



Transportation Management Plans for Projects Requiring Full Roadway Closure: Survey of Practice

Requested by
Koohong Chung, Caltrans District 4

November 16, 2020

The Caltrans Division of Research, Innovation and System Information (DRISI) receives and evaluates numerous research problem statements for funding every year. DRISI conducts Preliminary Investigations on these problem statements to better scope and prioritize the proposed research in light of existing credible work on the topics nationally and internationally. Online and print sources for Preliminary Investigations include the National Cooperative Highway Research Program (NCHRP) and other Transportation Research Board (TRB) programs, the American Association of State Highway and Transportation Officials (AASHTO), the research and practices of other transportation agencies, and related academic and industry research. The views and conclusions in cited works, while generally peer reviewed or published by authoritative sources, may not be accepted without qualification by all experts in the field. The contents of this document reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the California Department of Transportation, the State of California, or the Federal Highway Administration. This document does not constitute a standard, specification, or regulation. No part of this publication should be construed as an endorsement for a commercial product, manufacturer, contractor, or consultant. Any trade names or photos of commercial products appearing in this publication are for clarity only.

Table of Contents

Executive Summary	2
Background.....	2
Survey of Practice.....	2
Gaps in Findings.....	8
Next Steps.....	8
Detailed Findings	9
Background.....	9
Survey of Practice.....	9
Survey Overview.....	9
Transportation Management Plan Case Studies.....	10
Other Full Roadway Closure Projects.....	22
Other Full Roadway Closure Practices.....	23
Contacts	25
Appendix A: Survey Questions	26

Executive Summary

Background

Federal Highway Administration and California Department of Transportation (Caltrans) policies require the development of a transportation management plan (TMP) for construction projects requiring planned full roadway closures. Developing a comprehensive guideline to assist with preparation of a TMP to address such closures will help Caltrans determine the scope of a traffic impact analysis that identifies a recommended planned closure alternative and best practices for monitoring traffic during the closure.

Current guidance developed by the Caltrans Division of Traffic Operations was updated in 2014 and includes:

- Project Initiation Phase Full-Closure Checklist (see [Attachment A](#)).
- Full Closure Guidelines (see [Attachment B](#)).

Caltrans is seeking information from California transportation-related agencies that will:

- Inform development of updated guidance for preparing a TMP for planned major freeway closures that identifies the impact to the local and regional area.
- Identify innovative strategies for Caltrans' use in monitoring traffic conditions and reducing traffic congestion during the closure.

To assist Caltrans in this information-gathering effort, CTC & Associates surveyed the 12 Caltrans districts and planning- or traffic-related contacts at California's 18 metropolitan planning organizations (MPOs) about their experience with developing TMPs for projects requiring a full roadway closure. Respondents could describe up to two TMPs.

Survey of Practice

Survey Overview

The online survey sought information about the TMPs developed for projects implementing a full roadway closure in the following topic areas:

- Project description.
- Project data and analysis.
- Project assessment.
- TMP development.
- Monitoring traffic impacts.
- Assessing the TMP.

The survey also addressed other issues related to full roadway closure:

- Improving analysis of full roadway closure requests.
- Coordinating multiple full roadway closure projects.
- Implementing a full roadway closure without an alternate route.

Ten respondents submitted complete or nearly complete survey responses. Respondents from Caltrans Districts 1, 6, 10, 11 and 12 described six TMPs. A representative from Santa Barbara County Association of Governments (SBCAG)—one of two MPOs responding to the survey—described two TMPs. The second MPO respondent, from San Luis Obispo Council of Governments (SLOCOG), and representatives from Caltrans Headquarters and Districts 2 and 9 reported no experience with full roadway closures.

Three respondents provided a brief description of a full roadway closure project but provided no project details. The limited information provided by these respondents appears on page 22.

Findings from the survey of practice are presented below in three areas:

- TMP case studies.
- Other full roadway closure projects.
- Other full roadway closure practices.

Transportation Management Plan Case Studies

Project Description

Project details associated with the eight TMPs described by respondents appear in Table ES1.

Table ES1. Summary of Transportation Management Plan Case Studies

Agency / Project	Closure Length	Closure Period	Closure Options
Caltrans District 1 State Route 200/299 (SR-200/299) Separation Project	0.3 mile	One seven-hour closure anticipated in 2021.	Closure needed to lift a bridge 8 inches at footing; other option was no build. Impacts to drainage prompted a late change during the project approval phase from lowering the roadway to raising the bridge.
Caltrans District 6 Numerous Projects	N/A	N/A	N/A
Caltrans District 10 Old River Bridge Preventive Maintenance	Not provided	Three 55-hour closures; project is planned for construction in 2021.	No build; long-term full closure.
Caltrans District 10 Mokelumne River Bridge Deck Repairs	1,500-foot bridge	Nine 57-hour closures; project is planned for construction in 2021.	One-way reverse control for 24 hours; full closure for 12 consecutive days at 24-hour shifts; or nine weekends at 57-hour shifts per weekend.
Caltrans District 11 Mid-Coast Corridor Transit Project	2 miles	10:30 p.m. to 5 a.m.	Short-term full closure; no other options other than full freeway closure to drop falsework.
Caltrans District 12 I-405 Improvement Project (SR-73 to I-605)	1 mile	55 hours or weekend	No build and short- and long- term full closure. Also considered were local street alternatives, one-way operations, parking restrictions, law enforcement, traffic signal adjustments and a major public information campaign.
SBCAG Linden/Casitas Interchanges in Carpinteria	0.5-mile bridge over Highway 101	3 weeks	Partial closure with limited access.
SBCAG South Coast Highway 101 High-Occupancy Vehicle (HOV) Lanes	0.5 mile	16 to 36 months	Multiple shorter-term closures that would continually change traffic patterns.

Cost Comparisons

Only three respondents provided information about costs:

- *District 1* (SR-200/299 Separation Project). The respondent did not provide cost comparison data but noted that this project uses Cost + Time contracting. Under this approach, the respondent thought that, according to North Region policy, the state's working day (WD) estimate is reduced to 70%; Road User Cost (RUC) is set to 0.
- *Caltrans District 10* (Mokelumne River Bridge Deck Repairs). Table ES2 provides the cost-related data provided by the respondent.

Table ES2. Cost Comparisons: Mokelumne River Bridge Deck Repairs

Closure Type	Project Cost	Road User Cost	TMP Cost Estimates
Full Closure	\$3.84 million	\$3,138,833	Public information officer: \$250,000. Portable changeable message signs: \$55,000. COZEEP ¹ : \$160,000.
Daily Closure	\$23.31 million	Not available	Not available

¹ Construction Zone Enhanced Enforcement Program (COZEEP) uses California Highway Patrol units to assist with traffic management in static construction zones.

- *SBCAG* (South Coast Highway 101 HOV Lanes). The respondent estimates that the project as scoped (a single full closure for the project duration) will cost about \$3 million less than using multiple shorter-term closures.

Traffic Rerouting and Impacts

Traffic Analysis Tools

Respondents were asked about their use of traffic analysis tools such as Synchro and VISSIM. (Synchro is a macroscopic analysis and optimization software application used for traffic analysis; VISSIM is a traffic microscopic simulation software program.) SBCAG used VISSIM simulation software to develop both TMPs described in this report. The Caltrans District 10 traffic management team does not have access to these tools, but the respondent noted that “[b]etter tools to evaluate traffic impacts would be useful.”

Highlights of other respondent practices are presented below:

- *Caltrans District 1* (SR-200/299 Separation Project). The district focused on avoiding a weekday closure given lower weekend volumes. A Friday or Saturday evening (10 p.m. to 5 a.m.) construction period was desired to allow the construction team to identify and address any issues by the Monday morning commute.
- *Caltrans District 10* (Old River Bridge Preventive Maintenance). The full closure was approved based on safety reasons to prevent live traffic on the bridge during jacking operations, raising and lowering the bridge, and testing operations. The alternate route planning effort considered truck classification, seasonal operations of the farm community, and city and county concurrence on the detour route.
- *Caltrans District 10* (Mokelumne River Bridge Deck Repairs). The impact area is a commuter route during the workweek. The closure will only impact traffic during the weekend and for fewer days as compared to daily closures for 200 workdays. The full

closure detour route provided a shorter delay than a daily closure and was also deemed to have the least impact to water traffic.

- *Caltrans District 12* (I-405 Improvement Project (SR-73 to I-605)). The district used freeway operational analysis to evaluate traffic impacts. Alternate route planning focused on a collaboration with local agencies.
- *SBCAG* (Linden/Casitas Interchanges in Carpinteria). Alternate route planning resulted in routing traffic to the next nearest full-service overcrossing and interchange.
- *SBCAG* (South Coast Highway 101 HOV Lanes). The Cost + Time strategy was used to evaluate the impact of multiple closures and the impact on staging and time with input from the construction manager/general contractor. The evaluation also included an examination of adjacent access points through frontage roads and interchanges.

Managing and Monitoring Traffic Impacts

Respondents used or will use a range of tools and practices to manage and monitor traffic impacts during the full closure period, including:

- Caltrans Highway Information Network (CHIN, an 800 number that provides the public with current highway condition information) (Caltrans District 10).
- Cameras, including closed-circuit TV (CCTV) (Caltrans Districts 10 and 12; SBCAG).
- Collaborating with the construction inspector and neighboring TMPs (Caltrans District 10).
- COZEEP (Caltrans Districts 1 and 10).
- Data on collisions and delays (Caltrans District 12).
- Field staff monitoring (SBCAG).
- Highway advisory radio (Caltrans District 10).
- Inspector vehicles (District 11 and SBCAG).
- Performance Measurement System (PeMS) census stations (Caltrans Districts 1 and 12). (PeMS is a consolidated database of traffic-related information collected using Caltrans loop detectors from traffic management centers throughout the state.)
- Pilot cars (Caltrans District 1).
- Portable changeable message signs (Caltrans District 10).
- Press releases and flyers (Caltrans District 10).
- Public feedback (Caltrans District 12 and SBCAG).
- QuickMap, a Caltrans online application that displays a map of a user's location along with real-time traffic information, and Google Maps (Caltrans District 10).
- Traffic counts, detector loops and queue monitoring (Caltrans District 12 and SBCAG).

Successes, Challenges and Lessons Learned

Successful Practices

Below is a sampling of the project successes or effective practices used by respondents to develop a TMP that includes a full roadway closure:

- *Communication*. Caltrans District 1 found early discussions with other functional units about the TMP beneficial. Early communication among Project Development Team

(PDT) members was critical to the success of the TMP developed by District 10 for the Old River Bridge Preventive Maintenance project.

- *Decision-Making*. For Caltrans District 12, the effective decision-making practices of design-build forces that allowed for quick decisions using partial data were a key element of the project's success.
- *Lane Closure Review Committee (LCRC)*. A district and headquarters LCRC reviews and approves proposals for the work activities of a TMP's preferred alternative when a major lane closure is required. In lieu of approval, the district LCRC can make recommendations when planned activities are expected to result in significant traffic impacts. The Caltrans District 10 respondent noted that the LCRC process was used to generate the TMP and it "worked very well."

Challenges

The challenges respondents experienced in developing a TMP for a full roadway closure included the following:

- Contractor personnel and providers using local routes and not the prescribed haul routes. To limit this activity, the respondent recommends clearly describing haul routes and parking areas for the contractor (SBCAG).
- Obtaining approvals from local authorities for detour routes (Caltrans District 10).
- Working with the PDT to select the best alternative (Caltrans District 10).

Lessons Learned and Best Practices

Respondents offered recommendations for practitioners preparing to develop a TMP for a full roadway closure:

- Develop detours and obtain local approval (Caltrans District 10).
- Focus on communication:
 - Communicate with owners of all projects within the vicinity to prevent closure conflicts (Caltrans District 11).
 - Engage early and often with local agencies and law enforcement (Caltrans District 12).
 - Work with the public information officer to contact impacted groups (Caltrans District 10).
- Follow TMP guidelines that outline a comprehensive approach to TMP production (Caltrans District 12).
- Gain an understanding of traffic volumes during and around suggested closure times, keeping in mind special events, sporting event schedules, holidays and other events that may impact the suggested times for closure (Caltrans District 11).
- Identify early in the project development process if full closure is needed (District 10).
- Use inspector vehicles to drive and time the detour (Caltrans District 11).

Other Full Roadway Closure Practices

Improving Analysis of Full Roadway Closure Requests

Respondents reporting on a TMP developed for a full roadway closure project were asked about additional resources that might be helpful when analyzing full closure requests.

The SBCAG respondent noted that “SBCAG, in partnership with District 5, funded the traffic simulation analysis using consultants.” Respondents from Caltrans Districts 1 and 10, and the SBCAG respondent, agreed that it would be useful to have a signoff sheet and approval memo agreed to by the design, construction and operations functional units that allows for tracking any changes related to closure options. Other respondents did not respond or said these documents would not be useful.

Coordinating Multiple Full Roadway Closure Projects

The six respondents reporting on a full closure TMP offered little consensus when asked about the possibility of coordinating multiple full closure projects at one time. Below is a summary of respondents’ feedback:

Number of Full Closure Projects at One Time. No respondent recommended a specific limitation on the number of concurrently constructed full closure projects, recommending instead a project-specific examination that ensures projects don’t impact one another and implementing a longitudinal separation.

Distance Between Full Closure Projects. The two respondents who offered a specific distance recommended 1 mile and a minimum of 5 miles, while others recommended formal analysis on a project-by-project basis and consideration of routes that don’t interfere with another full closure project’s detour.

Contractor Availability. All respondents addressing this issue indicated that there are enough contractors to perform multiple full closure projects during the same construction season.

Implementing a Full Roadway Closure Without an Alternate Route

All respondents, including those not reporting experience with developing a TMP for a full closure project, were offered the opportunity to describe agency practices for implementing a roadway closure without establishing an alternate route. Only one respondent provided details of such a closure:

Caltrans District 1. An alternate route may not be established for projects on low-volume routes with limited width. (The respondent offered the following examples of state highways in Humboldt County: HUM-36, HUM-169 and HUM-254; and these examples of state highways in Mendocino County: MEN-1, MEN-162 and MEN-271.) For operations such as drilling, culvert replacement and equipment delivery, the district will use small nightly closure windows (four to eight hours) with contingency plans for emergency vehicles. The district also may use coordinated traffic pass times every two hours.

Only three Caltrans respondents—from Headquarters and Districts 1 and 10—indicated that their units or districts would consider closing a section of significant roadway without providing an alternate route. Other respondents described why their districts or agencies would not use this approach.

Gaps in Findings

Only 10 agencies provided complete or nearly complete survey responses, with just six reporting on TMPs that included a full roadway closure. Respondents provided very little cost information and relatively few details of the TMPs they described. Engaging with selected respondents may elicit additional information if Caltrans elects to make follow-up contacts. Reaching out to nonresponding Caltrans districts and California MPOs to potentially identify other TMPs that included a full roadway closure could provide useful information.

Next Steps

Moving forward, Caltrans could consider:

- Contacting the respondents reporting on TMPs that included a full roadway closure to learn more about how the TMPs were developed.
- Consulting with the respondent from Caltrans District 12 who cited use of the current version of the Full Closure Guidelines to discuss possible changes that could enhance the efficacy of this publication.
- Following up with District 1 to learn more about the district's experience with implementing a roadway closure without establishing an alternate route.
- Requesting copies of the TMPs addressed in this Preliminary Investigation to coordinate an audit of these documents that might shed more light on common themes and practices associated with this type of TMP.

Detailed Findings

Background

Federal Highway Administration and California Department of Transportation (Caltrans) policies require the development of a transportation management plan (TMP) for construction projects requiring planned full roadway closures. Developing a comprehensive guideline to assist with preparation of a TMP to address such closures will help Caltrans determine the scope of a traffic impact analysis that identifies a recommended planned closure alternative and best practices for monitoring traffic during the closure.

Current guidance developed by the Caltrans Division of Traffic Operations was updated in 2014 and includes:

- Project Initiation Phase Full-Closure Checklist (see [Attachment A](#)).
- Full Closure Guidelines (see [Attachment B](#)).

Caltrans is seeking information from California transportation-related agencies that will:

- Inform development of updated guidance for preparing a TMP for planned major freeway closures that identifies the impact to the local and regional area.
- Identify innovative strategies for Caltrans' use in monitoring traffic conditions and reducing traffic congestion during the closure.

To assist Caltrans in this information-gathering effort, CTC & Associates distributed an online survey to the 12 Caltrans districts and planning- or traffic-related contacts at California's 18 metropolitan planning organizations (MPOs) to inquire about respondents' experience with developing TMPs for projects requiring a full roadway closure. Respondents could describe up to two TMPs.

Findings from the survey of practice are presented in this Preliminary Investigation in four areas:

- Survey overview.
- Other full roadway closure projects.
- TMP case studies.
- Other full roadway closure practices.

Survey of Practice

Survey Overview

The online survey sought information about the TMPs developed for projects implementing a full roadway closure in the following topic areas:

- Project description.
- Project data and analysis, including:
 - Comparisons of costs for full and daily closures.
 - Use of vehicle miles traveled (VMT) data in traffic analyses.
 - Use of traffic analysis tools.
 - Need for additional resources when analyzing full closure requests.
 - Use of a Value Engineering Change Proposal (VECP) to evaluate the cost of a staff review.

- Project assessment, including:
 - Use of a public perception survey.
 - Identification of bidding-related issues.
- TMP development, including alternate route planning and traffic management strategies.
- Monitoring traffic impacts, including the tools used and challenges encountered.
- Assessing the TMP, including successes, challenges and key lessons learned.

The survey also addressed other issues related to full roadway closure:

- Improving analysis of full roadway closure requests.
- Coordinating multiple full roadway closure projects.
- Implementing a full roadway closure without an alternate route.

Survey questions are provided in [Appendix A](#). The full text of survey responses is presented in a supplement to this report.

Ten respondents submitted complete or nearly complete survey responses. Respondents from Caltrans Districts 1, 6, 10, 11 and 12 described six TMPs. A representative from Santa Barbara County Association of Governments (SBCAG)—one of two MPOs responding to the survey—described two TMPs. The second MPO respondent, from San Luis Obispo Council of Governments (SLOCOG), and representatives from Caltrans Headquarters and Districts 2 and 9 reported no experience with full roadway closures.

Three respondents provided a brief description of a full roadway closure project but provided no project details. The limited information provided by these respondents appears on page 22.

Transportation Management Plan Case Studies

The eight case studies that follow present selected information about the full closure projects described by respondents:

- Caltrans District 1: State Route 200/299 (SR-200/299) separation project.
- Caltrans District 6: Numerous projects.
- Caltrans District 10: Old River Bridge preventive maintenance.
- Caltrans District 10: Mokelumne River Bridge deck repairs.
- Caltrans District 11: Mid-Coast Corridor transit project.
- Caltrans District 12: Interstate 405 (I-405) improvement project (SR-73 to I-605).
- SBCAG: Linden/Casitas Interchanges in Carpinteria.
- SBCAG: South Coast Highway 101 high-occupancy vehicle (HOV) lanes.

None of the respondents reported experience with the following:

- Reviewing a VECP to evaluate the cost of a staff review.
- Completing a formal survey to assess public perception before and after the full closure. The SBCAG respondent did, however, report meeting multiple times with local public works and elected officials.
- Identifying bidding-related issues.

Only the SBCAG respondent identified the need for additional resources when analyzing full closure requests, noting that SBCAG, in partnership with Caltrans District 5, funded a traffic simulation analysis using consultants.

The case studies below present survey findings in five topic areas:

- Project description.
- Cost comparisons.
- Traffic rerouting and impacts.
- Managing and monitoring traffic impacts.
- Successes, challenges and lessons learned.

Case studies may not include information in all topic areas. Particularly for questions related to costs and staff time, some respondents indicated that the information was not available or the respondent was not responsible for the project.

Caltrans District 1: SR-200/299 Separation Project

Project Description

Caltrans District 1 is planning to raise a bridge on SR-299 in 2021. The project is described in CEQAnet, the California Environmental Quality Act web portal (<https://ceqanet.opr.ca.gov/2019100051/2>):

The 200/299 Separation Project is proposed due to the low vertical clearance of the bridge, which causes extra-legal permit loads to use State Route 200, a narrow winding route, to reach U.S. Route 101. By raising the bridge, this project would improve the movement of extra-legal permit loads.

Table 1 presents project details provided by the respondent.

Table 1. Project Description: SR-200/299 Separation Project

Project Element	Description
Closed Roadway	SR-299
Traffic Routing	U.S. Route 101 and SR-200
Closure Length	0.3 mile
Closure Period	One seven-hour closure anticipated in 2021.
Closure Options	Closure needed to lift a bridge 8 inches at footing; other option was no build. Impacts to drainage prompted a late change during the project approval phase from lowering the roadway to raising the bridge.
Staff Time for TMP Development	0.05 personnel years (PYs)
Closure Proposer	Caltrans Division of Design and Structure Design. (The latter is the project delivery subdivision in the Caltrans Division of Engineering Services.)

Cost Comparisons

The respondent did not provide cost comparison data but noted that this project uses Cost + Time contracting. Under this approach, the respondent thought that, according to North Region policy, the state's working day (WD) estimate is reduced to 70%; Road User Cost (RUC) is set to 0.

Traffic Rerouting and Impacts

A traffic analysis tool was not used to develop this TMP. The district sought to keep the detour on state facilities. Because only one seven-hour closure was needed, the strategy was to avoid the weekday commute, with weekend volumes lower than weekdays. The district also wanted to allow time to address constructability issues, and allow for a Friday or Saturday evening (10 p.m. to 5 a.m.) construction period to identify and address any issues by the Monday morning commute.

The district considered the following traffic management strategies in the TMP:

- Adjacent interchanges.
- Major geometric features.
- Maximum expected queue.
- Temporary traffic control measures.
- Travel time analysis (normal and detour travel time; detour distance).

Project Development Teams (PDTs) worked closely with staff from the design, construction, structures and environmental functional areas to consider traffic impacts.

Managing and Monitoring Traffic Impacts

The construction unit will monitor traffic impacts. The Construction Zone Enhanced Enforcement Program (COZEEP) will be used at each end of the construction site. (COZEEP uses California Highway Patrol units to assist with traffic management in static construction zones.) COZEEP units will be supplemented with pilot cars.

In other monitoring efforts, the district will use Performance Measurement System (PeMS) census stations placed about 3 miles from the construction site in both directions, which will allow for monitoring of traffic data. (PeMS, a consolidated database of traffic-related information collected using Caltrans loop detectors from traffic management centers (TMCs) throughout the state, provides a publicly available online source of historical and real-time traffic data.)

Successes, Challenges and Lessons Learned

The respondent highlighted the significance of partnering with other functional units on the TMP and also noted that early discussions are important. The respondent noted that project development time constraints were due to a swap of project alternatives (from lowering the roadway to raising the bridge) late in the project approval phase.

Caltrans District 6: Numerous Projects

Rather than describing a single full roadway closure project, the District 6 respondent provided general information, noting that the district requires a detour for all full closures. Full closure is decided by the PDT and not based on a TMP. Detours are approved by the Division of Traffic

Operations and submitted with the TMP request. Alternate route planning requires engagement with the local agency affected by the closure.

While the district does not use a traffic analysis tool to develop a TMP, it does complete a VMT calculation using VMT data from the Caltrans traffic census database compiled by Caltrans district offices.

The respondent indicated that the staff time required to develop a TMP for a full roadway closure is no different than the time needed to develop a TMP for any construction job. No additional traffic measuring tools are needed to monitor traffic during the construction period, and no challenges are associated with traffic monitoring “[a]s long as a good detour is available.”

District 10: Old River Bridge Preventive Maintenance

Project Description

Caltrans District 10 is planning to conduct preventive maintenance on the Old River Bridge in 2021. The project appears to be described in CEQAnet (<https://ceqanet.opr.ca.gov/2019058089/2>) under the project name *SJ Bridge Maintenance 1J530*:

The California Department of Transportation (Caltrans) proposes repair to place polyester concrete overlay on the entire bridge decks on some bridges, treat the deck with methacrylate, replace strip seals, joint seals and bridge railings if needed. The purpose of this project is to provide preventive maintenance to the 11 bridges in San Joaquin County on Interstate-5, State Route 4 and State Route 120, at [v]arious post miles.

Table 2 presents project details provided by the respondent.

Table 2. Project Description: Old River Bridge Preventive Maintenance

Project Element	Description
Closed Roadway	Old River Bridge; SR-4, San Joaquin County (SJ-4-0.0)
Traffic Routing	Byron Highway, Mountain House Parkway, Tracy Boulevard
Closure Length	Not provided
Closure Period	Three 55-hour closures; project is planned for construction in 2021.
Closure Options	No build; long-term full closure.
Time Savings	Time savings were not tracked; full closure was approved based on safety reasons.
Staff Time for TMP Development	160 hours (traffic management staff only)
Closure Proposer	Caltrans Division of Design

Cost Comparisons

The respondent did not provide cost comparison data.

Traffic Rerouting and Impacts

No traffic analysis was conducted. The full closure was approved based on safety reasons to avoid having live traffic on the bridge during jacking operations, raising and lowering the bridge, and testing operations. The alternate route planning effort considered truck classification, seasonal operations of the farm community, and city and county concurrence on the detour route.

Managing and Monitoring Traffic Impacts

Managing traffic during the construction period is expected to involve the use of highway advisory radio (HAR), additional portable changeable message signs (CMS), press releases, flyers, COZEEP, Caltrans Highway Information Network (CHIN, an 800 number that provides the public with current highway condition information), contingency plans and delay damage clauses for late pickups.

The TMC is expected to use Google Maps and QuickMap (<http://quickmap.dot.ca.gov/>), a Caltrans online application that displays a map of a user's location along with real-time traffic information, to monitor traffic during the closure. This monitoring will be supplemented by communication with construction staff and the neighboring district, and the use of available CMS and HAR. Monitoring traffic during the full closure period is expected to be made more challenging by an inadequate inventory of closed-circuit TV (CCTV) and CMS in the impact area.

Successes, Challenges and Lessons Learned

The respondent noted that the current Lane Closure Review Committee (LCRC) process was used to generate the TMP and "worked very well." (A district and headquarters LCRC reviews and approves proposals for the work activities of a TMP's preferred alternative when a major lane closure is required. In lieu of approval, the district LCRC can make recommendations when planned activities are expected to result in significant traffic impacts.)

The most challenging aspect of TMP development was obtaining approvals from local authorities for detour routes. Early communication among PDT members was critical to the success of the project.

The respondent recommended the following when developing a TMP for a full roadway closure:

- Identify early in the project development process if full closure is needed.
- Develop detours and obtain local approval.
- Work with the public information officer (PIO) to contact impacted groups.

Caltrans District 10: Mokelumne River Bridge Deck Repairs

Project Description

Caltrans District 10 is planning to repair the deck of the Mokelumne River Bridge in 2021. The project is described in CEQAnet (<https://ceqanet.opr.ca.gov/2020010466/2>):

The California Department of Transportation proposes repairing the Mokelumne River bridge (29-0043) at post mile 0.01 on State Route 12 within San Joaquin County. The scope includes replacing the center bearing with a new bronze disk and steel disk center bearing; rehabilitating the end jack/lock bar system at both ends of the swing span; refurbishing all 4 end jacks of the drawbridge; adjusting the balance wheels and tracks; replacing the pop-up

barrier and swing drive gearbox oil; adjusting the pop-up barrier lids; and repairing the catwalks. The purpose is to repair the damaged drawbridge and make the open-close function fully operable. The project is needed to ensure motorist safety and drawbridge functionality.

Table 3 presents project details provided by the respondent.

Table 3. Project Description: Mokelumne River Bridge Deck Repairs

Project Element	Description
Closed Roadway	Mokelumne River Bridge; SR-12, San Joaquin County (SJ-12-0.0); Project #29-0043
Traffic Routing	Traffic will be detoured using state routes.
Closure Length	1,500-foot bridge
Closure Period	Nine 57-hour closures; project is planned for construction in 2021.
Closure Options	One-way reverse control for 24 hours; full closure for 12 consecutive days at 24-hour shifts; or nine weekends at 57-hour shifts per weekend.
Time Savings	177 working days
Comparison of Project Quality	The scope of work includes concrete curing and setting. It was anticipated that a better product would result from the reduced vibrations associated with minimizing traffic on the bridge.
Closure Proposer	Caltrans Division of Design

Cost Comparisons

Table 4 summarizes the cost-related information provided by the respondent.

Table 4. Cost Comparisons: Mokelumne River Bridge Deck Repairs

Closure Type	Project Cost	Road User Cost	TMP Cost Estimates
Full Closure	\$3.84 million	\$3,138,833	PIO: \$250,000. Portable CMS: \$55,000. COZEEP: \$160,000.
Daily Closure	\$23.31 million	Not available	Not available

Traffic Rerouting and Impacts

SR-12 at this location is a commuter route during the workweek. The closure will only impact traffic during the weekend and for fewer days as compared to daily closures for 200 workdays. The 27-mile detour is expected to lead to a 15-minute delay as compared to 20-minute nightly delays for several months. The full closure was also deemed to have the least impact to water traffic.

The district's traffic management team does not have access to Synchro and VISSIM traffic analysis tools. (Synchro is a macroscopic analysis and optimization software application used

for traffic analysis; VISSIM is a traffic microscopic simulation software program.) The respondent noted that “[b]etter tools to evaluate traffic impacts would be useful.”

The project went through the LCRC review process, and the district coordinated with impacted groups, including the Farm Bureau, Sharpe Army Depot, the school district, emergency services, the neighboring Caltrans district, San Joaquin County, California Highway Patrol and the Coast Guard.

Managing and Monitoring Traffic Impacts

The project is expected to use HAR, permanent and portable CMS, press releases, flyers, COZEEP, CHIN and contingency plans to manage traffic during the construction period. The TMC is expected to use QuickMap, CCTV and CMS in collaboration with the traffic management team. Other monitoring efforts are expected to include communication with the construction inspector, the real estate unit and neighboring TMCs. Construction traffic management and members of the traffic management team will monitor traffic.

The respondent highlighted the following as best practices for monitoring traffic during a full closure:

- Ensure communication among neighboring district TMCs, the PIO, and construction and maintenance staff.
- Develop contingency plans to ensure the closure is opened on time.
- Use additional flaggers and COZEEP to monitor detour routes and the construction zone.

Successes, Challenges and Lessons Learned

Communication during the closure will be important, and the greatest success will be minimizing impacts to the commuters who need to use the impacted road daily. Most challenging for the district was working with the PDT to select the best alternative.

Caltrans District 11: Mid-Coast Corridor Transit Project

Project Description

The Caltrans District 11 respondent reported on this San Diego Association of Governments (SANDAG) project to extend the San Diego Trolley Blue Line. The project is described in CEQAnet (<https://ceqanet.opr.ca.gov/Project/2010051001>):

The project will extend the San Diego Trolley Blue Line from the Santa Fe Depot in Downtown San Diego north to the Old Town Transit Center [OTTC] in University City. Nine new stations (four at grade and five aerial) would be built at the following locations: Tecolote Road, Clairemont Drive, Balboa Ave[nue], Nobel Drive, Veterans Administration Medical Center, University of California San Diego West Campus (now referred to as Pepper Canyon), USCD East Campus (now referred to as Voigt Dr[ive]), Executive Drive and the UTC Transit Center. With this extension, the project would provide for continuous service on the Trolley Blue Line from the San Ysidro Transit Center at the U.S.– Mexico international border to University City. In addition to the 11 miles of new [t]rolley tracks and nine new stations, the project includes upgrades to existing facilities between the Santa Fe Depot and the OTTC, and the acquisition of new [t]rolley vehicles for extended project operation. The project alignment would be located primarily within existing Metropolitan Transit System,

City of San Diego or [Caltrans] right-of-way; along local streets; and within the Los Angeles–San Diego–San Luis Obispo Rail Corridor Agency and I-5 [c]orridors.

Table 5 presents project details provided by the respondent. The respondent noted that he was not involved in development of the TMP. (Follow-up questions about this project may be more appropriately directed to SANDAG.)

Table 5. Project Description: Mid-Coast Corridor Transit Project

Project Element	Description
Closed Roadway	Northbound I-5
Traffic Routing	La Jolla Village Drive
Closure Length	2 miles
Closure Period	10:30 p.m. to 5 a.m.
Closure Options	Short-term full closure; no other options other than full freeway closure to drop falsework.
Closure Proposer	SANDAG

Cost Comparisons

The respondent did not provide cost comparison data.

Managing and Monitoring Traffic Impacts

Inspector vehicles were used to monitor diversion of traffic and queues by driving the detour route several times during peak periods to time traffic and monitor traffic impacts.

Successes, Challenges and Lessons Learned

The respondent recommended gaining an understanding of traffic volumes during and around suggested closure times, keeping in mind special events, sporting event schedules, holidays and other events that may impact the suggested times for closure. He also suggested communicating with owners of all projects within the vicinity to prevent closure conflicts, and using inspector vehicles to drive and time the detour.

Related Resource

Transportation Impacts and Mitigation Report: Mid-Coast Corridor Transit Project, San Diego Association of Governments, September 2014.

https://www.sandag.org/uploads/projectid/projectid_577_25547.pdf

From the introduction: The Draft SEIS/SEIR [Supplemental Environmental Impact Statement/Subsequent Environmental Impact Report] includes an analysis of the affected environment and potential impacts on the social, economic, cultural and natural environment that would result from constructing and operating the alternatives under consideration within the Mid-Coast Corridor. The alternatives being considered and analyzed for potential impacts include a No-Build Alternative and a Build Alternative.

Caltrans District 12: I-405 Improvement Project (SR-73 to I-605)

Project Description

The Caltrans District 12 respondent reported on a project to improve mainline freeway and interchanges on I-405. The project is described in CEQAnet (<https://ceqanet.opr.ca.gov/Project/2009091001>):

Project would improve mainline freeway and interchanges on I-405, adding one general purpose lane in each direction of I-405 and SR-73 to SR-22 East, and a tolled express lan[e] in each direction on I-405 between SR 73 and SR 22 East. The proposed project traverses the cities of Costa Mesa, Fountain Valley, Huntington Beach, Westminster, Garden Grove, Seal Beach, Los Alamitos, Long Beach and the community of Rossmoor.

Table 6 presents project details provided by the respondent.

Table 6. Project Description: I-405 Improvement Project (SR-73 to I-605)

Project Element	Description
Closed Roadway	I-405
Traffic Routing	Various roadways, including Brookhurst and Warner avenues
Closure Length	1 mile
Closure Period	55 hours or weekend
Closure Options	No build and short- and long-term full closure. Also considered were local street alternatives, one-way operations, parking restrictions, law enforcement, traffic signal adjustments and a major public information campaign.
Closure Proposer	Overhead bridge demolition (Caltrans office or division not specified)

Cost Comparisons

The respondent did not provide cost comparison data.

Traffic Rerouting and Impacts

The district used freeway operational analysis to evaluate traffic impacts. Alternate route planning focused on a collaboration with local agencies. The district considered the following traffic management strategies in the TMP:

- Adjacent interchanges.
- Historical crash data within the impact area.
- Level of service estimation.
- Major geometric features.
- Maximum expected queue.
- Temporary traffic control measures.
- Travel time analysis (normal and detour travel time; detour distance).

Managing and Monitoring Traffic Impacts

The traffic measuring tools used to monitor traffic in the impact area included PeMS, traffic counts (manual, local agency and tube), CCTV, detector loops and observation. Among the best practices identified for traffic monitoring were feedback from the public, data on collisions and delays, complaints, and traffic data provided by temporary sensors. The challenges faced by the district during the construction period included cut sensor loops, power shutdowns, DUI and wrong-way drivers, and errant and emergency vehicles.

Successes, Challenges and Lessons Learned

The respondent cited the short response time to incidents and the effective decision-making practices of design-build forces that could make quick decisions using partial data as the project's greatest successes.

The respondent recommends following TMP guidelines that outline a comprehensive approach to TMP production but also noted that experience is "superior for reliability." Agencies are advised to start with six strategies and engage early and often with local agencies and law enforcement. The most critical time for operations staff was during the first month of freeway geometric constraint, which resulted in multiple deaths and a high number of collisions.

Santa Barbara County Association of Governments: Linden/Casitas Interchanges in Carpinteria

Project Description

A November 2019 staff report from the South Coast Subregional Planning Committee of SBCAG describes the Highway 101: Carpinteria to Santa Barbara Project (see the citation in [Related Resource](#) below):

In April 2020, SBCAG and Caltrans will commence construction on the Highway 101: Carpinteria to Santa Barbara Project which will be the first of three construction contracts awarded between now and summer 2021. These projects will result in 7 miles of new HOV lanes and general-purpose lanes, ramp improvements, and new creek bridges, undercrossings and interchanges. \$184 million in funding was received by SBCAG and Caltrans from the California Transportation Commission (CTC) through Senate Bill 1 (SB1) programs.

In planning for the construction of these projects, SBCAG and Caltrans will implement a Transportation Management Program (TMP) to minimize impacts to the businesses and residents, and improve safety for local, regional, and interregional travelers of Highway 101. The TMP also affords services to improve safety for construction crews from Caltrans, agencies, utility companies and the general contractor. SBCAG and Caltrans have partnered on similar TMPs on previous phases of the Highway 101 implementation. We are building off strategies that have worked in the corridor through our public information program, demand management and contracted transit services. Caltrans will also implement key components of the TMP through the existing construction contract.

Table 7 presents project details provided by the respondent.

Table 7. Project Description: Linden/Casitas Interchanges in Carpinteria

Project Element	Description
Closed Roadway	Linden Avenue
Traffic Routing	Casitas Pass Road
Closure Length	0.5-mile bridge over Highway 101; local connection
Closure Period	3 weeks
Closure Options	Partial closure with limited access
Time Savings	40 working days
Closure Proposer	Caltrans Division of Design

Cost Comparisons

The respondent did not provide cost comparison data.

Traffic Rerouting and Impacts

SBCAG used VISSIM simulation software to evaluate traffic impacts. Alternate route planning resulted in routing traffic to the next nearest full-service overcrossing and interchange. The agency considered the following traffic management strategies in the TMP:

- Adjacent interchanges.
- Major geometric features.
- Maximum expected queue.
- Temporary traffic control measures.
- Travel time analysis (normal and detour travel time; detour distance).

The respondent noted that city officials and the public understood the need for full closure with a much shorter window. Provisions were made for bike and pedestrian access, but the construction site was closed to vehicles.

Managing and Monitoring Traffic Impacts

Cameras were used to monitor traffic in the impact area during construction. City and Caltrans inspection and monitoring through field staff were supplemented by neighborhood input.

Successes, Challenges and Lessons Learned

Though the closure wrapped up on time, contractor personnel and providers using local routes and not the prescribed haul routes presented challenges during the construction period. To limit this activity, the respondent recommends clearly describing haul routes and parking areas for the contractor. The respondent also recommends working closely with local agency personnel, and beginning development of the TMP well in advance of the project start date.

Related Resource

Highway 101: Carpinteria to Santa Barbara—TMP, SCSPC Staff Report, South Coast Subregional Planning Committee of the Santa Barbara County Association of Governments, November 2019.

<http://meetings.sbcag.org/Meetings/SCSPC/2019/11%20Nov/Item%206%20Hwy%20101%20A%20to%204C%20TMP.pdf>

This staff report includes discussion of the Highway 101: Carpinteria to Santa Barbara project and identifies the agency's roles, responsibilities and level of funding for the TMP component.

Santa Barbara County Association of Governments: South Coast Highway 101 HOV Lanes

Project Description

This project, a collaboration of Caltrans District 5 and SBCAG, is described on the Caltrans web site (see the citation in Related Resource below):

This project, previously known as the South Coast 101 HOV Lanes Project, would add one high occupancy vehicle (HOV) lane in each direction on US 101 from 0.2 mile south of Bailard Avenue the City of Carpinteria to Sycamore Creek in the City of Santa Barbara. The project is 10.9 miles in length.

Caltrans District 5 is the lead agency for the project. SBCAG is the primary project sponsor. Project partners include the City of Santa Barbara, County of Santa Barbara, City of Carpinteria, SBCAG and Caltrans. The project is funded with Measure A regional sales tax funds, as well as other state and federal funding sources.

The proposed project would add one HOV lane in each direction, resulting in a six-lane freeway within the project limits. A no-build alternative and three build alternatives were considered in the environmental document. The added lanes are proposed part-time HOV lanes, meaning that they will operate as general-purpose lanes during off-peak periods of weekdays and on weekends. Project improvements for all build alternatives are confined primarily to the existing [s]tate [h]ighway right-of-way.

Table 8 presents project details provided by the respondent.

Table 8. Project Description: South Coast Highway 101 HOV Lanes

Project Element	Description
Closed Roadway	Sheffield Drive southbound ramps to and from Highway 101
Traffic Routing	San Ysidro Road and Evans Avenue
Closure Length	0.5 mile
Closure Period	16 to 36 months
Closure Options	Multiple shorter-term closures that would continually change traffic patterns.
Time Savings	13 months
Closure Proposer	Consultant team in conjunction with Caltrans District 5

Cost Comparisons

The respondent estimates that the project as scoped (a single full closure for the project duration) will cost about \$3 million less than using multiple shorter-term closures.

Traffic Rerouting and Impacts

The respondent noted that the Cost + Time strategy was used to evaluate the impact of multiple closures and the impact on staging and time with input from the construction manager/general contractor. VISSIM modeling was used for simulation analysis to evaluate traffic impacts. The evaluation also included an examination of adjacent access points through frontage roads and interchanges.

Managing and Monitoring Traffic Impacts

The agency considered the following traffic management strategies in the TMP:

- Adjacent interchanges.
- Major geometric features.
- Temporary traffic control measures.
- Travel time analysis (normal and detour travel time; detour distance).

Cameras and queue monitoring will be used to monitor traffic during the construction period.

Related Resource

South Coast Highway 101 HOV Lanes, District 5 Current Projects, Caltrans, undated.
<https://dot.ca.gov/caltrans-near-me/district-5/district-5-current-projects/d5-s-coast-us-101-hov-lanes>

This project description includes the following project purpose:

- To reduce congestion, decrease vehicle travel times and to facilitate the flow of goods and services.
- To facilitate a mode shift to carpool, vanpool, and bus travel in the corridor.
- To provide capacity for future travel demand.
- To provide for HOV lane continuity on US 101 in southern Santa Barbara County, as planned for in the 2040 Regional Transportation Plan and 101 in Motion.

Other Full Roadway Closure Projects

Three respondents provided a brief description of a full roadway closure project but provided no project details. The limited information provided by these respondents is presented below.

Caltrans District 7: I-5 Empire/Burbank Project

Roadway Closed: I-5 between SR-134 and SR-170.

Traffic Routing: Freeway-to-freeway detour using Automated Work Zone Information System.

Closure Length: 9.8 miles.

Closure Period: 36 hours.

Closure Proposer: Contractor, Office of Construction and office of district traffic manager.

Caltrans District 9: Cache Creek Bridge Replacement Project

Roadway Closed: SR-58 in Kern County.

Traffic Routing: Sand Canyon Road and on/off ramps.

Closure Length: Less than 1 mile.

Closure Period: Over two years.

Closure Proposer: PDT.

Caltrans District 12: Bridge Girder Repair Project

Roadway Closed: Connector from westbound SR-91 to northbound and southbound SR-57.

Traffic Routing: State College Boulevard and Kraemer Road.

Closure Length: Unspecified connectors.

Closure Period: Seven hours.

Closure Proposer: Caltrans Division of Design.

Other Full Roadway Closure Practices

Improving Analysis of Full Roadway Closure Requests

Respondents reporting on a TMP developed for a full roadway closure project were asked about additional resources that might be helpful when analyzing full closure requests.

The SBCAG respondent noted that “SBCAG, in partnership with District 5, funded the traffic simulation analysis using consultants.” Respondents from Caltrans Districts 1 and 10, and the SBCAG respondent, agreed that it would be useful to have a signoff sheet and approval memo agreed to by the design, construction and operations functional units that allows for tracking any changes related to closure options. Other respondents did not respond or said these documents would not be useful.

While the District 2 respondent did not report on development of a TMP for a full closure project, he commented on activities that can improve outcomes for full closure projects:

Public information campaigns have helped to cover public outreach throughout the duration of projects and worker safety media campaigns have been shown to reduce work zone vehicle collisions, increase [public and worker] safety, and reduce incident-related congestion.

Coordinating Multiple Full Roadway Closure Projects

The six respondents reporting on a full closure TMP were asked to comment on the possibility of coordinating multiple full closure projects at one time. Their responses are summarized below.

Number of Full Closure Projects at One Time

- Instead of identifying a specific number of projects, respondents recommended a project-specific approach that considers the specific situation, location and distance between sites (Districts 1, 10 and 11).
- There are no constraints on the number of projects as long as the closures don't impact one another (District 6).
- While there is no limit on closures, a longitudinal separation is needed (District 12).

Distance Between Full Closure Projects

- Rather than identifying a specific distance between full closure projects, the respondent recommended consideration of routes that don't interfere with another full closure project's detour (District 1).
- Minimum of 5 miles (District 6).
- Distances between full closures should be evaluated for each situation or project. There is no one-size-fits-all solution (District 10).
- Formal analysis rather than establishment of a specific distance should determine full closure project spacing (District 11).
- 1 mile (District 12).

Contractor Availability. All respondents addressing this issue indicated that there are enough contractors to perform multiple full closure projects during the same construction season.

Implementing a Full Roadway Closure Without an Alternate Route

All respondents, including those not reporting experience with developing a TMP for a full closure project, were offered the opportunity to describe agency practices for implementing a roadway closure without establishing an alternate route. Only one respondent provided details of such a closure:

Caltrans District 1. An alternate route may not be established for projects on low-volume routes with limited width. (The respondent offered the following examples of state highways in Humboldt County: HUM-36, HUM-169 and HUM-254; and these examples of state highways in Mendocino County: MEN-1, MEN-162 and MEN-271.) For operations such as drilling, culvert replacement and equipment delivery, the district will use small nightly closure windows (four to eight hours) with contingency plans for emergency vehicles. The district also may use coordinated traffic pass times every two hours.

Only three Caltrans respondents—from Headquarters and Districts 1 and 10—indicated that their units or districts would consider closing a section of significant roadway without providing an alternate route. Other respondents described why their districts or agencies would not use this approach:

- *District 2.* Doing so would likely create liability issues and impact public safety.
- *District 6.* The district might consider such an approach if “there was a good reason or [the] delay was under 30 minutes.”
- *District 9.* The district does not have many alternate routes including local roads.
- *District 11.* The respondent noted that the district is “obligated to provide the traveling public with alternate routes when a roadway is closed.”
- *District 12.* Emergency work sometimes requires full closure for safety and efficiency in opening. Planned closures always provide planned detours.
- *SBCAG.* The respondent noted that “[d]ue to high sensitivity to diverted traffic meandering through residential roads, [an] official detour along local frontage roads is always preferred.”
- *SLOCOG.* Alternate routes for all modes should be developed during the project development process.

Contacts

CTC contacted the individuals below to gather information for this investigation.

Caltrans

Caltrans Headquarters

Dwight Manlulu
Senior Transportation Engineer
916-869-9724, dwight.manlulu@dot.ca.gov

Caltrans District 1

Jamie Lusk
Transportation Engineer, Traffic
Management and Systems Operations
707-445-6419, jamie.lusk@dot.ca.gov

Caltrans District 2

Joe Baltazar
Chief, Office of Traffic Management
530-225-3245, joseph.baltazar@dot.ca.gov

Caltrans District 6

Florencia Allenger
TMP Manager, Traffic Operations
559-860-8433,
florencia.allenger@dot.ca.gov

Caltrans District 7

Daisy Vergara
Senior Transportation Engineer
213-897-4152, daisy.vergara@dot.ca.gov

Caltrans District 9

Garrett Rottner
Transportation Engineer
760-872-2198, garrett.rottner@dot.ca.gov

Lianne Talbot
Traffic Operations Engineer
760-872-0650, lianne.talbot@dot.ca.gov

Caltrans District 10

Evergleen Cara
Traffic Operations
209-948-3902, evergleen.cara@dot.ca.gov

Caltrans District 11

Dan Velazquez
Resident Engineer
858-688-1609,
daniel.i.velazquez@dot.ca.gov

Caltrans District 12

Manuan Kim
Transportation Engineer, Traffic Operations
949-233-3165, manuan.kim@dot.ca.gov

Steven Sowers
Branch Chief
949-697-7783, steven.sowers@dot.ca.gov

California Metropolitan Planning Organizations

San Luis Obispo Council of Governments

James Worthley
Chief, Planning Division
805-788-2002, jworthley@slocog.org

Santa Barbara County Association of Governments

Fred Luna
Director, Project Delivery and Construction
805-456-9362, fluna@sbcag.org

Appendix A: Survey Questions

The following survey was distributed to the 12 Caltrans districts and planning- or traffic-related contacts at California's 18 metropolitan planning organizations to gather information about respondents' experience with developing TMPs for projects that required a full roadway closure. Respondents could describe up to two TMPs.

Caltrans Survey on Transportation Management Plans for Projects Requiring Full Roadway Closure

Note: The response to the question below determined how a respondent was directed through the survey.

(Required) Has your district or agency developed a transportation management plan for a construction project that required a **full roadway closure**?

For **Caltrans district** respondents, we're interested in the full closure of a section of freeway that diverted traffic to local roads.

For **metropolitan planning organization** respondents, we're interested in the full closure of a major roadway that diverted traffic to city streets.

- No (Skips the respondent to **Detour Alternatives**.)
- Yes (Skips the respondent to **Developing a Transportation Management Plan for a Full Roadway Closure**.)

Developing a Transportation Management Plan for a Full Roadway Closure

The following questions address how your district or agency developed a transportation management plan (TMP) for a construction project that required a full roadway closure, and the practices used to monitor traffic in the local or regional impact area during the closure. You'll have an opportunity to describe **two TMPs** developed for projects requiring full roadway closure.

Project 1 Requiring Full Roadway Closure

Project Description

1. Please name the project for which the TMP was developed.
2. Please identify the roadway that was closed.
3. Please identify the local road or city street to which traffic was routed during the closure.
4. What was the length of the closed section of roadway?
5. What was the time period for the roadway closure?
6. Who proposed the full closure?
 - Caltrans Division of Design
 - Cost Reduction Incentive Proposal (CRIP) by the contractor
 - Other (Please describe.)

Project Data and Analysis

1. What closure options are included in the analysis? Select all that apply.
 - No build
 - Short-term full closure
 - Long-term full closure
 - Other (Please describe.)
2. What is the cost difference between the full closure versus the daily closure? Please indicate costs below.
 - Full closure:
 - Daily closure:
3. How much time did the project save by implementing the full closure? Please provide your response in number of working days.
4. What was the Road User Cost (RUC) for the full closure versus the daily closure?
 - Full closure:
 - Daily closure:
5. What was the TMP cost estimate for the full closure versus the daily closure?
 - Full closure:
 - Daily closure:
6. Was the Cost + Time strategy used?
 - No
 - Yes (Please describe the use of this strategy.)
7. Did your district/agency complete an evaluation of project quality that compared the full closure to daily closure?
 - No
 - Yes (Please describe this evaluation.)
8. Did your district/agency complete vehicle miles traveled (VMT) calculations?
 - No (Please skip to **Question 9**.)
 - Yes (Please respond to **Questions 8A and 8B**.)
- 8A. Please identify the source of VMT data. Select all that apply.
 - Performance Measurement System (PeMS)
 - INRIX
 - Caltrans Traffic Census database
 - Manual collection
 - Other (Please describe.)
- 8B. Did your district/agency compare full and daily closures using VMT?
 - No
 - Yes
9. Please describe how the traffic impact was evaluated.
10. Did your district/agency use a traffic analysis tool such as Synchro or VISSIM?
 - No, we didn't use a traffic analysis tool.
 - Yes, we used Synchro.
 - Yes, we used VISSIM.
 - Yes, we used another tool. (Please identify the tool below.)

11. Has your district/agency identified the need for additional resources when analyzing full closure requests?
 - No
 - Yes (Please describe the additional resources needed.)
12. Would it be useful to have a signoff sheet and approval memo agreed to by Design, Construction and Operations that allows for tracking any changes related to closure options?
 - Not applicable
 - No
 - Yes
13. When summarizing overall savings, does your district/agency review a Value Engineering Change Proposal (VECP) to evaluate the cost of staff review?
 - Not applicable
 - No
 - Yes

Project Assessment

1. Did your district/agency complete a survey to assess public perception before and after the full closure?
 - No
 - Yes (Please describe the public's perception of the closure.)
2. Were there any issues with bidders? For example, did your district/agency allow only larger contractors to bid on the full closure?
 - No
 - Yes (Please describe bidder-related issues.)
3. How much more was paid for staff time during the full closure?
4. How many full closure projects can happen at the same time?
5. If more than one full closure project is under construction at the same time, how far apart should each project be?
6. Do you feel there are enough contractors to perform multiple full closure projects during the same construction season?
 - No
 - Yes

Developing the Transportation Management Plan

1. Please briefly describe the alternate route planning effort that produced the recommended alternative for rerouting traffic.
2. What traffic management strategies were considered in the TMP for this project? Select all that apply.
 - Adjacent interchanges
 - Historical crash data within the impact area
 - Level of service estimation
 - Major geometric features
 - Maximum expected queue
 - Temporary traffic control measures

- Travel time analysis (normal and detour travel time; detour distance)
 - Other (Please describe.)
3. How much staff time was required to develop the TMP? **For Caltrans districts:** Please provide your response in personnel years (PYs).

Monitoring Traffic Impacts

1. Please describe the traffic measuring tools, cameras or other types of monitoring equipment used to monitor traffic in the impact area during the construction period.
2. Please describe other monitoring efforts used to monitor traffic in the impact area during the construction period.
3. What best practices did your district/agency identify for traffic monitoring during the full roadway closure?
4. What traffic monitoring challenges did your district/agency encounter in connection with the full roadway closure?

Assessing the Transportation Management Plan

1. What was the greatest success your district/agency identified in connection with developing the TMP for this project?
2. What was most challenging about your district's/agency's efforts to develop the TMP for this project?
3. What best practices do you recommend that other agencies follow when preparing a TMP for a similar project?
4. Please describe the key lessons learned from your agency's planning and implementation efforts.

Note: In the online survey, the question blocks presented above for Project 1 were repeated for Project 2 based on the respondent's reply to the question in **Other Projects Requiring Full Roadway Closure** (see below).

Respondents providing information on two projects were directed to the **Detour Alternatives** section after responding to the questions under Project 2.

Other Projects Requiring Full Roadway Closure

(Required) Our district/agency developed a transportation management plan for a second project requiring full roadway closure.

- Yes (Skips the respondent to **Project 2 Requiring Full Roadway Closure** questions.)
- No (Skips the respondent to the **Detour Alternatives** questions.)

Detour Alternatives

1. Has your district/agency successfully closed a section of significant roadway without establishing an alternate route?
 - No
 - Yes (Please briefly describe the project for which this approach was used.)

2. Would your district/agency consider closing a section of significant roadway without providing an alternate route?
 - Yes
 - No (Please briefly describe why your district/agency would not use this approach.)

Wrap-Up

1. Please provide a link to the TMP and any related documents. Send any files not available online to chris.kline@ctcandassociates.com.
2. Please use this space to provide any comments or additional information about your previous responses.