National Transportation Safety Board
Office of Highway Safety
Washington, DC 20594

HWY23FH014

SURVIVAL FACTORS

Group Chair's Factual Report

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A. CRASH

Location: City of Philadelphia, Philadelphia County, Pennsylvania
Date: June 11, 2023
Time: 6:17 a.m. EDT

B. SURVIVAL FACTORS GROUP

Group Chair — Ronald Kaminski
National Transportation Safety Board
Washington, D. C.

Group Member — Dennis J. Merrigan MS, Deputy Chief
City of Philadelphia Fire Department
Philadelphia, PA

C. CRASH SUMMARY

For a summary of the crash, refer to the *Crash Summary Report of the Investigation*, in the docket for this investigation.

D. DETAILS OF THE INVESTIGATION

The Survival Factors Group investigation focused on the exterior and interior damage sustained to the 2017 International in combination with a 2004 Heil cargo tank trailer, hereafter referred to as International, the driver's sustained injuries, and the quality and timeliness of the emergency response. The vehicle description refers to the left-side (driver-side) and right-side (passenger-side).

E. FACTUAL INFORMATION

1.0 Scene

An inspection of the scene was conducted on June 12, 2023. The approximate latitude and longitude of the crash scene location was: 40.024233° N, 75.0308° W. This crash occurred on State Road 8023 (SR8023), the offramp from Interstate 95 (I-95) northbound to Cottman Avenue (Exit 30), Philadelphia City/County, Pennsylvania. At the location of this crash, exit 30 consisted of two marked lanes with a usable right shoulder. The two travel lanes were on a decline that led to a sharp left curve under I-95. TL4 Concrete traffic barriers were located on each shoulder and were approximately 3 feet in height. At the top right of the off ramp a yellow truck rollover warning advisory traffic sign with a suggested speed of 25 mph was visible with no

interference. At the time of this crash, it was daylight with no adverse road conditions. The Pennsylvania State Police (PSP) indicated that they measured tire marks prior to the truck with the trailing tanker overturned. The post-crash fire of the truck's tank trailer resulted in the collapse of the Interstate 95 Northbound overpass. Refer to **Figure 1** below for the initial view of the scene upon arrival the following day.

Figure 1. Post-crash view of scene. International truck underneath collapsed I-95 overpass. (Source: PSP)

2.0 Vehicle

The vehicle was initially examined at a PennDOT facility, in Philadelphia, on June 12, 2023. On June 14, 2023, an additional inspection occurred at PSP's tow yard.

2.1 2017 International Truck with 2004 Heil Tanker Exterior Damage

The post-crash fire and the collapsing of the overpass on top of the truck resulted in catastrophic damage to the truck-tractor as shown in **Figures 2-3** below.

Figure 2. Frontal view of damage to truck.

Figure 3. Right rear angle view of damage to truck cab.

The truck-tractor exhibited oxidation of metal surfaces on the exterior, including the frame, cab, and engine. All combustible surfaces on the exterior of the cab were consumed, including plastic components, tires and other rubber components associated with the engine.

2.2 2017 International Damage

The truck cab interior likely sustained damage from the 90-degree rollover, however the damage was masked by the collapse of the overpass on top of the left side of the burning truck cab while it rested on its' right side. The collapsing overpass resulted in catastrophic intrusion into the cab resulting in minimal occupant survival space. The post-crash fire burned almost the entire cab interior leaving primarily the metal components such as the seat frames, dash, and steering wheel. Some combustible materials that survived the fire were found inside the cab. Firefighters found a duffle bag partially adhered to the floor. The duffle bag was opened and found to include personal items and paperwork associated with the pickups and deliveries for the day.

Examination of the cab's interior revealed catastrophic intrusion to both sides of the International. Intrusion was visibly more pronounced to the right side of the cab but there was significant intrusion into the driver's seating area as well. The extent of interior cab deformation and intrusion are shown in **Figure 4**. Post-crash, the Philadelphia Fire Department (PFD) firefighters used a hydraulic ram to expand the roof. PFD firefighters placed the hydraulic ram between the right side of the roof and driver side B-pillar in order to remove the driver. The steering wheel remained undeformed as shown in **Figure 5**. Examination to the burned truck cab interior showed that it was equipped with a lap and shoulder restraint in the driver and front right passenger seat positions. The interior examination also found the driver's latchplate still inserted into the driver's seat belt buckle as shown in **Figure 6**.

Figure 4. Interior view of cab deformation and intrusion.

Figure 5. View of undeformed steering wheel.

Figure 6. View of truck driver's seat belt latchplate still buckled (circled in green)**.**

2.3 2004 Heil Tank Trailer

NTSB investigators observed the remains of the cargo tank at the crash scene after removal of the bridge debris. The top of the cargo tank was observed to be top down on the road surface with approximately 1 to 2 feet of aluminum visible and the two axles near the rear of the debris.

2.4 Injuries to Truck Driver

The 53-year-old male truck driver was fatally injured in the rollover and post-crash fire. On Tuesday, June 13, 2023, at the Philadelphia Medical Examiner's Office the Philadelphia Medical Examiner conducted the autopsy in the presence of an NTSB investigator, and a representative from the PSP and PFD. The autopsy report was obtained and stated that the cranium was absent with exposure of dura and brain with scant hemorrhage to occipital lobe, heat contractures and fractures of the upper and lower extremities. There was a loss of tissue and structure of the upper and lower extremities including hands, right knee, leg, and foot, left leg and foot. Internal examination reveals soot on the tongue, pharynx, and esophagus. The carboxyhemoglobin saturation was 10% in the blood. The Medical Examiner listed the cause of death as blunt force trauma of head with inhalation and thermal injuries.

3.0 Emergency Response

The Philadelphia Police Department (PPD) dispatchers were notified of the crash through the 911 system at 6:17:12 a.m. A witness called saying she was on I-95 at the Cottman exit and the PPD dispatcher immediately interrupted the caller talking over her telling the caller that they are being transferred to the PSP dispatch.[1] Once on the phone with the PSP operator, the caller again stated that she was on I-95 at the Cottman exit and saw a huge truck flipped over onto its side and catch on fire.[2, 3] A second 911 call was received twenty-five seconds later at 6:17:37 a.m. by another witness that reported seeing a truck crash and "blow up" at the same location. The PPD dispatcher transferred the 911 caller to the PFD dispatcher since the caller mentioned a fire/explosion. These calls were followed by dozens of 911 callers reporting seeing smoke or fire at the same location but when asked by the dispatcher, none of the callers could name the source of the smoke/fire.[4]

According to the radio communications records obtained from the PSP, at 6:18:03 a.m. a PSP operator contacted the Pennsylvania Department of Transportation (PennDOT) and asked them if they were aware of the crash and fire on I-95 at the Cottman Avenue exit.[5] The PennDOT employee immediately looked at the camera feeds on his computer monitor and acknowledged the large fire and billowing smoke.

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[1] The PSP are responsible for crashes that occur on Interstate 95 in Pennsylvania.
[2] Refer to Survival Factors Attachment: Witness Interview Transcript in public docket of this NTSB crash investigation (case number HWY23FH014).
[3] Refer to Survival Factors Attachment: Philadelphia Police CAD Log in public docket.
[4] Upon answering the 911 call the dispatch operator asks, what is your emergency? If the 911 caller first mentions I-95, the dispatch operator immediately transfers the caller to the PSP operator. If the 911 caller first mentions anything fire related, the dispatch operator immediately transfers the caller to the PFD operator.
[5] Refer to the Survival Factors Attachment: Pennsylvania State Police CAD Reports in public docket.

The first two PSP Units were dispatched at 6:18 a.m., followed by over a dozen other PSP units.[6] At 6:26 a.m., while enroute PSP Unit K131 was assigned to close the entrance ramps to I-95 near exit 30 - Cottman Ave. At 6:31 a.m. PSP Units K128 and K131 arrived on-scene and positioned their vehicles to close northbound I-95 at the Cottman overpass. At 6:32 a.m. PSP Unit K127 arrived and proceeded to help close northbound I-95. At 6:39 a.m. while on foot, PSP Unit K131 closed the southbound travel lanes of I-95. There were no other vehicles involved in the post-crash fire or the collapsing of northbound I-95. Additionally, no other vehicles were involved in the severe buckling of southbound I-95.

The PFD was dispatched at 6:20 a.m. and their first Engine Unit 38 arrived on-scene at 6:25 a.m.[7] The Incident Commander (IC) stated that upon his arrival, he observed that the entire underpass area on the east side was engulfed in flames, and it was not immediately apparent what was burning. The IC estimated it was about 20 to 25 minutes into the firefighting operation before he observed the rear axle of the trailer protruding from the flames, and it became clear that a tanker truck was involved in the incident. As the IC approached the fire, he requested that "the box get filled out," which involves a full first alarm assignment that includes four Engine Units, two Ladder Units, two Battalion Chiefs and a medic unit. The IC eventually requested a 1st Alarm Call-out; which added two Engine Units, one Ladder Unit, one more Battalion Chief, and the Deputy Chief responded to the scene. The PFD set-up their staging area on the northeast corner of Cottman Ave. and State Rd. **Table 1** below, shows the event timeline of this event.

Table 1. Event Timeline

Dispatch Time	Responding Agency/ Notes from Philadelphia Office of Emergency Management, PSP, PFD, and PPD	Arrival Time On-scene
6:17:12 a.m.	911 caller reports being on I-95 at the Cottman exit and seeing a truck "flip over." The PPD operator immediately transferred the caller to the PSP. The PSP operator asked what's your emergency and the caller responded that she is on 95 just past the Cottman exit and saw a huge truck catch on fire.	
6:17:37 a.m.	911 Caller reports she was driving on 95 and saw a truck crash and "blow up" near the Cottman Avenue exit. The caller was then transferred to the PFD operator. Caller told the PFD operator she saw the truck crash, blow up, and catch on fire. Caller described the truck "as being like an oil truck, an 18-wheeler."	
6:17:37 a.m.	911 Caller reports huge fire off NB I-95 at Cottman Avenue underneath the underpass. They didn't see any vehicle just the fire and was transferred to the PFD.	

[6] The dispatch time was not recorded in the PSP CAD logs due to the amount of 911 calls dispatch operators were initially handling. The time was determined by NTSB investigators using the arriving PSP Trooper's dashcams which displayed their travel times, which was 13 minutes.
[7] Refer to Survival Factors Attachment: Philadelphia Fire Department Fire Alarm Report and CAD Log in public docket.

6:17: 58 a.m.	911 Caller reports huge fire off NB I-95 and is transferred to PSP.	
6:18:03 a.m.	PSP calls Pennsylvania Department of Transportation (PennDOT) informing them of crash and fire on I-95. PennDOT operator looks at I-95 cameras on his monitor and is heard responding, "Holy Crap! Here we go."	
6:18 a.m.	PSP dispatches their first Unit K128. Unit K128 arrives on-scene at 6:31:13 a.m. and proceeds to block NB I-95 traffic.	6:31:13 a.m.
6:18 a.m.	PSP Unit K131 is dispatched. After arriving on-scene at 6:31:28 a.m. started shutting down I-95 off-ramp at Cottman and State.	6:31:28 a.m.
6:19 a.m.	PSP Unit K139 is dispatched. Unit K139 arrives on-scene at 6:34:52 a.m. and proceeds to block NB I-95 traffic.	6:34:52 a.m.
6:19:50 a.m.	911 caller tells PSP dispatcher that flames are coming up on both sides of I-95 and through middle. Road seems to have dropped down a little.	
6:20 a.m.	PFD dispatched and sending Battalion Chief (BC), Ladder truck, Engine Unit, ambulance, and Rescue truck. Arrives on scene at 6:25 a.m.	6:25 a.m.
6:20:01 a.m.	911 caller states he heard explosion from fire location	
6:20:19 a.m.	911 caller states fire on both sides of I-95 at Cottman avenue exit.	
6:21:14 a.m.	PPD calls PSP asking if they are aware of crash and fire at NB I-95 at Cottman exit. PSP responds that everyone is enroute.	
6:21:17 a.m.	PSP calls PFD wanting to confirm that they are aware of fire at I-95 and the Cottman exit.	
6:21:58 a.m.	PFD calls PSP requesting that they close down NB and SB entrances and exit ramps at I-95 and Cottman Ave.	
6:22:12 a.m.	PPD dispatches Unit 1521 to State and Cottman. Unit 1521 arrives on scene at 6:24:22 a.m.	6:24:22 a.m.
6:24 a.m.	PPD sending multiple units to shut down streets surrounding Cottman and State.	
6:24 a.m.	PSP confirms units have been dispatched to close I-95 exit and entrances ramps near Cottman Ave. Highway about to collapse.	
6:25 a.m.	PFD on scene at Cottman off ramp N/B	
6:25 a.m.	PSP asking assistance from PPD to close down entrance ramps to I-95.	
6:25 a.m.	911 caller advising that I-95 is buckling.	
6:26 a.m.	Philadelphia Fire Department 1st Alarm Call-out; for a total of 6 Engine Units, 3 Ladder Units, 2 more Battalion Chiefs.	
6:26 a.m.	PSP Unit K127 dispatched to help close down I-95 NB.	6:32 a.m.
6:26 a.m.	PSP Unit K131 was assigned to close the entrance ramps to I-95 near exit 30 - Cottman Ave.	
6:26 a.m.	911 caller reports that SB I-95 is buckling.	
6:27 a.m.	PFD requesting PPD's assistance in closing down I-95.	
6:27 a.m.	More 911 callers advising that I-95 overpass is buckling	
6:27 a.m.	PPD on-scene asking for other units to close down SB State Rd to protect fire hoses that are crossing street.	
6:27:34 a.m.	PFD setting up staging at NE corner of Cottman Ave and State Rd.	
6:28 a.m.	PPD asking for 2 units to block off I-95 SB.	
6:30 a.m.	PFD requesting PSP shut down I-95 both ways.	
6:30 a.m.	PFD requesting PPD to close State Rd near Cottman due to vehicles driving over their 5-inch hoses being used to extinguish fire.	

6:31 a.m.	PSP arrives at crash location and starts shutting down northbound I-95 travel lanes prior to Cottman overpass.	
6:31 a.m.	I-95 NB starting to collapse. PFD retreating.	
6:31 a.m.	PPD reporting that SB I-95 is collapsing.	
6:32 a.m.	PPD shutting down on-ramps to I-95.	
6:33 a.m.	PPD transfers 911 caller to PSP and operator acknowledges that I-95 is collapsing, and PSP Units are responding to close it.	
6:35 a.m.	PSP Trooper from Unit K131 on foot shutting down SB highway.	
6:35 a.m.	PPD requested to assist in closing on-ramps to I-95 NB.	
6:35 a.m.	PPD Reports of manhole covers blowing off on State Rd. Advising all responding cars to stay away from manhole covers.	
6:36 a.m.	PPD has shut down Academy entrance ramp to I-95.	
6:38 a.m.	PPD setting up staging area at NE corner of Cottman and State Rd.	
6:38 a.m.	911 caller wanting to know what to do since traffic on I-95 is stopped.	
6:39 a.m.	PSP Unit K129 on scene at I-95 NB.	
6:39 a.m.	PSP Trooper from Unit K131 shuts down southbound I-95 travel lanes.	
6:40 a.m.	PPD sends out message warning responding units not to park on or near manhole covers.	
6:40 a.m.	Philadelphia Office of Emergency Management (PEMA) - Regional Integration Center (RIC) sent out an email at 6:40 a.m. to all OEM users, informing them of the oil tanker fire at the end of the northbound I-95 off ramp on Cottman Ave. under the overpass.	
6:41 a.m.	PSP contacts Officer of the Day Lt. Sunderlin who assumes Incident Command (IC) for PSP.	
6:41 a.m.	PSP shutting down NB I-95 at Aramingo.	
6:42 a.m.	Arriving PFD Units put on standby and told to go to Staging area.	
6:43 a.m.	PSP Unit K116 Shutting down Aramingo and NB I-95.	
6:45 a.m.	PennDOT enacts their Emergency Operations Plan (EOP)	
6:45 a.m.	PPD reports NB I-95 overpass has completely collapsed.	
6:49 a.m.	Delaware River Port Authority (DRPA) notified to shut down Betsy Ross Bridge to I-95.	
6:50 a.m.	PPD warns all units that manhole covers are blowing off on State Rd.	
6:50 a.m.	PPD blocking Bridge Street entrance to NB I-95.	
6:53 a.m.	PennDOT - PEMA Ops. informs the STMC that PSP per Philadelphia OEM, I-95 has holes and road is partially collapsed due to fire damage, no information on the source of the fire.	
6:53 a.m.	I-95 shut down at Academy.	
6:54 a.m.	PSP blocking Aramingo entrance to I-95 NB.	
6:54 a.m.	HAZMAT group requested for the fuel spill.	
7:01 a.m.	OEM-RIC email reports fire in the sewer system.	
7:02 a.m.	PennDOT - Called Area Command to provide details - a Tanker fire under I-95 has damaged the roadway/bridge, PSP per Philadelphia OEM reporting holes and a partial collapse of the roadway, NB trapped queue is being turned around, working on getting information regarding SB trapped queue.	
7:05 a.m.	PennDOT - Called South-Eastern RTMC to gather additional information on the incident - tanker truck fire on PA 73 (Cottman Ave) between I-95	

	Exit 30 Off ramp and State St., NB has completely collapsed, and SB is "barely hanging on", NB trapped queue is being turned around, no information on SB (CCTV is out in that area).	
7:11 a.m.	USCG was notified of the runoff into the river.	
7:11 a.m.	Battalion 12 reports that the bulk of the original fire is knocked down.	
7:13 a.m.	PennDOT post Dynamic Message Sign (DMS) D095S_21 -06-076 95 CLOSED AT EXIT 29 ALL TRAFFIC MUST EXIT	
7:16 a.m.	PennDOT post DMS D095S_21 DO95N-06-076, 95 CLOSED AT EXIT 31 ALL TRAFFIC MUST EXIT	
7:27 a.m.	PFD Battalion 12 has fire under control.	
7:27 a.m.	OEM RIC is reaching out to PEMA and PennDOT for coordination of the impact to major infrastructure.	
7:27 a.m.	PFD reports there is electric utilities running under the manholes that are causing explosions.	
7:45 a.m.	PennDOT is sending representatives to PEMA Coordination Center to collaborate on this incident.	
7:49 a.m.	Traffic completely cleared from I-95 NB.	
7:49 a.m.	PEMA notified regarding fuel spill.	
7:52 a.m.	PennDOT communicated to OEM RIC they are still working on a detour plan for I-95 and will call back when the plan is complete.	
7:59 a.m.	Unified Command Post set up at Cottman Ave and State Rd.	
8:04 a.m.	PennDOT Supervisor on scene.	
8:08 a.m.	PPD Traffic reported they have 7 officers and 2 supervisors in the area assisting with local traffic control.	
8:11 a.m.	PennDOT post DMS DO95N -06-193, ROAD CLOSED AT ARAMINGO AVE / #26 USE ALTERNATE ROUTE	
8:11 a.m.	PennDOT post DMS D095N_07 DMS-06-073, ROAD CLOSED AT ARAMINGO AVE/#26 USE ALTERNATE ROUTE	
8:12 a.m.	PennDOT post DMS D095N_12 DMS-06-006, ROAD CLOSED AT ARAMINGO AVE / #26 USE ALTERNATE ROUTE	
8:14 a.m.	PennDOT trucks on scene.	
8:19 a.m.	PennDOT short Term Traffic Detour Plan for I-95 is as follows: I-95 Southbound will exit at Academy Rd. I-95 Northbound will exit at Aramingo/Bridge.	
8:19 a.m.	PennDOT post DMS DO95N -06-193, ROAD CLOSED AT ACADEMY RD / #32 USE ALTERNATE ROUTE	
9:56 a.m.	PennDOT has incident command center set up in King of Prussia.	
10:00 a.m.	OEM-RIC has coordinated with PennDOT, PEMA, PSP, NJ OEM, USCG to assess impacts to infrastructure and coordinate resources.	
10:00 a.m.	Agencies Present on Command Post at Scene: PWD, L&I, PSP, PPD, PFD FMO, PFD, MDO, PECO, ATF, PGW, PennDOT, and Philadelphia OEM.	
10:44 a.m.	Penn Tank Lines Risk Management Department calls PSP advising the involved truck may be one of theirs.	

According to the IC and the Bureau of Alcohol Tobacco and Firearms Philadelphia Arson & Explosives Task force, the ruptured tanker ignited and spread

gasoline throughout the underpass. The burning gasoline entered storm drains near and along the underpass, running southeast toward the outlet at the Delaware River, approximately 800 feet away. There were no buildings exposed along the path of the storm drains towards the Delaware river. The burning gasoline in the stormwater system resulted in a series of recurring fuel/air explosions which ejected manhole covers along the path of the system and continued for several hours. The Philadelphia HAZ-MAT Task Force were dispatched at 6:54 a.m. and responded with their Engine and HAZ-MAT truck along with their air monitoring devices that were later used to detect hydrocarbons levels near some of the exploding manhole covers. They reported findings/changes to IC. The HAZ-MAT task force also located the area of fuel run-off into the Delaware river and coordinated with U.S. Coast Guard (USCG) and MU1 to setup booming operations. First responders were instructed not to park near the manholes for safety reasons.

At 6:30 a.m. the PPD was initially requested to close State Rd at the Cottman entrance to protect the fire hoses that ran across the street. The PPD and PennDOT assisted the PSP in closing down entrance ramps to north and southbound I-95 as well as traffic control.

Eighteen local, State and Federal service agencies responded to the crash scene. Numerous other local government agencies in the surrounding area were notified of the crash and fire but were not required to respond to the crash scene.

Table 2. Responding Agencies

Federal Agencies	State Agencies	City Agencies
Federal Bureau of Investigation (FBI)	Pennsylvania State Police (PSP)	Philadelphia Fire Department (PFD)
Alcohol, Tobacco, and Firearms (ATF)	Pennsylvania Emergency Management Agency (PEMA)	Philadelphia Police Department (PPD)
Department of Homeland Security (DHS)	Pennsylvania Department of Transportation (PennDOT)	Philadelphia Fire Marshal's Office (FMO)
U. S. Coast Guard (USCG)	Pennsylvania Department of Environment (PADEP)	City of Philadelphia Office of Emergency Management (OEM)
	Pennsylvania Electric and Natural Gas Company (PECO)	Philadelphia Water Department (PWD)
	Department of Environmental Protection (PA DEP)	Philadelphia Gas Works (PGW)
		Philadelphia Managing Directors Office (MDO)
		Department of Licenses and Inspections (L&I)

Copies of the responding fire departments Brief Field Incident Reports have been obtained, and information is included in this report.[8]

[8] Refer to Survival Factors Attachment: Philadelphia Fire Department Fire Alarm Report and CAD Log in public docket.

3.1 Philadelphia Office of Emergency Management

The Philadelphia Office of Emergency Management (OEM) coordinated all facets of this incident on the local level. OEM worked with organizations and partners throughout the city.

The morning of the crash, the Philadelphia OEM-Regional Integration Center (RIC) sent out an email at 6:40 a.m. to all OEM users, informing them of the oil tanker fire at the end of the northbound I-95 off ramp on Cottman Ave. under the overpass. The email described how State Rd, Cottman Ave, and I-95 in both directions were being closed off with heavy black smoke engulfing the highway. Per the PFD, *"chunks of concrete are starting to crumble off the overpass. Hazmat has also been requested. PPD and PSP responding. Water and waste management have also been requested."*

At 6:55 a.m. the Philadelphia OEM RIC sent out an updated email with the following updates as of 6:51a.m.:

- There has been a major collapse of the overpass on the northbound side.
- PennDOT has been notified.
- PSP and PPD on location for traffic control.
- There have been reports of explosions on the fire ground.
- OEM Team Leader and Assistant Team Leader have been notified.

The Philadelphia OEM RIC proceeded to send out emails with the updates to all the responding partners initially every 15-20 minutes until 8:26 a.m. The OEM then started issuing lengthy detailed Situation Reports (Sit-Reps) starting at 10:00 a.m. These informative updates continued every 3-5 hours with the fifth and final Sit-Rep coming at 12:00 p.m. June 12, 2023.

A Unified Command Post (UCP) was initially set up in a large tent on the east side of I-95 adjacent to the location of the staging area for the PFD. Eventually, a mobile command trailer was deployed to the location. By 10:00 a.m. Agencies present at the UCP included: PWD, L&I, PSP, PPD, PFD FMO, PFD, MDO, PECO, ATF, PGW, PennDOT, and Philadelphia OEM.

The Philadelphia's Emergency Operations Plan (EOP) establishes the policy and principles for the City of Philadelphia's emergency management program. This document describes how City government coordinates and functions to safeguard lives and property in the event of emergencies and disasters. The EOP details policies and procedures that are applicable to the management of all-hazard events including natural disasters, diseases, accidents, and terrorist or significant criminal incidents. The scope of the plan extends from pre-incident preparedness, prevention, and mitigation, to response and recovery activities. Their plan is pertinent to all associations acting for

or on behalf of the City of Philadelphia and is consistent with state and national emergency management statutes, plans, systems, and principles. The EOP serves as the base plan through which the City's portfolio of hazard-specific and functional plans are activated and implemented. The City of Philadelphia EOP establishes uniform, scalable, and consistent citywide policies, and procedures for the management of incidents in accordance with the National Incident Management System (NIMS) and the Commonwealth of Pennsylvania EOP.

According to the Hazard Mitigation Program Manager for the Philadelphia OEM, elements of several OEM and citywide response plans, frameworks, and guidebooks were utilized to manage this incident. The EOP have specific Standard Operating Procedures (SOPs) that their RIC followed to guide initial notifications to partners and alert warnings sent out to the public regarding the incident. The OEM's Field Response Guidebook outlined roles and responsibilities of OEM field responders supporting interagency coordination on-scene. The city's Hazardous Materials Plan was used both in the firefighting activities for the initially involved vehicle as well as managing the mitigation of runoff into the sewer system.

OEM did not conduct a formal After-Action Review (AAR). Through discussions between city emergency management, transportation, and public safety officials the OEM learned that the state's initial detour plan relying on state roads was inadequate and a local detour plan needed to be established. As a result, a plan was quickly developed between the city and the state that accounted for the state's detour and a local detour plan.

3.1.1 Pennsylvania Emergency Management Agency

Pennsylvania Emergency Management Agency's (PEMA)'s primary role is the coordination and direction of state agencies during times of disasters and other emergencies to support local needs. PEMA served as the primary coordinating agency between PSP, PennDOT, and Pennsylvania Turnpike Committee (PTC).

PEMA's three primary responsibilities include maintaining situational awareness across Pennsylvania through the Commonwealth Watch and Warning Center (CWWC), communicating a Common Operating Picture (COP), and coordinating any informational or resource needs of local governments or other state agencies during disasters or emergencies. The Commonwealth Response Coordination Center (CRCC) served as the primary coordination point for the state's response and was staffed by agency representatives from various state agencies, as needed to coordinate response activities. The Governor's Proclamation would have activated the CRCC response.

3.1.1.1 Governor's Proclamation

Due to the collapse of I-95, on June 12, 2023, the Governor of Pennsylvania proclaimed the existence of a general disaster emergency in Philadelphia County. Within the Proclamation it mentions that the adverse effects of the crash and fire are of such magnitude or severity as to render essential the Commonwealth's supplementation of county and municipal efforts and resources and the activation of all applicable state, county, and municipal emergency response plans.

The proclamation authorized and directed that the Pennsylvania Emergency Management Agency director, or designee, assume command and control of all statewide emergency operations and that all Commonwealth departments and agencies, under the direction of the Pennsylvania Emergency Management Agency director, or designee, utilize all available powers, resources and personnel as is deemed necessary to cope with the magnitude and severity of this emergency event pursuant to the provisions of the Emergency Management Services Code, Title 35, Part V of Pennsylvania's Consolidated Statutes. 35 Pa. C.S. § 7101, et seq.

3.2 Pennsylvania Department of Transportation (PennDOT)

PennDOT is primarily responsible for the maintenance of the 40,000 miles of state-owned roads and bridges throughout the Commonwealth. Through their Statewide Traffic Management Center (STMC) and Regional Traffic Management Centers (RTMC) they monitor traffic conditions 24/7 throughout the state, monitor the Roadway Condition Reporting System (RCRS), coordinate any support needed for long term closures with various entities, and provide coordinated messaging to motorists using Variable Message Signs (VMS), Highway advisory radio system, social media channels, 511 PA, and other applicable means. [9, 10]

PennDOT has an interagency agreement with the Pennsylvania Department of Health ("DOH") the PSP, the PEMA and the Pennsylvania Turnpike Commission (PTC).

At 6:18 a.m., a minute after the initial 911 call, the PSP called PennDOT informing them of crash and fire on I-95. PennDOT noted in their RCRS timeline, "PSP called about a truck on fire. Major fire on closed-circuit television (cctv) 9541. At 6:53 a.m. PennDOT noted in their RCRS timeline, PEMA Ops. informs the STMC that PSP per Philadelphia

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[9] https://gis-hub-pennshare.hub.arcgis.com/apps/PennShare::road-condition-reporting-system-rcrs/explore

[10] Traffic management centers (TMCs) oversee 24/7 operations of the freeway and major arterial systems through the use of ITS devices, freeway service patrols, communication with emergency responder agencies, and close coordination with districts and other agencies.

OEM, I-95 has holes and road is partially collapsed due to fire damage, no information on the source of the fire."

PennDOT was notified of the crash and fire at 6:19 a.m. and according to a Senior Manager for the PennDOT Traffic Operations Division, the City of Philadelphia's Emergency Operations Plan (EOP) was enacted at approximately 6:45 a.m.

According to PennDOT's Dynamic Messaging Sign (DMS) Guidelines, a DMS is a traffic control device capable of displaying various messages to inform motorists of unusual driving conditions. Section IA.02 of the MUTCD states that to be effective, a traffic control device should meet the following requirements:

- Fulfill a need
- Command attention
- Convey a clear, simple meaning
- Command respect of road users
- Give adequate time for a proper response

As shown in **Figure 7** below, four permanent DMS are within 10 miles of the I-95 bridge collapse location.

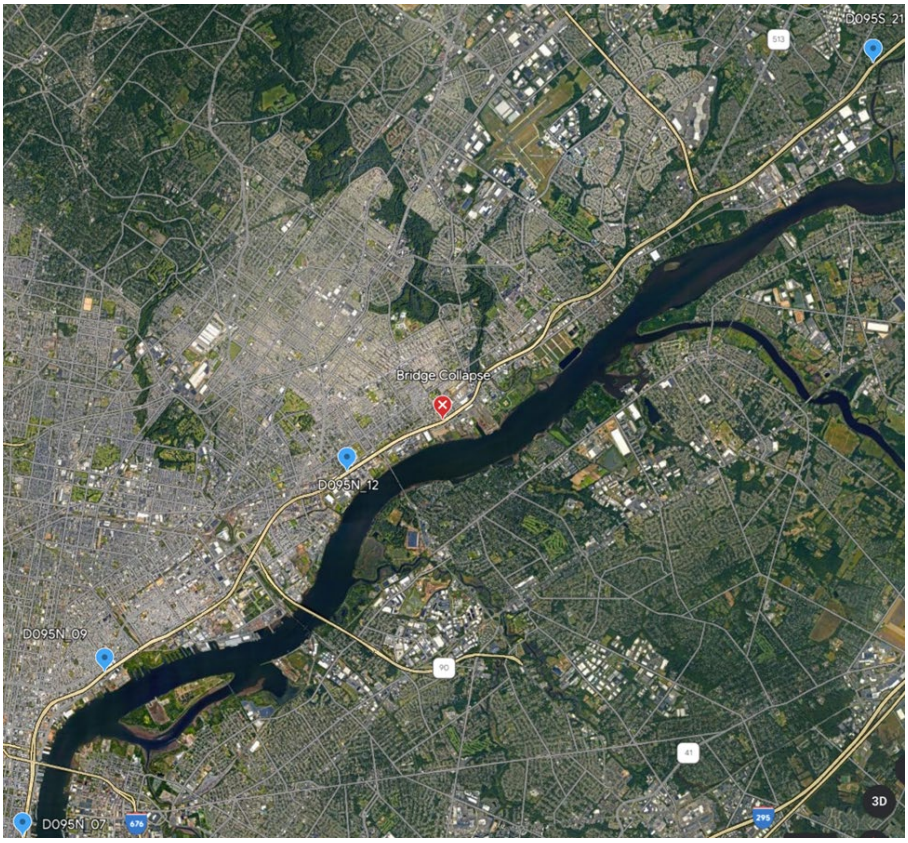

Figure 7. Overhead map view of DMS sign placement (blue dot) in relation to crash location (red dot).

According to PennDOT's DMS guidelines:
A full road closure demands the highest level of priority for messages. The message should alert motorists to the closure, warn them of potential queues and provide information on diversion routes if possible.

The guidelines recommend that DMS should not sidetrack motorists to specific alternate routes unless helpful directions are available along the alternate route in the form of guide signs and/or arrow boards that direct motorists back to law enforcement or traffic control personnel positioned at critical locations along the alternate route to control and guide traffic. The table below shows the timeline of the DMS display boards posted by PennDOT.

Table 3. Permanent Dynamic Messaging Sign Timeline

Time	DMS Sign #	Distance to Incident Location	Information Displayed
6:37 a.m.	**Event Created**		
7:13 a.m.	D095S_21 DMS-06-076	8.2 Miles	95 CLOSED AT EXIT 29 ALL TRAFFIC MUST EXIT
7:16 a.m.	D095S_21 DMS-06-076	8.2 Miles	95 CLOSED AT EXIT 31 ALL TRAFFIC MUST EXIT
8:19 a.m.	D095S_21 DMS-06-076	8.2 Miles	ROAD CLOSED AT ACADEMY RD / #32 USE ALTERNATE ROUTE
8:11 a.m.	D095N_09 DMS-06-193	6.2 Miles	ROAD CLOSED AT ARAMINGO AVE / #26 USE ALTERNATE ROUTE
8:11 a.m.	D095N_07 DMS-06-073	9.1 Miles	ROAD CLOSED AT ARAMINGO AVE/#26 USE ALTERNATE ROUTE
8:12 a.m.	D095N_12 DMS-06-006	3.4 Miles	ROAD CLOSED AT ARAMINGO AVE / #26 USE ALTERNATE ROUTE

The Federal Highway Administration produces a publication entitled the Manual on Uniform Traffic Control Devices (MUTCD) which lists every type of sign that can be installed on a highway or street in the United States. This manual is the basis for states to build upon to by adding their own signs.

Unlike at the federal level, there is no single book that contains all of this information for Pennsylvania, but it is instead spread out over the Handbook of Approved Signs (Publication 236), Pavement Markings and Signing Standards (Publication 111), Temporary Traffic Control Guidelines (Publication 213), Traffic Engineering Manual (Publication 46), and Traffic Signal Design Handbook (Publication 149).

PennDOT's Traffic Management Centers (TMCs) maintain situational awareness of planned and unplanned events impacting roadway operations and effectively identify and manage traffic events. PennDOT does not normally respond with

personnel or resources for incidents even on state roadways after normal working hours, unless there is a specific call for resources, or the traffic disruption is expected to last more than two hours. PennDOT manages the impact of unplanned incidents through the use of its TMCs along with coordination with emergency responders and other agencies.

TMCs oversee 24/7 operations of the freeway and major arterial systems through the use of Intelligent Transportation System (ITS) devices, freeway service patrols, communication with emergency responder agencies, and close coordination with districts and other agencies. TMCs objectives are shown in **Figure 8**.

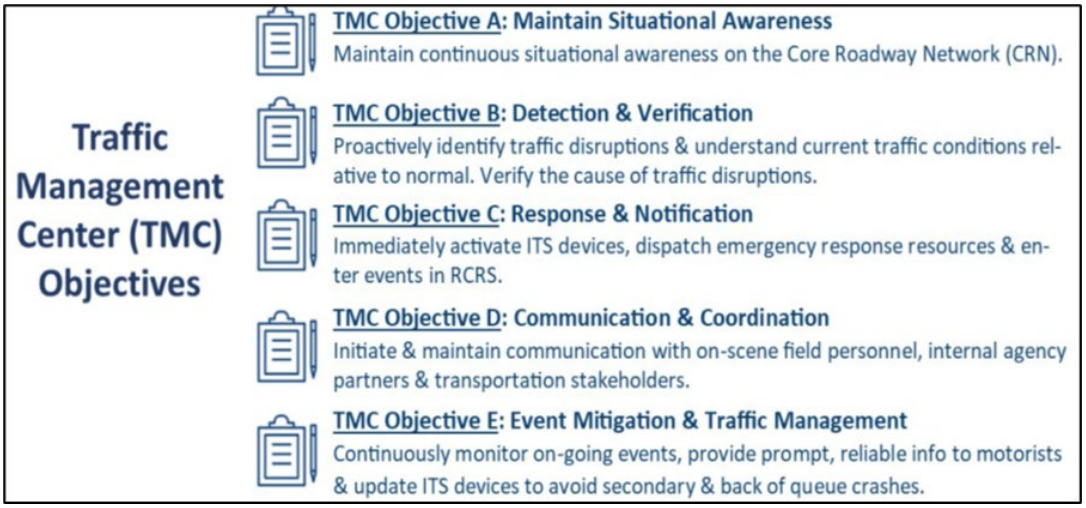

Figure 8. TMC objectives.

3.3 Traffic Incident Management (TIM)

As defined by the Federal Highway Administration (FHWA), Traffic Incident Management (TIM) is a planned and coordinated multidisciplinary process to detect, respond to, and clear traffic incidents so that traffic flow may be restored as safely and quickly as possible. Effective TIM reduces the duration and impact of traffic incidents and improves the safety of motorists, crash victims, and emergency responders.

TIM is integral to the USDOT National Roadway Safety Strategy (NRSS) and is specifically called out as a key element for the post-crash care objective.

The goal for the FHWA TIM Program is to continuously improve the safety of responders and road users, the reliability of travel, and the efficiency of incident and emergency response through the institutionalization of TIM programs.

Research has shown that the likelihood of a secondary crash increases by 2.8% for each minute the primary incident continues to be a hazard.[11] Incident clearance times can last anywhere from 30 minutes to several hours, and therefore, the risk of a secondary crash is higher in more involved crash incidents.

Building upon concepts from the National Unified Goal for Traffic Incident Management, a Pennsylvania Traffic Incident Management Enhancement ("Penn TIME") program targets many specific goals aimed at improving TIM practices and policies across the Commonwealth. The establishment of the PennTIME program is the result of recommendations contained in a report issued by the State Transportation Advisory Committee ("STAC") in February 2014. The program is supported by STAC's member agencies and numerous stakeholders across the Commonwealth of Pennsylvania.

While each of the parties have discrete functions and responsibilities regarding TIM, coordination of efforts through a multi-disciplinary approach has proven to be central for the development and maintenance of a successful statewide TIM program.

The PSP does not have a formal TIM plan but instead has a Direction and Control of Traffic policy governing incidents such as this crash and post-crash fire that require traffic control. The policies the PSP have in place either meet or exceed the tenants of a TIM plan. The PSP policy purpose states the following: This regulation establishes policy policies and procedures governing the direction and control of traffic. The Direction and Control of Traffic policy itself states:

> *Members directing and controlling traffic shall conduct such activities in a manner which is consistent with established training guidelines and operational practices, thereby ensuring the free, safe, and efficient movement of vehicles and pedestrians. Members shall also direct and control traffic in a manner that ensures their personal safety.*

The second procedure listed in their policy is for PSP to request the assignment of additional patrols or the assistance of non-Department personnel (e.g., PennDOT crew and equipment, hazardous materials team, emergency services personnel, towing service, etc.).

3.3.1 National Guidance on Traffic Incident Management

3.3.1.1 Federal Highway Administration Manual on Uniform Traffic Control Devices.

[11] Khattak, A. J., Wang, X., Zhang, H., & Cetin, M. (2011). Primary and secondary incident management: Predicting durations in real time. In Virginia Center for Transportation Innovation and Research. Report no. VCTIR 11-R11

The FHWA's MUTCD indicated the following regarding control of traffic through traffic incident management areas:[12]

"Section 6I.01 General

Support:

The National Incident Management System (NIMS) requires the use of the Incident Command System (ICS) at traffic incident management scenes.

A traffic incident is an emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic.

A traffic incident management area is an area of a highway where temporary traffic controls are installed, as authorized by a public authority or the official having jurisdiction of the roadway, in response to a road user incident, natural disaster, hazardous material spill, or other unplanned incident. It is a type of TTC [temporary traffic control] *zone and extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where vehicles return to the original lane alignment and are clear of the incident.*

Traffic incidents can be divided into three general classes of duration, each of which has unique traffic control characteristics and needs. These classes are:

A. Major—expected duration of more than 2 hours,
B. Intermediate—expected duration of 30 minutes to 2 hours, and
C. Minor—expected duration under 30 minutes.

The primary functions of TTC at a traffic incident management area are to inform road users of the incident and to provide guidance information on the path to follow through the incident area. Alerting road users and establishing a well-defined path to guide road users through the incident area will serve to protect the incident responders and those involved in working at the incident scene and will aid in moving road users expeditiously past or around the traffic incident, will reduce the likelihood of secondary traffic crashes, and will preclude unnecessary use of the surrounding local road system. Examples include a stalled vehicle blocking a lane, a traffic crash blocking the traveled way, a hazardous material

[12] Manual on Uniform Traffic Control Devices, Federal Highway Administration, 2009 Edition, Chapter 6I. Control of Traffic Through Traffic Incident Management Areas, pages 726 through 728.

spill along a highway, and natural disasters such as floods and severe storm damage.

Section 6I.02 Major Traffic Incidents

Support:

Major traffic incidents are typically traffic incidents involving hazardous materials, fatal traffic crashes involving numerous vehicles, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility for a period exceeding 2 hours.

Support:

A road closure can be caused by a traffic incident such as a road user crash that blocks the traveled way. Road users are usually diverted through lane shifts or detoured around the traffic incident and back to the original roadway. A combination of traffic engineering and enforcement preparations is needed to determine the detour route, and to install, maintain or operate, and then to remove the necessary traffic control devices when the detour is terminated. Large trucks are a significant concern in such a detour, especially when detouring them from a controlled-access roadway onto local or arterial streets.

During traffic incidents, large trucks might need to follow a route separate from that of automobiles because of bridge, weight, clearance, or geometric restrictions. Also, vehicles carrying hazardous material might need to follow a different route from other vehicles.

Some traffic incidents such as hazardous material spills might require closure of an entire highway. Through road users must have adequate guidance around the traffic incident. Maintaining good public relations is desirable. The cooperation of the news media in publicizing the existence of, and reasons for, traffic incident management areas and their TTC can be of great assistance in keeping road users and the general public well informed.

The establishment, maintenance, and prompt removal of lane diversions can be effectively managed by interagency planning that includes representatives of highway and public safety agencies.

3.3.1.1 Incident Command System & National Incident Management System

The Incident Command System (ICS) is used nationwide to manage incidents regardless of size or type. The ICS standardizes the approach to the command, control, and coordination of on-scene incident management and provides a common chain of command within which personnel from multiple organizations can operate. The ICS requires an organizational structure for incident management that combines and coordinates procedures, personnel, equipment, facilities, and communications. Using the ICS to manage every incident helps refine and maintain the skills needed to coordinate an incident response effectively. The ICS is used at all levels of government, including federal, state, and local jurisdictions. The ICS is part of the NIMS. The NIMS is "a comprehensive, nationwide, systematic approach to incident management, including the command and coordination of incidents, resource management, and information management." According to the NIMS doctrine:

> *NIMS guides all levels of government, nongovernmental organizations (NGO), and the private sector to work together to prevent, protect against, mitigate, respond to, and recover from incidents. NIMS provides stakeholders across the whole community with shared vocabulary, systems, and processes to successfully deliver the capabilities described in the National Preparedness System. NIMS defines operational systems, including the Incident Command System (ICS), Emergency Operations Center (EOC) structures, and Multiagency Coordination Groups (MAC Groups) that guide how personnel work together during incidents. NIMS applies to all incidents, from traffic accidents to major disasters.*

As the Governor Proclaimed the day following the event, the Pennsylvania Emergency Management Agency (PEMA) director, or designee, assumed command and control of all statewide emergency operations and they utilized all available powers, resources and personnel as is deemed necessary to cope with the magnitude and severity of this emergency event. Under PEMA's direction, the Philadelphia Office of Emergency Management (OEM) coordinated all facets of this incident. OEM worked with organizations and partners throughout the city.

According to the Director of the Philadelphia OEM, when asked about the command structure he responded:

> *This was fluid throughout the incident to meet the needs, but also with overlapping jurisdictions, "command" was never quite discussed and also was never an issue. On-scene there was an informal unified command. It was informal as there was no build out of an ICS org chart or official designations for positions or functions, however, there was always clear understanding over roles, priorities, resources, and points of contact. In the very initial response, it is*

accurate that the PFD was the incident command while there was active firefighting and other mitigation occurring. That is in-line with the City's Emergency Operations Plan. However, once the focus could more fully turn to secondary and tertiary impacts, as well as the recovery/rebuild process, there was a myriad of partners. On-scene at various times, this included: Philadelphia Fire, Philadelphia Fire Marshal (supported by ATF), Philadelphia Police, PA State Police, PennDOT, PennDOT's contractors, Philadelphia Streets Department, Philadelphia Water Department, Pennsylvania Department of Environmental Protection, US Coast Guard, PECO (electric), and the Philadelphia Office of Emergency Management. Order was maintained through good establishment of contacts and through the use of on-scene interagency meetings, backstopped by a recurring video conference.

Out of the EOC, we organized an incident support model with OEM staff connecting to liaisons, on-scene commanders, and operations centers virtually. An EOC Manager oversaw a joint planning and situational awareness section that focused on producing reports and facilitating the recurring coordination call for transportation and public safety officials. A resource support section processed resource requests and managed the deployment/demo process for city-controlled resources. A business support liaison worked with the City's Commerce Department and the Small Business Administration to support impacted businesses. The City's Crisis Communications Group worked with state public information officers and was connected to the EOC. On-scene activities were connected to the EOC via direct phone, direct email, recurring video conferences, and deployment of an OEM liaison officer to the scene. Had consequence management been more demanding, we would have switched to an ICS/ESF hybrid model that we more traditionally take when activating the EOC.

According to the Philadelphia PFD Chief Fire Marshall, every incident they respond to utilizes ICS and NIMS. The "command structure" would be as per the ICS. An overall Incident Commander delegating tasks down through a division, branches, sectors etc. It is a usual top-down command and control model. At the scene of the event, the PFD was in command of the incident until fire suppression and recovery was completed. The on-scene command was then passed on to the PSP for the investigation phase with support from the PPD with directing/rerouting traffic on the local roads.

4.0 Interviews

Interviews were obtained from the PFD IC Captain with Engine 46, who also was the initial first responder to arrive on-scene, and Battalion Chief of Battalion 12, and the IC for the PSP who ran the operations remotely. Interviews were also obtained from the Director of the Philadelphia Office of Emergency Management, and a witness/Good Samaritan who was the first 911 caller. All interviews were recorded, and the full transcripts are available in the docket for this investigation.[13, 14]

4.1 Synopsis of Interviews

The statements below are a synopsis of each interview.

4.1.1 First Responders

Captain, Initial Incident Commander
Philadelphia Fire Department

According to the Captain, he was working overtime on Engine 46 when the call came in for an accident. On the way to the scene, he saw two columns of smoke and thought it was two vehicles on fire. He said that he could tell by the color of the smoke that it was definitely something petroleum based that was burning.

After arriving on-scene, he said they set up on the I-95 on ramp going north, basically facing west. They ran a water/ supply line over top of the Jersey barriers, down the hill, and then across to Milner.

When they first pulled up, he observed that entire underpass was a heavy fire. The Captain stated that it took them 20 to 25 minutes before they finally could see what looked like an axle or a fifth wheel.

Battalion Chief, Overall Incident Commander
Philadelphia Fire Department

According to the IC, he requested that the box get filled out, which is a full first alarm assignment, calling out four engines, two ladders, two chiefs and a medic unit. The IC stated that upon his arrival they did a special call on top of the first alarm for two more engines to respond.

The IC stated that when they initially arrived I-95 was still open, so he immediately requested to have PSP shut it down. He stated that when the wind would

[13] Refer to Survival Factors Attachment - First Responder Interview Transcripts in public docket.
[14] Refer to Survival Factors Attachment - Witness Interview Transcript in public docket.

shift, he could see there was something long under the bridge and see the outline of like tires or rims, so, they knew it was big.

According to the IC after the first 15 minutes big chunks of I-95 started to fall, so he ordered that no one go underneath. As far as fire suppression, the IC stated that the collapse helped them in that it smothered the truck. There was still a fire burning underneath the slab, but not to the extent it was prior to the collapse.

When asked about the manhole explosions the IC stated that all the manhole explosions actually were all on the east side of the accident. That continued for at least an hour and half, almost two hours into the incident. The IC stated they decided that from where they were all the way to the river there were no building exposures, so they just let it burn.

The IC was on the west side of the incident, and the HAZMAT chief was on the east side. The HAZMAT crew were doing monitoring of some of the manhole covers, giving the IC carbon monoxide readings and if they were detecting hydrocarbons and other harmful substances.

Lieutenant, Incident Commander for
Pennsylvania State Police

According to the LT, on the date of the incident, he was assigned the officer of the day, where one of the commissioned officers from within his troop is assigned to handle multiple different stations, not just the individual station. So, his primary assignment was the station commander of his Troop K Media barracks, which is in Delaware County.

The shift supervisor told the LT that he was arranging to get units to shut down I-95 both north and southbound to prevent anyone from going onto the overpass. At that point, it had not collapsed on the northbound side yet, and then shortly after that, the shift supervisor notified the LT that it had collapsed.

The LT drove to the Philadelphia troop headquarters and not initially to the scene because they had to try and coordinate a unified response from the different state police stations to try and get manpower to cover the different highway exit ramps. In addition, the LT stated that they had to try and figure out how they were going to get some of the backlog of traffic off of the highway, and then try and work with our PennDOT to see if we could get reinforcements out there.

The LT stated that they had a temporary command post set up about a block away from the collapse. He stated that they wanted to get the northbound lanes closed first before it collapsed. Troopers were still trying to get in place and get around to close down the southbound lanes.

According to the LT, anytime that PSP needs PennDOT assistance, they call the District 6 headquarters. As for all the signage, the LT stated that PennDOT handled all of the signage and he put a request through their District 6 headquarters to basically try and expedite getting as many arrow boards put up as possible because there's numerous on and off ramps on I-95. It took some time until PennDOT could get fully mobilized, because being a Sunday they were short staffed.

4.1.2 Witness Interview[15]

Witness

According to the witness she was on I-95 northbound, all the way to the right, almost at the point where it actually splits from I- 95 and saw the truck. She was about to exit the off ramp and go down to the off ramp when she saw a bunch of dirt fly up and could tell the truck lost control or flipped or hit something. She said she didn't want to get stuck behind it, so she steered back onto I-95. She stated that the truck "just erupted, like completely exploded, huge ball of fire." She said the explosion was within a few seconds after hitting the wall. She didn't recall seeing any brake lights. She said she was driving pretty fast but couldn't say how fast the truck was going.

F. LIST OF ATTACHMENTS

Survival Factors Attachment -	Witness Interview Transcript
Survival Factors Attachment -	Philadelphia Police Department CAD Logs
Survival Factors Attachment -	Pennsylvania State Police CAD Reports
Survival Factors Attachment -	Philadelphia Fire Department Fire Alarm Report and CAD Log
Survival Factors Attachment -	First Responder Interview Transcripts

Submitted by:

Ronald Kaminski
Senior Survival Factors Investigator

[15] Refer to Survival Factors Attachment - Witness Interview Transcript in public docket.