HIGHWAY FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

Palm Springs, CA

HWY17MH005

(36 pages)

NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF HIGHWAY SAFETY
WASHINGTON, D.C.

HIGHWAY FACTORS GROUP CHAIRMAN'S FACTUAL REPORT

A. CRASH INFORMATION

Location:	Westbound Interstate 10 (I-10) in the vicinity of post mile marker 32.5, near Palm Springs, Riverside County, California
Vehicle #1:	1996 MCI Motorcoach
Operator #1:	USA Holiday Inc.
Vehicle #2:	2015 International Prostar Truck in combination with a 2013 Utility 3000 R Semi-trailer
Operator #2:	TSC, Tri-State Collision, LLC
Date:	October 23, 2016
Time:	Approximately 05:16 a.m. Pacific Daylight Time (PDT)
Transported:	30 Bus Passengers, 1 Truck Driver
Fatalities:	12 Bus Passengers, 1 Bus Driver
NTSB #:	**HWY17MH005**

B. HIGHWAY FACTORS GROUP

Dan Walsh, P.E., Senior Highway Factors Investigator, Group Chairman
NTSB Office of Highway Safety
490 L'Enfant Plaza East, S.W., Washington, DC 20594

John Bulinski, Director, District 8
California Department of Transportation (Caltrans)
464 West 4th Street
San Bernardino, California 92401

Danny D. Tran, Senior Transportation Engineer
California Highway Patrol (CHP) MAIT Engineer
California Department of Transportation (Caltrans)
District 11 – Traffic Operations
4050 Taylor Street, MS 230
San Diego, California 92110

C. CRASH SUMMARY

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

D. DETAILS OF THE HIGHWAY FACTORS INVESTIGATION

The Highway Factors Factual Report begins with a discussion of the prefatory and highway data related issues of the crash. The report continues with a description of the utility work performed by the Southern California Edison (SCE) Company and the staging of the traffic break performed by the California Highway Patrol (CHP). The report documents an extensive research effort into the number of traffic break related permits issued by the California Department of Transportation (Caltrans) statewide and provides information on the guidelines for work zone safety and transportation management plans at both the federal and state level. Lastly, the report documents the Federal Highway Administration's (FHWA) response to a list of questions submitted by NTSB investigators on November 4, 2016, and includes a discussion of the actions taken by Caltrans and the CHP to improve the safety of traffic breaks after the crash.

1. Prefatory Data

1.1. Crash Location

The crash occurred in the westbound travel lanes of I-10 in the vicinity of post mile 32.5, in Palm Springs, Riverside County, California. **Figure 1** is a crash map that illustrates the crash location was approximately 96 miles east of Los Angeles, California.

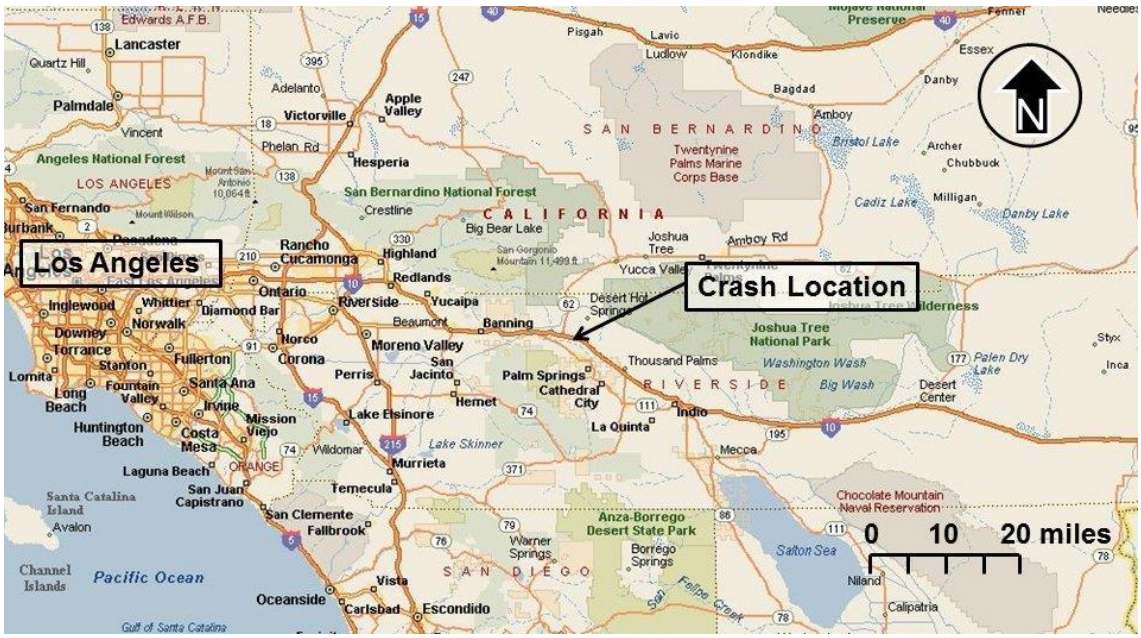


Figure 1 – Crash map (Source: Microsoft Streets and Trips modified)

1.2. Average Daily Traffic Volumes

Table 1 summarizes the average daily traffic volumes in the westbound direction of I-10 in the vicinity of the crash.

Table 1 – Average daily traffic volumes in the westbound direction of I-10

I-10	Average Daily Traffic Volumes
2010	38,500
2011	38,500
2012	38,500
2013	39,000
2014	41,000

1.3. Traffic and Fatal Accident Summary

Table 2 summarizes the traffic accident summary in the westbound direction of I-10 within a 5-mile radius of the crash from January 1, 2010 through December 31, 2014 from post mile 27.0 through post mile 37.0.

Table 2 – Traffic accident summary in the westbound direction of I-10

Type of Accident	Number of Accidents
Head-On	1
Sideswipe	51
Rear End	46
Broadside	9
Hit Object	70
Overturn	15
Auto/Pedestrian	1
Others	19
Totals	**212**

Table 3 summarizes the fatal accident summary in the westbound direction of I-10 within a 5-mile radius of the crash.

Table 3 – Fatal accident summary in the westbound direction of I-10

Date	Description of Fatal Accident
January 4, 2012	Post mile 36.28, type of collision (rear-end), primary collision factor (speeding), dark, passenger/passenger, 1 fatality, 1 injured
August 18, 2012	Post mile 32.02, type of collision (rear-end), primary collision factor (speeding), dark, passenger/motorcycle, 1 fatality
August 20, 2012	Post mile 28.33, type of collision (rear-end), primary collision factor (influence of alcohol), dark, passenger/truck-trailer, 1 fatality, 1 injured
October 17, 2014	Post mile 29.22, type of collision (rear-end), primary collision factor (influence of alcohol), dark, passenger/truck-trailer, 1 fatality, 6 injured
Totals	**4 fatalities**

2. Highway Data

2.1. Caltrans Districtwide Map and District 8 Map

Figure 2 illustrates the Caltrans districtwide map for the entire state. The October 23, 2016 motorcoach crash occurred in District 8 in Riverside County. District 8 covers San Bernardino and Riverside Counties and is the largest district geographically of the 12 statewide Caltrans districts.

Figure 2 – Caltrans districtwide map for the entire state (Source: Caltrans modified)

Figure 3 illustrates the Caltrans District 8 map. District 8 contains four interstates and 32 routes totaling over 7,000 lane miles within its boundaries. The crash location on I-10 is highlighted on the Caltrans District 8 map.

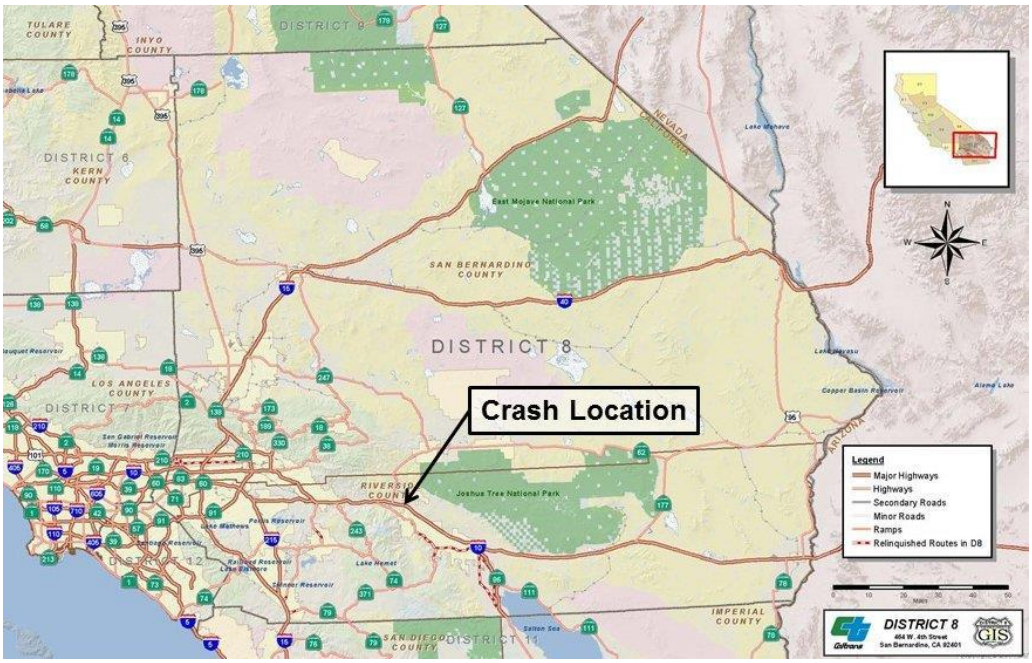


Figure 3 – Caltrans District 8 map (Source: Caltrans modified)

2.2. Highway Design

The cross section for I-10 in the immediate vicinity of the crash consisted of 4 westbound travel lanes. Each of the westbound travel lanes was approximately 12-foot wide measured from the centerline of pavement marking to the centerline of pavement marking. The total width of the 4 westbound travel lanes was approximately 48 feet wide.

A paved shoulder existed adjacent to the rightmost travel lane and leftmost travel lane in the direction of travel. The paved shoulder adjacent to the rightmost travel lane was approximately 10-feet wide measured from the centerline of highway marking to the edge of the shoulder. The paved shoulder adjacent to the leftmost travel lane was approximately 8-feet wide measured from the centerline of highway marking to the edge of the shoulder. The 4 westbound travel lanes and paved shoulders consisted of asphalt concrete pavement.

2.3. Lane Designation of Crash

The 4 westbound travel lanes are considered lanes 1 through 4, with the leftmost lane in the direction of travel being lane 1 and the rightmost lane being lane 4. The crash occurred in lane 3, or the center right lane.[1]

2.4. Construction History of I-10

I-10, from post mile 30.5 to 44.9 was built in 1954 (west of Indian Avenue) and 1957 (east of Indian Avenue). I-10 was widened to 8-lanes in 1967. The last pavement rehabilitation project

[1]The center right lane is considered the third lane viewed by the driver in the direction of travel looking from left to right.

was completed in September 2009 from post mile 25 to 44.5. A future corridor project from post mile 0 to 156.4 will upgrade all existing guide (green) signs. The future corridor project is estimated to begin in December 2019.

2.5. Speed Limit

The posted speed limit for I-10 in the vicinity of the crash was 70 miles per hour (mph). The maximum speed limit for vehicles towing trailers was 55 mph.

2.6. Horizontal Alignment

The horizontal alignment in the vicinity of the crash consisted of a 6,000-foot radius curve to the right for motorists travelling in the westbound direction of I-10. The horizontal curve was approximately 1,412 feet in length.

Highway Photograph 1 illustrates the tire marks and 6,000-foot radius curve to the right in the vicinity of the crash looking in the westbound direction of I-10 in Lane #3.

Highway Photograph 1 – View of tire marks and 6,000-foot radius curve to the right in the vicinity of the crash looking in the westbound direction of I-10 in Lane #3

2.7. Cross Slope of Travel Lanes and Shoulder

The cross slope of the 4 westbound travel lanes was approximately 1.5% sloped downward from the leftmost travel lane to the rightmost travel lane in the direction of travel. The cross slope of the paved shoulder adjacent to the rightmost travel lane was 5% sloped downward from the highway marking to the edge of the shoulder.

2.8. Rumble Strips

Grooved rumble strips existed in the paved shoulder adjacent to the rightmost travel lane and leftmost travel lane from post mile 17.5 to 44.5 in the westbound direction of I-10. The grooved rumble strips were installed in 1999. The rumble strip dimensions were approximately 3-feet long and 2-inches wide. The rumble strips were spaced approximately 8-inches apart measured from the centerline of the rumble strip. The depression of the rumble strip into the pavement was approximately 1-inch. The rumble strips were offset from the edge of traveled way by approximately 1-foot.

2.9. Highway Markings

The highway marking separating the paved shoulder from the rightmost travel lane consisted of a 4-inch wide solid white line. The highway markings separating the 4 westbound travel lanes consisted of 4-inch wide broken white lines that were each 12 feet long and had 36 foot spacing between them. At each broken white line, a series of 4 white raised delineators were epoxied to the line and spaced 4 feet apart. In addition, 1 white raised delineator was epoxied to the pavement located approximately 18 feet (or mid-point) between the broken white lines. The highway marking separating the paved shoulder from the leftmost travel lane consisted of a 4-inch wide solid yellow line. The last highway marking project in the vicinity of the crash location occurred in February of 2015.

2.10. Highway Lighting

No highway lighting was available in the westbound direction of I-10 in the vicinity of the crash. The nearest highway lighting was located along the westbound on-ramp from the Indian Canyon Drive / Indian Avenue interchange located approximately 0.6 miles east of the crash location. The highway lighting along the westbound on-ramp consisted of a 310-watt high pressure sodium luminaire mounted on a mast arm that extended approximately 15 feet. The mast arm was attached to a single pole that was approximately 35 feet high from the finished grade.

3. Description of Utility Work performed by the Southern California Edison (SCE) Company

On October 23, 2016 the Southern California Edison (SCE) Company was performing utility work at post mile 31.094. The encroachment permit dated October 7, 2016 indicated the following:

> "*Enter onto Interstate Freeway 10 (I-10) right-of-way in Riverside County to remove existing transverse overhead conductors from existing two pole wood structure and re- attach on to the new tubular steel pole structure, outside of the State right-of-way, north of I-10, north of 20th Ave./Diablo Rd., as per plans date stamped October 6, 2016 by Caltrans Encroachment Permits Office and/or as directed by the Caltrans Representative.*
>
> *Traffic breaks are required while transferring conductors onto the new pole and shall be provided by the California Highway Patrol (CHP) during non-peak hours. Each traffic break SHALL NOT exceed 5 minutes and no more than 5 breaks in the*

same day. A copy of the CHP Reimbursable Services Agreement shall be provided to the Caltrans Representative at the pre-construction meeting."

A pre-construction meeting was held on October 17, 2016 by email between Caltrans and SCE representatives. A second pre-construction meeting was held on October 20, 2016 between Caltrans and SCE representatives at the jobsite. The items discussed at the second pre-construction meeting held on October 20, 2016 included the following:

- Traffic breaks[2] shall occur during non-peak hours. Each traffic break shall not exceed 5 minutes and no more than 5 breaks in the same day.
- Utility work to be performed between the hours of 0200 and 0500 on October 23, 2016.
- SCE to call Caltrans dispatch before and after utility work is performed.
- SCE to email 100% completion notice to close out the project.

The general scope of the work activity on October 23, 2016 was part of a larger infrastructure replacement and improvement project on the Devers-Farrell-Windland 115,000-volt transmission line and the Cove 12,000-volt distribution circuit. The project was in line with Edison's general maintenance and improvement program to ensure safety and reliability in the Eastern Transmission Grid. Specific to the tasks being conducted on October 23, 2016, SCE was replacing one wood pole and a 2-pole "H" frame structure on the north side of I-10 approximately 1/4 mile from Highway 62. The structures were to be replaced with a new wooden pole and an engineered steel pole. Locations such as the one in question are of particular focus, as the conductors (wires) pass over heavily traveled roads. Activities such as this, involving work over or near freeways, are performed at minimal traffic volume times whenever possible.

Figure 4 illustrates a schematic of the utility work performed by SCE on October 23, 2016.

[2]A traffic break or rolling roadblock is a method of temporary traffic control that is used to slow or stop traffic. The rolling roadblock closes all lanes of traffic by using pacing vehicles to create a gap so that construction activities can be performed. Rolling roadblocks are generally used for short term work.

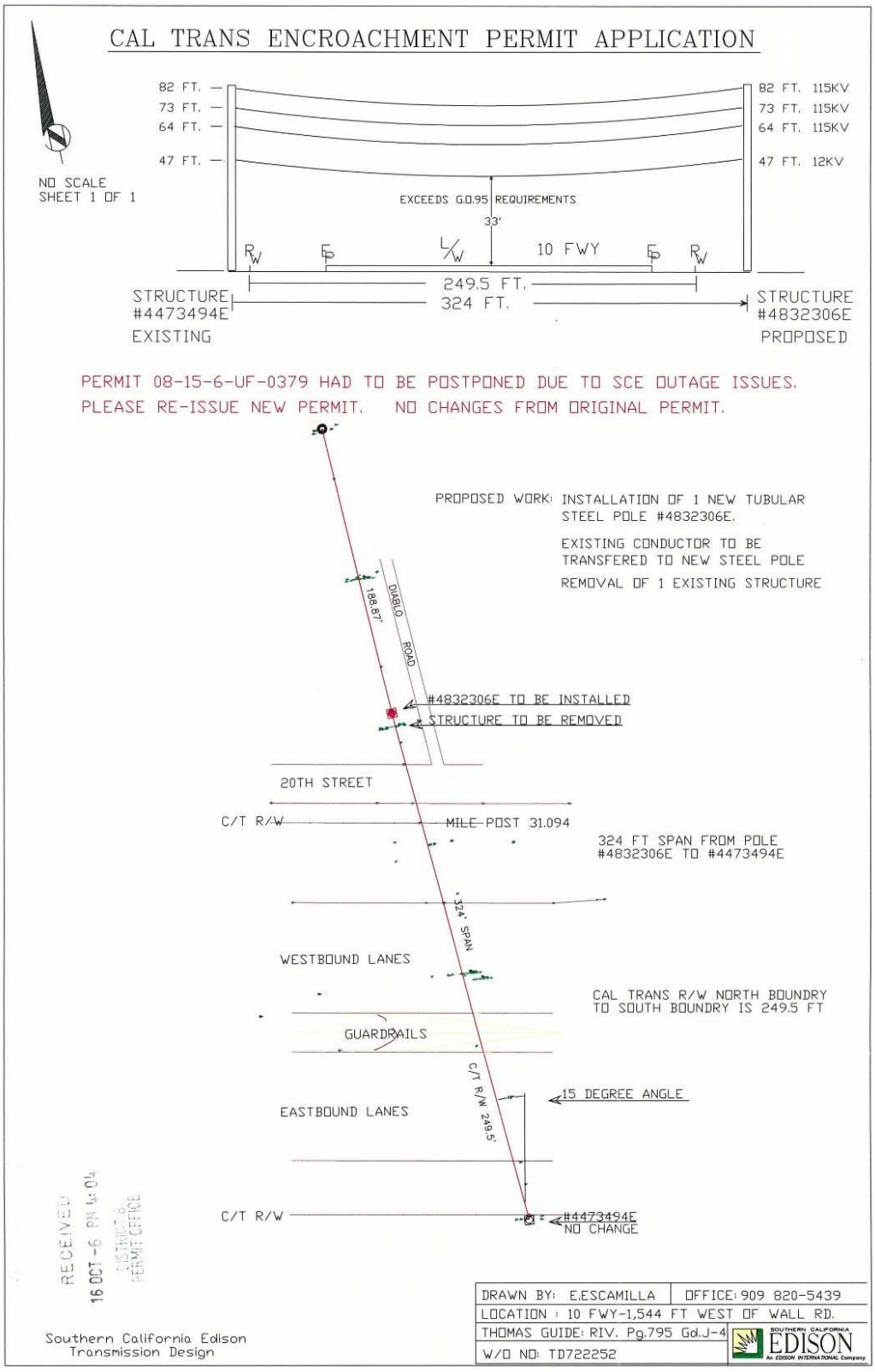


Figure 4 – Schematic of the utility work performed by SCE on October 23, 2016 (Source: Caltrans)

A meeting was held on Friday, October 28, 2016 at the scene of the utility work between representatives of SCE, Caltrans, CHP, and NTSB to discuss the timeline and scope of the utility work that was performed on October 23, 2016. The following is a summary of the items discussed at the meeting:

- SCE began mobilizing equipment at 2100 hours on October 22, 2016.
- The utility work was to be performed between the hours of 0200 and 0500 on October 23, 2016.
- At 0200 hours, SCE foreman calls CHP dispatch for CHP patrol units. In addition, SCE foreman calls Caltrans dispatch notifying them of the utility work.
- The foreman mentioned there was a delay of service from CHP Indio Area units, which resulted in the utility relocation work being completed past 0500 hours (Note: SCE foreman placed a call for the second traffic break after 5:17 a.m).
- Determination is made to communicate between SCE foreman and CHP patrol units by cell phone.
- The utility work consists of transferring 6 transmission lines from an H-frame wood structure to a new tubular steel pole structure (the schematic plan shows 4 lines, however, the bottom line contains 3 individual lines). At the beginning of the utility work, the new tubular steel pole structure has no transmission lines attached to it spanning I-10. The H-frame wood structure and new tubular steel pole structure are located side by side.
- SCE foreman is observing the utility work in a vehicle facing the jobsite approximately 300 feet east of the pole structures.
- Between 0445 and 0500 hours, the SCE foreman calls CHP patrol units for the first traffic break. The first traffic break is approximately 8 minutes long.
- During this time period, the top 3 lines are cut from the H-frame wood structure, transferred to the new tubular steel pole, and fastened to the new structure.
- SCE foreman calls CHP patrol units that the roadway is safe to open for traffic.
- SCE foreman calls CHP patrol units for the second traffic break. CHP patrol informs SCE foreman that a major traffic crash has occurred on I-10 and to cancel the job.
- Since the major traffic crash has caused a traffic break, SCE completes transferring the bottom 3 lines to the new tubular steel pole. Safety devices are attached to the bottom 3 lines as an additional measure to secure the transfer.
- The existing H-frame wood structure is removed from the jobsite.

3.1. Staging of SCE Utility Work

Photographs 2 through 5 illustrate the staging of the utility work that was performed by the SCE on the day of the crash.

Photograph 2 – Illustration depicting Stage 1 utility work

Stage 1 description: The utility work consisted of transferring 6 transmission lines from an H-frame wood structure located on the right side of **Photograph 2**, or north side of I-10, to a new tubular steel pole structure. At the beginning of the utility work, the new tubular steel pole structure has no transmission lines attached to it spanning I-10. The wood structure and new steel pole structure are located side by side.

Photograph 3 – Illustration depicting Stage 2 utility work

Stage 2 description: SCE places a call to the CHP patrol officers on-scene for the first traffic break between the hours of 4:45 and 5:00 a.m. to transfer the top 3 lines. The top 3 lines are fastened to the new steel pole structure.

Photograph 4 – Illustration depicting Stage 3 utility work

Stage 3 description: SCE places a call to the CHP patrol officers for the second traffic break after 5:17 a.m. and is informed a major traffic crash has occurred on I-10 and to cancel the job. The major traffic crash has caused a traffic break on I-10 and SCE makes a determination to transfer the bottom 3 lines to the new tubular steel pole. Safety devices are attached to the bottom 3 lines as an additional measure to secure the transfer.

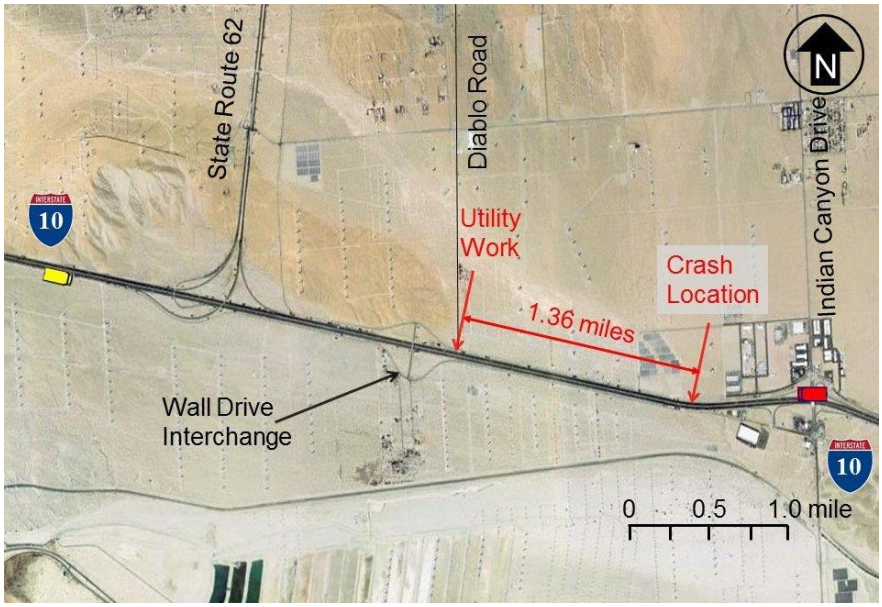
Photograph 5 – Illustration depicting Stage 4 utility work

Stage 4 description: The existing H-frame wood structure is removed from the jobsite.

4. Staging of the Traffic Break performed by the California Highway Patrol (CHP)

Figures 5 through 7 illustrate the staging of the traffic break that was performed by the California Highway Patrol (CHP) on the day of the crash. The crash location was located approximately 1.36 miles east of the utility work.

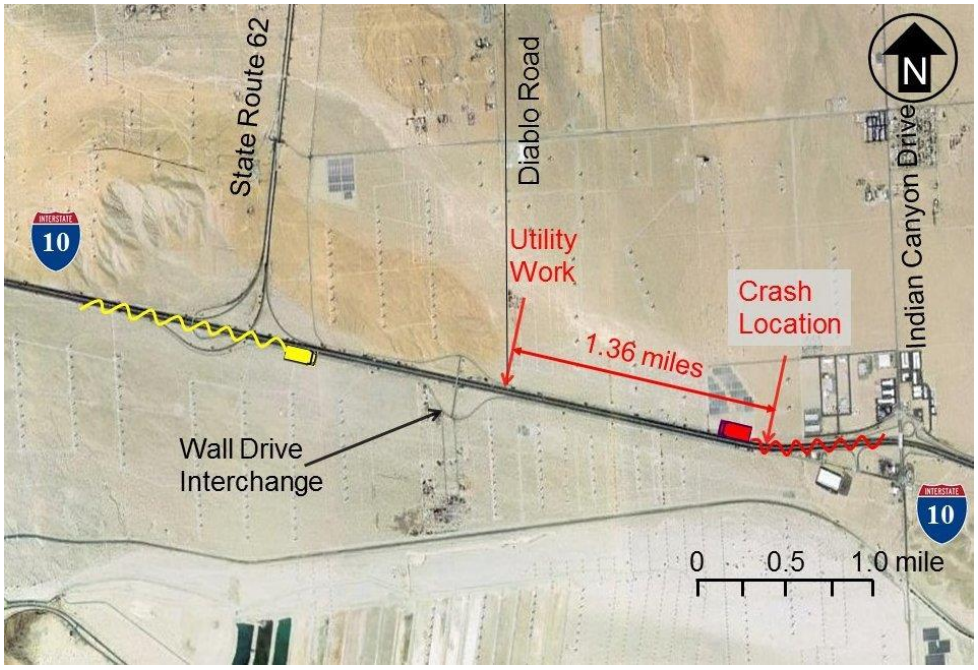
The Technical Reconstruction Factual Report should be consulted and provides a detailed description and timeline of events of both the eastbound and westbound CHP highway patrol vehicles that participated in the traffic break operations that preceded the crash.



Stage 1 description: The location of the CHP patrol vehicles highlighted in yellow and red are the staging positions before the first traffic break begins according to the MVARS[3] video. The SCE foreman is communicating with the eastbound CHP patrol officer (shown in yellow) by telephone and he is communicating with the westbound CHP patrol officer (shown in red) by radio.

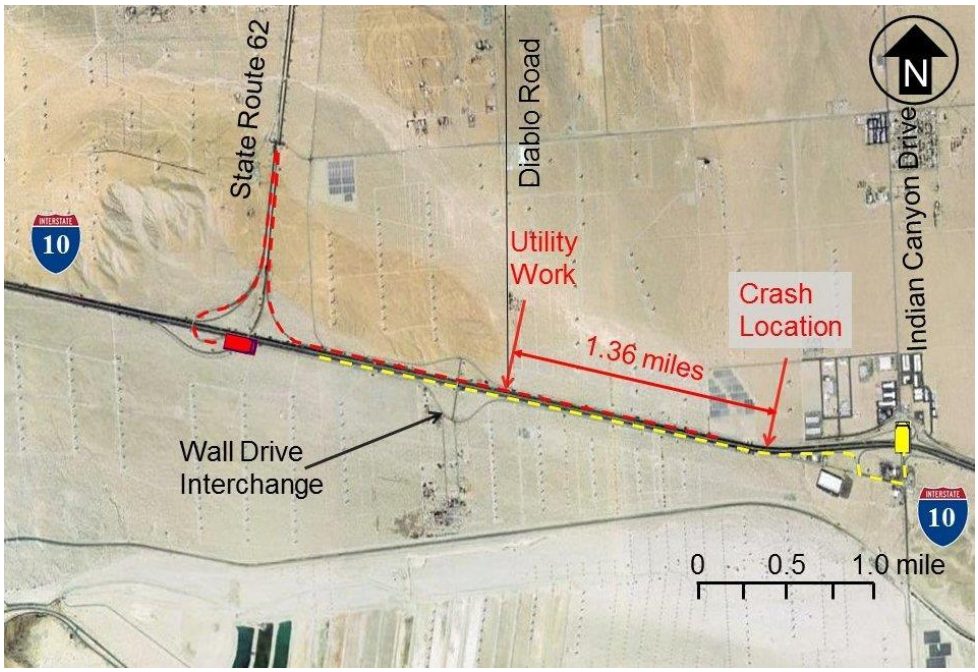
Figure 5 – Illustration depicting Stage 1 traffic break (Source: Google Earth modified)

[3]Mobile Video/Audio Recording System (MVARS) digital media (video) from the two highway patrol units that participated in the traffic break operation that preceded the crash.



Stage 2 description: The CHP patrol vehicles conduct a serpentine maneuver across all travel lanes before stopping traffic. From the MVARS video the westbound traffic was stopped for approximately 7 minutes and the eastbound traffic was stopped for approximately 6 minutes.

Figure 6 – Illustration depicting Stage 2 traffic break (Source: Google Earth modified)



Stage 3 description: The CHP patrol officers release the traffic break and proceed to their next staging positions. This is the point at which SCE placed a call to the CHP for the second traffic break and was informed a major traffic crash had occurred on I-10.

Figure 7 – Illustration depicting Stage 3 traffic break (Source: Google Earth modified)

5. Research

5.1. Traffic Break Related Permits issued by Caltrans

Table 4 summarizes the number of traffic break related permits issued by Caltrans for each District (District 1 through 12) and the entire state of California (statewide) over the last 3 years on freeways requiring rolling roadblocks. The table includes the traffic break related permits associated with overhead utility crossings and those associated with filming.

Table 4 – The number of traffic break related permits issued by Caltrans for each District (District 1 through 12) and the entire state of California (statewide)

District Number	2014		2015		2016*		Totals	
	Utilities	Filming	Utilities	Filming	Utilities	Filming	Utilities	Filming
1	20	0	10	0	8	0	38	0
2	6	0	4	0	3	0	13	0
3	7	0	13	0	16	0	36	0
4	26	4	28	4	40	1	94	9
5	19	0	16	0	15	0	50	0
6	31	0	30	0	28	0	89	0
7	30	7	36	4	20	0	86	11
8	26	1	48	0	34	0	108	1
9	2	0	2	0	7	0	11	0
10	5	0	13	0	19	0	37	0
11	30	1	23	0	35	1	88	2
12	12	0	3	0	3	0	18	0
Totals	**214**	**13**	**226**	**8**	**228**	**2**	**668**	**23**

* 2016 totals as of October 2016.
Utilities refers to all utilities in California.

In District 8, Caltrans issued approximately 74% of all traffic break related permits to SCE. For the entire state of California, Caltrans issued approximately 25% of all traffic break related permits to SCE. Most of SCE's overhead utility crossing work is concentrated in Southern California, in District's 7, 8, and 12. While Pacific Gas & Electric (PG&E) Company's overhead utility crossing work is concentrated in other districts. San Diego Gas & Electric Company's overhead utility crossing work is concentrated in District 11.

5.2. Rule on Work Zone Safety and Mobility (23 CFR 630 Subpart J)

Federal Highway Administration's (FHWA) Rule on Work Zone Safety and Mobility[4] (23 CFR 630 Subpart J) indicated the following:

[4]FHWA's Rule on Work Zone Safety and Mobility (23 CFR 630 Subpart J) can be accessed at the following link http://ops.fhwa.dot.gov/wz/rule_guide/.

*"**1.1.1 Goals***

The over-arching goal of the updated Rule is to reduce crashes and congestion due to work zones. The provisions of the updated Rule encourage:

- ***Expanding planning beyond the project work zone itself** to address corridor, network, and regional issues (e.g., alternate routes and/or modes, truck traffic, special events, etc.) while planning and designing road projects.*

- ***Expanding work zone management beyond traffic safety and control to:***

    - *Address mobility in addition to safety.*

    - *Address current day issues of operations and management and public information.*

- ***Innovative thinking in work zone planning, design, and management.** Thinking outside of the traditional traffic safety and management box and considering alternative/innovative design, construction, contracting, and transportation management strategies can bring additional solutions to light.*

Therefore, the updated Rule is intended to facilitate the systematic consideration of the safety and mobility impacts of work zones, and the development of strategies and plans to reduce work zone impacts.

5.0 Significant Projects

Some projects are likely to have much greater effects on traffic conditions in and around their work zones than other projects will. So it is reasonable to pay more attention to the effects of certain projects, such as those that we think will cause greater congestion, compromise road safety, or greatly reduce access to businesses or event venues (e.g., stadiums, arenas). Recognizing that not all road projects cause the same level of work zone impacts, the updated Rule (the Rule) establishes a category of projects called "significant projects." This Section provides an overview and general guidance for identifying significant projects.

5.1.1 What is a Significant Project?

Simply stated, a significant project is a project that a State or local transportation agency expects will cause a relatively high level of disruption. The Rule provides a specific, more detailed definition of significant project in § 630.1010:

- *A significant project is defined as one that, alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts that are greater than what is considered tolerable based on State policy and/or engineering judgment.*

While the Rule gives agencies flexibility in determining their own definitions for significant project, the Rule does specifically state that projects meeting a certain set of criteria are automatically classified as significant projects. The Rule does allow for agencies to apply for and Federal Highway Administration (FHWA) Division Offices to grant exceptions to the requirements triggered by the automatic classification. The Rule states that, in addition to projects meeting the agency's own definition of significant:

- *All Interstate system projects within the boundaries of a designated Transportation Management Area (TMA) that occupy a location for more than three days with either intermittent or continuous lane closures shall be considered as significant projects. For an Interstate system project or categories of Interstate system projects that are classified as significant through the application of this provision, but in the judgment of the State they do not cause sustained work zone impacts, the State may request from the FHWA, an exception to the requirements triggered by the classification. Exceptions to these provisions may be granted by the FHWA based on the State's ability to show that the specific Interstate system project or categories of Interstate system projects do not have sustained work zone impacts.*

5.3.1 Possible Criteria for Identifying Significant Projects

Another example of a possible framework for identifying and categorizing significant projects is from FHWA's Work Zone Self Assessment (WZSA). The WZSA divides projects into four different categories using qualitative criteria. With a project classification framework such as the one in the WZSA, an agency can designate certain project categories as significant projects (e.g., all projects falling into the Type I and Type II project categories are considered significant).

- ***Type I.** Work impacts the traveling public at the metropolitan, regional, intrastate, and possibly at the Interstate level. It has a very high level of public interest. It will directly impact a very large number of travelers. It will have significant user cost impacts and the duration is usually very long. Examples of this work type would be: Central Artery/Tunnel in Boston, Massachusetts; Woodrow Wilson Bridge in Maryland/Virginia/District of Columbia; Springfield Interchange "Mixing Bowl", Springfield, Virginia; and I-15 reconstruction in Salt Lake City, Utah.*

- ***Type II.** Work impacts the traveling public predominately at the metropolitan, and regional level. It has a moderate to high level of public interest. It will directly impact a moderate to high number of travelers. It will have moderate to high user cost impacts and the duration is usually moderate to long. Examples of this work type would be: major corridor reconstruction, high impact interchange improvements, full closures on high volume facilities, major bridge repair, repaving projects that require long term lane closures, etc.*

- ***Type III.*** *Work impacts the traveling public at the metropolitan or regional level. Has a moderate level of public interest. It will directly impact a low to moderate level of travelers. It will have low to moderate user cost impacts, and can include lane closures for a moderate duration. Examples of this work type would be: Repaving work on roadways and the National Highway System (NHS) with moderate average daily traffic (ADT), minor bridge repair, shoulder repair and construction, minor interchange repairs, etc.*

- ***Type IV.*** *Work impacts the traveling public to a small degree. Public interest is low. Duration of work is short to moderate. Work zones are usually mobile, and typically this work is recurring. Examples of this work type would be: Certain low impact striping work, guardrail repair, minor shoulder repair, pothole patching, very minor joint sealing, minor bridge painting, sign repair, mowing, etc.*

5.4 Exception Process

The Rule specifies that all Interstate system projects within the boundaries of a designated Transportation Management Area (TMA) that occupy a location for more than three days with either intermittent or continuous lane closures shall be considered as significant projects.

Therefore, the Rule provides for an exception clause for those Interstate system projects, or classes of projects, that are deemed to be significant according to the Rule, but in reality, may not have a high level of sustained work zone impacts. For such projects that are classified as significant through the application of this provision, but in the judgment of the agency they do not cause sustained work zone impacts, the agency may request an exception, from the FHWA Division Office, to the requirements triggered by the classification. Exceptions to these provisions may be granted by the FHWA Division Office based on the agency's ability to show that the specific Interstate system project or categories of Interstate system projects do not have sustained work zone impacts.

Blanket exceptions for certain categories of projects may be sought by the agency if the agency determines that such projects will not have sustained impacts, and can demonstrate the same to the FHWA. Some examples of Interstate system projects that might qualify for blanket exceptions include:

- *Road work on Interstate projects where the capacity far exceeds the demand (e.g., single lane closures on highways that have low volumes of traffic;)*

- *Night work on certain Interstate routes; and*

- *Off-peak and weekend lane-closures on certain Interstate routes.*

- *Short-term, moving operations (e.g., striping) on certain Interstate routes.*

6.1.1 What is a TMP?

A Transportation Management Plan (TMP) lays out a set of coordinated strategies and describes how these strategies will be used to manage the work zone impacts of a project. The scope, content, and level of detail of a TMP may vary based on the agency's work zone policy and the anticipated work zone impacts of the project. The type of TMP needed for a project is based on whether the project is determined to be a "significant project" (as described in detail in Section 5.0 of this document).

Step 2 – Determine TMP Needs

The elements of a TMP needed for a project are based on whether the project is determined to be significant. Section 5.0 of this document provides guidance for identifying significant projects. If a project is expected to be significant, the TMP will consist of a Temporary Traffic Control (TTC) as well as a Traffic Operations (TO) component and a Public Information (PI) component. For projects that are not classified as significant projects, the TMP needs to contain a TTC plan. While TO and PI components are optional for non-significant projects, agencies are encouraged to consider including them."

5.3. Caltrans Transportation Management Plan Guidelines

Caltrans Transportation Management Plan Guidelines indicated the following:[5]

*"**POLICY***

The California Department of Transportation (Caltrans) minimizes disruption to the traveling public on the State Highway System (SHS) by utilizing Transportation Management Plans (TMPs). TMPs are required for all planned construction, maintenance, and encroachment permit activities on the SHS to minimize work-related traffic delays while reducing overall duration of work activities.

BACKGROUND

Caltrans' emphasis towards the State Highway System (SHS) has largely shifted from new construction to the reconstruction, rehabilitation, operation, and maintenance of existing facilities. With the ever increasing traffic volumes on California's SHS and more complex highway corridor projects, the need to actively manage traffic on the state's highway facilities is even more critical.

In order to prevent unreasonable traffic delays resulting from planned work, TMPs must be carefully developed and implemented to maintain acceptable levels of service and safety during all work activities on the SHS.

[5]Transportation Management Plan Guidelines, California Department of Transportation (Caltrans), Division of Traffic Operations, Office of Traffic Management, November 2015, Appendix–A, Deputy Directive–60–R2, pages A-1 and A-2.

Federal Work Zone Safety and Mobility regulations (23 Code of Federal Regulations 630, Subpart J) require Caltrans to adopt a policy for the systematic consideration and management of work zone impacts on all federally funded highway projects. This policy and TMPs are to be consistent with the regulations.

TMPs are also to be consistent with Deputy Directive-64, "Complete Streets-Integrating the Transportation System."

DEFINITIONS

Transportation Management Plan is an approach for alleviating or minimizing work-related traffic delays by the effective application of traditional traffic handling practices and the innovative combination of various strategies. These strategies encompass public awareness campaigns, motorist information, demand management, incident management, construction methods and staging, and alternate route planning. Caltrans' "Transportation Management Plan Guidelines" provide more information on the recommended level of detail for TMPs.

Major Lane Closures are closures that are expected to result in significant traffic impacts despite the implementation of TMPs.

Significant Traffic Impact is defined as being an individual traffic delay of 30 minutes or more above normal recurrent travel time on the existing facility or the delay time set by the District Traffic Manager (DTM), whichever is less. TMP strategies are designed to maintain additional delays to be less than 20 minutes above normal recurrent travel time.

District Lane Closure Review Committee (DLCRC) is composed of the Deputy District Directors of Construction, Design, Maintenance and Traffic Operations, and the District Public Information Officer (PIO). In a regionalized setting, DLCRC is composed of the representatives of the Deputy District Directors of Construction, Design, Maintenance and Traffic Operations, and the District PIO.

Headquarters Lane Closure Review Committee (HLCRC) is composed of the Division Chiefs of Construction, Design, Maintenance, Traffic Operations, and the Deputy Director of External Affairs. The California Highway Patrol may be called upon to participate as appropriate at the district or headquarters level."

5.4. Guidelines on Rolling Roadblocks for Work Zone Applications

FHWA in collaboration with the American Traffic Safety Services Association (ATSSA) developed Guidelines on Rolling Roadblocks for Work Zone Applications.[6] The guidelines indicated the following:

*"**What is a Rolling Roadblock?***

A rolling roadblock is a method of temporary traffic control that is used to slow or stop traffic as a means of temporarily removing traffic from a roadway. The rolling roadblock closes all lanes of traffic by using pacing vehicles to create a gap so that construction activities can be performed. Rolling roadblocks are used for short term work where long term road closures using temporary traffic control devices (TTCD) are not needed. Activities that may warrant the use of a rolling roadblock include, but are not limited to:

- *Setting bridge beams;*
- *Placing overhead sign structures; or*
- *Pulling wires or cables across the roadway.*

These activities could be an inherent danger to the motoring public in that they are performed on or above the roadway where traffic is present. Removing the traffic from the work area removes the risk for the motorist if some unexpected mishap should occur, such as a bridge beam being dropped. The Maryland State Highway Administration's Policy for use of rolling roadblocks also cites use based on the need to slow traffic due to abrupt lane shifts or hazardous conditions requiring reduced speed.

A rolling roadblock requires one blocking/pacing vehicle per lane of traffic, a clearing vehicle, and an advance warning vehicle. The following describes the functions of the vehicles used to control a rolling roadblock.

- ***Blocking/pacing vehicles** – These vehicles travel side by side, one in each lane, to keep traffic blocked behind them as they move down the road. These may be law enforcement or work vehicles equipped with flashing lights and/or changeable message signs. A minimum speed of 10 mph with speeds of 20-30 mph is the preferred speed for the pacing operation. In at least one State, a single law enforcement vehicle has also been used for this function by driving in a back and forth weaving motion across all lanes of traffic to block traffic.*
- ***Advance warning vehicle (optional)** – If used, this vehicle would be a law enforcement vehicle and would remain on the shoulder of the road with flashing*

[6] Guidelines on Rolling Roadblocks for Work Zone Applications developed by FHWA in collaboration with the American Traffic Safety Services Association (ATSSA) can be accessed at the following link https://www.workzonesafety.org/training-resources/fhwa_wz_grant/atssa_rolling_roadblocks/.

lights on at the location where the blocking/pacing begins. The purpose of this vehicle is to alert traffic to the slowed traffic ahead. In addition, if a queue forms beyond the advance warning vehicle's location, the officer can back down the shoulder warning and slowing traffic to help prevent rear end collisions.

- ***Lead/Clearing vehicle** – After the traffic has been blocked, this vehicle travels through the pacing distance to verify that all traffic has cleared. It would stop short of the actual work area to block any errant vehicle.*

Communicating with the Public and Other Agencies

- *Portable changeable message signs (PCMS) should also be made available with appropriate messages at a minimum of a week in advance of the roadblock.*

- *On the day of the activity the (PCMS) should be updated to show that the operation is to be performed that day (or night) and the hours during which it will occur.*

- *Any permanent message boards within the activity area should also be used to advise the motorist of the activity and if appropriate advise motorist to use alternate routes.*

Appendix A. Pacing Distance Calculations

The following information is taken from Florida Department of Transportation's Traffic Pacing Guide, which can be accessed in its entirety at: http://www.dot.state.fl.us/rddesign/MOT/MOT.shtm

Traffic Pacing General Notes

1. Install ROAD CLOSED (W20-3) signs approximately 1000' prior to the work area. These signs shall remain covered until the pacing operation begins and be covered again when the pacing operation has ended.

2. Prior to requesting that the traffic control officer supervisor initiate the pacing operation, the contractor shall ensure that the necessary equipment is properly positioned (off the roadway) for the construction activity requiring the traffic pacing operation.

3. Truck mounted attenuator(s) with changeable message sign(s) are required to protect workers and/or equipment positioned in a travel lane(s) at the work area during the pacing operation from an errant vehicle. If no workers and/or equipment are positioned in a travel lane(s) at the work area, truck mounted attenuator(s) are not required.

Traffic Control Plans or Technical Specification

4. Changeable message signs shall be displayed one week prior to work using messages described in the traffic pacing plan. The number and location of changeable message signs shall be called out in the traffic control plans.

Appendix B. Example Press Releases

Rolling Roadblocks on I-75 Northbound

Arrow boards and signs will be in place prior to the work zone to alert motorists of the upcoming rolling roadblocks. Law enforcement will be on hand to monitor traffic flow."

5.5. Federal Manual on Uniform Traffic Control Devices (MUTCD) Chapter 6B – Fundamental Principles of Temporary Traffic Control

The Federal Manual on Uniform Traffic Control Devices (MUTCD) indicated the following regarding the fundamental principles of temporary traffic control:[7]

*"**Section 6B.01 <u>Fundamental Principles of Temporary Traffic Control</u>***

Guidance:
The following are the seven fundamental principles of Temporary Traffic Control (TTC):

1. General plans or guidelines should be developed to provide safety for motorists, bicyclists, pedestrians, workers, enforcement/emergency officials, and equipment, with the following factors being considered:
   A. The basic safety principles governing the design of permanent roadways and roadsides should also govern the design of TTC zones. The goal should be to route road users through such zones using roadway geometrics, roadside features, and TTC devices as nearly as possible comparable to those for normal highway situations.
   B. A TTC plan, in detail appropriate to the complexity of the work project or incident, should be prepared and understood by all responsible parties before the site is occupied. Any changes in the TTC plan should be approved by an official who is knowledgeable (for example, trained and/or certified) in proper TTC practices.
2. Road user movement should be inhibited as little as practical, based on the following considerations:
   A. TTC at work and incident sites should be designed on the assumption that drivers will only reduce their speeds if they clearly perceive a need to do so (see Section 6C.01).
   B. Frequent and abrupt changes in geometrics such as lane narrowing, dropped lanes, or main roadway transitions that require rapid maneuvers, should be avoided.

[7] *Manual on Uniform Traffic Control Devices for Streets and Highways*, Federal Highway Administration; 2009 Edition; pages 549 and 550.

C. Work should be scheduled in a manner that minimizes the need for lane closures or alternate routes, while still getting the work completed quickly and the lanes or roadway open to traffic as soon as possible.

D. Attempts should be made to reduce the volume of traffic using the roadway or freeway to match the restricted capacity conditions. Road users should be encouraged to use alternative routes. For high-volume roadways and freeways, the closure of selected entrance ramps or other access points and the use of signed diversion routes should be evaluated.

E. Bicyclists and pedestrians, including those with disabilities, should be provided with access and reasonably safe passage through the TTC zone.

F. If work operations permit, lane closures on high-volume streets and highways should be scheduled during off-peak hours. Night work should be considered if the work can be accomplished with a series of short-term operations.

G. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur if significant impacts to roadway operations are anticipated.

3. Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner while approaching and traversing TTC zones and incident sites. The following principles should be applied:

A. Adequate warning, delineation, and channelization should be provided to assist in guiding road users in advance of and through the TTC zone or incident site by using proper pavement marking, signing, or other devices that are effective under varying conditions. Providing information that is in usable formats by pedestrians with visual disabilities should also be considered.

B. TTC devices inconsistent with intended travel paths through TTC zones should be removed or covered. However, in intermediate-term stationary, short-term, and mobile operations, where visible permanent devices are inconsistent with intended travel paths, devices that highlight or emphasize the appropriate path should be used. Providing traffic control devices that are accessible to and usable by pedestrians with disabilities should be considered.

C. Flagging procedures, when used, should provide positive guidance to road users traversing the TTC zone.

4. To provide acceptable levels of operations, routine day and night inspections of TTC elements should be performed as follows:

A. Individuals who are knowledgeable (for example, trained and/or certified) in the principles of proper TTC should be assigned responsibility for safety in TTC zones. The most important duty of these individuals should be to check that all TTC devices of the project are consistent with the TTC plan and are effective for motorists, bicyclists, pedestrians, and workers.

B. As the work progresses, temporary traffic controls and/or working conditions should be modified, if appropriate, in order to provide mobility and positive guidance to the road user and to provide worker safety. The individual responsible for TTC should have the authority to halt work until applicable or remedial safety measures are taken.

C. TTC zones should be carefully monitored under varying conditions of road user volumes, light, and weather to check that applicable TTC devices are effective, clearly visible, clean, and in compliance with the TTC plan.

D. When warranted, an engineering study should be made (in cooperation with law enforcement officials) of reported crashes occurring within the TTC zone. Crash records in TTC zones should be monitored to identify the need for changes in the TTC zone.

5. *Attention should be given to the maintenance of roadside safety during the life of the TTC zone by applying the following principles:*

   A. To accommodate run-off-the-road incidents, disabled vehicles, or emergency situations, unencumbered roadside recovery areas or clear zones should be provided where practical.

   B. Channelization of road users should be accomplished by the use of pavement markings, signing, and crashworthy, detectable channelizing devices.

   C. Work equipment, workers' private vehicles, materials, and debris should be stored in such a manner to reduce the probability of being impacted by run-off-the-road vehicles.

6. *Each person whose actions affect TTC zone safety, from the upper-level management through the field workers, should receive training appropriate to the job decisions each individual is required to make. Only those individuals who are trained in proper TTC practices and have a basic understanding of the principles (established by applicable standards and guidelines, including those of this Manual) should supervise the selection, placement, and maintenance of TTC devices used for TTC zones and for incident management.*

7. *Good public relations should be maintained by applying the following principles:*

   A. The needs of all road users should be assessed such that appropriate advance notice is given and clearly defined alternative paths are provided.

   B. The cooperation of the various news media should be sought in publicizing the existence of and reasons for TTC zones because news releases can assist in keeping the road users well informed.

   C. The needs of abutting property owners, residents, and businesses should be assessed and appropriate accommodations made.

   D. The needs of emergency service providers (law enforcement, fire, and medical) should be assessed and appropriate coordination and accommodations made.

   E. The needs of railroads and transit should be assessed and appropriate coordination and accommodations made.

   F. The needs of operators of commercial vehicles such as buses and large trucks should be assessed and appropriate accommodations made."

6. FHWA Response to List of Questions submitted by NTSB Investigators

FHWA responded to a list of questions submitted by NTSB investigators on November 4, 2016. FHWA's response was received on January 31, 2017 and indicated the following:

"***Question #1: Would traffic breaks (rolling roadblocks) be considered a significant project under the rule on work zone safety and mobility (23 CFR 630 Subpart J)? If the answer is no, would the traffic breaks (rolling roadblocks) be considered a state responsibility?***

The regulations define a "significant project" as a project meeting one of two conditions as defined in 23 CFR §630.1010, as follows:

(a) one "anticipated to cause sustained work zone impacts that are greater than what is considered tolerable based on State policy and/or engineering judgement", such determination being based on "The State's work zone policy provisions, the project's characteristics, and the magnitude and extent of the anticipated work zone impacts.", or

(b) "All Interstate system projects within the boundaries of a designated Transportation Management Area (TMA) that occupy a location for more than three days with either intermittent or continuous lane closures."

For the subject crash, the project specified a series of intermittent short-duration full roadway closures over a three-hour period. As such, condition "(b)" above does not apply. Therefore, the determination of "significant project" status relies upon State policy which defines a "significant traffic impact" as one causing an "individual traffic delay of 30 minutes or more above normal recurrent travel time on the existing facility" (Caltrans Deputy Directive 60-R2, Appendix A of the Caltrans Transportation Management Plan Guidelines, November 2015, http://www.dot.ca.gov/trafficops/tm/docs/TMP_Guidelines.pdf). According to the Encroachment Permit submitted to Caltrans for this work, the traffic break duration was to be limited to five minutes. According to the NTSB On-Scene Investigation Narrative, the actual duration of the traffic break was eight minutes, both of which are below the threshold for identification as a "significant project" according to State policy.

Based on the above, the use of traffic breaks as used for this project would not be considered "significant projects" within the definition of 23 CFR 630 §630.1010.

Question #2: Does the MUTCD address traffic breaks (rolling roadblocks) under Part 6 Temporary Traffic Control? Are there any references in the MUTCD pertaining to traffic breaks (rolling roadblocks)?

Neither Part 6 of the Federal MUTCD (http://mutcd.fhwa.dot.gov/) nor the California MUTCD (http://www.dot.ca.gov/trafficops/camutcd/) specifically addresses rolling roadblocks. Both the Federal and California MUTCD provide guidance that would require a temporary traffic control plan (TTCP) for this type of activity but do not provide specifics for the types and location

of any traffic control devices that should be used. Chapter 6B of the Federal MUTCD outlines fundamental principles of temporary traffic control that should be followed in development of a TTCP, including consideration of the types and volumes of traffic, type of work activity, and duration of the activity.

Question #3: The number of traffic break related permits over the last 3 years in Caltrans District 8 was approximately 109 permits. We are in the process of receiving the total number of traffic break related permits for the entire state of California.

Acknowledged, FHWA does not have a comment.

Question #4: What is FHWA's experience with traffic break (rolling roadblocks) in other states? Is this a fairly common occurrence in other states? Please cite specific examples and contact information. Listed below is a link to FHWA supported material regarding "Guidelines on Rolling Roadblocks for Work Zone Applications". https://www.workzonesafety.org/training-resources/fhwa_wz_grant/atssa_rolling_roadblocks/

The FHWA Office of Operations placed an inquiry to FHWA Division offices on November 8, 2016, soliciting feedback regarding State-specific practices regarding rolling roadblocks and what policies, standards, or institutional practices are in place regarding their use. The response included information on practices for 28 State transportation agencies, summarized as follows:

Of all 28 states that responded:

23 (82%) Do use traffic breaks or rolling roadblocks
5 (18%) Do not use traffic breaks or rolling roadblocks

Of the 23 states that use traffic breaks or rolling roadblocks:

16 (57%) do so as common practice
6 (21%) do so infrequently
1 (4%) do so only when initiated by police
13 (46%) Have some written policy, specification, or standard regarding their use

Of the 13 states that have a policy regarding the use of rolling roadblocks:

1 (4%) Policy requires upstream static signs
13 (46%) Policy requires upstream static signs and/or PCMS
4 (14%) Require additional supplementary traffic control, pilot car upstream with signs, rumble strips, etc.
6 (21%) Specify public involvement component in policy for rolling roadblocks

A compilation of responses from all Divisions is included as an attachment.

Question #5: What is FHWA's thought on whether the states should provide advance warning for traffic breaks (rolling roadblocks)? As a result of this crash, Caltrans District 8 indicated they will be reviewing internal procedures to require advance warning for all future traffic break (rolling roadblock) permits.

The FHWA encourages the use of traffic control devices placed in advance of the back of traffic queues that develop upstream of capacity-constrained work zones, with messages such as "Stopped Traffic Ahead" to warn drivers of the need to respond to a stopped traffic queue. The determination of what traffic control is appropriate should be made based on specific project conditions during the development of a Transportation Management Plan (TMP), as described in 23 CFR §630.1012b and incorporating the broader requirements of Part 6 of the MUTCD."

Table 5 summarizes the FHWA Office of Operations inquiry to Division offices on November 8, 2016, soliciting feedback regarding State-specific practices regarding rolling roadblocks and what policies, standards, or institutional practices are in place regarding their use. The response included information on practices for 28 State transportation agencies.

Some of the key findings in FHWA's Office of Operations inquiry to Division offices included the following:

- Of the 28 states that responded, 23 states use traffic breaks or rolling roadblocks.
- Of the 23 states that use traffic breaks or rolling roadblocks; 16 states do so on a routine basis, 6 states do so on an uncommon basis, and 1 state does so on an ad-hoc basis.
- Currently, 10 states do not have standard policies or specifications in place that use traffic breaks or rolling roadblocks on a routine, uncommon, and ad-hoc basis.

Table 5 – FHWA Office of Operations inquiry to Division offices on November 8, 2016, soliciting feedback regarding State-specific practices regarding rolling roadblocks and what policies, standards, or institutional practices are in place regarding their use (Source: FHWA Office of Operations Work Zone Management Team)

State	Uses Traffic Breaks or Rolling Roadblocks	Frequency	Does state have standard policies or specifications?	Summary of supplementary traffic control upstream of closure
Alabama	Yes	Uncommon	No	PCMS, TMA, arrow boards HAR, etc.
Arkansas	Yes	Uncommon	No	LE only
California	Yes	Routine	No	Not specified
Connecticut	Yes	Routine	Yes	Mobile PCMS 1/2 mile upstream of back of queue

Delaware	Yes	Routine	No	Public Information
Florida	Yes	Uncommon	Yes	PCMS
Georgia	Yes	Routine	Yes	Static sign w/flashers upstream of queue
Hawaii	Yes	Routine	Yes	Other advance supplementary traffic control
Iowa	Yes	Ad-hoc when initiated by Iowa State Police	No	Not specified
Idaho	No	n/a	n/a	n/a
Illinois	Yes	Routine	Yes	PCMS, rumble strips on freeways
Massachusetts	Yes	Routine	Yes	Static signs, PCMS (optional)
Maryland	Yes	Routine	No	Static signs, PCMS (optional)
Missouri	Yes	Routine	Yes	CMS
Montana	Yes	Uncommon	No	Not specified
North Carolina	Yes	Uncommon	Yes	Static signs, PCMS (optional), TMA
North Dakota	No	n/a	n/a	n/a
New Mexico	Yes	Uncommon	No	Not specified
New York	Yes	Routine	No	Not specified
Ohio	Yes	Routine	Yes	Static signs w/ flashers + PCMS
Oklahoma	No	n/a	n/a	n/a
Pennsylvania	Yes	Routine	Yes	Static sign, PCMS (optional)
South Dakota	No	n/a	n/a	n/a
Tennessee	Yes	Routine	No	Static sign, PCMS (optional)
Utah	Yes	Routine	Yes	LE only
Virginia	Yes	Routine	Yes	Static signs, PCMS (optional)
Washington	Yes	Routine	Yes	TMA + Truck mounted PCMS + PCMS (trailer, static location)

Wyoming	No	n/a	n/a	n/a

Legend:
PCMS – Portable changeable message sign
TMA – Truck mounted attenuator
HAR – Highway advisory radio
LE – Law enforcement
CMS – Changeable message sign

7. Cell phone records of SCE Foreman associated with utility work and traffic break

NTSB investigators obtained the cell phone records of the SCE foreman associated with the utility work and traffic break on the day of the crash, October 23, 2016. The cell phone records are summarized in **Table 6**.

Table 6 – Cell phone records of the SCE foreman associated with the utility work and traffic break on the day of the crash, October 23, 2016

Date / Time	Call Duration	Inbound / Outbound	Phone Listed to
10-23-16 / 2:01 a.m.	38 seconds	Outbound	CHP Indio
10-23-16 / 2:02 a.m.	94 seconds	Outbound	CHP Com Center
10-23-16 / 4:33 a.m.	183 seconds	Inbound	SCE electrician
10-23-16 / 4:44 a.m.	39 seconds	Outbound	SCE electrician
10-23-16 / 5:01 a.m.	25 seconds	Outbound	CHP
10-23-16 / 5:08 a.m.	24 seconds	Inbound	CHP
10-23-16 / 5:08 a.m.	24 seconds	Inbound	SCE electrician
10-23-16 / 5:13 a.m.	26 seconds	Outbound	CHP
10-23-16 / 5:37 a.m.	37 seconds	Outbound	CHP

8. Actions taken by Caltrans and CHP to improve the safety of traffic breaks after the crash

The actions taken by Caltrans and the CHP to improve the safety of traffic breaks after the crash was contained in a memorandum entitled Implementation of Traffic Breaks dated July 16, 2017.[8] The memorandum indicated the following:

> *"**Background***
>
> *Caltrans and the CHP have agreed that at least one PCMS (portable changeable message sign) will be provided when a planned traffic break is conducted by a CHP officer or other law enforcement officer. The purpose of using PCMS is to caution motorists of the change in traffic conditions resulting from a planned traffic break.*
>
> ***Implementation***

[8] Implementation of Traffic Breaks, State of California Department of Transportation Memorandum, July 16, 2017, pages 1 and 2.

Placement of the PCMS shall be positioned sufficiently upstream of the planned traffic break to provide advance notice to motorists regarding the sudden change in traffic conditions before they approach the traffic queue.

A minimum of one (1) PCMS shall be placed during the planned traffic break. Additional PCMS's may be placed to caution motorists as needed.

A minimum of two (2) CHP vehicles (or other law enforcement vehicles) will be assigned to conduct a planned traffic break. One vehicle will conduct the traffic break, and the other vehicle will be stationed on the shoulder with its rear emergency lights on to caution motorists."

Further actions taken by Caltrans included working with the Office of Encroachment Permits and Engineering Support to develop special provisions for conducting traffic breaks under an encroachment permit. The special provisions were contained in a memorandum entitled Encroachment Permits Manual Revisions – General Provisions and Special Provisions for Permits with Rolling Traffic Breaks dated September 1, 2017.[9] The memorandum indicated the following:

*"**Rolling Traffic Breaks Special Provisions***

1. Permittee must arrange a meeting with the California Highway Patrol (CHP) and the Caltrans permit inspector, at least two (2) weeks prior to the start of work in order to determine the appropriate number of CHP vehicles required for planned traffic breaks. A minimum of two (2) CHP vehicles in each direction are required. One CHP vehicle will be conducting the planned traffic break and the second CHP vehicle will be stationed on the shoulder with its rear emergency lights on to caution motorists at the end of the queue. Additional CHP vehicles may be required if determined to be necessary by the CHP. It is the responsibility of the permittee to make arrangements with CHP for providing planned traffic breaks to facilitate the approved work.

2. The duration of a planned traffic break MUST NOT exceed five (5) minutes. If additional traffic breaks are required, traffic backup must be cleared before performing another break.

3. The permittee must provide a minimum of one (1) Portable Changeable Message Sign (PCMS). Additional PCMS(s) must be provided if required by Caltrans permit inspector or CHP. PCMS(s) must be placed at the locations directed by the CHP and be moved or relocated as needed. Each PCMS must comply with section 12-3.32 of the Caltrans Standard Specifications. PCMS(s) must be removed promptly after the planned traffic break is completed.

4. Message to be displayed on the PCMS(s) must be coordinated with Caltrans permit inspector/representative and CHP.

[9] Encroachment Permits Manual Revisions – General Provisions and Special Provisions for Permits with Rolling Traffic Breaks, State of California Department of Transportation Memorandum, September 1, 2017, page 2.

5. All aerial crossings must be scheduled on Sunday mornings only (excluding holidays), from daylight to 10:00 a.m., unless otherwise authorized by the District Permit Engineer or authorized Caltrans' representative.

6. No aerial crossings must be performed in rainy, foggy or other inclement weather."

The final execution of the interagency agreement between Caltrans and the CHP to include the procedures for conducting traffic breaks on the State Highway System will be completed in early 2018.

E. DOCKET MATERIAL

The following attachments and photographs are included in the docket for this investigation:

LIST OF ATTACHMENTS

Highway Attachment – State of California Department of Transportation (Caltrans) Encroachment Permit issued to Southern California Edison (SCE) Company dated October 7, 2016

Highway Attachment – Schematic of utility work performed by Southern California Edison (SCE) Company on October 23, 2016

Highway Attachment – Plan and profile of I-10 in the vicinity of the crash

Highway Attachment – Typical cross section of I-10 in the vicinity of the crash

Highway Attachment – Cross slope of travel lanes and shoulder of I-10 in the vicinity of the crash

Highway Attachment – Striping details of travel lanes of I-10 in the vicinity of the crash

Highway Attachment – Guidelines on Rolling Roadblocks for Work Zone Applications

Highway Attachment – Federal Highway Administration (FHWA) response to a list of questions submitted by NTSB investigators on November 4, 2016

Highway Attachment – Caltrans Transportation Management Plan Guidelines

Highway Attachment – Caltrans Implementation of Traffic Breaks Memorandum dated July 16, 2017

Highway Attachment – Caltrans General Provisions and Special Provisions for Permits with Rolling Traffic Breaks Memorandum dated September 1, 2017

LIST OF PHOTOGRAPHS

Highway Photograph 13 – View of the posted speed limit sign of 70 miles per hour (mph) in the westbound direction of I-10 prior to the crash location

Highway Photograph 14 – View of the maximum speed limit sign for vehicles towing trailers of 55 miles per hour (mph) in the westbound direction of I-10 prior to the crash location

Highway Photograph 15 – View of the "Sonny Bono Memorial Freeway" sign in the westbound direction of I-10 prior to the crash location

END OF REPORT

Dan Walsh, P.E.
Senior Highway Factors Investigator