FINAL REPORT OF INVESTIGATION A&I E19151, E19152, and E19159

March 25 and 28, 2019

Incorrect Route

W-0026

Adopted by the Washington Metrorail Safety Commission at its meeting on March 12, 2020.

Washington Metrorail Safety Commission
777 North Capitol Street, NE, Suite 402
Washington, DC 20002

FINAL REPORT OF INVESTIGATION A&I **E19151, E19152, and E19159**

SMS 20190326#78749

20190326#78750

20190328#78807

Date of Event:	3/25/2019 & 3/28/2019
Type of Event:	Any operation or action not listed elsewhere that is noteworthy or can be perceived as an unsafe operation or violation of operating practices
Incident Time:	07:28 hrs.; 11:52 hrs.; 16:20 hrs.
Location:	D&G Junction, Track 1
Time and How received by SAFE:	07:46 hrs.; 12:02 hrs.; 16:34 hrs.; SAFE On-Call Phone
Safety Officer Response:	N/A
Time of Safety Officer Arrival:	N/A
Time of Safety Officer Departure:	N/A
Rail Vehicle:	Train ID 910: Consist (7600-7601.7603-7602.7582-7583.7581-7580) Train ID 908: Consist (3025-3024.3044-3045.3127-3126) Train ID 917: Consist (6180-6181.6122-6123.6140-6141)
Injuries:	None
Damage:	None
Emergency Responders:	RTRA, ATC

Executive Summary

Incident Number One: E19151

On Monday, March 25, 2019 at approximately 07:46 hrs., Rail Operations Control Center (ROCC) received a report that Orange Line Train ID 910 (7600-7601.7603-7602.7582-7583.7581-7580), accepted an incorrect route at D98-36 Signal, Track 1 set by the ROCC Controller. As a result, Train ID 910 was routed toward Largo Town Center (G05, Blue Line). Train ID 910 was offloaded at Benning Road station (G01) and the customers

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Approved By: SAFE 70 – 05/13/2019

boarded an inbound train and returned to Stadium-Armory station (D08) to continued route towards New Carrolton (D13). There were no injuries or damage reported as a result of this event.

Based on post incident inspection and Supervisory Control Data Acquisition (SCADA) Event Log, SAFE arrived at the following conclusion:

- D98-36 Signal was automatically routed (fleeted) to Blue Line/Largo Town Center prior to the incorrect route event
- The T/O did not notify ROCC of the incorrect Flashing Lunar aspect that subsequently routed Train ID 910 to Benning Road station.
- There was no data from CENV to support any anomalies with the train.

Considering all the salient facts, SAFE concludes that ROCC Controllers incorrectly fleeted D98-36 Signal towards Largo Town Center and Train ID 910 accepted an incorrect route towards Largo Town Center.

Incident Number Two: E19152

On Monday, March 25, 2019 at 12:08 hrs., SAFE was notified by ROCC that at approximately 11:52 hrs. an Orange Line Train ID 908 (T3025-3024.3044-3045.3127-3126L) accepted an incorrect route at D98-36 Signal, Track 1 set by the Automatic Train Control (ATC) Technician. As a result, Train ID 908 was routed toward Largo Town Center (G05, Blue Line). Train ID 908 was offloaded at Benning Road station (G01) and the customers boarded an inbound train and returned to Stadium-Armory station (D08) to continue route towards New Carrolton station (D13). There were no injuries or damage reported as a result of this event.

Based on post incident investigation, SAFE arrived at following conclusion:

- ATC personnel were dispatched to D98 to troubleshoot ATC problems.
- ROCC granted Local Control of the D98 interlocking to ATC personnel to establish an ETO form of Roadway Worker Protection (RWP).
- An ATC technician took control of the Local Control Panel (LCP) in the Train Control Room (TCR), he monitored the ROCC Live Train Maps tool for information and subsequently set the incorrect route to Train ID 908 toward Largo. **Note: ATC personnel should have been monitoring train destination indications on the LCP instead of the Live Train Maps as emphasized in the "Lessons Learned" (attachment 3).**
- There was no data from CENV to support any anomalies with the train

Incident Number Three: E19159

On Thursday, March 28, 2019 at approximately 16:25 hrs., ROCC received a report of an Orange Line Train ID 917 (L6180-6181.6122-6123.6140-6141T) that accepted an incorrect route at D98-36 Signal, Track 1 set by the ROCC Controller. The T/O stopped the train after passing D98-36 Signal and contacted ROCC for further instructions. ROCC

then instructed the T/O to reverse ends to clear D98-36 Signal so the proper route could be re-established. **Note:** Switches associated with D98-36 Signal were clamped in the normal position as displayed on the Advanced Information Management System (AIMS) playback prior to this event due to scheduled track work. Once D98-36 Signal was cleared, the correct route was set and Train ID 917 resumed revenue service towards New Carrolton. There were no injuries or damage reported as a result of this event.
Based on post incident inspection and the SCADA Event Log, SAFE came to the following conclusion:

- The T/O of Train ED 910 did not notify ROCC about the Flashing Lunar displaying an incorrect signal aspect and subsequently routed to Benning Road station.
- There was no data from CENV to support any anomalies with the train
- There is no Audio Recording System (ARS) radio communication playback to substantiate the confirmation of switch alignment nor was there 100 percent repeat back between ROCC and the T/O. Per MSRPH section 1.78, "Employee shall, when communicating with ROCC, provide train/unit number or name/title and location (including track number, when appropriate). ROCC shall acknowledge employee by repeating train number, location and track".

Considering all the salient facts, SAFE concludes that the ROCC Controller failed to positively verify the train's ID/Destination with the T/O and subsequently set the incorrect route. The T/O failed to recognize the incorrect switch alignment and the incorrect lunar signal aspect.

Notification

Title	Time	Comment:
FTA	16:02 hrs. 16:06 hrs. 17:30 hrs.	WMSC Notification

Incident Site

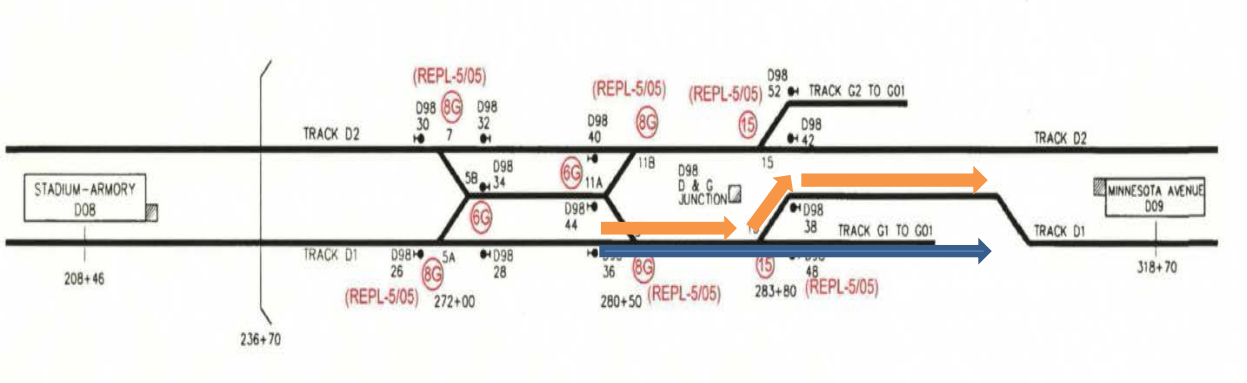
D&G Junction (D98), Track 1, D98-36 Signal

Field Sketch/Schematics

Key: The arrows are showing the direction of traffic on Track 1.

The Blue Arrow is showing the incorrect route the train took during the incidents.

The Orange Arrow is showing the correct route the train should've taken.



Investigation

Background:

Track Productions group from Track and Structures (TRST) was scheduled to perform a track work assignment at the D&G Junction (D98) location as part of a D Line Shutdown. The scheduled work involved improvements to replace grout pads, rail fasteners, third rail insulators, and cover boards. The work commenced at 01:00 hrs. Sunday, March 17, 2019 and concluded at 01:01 hrs., Saturday, March 23, 2019 between Chain Markers (CM) D1-272+50 to D1-280+00 Track 1. During Track 1 shutdown, ROCC utilized pocket track (Track 3) to reroute trains around the work area on Track 1 in the outbound direction of D13 and G05. Switch Machine 13 (D98-13 switch) and D98-15 Switch were the pivot switches used to control the converging and diverging routes.

Roadway Personnel moved the work area from Track 1 to Track 2, which commenced at 01:01 hrs. Sunday, March 24, 2019 and concluded at 01:01 hrs. Saturday, March 30, 2019 at CM D2-280+00 to D2-272+50, Track 2. During Track 2 shutdown, ROCC utilized pocket track (Track 3) to reroute trains around the work area on Track 2 in the inbound direction of Vienna (K08) from G01 and D09. D98-13 Switch and D98-15 Switch were also the pivot switches used to control the converging and diverging routes.

Incident Number One:

The SCADA Event Log indicated that D98-36 Signal was fleeted by ROCC Controllers for the direction towards Largo at 07:24:55 hrs. (Attachment 1) on March 25, 2019, resulting in setting the wrong route for Train ID 910 towards Largo Town Center. The T/O failed to observe the Flashing Lunar Aspect (should be a Solid Lunar Aspect towards New Carrollton). Once the T/O realized that he accepted an incorrect lead at 07:28:44 hrs. He then notified ROCC and was instructed to offload at Benning Road. There was no radio communication between ROCC and the T/O as governed by MSRPH 1.78 before the incorrect route was set.

Note: If D98-36 Signal fleeted, this condition inhibits automatic operating mode to D98-36 Signal. A signal in automatic operating mode controls the corresponding switch alignment to set a correct route by identifying the train's destination via ATC Train to

Wayside (TWC) system. If the automatic signaling system fails, ROCC Controllers must manually set the correct route.

Incident Number Two:

The Maintenance Operations Center (MOC) reported multiple ATC-related problems such as bobbing track circuits and switches going out of correspondence at D98 interlocking. An ATC crew was dispatched from Largo (G05) to D98 to assist with interlocking troubleshooting efforts. One ATC Technician was assigned by the Roadway-Worker-In-Charge (RWIC) to contact ROCC and take local control of the interlocking by utilizing the LCP in order to establish an ETO form of Roadway Worker Protection (RWP). The ROCC Controllers could see if an interlocking was in Central or Local Control by the visual indication on AIM.

There are visual indications on the LCP at the corresponding TCR to show direction of traffic and switch positions. Once the ATC Technician took local control of the interlocking, he used the ROCC Live Train Maps (PIDS) as a reference, instead of monitoring the Train's ID/Destination LED indication on the LCP. The ATC Technician stated that he observed a Blue Line train on approach to D98-36 Signal and monitored the PIDS to establish a route for a Largo destination. This action resulted in a wrong route established for Orange Line Train ID 908. During the interview with SAFE, the ATC Technician advised that he had been using the PIDS Live Train Maps for the past few years and never had any problem. However, before the incident happened, Train ID 908 did not appear on the Live Train Maps screen, only Silver Line and Blue Line Train IDs 605 and 405 respectively. **Note:** The duties of the Local Control Panel Operator primary are RWP and follow the instruction of the Roadway Worker in Charge (RWIC). Trains that are identified will show a destination indication at the LCP. MSRPH rules and Standard Operation Procedures (SOP) both provides guidance to Local Operators to communicate with ROCC when routing trains.

Incident Number Three:

Per AIM playback, at 16:20 hrs. on March 28, 2019, Train ID 917 accepted a lunar aspect at D98-36 Signal traveled past D98-36 Signal and stopped before fouling D98-13 Switch, after the T/O realized the switch was incorrectly aligned for the Orange Line move. The AIMS playback indicated the train was on top of D98-9 Switch and the back end of the train did not clear D98-36 Signal. D98-9 Switch was clamped in a Normal Position due to scheduled track work. ROCC canceled Lunar at D98-26 Signal to hold trains trailing behind Train ID 917 and instructed the T/O to reverse operating ends (change from the lead car position to the trailing car position) to bring the entire train consist back behind D98-36 Signal in manual operation mode. Once this action occurred, ROCC was able to set the correct route and Train ID 917 continued service to New Carrolton.

Weather

At the time of the incidents, the temperature was 64°F on March 25th and 57°F and clear on March 28th, 2019. SAFE has concluded that weather was not a contributing factor in these incidents (Weather source: National Oceanic Atmospheric Administration (NOAA) - Location: Washington, DC.)

Findings

Incident Number One:

- D98-36 Signal was fleeted by ROCC Controller for the direction towards Largo and should have been in Automatic Operation and not fleeted
- There was no radio communication between ROCC and the T/O before the incorrect route was set. Note: This was not due to poor radio communication. Communication did not report any communication anomalies that contributed to event
- The T/O did not notice the incorrect flashing lunar aspect and failed to verify proper switch alignment
- The T/O only notified ROCC after he took the incorrect route and was instructed to offload at Benning Road station.

Incident Number Two:

- There were multiple ATC-related problems at D98 interlocking and ATC personnel were dispatched from Largo to help with the troubleshooting efforts
- An ATC technician was assigned by the RWIC to take the LCP to establish an ETO RWP to protect the crew working on the roadway
- The ATC technician monitored the Live Train Maps tool and ended up set the incorrect route for Orange Line train ID 908 towards Largo
- The ATC technician stated that the train ID 908 did not appear on the Live Train Maps screen, only the Silver Line and Blue Line Train IDs 605 and 405 respectively.

Incident Number Three:

- The incorrect route was set by ROCC Controller.
- The T/O did not notice the incorrect flashing lunar aspect and failed to verify proper switch alignment
- ROCC instructed train ID 917 to reverse operating ends to bring the train back behind D98-36 Signal
- Once this action occurred, ROCC was able to set the correct route to New Carrolton.

Conclusion

Considering all the salient facts, SAFE concludes that the common contributing factor for all three incorrect route incidents was human error. These events could have been avoided if:

1. OCC Controllers established better communication with the T/O's per MSRPH rules
2. ATCM personnel follow MSRPH rules and Standard Operation Procedure (SOP)

Immediate Mitigation to Prevent Re-Occurrence

Incident Number One:

- On March 29, 2019, ROCC issued a "Lessons Learned" that required ROCC Controllers acknowledgement and confirmation of receipt. See attachment 2.

Incident Number Two:

- On April 1, 2019, ATCM Office of Safety & Compliance issued a "Lessons Learned" and distributed to all ATC personnel. See attachment 3.

Incident Number Three:

- On March 29, 2019, ROCC issued a "Lessons Learned" that required ROCC Controllers acknowledgement and confirmation of receipt. See attachment 2.

Attachments

Date and Time	Location	Events	Direction	Functional Partition	Priority
Mon Mar 25 07:30:04 EDT 2019	D & G Junction	D98-36 Signal Request Route COMMANDED Cancel Route BY 008698 AT ctwksob-wkstpp	OB	LAMR	1-EVENT
Mon Mar 25 07:29:37 EDT 2019	D & G Junction	TRAIN PM46 OVERRAN SIGNAL D98-40 WHICH WAS RED SINCE 06:02:10 BY	OB	LAMR	9-SMAJOR
Mon Mar 25 07:28:09 EDT 2019	D & G Junction	TRAIN 618 ON TRACK D98-D1-281 WAS DELETED BY 008698 AT ctwksob-wkstpp	OB	LAFTPOCMSR	1-EVENT
Mon Mar 25 07:27:53 EDT 2019	D & G Junction	TRAIN 618 TURNBACK ON TRACK D98-D1-28001 00	OB	LAMR	1-EVENT
Mon Mar 25 07:27:13 EDT 2019	D & G Junction	D98-44 Signal Request Route COMMANDED Request Route BY SYSTEM AT ctsc-hostapva	OB	LAMR	1-EVENT
Mon Mar 25 07:27:12 EDT 2019	D & G Junction	D98-42 Signal Request Route COMMANDED Request Route BY SYSTEM AT ctsc-hostapva	OB	LAMR	1-EVENT
Mon Mar 25 07:27:12 EDT 2019	D & G Junction	D & G Junction ROUTE D98-42-44 IN PROGRESS	OB	LAMR	1-EVENT
Mon Mar 25 07:27:11 EDT 2019	D & G Junction	D & G Juncti ROUTE FROM D98-42 TO D98-44 REQUESTED BY 008698 AT ctwksob-wkstpp	OB	LAMR	1-EVENT
Mon Mar 25 07:25:46 EDT 2019	D & G Junction	TRAIN 417 TURNBACK ON TRACK D98-G1-28005 00	OB	LAMR	1-EVENT
Mon Mar 25 07:25:39 EDT 2019	D & G Junction	TRAIN 417 TURNBACK ON TRACK D98-D1-28001 00	OB	LAMR	1-EVENT
Mon Mar 25 07:24:59 EDT 2019	D & G Junction	D98-52 Signal Fleeting COMMANDED CHANGE = Not Fleeted	OB	LAMR	1-EVENT
Mon Mar 25 07:24:58 EDT 2019	D & G Junction	D98-52 Signal Request Route COMMANDED Request Route BY 008698 AT ctwksob-wkstpp	OB	LAMR	1-EVENT
Mon Mar 25 07:24:58 EDT 2019	D & G Junction	D98-52 Signal Request Fleet COMMANDED Cancel Fleet BY 008698 AT ctwksob-wkstpp	OB	LAMR	1-EVENT
Mon Mar 25 07:24:55 EDT 2019	D & G Junction	D98-36 Signal Fleeting COMMANDED CHANGE = Fleeted	OB	LAMR	1-EVENT
Mon Mar 25 07:24:54 EDT 2019	D & G Junction	D98-36 Signal Request Route COMMANDED Request Route BY SYSTEM AT ctsc-hostapva	OB	LAMR	1-EVENT
Mon Mar 25 07:24:54 EDT 2019	D & G Junction	D98-36 Signal Request Fleet COMMANDED Fleet BY SYSTEM AT ctsc-hostapva	OB	LAMR	1-EVENT
Mon Mar 25 07:24:42 EDT 2019	D & G Junction	D98-48 Signal Request Route COMMANDED Request Route BY SYSTEM AT ctsc-hostapva	OB	LAMR	1-EVENT
Mon Mar 25 07:24:41 EDT 2019	D & G Junction	D98-36 Signal Request Route COMMANDED Request Route BY SYSTEM AT ctsc-hostapva	OB	LAMR	1-EVENT

Attachment 1 – SCADA AIM Data – Signal D98-36 was fleeted prior to the incorrect route incident.

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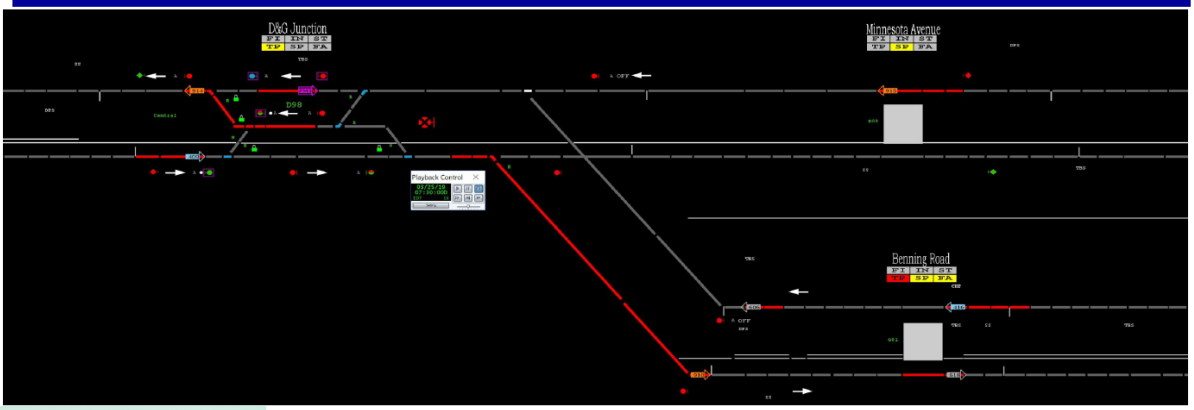
Lessons Learned



Pay Attention!!! Stay focused at the task.

Conform the Train ID before you set routing. Do not assume. Get confirmation via radio.

Use Alpha-Numerics, signal numbers and chain markers to confirm the location of the train that needs to be routed.

Do not rush.

Refer to MSRPH 1.4.1, 1.4.4.1, 1.4.7.1 and 1.4.12

Incorrect Leads

On Monday, March 25, 2019 at 07:30, D98-36 signal was fleeted to allow a blue and silver line train to be routed to the G line. The Ops #2 Train Controller failed to remove the fleet at D98-36 signal and Train #910 accepted the incorrect lead to the G Line; in the direction of Largo.

On Thursday, March 28, 2019 on OPS #2, The Train Controller established an incorrect route. This lead to an Orange Line train being misrouted to the G line; in the direction of Largo.

While there was not any damage to equipment or injury to personnel, setting incorrect routes is a concern to the ROCC Management team. Setting incorrect leads causes major delays and an inconvenience to our customers.

Here are some tips to avoid setting incorrect leads:

- **Radio Controller-** Positively verify the train's ID and destination by ascertaining the needed information and providing a 100% repeat back.
- **Train Controller-** Once the Radio Controller has positively identified the train's ID and destination, the Train Controller must establish the correct routing.
- **Stay focused–** Limit conversations with coworkers. Monitor the AIM System, Limit phone use to business calls only.
- **Cancel Fleets-** Fleeted signals must be cancelled before the last train is routed in that direction.

Attachment 2 – ROCC Lessons Learned

Drafted By: SAFE 703 – 04/17/2019
Reviewed By: SAFE 704 – 04/20/2019
Approved By: SAFE 70 – 05/13/2019

ATCM Office of Safety, Compliance, and OJT

Lessons Learned

Date 04/01/2019

D98 - Wrong Route - Signal 36

INCIDENT SUMMARY

On Monday, March 25, 2019 at approximately 11:54 Train #908 accepted the wrong route at D98 Signal #36. Train #908 was an Orange Line train with a destination of New Carrollton. ATCM work crew had local control of the Interlocking utilizing ETO protection. The ATCM mechanic operating the LCP incorrectly routed the Orange Line train to Largo (Blue Line). The mechanic was utilizing the PIDS/ROCS map tool to align routes. While utilizing the PIDS/ROCS tool the mechanic aligned a route at Signal #36 for the next train (Blue Line) as indicated on the PIDS/ROCC map. However, there was an Orange Line Train (#908) stopped at Signal #36 which was not displayed on the PIDS/ROCS map.

LESSONS LEARNED

What happened…	*What should have happened…*
While utilizing ETO (Local Control) of interlocking ATC incorrectly routed train. Train Operator received and accepted incorrect route.	ATCM personnel should have been monitoring the "Next Train" destination register instead of the PIDS/ROCS Map. Train Operator should have acknowledged incorrect lunar and contacted ROCC.

RECOMMENDATIONS

- ✓ ATC personnel shall clear Signals only after positive communication verifying that all crew members have cleared to the safety walk or other known clearance area is received by the person controlling the signals. ROCC shall coordinate train movement through the affected area. Ensure ATCM personnel understand the PIDS/ROCS and ROCS Live Map are for informational/reference purposes only and should be used when aligning routes.
- ✓ Animated ROCC maps, PID information are never to be used to route trains. The information can be used as a reference tool only.

Investigation Results:

- ATCM personnel incorrectly aligned routed a train based on information from a PIDS/ROCS-RDD map.

Attachment 3 – ATCM Lessons Learned

Drafted By: SAFE 703 – 04/17/2019
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