South Central Fresno Truck Reroute Study

Best Practices Report

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City of FRESNO

San Joaquin Valley AIR POLLUTION CONTROL DISTRICT

ARCADIS

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Introduction & Background

The City of Fresno and the San Joaquin Valley Air Pollution Control District (SJVAPCD) are seeking to develop innovative and implementable mobility solutions and strategies to support the South-Central Fresno community. There is a significant industrial presence operating in the southwest portion of the community, which includes a fossil fuel electric power generation facility along with several other industrial sources. Industrial uses in the South-Central Fresno community have created a high cumulative air pollution exposure burden. This has in turn impacted a considerable number of census tracts that have been designated as disadvantaged communities, as well as sensitive locations including schools, daycares, and hospitals.

The community was prioritized by the San Joaquin Valley's AB (Assembly Bill) 617 Environmental Justice Steering Committee. The San Joaquin Valley has been the focus of numerous air quality studies which lay the necessary foundation for the development of an emissions reduction program in this urban community. The community also has high asthma rates and cardiovascular disease impacts, along with high rates of poverty, unemployment, and linguistic isolation. The Truck Reroute Study will identify, analyze, and evaluate potential strategies that freight impacted communities in the AB 617 area might take in cooperation with the City of Fresno to abate truck impacts. Such truck impacts include air pollution, noise, polluted runoff, traffic crashes, traffic congestion, active transportation conflicts, residential and school impacts, and excess wear for local pavements and bridges.

The overall study will determine whether heavy-duty trucks travelling within the community can be rerouted to reduce the negative effects of excess truck traffic for South-Central Fresno community residents. The purpose of this report is to establish truck rerouting best practices related to safety, environmental impact, and community engagement specific to the South-Central Fresno community. The report also presents relevant case studies that can be utilized to set the foundation for successful implementation of context-specific strategies and improvements.

1 Safety

The safety of both truck drivers and other transportation users, especially pedestrians and bicyclists, is typically a top priority when looking at best practices. A truck reroute study should evaluate the entirety of road conditions, intersections, and potential hazards along the new truck route. Rerouted traffic must be analyzed to ensure that trucks can be accommodated safely, with adequate signage, traffic control measures, and appropriate speed limits. There are many strategies that can be that can be implemented through geometric road improvements, parking and loading, and signage and wayfinding that can enhance the safety of a neighborhood or region.

1.1 Geometric Improvements

Geometric design refers to the dimensions and configuration of the physical features of any given roadway. Geometric improvements can be made to enhance new and existing truck routes, as well as to discourage and/or prevent truck use on non-truck designated streets. There are many geometric design features to consider that relate to truck routing, including turning radii, lane width, sight distance, access management, traffic control, and traffic calming measures.

1.1.1 Turning Radii

The turning radius of a truck defines the minimum dimensions or radius of available space required to make a turn, such as left-turns, right-turns, and U-turns. Establishing minimum turning radii on roadways and intersections is a tool often utilized to minimize the conflict of truck traffic with automobiles, bicyclists, and pedestrians on designated routes.

The *Design and Access Management Guidelines for Truck Routes: Planning and Design Guide (2020)* establishes the minimum turning radii of design vehicles, shown in Table 1 below.

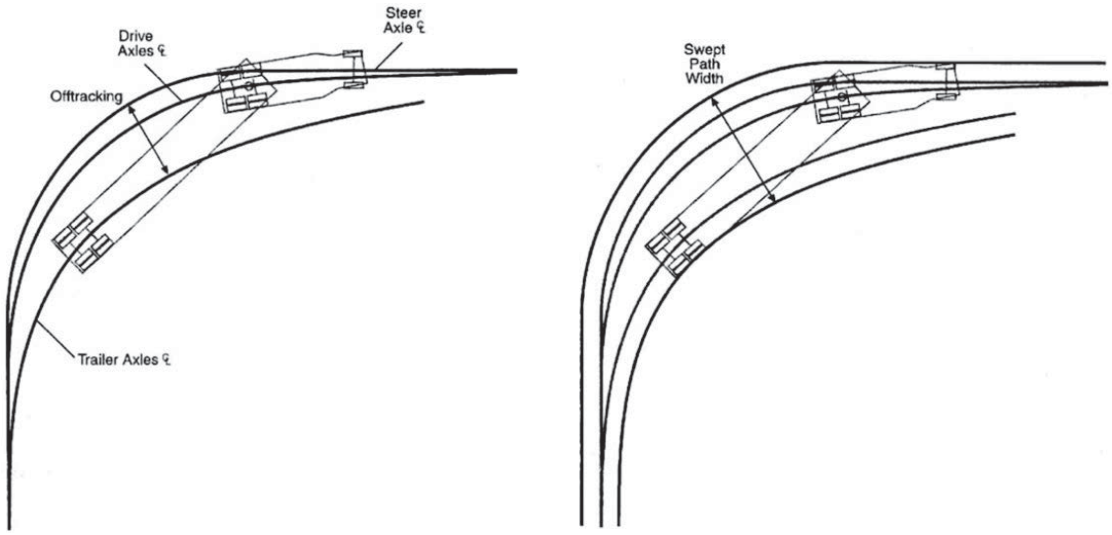
TABLE 1: MINIMUM TURNING RADII OF DESIGN VEHICLES

Design Vehicle Type	Single-Unit Truck		Single-Unit Truck (Three Axle)	Articulated Bus		Intermediate Semitrailer
Symbol	SU-30		SU-40	A-BUS		WB-40
Minimum Design Turning Radius (ft)	41.8		51.2	39.4		39.9
Centerline[a] Turning Radius (CTR) (ft)	38.0		47.4	35.5		36.0
Minimum Inside Radius (ft)	28.4		36.4	21.3		19.3
Design Vehicle Type	Interstate Semitrailer		"Double-Bottom" Combination	Rocky Mtn Double	Triple-Semitrailer-trailers	Turnpike Double-Semitrailer-trailer
Symbol	WB-62*	WB-67**	WB-67D	WB-92D	WB-100T	WB-109D*
Minimum Design Turning Radius (ft)	44.8	44.8	44.8	82.0	44.8	59.9
Centerline[a] Turning Radius (CTR) (ft)	41.0	41.0	40.9	78.0	40.9	55.9
Minimum Inside Radius (ft)	7.4	1.9	19.1	55.6	9.7	13.8

**Design vehicle with 48-ft trailer as adopted in 1982 STAA (Surface Transportation Assistance Act).*
***Design vehicle with 53-ft trailer as grandfathered in with 1982 STAA.*
[a] The turning radius assumed by a designer when investigating possible turning paths and set at the centerline of the front axle of a vehicle. If the minimum turning path is assumed, the CTR equals the minimum design turning radius minus one-half the front width of the vehicle.

Off-tracking refers to the phenomenon where axles or axle sets located towards the rear of a truck do not follow the same path as the front axle. When a truck is traveling at low speeds, particularly at intersections, the rear axles tend to follow a path that is inside the path of the front axles. The space between the innermost and outermost edges of the truck's body during a turn is called the swept path, which is slightly wider than the space between the inside front axle and the outside rear axle. The maximum width of the swept path during a turn is known as the swept path width. In intersection design, both the minimum turning radius and the swept path width are considered to determine if a specific truck design vehicle can navigate through the intersection without encroaching on curbs, shoulders, adjacent lanes, or opposing traffic. Figure 1 shows the general turning maneuver patterns of a 5-axle semi-trailer truck, one of the most prevalent truck found in the AB617 study area.

FIGURE 1: ILLUSTRATION OF TRUCK OFF TRACKING AND SWEPT WIDTH DURING A TURNING MANEUVER



(a) Off tracking (b) Swept Path Width

In many cases, there are intersections along truck routes in where it is challenging to design the intersection in a way that minimizes encroachment on adjacent or opposing lanes without widening the roadway and disrupting the surrounding development. Acquiring additional land and demolishing important community structures solely to accommodate large trucks is not preferred due to its impact on the community and prohibitive cost associated with right-of-way acquisitions. In such situations, there are three alternatives to consider:

1. Reconfigure the intersection to allow trucks to make turns within the current right-of-way.
2. Maintain the current intersection layout and accept occasional instances of trucks encroaching on adjacent or opposing lanes during turns. While this approach may reduce the operational efficiency of the intersection, other drivers can usually adapt to occasional truck encroachments without significant safety concerns. Use of cat tracks or guidelines should be considered with this alternative.
3. If there is a substantial number of large trucks making turning movements that frequently disrupt traffic operations, it may be necessary to consider redirecting truck traffic to different routes.

1.1.2 Lane Width

Lane width relates to the width of a travel lane. The design of truck roadways involves specific lane widths and may include use of barriers to separate truck lanes from other lanes. It is common to have a minimum of two lanes on truck roadways to accommodate passing maneuvers, though capacity analyses can determine if additional lanes are necessary. The FHWA, adopts a total pavement width of the truck roadway consisting of two 13-foot lanes, a 12-foot outside shoulder, and a 6-foot inside shoulder, totaling 44 feet. The pavement itself is constructed with 14-inch thick continuously reinforced concrete on both roadways.

The 2020 Design and Access Management Guidelines for Truck Routes: Planning and Design Guide (2020) provides flexibility in selecting lane widths, particularly for urban arterial streets, allowing for lane widths ranging from 10 feet to 12 feet. Many transportation agencies are opting for narrower lanes (10-11 feet) to accommodate additional features like medians, turn lanes, bicycle lanes, and shorter pedestrian crossings. However, due to the width of large trucks (up to 8.5 feet or 10.5 feet including mirrors), wider lanes are preferable on truck routes. Providing 12-foot lanes on truck routes or using differential lane widths, with a 12-foot outside or curb lane and narrower center or left lanes, is recommended.

1.1.3 Sight Distance

Sight distance refers to the length of the road visible to a driver, unobstructed by any physical obstacle. Roadways should be designed to provide sufficient sight distances for drivers, and to perceive potential hazards and act if needed to avoid conflicts. Drivers should have sufficient unobstructed views at intersection approach from all directions. At mid-block road segments unobstructed sight distance allows drivers the opportunity to see other vehicles entering their lane and stop in time to avoid collision. Conversely, appropriate sight distance allows stopped drivers to see vehicles approaching, and make informed decisions on the best time to enter the roadway safely.

When looking left and right, a sight triangle is formed, which is the total unobstructed view of an oncoming intersection. Longer curb turn radii can have an impact on intersection sight distance by moving the stop line further from the curb line, potentially reducing visibility.

The Design and Access Management Guidelines for Truck Routes: Planning and Design Guide (2020) outlines design criteria for intersection sight distance (ISD) and provides seven cases based on the type of traffic control. For three of these cases (B, C, and F) involving truck acceleration, alternative parameter values are considered for trucks. The sight distances for these cases are based on a gap-acceptance model, with increased gap values of 2 seconds and 4 seconds for single-unit trucks and combination trucks, respectively. Case B specifically addresses accommodating trucks at intersections with stop-control on the minor road, emphasizing the necessary sight distance for a 73.5-ft truck to cross a set of tracks from a stopped position. It highlights the distance between the grade crossing and adjacent intersections, which should allow trucks to pass through both without stopping, and the vertical profile of the crossing, ensuring trucks can traverse it without contacting the road surface.

1.1.4 Access Management

Access management is the method to allow or restrict specific types of vehicles from utilizing a roadway, using a number of strategies. The objective is to enable access to specific land uses while maintaining roadway safety through controlling access location, design, spacing, and operation.

Access management features include preventing left or right turns at intersections, or clearance bars so trucks are deterred from taking non-truck routes.

Within access management, truck routes must be identified that provide efficient access to freight facilities, such as ports, rail yards, intermodal terminals, and distribution centers. This ensures that truck routes are optimized to support the freight network and effective cargo movements.

Alternatively, other streets must be identified that restrict access to trucks, such as those that connect to residential neighborhoods.

For truck routes, considerations should be made for evaluating the capacity and condition of transportation infrastructure, including roads, bridges, and other crucial components. Recognizing sections that may necessitate enhancements or maintenance to support the movement of heavy truck traffic effectively and prevent any disruptions.

Time-of-day restrictions should be considered, particularly in congested areas. Some municipalities enforce restrictions on truck traffic during certain hours to minimize congestion and improve safety. Planning routes to avoid these restricted periods whenever possible and promoting off-peak delivery schedules can help minimize truck traffic during peak residential hours, thus reducing the impact on residents and improving overall traffic flow.

To address concerns in residential areas, restrictions on truck traffic can be implemented to minimize noise, congestion, and potential safety issues for pedestrians and residents. This can involve measures such as weight restrictions, time-of-day restrictions, or even outright bans on truck traffic in residential zones. By implementing these restrictions, the aim is to create quieter and safer environments for residents while ensuring smooth traffic flow on designated truck routes.

FIGURE 2: DIVIDERS RESTRICTING A LEFT TURN

FIGURE 3: CLEARANCE BAR

FIGURE 4: SINAGE DENOTING RESTRICTED TRUCK ACCESS

1.1.5 Traffic Control

Traffic control deals with the use and manipulation of traffic control devices. Controlling traffic helps establish a high efficiency for truck routes, while limiting the effectiveness for trucks on non-truck routes.

Traffic control includes elements for signalized and non-signalized intersections. For signalized intersections, traffic control devices included signal improvements, such as timing, signal synchronization, and traffic phasing. For non-signalized intersections, stop signs, yield signs, and two-way stop intersections all help orchestrate traffic. These traffic control devices all help to improve truck flow on identified truck routes. In turn, traffic control can help steer truck drivers away from non-truck routes by establishing new stop signs, adding mid-block crossings, changing traffic phasing, and more.

FIGURE 5: TRAFFIC CONTROL STOP SIGN

1.1.6 Traffic Calming Measures

Traffic calming measures are used to slow down or disincentivize truck traffic on specific streets. When implementing truck traffic calming measures to restrict trucks from using certain streets, several strategies can be considered. It is important to first identify streets that are suitable for traffic calming measures. These candidate roadways are often seen as a shortcut to a designated truck route, but are not designated as they often connect to sensitive land uses.

Once candidate roadways are identified, measures such as speed bumps, roundabouts, chicanes, or narrower lanes, can be employed to reduce truck speed, encourage safer driving behavior, or reroute truck traffic altogether. Slower speeds not only mitigate noise levels but also enhance safety for residents.

Speed bumps are one of the most common and recognizable features, and are common in residential areas and locations with a high number of pedestrians or vehicle turning movements.

Speed bumps reduce vehicle speeds and are restrictive to trucks often are most efficient maintaining constant speeds. Speed bumps are the easiest less cost prohibitive way to slow vehicles in between intersections.

Roundabouts are located in the center of intersections to promote a continuous, circular flow of traffic without stopping. Roundabouts are typically located in residential neighborhoods, but can also be present on higher speed roadways that have little cross-traffic interference. In certain circumstances, roundabouts are restrictive to trucks because of the tight radius and accurate turning movements necessary to operate within a roundabout intersection. Roundabouts are the best solution to slow vehicles at an intersection.

A chicane is a designed serpentine curve in a road, added via striping, bollards, or medians. Chicanes add extra turns to slow traffic for safety purposes. The curved nature of a roadway with chicanes is restrictive to trucks due to the number of turning movements required to operate. Chicanes are the best solution in roadways with significant width, have too many lanes for the roadway's purpose and level of traffic, or do not have existing street parking.

Narrow lanes help promote slower driving speeds due to the level of accuracy needs to drive, which helps reduce the number and severity of crashes. Narrow lanes are common in residential areas and in locations with a high number of pedestrians. Narrow lanes are quite restrictive to trucks as the lane width would be not significantly wider than the width of the truck itself. Narrow lanes are a good solution in denser, street-facing commercial areas, areas looking to better accommodate alternative modes of travel, and in locations where driver awareness needs to be prioritized.

FIGURE 6: SPEED BUMPS

FIGURE 7: ROUNDABOUT

FIGURE 8: CHICANES

FIGURE 9: ROAD NARROWING

1.2 Parking & Loading

Insufficient truck parking can lead to various issues, including increased congestion, safety hazards, and driver fatigue. To address these concerns, it is crucial to identify rest areas, truck stops, and designated parking areas along the route.

Providing appropriate places for truck drivers to rest is essential for their well-being and compliance with hours-of-service regulations. Rest areas offer facilities specifically designed to accommodate trucks and provide drivers with spaces to park and rest. Truck stops are commercial facilities that cater to the needs of truck drivers, offering fuel, food, restrooms, and parking. Designated parking areas, which can include parking lots or dedicated spaces, ensure that drivers have suitable places to park their vehicles safely.

By considering the availability of truck parking, planners and stakeholders can mitigate potential problems caused by inadequate parking. It allows for better management of truck traffic, reduces congestion, enhances road safety, and promotes driver well-being by preventing fatigue. Adequate truck parking infrastructure is crucial for supporting the efficient and safe operation of the trucking industry and maintaining the integrity of the transportation network.

Loading

Trucks often need to make pickups and deliveries along roads and streets where off-road loading and unloading areas are unavailable. Transport agencies have the option to establish roadside loading zones and mark them according to the FHWA guidelines. Due to the growing demand for truck deliveries driven by e-commerce, companies are adopting strategies such as off-peak or nighttime deliveries to minimize their impact on traffic, pedestrians, and cyclists. However, challenges arise, including the need for receivers to staff up during non-business hours, availability of truck staging parking, and increased costs due to added waiting time.

When planning bicycle lanes, it is important to consider frequent truck delivery locations to avoid conflicts. Trucks require more space to maneuver and have different operational characteristics, necessitating specific site layout considerations. Different types of sites, such as shopping centers, industrial areas, and urban cores, each have unique characteristics that impact truck operations and usage. The site layout should support efficient circulation and accommodate truck-specific needs, including wider lanes, larger turning radii, and storage areas for queuing without obstructing traffic or pedestrians.

Furthermore, there is a nationwide shortage of truck parking places for rest. Drivers must find parking within specific time limits to comply with hours-of-service regulations. Illegal parking on highway shoulders or ramps has become a preferred option for some drivers. While the responsibility for resolving the parking shortage lies with commercial facilities, collaboration between transportation agencies and commercial operators is needed to address this issue and mitigate its undesirable effects on the highway system.

City of Oakland Truck Management

The West Oakland Truck Management Plan (TMP) encompasses several measures to address truck-related challenges in the city. It proposes the establishment of new truck parking locations, the prohibition of parking in heavily populated areas, the elimination of unattached trailer parking, and

the creation of truck-prohibited streets and new truck routes. These strategies collectively aim to improve traffic flow, reduce congestion, enhance safety, and create a more organized and efficient trucking environment in Oakland.

Firstly, it suggests the establishment of new truck parking locations to ensure sufficient parking availability for trucks. By identifying and designating these areas, the plan aims to alleviate congestion and safety hazards caused by trucks parking in inappropriate locations. This step is crucial in promoting efficient traffic flow and reducing the risks associated with improper parking.

Additionally, the plan focuses on regulating truck parking in heavily populated areas. It prohibits parking in these areas to minimize disruptions to residents and businesses. To provide clarity and guidance, the plan suggests implementing signage explicitly allowing truck parking in designated areas. This approach helps drivers identify appropriate parking spots, reducing confusion and improving compliance with parking regulations.

Furthermore, the plan aims to address unattached trailer parking by implementing a city-wide prohibition. This measure seeks to eliminate the issue of unattended trailers occupying parking spaces unnecessarily and obstructing traffic flow. By strictly outlawing unattached trailer parking, the plan aims to create a more organized and efficient parking environment throughout the city.

Lastly, the plan proposes the creation of truck-prohibited streets and new truck routes. This initiative aims to optimize traffic flow by diverting trucks away from congested areas or sensitive locations. By designating truck-prohibited streets and establishing new truck routes, the plan seeks to improve overall traffic safety, reduce congestion, and enhance the quality of life for residents in affected areas.

1.3 Signage & Wayfinding

Clear and visible signage along truck routes guides drivers and provides information about restrictions, turns, and access points. Wayfinding measures help drivers navigate the City and reduce the likelihood of trucks getting lost or entering restricted areas. These measures improve navigation and overall safety for truck drivers.

To enhance truck routing and improve efficiency, several key strategies can be implemented. First, the use of GPS systems and advanced routing software designed for commercial vehicles can optimize routes by considering factors such as truck specifications, weight restrictions, road conditions, and traffic patterns. These tools ensure that the most efficient and safe routes are generated.

Monitoring and updating routes in real-time is crucial. By incorporating real-time traffic information and incident alerts, adjustments can be made on-the-fly to avoid congestion or delays. Regular review and updates should also be conducted to account for changes in infrastructure, road conditions, or traffic patterns.

Periodic review and optimization of truck routing plans help identify areas for improvement. Analyzing data on travel times, fuel consumption, and other relevant metrics can provide insights into efficiency. Utilizing route optimization software and algorithms based on current data can further enhance routing efficiency.

U.S. Department of Transportation GPS Visor Card

Not all GPS systems are suitable for commercial trucks and bus drivers, as they may not provide crucial route restrictions and information. Using the wrong GPS system can lead to costly mistakes, such as encountering low bridge overpasses or other route restrictions that can result in delays, additional expenses, and potential safety hazards. Therefore, it is essential for professional truck and bus drivers to select a GPS navigation system specifically designed for their vehicles.

To ensure safe and efficient navigation, drivers should input accurate vehicle information, including length, width, height, axle weights, and any hazardous materials being transported. It is important to follow the recommended route provided by the GPS system, while also obeying traffic signs and advisories that may include additional restrictions not indicated by the navigation system. Drivers should avoid distracted driving by refraining from typing or entering information into the GPS while driving. Additionally, keeping the GPS maps updated regularly is crucial to access the most current and accurate route planning information. By following these tips, commercial truck and bus drivers can enhance their safety and efficiency on the road.

2 Environmental Impact

The environmental impact of truck routing is important now and in the future. Trucks are a mobile source for greenhouse gas emissions, including carbon monoxide, hydrocarbons, nitrogen oxides, and particulate matter (PM) 2.5. Reducing truck operation in residential and other sensitive areas is critical to support community heath. There are two methods to reduce the environmental impact of trucks, either through existing truck route improvement or rerouting.

2.1 Route Improvement

Route improvement relates to improving an existing truck route in way to reduce the environmental impact on the adjacent community. The environmental impact can include emissions pollution, noise pollution and more.

2.1.1 Emissions Reductions

To reduce emissions from trucks operating in residential areas, it is important to implement and enforce stringent emission standards. Regular vehicle inspections should be conducted to ensure compliance with these regulations and identify any high-emitting vehicles. Encouraging regular maintenance and upgrades is crucial to ensure trucks operate efficiently and produce fewer emissions.

Integrating green infrastructure elements into truck routes in residential areas, such as planting trees and vegetation, can help mitigate air pollution, dampen noise, and enhance the overall environment. Additionally, promoting the use of alternative fuel vehicles like electric or natural gas-powered trucks can be incentivized. These vehicles emit fewer pollutants and contribute to improved air quality in residential areas. By combining these strategies, it is possible to reduce emissions from trucks, enhance air quality, and create more sustainable and pleasant residential environments.

To reduce diesel pollution and associated health impacts, several best practices can be implemented. The key practices include decreasing the average age of the fleet, reducing idle and creep time, participating in the EPA SmartWay Program, considering complementary rail operations, and designating truck routes that avoid at-risk populations.

Lowering the average age of the fleet by replacing older trucks with newer models equipped with improved emission control technologies is an effective way to reduce pollution. Proper maintenance and selecting trucks with aerodynamic features and low rolling resistance tires also contribute to fuel efficiency and emissions reduction. Installing diesel oxidation catalysts and low-rolling resistance tires can be considered for older trucks that will not be replaced.

Minimizing idle and creep time helps reduce air pollution and save fuel. Strategies such as appointment systems, automated gates, extended gate hours, and off-peak operations can be employed to decrease truck turn times, emissions, and congestion at ports. Participation in the EPA SmartWay Program enhances efficiency, fuel economy, and competitiveness. Ports can also explore complementary rail and marine operations, which utilize energy-efficient modes of transport and alleviate emissions and congestion.

Designating truck routes that avoid residential areas and at-risk populations is crucial for mitigating air pollution and improving safety. Collaborating with community leaders and implementing physical barriers like sound walls and vegetative barriers can further reduce exposure to air pollutants. Evaluating existing and alternative truck routes, considering distances to sensitive locations, and consulting air quality experts can guide decision-making.

By adopting these best practices, cities can significantly reduce diesel pollution, improve air quality, and protect the health of nearby communities while maintaining efficient operations.

2.1.2 Noise Reductions

To minimize the impact of truck traffic noise on residents, noise reduction measures can be implemented. These measures aim to mitigate the noise generated by trucks and improve the quality of life for nearby residents. Strategies include installing noise barriers along truck routes, implementing restrictions on engine braking, and establishing regulations for truck noise levels, especially during nighttime hours.

The implementation of noise barriers along truck routes can act as physical barriers that block or absorb the sound, reducing the noise reaching residential areas. This helps to create quieter environments for residents living near truck routes. Additionally, restrictions on engine braking, which involve using the vehicle's engine to slow down instead of traditional braking methods, can help minimize noise disturbances caused by the loud noise produced during braking.

Regulations for truck noise levels, particularly during nighttime, can limit the maximum noise trucks can emit. These regulations can be enforced through sound monitoring and compliance checks to ensure that trucks adhere to the specified noise standards. By implementing these measures, the impact of truck traffic noise on residents can be significantly reduced, leading to improved living conditions, and increased overall community satisfaction.

2.2 Rerouting

In some cases, existing truck routes can be changed to other roadways, bypassing residential and other sensitive areas. Rerouting trucks away from these areas may reduce the extent of air emissions and pollution in sensitive areas, improving community health and quality of life. The environmental impacts may be weighed against longer truck travel times if the reroute is more circuitous to a truck's final destination. When rerouting a truck route, the selected route must maintain proper capacity. In addition, proper compliance and enforcement is necessary to ensure that truck drivers utilize the new route.

2.2.1 Infrastructure Capacity

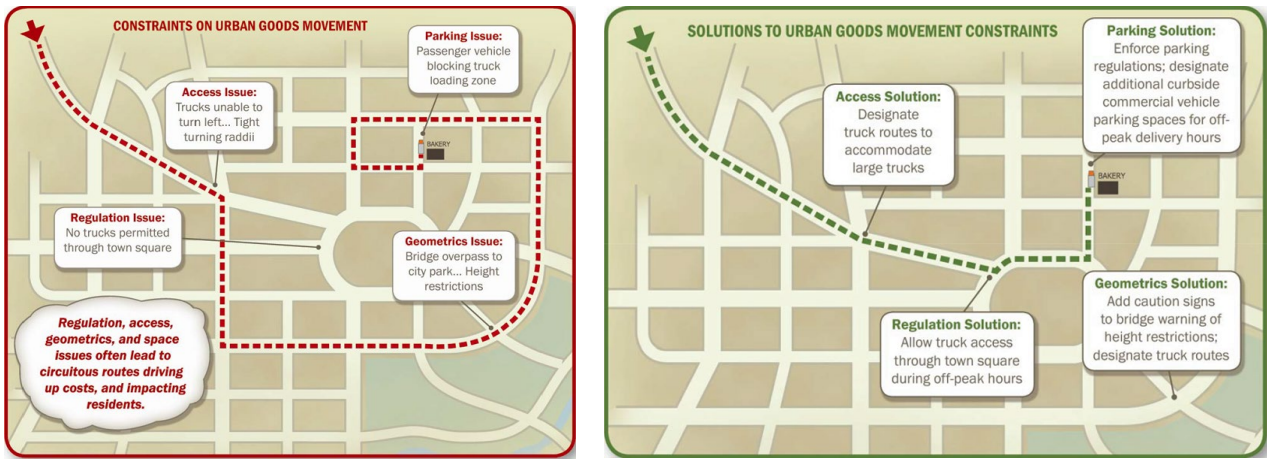
Roadway infrastructure must be suitable on selected reroute corridors. The selected roadway must be designed to accommodate heavy commercial vehicles, with weight limits, wider lanes, and suitable turning radii. The route should avoid low bridges, weight restrictions, and other physical limitations. The route should also avoid sensitive receptors, such as schools, hospitals, and residential areas, to reduce negative impacts.

The increase in truck traffic on a chosen reroute corridor must also be studied. The roadway must have capacity to accommodate an increase in truck traffic. A traffic study may be necessary to

ensure that the reroute maintains a high level of service on all corridors, and that total community VMT remains the same or is reduced.

The U.S. Environmental Protection Agency created a truck reroute scenario that aims to identify common constraints and solutions in truck rerouting. These include constrains and solutions related to access, regulations, geometrics and turning, and parking. A truck reroute aims to create better outcomes that benefit both truck driers and the community.

FIGURE 10: EXAMPLES OF TRUCK ROUTE ACCESS



Source: EPA

2.2.2 Compliance & Enforcement

Enforcement and compliance play a crucial role in ensuring the effectiveness of truck route regulations. Establishing clear mechanisms for enforcement and penalties for non-compliance helps maintain order and safety on the roads. City staff and relevant stakeholders work closely with law enforcement agencies to ensure adherence to the established rules and regulations, aiming to deter violations that could jeopardize safety or disrupt communities.

By outlining enforcement mechanisms, such as regular patrols and inspections, authorities can actively monitor truck routes and identify any instances of noncompliance. This proactive approach helps to maintain the integrity of the regulations and mitigate potential risks associated with noncompliant behavior. Penalties for violations are established to discourage non-compliance and reinforce the importance of adhering to the designated truck routes.

Collaboration with law enforcement agencies is vital to effectively enforce truck route regulations. Working hand in hand, city staff and law enforcement officials can share information, coordinate efforts, and take appropriate action against violations. This joint approach enhances the ability to identify and address non-compliance, ensuring truck operators follow the prescribed routes and guidelines.

3 Community Engagement

3.1 Involvement Methodology

Truck reroute studies are complex endeavors that require careful consideration of several factors, including community impact, road safety, and logistical efficiency. To ensure a comprehensive and context-sensitive approach, involving the public at every step of the study becomes crucial. This report outlines a typical involvement methodology employed in a truck reroute study, emphasizing the active participation of the public. By seeking public input, sharing ideas and plans, and providing opportunities for feedback and decision-making, this methodology aims to develop context-sensitive solutions that address community concerns and promote collaboration.

Public Meetings

Public meetings are conducted as an integral part of the involvement methodology in a truck reroute study. These meetings provide a platform for the community to express their opinions, concerns, and suggestions regarding the proposed rerouting plans. By involving the public from the preliminary stages, project organizers can gain valuable insights into the potential impacts and identify community-specific needs. These meetings allow for open discussions and help in building trust and understanding between stakeholders and the community. The input gathered during these meetings forms a foundation for decision-making, ensuring that community voices are considered throughout the study.

Community Activities

Community activities serve as another avenue for engaging the public in a truck reroute study. These activities can include workshops, information sessions, or interactive displays where project organizers share their ideas, concepts, and potential solutions with the community. By presenting the underlying rationale and alternative routes, project organizers foster transparency and educate the public about the study's goals and objectives. This facilitates a better understanding of the potential benefits and challenges associated with the rerouting plans. Furthermore, community activities encourage dialogue and provide an opportunity for individuals to ask questions, provide feedback, and contribute to the development of context-sensitive solutions.

Public Input Surveys

To ensure broader community participation and gather diverse perspectives, surveys are distributed to the public as part of the involvement methodology. Surveys provide a structured format for individuals to provide their input on specific aspects of the reroute study, such as preferred alternative routes, potential mitigation measures, or concerns about specific areas. These surveys help project organizers collect quantitative data, identify trends, and gain insights into the community's priorities and preferences. Moreover, involving the public in the decision-making process, an official plan is formulated and shared for their review and approval. This empowers the community by allowing them to vote on the plan before it gets put into effect, ensuring that their opinions and interests are duly considered.

The involvement methodology of a truck reroute study emphasizes the active participation of the public at every step. By holding public meetings, sharing ideas and plans at community activities, and providing surveys for input and decision-making, the study seeks to develop context-sensitive solutions that address community concerns. This methodology promotes transparency, trust, and collaboration between project organizers and the public. By actively involving the community, their valuable insights contribute to the creation of a more inclusive, informed, and acceptable rerouting plan. This involvement methodology ensures that the public leads the way in shaping the study's outcomes and facilitates the development of solutions that are aligned with community needs and priorities.

3.2 Training & Education

Training, educating, and providing accurate information to truck drivers in truck reroute studies are vital elements for success. By investing in comprehensive driver training programs, road safety is maximized and accidents are minimized. Equipped with knowledge about rerouting initiatives, drivers can adapt efficiently to changes, optimizing their routes and contributing to efficient supply chain management. Furthermore, education fosters collaboration, enabling drivers to understand the wider benefits of rerouting and actively support these initiatives. By prioritizing the training, education, and informed involvement of truck drivers, we can achieve safer roads, efficient transportation systems, and successful implementation of truck reroute studies.

Comprehensive training programs for truck drivers are paramount for promoting road safety. Large commercial vehicles require specialized skills to operate safely and maneuver through various road conditions. Proper training equips drivers with the knowledge and techniques necessary to handle these vehicles responsibly. By integrating defensive driving practices, awareness of blind spots, and adherence to traffic regulations, trained drivers contribute to a safer road environment. In the context of a truck reroute study, where drivers may encounter unfamiliar routes or altered traffic patterns, this training becomes even more crucial. Well-trained drivers can adapt more effectively, minimizing the risk of accidents, ensuring their safety, and that of other road users.

Effective training and education for truck drivers can significantly impact the efficiency of supply chains. Knowledge of logistics principles, route planning, and familiarity with alternative routes allows drivers to navigate rerouting with minimal disruption. By understanding the goals and objectives of a truck reroute study, drivers can proactively adapt their schedules and select optimized routes, reducing delays and ensuring timely deliveries. The ability to anticipate challenges, such as road closures or congested areas, enables drivers to make informed decisions, improving overall supply chain efficiency. Professionally trained drivers contribute to the smooth operation of businesses, minimizing financial losses, and maintaining customer satisfaction.

Educating truck drivers about the purpose and details of a truck reroute study promotes collaboration and support for such initiatives. By providing drivers with accurate information about the study's goals, expected changes in traffic patterns, and alternative routes, a sense of shared responsibility and understanding is fostered. Drivers become aware of the broader benefits that rerouting can bring, such as reduced traffic congestion and improved road infrastructure. This knowledge encourages drivers to actively participate, comply with rerouting instructions, and contribute to the success of the study. Additionally, transparent communication channels between stakeholders and drivers can address concerns, gather feedback, and foster a cooperative relationship throughout the rerouting process.

4 Case Studies

4.1 Wilmington, CA

Published in 2021, the Wilmington Freight Mitigation Study assessed the impacts of increased truck travel on a disadvantaged community in the Wilmington area of Los Angeles, and recommended traffic and general land use mitigations to improve quality of life for residents in this community. The study focused on the permanent closure of two private railroad crossings, which exacerbated already high levels of truck traffic in the residential area.

The study included literature and data review, stakeholder involvement, opportunity and vulnerability assessment, and preliminary mitigation measure recommendation. Project goals, objectives, and performance measures were also established to bring value into the planning process and allow for a balanced review of conditions, needs, and solutions, which helped inform the development of mitigation measures in Wilmington. Project goals included:

- Reduce truck and train conflicts and reduce truck intrusion into the adjacent disadvantaged community
- Develop design treatments within the existing right-of-way to accommodate safe and efficient goods movement
- Provide design treatments for multimodal, complete, and safe streets

Performance measures, or metrics, were identified on which to base potential mitigation measures upon, which correspond to with Los Angeles Department of Transportation's (LADOT) mobility initiatives. These include:

- Accessibility
- Safety and Comfort
- Culture and Community
- Equity and Transparency
- Level of Service and Delay
- Congestion and Queuing

In addition to these primary metrics, additional impacts related to traffic diversion, parking loss, noise, or potential environmental concerns were considered.

Extensive stakeholder input included two rounds of one-on-one interviews, two rounds of focus group discussions, a community meeting, an online briefing, a pop-up event, two technical working group meetings, as well as communications with trucking companies, local and regional agencies, businesses, community stakeholders, and representatives from the disadvantaged communities.

In total, nine mitigation measures are recommended, while some measures have multiple alternatives. Mitigation measures included a mix of turning radii improvements, truck restriction improvements (roadway narrowing, roundabouts/ traffic circles, clearance poles, medians), intersection signalization and reconfiguration, enforcement, signage, and striping. To ensure proper

use of designated truck routes, recommendations are noted for roadway extensions for new truck routes, and roadway widening on designated routes consistent with city-planned network buildouts.

4.2 West Oakland, CA

The West Oakland Truck Management Plan (TMP) is a 2019 action-based plan designed to reduce the effects of transport trucks on local streets in West Oakland. The TMP aims to reduce truck traffic and parking in residential areas, improve safety for active transportation users, reduce truck nuisance, and improve the quality of life of people living and working in West Oakland.

The scope of the plan included establishing TMP goals, technical study and analysis, extensive public engagement, truck management strategies, along with an implementation approach. TMP goals included:

- Reduce disruptions from truck circulation and truck parking on residents and businesses in West Oakland.
- Increase safety along designated truck routes.
- Have truck drivers know preferred routes to reach their destinations and know the City's parking restrictions.
- Monitor TMP implementation and modify implementation strategies to improve outcomes as needed.

Public engagement was obtained through a series of five stakeholder workshops, as well as one-on-one meetings, presentations before community and business associations, and surveys.

The West Oakland TMP established ten strategies within three distinct groups to address safety concerns at key intersections on truck routes near the Port, keep trucks on designated truck routes and restrict trucks from prohibited streets, and lastly, address truck and trailer parking by improving enforcement and changing regulations.

Pedestrian and bicycle safety is planned through new high-visibility crossings, pedestrian/bike signals, traffic signal improvements, improved signage and pedestrian refuges, and accommodation of safe truck turning movements. The City of Oakland will also develop and communicate preferred truck routes to businesses in West Oakland to minimize driving on residential streets. After implementation, targeted enforcement is recommended as necessary to address problem areas where trucks continue to drive on non-truck route streets. Specific streets have been identified as candidates to be added to the Truck Prohibited Street network, and for specific streets remove inconsistencies in truck route designation. The TMP also aims to create a coherent system of truck route signage by using larger or different sign types in key locations. The TMP calls for improved enforcement training of illegally parked trucks with increased fines, and updated parking restrictions to better match the new truck route network.

4.3 Atlanta, GA

The 2010 Atlanta Strategic Truck Route Master Plan (ASTRoMaP) designed a truck route system in greater Atlanta to provide regional truck access that will guide current and future decision making. ASTRoMaP, which builds from efforts in 2008 culminating in the Freight Mobility Plan, identifies preferred routes and develops strategies to support the efficient movement of truck traffic without disproportionately impacting existing communities, the environment, or the transportation network. Four objectives were established for this plan:

- Collect and analyze data pertinent to the status, condition, and suitability of all routes within the previous 2008 plan.
- Develop the specific route network into a grid system spanning the metropolitan region, considering the physical characteristics of the roadways alongside recommendations from stakeholders. Stakeholders were to fall broadly into three groups: public sector, private sector, and local communities.
- Identify and organize a series of "best practices" to guide future access management policies.
- Identify and evaluate projects to enhance the utilization of existing roadways as designated within the truck route plan

The focus of the plan was on cross-town travel, including corridors within the metro region that connect to economic centers and beyond greater Atlanta. Local jurisdictions had taken the lead in assigning polices for local truck routes.

The project incorporated extensive outreach programs within the public sector (nineteen jurisdictions), the private sector, and the communities. Outreach consisted of in-person meetings and interviews, presentations, and community meetings in freight-sensitive areas. The approach also consisted of an environmental justice/ land use review, needs assessment, criteria scoring, system identification and evaluation, and recommended strategies.

Strategies highlighted best design principles, while also recommending specific locations for design treatments. Strategies were recommended for new truck-friendly roundabouts, signage consideration, at-grade rail crossings, intersection geometries, capacity enhancements, pull-outs, and grade separations. Benefit-cost ratios were provided for each of the 50 short-to-medium term projects throughout the Atlanta region.