train Operator an absolute block to E99-98 signal red and hold, verifying a lunar at E99-156 signal; the Interlocking Operator also stated that they gave permission to the Train Operator to pass E99-170 red; the Interlocking Operator reported that the Train Operator gave the proper repeat back acknowledging the absolute block.

The Interlocking Operator reported that at 05:53 hrs., the Train Operator reported that they slid pass E99-98 signal red. The Interlocking Operator reported that their first notification was to ATC due to switch 109 showing occupancy and they wanted to ascertain if there was any damage to the switch. The Interlocking Operator then stated that they notified the Terminal Supervisor that they would not be receiving their last two trains for revenue service. The Interlocking Operator then stated that after notifying ROCC of the red signal overrun they requested an RTRA Supervisor to the scene to investigate and provide an update. The Interlocking Operator stated that upon the investigation ATC reported that there was no structural damage to switch 109.

Train Operator

The Train Operator is a WMATA employee with two (2) years of experience as a Train Operator and (5) years of service in various positions as Bus Operator.

Based on the SAFE interview, the Train Operator reported that they were transporting a 4-car consist to Greenbelt Yard, the Train Operator stated they did not know the intent of the 4-car consist at the time of the transportation. The Train Operator reported that they were holding at E99-156 signal waiting to enter the rail yard. The Train Operator stated that when they received their absolute block to E99-98 signal they thought that they heard the Interlocking Operator state they had an absolute block to E99-198 signal. The Train Operator reported that due to precipitation the tracks were slippery in approach to the crosswalk.

The Train Operator under the assumption that they were on an absolute block to E99-198 signal diverted their attention to the Operator console to ensure they did not exceed the speed limit in the yard, believing that E99-198 signal was further down the yard tracks. The Train Operator

reported that when they observed the red signal at E99-98 they attempted to stop the train by placing the Master Controller in a B5 brake rate, however, the train slid passed E99-98 signal red. The Train Operator stated that they reported the incident to the Interlocking Operator and was instructed to not move the train. The Train Operator reported that they remained in the Operator's cab while ATC personnel and an RTRA Supervisor accessed the roadway to assess any damage.