Appendices
Appendix A. 2014 CFMP Goals, Objectives, Strategies, and Accomplishments

The following are the six goals, objectives, and strategies from the 2014 CFMP. The projects and achievements to accomplish each goal are also presented.

Goal 1: Economic Competitiveness

Improve the contribution of the California freight transportation system to economic efficiency, productivity, and competitiveness.

Objectives

- Build on California’s history of investments to seek sustainable and flexible funding solutions with federal, private, and green partners
- Invest in freight projects that enhance economic activity, freight mobility, reliability, and global competitiveness
- Develop partnerships between the public and private sectors to initiate programs/activities that advance the economic competitiveness of the freight industry

Strategies

- Conduct a cost-benefit analysis for each freight project proposed for programming
- Reduce transportation costs by eliminating bottlenecks and recurrent delay, making operational improvements, and accelerating rapid incident response on priority freight corridors
- Seek creation of national, state, and regional dedicated freight funding programs
- Expand capacity of freight corridors or subsections through infrastructure or operational improvements
- Eliminate unnecessary freight lifts or handling
- Improve system condition and performance on priority freight corridors
- Coordinate with other states and regions to improve multi-jurisdictional freight

Accomplishments since 2014

- Investment in freight infrastructure and mobility to enhance the State's economic activity, freight mobility, reliability, and global competitiveness
- The creation of new federal and state dedicated freight funding sources, such as:
  - The federal Fixing Americans Surface Transportation (FAST) Act that established the National Highway Freight Program (NHFP), providing California with approximately $518 million (five-year funding cycle) to fund projects that improve the efficient movement of freight on the National Highway Freight Network and support various federal freight goals
The State of California’s Road Repair and Accountability Act of 2017, also known as SB1, created a new Trade Corridor Enhancement Account providing approximately $300 million per year in state funding for projects which more efficiently enhance the movement of goods along corridors.

Goal 2: Safety & Resiliency

Improve the safety, security, and resilience of the freight transportation system.

Objectives

- Reduce rates of incidents, collisions, fatalities, and serious injuries associated with freight movements
- Utilize technology to increase the resilience and security of the freight transportation system

Strategies

- Reduce points of conflict on the freight system by constructing railroad grade crossings where there is a history of crashes and at crossings that have a high volume of vehicle and train traffic
- Create truck-only lanes and facilities, and encourage off-peak usage
- Fully implement positive train control (PTC)
- Expand number and scope of cargo security screenings
- Expand the system of truck parking facilities
- Ensure consistent and effective safety and security requirements at all California ports
- Identify alternate freight routes to maintain freight movement at times of disruption by disaster
- Inventory and assess risks for freight facilities vulnerable to sea level rise and other natural disasters and prioritize for abandoning, armoring, adapting, moving, or replacing

Accomplishments since 2014

- The State of California’s Strategic Highway Safety Plan (SHSP) 2015, a data-driven plan reducing traffic-related fatalities and severe injuries on all public roads through:
  - Strategies and actions identified as having the greatest impact on road safety for all modes of travel and guidance for the investment of FHWA and NHTSA safety funding across multiple state departments
  - Actions identified and delivered through public and private industries representing the 4 Es of safety (Education, Enforcement, Emergency Services, and Engineering)
- Implementation of PTC on all California Class I Railways
Programmed and Constructed Projects

- Lake County SR 29 Expressway Project (SHOPP) – Caltrans District 1
  Facilitate the efficient flow of goods and service through Lake County, provide a facility with the potential for diverting through traffic (including through truck traffic) from north shore SR 20, and improve the safety and operation of SR 29
- Yuba County SR 20 at Timbuctoo Improvements – Caltrans District 3
  Improve safety by reducing the number of run-off-road collisions on a section of SR 20 in Yuba County; provide a truck climbing lane
- Etiwanda Avenue Grade Separation – Rancho Cucamonga
  Widen and construct Etiwanda Avenue as a grade-separated roadway over the SCRRA/BNSF San Gabriel subdivision, currently an at-grade crossing; a grade separation reduces vehicles and truck delays and queuing along Etiwanda Avenue and improve mobility, safety, and level of service at the crossing
- Fyffe Grade Separation – Port of Stockton
  Improves safety by removing the at-grade crossing and eliminating the potential for vehicle/rail conflicts. Provides a critical, reliable emergency evacuation route for the employees, tenants, visitors, and emergency response vehicles at the Port of Stockton West Complex
- Rice Avenue and 5 Street Grade Separation – Caltrans District 7
  Eliminate conflicts between vehicles and trains at the rail-highway crossing
- 7th Street Grade Separation (East) – Alameda County Transportation Commission
  Realigns and reconstructs the existing railroad underpass and multi-use path along 7th Street between west of I-880 and Maritime Street to increase vertical and horizontal clearances for trucks to current standards and improve the shared pedestrian/bicycle pathway
- SR 60 Truck Safety and Efficiency (Phase 1A) – Riverside County Transportation Commission
  Construct new eastbound climbing and westbound descending truck lanes from Gilman Springs Rd to approximately 1.47 miles west of Jack Rabbit Trail and upgrade existing inside and outside shoulders to standard width
- Quiet Zone Safety Engineering Measures

Goal 3: Freight System Infrastructure Preservation

Improve the state of good repair of the freight transportation system.

Objectives

- Apply sustainable preventive maintenance and rehabilitation strategies

Strategies
• Ensure adequate and sustainable funding for preservation of the freight system
• Expand scope of freight system rehabilitation projects to include facility modernization, where possible and merited, to increase range of available funding sources
• Make preservation projects multi-purpose
• Identify maintenance and preservation needs on priority freight corridors

Programmed and Constructed Projects

• District 1 - Del Norte - Highway 101 Hunter/Panther Creek Bridge Replacement
  Upgrade Hunter Creek and Panther Creek Bridges to meet current seismic and design standards; the existing structures are over 50 years old and do not meet Caltrans requirements for seismic safety
• District 1 - Humboldt - Highway 101 Redcrest Capital Pavement Maintenance (CPAM)
  Preserve and extend the service life of the existing distressed pavement on US 101, a critical north/south interregional freight corridor
• District 3 - Placer - Interstate 80 Bridge Rehabilitation
  Rehabilitate or replace deficient structural components at four over-crossings located at various locations along I-80 in Placer County; Interstate 80 is a critical interregional east-west freight corridor which serves freight traffic moving from the Ports of Oakland and West Sacramento across the state, into Nevada, and beyond. Within the project limits, I-80 is a four-lane freeway with intermittent truck climbing lanes
• District 3 - Sacramento - State Route 99 Rubberized Hot Mix Asphalt (RHMA) Overlay
  Preserves and extends this section of the pavement life on SR 99, a critical north/south interregional freight corridor travel by high volumes of heavy trucks
• District 4 - Solano - Interstate 80-Bridge Rehabilitation
  Increases the vertical clearance of the six over-crossings over I-80 to standard 16'-6" to allow over-height and commercial permit vehicles to travel continuously along I-80 under these over-crossings
• District 6 - Fresno - State Route 99 Roadway Rehabilitation (R2)
  Extends the service life of the pavement structure for a minimum of 40 years on a critical north/south interregional freight corridor travel with high volumes of heavy trucks
• District 6 - Kings - State Route 99 Kingsburg Rehabilitation Overlay
  Preserves and extends the pavement life on SR 99, a critical north/south interregional freight corridor travel by high volumes of heavy trucks
• District 6 - Kern - State Route 99 Roadway Rehabilitation (R2)
  Resolves structure pavement failure on SR 99 (a critical north/south interregional freight corridor) caused by high volumes of heavy trucks and restore the structural integrity by rehabilitating the roadbed
• District 7 - Los Angeles - Interstate 5 Pavement Rehabilitation
  Preserves and extends the pavement life on I-5, a critical north/south interregional freight corridor traveled by high volumes of heavy trucks

Goal 4: Environmental Sustainability
Avoid and reduce adverse environmental and community impacts of the freight transportation system.

Objectives

- Integrate environmental, health, and social equity considerations into all stages of freight planning and implementation, including considering impacts and mitigation relative to the context of the project location
- Conserve and enhance natural and cultural resources
- Avoid and reduce air and water pollution, greenhouse gas (GHG) emissions, and other negative impacts associated with freight transportation by transitioning to a lower-carbon and more efficient freight transportation system
- Implement freight projects that demonstrate, enable, implement or incentivize use of advanced, clean technologies (including zero- and near-zero-emissions technologies) and efficiency measures needed to attain ambient air quality standards and achieve needed air toxics and GHG emission reductions

Strategies

- Establish corridor specific impact reduction goals and projects
- Incentivize and prioritize freight projects that maximize GHG, criteria pollutant, and air toxin emission reductions
- Incentivize impact reduction
- Implement projects in freight corridors that are specifically targeted to avoiding, reducing, or mitigating freight impacts on the environment and community
- Support and fund research focused on impact reductions and mitigation
- Ensure that there is coordination and alignment of the plan with State GHG reduction goals and requirements and State and federal air quality standards

Accomplishments since 2014

- Adoption of the California Sustainable Action Plan (CSFAP), Freight Targets, and Pilot Projects in 2016.
- Significant investments in all three CSFAP Pilot Projects:
  - Dairy Biomethane for Freight Vehicles: approximately $3 million from the Energy Commission for a community-scale advanced biofuels production project, and a minimum of five more projects to soon launch
  - Advanced Technology Corridors at Border Ports of Entry: Phases I and II, which includes 15 air quality monitors, funded through the Trade Corridor Enhancement Program and other Caltrans funds
  - Advanced Technology for Truck Corridors in Southern California: significant investments by the South Coast Air Quality Management District in zero-emission freight vehicles and equipment, and the I-10 Truck Parking Availability System fully funded through California, Arizona, New Mexico, and Texas
• Adoption of the Zero-Emission Vehicle (ZEV) Action Plan
• Deployment of an estimate of over 10,000 freight ZEV and equipment, with a goal of 100,000 deployed by 2030
• 60-98% reduction of criteria pollutants and 13% reduction of carbon dioxide emitted at the San Pedro Ports from 2005 to 2017, 98% reduction in truck emissions, and 76% reduction in vessel emissions at the Port of Oakland from 2009 to 2018
• Establishment of the Community Air Protection Program (pursuant to Assembly Bill (AB) 617) to reduce exposure in communities most impacted by air pollution
• Commitment to the Clean Transportation Program, the Cap and Trade system, and the Low Carbon Transportation Investments and the Air Quality Improvement Program, which includes freight-specific funding

Goal 5: Congestion Relief

Reduce costs to users by minimizing congestion on the freight transportation system.

Objectives

• Develop, manage, and operate an efficient, integrated freight system
• Identify causes and solutions to freight bottlenecks
• Invest strategically to optimize system performance

Strategies

• Create multimodal freight bottleneck list for priority corridors and prioritize for correction
• Identify the most congested freight corridors and facilities and prioritize these for improvement
• Implement detection on priority corridors to identify problem areas across modes, particularly targeted to truck data
• Construct railroad grade crossings at high volume roadway crossings
• Add mainline track and sidings to accommodate demand for freight and passenger rail services
• Implement system management and expand the freight travel information availability with the focus on freight corridors
• Expand freight travel information availability to the entire truck fleet

Accomplishments since 2014

• Caltrans’ collaboration with Metropolitan Planning Organizations and Regional Transportation Planning Agencies from 2014 to 2019 to develop a performance target for truck travel time reliability on the interstate system
• Caltrans’ continued analysis and reporting of the state’s progress in reaching the Federal Highway Administration’s (FHWA) travel truck time reliability targets
• Caltrans' identification of major freight bottleneck locations, inclusion of those locations in the 2018 California Freight Mobility Plan Addendum, and monitoring of the State’s progress in reducing the congestion at those locations
• District 7: I-605 / SR 91 Interchange Improvement Gateways Cities Freight Crossroads
  This project will reduce congestion, improve freeway operations on the mainline and ramps, and enhance safety on local and system interchange operations.
• District 8: US 395 Widening from SR 18 to Chamberlain Way
  Widening improvements will reduce congestion and enhance the operational efficiencies of a critical north/south interregional freight corridor that carries a large volume of traffic with a high percentage of heavy trucks.
• District 12: ORA-SR 57/ SR 91/ I-5 Install and Modify ITS Elements
  This project will upgrade existing elements, facilitate heavy truck traffic flow, and deploy new elements to enhance the fail-safe system through redundancy in managing incidents and congestion during normal operations and special events.

Goal 6: Innovative Technologies and Practices

Use innovative technology and practices to operate, maintain, and optimize the efficiency of the freight transportation system while reducing its environmental and community impacts.

Objectives

• Support research, demonstration, development, and deployment of innovative technologies
• Promote the use of zero- and near-zero-emissions technologies within the freight industry to support the State Implementation Plan (SIP), attainment of California greenhouse gas reduction targets, and reduction of local air toxics
• Support and incorporate the use of low-carbon renewable fuels
• Promote innovative technologies and practices that utilize real-time information to move freight on all modes more efficiently

Strategies

• Prioritize Freight Plan projects implementing state-of-the-art and demonstration technologies
• Support deployment of new, non-fossil fuel distribution, recharging facilities, and shore-side power on the freight system, focusing on particular regions and corridors
• Support implementation of new engine technologies that are cleaner and quieter
• Research opportunities for automation of some freight movements

Accomplishments since 2014
• Port Optimizer software at the Ports of Los Angeles and Long Beach is being implemented and is anticipated to significantly reduce port congestion.
• $82.5M awarded through TCEP to border projects, which includes funding for Phases I and II of the Advanced Technology Corridors at Border Ports of Entry, a CSFAP Pilot Project on the D11 Border.
• Continuation of the California Energy Commission’s Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program, to fund over $100 million per year to promote accelerated development and deployment of advanced transportation and fuel technologies.
• Investments in zero-emission truck technologies leading to advancements in engine torque to reduce speed differentials and system mechanics that help reduce wear and tear on roadways.
• Implementation of Positive Train Control to make freight rail transportation safer on the major freight rail corridors by automatically stopping a train before certain types of collisions occur.
• Formation of workgroups to establish formal standards for medium- and heavy-duty charging.
• Testing and deployment of truck platooning technologies.
• Commitment to alleviating truck parking issues through:
  o The launch of americantruckparking.com
  o Testing and soon deploying truck parking availability systems
  o Forming the Truck Parking Technical Advisory Committee
• Establishment of the San Diego Unmanned Aircraft System (UAS) Integration Pilot Program to accelerate safe UAS integration and innovation, including freight deliveries.
Appendix B. Freight System Policy Framework

This section provides an overview of policies that influence Federal, statewide and freight transport decisions. The decision on how and where to move freight, by which transportation mode, through which gateway, and to which destination, is most often determined by the total cost of moving freight from point A to point B. Closely related to costs, the private sector of the freight industry understands and plans for disruptions, both short and long-term, and the role that freight delays play in customer retention. While policies that increase the cost of doing business, or pose threats to reliability, play major roles in where and how the private sector of freight industry invests and operates, it is important that economic aspects of freight do not contradict other policies such as environmental and public health.

Federal regulations significantly influence the cost of goods movement. Rules on truck driver hours of service (HOS), the requirement of using electronic logging devices (ELD) to monitor drivers’ HOS, and Corporate Average Fuel Economy (CAFÉ) standards for heavy duty vehicles are examples. At the State level, California Labor Code rest and meal period requirements often misalign with federal HOS rules and result in more time away from home for truck drivers. Environmental policies, such as Senate Bill 375 (SB 375) and SB 100, while vital to protecting the state’s environment, can potentially add costs to industry in terms of equipment replacement and uncertainty because some equipment does not yet exist, and the California Environmental Quality Act adds costs and time for expanding existing or building new logistics facilities in California. Regional and local policies can also influence the cost of shipping, such as the San Pedro Bay Ports and Port of Oakland’s Clean Truck Programs and PierPass, and South Coast Air Quality Management District’s proposed logistics industry indirect source rules.

This section covers the latest policies and regulations at all levels of government with a focus on what each policy means for California. This section also highlights prior regional studies that influence freight planning in the State. The federal perspective summarizes California’s role in moving the nation’s goods, coordinating with neighboring states on major truck, rail, and pipeline corridors, and ensuring compliance with requirements for obtaining federal funding. The state perspective focuses on identifying freight-related or impactful policies and regulations established by all State agencies and areas of conflict. The discussion of regional and local context identifies freight-related policies, regulations, and planning efforts.

U.S. Department of Transportation (DOT)

Freight policy and regulation is primarily a function of the U.S. Department of Transportation (DOT). Within DOT, the Federal Highway Administration (FHWA) provides much of the federal funding for infrastructure construction, operations, and maintenance for truck cargo. While FHWA focuses on building and maintaining the National Highway System (NHS) which is a public asset, the Federal Railroad Administration (FRA), Federal Aviation Administration (FAA), Maritime Administration (MARAD), and Pipeline and Hazardous Materials Safety
Administration (PHMSA) each focus primarily on safety and security associated with moving goods on privately-owned infrastructure. FRA’s funding role is limited to projects that enhance safety, such as grade-separations of railroad/roadway at-grade crossings and positive train control (PTC). Similarly, FAA focuses on safe operations of air traffic, while MARAD focuses on security of maritime operations in our nation’s ports and inland waterways.

Related to safety, both the National Highway Traffic Safety Administration (NHTSA) and the Federal Motor Carrier Safety Administration (FMCSA) focus on equipment manufacturing and vehicle operations – which also play significant roles in the transportation of goods. The NHTSA primarily focuses on the total population of drivers and vehicles, while the FMCSA focuses on commercial vehicles. Funding for DOT programs occurs through multi-year bills passed by Congress and signed into law by the President. Each of these agencies receive and allocate funding approved by these transportation bills to carry out their duties. The most recent transportation bills are described later in this section.

**U.S. Department of Energy (DOE)**

The DOE plays a role in freight as it relates to both transportation and site selection decisions for logistics facilities. In recent years, the Office of Energy Efficiency and Renewable Energy has become a major player in the strengthening of federal, state, and regional and local air quality rules and regulations, with an increasing focus on clean energy options. DOE research, through its National Laboratories, assists original equipment manufacturers (OEM) with the development of cleaner vehicles, including heavy duty trucks. DOE also supports the development of technologies to improve how electricity is created, stored, and used, in addition to development of disruptive technologies, including robotics, additive manufacturing, and artificial intelligence. California is fortunate to have four of the Nation’s 17 laboratories. Federal funding bills allocate funding to DOE for investments in Research and Development, as well as aiding private industry with the purchase of cleaner equipment pursuant to air quality goals.

**U.S. Department of Commerce (DOC)**

The U.S. DOC promotes private investments in economic development through its Economic Development Administration. In 2018, the EDA programs focused on Regional Innovation Strategies (RIS) and University Center Economic Development. Whereas RIS provides funding for high-technology and innovation start-up companies to further research and development, the University Center’s program focuses on training/retraining the workforce of tomorrow. EDA grants have funded a significant amount of disaster recovery and business resiliency efforts over the past decade, including efforts from the aftermath of hurricanes Harvey and Irma. In prior funding years, EDA grants have contributed to public works projects in support of major economic development projects, such as a $1.25 million grant to Kentucky for job retraining in e-commerce to help coal-impacted communities’ transition to high-tech jobs.
U.S. Department of Labor (DOL)

The DOL provides information about jobs and labor, and it serves to regulate both employers and workers. The Bureau of Labor Statistics (BLS) provides information about where firms are located and how many workers they employ, whereas other DOL agencies are responsible for enforcing labor laws, such as labor hours and safety rules for warehouse, dock, and aviation workers. Truck driver hours of service (HOS) regulations are controlled by the FMCSA, a DOT agency; however, truck driver safety while picking up or dropping off cargo at a facility is regulated by DOL’s Occupational Safety and Health Administration (OSHA). DOL funds safety programs that address workplace hazards.

U.S. Environmental Protection Agency (EPA)

In recent decades, the DOT, EPA, and DOE have been working together to encourage the transition of equipment, both on-road and off-road, to cleaner, more fuel-efficient technologies. EPA has worked closely with the logistics industry to encourage cleaner technologies through programs such as SmartWay. SmartWay rewards and recognizes shippers that meet clean transport goals. Major participants include Target, Home Depot, Lowe’s, Kroger, FedEx, and UPS. The overwhelming success of the program derives from both the recognition and funding to help companies purchase cleaner, more expensive equipment.

Federal Deregulation (Trucking, Railroad, and Air)

Prior to the late 1970s, the federal government heavily regulated several aspects of the freight industry (trucking, rail, and air cargo), including rates charged and wages paid. By 1982, the entire transportation industry was deregulated, and by 1995, Congress enacted the Interstate Commerce Commission (ICC) Termination Act, which eliminated the ICC and established the Surface Transportation Board (STB). The railroads have been a focus of STB efforts, in that rail operations have no effective substitutes and needed to be regulated to avoid monopoly conditions. The STB replaced the ICC to regulate the movements of bulk commodities on railways, interstate waterways, international ports and waterways, and non-energy products moving by pipeline. The STB is charged with the responsibility of balancing the needs of shippers for fair and reasonable rates and service, with the railroads’ need to return adequate revenues. This is important for understanding private rail freight financing and funding, and a public agency’s ability to support and fund private rail improvements.

National Strategic Freight Plan (Draft, 2016)

A draft version of the National Freight Strategic Plan was released for public comment in early 2016, and the comment period closed on April 25, 2016, but the plan has not been finalized. The draft plan describes the freight transportation system, including major corridors and gateways, and assesses the physical, institutional, and financial barriers to improvement. The draft plan also highlights strategies to help support our freight transportation system through improved planning, dedicated funding streams, and innovative technologies.
National Multimodal Freight Network

In 2016, the National Highway Freight Network (NHFN) replaced the Primary Freight Network (PFN) and the National Freight Network. The NHFN was established to strategically direct federal resources and policies toward improved performance on highways carrying higher amounts of freight. As part of the NHFN, critical connections to freight facilities, such as rail intermodal yards, seaports and airports, were added through two new designations, Critical Rural Freight Corridors (CRFC) and Critical Urban Freight Corridors (CUFC). States and MPOs are responsible for designating facilities within their jurisdictions pursuant to federally set mileage allocations for each state.

The Highway Trust Fund and Federal Transportation Bills

In 2017, Highway Trust Fund tax revenue totaled just over $40 billion, and approximately 86 percent of this revenue was raised through federal excise tax on gasoline and diesel fuels. Historically, the federal transportation bills have been funded by the Highway Trust Fund; however, this has been changing. Unlike many other federal excise taxes, the fuel tax is a flat tax that is not indexed to inflation. The fuel tax was last raised in 1993 and remains at $0.184 and $0.244 per gallon for gasoline and diesel fuel, respectively. During that time, inflation has risen nearly 70 percent and cars have become more fuel efficient. Starting in 2008, Congress began transferring General Fund dollars into the Highway Trust Fund to sustain highway funding, but funding still lags behind where it was in the 1990s. Less federal funding has resulted in lower federal funding shares in projects across the nation. Some states, such as California, have proactively developed and implemented state and local taxes to build and maintain infrastructure. In the 1990s, federal funding typically paid up to 80 percent of a major highway project. Today, federal allocations more often represent 20 percent of the funding. In addition to changes in federal funding levels, federal funding has become more focused on projects of national significance, such as projects that improve the movement of goods. The following summary of transportation bills focuses on those that began to include freight components, from ISTEA through the FAST Act. Since the early 1990s, recognition of freight has been reflected in these policies, and most recently through funding allocations.

ISTEA (Intermodal Surface Transportation Efficiency Act, 1991)

Since the inception of the Federal Highway Administration, freight’s importance has been recognized by the federal government. However, the first federal transportation bill to take an overall intermodal and multimodal approach occurred in 1991 with the passage of ISTEA, which linked highway, rail, air, and marine transportation and made funding available for projects that reduced congestion, improved air quality, and improved safety.

One of ISTEA’s chief goals was to develop a "National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the nation to compete in the global economy, and will move people and goods in an energy-efficient manner."
This bill also was the first to tie transportation improvements to air quality conformity in Regional Transportation Plans (RTP) and gave additional powers to metropolitan planning organizations (MPOs). ISTEA did not set aside funding for freight projects. Instead, ISTEA prioritized projects that supported intermodal transportation and high priority corridors many of which served freight. In California, ISTEA High Priority Corridors included the following:

- Corridor 16 (and 70), Economic Lifeline Corridor, I-15 and I-40 (California, Arizona and Nevada)
- Corridor 22, Alameda Corridor (POLA/ POLB to East Los Angeles)
- Corridor 30, I-5 (California, Oregon and Washington)
- Corridor 34, Alameda Corridor East (East Los Angeles to Barstow) and Southwest Passage (Coachella and San Bernardino to Arizona)
- Corridor 46, I-710 (POLB to SR-60)
- Corridor 69, Cross Valley Connector (I-5 to SR-14 in Santa Clarita Valley)
- Corridor 70 (and 16), Economic Lifeline Corridor, I-15 and I-40 (California, Arizona and Nevada)
- Corridor 71, High Desert Corridor (Los Angeles to Las Vegas)

ISTEA provided more flexibility to states by reclassifying the highways with a focus on functional classification and establishing the National Highway System (NHS) which brought greater focus to key state and local connectors that are vital to the nation’s economy, defense, and mobility. ISTEA also altered the federal funding focus from major capital investments for new facilities to one of operations and maintenance. Lastly, ISTEA instituted a new practice—public participation, and it established the Transportation Enhancement Program for funding community priorities, such as bikeways, historic and scenic preservation of byways, and environmental mitigation. Many of the planning principles that guide freight project planning and implementation as we know it today grew out of ISTEA.

**TEA-21 (Transportation Equity Act of the 21st Century, 1998)**

TEA-21, a six-year omnibus funding bill for transportation, provided the first major funding for Border Crossings and Trade Corridors. It also provided more funding for projects that increase America’s competitiveness (port, intermodal, border crossing; also known as Projects of National and Regional Significance or PNRS).

In addition, TEA-21 provided the first funding for federal tracking and analysis of commodity flow data ($186M to Bureau of Transportation Statistics) and led to the Freight Analysis Framework (FAF) dataset that is still used by most states for freight planning and freight-related economic analyses. TEA-21 continued the need for coordination with the EPA, as well as with MPOs. TEA-21 consolidated the 23 regional and statewide planning “factors” contained in ISTEA into seven broad “areas” that must be considered in RTPs, with a growing recognition of the importance of operations and maintenance:

- Support the economic vitality of the metropolitan planning area by enabling global competitiveness, productivity, and efficiency
• Increase the safety and security of the transportation system for motorized and non-motorized users
• Increase the accessibility and mobility options available to people and for freight
• Protect and enhance the environment, especially by promoting energy conservation and improving quality of life
• Integrate and connect the transportation system across and between various transportation modes to prioritize people and freight
• Promote efficient system management and operation
• Emphasize the efficient preservation of existing transportation systems

SAFETEA-LU (Safe, Accountable, Flexible, Efficient Transportation Equity Act – a Legacy for Users, 2005)
SAFETEA-LU provided funding for highways, highway safety, and public transportation totaling $244.1 billion and continued to build on the success of the prior two landmark bills that brought surface transportation into the 21st century—the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21). SAFETEA-LU refined the programmatic framework for investments needed to maintain and grow our transportation infrastructure. Specifically, SAFETEA-LU addressed safety, traffic congestion, efficiency in freight movement, intermodal connectivity, and environmental protection. It also laid the groundwork for addressing future challenges that were beginning to surface in international trade and urban delivery, notably e-commerce. SAFETEA-LU included provisions for innovative financing and public-private partnerships, as well as special funding for freight pilot projects such as truck parking studies.

Moving Ahead for Progress in the 21st Century (MAP-21)
On July 6, 2012, the Moving Ahead for Progress in the 21st Century Act (MAP-21) bill was adopted. The Act provided over $105 billion in funds for surface transportation programs to be used in fiscal years (FY) 2013 and 2014. This transformed the framework for investments in transportation infrastructure. MAP-21 created a streamlined and performance-based surface transportation program building on many of the highway, transit, bike, and pedestrian programs and policies established in 1991.

Sections 1117 and 1118 of MAP-21 directed the Secretary of Transportation to encourage each state to develop a comprehensive state freight plan outlining immediate and long-range plans for freight-related transportation investments. Section 1116 of MAP-21 authorized DOT to increase the federal share of project costs to 95 percent for a highway project on the US Interstate system, or 90 percent for a non-Interstate project if the project is certified by the Secretary of Transportation to make a demonstrable improvement in the efficiency of freight movement and is included in the state freight plan.

In October 2012, the U.S. Department of Transportation provided the required guidance on the freight planning process states must undertake to qualify for the freight prioritization provisions of Section 1116.
Fixing America’s Surface Transportation (FAST) Act

The FAST Act of 2015 provided $305 billion over five years for transportation funding\(^{15}\). This bill was the first to establish state formula funding specifically for freight projects, as well as a competitive freight projects grant program. Specifically, FAST did the following:

- Established a National Multimodal Freight Policy
- Required the development of a National Freight Strategic Plan
- Created a freight-focused grant program of $4.5 billion over five years
- Established a National Highway Freight Program that provides $6.3 billion in formula funds over five years for states to invest in freight projects on the National Highway Freight Network. Up to 10 percent of these funds may be used for intermodal projects. Current projections of funding competitively available for all states to pursue are: $293M for 2017/18, $115M for 2018/19, and $127M for 2019/20 for a total 3-year funding amount of $535M\(^{16}\).
- Established freight performance measures for leading US seaports

FAST continued the focus on infrastructure investment, operations and maintenance, safety, and environmental sustainability. More emphasis was placed on innovation and technological advancements that improve the efficiency of moving goods while minimizing environmental impacts of freight. In addition, this bill continued to foster and promote interstate partnerships to address multi-state corridor planning and highway freight connectivity.

State Freight Policies and Plans

California has long been a leader in logistics and the movement of goods. The State understands how critical freight is to jobs and prosperity both within California and for the nation. Home to the nation’s largest container seaport, the San Pedro Bay Ports of Los Angeles and Long Beach, the largest agricultural production in the Central Valley, the largest logistics facilities cluster, and several of the largest population centers, California moves significant amounts of cargo on trains, planes, trucks – and more recently by automobiles, bicycles, pedestrians, and even robots. The following discusses the State’s progress and policy experience and provides a launch point for the update of the State’s Freight Mobility Plan.

California Freight Mobility Plan (2014)

The 2014 California Freight Mobility Plan (CFMP) was successful in establishing existing conditions, identifying funding, and sketching a roadmap for implementing plans and programs to improve the efficiency of freight transportation throughout California\(^{17}\). The plan focused on the following goals:

- Increase the contribution of the California freight transportation system to economic efficiency, productivity, and competitiveness
- Improve the safety, security, and resilience of the freight transportation system
- Improve the state of good repair of the freight transportation system
• Use innovative technology and practices to operate, maintain, and optimize the efficiency of the freight transportation system while reducing its environmental and community impacts
• Reduce costs to users by minimizing congestion on the freight transportation system
• Environmental Stewardship – Avoid and reduce adverse environmental and community impacts of the freight transportation system

California Sustainable Freight Action Plan (2016)

The California Sustainable Freight Action Plan (CSFAP) was developed jointly by Caltrans, the California Air Resources Board (CARB), the California Energy Commission (CEC), and the Governor’s Office of Business and Economic Development (GO-Biz) pursuant to the following two executive orders signed by the governor:

• Governor’s Executive Order B-32-15
• Governor’s Executive Order B-30-15 establishing a 2030 GHG emissions target of 40 percent below 1990 levels and requiring State agencies to incorporate climate change impacts into the State’s Five-Year Infrastructure Plan

The key underpinning of the orders was the recognition that California continues to be a non-attainment area under federal air quality standards, and mobile sources in California are the primary contributors to the State’s emissions problem. The CSFAP's guiding principles are as follows:

• Support local and regional efforts to improve trade facilities and corridors that achieve regional environmental, public health, transportation, and economic objectives consistent with statewide policy goals
• Improve the state-of-good-repair of the multi-modal freight transportation system
• Grow the number of well-paying employment opportunities in the freight sector
• Apply innovative and green technology, along with accompanying infrastructure and applicable practices, to optimize the efficiency of the freight transportation system
• Grow the economic competitiveness of California’s freight sector
• Reduce or eliminate health, safety, and quality of life impacts on disproportionately affected communities near major freight corridors and facilities
• Invest strategically to improve travel time reliability and to achieve sustainable congestion reduction on key bottlenecks on primary trade corridors
• Reduce freight-related deaths and injuries, as well as security threats
• Improve system resiliency by addressing infrastructure vulnerabilities associated with climate change/sea-level rise, natural disasters, etc.
• Site freight projects to avoid greenfield development by enhancing existing freight infrastructure or targeting infill development near compatible land uses

The CSFAP focuses on aligning the need to move goods with the needs to reduce emissions through provisions for cleaner technologies, especially on-road trucks and off-road cargo handling equipment. Understanding how difficult some of the mandates of the Plan would be
for the freight industry to incur, $1 billion in funding was allocated to the industry for the procurement of cleaner goods movement technologies through Proposition 1B. The Plan also established air quality and efficiency targets for freight, including the following:

- **System Efficiency** – 25 percent efficiency by increasing the value of goods and services produced from the freight sector relative to the amount of its produced carbon
- **Transition to ZE Technology** – deploy over 100,000 ZE and near-ZE freight vehicles and CHE powered by renewable energy by 2030

The CSFAP additionally acknowledged the potential impact on businesses and included a policy aimed at increasing competitiveness and economic growth by developing key performance metrics for measuring economic competitiveness through collaboration with economists and industry experts. In addition, the Plan outlined potential freight funding sources to implement the Plan, including federal funding, State SB 1 ($0.12 gas tax) freight funding allocation, and Cap and Trade. Furthermore, the Plan developed an approach to fund ongoing freight investments by the below:

- Prioritizing projects
- Building upon existing infrastructure
- Investing in sustainable communities (clean air initiatives related to goods movement)
- Investing in fueling infrastructure of the future
- Eliminating/reducing congestion/freight bottlenecks

Lastly, the CSFAP established a Call for Pilot Projects focused on cleaner technologies and operational innovations.

**State Rail Plan (2018)**

Pursuant to the federal Passenger Rail Investment and Improvement Act (PRIIA 2008) and state legislature AB 528 (2013), the 2018 State Rail Plan (Rail Plan) establishes a statewide vision of an integrated rail system. The Rail Plan describes a policy framework for working with and guiding public and private investments that enhance freight movement while providing co-benefits with passenger services. The integrated vision relies on more efficient utilization of the existing rail system; expanding the coverage and mix of rail services in several corridors; scaling services to meet market demand; and facilitating network coordination through scheduling. For freight movements, this integrated system means better system reliability and a clear pathway to growing capacity. Improvements in rail freight reliability will result in the form of economic benefits that reverberate locally, regionally, and nationally. By improving rail infrastructure to attract additional long-distance freight movement, extra capacity is created on highways for passengers and short-distance freight travel. The improvements identified in the Rail Plan are designed to either preserve rail freight capacity, or to provide for rail freight enhancements in certain high traffic corridors, particularly intercontinental trade corridors that provide rail connections to ports. The improvements are categorized in six major areas of need and opportunity:

- Trade corridor improvements
• Economic development and short lines
• Grade-crossing improvements
• Additional terminal and yard capacity
• Short-haul rail improvements
• Advancement of zero- and near-zero- emissions technologies

Rail is an effective mechanism for congestion relief by diverting truck trips which can reduce congestion contributing to emissions reductions and improve safety on the roadway networks. Rail investments can make a region more economically competitive, attracting development from other regions.


The California Energy Commission's 2017 Integrated Energy Policy Report covers a broad range of topics, including implementation of Senate Bill 350, integrated resource planning, distributed energy resources, transportation electrification, solutions to increase resiliency in the electricity sector, energy efficiency, transportation electrification, barriers faced by disadvantaged communities, demand response, transmission and landscape-scale planning, the California Energy Demand Preliminary Forecast, the preliminary transportation energy demand forecast, renewable gas (in response to Senate Bill 1383), updates on Southern California electricity reliability, natural gas outlook, and climate adaptation and resiliency. The California Energy Commission (CEC) is anticipating that more than 25 percent of heavy-duty trucks will be electric-diesel hybrids by 2030. This report also provides extensive information about natural gas pipeline infrastructure and the ability to fuel transportation with our existing assets.

Safeguarding California: Reducing Climate Risk Update (2017)

The California Natural Resources Agency's Climate Adaptation Strategy identifies vulnerabilities throughout California and identifies strategies to mitigate them\textsuperscript{21}. Climate change impacts from sea-level rise, storm surge, and coastal erosion have been identified as imminent threats to highways, roads, bridge supports, airports at or near sea level, seaports, and some transit system and rail lines. Shifting precipitation patterns, higher temperatures, wildfire, and an increased frequency of extreme weather events threaten transportation assets at varying locations across the state.

Temperature extremes and increased precipitation can increase the risk of road and railroad track failure, decrease transportation safety, and create higher maintenance costs. As climate changes occur over time, the choices for the State and all the transportation partners are to build protection against the threat (defend), redesign the infrastructure (accommodate), or abandon and relocate (retreat). The economic cost associated with such fortification, alteration, or relocation of existing infrastructure has yet to be fully estimated but is it likely to be billions of dollars. Impending climate impacts have implications not only for the siting of
new transportation infrastructure, but also maintenance and operation, design features of transportation systems, and emergency planning and response for extreme climate events.

**California Transportation Plan 2040**

The California Transportation Plan 2040 (CTP) is California’s long-range transportation plan and is currently in the process of being updated. Pursuant to SB 391 (2009), the CTP defines the statewide multimodal transportation system that is necessary to meet GHG emissions targets to obtain 1990 levels by 2020 and 80 percent below the 1990 levels by 2050. To meet these goals, SB 391 requires Caltrans to update the CTP every five years. The CTP 2040 is an umbrella plan that integrates Caltrans’ modal plans into a statewide multimodal transportation vision. The CTP 2040 offers a detailed overview of the existing transportation network and assesses future transportation trends and challenges. The CTP offers strategies that improve mobility and accessibility across all modes, contribute to system preservation, support a vibrant economy, improve public safety and security, promote livable communities and social equity, and support environmental stewardship.

**Caltrans Strategic Management Plan**

The Strategic Management Plan shifted Caltrans from a capacity-building to a fix-it-first mentality, focusing in on improving system operations, achieving greater efficiency, and eliminating the backlog of maintenance projects. The Plan provides a roadmap for Caltrans by defining its role, setting expectations, and focusing on operations. The overarching framework of the Plan is transparency, accountability, sustainability, and innovation.

**Caltrans Interregional Transportation Strategic Plan (ITSP) 2015**

The ITSP provides guidance for the identification and prioritization of interregional transportation improvements. Projects identified are eligible for Interregional Transportation Improvement Program (ITIP) funding. The 2015 ITSP expanded the analysis from focusing on ITIP investment in interregional highways and intercity rail to analyzing the entire interregional transportation system regardless of funding source. The purpose of the ITSP is to be a guiding document for all investment in the interregional transportation system.

**Strategic Highway Safety Plan (2015)**

The Strategic Highway Safety Plan (SHSP) is a statewide, coordinated safety plan that provides a comprehensive framework for reducing highway fatalities and severe injuries on all public roads. It identifies key safety needs and guides investment decisions towards strategies and countermeasures with the most potential to save lives and prevent injuries. This document relies on data to identify problems and develop solutions. California adopted the following measurable objectives for the (2015-2019) SHSP:

- A 3 percent annual reduction in the number and rate of fatalities
• A 1.5 percent annual reduction in the number and rate of severe injuries

The first SHSP was required by the Safe, Accountable, Flexible, Efficient Transportation Equity Act—A Legacy for Users (SAFETEA-LU) in 2005 and the FAST Act made the SHSP a permanent program. The current SHSP spans 2015-2019 and was developed with the involvement of over 400 safety stakeholders from 170 public and private sector agencies and organizations. SHSP Executive Leadership and a 13-member Steering Committee provided oversight. The SHSP includes 15 “Challenge Areas”, or areas on which the plan focuses efforts. The next SHSP is under development and will span from 2020-2024.

Recent State Legislation Related to Freight

Trade Corridor Enhancement Program (TCEP) 2018

SB 1 TCEP Provisions
SB 1 created the Road Maintenance and Rehabilitation Program to address deferred maintenance on state and local roadway systems throughout the state through a combination of fuel taxes and license and registration fees. SB1 increased State gas tax by $0.12 per gallon for gasoline and $0.20 per gallon for diesel fuel and included an inflation adjustment factor. The bill increased vehicle license fees by $25 to a maximum of $175 and adjusts for inflation. Recognizing that the State is aiming for more EV registrations, the bill also created a new $100 increase in vehicle license fees for zero-emission vehicles starting in 2020 with an inflation adjustment factor. SB1 provides an annual set-aside of $200 million for self-help counties, defined as counties with adopted transportation sales tax measures and/or established development impact fee programs. 50 percent of the revenue generated by the $0.20 per gallon diesel fuel tax will be deposited into the newly created Trade Corridor Enhancement Account to expend on corridor-based freight projects resulting in an estimated 10-year funding of $3 billion. Furthermore, SB1 created a $30 million annual Advanced Mitigation Program to protect natural resources and accelerate project delivery.

SB 103 TCEP Provisions
SB 103 deleted references to the Trade Corridor Infrastructure Fund (TCIF), revised the TCIF requirements, and applied the revised TCIF requirements to the Trade Corridor Enhancement Account. SB 103 also mandates the California Transportation Commission (CTC) to allocate 60 percent of the available funds to projects nominated by regional transportation agencies and local agencies with the remaining 40 percent to be allocated to projects nominated by Caltrans.

Senate Bill 1: Solutions for Congested Corridors Program (SCCP)
SB 1 created the SCCP which continuously provides $250 million annually for projects that improve highly congested and traveled corridors throughout the state. For projects to be eligible for SCCP funding, the regional transportation planning agency or other eligible agency must have a Comprehensive Multimodal Corridor Plan. The CTC selects these projects based on
their ability to balance transportation, environmental, and community access needs through the promotion of a holistic and multimodal approach. On December 5, 2018, the CTC adopted the 2018 Comprehensive Multimodal Corridor Plan Guidelines. The improvements must consider the movement of people and goods on all modes, and improvements are not limited to state highways, but rather, may also be on local streets and roads, public transit and rail facilities, cycling and pedestrian facilities, required mitigation and restoration, or some combination of solutions.

Pursuant to Streets and Highways Code (SHC), a comprehensive multimodal corridor plan must be submitted at the time of the project funding application. CTC will review and approve projects pursuant to the following criteria:

- Congestion reduction in highly traveled corridors by providing more transportation choices for residents, commuters, and visitors to the area of the corridor while preserving the character of the local community and creating opportunities for neighborhood enhancement projects. [SHC 2391]
- Reflects a comprehensive approach to addressing congestion and quality-of-life issues within the affected corridor through investment in transportation and related environmental solutions. [SHC 2392]
- Developed in collaboration with state, regional, and local partners. [SHC 2392]
- Evaluated the following criteria as applicable [SHC 2394]
  - Safety
  - Congestion
  - Accessibility
  - Economic Development and Job Creation and Retention
  - Air Quality and Greenhouse Gas Emissions Reduction
  - Efficient Land Use
- Consistent with the goals and objectives of the Regional Transportation Plan [SHC 2393].

Assembly Bill 32 (AB 32)

AB 32 created the Cap-and-Trade Program, which requires California to reduce its GHG emissions to 1990 levels by 2020—a reduction of approximately 15 percent below emissions expected under a “business as usual” scenario. In addition, SB 862 established a long-term funding plan for portions of Cap-and-Trade Program money, including a continuous appropriation of 25 percent of the funds to the California High-Speed Rail project and 10 percent to the Transit and Intercity Rail Capital Program. In 2017, Assembly Bill 398 extended the Cap and Trade Program through 2030.

Assembly Bill 133 (Weber, 2016)
This bill provided transfer of $11M to the Trade Corridor Improvements Fund (TCIF), a program initially implemented and funded by Proposition 1B. The TCIF funds can be used directly or indirectly to improve freight movement in key corridors.

**Senate Bill 350 (de Leon, 2015)**

On October 7, 2015, the California State Senate passed Senate Bill 350: Clean Energy and Pollution Reduction Act into law²⁸. SB 350 established California’s 2030 greenhouse gas reduction target of 40 percent below 1990 levels. To achieve this goal, SB 350 sets ambitious 2030 targets for energy efficiency and renewable electricity, among other actions aimed at reducing greenhouse gas emissions across the energy and transportation sectors.

**Senate Bill 743 (D. Steinberg, 2013)²⁹**

Signed in 2013, SB743 has the intent to “more appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions.” When implemented, “traffic congestion shall not be considered a significant impact on the environment” within California Environmental Quality Act (CEQA) transportation analysis.

SB 743 requires the Governor’s Office of Planning and Research (OPR) to identify new metrics for identifying and mitigating transportation impacts within CEQA. For land use projects, OPR identified Vehicle Miles Traveled (VMT) per capita, VMT per employee, and net VMT as new metrics for transportation analysis. For transportation projects, lead agencies for roadway capacity projects have discretion, consistent with CEQA and planning requirements, to choose which metric to use to evaluate transportation impacts.

Regulatory changes to the CEQA Guidelines that implement SB 743 were approved on December 28, 2018. July 1, 2020 is the statewide implementation date and agencies may opt-in use of new metrics prior to that date.

**Regional Freight Policies and Plans**

**Caltrans Districts Freight Plans**

**District 3 Goods Movement Study (2015)**

This study includes a comprehensive list of freight flows by all modes moving in and through the Sacramento region, an evaluation of projects on the State Highway System and intermodal connectors, and recommends strategies for addressing congestion, safety, efficiency, and ongoing operations and maintenance concerns. The study provides an overview of funding mechanisms and recommendations for prioritization and implementation.

**District 9: Eastern Sierra Corridor Sustainable Freight Strategies Study (2019)**
The Eastern Sierra Corridor Sustainable Freight Strategies Study, completed in 2019, is taking a fresh look at issues along U.S. 395 generally between I-40 on the south and I-80 on the north. Key issues included identifying and addressing truck parking shortages, as well as operational improvements for trucks.

Caltrans District 9 commissioned this study to investigate truck traffic origins and destinations on U.S. 395. The study involved paper surveys and interviews of truck drivers along the corridor to gain a better understanding of why trucks use U.S. 395, and to also understand how the drivers feel about the conditions of the roads and to seek comments and input. The Eastern Sierra Corridor Sustainable Freight Strategies Study provided an update to this effort.

Regional/County Freight Plans

California-Baja California Border Master Plan (2014)
The California-Baja California Border Master Plan, completed in 2014, was a bi-national effort to coordinate planning and delivery of projects at land port of entries and the transportation infrastructure serving them. The primary objectives of the California-Baja California Border Master Plan were to increase the understanding of Port of Entry (POE) and transportation planning on both sides of the border and create a plan for prioritizing and advancing POE and related transportation projects.

Based on the outcomes of this pilot bi-national planning process, the California-Baja California approach could be expanded to other border states and customized to address their needs, resulting in a master planning process for the entire U.S.-Mexico border.

Regional Transportation Plans (RTP), Goods Movement Sections
There are 18 Metropolitan Planning Organizations (MPO) and 26 Regional Transportation Planning Agencies (RTPA) in California that are responsible for updating Regional Transportation Plans (RTP) for their respective areas. Pursuant to the State RTP Guidelines, each RTP must address goods movement. The RTP guidelines list 11 items that must be addressed in the RTPs for both MPOs and RTPAs. As stated in the RTPA RTP Guidelines:

“RTPAs must plan for the goods movement infrastructure in the same way they plan the transportation infrastructure for the movement of people to support projected population growth and economic development.”

The most urban regions began preparing goods movement plans in the mid-2000s, such as SCAG and MTC. All the current RTPs for the MPOs and RTPAs include a list of freight projects, programs, and needs. These projects are incorporated into the CFMP. In addition to the regional transportation plans, regional planning agencies have commissioned the following freight plans:

Alameda County Goods Movement Plan (2016)
This countywide goods movement plan – a first for Alameda County – took a holistic view of freight from an industry and a neighborhood perspective\textsuperscript{31}. The plan stemmed from the MTC Goods Movement Plan, but locally, this plan focused on congestion, truck parking, air quality, and conflicting land uses, whereas regionally and nationally, it focused on rail and road connections. The Plan identified performance measures, analyzed existing and future conditions, identified needs, and provided a comprehensive strategy for funding the County’s freight infrastructure needs.

**U.S. 101 Central Coast California Freight Strategy**
This study of U.S. 101 from San Benito County to the North to Santa Barbara County to the south identifies a set of freight performance metrics and weights to prioritize funding for projects, identifies projects that will improve the movement of goods along U.S. 101 and key connecting routes, and establishes strategies for implementation. This plan set a precedent for interregional cooperation on freight planning and provided a path forward for lobbying on freight issues to capture its fair share of freight funding.

These two studies analyze goods movement in the Central Valley. The I-5/SR 99 study covers the 200-mile stretch of the I-5 and SR 99 corridors from the southern limit of Kern County to the northern limit of San Joaquin County in the Central Valley. This study identified freight and logistics clusters and the origins/destinations of a sample of trucks stopping at these freight clusters. This information was used to identify truck patterns in the region and correlate them with truck-involved crashes, speeds, and congestion along the corridors to guide the development and implementation of strategies to improve truck flows and travel time reliability. Closely related and prepared during the same timeframe using some of the same data sources, the Central Valley Sustainable Goods Movement Action Plan focused on first- and last-mile connectors to freight clusters and investigated potential Critical Rural Freight Corridors (CRFC).

**Goods Movement Border Crossing Study (SANDAG, 2012)**
This study focused on the inter-relatedness of the U.S. and Mexican economies along California’s southern border\textsuperscript{32}. The purpose of this analysis focused on identifying infrastructure improvements that would improve logistics and create economic benefits. The study identified the importance of the SCAG and SANDAG regions to the Mexicali, Mexico region, and vice-versa through a high-level characterization of the supply chains for large, multinational firms that heavily rely on cross-border transportation.

In 2004, Metro spearheaded the development of MCGMAP, which consisted of Metro, Orange County Transportation Authority (OCTA), Riverside County Transportation Commission (RCTC), San Bernardino Associated Governments (SANBAG), San Diego Association of Governments (SANDAG), Ventura County Transportation Commission (VCTC), Southern California Association
of Governments (SCAG), and Caltrans Districts 7, 8, 11, and 12. MCGMAP was the master plan for goods movement in Southern California that guided preparation of state, regional, and local transportation plans. The objective of the MCGMAP was to develop strategies and projects that: 1) address the goods movement infrastructure capacity needs of the region; 2) reduce goods movement emissions to help achieve air quality goals; and 3) improve the quality of life and community livability for Southern California residents.

The strong collaboration within the entire SCAG region resulted in Southern California obtaining more than 50 percent of the Proposition 1B TCIF dollars, which it was then able to leverage for federal funding. The collaborative was unified in its messaging under this process when traveling to Sacramento and Washington, D.C. in search of funding.

In 2012, SCAG updated MCGMAP with new information, including an updated cargo forecast from the San Pedro Bay Ports, updated industrial warehouse demand and capacity estimates, and the latest environmental policies, programs and strategies for addressing the impacts of goods movement in the region. SCAG incorporated recommendations from this study into the 2012 RTP/SCS.

**Los Angeles County Strategic Goods Movement Arterial Plan (CSTAN, 2015)**
The CSTAN is a planning tool that is intended to accomplish six goals:

1. Identify truck arterial system needs and connectivity gaps
2. Prioritize funding to projects showing the greatest expected benefits
3. Minimize truck and pedestrian/bicycle conflicts
4. Establish a database of arterial truck data that can be used by industry as well as for planning purposes
5. Assist the trucking industry in identifying designated truck routes
6. Support the development of the Federal PFN

Los Angeles Metro is currently updating their freight plan. Metro expects to complete the plan by 2020.
Endnotes

16 Trade Corridor Enhancement Program (TCEP). California Transportation Commission. Cartc.ca.gov/programs/sb1/trade-corridor-enhancement-program
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   https://dot.ca.gov/programs/transportation-planning/office-of-smart-mobility-climate-change/sb-743
   http://media.metro.net/projects_studies/mcgmap/images/02_Vol1_Executive_Summary_043008.pdf.
Appendix C. California’s Competitive Position

California’s competitiveness is vital to both public agencies and private stakeholders. Losses of commerce, businesses, and jobs to other states or other nations are keenly felt throughout the state and across sectors. Increasing statewide competitiveness is a key priority for the State; this section connects the role, and potential growth, of efficient goods movement in California’s competitiveness and achieving this goal.

Losses of economic activity due to interstate and international competition vary in scope and effect. Losses are highly visible and tangible when businesses move away from California or when businesses that might have located in California choose a competing location instead. Other economic losses are less obvious or immediate, such as gradual shifts in business activity away from California or closures of California businesses. Yet, these less-obvious losses can be equally important to California’s aggregate economy and affect some communities disproportionately. Increasing competitiveness across the state can contribute to local and state economic development by making California the preferred choice of developers, businesses, and transportation providers.

“Competitiveness” is often defined in general terms but is typically grounded in economic activity and attraction. Key definitions of “competitiveness” are included below:

- “A competitive region is one that can attract and maintain successful firms and maintain or increase standards of living for the region’s inhabitants. Skilled labor and investment gravitate away from ‘uncompetitive’ regions towards more competitive ones.” - The Organization for Economic Co-operation and Development (OECD)
- “Competitive regions provide conditions under which companies can compete successfully on national and international markets while paying wages that can support a high standard of living to citizens.” - US Cluster mapping

Few discussions of competitiveness specify what exactly states are competing for, what entities are competing, or how freight transportation affects winning or losing. There are few available comparisons of freight transportation performance between regions, states, or nations. This chapter serves to address the nature of competition between locations and the role of goods movement in that competition.

The state, its communities, its transportation providers, and its businesses compete in several ways:

- The State of California and California municipalities compete for business locations, including production facilities, distribution centers, and offices.
- California producers, manufacturers, distributors, and wholesalers compete for business and market share with their domestic and foreign counterparts elsewhere and may also compete for business within their own firms.
• California seaports, airports, and freight carriers compete with their counterparts in other states and nations for freight transportation business.

This section examines these different types of competition and the factors that affect California’s competitive position in each.

The role of freight transportation in economic competitiveness is usually assumed to be a function of freight system capacity, performance, and efficiency. In most discussions of competitiveness, quantitative or qualitative shortfalls in freight capacity, cost, service frequency, transit time, reliability, safety, etc. are presumed to diminish economic competitiveness.

Beyond freight transportation costs and services, California’s competitiveness is affected by several factors cited in the industry focus groups conducted for the CFMP 2020. These factors include:

• **Workforce availability and cost of living**-- Production and distribution facilities have reported difficulty in obtaining qualified workers and truck drivers in California. California’s cost of living, particularly housing costs, makes it difficult for workers to make ends meet on typical wages.

• **Land and development costs and uncertainty**-- The difficulty and cost of securing land and developing facilities in California are frequently cited as handicaps in California’s competitiveness. The length and uncertainty of the development approval process contribute to this problem.

• **Environmental regulations**-- California’s environmental regulations, and the cost of compliance, are frequently cited as decreasing the state’s competitiveness. Uncertainty over future regulations is also a significant factor.

• **Lack of linkage between goods movement and economic development efforts**-- Stakeholders feel that California’s economic development efforts lag behind other states and are not effectively linked to the goods movement industry or its capabilities.

This section provides a high-level perspective on the potential role of goods movement in California’s national and international competitiveness and identifies factors that may be of concern to non-transportation agencies. The section addresses the following subjects:

• **Competition for:**
  o Business locations
  o California products and production
  o Distribution centers
  o Seaport business
  o Air cargo business

• **Cost differences in:**
  o Freight transportation
  o Labor and supply
  o Land
Energy and utilities
- Perceptions of California’s business climate
- Competitive economic development efforts
- Implications for competitiveness and potential growth

Competition for Business Locations

The focus of most regional and state competitiveness discussions is competition for locations of new production, distribution, or transportation facilities. These facilities generate jobs, tax revenue, and positive economic impacts within communities. Californians are concerned over the potential loss of businesses, and over facilities that close due to out-of-state competition or relocate to outside of the state. For this discussion, it is critical to first understand how companies are making various location decisions.

Types of location decisions-- Although there are many possible variations and combinations, most location decisions fall under a few basic types:

- Choosing a location for a new production or distribution facility
- Choosing whether to expand, contract or close an existing location
- Choosing how much production or distribution activity to allocate among locations

Location Decision Factors-- Key factors in location decisions commonly include:

- Access to target markets
- Availability of suitable sites, buildings, or other facilities, with appropriate zoning
- Fit within existing or planned production, supply chain, and distribution networks
- Development timeline (e.g. permitting, construction, EIRs)
- Land cost and zoning
- Cost of doing business (other than transportation)
- Local regulations and other restrictions
- Workforce availability
- Proximity to suppliers, intellectual capital, and other inputs
- Freight transportation capacity and reliability
- Freight transportation service and cost

California’s consumer population and direct access to international markets via ports on the Pacific Rim give the state a competitive edge to the first factor, access to target markets. Few businesses have a major presence in the California market without a physical location in California.

Some of these factors, such as site availability and access to inputs, can eliminate a given location from further consideration. If there are no suitable sites available or if critical inputs cannot be obtained, other factors do not matter. Similarly, if freight transportation capacity and reliability needs cannot meet in a given location, the business will locate elsewhere.
While freight transportation capacity (e.g. highway, port, rail, or air cargo capacity) can usually be taken for granted, this is not always the case. Facilities that require or produce large volumes of marine bulk cargo (e.g. export grain elevators) or specialized cargo (e.g. import autos) need specialized terminals with sufficient capacity. Reliability can usually be achieved, but sometimes at a higher cost. If fleet operators must add drivers, add equipment, or allow extra time to overcome local problems, then costs can increase significantly. Notably, some parts of rural California have limited STAA truck access, which can reduce the ability of those areas to compete for new facilities.

While cost differences are relatively easy to quantify, reliability differences are not. There is a relationship between reliability and inventory levels (e.g., the need for larger or smaller “safety” stocks), but in most cases, the greater concern is the ability to meet corporate and customer requirements consistently. Recurrent congestion reduces productivity and can affect reliability if the parties cannot anticipate and accommodate expected delays.

Non-recurrent delays and congestion are a more serious reliability problem. As California transportation facilities of all kinds – highways, arterials, ports, airports, railroads – operate closer to their capacity, the frequency and severity of non-recurrent congestion tend to rise. In some parts of California, notably the San Francisco Bay Area, usable corridors are restricted by geography. Often, there are no practical alternatives to congested routes.

Manufacturing plants may have flexibility in their location decision, either within California or in other states. Manufacturing plants that use easy-to-transport inputs (e.g. electrical components) or widely available inputs (e.g. paper or basic metals) may take the full list of location factors above into account. If all other factors are equal, goods movement may become the deciding factor. However, the ability of the facility to locate in a wide variety of locations implies that either goods movement differences are not likely to be critical, or that there are few significant goods movement differences between locations.

Where more generic inputs such as semi-skilled labor, space, or electrical power are a major part of production expenses, the costs of those inputs will have a greater impact on location decisions. In this case, California’s higher labor, land, or power costs – or perceptions of higher costs – may place the state at a competitive disadvantage. These perceptions are discussed further in the Perceptions of California’s Business Climate section of this section.

**Local Market Facilities**—Many goods movement and freight-dependent industry facilities must be located close to the market that they serve or the sources on which they rely. California does not need to compete for these local market facilities, although there may be competition between cities and counties within California. For example:

- Suppliers of basic building materials (aggregates, cement, lumber) need to be close to construction projects. Consequently, these facilities are spread widely throughout the state.
- Processors of perishable inputs (wine grapes, tomatoes, strawberries) need to be close to the source to maintain quality without excess transport and handling costs.
Suppliers of inputs to true “just in time” manufacturing (e.g. auto assembly plants) must be located close to their customers to maintain the required responsiveness.

Facilities that require specific work force skills (e.g. high-tech product development, software engineering) usually located near sources for those skills (e.g. major universities) or other facilities that need those skills (e.g. Silicon Valley).

These local market examples are cases where California does not need to compete for the production or distribution function. Cement batch plants, for example, are distributed throughout the state to serve local markets, and cannot serve California cities from other states. Likewise, sand and gravel producers – quarries, etc. – cannot locate away from the underlying resource. In general, fungible commodities with high transportation costs relative to their value cannot be shipped very far and still compete with nearer suppliers.

**Competition for California Products and Producers**

California producers and their products compete with producers and products from other states and nations. The extent and nature of that competition depend on commodity type. For example, some California products are differentiated by source or brand, such as Napa Valley wines, California raisins, or Tesla autos. Since customers may not see wines, raisins, or autos from elsewhere as perfect substitutes, differentiated products can often command a somewhat higher price and have a greater ability to absorb transportation cost differences without losing market share. Other California products dominate their industry due to production volume and are somewhat shielded from competition because other sources cannot satisfy the market demand. However, California products that are not differentiated by source or brand must compete on delivered price and reliability of supply. Examples discussed below to illustrate the differences in competition between products and markets.

**Medium-grain rice**

California medium-grain rice is an example of a product that is slightly differentiated but must also compete on delivered price. Medium-grain produced in and milled in California (e.g. Sutter County), for example, must compete in domestic and foreign (Asian) markets with medium-grain rice of equivalent grades from elsewhere in the U.S. or from other countries. Medium-grain rice generally competes with other types of rice, including long-grain and basmati rice, also produced in California and elsewhere. Within the U.S., Arkansas is the leading rice production state and is a competitor to California’s rice industry. Some California rice varieties, such as the Calrose variety, and its commercial descendants, are favored for their texture in sushi and other Asian cuisines, and therefore can command a somewhat higher price in those markets.

Within the medium-grain rice export production and shipping process, freight transportation efficiency would affect:

- Transportation of rice seed, fertilizer, and equipment to fields
- Transportation of harvested rice to rice mills
- Transportation of milled rice in bags or bulk to seaports
- Transportation of rice by ship to foreign markets

Medium-grain rice growers in one part of California (e.g. Sutter County) may compete with growers in other areas (e.g. Glen and Butte Counties). If growers in both areas receive the same delivered price at the mill, the grower with the lower trucking cost will have higher net revenue. The difference in total trucking cost is likely to be small, however, and the difference in trucking efficiency (e.g. cost per mile) within California is likely to be smaller yet.

The delivered cost of California medium-grain rice in Hong Kong would include:

- California production, milling, and distribution costs
- Trucking costs in California
- Shipping costs (including port costs) from California to Hong Kong
- Distribution and delivery cost in Hong Kong

Due to the short distances involved, internal California transportation costs would have a relatively minor role in the delivered cost of California medium-grain rice and its competitiveness in world markets. For a given and competitively determined delivered price in Hong Kong, the rice wholesaler or broker will realize a greater net profit if transportation costs are lower.

Within California, there may be competition for the location of new rice milling or storage facilities. That location may be influenced by the condition of local roads and access to rail service, but it is more likely to be determined by land costs and distance to growers and ports.

**Almonds**

California almond production is shielded from domestic and foreign competition, due to both sheer production volume and product differentiation. In 2016, California produced about 80 percent of the world’s almonds and 100% of the U.S. commercial supply. California also produced about 65 percent of the world’s almond exports to more than 90 countries worldwide. As a result, California almonds face very little competition.

Depending on market conditions, higher transportation costs will either raise the delivered cost or reduce the producer’s profit. In the case of almonds, California dominates world trade. If foreign consumers want more almonds than are available locally, they must pay California prices. The risk to California almond producers is that foreign consumers will buy fewer almonds if prices become too high or if the delivery becomes unreliable.

For almonds, California goods movement efficiency would have a little competitive impact. The almond industry cannot readily move to another state, nor can other producers quickly increase production to displace California almonds.
Competition for Distribution Centers

Distribution centers (DCs) can be national (NDCs), serving the entire nation, regional (RDCs, serving a region within the nation), or local in scope. There may also be separate import distribution centers (IDCs), handling imported goods separately from domestic goods. A state or a sub-region may compete as a potential location for a national, regional, or import DC. RDCs in the state may also “compete” for coverage with RDCs in other states.

Large retail chains, manufacturers, and wholesalers may adopt one of several distribution center strategies to access their customers:

- A single national distribution center (NDC)
- A series of regional DCs (RDCs)
- A tiered system of an NDC feeding multiple RDCs

Firms may progress through different strategies:

- Starting with a single NDC, often at the point of production or near a port
- Establishing additional RDCs as a volume in regional markets grows
- Establishing additional IDCs as import volumes justify multiple entry ports

Large, well-known retail chains typically have multiple RDCs. For example, the following retail chains have RDCs in California:

- Target – Woodland, Rialto, Shafter
- Home Depot – Lathrop, Mira Loma
- Crate & Barrel – Tracy, Santa Fe Springs
- Rite Aid – Woodland, Lancaster
- Safeway – Tracy, Santa Fe Springs, Norwalk
- J.C. Penney – Stockton
- Walmart – Porterville, Mira Loma
- IKEA – Lebec
- Kohl’s – Patterson, San Bernardino

California is such a large market that it is unlikely that a major retail business would serve the state without at least one RDC there. As noted, many DCs are already here. However, the activity level of California’s DCs may be subject to “competition” within the supply chain of various types:

- **Competition for existing territory** – how much of California, or the western states, will be served from California DCs, as opposed to DCs elsewhere?
- **Competition for expansion** – will the firm choose to expand stores or sales in the state, thus increasing volume at the state DC, or elsewhere?
• **Competition for the new territory** – as a producer, importer, or retail chain expands into new markets, will those markets be served from California DCs, from existing DCs elsewhere, or from new DCs elsewhere?

For example, an importer with growing volume at a single Inland Empire facility might choose: 1) to expand that facility and continue to serve the whole country from a single point; or 2) to establish a second import facility in Georgia, served by the Port of Savannah. In the first case, California lost the facility, but in the second case, the state loses volume, expansion potential, jobs, and tax revenue.

In making a decision of this type, the importer must weigh the total cost of serving a mid-continent market (Kansas City, for example) from the Inland Empire versus from Georgia. The relevant costs would include:

- Ocean transportation costs from the source to the U.S. port
- Inland transportation (truck) to the port-area DC
- Inland transportation to the store or customer in Kansas City

Port handling costs do not figure directly into the importer’s calculations, because those costs are part of the ocean transportation expense. However, the importer may see additional clean trucks and PierPass/Off Peak fees at Southern California ports.

In the example above, the importer may pay for truck drayage between the port and the DC, and between the DC and an intermodal rail terminal for the trip to Kansas City.

California ports “compete” for this business but have no direct influence over the costs and services involved, except for their own fees.

CFMP outreach and interviews with importers and other parties revealed that transportation cost is only one factor in the DC location decision, and perhaps not the deciding factor. Many stakeholders regard it as significantly more difficult, more time consuming, costlier, and less certain to build or expand a facility in California than elsewhere. This perception – whether it is true or not in every case – tends to tip the scale in favor of locations in other states. Other consequences and effects of perceptions are discussed further in the Perceptions of California’s Business Climate section.

**Competition for California Seaport Business**

While there has been much commentary on the efficiency of U.S. and West Coast ports compared to leading Asian and European ports, a realistic view of the role of ports in state competitiveness is much narrower.

California has 12 deep water port complexes, each specializing in a different mix of major cargo types, commodities, and service territories:
• The Ports of Los Angeles, Long Beach, and Oakland are best known as container ports, but the San Pedro Bay ports also handle autos, break-bulk cargo, dry bulks, and liquid bulks (chiefly petroleum and petroleum products).
• The Ports of San Diego and Hueneme handle fresh fruit in conventional refrigerated ships and in containers, and autos.
• The Port of Richmond handles autos, vegetable oils, and break-bulk cargo.
• The Port of Benicia handles autos.
• The Port of Redwood City handles bulk commodities.
• The Port of Humboldt Bay handles forest products and fuels.
• The Port of San Francisco handles bulk commodities and autos.
• The Ports of West Sacramento and Stockton handle bulk commodities and break-bulk cargo.

California also has numerous private terminals that handle liquid and dry bulk commodities, such as petroleum products, gypsum, and scrap metal.

**Container Port Competition**

As container ports, Los Angeles, Long Beach, and Oakland compete for different trade flows in different ways.

The San Pedro Bay ports handle essentially all dry containerized cargo moving to and from Southern California, with incidental amounts moving via Oakland or Mexican ports. To some extent, the Ports of Los Angeles and Long Beach compete with the Ports of San Diego and Hueneme for refrigerated cargo. Port Hueneme and San Diego, however, are served by specific carriers in the refrigerated fruit trade that does not call at San Pedro Bay, so the primary competition is between carriers, while the ports may compete for carrier calls.

The Port of Oakland handles nearly all containerized imports and exports for Northern California, as well as some intermodal cargo moving to and from inland points.

California container ports compete with other U.S. and North American ports in two ways:

1. California ports compete for “discretionary” container traffic that can move by rail to other regions through any one of several ports. For example, Los Angeles or Long Beach compete for Asian imports to Midwestern consumer markets with the Ports of Oakland, Vancouver, Prince Rupert, New York-New Jersey, Baltimore, and Norfolk.
2. California ports compete with other regions for the location of import DCs and their inbound trade flows. For example, Riverside County might compete with Georgia for a new import DC that would bring in goods through either Los Angeles/Long Beach or Savannah.

In the case of discretionary cargo, economic activity and employment, both at the port and in the transportation network, are at risk due to competition with other ports. In the case of import DC location, economic activity and employment at the DC itself are also at risk due to competition with other regions.
The large local and regional markets in Southern California draw first inbound vessel calls to Los Angeles and Long Beach. Inland importers use these vessel schedules to get the fastest service from Asia. However, Pacific Northwest and British Columbia ports have faster sailing times from ports in North Asia (e.g. Korea, Japan, Northern China), giving these ports a transit time advantage over California ports for discretionary intermodal imports.

For exports, Oakland’s geographic position near California agricultural production gives it an advantage. Oakland is also often the last port of call before vessels return to Asia, providing a faster shipping option for exporters. As a result, Oakland is one of few U.S. ports where containerized exports exceed imports.

There is an overlap between the Los Angeles, Long Beach, and Oakland markets in the Central and Southern San Joaquin Valley. There, importers and exporters may choose ports based on relative trucking ocean costs and timing of vessel schedules.

**Port Market Shares**

Table C.1. and Figure C.1. show, the Pacific Coast ports combined had a 55 to 58 percent share of the loaded U.S. import container trade from 2000 through 2012. Starting in 2012, that share declined to 49 percent in 2017. Since 2012, the Atlantic port share has risen from 40 to 45 percent and the Gulf port share from 5 to 7 percent. This apparent loss of market share, shown graphically in Figure C.1 has prompted concerns over the competitiveness of California’s container ports.
### Table C.1. Coastal Shares of Loaded Import TEU, 2000-2017

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<tr>
<th>Year</th>
<th>Pacific</th>
<th>Atlantic</th>
<th>Gulf</th>
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<tr>
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<td>58%</td>
<td>37%</td>
<td>5%</td>
</tr>
<tr>
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<td>57%</td>
<td>38%</td>
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<td>38%</td>
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</tr>
<tr>
<td>2017</td>
<td>49%</td>
<td>45%</td>
<td>7%</td>
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</table>

Source: American Association of Port Authorities
Figure C.1. A shift in Coastal Import Shares

Source: American Association of Port Authorities

As Figure C.1 reveals, however, the market share shift did not result from net cargo loss at California or Pacific Coast ports, but from faster growth at Atlantic and Gulf Coast ports. Imports on all three coasts grew rapidly up to a peak in 2006-2007, then fell off during the 2008-2009 recession. After the recession, growth resumed on all coasts (although interrupted on the West Coast by the labor-management dispute of late 2014 and early 2015). Figure C.2 shows the U.S Loaded Import TEU by Coast, 2000-2017.  

Figure C.2
There was faster growth on the Atlantic and Gulf coasts for several reasons identified in the literature and trade press:

- Strong growth in the transatlantic/European and Caribbean/South American trades served by the Atlantic and Gulf ports
- Increased use of Suez Canal routings from Southeast Asia to the U.S., driven in part by a shift of manufacturing and sourcing from China to Southeast Asia and the Indian subcontinent
- Increased adoption of “three corners” and “four corners” logistics strategies by large importers (notably large retail chains), which dispersed import flows from the major Southern California gateway \(^7,\ 8\)
- A reduction in Southern California import transloading
- An increase on rail intermodal service, leading ocean carriers to replace rail movements from Southern California to some inland markets with truck or rail moves from other ports
- Rising costs of locating and operating distribution and manufacturing facilities in California, versus aggressive economic development efforts in other states

Source: American Association of Port Authorities

Figure C.2. U.S. Loaded Import TEU by Coast, 2000-2017
Modernization and increased capacity at Atlantic and Gulf ports
• New Panama Canal locks permitting larger, more efficient vessels on that route
• Increased cost at Southern California ports (and California ports in general) due to "clean truck" requirements, PierPass/Off Peak fees, and rising drayage costs from port and highway congestion
• Concern over West Coast labor relations stability after the lengthy 2014-2015 dispute and accompanying shipping disruption

Of these factors, only the last two are specific to California ports; the others are shifts in trade patterns and in the economic context in which California ports must compete.

There is virtually no publicly available information on relative costs at different container ports. The fees that marine terminal operators charge their ocean carrier customers are negotiated and embodied in confidential contracts. The rents that port authorities charge marine terminals operators are likewise negotiated and confidential.

Table C.2. provides a key perspective on the relative growth of California’s container port volumes. In the rapid growth era of 1990-2007, Southern California ports outperformed the nation. Much of the cargo and share growth in that period was attributable to the rapid expansion of rail intermodal container movements through San Pedro Bay in response to the introduction and adoption of double-stack rail cars. This period also saw an increase in the practice of import transloading: bringing in international containers of imported merchandise and transferring the goods to domestic containers or trailers in Southern California. Finally, this period also saw dramatic growth in U.S. imports from China, with Southern California as the leading gateway. The Port of Oakland did not benefit as much from the expansion of intermodal traffic or transloading, and Northern California TEU totals did not grow as fast.

Table C.2. Container Port Cargo Growth Rates 1990-2017

<table>
<thead>
<tr>
<th>Compound Average Growth Rate (CAGR)</th>
<th>1990-2007</th>
<th>2007-2009</th>
<th>2009-2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>6.4%</td>
<td>-6.1%</td>
<td>4.4%</td>
</tr>
<tr>
<td>California</td>
<td>7.9%</td>
<td>-8.4%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Southern California</td>
<td>8.9%</td>
<td>-8.9%</td>
<td>4.6%</td>
</tr>
<tr>
<td>Northern California</td>
<td>3.8%</td>
<td>-5.0%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Pacific Northwest</td>
<td>3.6%</td>
<td>-8.1%</td>
<td>1.4%</td>
</tr>
<tr>
<td>British Columbia</td>
<td>11.7%</td>
<td>-1.3%</td>
<td>7.1%</td>
</tr>
</tbody>
</table>

Source: American Association of Port Authorities
U.S. container ports were hit hard by the recession, with Southern California losing 24 percent of its 2007 peak volume by 2009. Following the recession, the Southern California ports rebounded slightly faster than the nation. Oakland's volume dropped by 14 percent during the recession but did not grow as quickly after partial recovery in 2010. The labor-management issues in late 2014 and early 2015 hampered recovery for all U.S. West Coast ports.

Table C.2. also highlights one other critical factor: the rapid growth of the British Columbia ports as a gateway to both Canadian and U.S. markets. Before the recession, the Port of Vancouver began working with the Canadian railroads to offer highly competitive rail intermodal service to both markets. This effort, backed by Transport Canada's Asia-Pacific Gateway and Corridor Initiative, infrastructure funding, and the extension of Canadian railroads into U.S. markets through merger and acquisition, led to notable market share growth. The opening of Prince Rupert’s Fairview terminal in 2007 created a second British Columbia rail intermodal gateway. Much of the market share gained by the British Columbia ports has come at the expense of U.S. Pacific Northwest ports (as suggested by their slow post-recession growth in Table C.2), but the success of Vancouver and Prince Rupert has restrained Southern California's growth as well.

Figure C.3. shows this shift of Pacific Coast shares graphically. The share going to California ports peaked in 2001 at 73.4 percent. The post-recession California share has varied from 70.2 to 71.5 percent, where it stood in 2017. In contrast, the Pacific Northwest ports dropped from a high of 29.7 percent in 1990 to 13.2 percent in 2017. Portland has not handled significant container business since 2014. Seattle and Tacoma have joined forces as the Northwest Seaport Alliance, partly to rationalize infrastructure investment and reinforce marketing efforts.
For roll-on/roll-off (Ro-Ro) trade, mainly automobiles and vehicles, the Ports of San Diego, Long Beach, Hueneme, San Francisco, and Richmond all participate and compete. Ro-Ro facilities are the principal of two types: brand-linked (such as the Toyota import facility at Long Beach) and operator-based (such as the Pasha facilities at San Diego and San Francisco). Ports and terminal operators compete for multi-year contracts with major auto importers and on a shipment-by-shipment basis for other flows. The key factors in this competition are:

- Fit within the importer’s international market strategy
- Access to major consumer markets
- Costs of ocean shipment, port handling, and vehicle processing
- Trucking costs to local and regional markets
- Rail access, service, and cost to intrastate markets

From the above factors, most often geography and market access are primary factors, and transportation cost is a secondary factor.
The Ports of Richmond and Benicia are entry and distribution points for imported autos, and Pasha has recently started up auto operations at the Port of San Francisco. Each manufacturer/importer tends to choose one or more ports as entry points for multi-year commitments. Ports and auto terminal operators, therefore, tend to compete for these long-term commitments rather than shipment-by-shipment. Other major West Coast auto import ports include Long Beach and Portland. To the extent that one importer may bring in autos to more than one port, the port terminal operators may compete for volume and territory, as do distributors of other goods.

**Break-bulk Trade**

“Break-bulk” trade, also called “general cargo”, includes non-bulk, non-containerized commodities such as structural steel, lumber, and machinery. “Project cargo” is a key subcategory of break-bulk trade, and includes goods such as bridge components, refinery assemblies, subway car shells, and other goods requiring special handling to support a near-term local or regional project. Wind farm generator towers and blades are an important project cargo at many ports. Occasional project cargo shipments may be handled through special stowage on container vessels and handled at container terminals.

Project cargo and break-bulk cargo, in general, are typically handled at multi-purpose terminals at Los Angeles, Long Beach, Stockton, or West Sacramento. Handling and inland transport costs are high for items such as windmill blades, steel shapes, or transit cars, so shipments typically move through the closest port. California ports would thus compete with other California ports. The only significant area of overlap may be Northern California and Southern Oregon.

Oakland, Stockton, West Sacramento, and other Northern California ports do not compete with other ports for shipments to and from Northern California. Northern California importers and exporters do not regularly use the Southern California or Pacific Northwest ports unless they require a specific service that is not available in Northern California.

**Bulk Commodities**

There is also limited competition between regional ports for bulk commodity exports. The Port of Stockton and Levin Richmond Terminals have handled export coal and iron ore movements, primarily from Utah to China. These movements might have been handled through the bulk export terminal at the Port of Long Beach.

Southern California ports have major flows of petroleum products for local refineries and markets. The San Francisco Bay Area refineries act as petroleum import ports. They compete with other refineries for imports to the extent that they compete for inland markets (e.g. in the San Joaquin Valley) with refineries elsewhere (e.g. in Southern California).

**Competition for California Air Cargo Business**

Like seaports, the competitive position of California’s cargo airports is largely determined by their geographic position relative to major markets.
Because both domestic and international air cargo tends to be time-sensitive, shippers commonly choose airports based on the combination of ground and air transit time. As a practical matter, the ground transit time to and from the airport may differ more than the air transit time, especially where carriers offer equivalent service from multiple airports. A shipper or air freight forwarder in the San Joaquin Valley might, therefore, choose between San Francisco (SFO) and Los Angeles (LAX) for an export shipment based on the truck time and cost to the airport, rather than on airport or air service characteristics.

Direct competition for air cargo business is largely regional, as outlined below:

- **Oakland (OAK)** and SFO compete for Bay Area air cargo, with OAK prevalent in domestic and SFO in international. San Jose (SJC) has a much smaller air cargo business at present.
- **Sacramento (SMF)** and Mather (MHR) compete for air cargo business in the Sacramento area (DHL and UPS serve MHR).
- **LAX** and Ontario (ONT) compete for air cargo in Southern California with LAX having the dominant share. San Diego (SAN) competes for the southern portion of the market.
- The numerous other California airports (Stockton, Modesto, Merced, Fresno, etc.) are served by feeder connections to the major airports. Stockton (SCK) has recently added service by Amazon flights.

California airports compete with other states for hub status and for transfer/interchange freight.

Hub airports host a larger number of feeder flights to and from regional airports, as well as a full schedule of flights serving other major airports and markets. At present, California has the following hub relationships:

- LAX – DHL, FedEx, UPS
- ONT – UPS, FedEx
- SFO – FedEx (International)
- OAK – FedEx, UPS
- MHR – DHL, UPS

The competition for West Coast hub status is primarily within California, the nearest alternatives being Portland or Las Vegas. The size of the Northern and Southern California markets, however, will keep major air cargo hub locations within the state.

Major hubs may also compete for air cargo transfer/transshipment business between foreign and domestic carriers. For this market, all major West Coast international airports can be in contention: Anchorage, Seattle-Tacoma, San Francisco, Vancouver, and Los Angeles. The outcome of this competition is affected by on-airport costs and network connections, not by ground transportation issues.

Air cargo is increasingly dominated by the integrated carriers, chiefly FedEx, UPS, and DHL. To use these carriers the customer tenders the shipment locally, and the carrier chooses the
routing and the airports. UPS, for example, uses OAK but not SFO. California airports, therefore, compete mostly for the business of the integrated carriers rather than for the underlying customer choices. Passenger airlines continue to carry substantial volumes of “belly cargo”. These air cargo services may be sold directly to the customer or through an air freight forwarder.

Relatively few producers or businesses rely heavily on on-air cargo due to the high cost. E-retailers such as Amazon make strenuous efforts to develop and manage regional and local distribution centers to minimize air cargo use. Businesses that do rely heavily on on-air cargo, particularly repair parts suppliers, are likely to locate next to a major national hub, or even on airport property. LAX, SFO, or OAK could compete for such businesses with other major hubs.

Key factors in airport competition include:

- Availability of takeoff/landing windows at key flight times
- Availability of gates and gate time slots for passenger services
- Airport landing and gate fees

Except for the air cargo transloading segment, which stays on the airport footprint, California’s airports are not in close competition with those in other states. Goods movement mobility within the state is unlikely to affect the competitive position of California airports either nationally or internationally.

California Cost Differences

Freight Transportation Costs

Trucking Costs

Table C.3 shows average U.S. marginal trucking costs per mile for 2009–2017, as computed by the American Transportation Research Institute.\(^\text{12, 13}\) As of 2017, the average U.S. marginal cost per mile was estimated at $1.691.

Table C.3. Average Marginal Costs per Mile, 2009-2017 (ATRI 2018)

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<tbody>
<tr>
<td>Vehicle-based</td>
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</tr>
<tr>
<td>Driver wages</td>
<td>$0.403</td>
<td>$0.446</td>
<td>$0.460</td>
<td>$0.417</td>
<td>$0.440</td>
<td>$0.462</td>
<td>$0.499</td>
<td>$0.523</td>
<td>$0.557</td>
</tr>
<tr>
<td>Driver benefits</td>
<td>$0.128</td>
<td>$0.162</td>
<td>$0.151</td>
<td>$0.116</td>
<td>$0.129</td>
<td>$0.129</td>
<td>$0.131</td>
<td>$0.155</td>
<td>$0.172</td>
</tr>
<tr>
<td>Total</td>
<td>$1.451</td>
<td>$1.548</td>
<td>$1.706</td>
<td>$1.633</td>
<td>$1.676</td>
<td>$1.703</td>
<td>$1.575</td>
<td>$1.592</td>
<td>$1.691</td>
</tr>
</tbody>
</table>

Source: American Transportation Research Institute (ATRI) 2018

As Table C.4 shows, the costs vary by the trucking sector. Less-than-truckload (LTL) costs were higher at $1.84 per mile due to last mile pickup and delivery costs and terminal handling costs. Truckload (TL) costs were lower at $1.49 per mile.

**Table C.4. Average Total Marginal Costs by Sector, 2009-2017 (ATRI 2018)**

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LTL</td>
<td>$1.43</td>
<td>$1.76</td>
<td>$1.93</td>
<td>$1.79</td>
<td>$1.84</td>
<td>$1.83</td>
<td>$1.60</td>
<td>$1.74</td>
<td>$1.84</td>
</tr>
<tr>
<td>Other</td>
<td>$1.67</td>
<td>$1.61</td>
<td>$1.79</td>
<td>$1.73</td>
<td>$1.67</td>
<td>$1.85</td>
<td>$1.72</td>
<td>$1.83</td>
<td>$1.95</td>
</tr>
<tr>
<td>TL</td>
<td>$1.36</td>
<td>$1.43</td>
<td>$1.57</td>
<td>$1.51</td>
<td>$1.60</td>
<td>$1.58</td>
<td>$1.50</td>
<td>$1.42</td>
<td>$1.49</td>
</tr>
</tbody>
</table>

Source: American Transportation Research Institute (ATRI) 2018

The share data in Table C.5 indicate that fuel accounts for 22 percent and driver wages and benefits are 43 percent of average marginal cost.

**Table C.5. Share of Total Average Marginal Cost, 2009-2017 (ATRI 2018)**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle-based</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Costs</td>
<td>28%</td>
<td>31%</td>
<td>35%</td>
<td>39%</td>
<td>38%</td>
<td>34%</td>
<td>26%</td>
<td>21%</td>
<td>22%</td>
</tr>
</tbody>
</table>
Fuel economy ranges from 4.9 to 6.3 mpg, as shown in Table C.6. At a mid-range value of about 6.8 mpg, California’s recent $0.12 per gallon diesel fuel tax increase would add about $0.02 per mile to trucking costs.

Table C.6. Respondent Reported Fuel Economy Compared to Typical Operating Weight (ATRI 2018)

<table>
<thead>
<tr>
<th>Typical Operating Weight</th>
<th>MPG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 20,000 lbs</td>
<td>6.3</td>
</tr>
<tr>
<td>20,001-40,000 lbs</td>
<td>6.8</td>
</tr>
<tr>
<td>40,001-60,000 lbs</td>
<td>7.2</td>
</tr>
<tr>
<td>60,001-80,000 lbs</td>
<td>6.3</td>
</tr>
<tr>
<td>Greater than 80,000 lbs</td>
<td>4.9</td>
</tr>
</tbody>
</table>

Source: American Association of Port Authorities
Table C.7 below shows that the West has an average marginal cost of about $1.616 per mile – higher than most regions, but lower than the Northwest.\textsuperscript{17} If the Southeast and Southwest are regarded as the West’s key competitors, their average trucking costs are about 4 to 5 percent lower.

Table C.7. Average Marginal Cost per Mile by Region, 2017 (ATRI 2018)

<table>
<thead>
<tr>
<th>Motor Carrier Costs</th>
<th>Midwest</th>
<th>Northeast</th>
<th>Southeast</th>
<th>Southwest</th>
<th>West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle-based</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel Costs</td>
<td>$0.350</td>
<td>$0.336</td>
<td>$0.327</td>
<td>$0.314</td>
<td>$0.377</td>
</tr>
<tr>
<td>Truck/Trailer Lease or Purchase Payments</td>
<td>$0.238</td>
<td>$0.300</td>
<td>$0.242</td>
<td>$0.253</td>
<td>$0.230</td>
</tr>
<tr>
<td>Repair &amp; Maintenance</td>
<td>$0.158</td>
<td>$0.163</td>
<td>$0.145</td>
<td>$0.128</td>
<td>$0.180</td>
</tr>
<tr>
<td>Truck Insurance Premiums</td>
<td>$0.077</td>
<td>$0.071</td>
<td>$0.061</td>
<td>$0.064</td>
<td>$0.078</td>
</tr>
<tr>
<td>Tires</td>
<td>$0.024</td>
<td>$0.025</td>
<td>$0.018</td>
<td>$0.021</td>
<td>$0.028</td>
</tr>
<tr>
<td>Tolls</td>
<td>$0.027</td>
<td>$0.040</td>
<td>$0.022</td>
<td>$0.023</td>
<td>$0.014</td>
</tr>
<tr>
<td>Driver-based</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver wages</td>
<td>$0.530</td>
<td>$0.575</td>
<td>$0.543</td>
<td>$0.564</td>
<td>$0.498</td>
</tr>
<tr>
<td>Driver benefits</td>
<td>$0.150</td>
<td>$0.194</td>
<td>$0.160</td>
<td>$0.129</td>
<td>$0.172</td>
</tr>
<tr>
<td>Total</td>
<td>$1.591</td>
<td>$1.735</td>
<td>$1.553</td>
<td>$1.536</td>
<td>$1.616</td>
</tr>
</tbody>
</table>

Source: American Association of Port Authorities

It should be noted, however, that firms shipping to and from California locations do not necessarily pay the higher costs incurred by California-based motor carriers for the following reasons:

- National truckload carriers may be based anywhere in the U.S., and their cost structure may reflect a mix of labor, fuel, and other costs across many locations
- Large carriers recruit and pay drivers nationwide
- With fuel tanks holding up to 250 gallons, long-haul trucks can often avoid buying fuel at California prices
California’s higher operating costs are therefore more likely to affect trucking within California, rather than affecting trucking to or from California. Out-of-state carriers do, however, compete for trips within California.

In the industry focus groups, Californian carriers expressed concern about competition from out-of-state carriers with lower cost structures. These higher cost factors are 1) the higher fuel costs (noted above), 2) the higher costs of “clean” trucks to meet California ARB requirements, and 3) congestion in California cities. However, out-of-state carriers must use ARB-compliant trucks when operating in California, and large cities in other states are also congested.

Within California, motor carriers are deeply concerned about highway and facility congestion that reduces driver productivity, vehicle productivity, and effective capacity. This issue has received the most attention in connection with port container drayage, where longer times spent in terminals, and on congested highways to and from the terminals reduce the number and length of the trips a driver can make within HOS limits. These issues are not unique to California or to port drayage, as busy Pacific Northwest and East Coast ports have similar problems, and urban congestion affects all trucks. When in competition with less congested regions and ports such as Savannah or Charleston, however, these costs place California at a disadvantage. The higher cost of port drayage in California is likely to be a significant factor in choosing the location for import distribution facilities or export-oriented businesses, offsetting California’s advantage in being closer to Asian sources and markets.

**Potential State Actions**

These observations imply that California public agencies can improve the state’s competitiveness on trucking costs by:

- Increasing capacity on state highways and local roads to reduce congestion
- Deploying ITS technologies to reduce congestion and lower trucking costs
- Easing emissions limits, clean truck requirements, and fuel taxes (contrary to environmental objectives)
- Acting, where possible, to reduce truck driver time spent at marine terminals and other freight facilities
- Improving truck driver training to increase the supply of drivers

**Railroad Costs**

California is served by two Class 1 railroads: BNSF and Union Pacific. The two railroads have extensive networks across the Western states with connection to other railroads at Midwestern gateways, to Canada, and to Mexico. California’s short line railroads operate within the state. Their rates and service would not ordinarily affect California’s competitiveness with other states.
It is not ordinarily possible to compare railroad rates charged to California customers or for routes through California ports with rates elsewhere. Since economic deregulation in 1980, most railroad traffic has travelled under confidential, negotiated contract rates rather than under published tariffs. Those contracts may include annual volume commitments, rate tiers, fuel surcharges, or rebates that are not reflected in any public records.

Railroad operating costs may be slightly higher in California than in other states. There has been a series of ARB actions designed to reduce emissions from both line-haul and yard operations, including:

- Increased use of low-sulfur fuel
- Introduction of low-emission, high-efficiency road locomotives
- Introduction of hybrid and other low-emission switching locomotives

In many respects, the ARB actions simply accelerate requirements eventually implemented by the U.S. EPA. Recently, the railroads have been acquiring low-emission locomotives for use across their systems. Over time, any higher costs in California will thus tend to equalize.

Railroad rate making is driven by three objectives that sometimes conflict:

- Maximizing business volume
- Maximizing profits
- Maximizing infrastructure, equipment, and labor utilization

Where railroads face effective competition from other railroads, rates tend to be lower and railroads will accept lower profits. Where railroads have available capacity, they will set rates more competitively to fill that capacity. Where demand is higher, and capacity is tight, railroads will set rates higher to maximize profit.

Recent downturns in key rail traffic volumes may lead BNSF and UP to encourage intermodal and other traffic to and from California. With the advent of fracking, lower-cost natural gas has replaced coal as a fuel for many electric power plants. The resulting decline in railroad coal traffic has reduced profits and created excess capacity in many places. While BNSF and UP lines in California were not dramatically affected, system traffic levels and profitability on both railroads declined. Both railroads have been seeking to expand other traffic sources, which may benefit current and potential rail customers in California, as well as in other states.

Differences in railroad costs and service may affect the ability of California ports to compete for discretionary intermodal shipments with Pacific Northwest and British Columbia ports. As described earlier, in Canada’s Pacific Gateway Initiative, Canadian railroads have cooperated with British Columbia ports and the Canadian government to improve rail access, capacity, and service in competition for discretionary cargo. It is generally believed in the shipping industry that the Canadian railroads have also engaged in aggressive rate setting in competition with U.S railroads – specifically BNSF and Union Pacific. These initiatives have contributed to the shift in market shares between U.S. and British Columbia ports on the West Coast of North America.
In at least one instance, the difficulty of developing facilities in California has prevented a railroad from improving service and lowering costs. BNSF’s proposed Southern California Intermodal Gateway terminal (SCIG) would be located near the Ports of Los Angeles and Long Beach. Development of SCIG would add new, efficient intermodal transfer capacity to the port rail system and divert thousands of annual truck trips from I-710. SCIG development was initially proposed prior to 2011, but BNSF has so far been prevented from building the facility due to local opposition. Costs have risen to the point where BNSF may no longer find the project desirable. If SCIG is not built, then the competitiveness of the Ports of Los Angeles and Long Beach may decrease in the future.

**Precision Scheduled Railroading**

The advent of “Precision Scheduled Railroading” (PSR) may lead railroads to shed less profitable traffic while improving service to more profitable sectors. PSR generally consists of improving rail service by paring complex and less profitable services to simplify and speed up more profitable operations, permitting the railroad to improve overall service and profitability. Railroad industry investors and financial analysts tend to judge railroads by their operating ratio, the ratio of operating costs to revenue. UP, which historically enjoyed the industry’s best operating ratio, produced a third quarter 2018 operating ratio of 61.7 percent, the same as in 2017. In comparison, railroads that had implemented PSR had operating ratios below 60 percent.

UP’s Unified Plan 2020 (UP 2020), a new operating plan that implements PSR principles, was launched on October 1, 2018. The goal of UP 2020 is to help UP achieve a 60 percent operating ratio goal by 2020, on the way to eventually achieving a 55 percent operating ratio. UP 2020 is scheduled to be implemented in California in 2019. UP 2020 anticipates layoffs, some of which have already occurred, and more of which are planned. The strong economy and truck driver shortage is facilitating this strategy. Under this system, UP’s financial hurdle for the continuation of any existing business or the addition of any new business will be much higher than in the past.

**Ocean Shipping Costs**

The ocean shipping rates paid by customers include the cost of vessel operations, the cost of terminal operations, fees assessed by ports, canal tolls, and ocean carrier overhead.

The current, highly competitive container shipping environment has resulted in very low rates for California shippers. Since the recession, containerized U.S. and world trade have grown slower than ocean carrier capacity. The capacity increase has been driven by carrier acquisition of larger container vessels to secure economies of scale. Faster growth in capacity than in demand has resulted in persistent industry-wide overcapacity. Under these conditions, intense competition has driven down shipping rates to the point of widespread financial losses among the carriers.

The rate differences between California ports and their competitors are likely to be small and based on small differences in underlying cost. Container shipping at all U.S. and Canadian ports
are dominated by the same carriers and carrier alliances. Many of the terminal operating costs are similar between California ports and competing ports elsewhere. All West Coast port terminals in North America are covered by the same basic labor contract, and many are operated by the same firms. The ports’ own charges tend to be highly competitive. Vessels calling California ports do incur slightly higher costs for low-sulfur fuel and cold-ironing.

The opening of new, wider Panama Canal locks has enabled carriers to use large ships through the canal. The new locks can thereby reduce unit costs for Asia-East Coast voyages, competing with the combination of Asia-West Coast voyages and cross-country rail service. Some of the savings are captured in higher Panama Canal tolls, and moreover, the West Coast option is faster. The net result has been a minor shift in market share, as discussed in the section on port competition.

Almost all the relevant rates and fees are contained in confidential, negotiated contracts. It is not possible to assemble a quantitative comparison from available data.

**Air Cargo Costs**

The air cargo industry is dominated by the integrated carriers, Fedex and UPS, trailed by smaller air freight forwarders and airlines offering belly cargo space on passenger flights. Air cargo operations in California have similar costs as in other states, and California customers likely face similar rates for air cargo service.

**Labor Costs**

As Figure C.4 shows, the differences in labor costs, reflected in median earnings and living wage levels, can vary. California’s median earnings for the transportation and material moving occupations and production occupations are comparable or even lower than in some competing regions. In the construction trades, California earnings are higher, likely due to higher housing demand and prices, and the strength of organized labor in public sector construction.

High housing and living costs in California create a higher threshold for “living wage” earnings than in some competing regions. The differences in these costs vary from about 7 to 20 percent.

Because transportation occupations do not pay more in California and living costs are higher, transportation workers may enjoy a better standard of living in other states. This disparity makes transportation and materials handling jobs in California relatively less attractive than they are in other states.

**Figure C.4. 2016 Median Earnings Comparison**
Land Costs

Land cost is a significant factor for businesses with multiple alternatives for production locations. Within states, business location is central and fundamental to the cost of commercial land. Lands in central business districts of dense urban areas cost many times more than the same commercial or industrial land area in undeveloped rural areas. Land costs become more significant as facility sizes, and ensuing land requirements, increase. Modern distribution centers typically occupy at least 100,000 square feet, and facilities over 1,000,000 square feet are common.

For investors who use commercial land and properties as investments, high land values can be attractive. California ranks first in a national study of total land valuation by an economist at the U.S. Bureau of Economic Analysis. That study estimated the combined value of all land in the country, finding that California accounts for 17 percent of the total value of the land in the 48 contiguous states. States with generally larger rural areas tend to have lower commercial land values relative to their size, while states with more densely populated areas, especially along the coasts, tend to have the highest estimated value per acre. Land use policies and zoning affect commercial land valuation as well, with undeveloped land generally having lower value.
per acre, while improved, commercially zoned properties with good transportation access have generally higher land values.

In a populous state such as California, possible alternative land uses affect current land values, especially where undeveloped commercial land in metropolitan areas is scarce. In those cases, land values for residential use influence commercial land values where the potential conversion of commercial space for housing use or mixed-use development competes with continued commercial use. Thus, an understanding of more readily available residential land valuation can provide context to understand commercial land valuation market pressures.

In California, residential land prices have been increasing for decades, even in comparison to the values of the buildings on the land. In a national study of property values by the Lincoln Institute, California residential land values as a percentage of total property values have increased substantially over the last 40 years. \(^{21}\) Compared with 1976, the land value as a share of total property value increased from 36 percent to 61 percent. California ranks second nationally for this land value share, behind only Hawaii. This trend reflects the relatively high average cost of the land itself in California. Location matters, and the lower land values are found in many rural California areas with have led to the dispersion of businesses, especially distribution centers, into formerly rural areas near population centers. The Inland Empire in Southern California’s San Bernardino and Riverside Counties is the best-known example, while the area of San Joaquin and Stanislaus Counties are known as the “Tracy Triangle” is a growing Northern California example.

**Energy and Utility Costs**

There are several energy source price metrics that affect California’s competitiveness for business locations and freight movement, including the prices of gas, diesel, natural gas, and electricity.

Energy and utility costs, including electricity and water, can be prominent factors in facility operating costs and therefore in competition for such facilities between states. These factors become more important for facilities that use electric power for lighting, climate control, and production equipment, and water for processing. These costs also affect the cost of living for employees.

California’s average commercial, industrial, and residential electric power rates are high compared with most other states. In 2018, according to the U.S. EIA, California had the fifth highest average commercial electricity rates, the sixth highest average industrial electricity rates, and the seventh highest average residential electricity rates. In studying a year of California’s average commercial electricity rates, rates proved 59 percent higher in California than the US average for all other states. California’s average industrial electricity rates for the same period were 100 percent higher than the average of all other states. California’s average
residential electricity rates were 49 percent higher than the average of all other states for this period.\textsuperscript{22}

Average retail gasoline prices in California are higher than in other states; only Hawaii typically has higher gas prices than California. The difference is significant. For example, in September 2018 the price difference was $0.87 per gallon or 31 percent of the U.S. average gas price.\textsuperscript{23} Gas price comparisons should be considered in the context of environmental regulations that require motor gasoline grades sold in California to create fewer emissions than in gasoline grades sold for less in other states.

Diesel fuel prices are an especially important factor in freight transportation, which currently still depends on diesel-powered trucks and rail locomotives. Compared with other states, California’s average diesel fuel prices are commonly ranked second-highest, behind only Hawaii. In September 2018, for example, the average diesel fuel price in California was $0.86 higher than the average for the other states, a 27 percent difference.\textsuperscript{24}

Another energy source price metric used as a competitiveness measure is natural gas. Average natural gas prices for transportation and for building heating and industrial process use are higher in California than in other states. The U.S. EIA reports that for the 12 months ending July 2018, California’s average residential natural gas rates were 16 percent higher than the average for other states. In the same period, California’s average natural gas rates for commercial customers were seven percent higher than the average for the rest of the U.S., while industrial natural gas customers in California paid an average natural gas rate 77 percent higher than the average for the rest of the country.

The energy price averages across the state mask local variations in a state as large as California. In California, regions are subject to various levels of regulation; therefore, there are specific prices for electricity and natural gas utilities, and the gasoline and diesel in each market across the state. As one example, in September 2018 the difference in average regular gasoline prices in California compared to the average for the rest of the U.S. varied from $0.77 in the Sacramento Region up to $0.97 in the Central Sierra Region.\textsuperscript{25}

**Comparative Distribution Center Costs**

The combined impact of these various cost factors is evident in overall operating costs for distribution centers or other industrial facilities. The comparisons in this section were derived from *Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities*, a 2015 report by The Boyd Company, Inc. The Boyd study estimated costs for 25 potential distribution center locations, including Patterson and Tracy in Northern California and Hesperia, Apple Valley, Victorville, and Mira Loma in Southern California. Warehouse operating costs were scaled to a hypothetical 500,000 sq. ft. facility employing 150 nonexempt workers and shipping over-the-road to the nearest intermodal and port city.

As Table C.8 indicates, California locations had the highest annual combined costs except for points in the Northeast and Idaho.\textsuperscript{26} The estimate for Tracy, for example, was 16% higher than
in Cordele, GA, and the company would save $1.85 million annually by choosing Cordele over Tracy.

### Table C.8. Distribution Center Operating Cost Ranking, 2015

<table>
<thead>
<tr>
<th>Distribution Warehouse Location</th>
<th>Total Annual Operating Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stoughton, MA</td>
<td>$15,081,230</td>
</tr>
<tr>
<td>Meadowlands, NJ</td>
<td>$14,631,975</td>
</tr>
<tr>
<td>Idaho Falls, ID</td>
<td>$14,576,733</td>
</tr>
<tr>
<td>Bordentown, NJ</td>
<td>$14,273,497</td>
</tr>
<tr>
<td>Newburgh, NY</td>
<td>$13,660,758</td>
</tr>
<tr>
<td>Tracy, CA</td>
<td>$13,302,372</td>
</tr>
<tr>
<td>Patterson, CA</td>
<td>$13,104,947</td>
</tr>
<tr>
<td>Hesperia, CA</td>
<td>$12,937,809</td>
</tr>
<tr>
<td>Apple Valley, CA</td>
<td>$12,923,646</td>
</tr>
<tr>
<td>Victorville, CA</td>
<td>$12,913,886</td>
</tr>
<tr>
<td>Mira Loma, CA</td>
<td>$12,912,925</td>
</tr>
<tr>
<td>Bethlehem, PA</td>
<td>$12,894,630</td>
</tr>
<tr>
<td>Casa Grande, AZ</td>
<td>$12,694,040</td>
</tr>
<tr>
<td>Miramar, FL</td>
<td>$12,573,879</td>
</tr>
<tr>
<td>Kent, WA</td>
<td>$12,490,728</td>
</tr>
<tr>
<td>Mequite, NV</td>
<td>$12,490,074</td>
</tr>
<tr>
<td>York, PA</td>
<td>$12,120,409</td>
</tr>
<tr>
<td>Kingman, AZ</td>
<td>$11,936,644</td>
</tr>
</tbody>
</table>
Table C.9 breaks down the operating cost estimates for locations in Southern California and competing locations in Arizona. Labor, electric power, and amortization (construction) costs are markedly higher in California, while property and sales tax costs are higher in Arizona. The much higher transportation cost to reach Arizona is a tradeoff for the otherwise lower operating costs. Even with the offsetting transportation costs, Kingman is about a million dollars less annually than the Southern California locations.

Table C.9. Annual DC Operating Costs, California vs. Arizona

<table>
<thead>
<tr>
<th>Comparative Annual Operating Cost Simulation Summary</th>
<th>Casa Grande</th>
<th>Kingman</th>
<th>Apple Valley</th>
<th>Hesperia</th>
<th>Mira Loma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonexempt Labor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighted Average Hourly Earnings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual Base Payroll Costs</td>
<td>$3,969,840</td>
<td>$3,584,280</td>
<td>$4,689,552</td>
<td>$3,769,520</td>
<td>$4,812,360</td>
</tr>
</tbody>
</table>

Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities
Table C.10 shows the construction cost and land cost differences that drive the amortization costs higher in California. With higher land and construction costs, the same warehouse in California would cost roughly $15 million or approximately 27 percent more in California than in Arizona.

### Table C.10. Warehouse Construction and Amortization Costs, California vs. Arizona

<table>
<thead>
<tr>
<th>Warehouse Construction and Amortization Costs</th>
<th>Casa Grande</th>
<th>Kingman</th>
<th>Apple Valley</th>
<th>Hesperia</th>
<th>Mira Loma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro Area</td>
<td>AZ</td>
<td>AZ</td>
<td>CA</td>
<td>CA</td>
<td>CA</td>
</tr>
<tr>
<td>Site Acquisition: No. of Acres</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Cost per Acre</td>
<td>73,500</td>
<td>$57,500</td>
<td>$298,500</td>
<td>$303,500</td>
<td>$322,500</td>
</tr>
</tbody>
</table>

Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities
### Site Improvement Cost

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Land Cost</strong></td>
<td>$2,572,500</td>
<td>$2,012,500</td>
<td>$10,447,500</td>
<td>$10,622,500</td>
<td>$11,287,500</td>
<td></td>
</tr>
<tr>
<td><strong>Construction Cost</strong></td>
<td>$32,677,230</td>
<td>$32,853,690</td>
<td>$39,576,510</td>
<td>$39,576,510</td>
<td>$40,286,430</td>
<td></td>
</tr>
<tr>
<td><strong>Machinery and Equipment</strong></td>
<td>$20,000,000</td>
<td>$20,000,000</td>
<td>$20,000,000</td>
<td>$20,000,000</td>
<td>$20,000,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total Project Investment</strong></td>
<td>$55,249,730</td>
<td>$54,866,190</td>
<td>$70,024,010</td>
<td>$70,199,010</td>
<td>$71,573,930</td>
<td></td>
</tr>
</tbody>
</table>

### Project Amortization

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost of Funds (Interest)</strong></td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td><strong>Payment Factor</strong></td>
<td>0.0569</td>
<td>0.0569</td>
<td>0.0569</td>
<td>0.0569</td>
<td>0.0569</td>
<td>0.0569</td>
</tr>
<tr>
<td><strong>Total Annual Amortization Cost</strong></td>
<td>$3,143,710</td>
<td>$3,121,886</td>
<td>$3,984,366</td>
<td>$3,994,324</td>
<td>$4,072,557</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities

*Table C.11* breaks down the operating cost estimates for locations in Southern California and competing locations in the Southeast. Labor, electric power and amortization (construction) costs are again markedly higher in California. Property and sales tax costs can be either lower or higher in the Southeast. The transportation cost differences are minimized by the proximity to the South Atlantic ports. Overall, the Southeast locations can be about $0.5 million to $1.8 million lower annually than the California locations.
## Table C.11. Annual DC Operating Costs, California vs. Southeast

<table>
<thead>
<tr>
<th>Comparative Annual Operating Cost Simulation Summary</th>
<th>Patterson</th>
<th>Tracy</th>
<th>Victorville</th>
<th>Miramar</th>
<th>Cordele</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CA</td>
<td>CA</td>
<td>CA</td>
<td>FL</td>
<td>GA</td>
</tr>
<tr>
<td></td>
<td>Metro Area</td>
<td>Metro Area</td>
<td>Metro Area</td>
<td>Metro Area</td>
<td>Metro Area</td>
</tr>
<tr>
<td>Nonexempt Labor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weighted Average Hourly Earnings</td>
<td>$16.99</td>
<td>$17.00</td>
<td>$16.52</td>
<td>$15.05</td>
<td>$14.13</td>
</tr>
<tr>
<td>Annual Base Payroll Costs</td>
<td>$4,852,344</td>
<td>$4,855,200</td>
<td>$4,718,112</td>
<td>$4,298,280</td>
<td>$4,035,528</td>
</tr>
<tr>
<td>Fringe Benefits</td>
<td>$1,649,797</td>
<td>$1,650,768</td>
<td>$1,604,158</td>
<td>$1,461,415</td>
<td>$1,372,080</td>
</tr>
<tr>
<td>Total Annual Labor Costs</td>
<td>$6,502,141</td>
<td>$6,505,968</td>
<td>$6,322,270</td>
<td>$5,759,695</td>
<td>$5,407,608</td>
</tr>
<tr>
<td>Electric Power Costs</td>
<td>$702,000</td>
<td>$958,368</td>
<td>$837,888</td>
<td>$520,788</td>
<td>$477,360</td>
</tr>
<tr>
<td>Amortization Costs</td>
<td>$4,212,951</td>
<td>$4,245,771</td>
<td>$3,992,332</td>
<td>$3,721,880</td>
<td>$3,075,686</td>
</tr>
<tr>
<td>Property and Sales Tax Costs</td>
<td>$1,208,857</td>
<td>$1,292,371</td>
<td>$1,236,581</td>
<td>$1,584,364</td>
<td>$1,123,754</td>
</tr>
<tr>
<td>Shipping Costs</td>
<td>$478,998</td>
<td>$299,894</td>
<td>$524,815</td>
<td>$987,152</td>
<td>$1,366,186</td>
</tr>
<tr>
<td>Total Annual Geographically-Variable Operating Costs</td>
<td>$13,104,947</td>
<td>$13,302,372</td>
<td>$12,913,886</td>
<td>$12,573,879</td>
<td>$11,450,594</td>
</tr>
</tbody>
</table>

Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities
Table C.12 shows the construction cost and land cost differences that drive the amortization costs higher in California. With higher land and construction costs, the same warehouse in California would cost roughly $5 to 20 million more in California than in Georgia or Florida.

### Table C.12. Warehouse Construction and Amortization Costs, California vs. Southeast

<table>
<thead>
<tr>
<th>Warehouse Construction and Amortization Costs</th>
<th>Patterson CA</th>
<th>Tracy CA</th>
<th>Victorville CA</th>
<th>Miramar FL</th>
<th>Cordele GA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site Acquisition: No. of Acres</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Cost per Acre</td>
<td>$348,000</td>
<td>$358,500</td>
<td>$302,500</td>
<td>$315,500</td>
<td>$76,500</td>
</tr>
<tr>
<td>Site Improvement Cost</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total Land Cost</td>
<td>$12,180,000</td>
<td>$12,547,500</td>
<td>$10,587,500</td>
<td>$11,042,500</td>
<td>$2,677,500</td>
</tr>
<tr>
<td>Construction Cost</td>
<td>$41,861,310</td>
<td>$42,070,617</td>
<td>$39,576,510</td>
<td>$34,368,390</td>
<td>$31,376,730</td>
</tr>
<tr>
<td>Machinery and Equipment</td>
<td>$20,000,000</td>
<td>$20,000,000</td>
<td>$20,000,000</td>
<td>$20,000,000</td>
<td>$20,000,000</td>
</tr>
<tr>
<td>Total Project Investment</td>
<td>$74,041,310</td>
<td>$74,618,117</td>
<td>$70,164,010</td>
<td>$64,410,890</td>
<td>$54,054,230</td>
</tr>
<tr>
<td>Project Amortization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of Funds (Interest)</td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td>Payment Factor</td>
<td>0.0569</td>
<td>0.0569</td>
<td>0.0569</td>
<td>0.0569</td>
<td>0.0569</td>
</tr>
<tr>
<td>Total Annual Amortization Cost</td>
<td>$4,212,951</td>
<td>$4,245,771</td>
<td>$3,992,332</td>
<td>$3,721,880</td>
<td>$3,075,686</td>
</tr>
</tbody>
</table>

Source: Comparative Distribution Warehousing Costs in Port and Intermodal-Proximate Cities
These comparisons resonate with comments made by industry stakeholders in the CFMP workshops. The cost advantages of the Southeast states also align with the market shares gains made by Southeast ports at the expense of California ports.

Perceptions of California’s Business Climate

Many of the freight industry stakeholders contacted for this study perceive an “anti-business” attitude in California, and see that attitude manifest in environmental regulations, high taxes and fees, and opposition to facility development.

Opinions and concerns over California’s friendliness to business are evident in state rankings on the ease of doing business, or as places to start a business. For example, WalletHub used a variety of statistics to rank states as places to start a business (Table C.13). Although California ranked eighth overall, it lagged behind states such as Texas and Georgia that are making strong efforts to attract firms. It is notable that California ranked 47th in business costs.

Table C.13. WalletHub Ranking of Best States to Start a Business

<table>
<thead>
<tr>
<th>Overall Rank</th>
<th>State</th>
<th>Total Score</th>
<th>&quot;Business Environment&quot; Rank</th>
<th>&quot;Access to Resources&quot; Rank</th>
<th>&quot;Business Costs&quot; Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Texas</td>
<td>61.05</td>
<td>1</td>
<td>11</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Utah</td>
<td>60.95</td>
<td>7</td>
<td>2</td>
<td>26</td>
</tr>
<tr>
<td>3</td>
<td>Georgia</td>
<td>58.12</td>
<td>5</td>
<td>17</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>North Dakota</td>
<td>57.68</td>
<td>2</td>
<td>19</td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>Oklahoma</td>
<td>57.58</td>
<td>8</td>
<td>36</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Florida</td>
<td>56.75</td>
<td>4</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>7</td>
<td>Arizona</td>
<td>54.39</td>
<td>9</td>
<td>12</td>
<td>29</td>
</tr>
<tr>
<td>8</td>
<td>California</td>
<td>54.30</td>
<td>3</td>
<td>3</td>
<td>46</td>
</tr>
<tr>
<td>9</td>
<td>Montana</td>
<td>53.71</td>
<td>11</td>
<td>30</td>
<td>8</td>
</tr>
<tr>
<td>10</td>
<td>Colorado</td>
<td>52.67</td>
<td>6</td>
<td>18</td>
<td>34</td>
</tr>
</tbody>
</table>

Source: WalletHub, 2019
A ranking by USA Today placed California 15th among the best states in which to do business.32 Similarly, a 2018 CNBC poll placed California 25th among “America’s Top States for Business”.33 California was ranked:

- 12th on workforce
- 24th on infrastructure
- 48th on the cost of doing business
- 11th on the economy
- 21st on quality of life
- 1st on technology.

A 2018 ranking by Area Development did not list California among the top 20 States for doing business.34

A 2009 study by the Public Policy Institute of California compared multiple rankings and found that California typically ranks highly on productivity, but poorly in terms of taxes and costs (Figure C.5). 35, 36

California is viewed by some sources as a magnet for high-tech research and product development, with superlative access to venture capital and expertise. These advantages, however, do not translate well for a wholesaler seeking to build a distribution center.
Figure C.5. California’s Business Climate Rankings

![Graph showing California's position among states based on business climate rankings.](image)

Source: Tioga Group

Competitive Economic Development Efforts

Industry outreach efforts have revealed deep concerns over California’s economic development efforts and the linkage of those efforts to goods movement, logistics, and freight transportation infrastructure.

Figure C.6 shows relative state spending on economic development and related functions, such as work force development, in Fiscal Year 2016, as compiled by the Council for Community and Economic Research. California ranked 48th among the 50 states. As calculated by the Council for Community and Economic Research, the State spent only $173 per business establishment on economic development programs in Fiscal Year 2016. The only states that spent less were Massachusetts and Connecticut. Table C.14 compares California’s spending in Fiscal Year 2016 with major competing states. The spending by the Southeast states is noteworthy and paralleled with strong economic development in that region.
**California Freight Mobility Plan 2020**

**Figure C.6. State Economic Development Spending, Fiscal 2016**

![Map showing state economic development spending](image)

Source: The Council for Community and Economic Research

**Table C.14. State Economic Development Spending**

<table>
<thead>
<tr>
<th>State</th>
<th>Fiscal 2016 Spending per Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>$ 173</td>
</tr>
<tr>
<td>Texas</td>
<td>$ 237</td>
</tr>
<tr>
<td>Arizona</td>
<td>$ 532</td>
</tr>
<tr>
<td>Nevada</td>
<td>$ 696</td>
</tr>
<tr>
<td>Georgia</td>
<td>$ 758</td>
</tr>
<tr>
<td>North Carolina</td>
<td>$ 988</td>
</tr>
<tr>
<td>Alabama</td>
<td>$ 988</td>
</tr>
<tr>
<td>Utah</td>
<td>$ 1,097</td>
</tr>
<tr>
<td>Florida</td>
<td>$ 1,113</td>
</tr>
</tbody>
</table>
Conventional vs. Logistics-Based Economic Development

While conventional economic development practices and tools are widely known and used, logistics-based economic development efforts use slightly different tools and have different targets. Rather than seeking new corporate headquarters or manufacturing developments based on local cost advantages, logistics-based development expands the market to include transportation, distribution, and logistics facilities on the basis of supply chain efficiency. Table C.16 highlights the differences between the two types of development. 39

Table C.16. Economic development and logistics-based development comparison

<table>
<thead>
<tr>
<th>Economic Development</th>
<th>Logistics-Based Development</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal: Attract beneficial businesses and organizations to the region.</td>
<td>Goal: Attract logistics-based businesses to the region.</td>
</tr>
<tr>
<td>Message: The region is an attractive, low-cost, and high-yield place to do business.</td>
<td>Message: The region/site offers specific logistical advantages (besides its general business advantages).</td>
</tr>
<tr>
<td>Anchor Tenants: Any business, but often manufacturers.</td>
<td>Anchor Tenants: Distribution centers, carrier facilities.</td>
</tr>
<tr>
<td>Issues and tools:</td>
<td>Issues and tools:</td>
</tr>
<tr>
<td>Location assistance</td>
<td>Freight transportation infrastructure (truck, rail, water, air)</td>
</tr>
<tr>
<td>Zoning and permitting</td>
<td>Location on trade lanes and corridors</td>
</tr>
<tr>
<td>Telecom &amp; utilities</td>
<td>Role in supply chains</td>
</tr>
<tr>
<td>Labor pool</td>
<td>Freight carrier participation</td>
</tr>
<tr>
<td>Marketing assistance</td>
<td>Regional &amp; national market access</td>
</tr>
<tr>
<td>Financial assistance</td>
<td>Cost of logistics</td>
</tr>
<tr>
<td>Cost of doing business</td>
<td>Local receptivity to freight &amp; logistics</td>
</tr>
<tr>
<td>Local business climate</td>
<td></td>
</tr>
</tbody>
</table>

Source: Tioga Group

Conventional Economic Development
Economic development agencies typically have responsibility for attracting a wide range of desirable businesses and other organizations to the region. The target organizations and
businesses can range from a franchise restaurant to a department store or an auto manufacturer. The basic message of economic development agencies is, “our region is an attractive place for your organization.” For businesses, the message tends to emphasize low capital and operating costs, a high-yield market, and various financial incentives. For headquarters offices, the agency is more likely to emphasize the quality of life and cultural advantages. In seeking an “anchor tenant” for a large development, an economic development agency is likely to seek a manufacturer, hotel, department store, or office building as appropriate. Economic development agencies will address transportation issues but tend to emphasize passenger transportation and access to regional markets.

Logistics-based Economic Development
By focusing on the freight transportation and logistics advantages of a candidate site, logistics-based developers bring additional tools and leverage to bear on location decisions. The Alliance Texas development, for example, is one of the earliest and best-known logistics-based developments. A critical distinction is that logistics-based advantages can complement and strengthen the basic attractions of a city, region or site, but cannot override the poor location. Logistics-based development is much more likely to succeed with the involvement of a specialized master developer, such as CenterPoint Properties (Joliet) or the Hillwood Group (Alliance Texas, Alliance California). Another key factor in successful logistics development is willing long-term commitments from trucking companies, ports, railroads, air cargo operators, or other carriers. The difference between logistics-based development and market-based development is illustrated by the emergence of trade and transportation corridors as DC candidates. DCs used to be located to serve a given local or regional market at the least cost, usually by locating them at or near the center of the market. A category of DCs is emerging, however, and is intended for forwarding distribution of transloaded or sorted goods to more distant points in a corridor. The two Wal-Mart DCs at Joliet, for example, are intended primarily to receive import loads from the Pacific Northwest and distribute sorted goods to points in Chicago and eastward.

Canada’s Asia-Pacific Gateway Initiative
Canada launched the Asia-Pacific Gateway initiative in 2006, and the program is on-going: The primary objective of the Asia-Pacific Gateway and Corridor Transportation Infrastructure Fund is to address capacity challenges facing Canada’s Asia-Pacific Gateway and Corridor transportation system. The Asia-Pacific Gateway and Corridor Transportation Infrastructure Fund provides funding for strategic infrastructure projects in British Columbia, Alberta, Saskatchewan, and Manitoba that enhance the competitiveness, efficiency, and capacity of Canada’s multimodal transportation network focused on international commerce with the Asia-Pacific region.

The Asia-Pacific Gateway and Corridor Transportation Infrastructure Fund transfer payment program will result in the completion and advancement of strategic transportation infrastructure projects that contribute to the objectives of the Asia-Pacific Gateway and Corridor Initiative, including addressing bottlenecks, capacity constraints and other impediments to the flow of trade.40
Expenditures were $18.5 million in the Fiscal Year 2016–2017 and are planned for $32.6 million in the Fiscal Year 2017–2018.

In November 2018, Canada announced that it would invest $16.7 million in transportation infrastructure to improve the competitiveness of the Port of Prince Rupert. Fairview Terminal at Prince Rupert handles only discretionary rail intermodal cargo. As Figure C.7 shows, Prince Rupert is connected to U.S. Midwestern and Eastern markets by rail.41

Figure C.7. Prince Rupert Rail Connections

Source: Port of Prince Rupert

Prince Rupert has already attracted substantial cargo away from Southern California ports, and intends to attract more:

“Chicago remains the top destination for import containers from Asia,” said Brian Friesen, Prince Rupert’s director of trade development. “Toronto and Montreal are up there as is Memphis, a destination that has seen a lot of growth in the past few years. We are also seeing growth in Detroit and the Ohio valley. Much of that is driven by auto parts. On the way out, we are seeing agricultural products from the Midwest coming to Prince Rupert via the CN network which are then shipped to overseas markets.”42

A key strength of the Asia-Pacific Gateway Initiative is its flexibility:

The targeted recipients are provinces and territories, including provincial and territorially-owned transportation entities; municipalities, including municipally-owned
transportation entities; public sector organizations, including transit agencies, commissions and boards but excluding federal Crown corporations; not-for-profit organizations; and, industry-related organizations, including for-profit organizations and Canada Port Authorities (subject to Canada Marine Act amendments). Funds have been used to support workforce programs as well as improving infrastructure.

From the freight industry’s perspective, the construction of some major California network improvements requires a long lead time that needs to be accounted for. The I-710 Corridor project, for example, has been in progress for over 15 years with no tangible capacity improvements.

Implications for Competitiveness and Potential Improvements

Competitiveness is a matter of degree rather than a dichotomy. California’s competitiveness varies depending on the type of decision being made, the industry sector and products involved, and the location within California. California is highly competitive in sectors where its resources, products, markets, and capabilities are difficult to match elsewhere. Examples include unique agricultural products and high-technology research and development. Freight mobility is a minor factor in those sectors. California is much less competitive for businesses or functions that can be readily located elsewhere and that are vulnerable to high transportation, labor, land, or utility costs. Distribution is one such sector, and distribution centers that do not need to be near California markets or ports are increasingly likely to locate elsewhere. Freight mobility is a significant factor in such sectors.

Some of the perceived losses of economic activity and market share are resultant of exogenous logistics developments and strategies. Wider Panama Canal locks have reduced the cost of shipping from Asia to the East Coast versus the West Coast, and port market shares have shifted in response. As import volumes grow and import supply chains mature, importers have established multiple import routes and facilities, again reducing California’s market share.

Many of the factors in state competitiveness are beyond the direct control of state government or state planning. Issues such as housing availability, cost of living, and market geography are driven by major long-term demographic and economic trends. While state government efforts may be warranted to blunt the most dramatic impacts on groups or industries at risk, the CFMP will not be able to reverse those demographic and economic trends. Workforce training is one area in which California can actively increase competitiveness.

Goods Movement Initiatives
The measures and initiatives that can improve California’s competitiveness through increased capacity, reliability, and efficiency are the same as those that can improve performance for California’s own needs:
• Highway capacity: Congestion in urban areas and on rural highways is the most frequently cited factor in poor California goods movement performance, and in freight transportation’s impact on competitiveness. The standard tools of bottleneck relief and capacity increase may be augmented by effective IT solutions if and when they emerge.

• Seaport Capacity: California’s ports, particularly the major container ports, have regularly added to their capacity and increased their productivity with relatively little state involvement. Unlike in most competing states, they are not state agencies. Yet if California wishes to compete more vigorously with other states, there may be a need for greater state support.

Economic Development Programs
California may need to link port and state economic development efforts and fund them at competitive levels to meeting competitive challenges from other states. Beyond the issues of transportation and development costs, California has not kept pace with logistics-based, transportation-linked economic development initiatives in competing states and nations, as in the case of Canada. The Ports of Georgia, Virginia, South Carolina, and Houston are state agencies and have been highly effective in attracting cargo growth and regional economic development. As local entities, California’s ports lack statewide development responsibility and statewide development resources. Local and regional economic development agencies can play an effective role in facilitating industrial and commercial development. There may be room to augment their traditional tools of tax concessions, site location and preparation help, etc. There can be a downside when inter-jurisdictional competition for development leads to concessions with adverse long-term impacts, such as allowing higher floor area ratings (FARs) that relegate truck parking to public streets.

Business Climate
Competitiveness is a matter of perception as well as reality, and – compared to other states – California is perceived to have little interest in attracting or keeping business. Businesses making location, production, distribution, and routing decisions compare costs and other tangible factors. Yet, they also hold their own perceptions of indifference or even hostility from communities, and of the difficulty of locating and operating in California, as external sources and studies affirm. Changing these perceptions may require significant “public relations” efforts linked to economic development programs.

Environmental and Building Regulations
As part of the State’s efforts to improve freight mobility and competitiveness, the State may wish to examine environmental and other regulations, and the processes governing commercial and industrial development, to see if they can be streamlined without compromising their goals or effectiveness. While the rules and processes may be formulated by the State, they are implemented at the local level, and it is frequently at the local level where delays and uncertainty appear.
The cost, time, and uncertainty of developing or expanding facilities in California are primarily local or regional issues rather than a state government issue. Many local communities are legitimately concerned with the growth of transportation and distribution activity. Localities typically welcome the potential employment and expansion of the local tax base, but those benefits can be offset by unintended environmental impacts, like new traffic, emissions, and noise. Businesses attempting to build facilities may be met with open arms in other states’ communities while it may perceive or experience organized community opposition in California. One major California-based industrial development company reported that visits from governors of other states encourage projects there, in contrast to a perceived indifference or hostility to projects within California.

**Regulatory Stability and Predictability**

Many stakeholders expressed concerns over what they see as frequent and unpredictable changes in California’s regulations, specifically environmental regulations. Stakeholders in this and other studies have cited progressively restrictive clean air action plans by the ARB and the San Pedro Bay ports, which stakeholders claim have made some previous compliance investments obsolete. Here, too, the issue may be as much perception as reality, but the effect on competitiveness is the same. The State may wish to consider changes in regulations less often or communicate the nature and need for change more clearly to industry (although industry bears some responsibility for following and understanding the regulatory process).

**Trade-offs**

There is an implicit balance between economic development and environmental objectives in California’s policies and funding choices. The tradeoff between environmental quality and economic growth is difficult to negotiate. In enforcing and strengthening California Environmental Quality Act (CEQA) requirements, ARB regulations, and other related measures, the State and its communities have made an implicit choice to accept the costs of a better environment. Those costs necessarily diminish California’s short-term economic competitiveness with less restrictive locations but produce a better quality of life for Californians. That quality of life must be balanced against the need for employment and earnings security with California’s high cost of living. California has many areas of high poverty, which are often very areas with environmental justice issues from nearby transportation activity.

California is not alone in environmental concerns. Federal emissions standards lag behind California’s but have moved in the same direction. Congested urban areas throughout the country face emissions issues and will need to act. Other port areas now require clean trucks, and more will likely follow. In this regard, some of California's higher costs may be regarded as only near-term competitive disadvantages that may be reduced in the long run.
Endnotes

4 American Association of Port Authorities
5 American Association of Port Authorities
6 American Association of Port Authorities
7 Using four import ports, such as Los Angeles, Seattle, Savannah, and New York-New Jersey
8 Using three import ports, such as Los Angeles, Savannah, and New York-New Jersey
9 American Association of Port Authorities
10 American Association of Port Authorities
11 American Association of Port Authorities
12 American Transportation Research Institute (ATRI) 2018
14 American Transportation Research Institute (ATRI) 2018
15 American Transportation Research Institute (ATRI) 2018
16 American Association of Port Authorities
17 American Association of Port Authorities
18 Source: Massachusetts Institute of Technology Living Wage Calculator
19 A living wage is the minimum income necessary for a worker to meet their basic needs. Needs are defined to include food, housing, and other essential needs such as clothing.
20 United States, U.S. Bureau of Economic Analysis, Larson, William. New Estimates of Value of Land of the United States, 2015. The estimated values were aggregated from valuation of different property types, including agricultural areas, federal land, and developed suburban and urban areas.
25 Online search result from http://www.gaspricewatch.com/CA-california/cities/gas-prices/1.htm
26 Figures copied from the Boyd report should be replaced by fresh versions for the final report.


35 Tioga Group


38 Council for Community and Economic Research, State Economic Development Program Expenditures Database

39 Tioga Group


41 Prince Rupert Port Authority, https://www.rupertport.com/our-advantages/


## Table D.1. California Primary Highway Freight System (PHFS) Route

<table>
<thead>
<tr>
<th>Route</th>
<th>Start Point</th>
<th>End Point</th>
<th>Length (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dillon Rd</td>
<td>S86</td>
<td>I10</td>
<td>1.51</td>
</tr>
<tr>
<td>Figueroa St</td>
<td>CA30P</td>
<td>I110</td>
<td>0.17</td>
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<tr>
<td>I10</td>
<td>I405</td>
<td>I5</td>
<td>13.03</td>
</tr>
<tr>
<td>I10</td>
<td>I710</td>
<td>CA/AZ Line</td>
<td>221.71</td>
</tr>
<tr>
<td>I105</td>
<td>CA3A</td>
<td>I605</td>
<td>17.39</td>
</tr>
<tr>
<td>I110</td>
<td>S47</td>
<td>I10</td>
<td>20.50</td>
</tr>
<tr>
<td>I15</td>
<td>I8</td>
<td>CA/NV Line</td>
<td>288.47</td>
</tr>
<tr>
<td>I205</td>
<td>I580</td>
<td>I5</td>
<td>12.96</td>
</tr>
<tr>
<td>I210</td>
<td>I5</td>
<td>I10</td>
<td>48.79</td>
</tr>
<tr>
<td>I215</td>
<td>I15</td>
<td>S30</td>
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<tr>
<td>I238</td>
<td>I880</td>
<td>I580</td>
<td>2.16</td>
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<tr>
<td>I305</td>
<td>CA34P</td>
<td>I80</td>
<td>0.81</td>
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<tr>
<td>I305</td>
<td>I5</td>
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<tr>
<td>I40</td>
<td>I15</td>
<td>CA/AZ Line</td>
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<td>I5</td>
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<td>CA37P</td>
<td>I8</td>
<td>3.21</td>
</tr>
<tr>
<td>I5</td>
<td>I805</td>
<td>CA/OR Line</td>
<td>772.38</td>
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<tr>
<td>I580</td>
<td>U101</td>
<td>I80</td>
<td>13.33</td>
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<tr>
<td>I580</td>
<td>I238</td>
<td>I205</td>
<td>30.60</td>
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<tr>
<td>I605</td>
<td>I405</td>
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<tr>
<td>I680</td>
<td>U101</td>
<td>I580</td>
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<tr>
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<td>CA29P</td>
<td>I10</td>
<td>20.55</td>
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<tr>
<td>I780</td>
<td>CA40P</td>
<td>I80</td>
<td>6.62</td>
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<tr>
<td>I8</td>
<td>I5</td>
<td>0.17 Miles East of S67</td>
<td>15.92</td>
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<tr>
<td>I8</td>
<td>S111</td>
<td>S7</td>
<td>7.14</td>
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<tr>
<td>I80</td>
<td>U101</td>
<td>CA/NV Line</td>
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<tr>
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<td>S905</td>
<td>I5</td>
<td>26.67</td>
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<tr>
<td>I880</td>
<td>U101</td>
<td>I80</td>
<td>41.78</td>
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<tr>
<td>Miramar</td>
<td>I805</td>
<td>I15</td>
<td>5.15</td>
</tr>
<tr>
<td>S111</td>
<td>I8</td>
<td>S78</td>
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<tr>
<td>S118</td>
<td>I405</td>
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<tr>
<td>S120</td>
<td>I5</td>
<td>S99</td>
<td>6.34</td>
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<tr>
<td>S134</td>
<td>I5</td>
<td>2.39 Miles East of I5</td>
<td>2.39</td>
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<tr>
<td>S14</td>
<td>I5</td>
<td>23.45 Miles Northeast of I5</td>
<td>23.45</td>
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<tr>
<td>S170</td>
<td>U101</td>
<td>I5</td>
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### National Highway Freight Network Mileage

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<td>S22 I405 I5</td>
<td>9.88</td>
</tr>
<tr>
<td>S23 U101 S99</td>
<td>6.85</td>
</tr>
<tr>
<td>S4 I5 S99</td>
<td>3.37</td>
</tr>
<tr>
<td>S47 CA30P I110</td>
<td>2.08</td>
</tr>
<tr>
<td>S55 I405 S91</td>
<td>11.84</td>
</tr>
<tr>
<td>S57 I5 S60 I10</td>
<td>16.22</td>
</tr>
<tr>
<td>S57 S60 I10</td>
<td>3.12</td>
</tr>
<tr>
<td>S58 S99 I15</td>
<td>5.71</td>
</tr>
<tr>
<td>S58 S99 I15</td>
<td>5.71</td>
</tr>
<tr>
<td>S60 I10 I215</td>
<td>8.95</td>
</tr>
<tr>
<td>S7 MX/CA Line I8</td>
<td>7.19</td>
</tr>
<tr>
<td>S71 S60 I215</td>
<td>3.63</td>
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<tr>
<td>S710 I210 S86</td>
<td>2.11</td>
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<tr>
<td>S78 S111 S86</td>
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<td>S86 S78 Dillon Rd</td>
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<td>U101 CA36P I5</td>
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<tr>
<td>U101 I80 26.12 Miles South</td>
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<tr>
<td>U101 I580 6.38 Miles North</td>
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<tr>
<td>U50 S99 12.53 Miles East</td>
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<td><strong>TOTAL</strong></td>
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Source: USDOT Federal Highway Administration, 2017

### Table D.2. California PHFS Intermodal Connection

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<th>Length (Miles)</th>
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<tr>
<td>Bob Hope Airport (formerly the Hollywood Burbank Airport)</td>
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<tr>
<td>Port of Long Beach</td>
<td>3.38</td>
</tr>
<tr>
<td>Port of Los Angeles</td>
<td>2.85</td>
</tr>
<tr>
<td>Port of San Francisco</td>
<td>2.10</td>
</tr>
<tr>
<td>Port of Oakland</td>
<td>1.96</td>
</tr>
<tr>
<td>Port of Richmond</td>
<td>1.85</td>
</tr>
<tr>
<td>Port of Sacramento</td>
<td>0.40</td>
</tr>
<tr>
<td>Port of Redwood City</td>
<td>1.26</td>
</tr>
<tr>
<td>Port Hueneme</td>
<td>20.45</td>
</tr>
<tr>
<td>Port of San Diego</td>
<td>3.13</td>
</tr>
<tr>
<td>Port of Benicia</td>
<td>2.30</td>
</tr>
<tr>
<td>Port of Stockton</td>
<td>1.28</td>
</tr>
<tr>
<td>Location</td>
<td>Mileage</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Channel Islands Harbor</td>
<td>1.02</td>
</tr>
<tr>
<td>Lindbergh Field - San Diego</td>
<td>1.56</td>
</tr>
<tr>
<td>Los Angeles International Airport</td>
<td>1.02</td>
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<tr>
<td>Oakland International Airport</td>
<td>1.04</td>
</tr>
<tr>
<td>Ontario International Airport</td>
<td>1.06</td>
</tr>
<tr>
<td>San Francisco Intl Airport</td>
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<tr>
<td>Fresno TOPC Rail Yard</td>
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<tr>
<td>Long Beach (Carson) Rail Yard</td>
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<tr>
<td>Oakland Rail Yard</td>
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<td>Lathrop Rail Yard</td>
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<tr>
<td>LA (Union Station)</td>
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<tr>
<td>Richmond Rail Yard</td>
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<tr>
<td>LA ATSF Rail Yard</td>
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<tr>
<td>Stockton Rail Yard</td>
<td>1.59</td>
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<tr>
<td>San Bernardino Rail Yard</td>
<td>1.73</td>
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<tr>
<td>City of Industry Rail Yard</td>
<td>0.99</td>
</tr>
<tr>
<td>UPS - Richmond Terminal</td>
<td>1.83</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>64.01</strong></td>
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</tbody>
</table>

Source: USDOT Federal Highway Administration, 2017

### Table D.3 California Non-PHFS Interstate Highway

<table>
<thead>
<tr>
<th>Route</th>
<th>Start Point</th>
<th>End Point</th>
<th>Length (Miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I10</td>
<td>Lincoln Blvd</td>
<td>I405</td>
<td>2.94</td>
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<tr>
<td>I10</td>
<td>I5</td>
<td>I710</td>
<td>3.26</td>
</tr>
<tr>
<td>I215</td>
<td>Highland Ave</td>
<td>I15 (North)</td>
<td>8.40</td>
</tr>
<tr>
<td>I280</td>
<td>6th St</td>
<td>I101 (South)</td>
<td>57.32</td>
</tr>
<tr>
<td>I305</td>
<td>I5</td>
<td>Harbor Blvd</td>
<td>2.30</td>
</tr>
<tr>
<td>I380</td>
<td>I280</td>
<td>U101</td>
<td>3.01</td>
</tr>
<tr>
<td>I5</td>
<td>MX/CA Line</td>
<td>Grape St</td>
<td>16.76</td>
</tr>
<tr>
<td>I5</td>
<td>I8</td>
<td>I805 (North)</td>
<td>10.58</td>
</tr>
<tr>
<td>I505</td>
<td>I5</td>
<td>I80</td>
<td>32.96</td>
</tr>
<tr>
<td>I580</td>
<td>I880</td>
<td>Grand Ave</td>
<td>2.88</td>
</tr>
<tr>
<td>I580</td>
<td>0.31 Miles North of Fairmont Dr</td>
<td>I238</td>
<td>2.15</td>
</tr>
<tr>
<td>I580</td>
<td>I205</td>
<td>I5</td>
<td>15.66</td>
</tr>
<tr>
<td>I680</td>
<td>I80</td>
<td>I580</td>
<td>40.96</td>
</tr>
<tr>
<td>I8</td>
<td>0.17 Miles East of S67</td>
<td>S111</td>
<td>109.54</td>
</tr>
<tr>
<td>I8</td>
<td>S78</td>
<td>CA/AZ Line</td>
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<td>I805</td>
<td>I5 (South)</td>
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Table D.4. Freight Intermodal Connectors

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<tr>
<th>Facility</th>
<th>Type</th>
<th>Connector Description</th>
<th>Connector Length (Miles)</th>
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<tbody>
<tr>
<td>Bob Hope Airport formerly the Hollywood Burbank Airport</td>
<td>Airport</td>
<td>Thornton Av. (Airport to Buena Vista), Buena Vista St. (Thornton to I-5)</td>
<td>1.1</td>
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<tr>
<td>Fresno Air Terminal Airport</td>
<td>Airport</td>
<td>Clinton Way (Airport to McKinley), McKinley Av. (Clinton to Rte. 41)</td>
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<tr>
<td>John Wayne Airport - Orange Co.</td>
<td>Airport</td>
<td>MacArthur Blvd. (Airport to I-405)</td>
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</tr>
<tr>
<td>Lindbergh Field - San Diego</td>
<td>Airport</td>
<td>N. Harbor Dr. (Terminal to W. Laurel St.), W. Laurel St (N. Harbor Dr. to I-5)</td>
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<tr>
<td>Long Beach Airport</td>
<td>Airport</td>
<td>Lakewood Blvd. (Airport to Route 405)</td>
<td>1</td>
</tr>
<tr>
<td>Los Angeles International Airport</td>
<td>Airport</td>
<td>Century Blvd (Sepulveda to I-405), Aviation Blvd (Century Blvd to I-105), La Cienega Blvd (Century to I-105), Imperial Hwy (La Cienega to Sepulveda), Sepulveda Blvd (Century to I-105), 104th St (Aviation to La Cienega), 111th St (Aviation to La Cienega)</td>
<td>8.2</td>
</tr>
<tr>
<td>Oakland International Airport</td>
<td>Airport</td>
<td>Airport Dr. (Hegenberger to Doolittle), Hegenberger Dr. (Doolittle to I-880), 98th Ave (Airport Dr. to I-880)</td>
<td>1.9</td>
</tr>
<tr>
<td>Ontario International Airport</td>
<td>Airport</td>
<td>Archibald Av (Airport to Rte. 10)</td>
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<tr>
<td>Ontario International Airport</td>
<td>Airport</td>
<td>Vineyard Av. (Airport to Rte. 10)</td>
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</tr>
<tr>
<td>Palm Springs Regional Airport</td>
<td>Airport</td>
<td>Tahquitz Canyon Way (Airport to N. Indian Canyon Drive) N. Indian Canyon Drive (from Tahquitz Canyon Way to I-10)</td>
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<tr>
<td>Location</td>
<td>Type</td>
<td>Route Description</td>
<td>Mileage</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Sacramento Metro Airport</td>
<td>Airport</td>
<td>Served by an existing NHS route</td>
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</tr>
<tr>
<td>San Francisco Intl Airport</td>
<td>Airport</td>
<td>San Bruno Ave (US 101 to Airport Entrance)</td>
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</tr>
<tr>
<td>San Jose Intl Airport</td>
<td>Airport</td>
<td>Served by an existing NHS route</td>
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<tr>
<td>Santa Barbara Airport</td>
<td>Airport</td>
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<tr>
<td>Channel Islands Harbor</td>
<td>Port Terminal</td>
<td>Victoria Ave (Terminal to Rte. 101) mileage include in CA36P</td>
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<td>Port Hueneme</td>
<td>Port Terminal</td>
<td>Hueneme Rd (Port to Los Pasos), Los Pasos (Hueneme to US 101)</td>
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<tr>
<td>Port Hueneme</td>
<td>Port Terminal</td>
<td>Ventura Rd (Hueneme to Channel Island), channel Island Blvd (Ventura to Victoria), Victoria Ave (Channel Island to US 101)</td>
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<tr>
<td>Port of Benicia</td>
<td>Port Terminal</td>
<td>Bayshore Rd. (Port to Park), Park Rd. (Bayshore to Industrial), Industrial Way (Park to I-680)</td>
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<td>Port of Humboldt</td>
<td>Port Terminal</td>
<td>Washington St. (Port to Rt. 101)</td>
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<tr>
<td>Port of Long Beach</td>
<td>Port Terminal</td>
<td>From Henry Ford Ave, E on Anaheim St, S on Santa Fe Ave, SE on 9th St, South on Pico Ave to Ocean Blvd to Terminal</td>
<td>3</td>
</tr>
<tr>
<td>Port of Los Angeles</td>
<td>Port Terminal</td>
<td>From Henry Ford Ave, West on Alameda St and Harry Bridges Blvd, SW on John S. Gibson Blvd to Terminal</td>
<td>3.6</td>
</tr>
<tr>
<td>Port of Los Angeles</td>
<td>Port Terminal</td>
<td>From Ocean Blvd, NW on Front St, N on John S. Gibson Blvd to terminal</td>
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<tr>
<td>Port of Oakland</td>
<td>Port Terminal</td>
<td>Maritime St (7th to W Grand Ave), W Grand Ave (Maritime to I-880), 7th St (Maritime to I-880)</td>
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<tr>
<td>Port of Redwood City</td>
<td>Port Terminal</td>
<td>From Route 101, North on Seaport Blvd to Hinman Rd, to Frontage Rd, to port entrance</td>
<td>1.6</td>
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<tr>
<td>Port of Richmond</td>
<td>Port Terminal</td>
<td>Harbor Way (Terminal to I-580)</td>
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<tr>
<td>Port of Richmond</td>
<td>Port Terminal</td>
<td>Canal Blvd (Terminal to I-580)</td>
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</tr>
<tr>
<td>Port of Sacramento</td>
<td>Port Terminal</td>
<td>Enterprise Blvd (Industrial Rd to I-80), Industrial Blvd (Enterprise Blvd to Harbor Blvd), Harbor Blvd (Industrial Blvd to US50)</td>
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<tr>
<td>Port of San Diego</td>
<td>Port Terminal</td>
<td>Pacific Hwy) Laurel to NSC Compound, Grape St (Pacific Hwy to I-5), Hawthorne St (Pacific Hwy to I-5), Broadway (Pacific Hwy to 11th), 11th St. (Broadway to I-5)</td>
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</tr>
<tr>
<td>-------------------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Port of San Francisco</td>
<td>Port Terminal</td>
<td>Cargo Way (Jennings to 3rd), 3rd St (Cargo Way to Army St), Army St (3rd St to Rte. 101) - (Cargo Way proposed)</td>
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<tr>
<td>Port of Stockton</td>
<td>Port Terminal</td>
<td>Harbor St. (Terminal to Fresno), Fresno Ave (Harbor to Navy), Navy Dr. (W Washington to Charter Way), Charter Way (Navy to I-5), @ Washington St (Navy to Fresno)</td>
<td>4.3</td>
</tr>
<tr>
<td>Eureka Pipeline Ter.</td>
<td>Truck/Pipeline Terminal</td>
<td>Washington St. (Uses same connection as Port of Humboldt)</td>
<td>0</td>
</tr>
<tr>
<td>Los Angeles 1 Pipeline Ter.</td>
<td>Truck/Pipeline Terminal</td>
<td>Served by an existing NHS route</td>
<td>0</td>
</tr>
<tr>
<td>Los Angeles 2 Pipeline Ter.</td>
<td>Truck/Pipeline Terminal</td>
<td>Served by an existing NHS route</td>
<td>0</td>
</tr>
<tr>
<td>City of Industry Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>From Route 60 (Pomona Freeway), north on Fullerton Rd, West on Arenth Ave to terminal entrance (0.1 mile east of Anaheim Puente Rd).</td>
<td>2.13</td>
</tr>
<tr>
<td>Fresno TOPC Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>North Ave. (Facility to Rt.99)</td>
<td>0.5</td>
</tr>
<tr>
<td>LA (Union Station)</td>
<td>Truck/Rail Facility</td>
<td>Lamar St (Station to N Main), N Main St (Lamar to Daly), Daly St (N Main to N Mission), Mission Rd (Daly to I-5)</td>
<td>1.3</td>
</tr>
<tr>
<td>LA (Union Station)</td>
<td>Truck/Rail Facility</td>
<td>Ave 20 (N Main to N Broadway), N Broadway (Ave 20 to I-5)</td>
<td>0.6</td>
</tr>
<tr>
<td>LA ATSF Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>Washington Blvd (Hobart Yard to I-710)</td>
<td>1.8</td>
</tr>
<tr>
<td>LA ATSF Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>Shelia St (Arrowmile to Atlantic), Atlantic Blvd (Shelia to Bandini), Bandini Blvd (S Downey to I-710) - Connector 2 is proposed)</td>
<td>3.1</td>
</tr>
<tr>
<td>LA/Vernon Facility</td>
<td>Truck/Rail Facility</td>
<td>Washington St. (Facility to I-710) - Included in LA ATSF Railyard (CA66R)</td>
<td>0</td>
</tr>
<tr>
<td>Location</td>
<td>Facility Type</td>
<td>Address Description</td>
<td>Distance</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Lathrop Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>E Roth Rd (Lathrop Rlyd IFC Airport Wy to I-5), Airport Wy (E Roth Rd to French Camp Rd), French Camp Rd (Airport Wy to Rte 99)</td>
<td>3.1</td>
</tr>
<tr>
<td>Long Beach (Carson) Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>Sepulveda Blvd. (Facility to Rt. 47)</td>
<td>0.7</td>
</tr>
<tr>
<td>Oakland Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>Middle Harbor Rd (7th St to I-880)</td>
<td>1.9</td>
</tr>
<tr>
<td>Richmond Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>Canal Blvd. (Facility to Rt. 580)</td>
<td>0.2</td>
</tr>
<tr>
<td>San Bernardino Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>2nd St (I-215 to Mt Vernon), Mount Vermont (4th St to Rialto), 4th St (Mt Vernon to 5th), Rialto Ave (Mt Vernon to Sidewinder Mountain Rd)</td>
<td>2.9</td>
</tr>
<tr>
<td>Stockton Rail Yard</td>
<td>Truck/Rail Facility</td>
<td>Anderson St (Facility to Diamond St), Diamond St (Anderson to Mariposa Rd), Mariposa Rd (Diamond St to Rte 99), Charter Wy (Diamond St to Rte 99)</td>
<td>2.8</td>
</tr>
<tr>
<td>UPS- Richmond Terminal</td>
<td>Truck/Rail Facility</td>
<td>Atlas Rd (Facility to Richmond Pk), Richmond Pkwy (Atlas to I-80)</td>
<td>1.9</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td><strong>100.13</strong></td>
</tr>
</tbody>
</table>

Source: USDOT Federal Highway Administration, 2017
Endnotes

1 FHWA, National Highway Freight Network, 2018
   https://ops.fhwa.dot.gov/freight/infrastructure/nfn/index.htm
Appendix E. Critical Urban Freight Corridor (CUFC) and Critical Rural Freight Corridor (CRFC) Designation Process

Background

In response to FAST Act requirements, California Department of Transportation (Caltrans) and Metropolitan Planning Organizations (MPOs) need to collaborate and submit nominations to Federal Highway Administration (FHWA) for the designation of CUFC/CRFC, which will be part of the National Highway Freight Network (NHFN).

The NHFN is the focus of funding for the National Highway Freight Program (NHFP) and for federal grant programs such as FASTLANE and INFRA (for projects that support national goals identified in 23 U.S.C. 167(b) and 23 U.S.C. 117(a)(2)). The portion of NHFN already designated by Congress is called the Primary Highway Freight System (PHFS) and the CRFCs and CUFCs are important freight corridors that provide critical connectivity to the NHFN. The purpose and intent of these CUFC/CRFC is provided in detail on the federal websites.

As noted in the federal guidance Q9 and Q10, there is no deadline for designating the CUFC/CRFC, and designations and de-designations will be on a rolling basis, based on needs. At any given time, California can have up to a maximum of 311 miles designated as CUFC and 623 miles as CRFC. FHWA recommends that Caltrans and MPOs work with the FHWA to develop an approach and timeline for identifying, tracking changes to, updating information on, and verifying the status of CUFC and CRFC roadways as part of the certification process.

This document describes the initial corridor designation process, assumptions applied for calculating miles, the rolling designation (or “on/off”) process, and mileage methodology assumptions. Per the FAST Act, States are responsible for designating public roads in their state as CRFCs. In accordance with 23 U.S.C. 167(e), a State may designate a public road within the borders of the State as a CRFC if the public road is not in an urbanized area.

- In an urbanized area (UZA) with a population of 500,000 or more, the MPO in consultation with the State, is responsible for designating the CUFCs.
- In an urbanized area with a population of less than 500,000, the State, in consultation with the MPO, is responsible for designating the CUFCs.

Note that if a project is on the Primary Highway Freight System (PHFS), no CUFC/CRFC designation is required. For others, the following CUFC/CRFC nominating process will apply.
Process for CUFC/CRFC Designation in California

To initiate the coordination process, Caltrans reached out to all regional partners in October 2016. First, Caltrans and its partners formed a Technical Working Group (TWG) which met over several months to agree upon a process for the ongoing/rolling designations. The TWG reached a statewide consensus that each MPO be provided a certain “initial target allocation” out of the 311 CUFC miles, with the flexibility of temporarily increasing their target allocation by “trading miles” with donor agencies based on needs and facilitated by Caltrans. There is no regional “target allocation” for CRFCs and Caltrans will oversee statewide distribution of CRFCs working with all regional agencies. This process is anticipated to continue for multiple years. After reviewing several potential options for the target allocations for CUFC, the MPO subcommittee developed a formula based on a 75 percent weight for the urbanized area populations and 25 percent weight on the proportion of PHFS (see Table E.1).

Table E.1. CUFC Target Miles and Caltrans Role in Managing the CUFC Target Miles

<table>
<thead>
<tr>
<th>MPO</th>
<th>Target Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMBAG</td>
<td>3.75</td>
</tr>
<tr>
<td>BCAG</td>
<td>0.69</td>
</tr>
<tr>
<td>FCOG</td>
<td>5.35</td>
</tr>
<tr>
<td>KCAG</td>
<td>0.62</td>
</tr>
<tr>
<td>KCOG</td>
<td>5.67</td>
</tr>
<tr>
<td>MCAG</td>
<td>1.96</td>
</tr>
<tr>
<td>MCTC</td>
<td>0.87</td>
</tr>
<tr>
<td>MTC</td>
<td>65.07</td>
</tr>
<tr>
<td>SACOG</td>
<td>18.18</td>
</tr>
<tr>
<td>SANDAG</td>
<td>28.67</td>
</tr>
<tr>
<td>SBCAG</td>
<td>2.64</td>
</tr>
<tr>
<td>SCAG</td>
<td>160.58</td>
</tr>
<tr>
<td>SJCOG</td>
<td>7.76</td>
</tr>
<tr>
<td>SLOCOG</td>
<td>1.23</td>
</tr>
<tr>
<td>SRTA</td>
<td>1.8</td>
</tr>
<tr>
<td>StanCOG</td>
<td>4.24</td>
</tr>
<tr>
<td>TCAG</td>
<td>2.69</td>
</tr>
<tr>
<td>California Total</td>
<td>311.77</td>
</tr>
</tbody>
</table>

Source:

Caltrans Office of Freight Planning will develop a Statewide critical freight corridor inventory (Scoreboard) which will include:
• A publicly available GIS mapping and a database of all critical freight corridor mileage
• A historical record of designated and de-designated miles will be maintained in GIS

After the initial CUFC designation cycle, the TWG will reconvene every quarter to review the status of the freight network and may also update this guide as needed. The initial CUFC allocation in **Table E1** is more of a target for the purposes of soliciting CUFC mileage nominations. There will likely need to be a trading process between regions that Caltrans should oversee.

**GIS Process**

Refer to this web page for detailed instruction on the GIS process: [http://www.dot.ca.gov/hq/tpp/offices/ogm/gisdata.html](http://www.dot.ca.gov/hq/tpp/offices/ogm/gisdata.html)

**CUFC “ON” Process**
The MPOs identify needed CUFC miles based upon available target miles for each region and the need to apply those miles to a project for funding allocation or FASTLANE/INFRA grant eligibility. The MPOs assign miles to a project when CTC approves of a project and has approved obligation of funds (funds approved) or as needed for FASTLANE/INFRA grant eligibility; the MPOs advise Caltrans of this and request concurrence.

Upon receipt of a concurrence letter (within 15 days of request), MPOs submit nominations directly to FHWA for UZAs with population of 500,000 or more within MPO boundaries. For UZAs with population under 500,000, MPOs submit nominations to Caltrans for official submittal to FHWA. Caltrans adjusts CUFC target miles on the scoreboard.

**CUFC “OFF” Process**
When project funding has been obligated (funds transferred), the MPOs can then de-designate those miles from its respective CUFC target allocation for the region. Caltrans adjusts the CUFC scoreboard accordingly.

**CUFC “Swap” Process**
When a loan of CUFC miles is negotiated from one region to another, Caltrans shall approve of the swap and indicate this swap on the publicly posted CUFC scoreboard. An official letter

Appendix E. Critical Urban Freight Corridor (CUFC) and Critical Rural Freight Corridor (CRFC) Designation Process
requesting the swap will be submitted to Caltrans, followed by an official response from Caltrans.

CRFC Process
Statewide, the 623 CRFC miles will be managed by Caltrans as part of the assignment process. The “need” for CRFC designations, based on an initial call for shovel-ready projects, is estimated to be much less than the miles allocated to California. Therefore, Caltrans has proposed a list of criteria to prioritize corridors (if CRFC mileage needs are more than the federally allocated 623 miles).

CRFC Assignment
The large MPOs and the smaller MPOs similarly submit their CRFC mile request to Caltrans. Caltrans then submits requests to FHWA California Division Office. Caltrans maintains a CRFC scoreboard similar to the CUFC Scoreboard.

Mileage Methodology and Assumptions

Interchanges
If one of the interchange roads is on the PHFS, no additional miles are required for this interchange project. This includes reconfiguring ramps, widening an overcrossing, signalizing ramps, and/or adding connections to reduce weaving which will improve operations for the mainline particularly if congestion on the ramps/non-PHFS crossing causes queues to extend onto the PHFS. This is consistent with clarification that FHWA provided at the April 3, 2017 meeting of the TWG.

If neither of the roads is on the PHFS, project sponsor should measure the distance on the mainline segment that corresponds to the largest project “footprint.” For example, if the interchange project includes adding a new lane on one of the highways in addition to ramp modifications, the CUFC/CRFC would correspond to the distance of the widening component of the project. Per the logic for an interchange on the PHFS, only one of the intersecting roads needs to be designated as a CUFC/CRFC.

- If an interchange project includes significant mainline widening, the portion of the widening beyond the extent of the interchange would need to be designated as a CRFC/CUFC.
- If the interchange is on the PHFS, then the interchange would be exempt, and mileage would only be assigned to the widening portion of the project beyond the interchange extents on a non-PHFS route.
New Roadway Alignment Projects
Projects that would construct new alignments should use the mileage of the new alignment for designating a CUFC/CRFC. If the new alignment is planned to replace a route currently designated as part of the PHFS, no mileage is needed to be assigned to this project.

Roadway Projects Crossing Urban/Rural Boundaries
The urban portion of the project would be assigned CUFC and the rural portion of the project would be assigned CRFC mileage.

Port Projects
Statewide, Port Projects (seaport, airport, land port) cannot amount to more than 10% of the State’s entire FAST Act Formula funds. No CUFC miles should be assigned.

ITS Projects/Non-Traditional Projects/Emission Reduction Projects
Intangible operational improvements such as ITS projects, incentives for near-zero emission technology or upgrading truck scales require no CUFC/CRFC miles.

Grade Crossing Improvements
Grade crossing improvements like safety measures associated with implementing rail quiet zones and multimodal infrastructure at rail crossings are not roadway projects. No CUFC/CRFC miles should be assigned.

Grade Separation Projects
If the project would separate rail from a roadway that is already the PHFS, no CUFC/CRFC miles should be assigned. This is consistent with clarification that FHWA provided at the April 3, 2017 meeting of the TWG. If the project would separate rail from a roadway off the PHFS, the non-PHFS roadway would need to be designated as CUFC/CRFC and mileage should be measured along the length of the project footprint. In both cases, rail grade separation needs no CUFC/CRFC.

Table E.2. Draft Schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Lead Agency</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUFC/CRFC Guidance Cleared</td>
<td>Caltrans</td>
<td>End of April 2017</td>
</tr>
<tr>
<td>MPOs send nominations for CUFCs for Caltrans concurrence</td>
<td>MPOs</td>
<td>Rolling – May</td>
</tr>
</tbody>
</table>

Appendix E. Critical Urban Freight Corridor (CUFC) and Critical Rural Freight Corridor (CRFC) Designation Process
<table>
<thead>
<tr>
<th>Event</th>
<th>Responsible Parties</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caltrans concurrence within 15 days; MPOs</td>
<td>Caltrans, MPOs</td>
<td>through TCEP Allocation*</td>
</tr>
<tr>
<td>submit <strong>CUFC</strong> nominations to FHWA (directly or via Caltrans per UZA requirement)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caltrans updates online web portal</td>
<td>Caltrans</td>
<td></td>
</tr>
<tr>
<td>MPOs/RTPAs send nominations to Caltrans for <strong>CRFCs</strong></td>
<td>MPOs</td>
<td></td>
</tr>
<tr>
<td>Caltrans sends <strong>CRFC</strong> nominations to FHWA;</td>
<td>Caltrans</td>
<td></td>
</tr>
<tr>
<td>Caltrans sends <strong>CUFC</strong> nominations to FHWA for UZAs with pop between 50K and 500K</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TWG</strong> meets quarterly for subsequent rolling designations</td>
<td><strong>TWG</strong></td>
<td>Jan 2018 - beyond</td>
</tr>
</tbody>
</table>

Source:

*TCEP allocation date dependent on CTC schedule*
Endnote

Appendix F. Multistate Corridor Efforts

California is an active member of key multistate, multimodal corridor initiatives that include the identification, planning, and implementation of corridor management and operational strategies that improve the effectiveness and efficiency of freight and passenger movement. The goal of these efforts is to bring states together to cooperatively and collaboratively plan, manage, rehabilitate, and fund the capital and operational improvements needed to operate and maintain select nationally significant freight corridors. These efforts consist of the Interstate 15 Mobility Alliance (I-15 MA), the Interstate 15 Freight Mobility Enhancement Plan (I-15 MEP), the Western States Freight Coalition (WSFC), and the Marine 5 Highway (M-5) Corridor.

Interstate 15 Mobility Alliance

The I-15 Mobility Alliance was a multistate cooperative alliance between California, Nevada, Arizona, and Utah that was established in 2011 to develop a comprehensive, multimodal plan (including prioritize projects and policies of interregional significance) and to devise appropriate governance mechanisms for the on-going efficient and effective construction, operation, and maintenance of the I-15 Corridor. The effort resulted in the development of the 2012 Interstate 15 Corridor System Master Plan and the Interstate 15 Corridor System Master Plan 2017 update.

While the cooperative agreement between the states has expired, the Nevada Department of Transportation (NDOT) is currently in the process of renewing the agreement through a new cooperative agreement between California, Nevada, and Utah.

Interstate 15 Freight Mobility Enhancement Plan (MEP)

The I-15 Freight MEP is a multistate truck parking study being led by NDOT and funded through a federal National Economic Partnerships for Innovative Approaches to Multi-Jurisdictional Coordination grant. The purpose of the grant is to fund National Economic Partnerships that will implement innovative approaches to multi-jurisdictional coordination and regional planning (e.g., megaregion planning). The purpose of the study is to define truck parking issues at a multi-state level, focus on local and regional truck parking challenges, and to identify realistic and coordinated actions that partner agencies can implement at the regional level.

Western States Freight Coalition (WSFC)

The WSFC is a voluntary partnership of state DOTs, which are committed to multi-jurisdictional coordination, organized around a common agenda and facilitated through a cooperative support structure. The WSFC mission is to facilitate, through multi-state coordination, efficient, safe, sustainable, and forward-looking multimodal freight transport across the Western U.S., helping to foster economic opportunities.
Marine Corridors

Consistent with the America’s Marine Highway Program developed by the U.S. Department of Transportation’s Maritime Administration (MARAD), California has been exploring the use of Marine Highways which allow freight to be shipped between ports and harbors using navigable waterways instead of landside and highway and rail facilities. Utilizing these marine highways and freeing up rail capacity will ultimately reduce the amount of truck trips on already congested parallel highways, and further reduce freight-related greenhouse gas (GHG) emissions. Within California there is one multistate Marine Highways, the M-5. MARAD is working with the western states of California, Oregon, and Washington to explore development of the M-5 Marine Highway Corridor to help alleviate freight movements and congestion along Interstate 5 from the California–Mexico border region in San Diego to the U.S.–Canada border north of Seattle, Washington. Figure F.1. shows America’s marine highway routes.

**Figure F.1. America’s Marine Highway Routes**

![Image showing America’s Marine Highway Routes](https://www.maritime.dot.gov/grants/marine-highways/marine-highway)


**Marine 5 Highway Corridor**

The Marine 5 Highway Corridor is a multistate partnership between California, Oregon, and Washington. Together, these states are working with seaports, harbors, and a variety of freight
stakeholders in all three states to further explore development of a marine highway corridor that will help alleviate freight movements and congestion along Interstate 5 and other freight routes from the California–Mexico border in San Diego to the U.S.–Canada Border north of Seattle, Washington.

In 2014, the West Coast Corridor Coalition sponsored the M-5 Marine Highway Corridor study to determine the market and operational viability of Marine Highway services on the West Coast. The study investigates if M-5 services are economically and operationally attractive to shippers and able to obtain sufficient cargo volumes in the marketplace. Operational, utilization, and cost parameters for six potential Marine Highway services were developed for the study. Four of the services were between port pairs, and the other two services were strings with multiple ports. Three of the four potential services between port pairs were estimated to have the greatest potential to be economically viable from an operational perspective, and a business plan and viability assessment was developed for them. Those port pairs were as follows:

- San-Pedro Bay Ports (Ports of Los Angeles and Long Beach) to the Port of Oakland.
- San-Pedro Bay Ports to Pacific Northwest Ports (Ports of Seattle and Tacoma).
- Port of Oakland to Pacific Northwest Ports.

The two multi-port service strings were not studied in detail, because the relatively short distance between the port pairs on the strings was not cost or time competitive with truck transportation. The strings included San Diego/San Pedro, San Pedro/Port Hueneme, Oakland/Redwood City, and Humboldt Bay/Crescent City. The business plan and viability assessment found that a Marine Highway service between the San-Pedro Bay Ports and the Port of Oakland appears to have potential for financial viability due to available cargoes and other operational factors. The study also identified several challenges that, if solved, could increase the likelihood of developing other successful Marine Highway services on the M-5 Marine Highway Corridor, such as the below:

- The shortage of efficient, right-sized vessels eligible to transport U.S. domestic cargoes
- The shortage of credible market data to identify cargoes available for Marine Highway services
- The lack of maritime entrepreneurs willing to take the risk of starting up a new service

Caltrans has discussed opportunities with private entities interested in M-5 official project designation. Further steps on implementation of M-5 have not been determined.
Appendix G. Truck Technology Types

Dual-Mode Hybrid & Plug-In Hybrid Electric Vehicle

This is an advanced parallel hybrid with the internal combustion engine as the main source of power. The technology is moderately mature, with little to no changes in operations as compared to a diesel-operated truck. However, the actual ZE range is limited, as it only functions in ZE mode at low speeds and/or is subject to certain load limits. Unlike the Hybrid Electric Vehicles (HEVs), the Plug-In Hybrid Electric Vehicles (PHEVs) have batteries that are recharged through the electrical grid. Recharging is becoming faster, and charging locations are becoming more prevalent. PHEVs can operate in ZE mode for longer distances than HEVs. These trucks achieve approximately 15 percent emissions savings compared to conventional diesel trucks.

Range-Extended Electric Vehicles with Integrated Engine

These vehicles can use either electric power or diesel fuel, but the primary source of energy is the electric motor. The engine can run either on diesel or compressed natural gas (CNG) when the batteries are depleted. The determining factor for ZE range is battery size. Therefore, this truck type can be designed for specific ZE ranges as needed, subject to corresponding changes in cost. These trucks achieve approximately 25 percent emissions savings compared to conventional diesel trucks.

Range-Extended Electric Vehicles with Integrated Fuel Cells

This technology is analogous to the REEV with integrated engine, except that it relies on a fuel cell in place of an integrated engine when the vehicle battery is depleted. The fuel cells require hydrogen refueling stations for recharging, making these trucks a practical solution only in areas where such refueling stations exist. The technology can be designed to fit within tight spaces and can be accommodated by a standard diesel truck, though this comes at a higher price point compared to other technologies. These vehicles also offer relatively long useful lifespans and small maintenance costs. This technology is already available on the market. Because these vehicles can operate in true zero-emissions mode, it is relatively easy to obtain regulatory certification for them.

Battery Electric Vehicles

The Battery Electric Vehicle (BEV) is an electric-only vehicle powered by its battery alone, meaning that longer ranges require larger, heavier, more costly batteries. The vehicle batteries can be recharged using dedicated recharging stations or overhead/in-pavement catenary power systems (if the vehicle is properly equipped to draw power from such a source). Recharging of the internal battery requires more time than refueling a REEV fuel cell or internal combustion
engine. Alternatives to on-road charging include battery exchange. Battery exchange is currently being used in port environments, such as the Port of Long Beach’s Middle Harbor Terminal, which uses battery exchange to continuously power automated guided vehicles (AGV) that move cargo throughout the terminal. Full-electric trucks require larger batteries than HEVs and typically weigh more. HEVs have a longer range, but as battery technology continues to improve, some EV trucks have demonstrated travel ranges of 200 miles. One of the major disadvantages posed by EVs is cost. The batteries for full-electric trucks currently add approximately $100,000 to the vehicle price. Because these vehicles can operate in true zero-emissions mode, it is relatively easy to obtain regulatory certification for them.

Range Extenders Utilizing Roadway Power

New truck technologies require roadway infrastructure to charge the electric trucks while on route using technologies that are already widely used for transit vehicles. This technology allows for smaller, cheaper on-board batteries and therefore lower vehicle costs as well. This cost savings per vehicle is offset by significantly greater costs for infrastructure supporting systems relative to other ZE/NZE technologies, however. Because these vehicles can operate in true zero-emissions mode, it may relatively easier to obtain regulatory certification for them.
Appendix H. Outreach and Engagement Efforts

During the development of the CFMP 2020, various outreach efforts, such as public workshops, public outreach, and a digital outreach strategy via Facebook were conducted in order to better identify and understand the freight-related concerns of California residents. The main focus was to gather feedback from a diverse set of demographic populations and geographic regions. Additionally, the outreach targeted communities in which interests of residents reflected a heavy trend for online shopping, longer commutes to work and areas where freight has a significant impact on the community. Primary communities of focus were:

- **Rural Communities** - Rural communities tend to be isolated which often leads to fewer supply chain transportation routes in their community. Goods being delivered in and out of these communities experience specific challenges related to this common lack of infrastructure.

- **Urban Communities** - Urban communities experience congestion from the many supply chain transportation routes traversing their communities. On the other hand, they also experience a great benefit from the proximity of the supply chain.

- **Native American Tribes** – There are roughly 109 Indian tribes in the California. Some are near highly populated cities like Los Angeles, San Francisco, San Diego, and Sacramento, while others are located in the mountains of northern and eastern California. Native American concerns are a priority for the State, targeting this group as a specific audience provided the quality feedback necessary to ensure their needs are taken into account within the CFMP.

- **Environmental Justice Communities** – Communities classified under AB 617 (Ab617), an effort to reduce health impacts from nonvehicular air pollution, supported by an extensive emissions database and air monitoring networks. These communities were identified by the CARB to participate in the Community Air Protection Program (CAPP). In response to AB617, CAPP will develop and implement focus actions to improve overall air quality for these selected communities. Including feedback from these communities was extremely vital to the overall implementation of the CFMP.

**Outreach Activities**

**Public Workshops and Outreach Activities**

Caltrans hosted two public workshops during the development of the CFMP. The Southern California Introductory Public Workshop was held in Diamond Bar on May 17, 2018 and the Northern California Introductory Public Workshop in West Sacramento on June 6, 2018. In both workshops, participants were given an overview of the CFMP and were asked to discuss how they interacted with freight, how they benefitted from freight, how they were impacted by freight, and what types of investments they would like to see regarding freight in their respective communities. To promote participation in the workshops, more than 1,200 email
invitations were sent, over 100 personal phone invitations were made, and numerous organizations invited their entire memberships (estimated in the hundreds). Public Outreach was conducted at five different events throughout California. These events were staggered in order to conduct outreach both before and after the draft plan was released. These events included the following:

- California Transportation Planning Conference in San Diego from February 23-25, 2019
- Kool April Nights in Redding on April 27, 2019 from 7am-4pm
- CicLAvia in Wilmington on April 28, 2019 from 9am-4pm
- Downtown Farmers Market in San Luis Obispo on May 23, 2019 from 6pm-9pm
- Portside Environmental Justice Steering Committee Meeting in San Diego on September 24, 2019 from 6pm-8pm

Caltrans staff created innovative ways to engage people at these events to spark their interest in freight, such as asking how far they thought a banana traveled on average to reach their grocery store. Once the public was engaged, staff proceeded to converse with them about freight issues in California and encouraged participants to share how freight affected them and their communities. Some of the prominent questions we asked, and themes we noticed from these conversations included the following:

- What impacts from freight do you observe in your community?
- How do you interact with freight in your community?
- What benefits from freight do you observe in your community?
- What freight investments should be made in your community?

Caltrans staff invited participants to take a 10-question survey on provided iPads. If they declined, staff offered a CFMP business card which included a QR code. Once scanned, this code would direct them to the freight survey, which they could complete on their own. Additionally, Caltrans created mailers with the questions listed above for people to fill out and mail back. Conducting public outreach proved to be much more effective than the two public workshops, as these events allowed Caltrans staff to speak with a larger number of people from a diverse range of backgrounds.

**Public Survey**

1. How many shipments do you receive each month from online retailers like Amazon, Walmart, Wayfair?
   - 1-2
   - 3-5
   - 6-10
   - More than 10
2. Where are these shipments delivered?
   - Home
   - Work
• Amazon Box
• Other

3. How do you experience the merchandise movement activity in your community?
   • Cargo trains at rail crossings
   • Semi-trucks on major highways
   • UPS/FedEx trucks in your neighborhood
   • Industries such as manufacturing/distribution in your city

4. Rank which good move below benefits your community the most. (1st Most Beneficial)
   • Higher tax revenues
   • High number of jobs
   • Faster economic development
   • Higher house prices
   • Access to a larger market through online shopping

5. Classify the following items in order for the biggest truck traffic impact in your community. (1st Biggest Impact)
   • Truck traffic congestion
   • Health impacts and air pollution
   • Acoustic pollution
   • Truck/driver safety (sharing the public road)
   • Truck-damaged road/pavement

6. Have you ever had to move due to negative freight impacts?
   • Yes, my house
   • Yes, my work
   • Yes, my children’s school
   • No

7. What projects do you think should be a priority in your community?
   • Safety projects at the rail crossing
   • Alleviating truck congestion
   • Improving air quality
   • Created goods movement work/job training programs
   • Increasing the use of alternative energies
   • Increase flexibility in out-of-hours and nighttime delivery

8. Did you participate in the development of the 2014 California Cargo Mobility Plan (CFMP)?
   • Yes
   • No
   • I do not know

9. What motivated you to participate today?
   • I want to learn more
   • I want concerns about the impact of freight on my community
   • I think freight can benefit my community
10. Provide additional feedback.

Industry Focus Groups
The six focus groups in Bakersfield, Oakland, San Bernardino, Stockton, Redding, and Los Angeles each began with the same general agenda topics: Competitiveness, Technologies, Workforce, Sustainability, Projects. For each topic, the team asked participants specific questions to solicit views of major groups with similar interests. The questions are listed below under their corresponding topics:

Competitiveness:
- How does the cost of freight transportation in California affect your ability to grow and to compete with non-California firms or locations?
- What can Caltrans and other state agencies do to lower those barriers?
- How should we measure freight transportation’s impact on California’s Competitiveness for new jobs or market share?
- Do you have data or other information that would be helpful?

Technologies:
- What technologies do you see as most promising for your business?
- What should the State do to encourage or enable new freight transportation technology?

Workforce:
- Do you expect to have the workforce you need to operate and grow in the future?
- What workforce shortfalls have you experienced, or do you expect?
- What can the public and private sectors do to develop the workforce we need?

Sustainability:
- If we define sustainability as including operations, economics, environmental impacts, and social impacts, what do you see as the challenges to achieving sustainability for your business in California?
- What should Caltrans and the State of California do to help you achieve sustainability?

Projects:
- What California infrastructure projects or programs are most important to your business?
- What are the most important criteria Caltrans should use in evaluating freight projects or programs?
- How should Caltrans measure progress against those criteria?
**Industry Interviews**

Major industry stakeholders such as trucking, ports, railroads, and industry associations were interviewed with the same questions as the industry focus groups. Like the Industry Focus Groups, questions fell under the following themes: Competitiveness, Technologies, Workforce, Sustainability, and Projects.

**Industry Survey**

An online survey was created and distributed via email to freight stakeholders from the Public and Private sectors throughout the state. There were 106 respondents categorized as shown below.

15 substantive questions and 3 identification questions were asked. Questions are listed below:

1. How does the cost of freight transportation in California affect your ability to grow and to compete with non-California firms or locations?
2. What can Caltrans and other State agencies do to increase your competitiveness?
3. What elements do you think we should consider when measuring freight transportation's impact on California's competitiveness?
4. What new technologies or innovative programs do you currently have or will deploy within the next few years?
5. If you are not currently, or do not plan to deploy any new technologies or innovative programs from Question 4, what are the biggest barriers?
6. What technologies do you see as most promising for your business?
7. What should the State do to encourage or enable new freight transportation technology?
8. What type of workforce shortfalls have you experienced, or do you expect to encounter in the near future?
9. What can the public sector do to develop the workforce we need?
10. What can the private sector do to develop the workforce we need?
11. If we define sustainability as including operations, economics, environmental impacts, and social impacts, what do you see as the challenges to achieving sustainability for your business in California?
12. What are the best opportunities to reduce energy consumption in your business?
13. What California infrastructure projects or programs are most important to your business?
14. What are the most important criteria in evaluating freight projects or programs?
15. What other issues should the California Freight Mobility Plan address?

Digital Outreach and Social Media Survey
An online survey tailored specifically for the public was created and distributed via mailers, business cards, and Facebook (described below). The public survey included the following questions:

The Digital Outreach effort was designed to gather information through Facebook from specific, targeted groups throughout California. Caltrans began this effort by running a test Facebook post through the Caltrans Headquarters main Facebook page which allowed Facebook users two ways to take the survey:

- via the Caltrans Facebook Page, and
- via a “boosted” post on targeted users’ newsfeeds.

The boosted post reached from 1,200 to 4,400 persons for 7 days within the Moreno Valley and Oakland areas who associated with certain lifestyles and interests (parenting, online shopping, travel, education, retail shopping, etc.). The post allowed targeted users to voluntarily access a link directing them to the CFMP survey on Constant Contact’s digital platform. Caltrans staff found that they were able to engage thousands of people in a short amount of time for a very low cost through Facebook.

After the test proved to be affective, we created six additional Facebook posts unique to different geographic areas that included compelling information about goods movement, freight industry facts, and other posts seeking the general public’s needs when it comes to freight. These six targeted communities were: Long Beach, Ontario, Moreno Valley, Bakersfield, San Pedro, Oakland, and Redding. All posts included a call-to-action which motivated our
audience to complete the CFMP survey to help improve freight mobility in their respective communities.

Survey Results
As mentioned above, a main component of our outreach efforts included the CFMP survey. In this survey, respondents were asked nine questions regarding the impact of freight in their lives and communities. Approximately 40 members of the public took the survey via the Facebook posts. The survey was not scientific but did provide a qualitative assessment of how the public who uses Facebook feel about freight in California.

This survey served as a useful tool to gather information regarding freight related issues in various communities. When respondents were asked about their participation in the development of the 2014 CFMP, 62 percent said they did not participate at all and 32 percent of respondents said they were motivated to participate now so they could learn more and understand the concerns about freight impacts in their respective communities. Not only did this survey allow Caltrans to gather important information regarding public perceptions of freight, the digital outreach effort was able to increase public participation in the development of this plan and create awareness surrounding freight related issues statewide.
Appendix I. Safety, Security, and Resiliency

The freight system is a complex network that is susceptible to natural disasters and human-caused events. Whether the result of natural processes, accidents, criminal activity or terrorism, freight system disruptions can have devastating consequences. California’s economy is dependent on the strength, reliability, and resiliency of its freight sector. Disruptions may impact the economic health of individual companies, communities, regions, the state and nation. California needs to ensure that the freight transportation system prevents and minimizes negative impacts from such events and quickly recover when they occur. California’s freight system needs to be particularly adaptable so that emergency supplies can be transported and distributed when and where they are needed.

Emergency Support Functions

The State of California is prepared to respond quickly and effectively to large-scale safety and security events on a 24-hour basis. When an event or potential event is first detected, the California Office of Emergency Services (Cal OES) is activated to a level appropriate to the magnitude of the threat. All state agencies and volunteer organizations that comprise the State Emergency Response Team (SERT) are grouped into 18 Emergency Support Functions (ESF) to carry out coordination and completion of assigned missions. These functions represent specific response activities that are common to all disasters. Each ESF comprises one or more primary agencies serving as the lead and several other agencies and organizations providing support. The State-level ESF 1 activities support the coordination of transportation across various modes, including surface, maritime, railroad, aviation, and pipeline.

The ESF 1 lead agency, the CalSTA, has delegated to the CHP and Caltrans the responsibility to provide expertise primarily for surface transportation, and has identified stakeholders from primary and supporting agencies to take the coordination lead for other modes of transportation. According to the State of California Emergency Plan, ESF 1 – Transportation, “assists in the management of transportation systems and infrastructure during domestic threats or in response to incidents.” ESF 1 also provides recommendations and subject matter expertise to Cal OES associated with ESF 1 preparedness, mitigation, response, and recovery.

Caltrans specific responsibilities directly related to ESF 1 activities:

- As the owner operator of the SHS, has administrative orders to repair, maintain and operate the SHS during and following emergencies and disasters;
- Provide assessments of transportation infrastructure and traffic conditions;
- Assess damage to highway system and establish route priorities during recovery efforts;
- Operate as liaison with the FHWA regarding the status of the SHS;
- Operate as liaison with the U.S.DOT regarding the status of the SHS;
- Provide transportation policies and guidance as needed;
• Coordinate state agency plans, procedures and preparations for route recovery, traffic regulation and air transportation; and
• Develop routing and directions for the movement of incident victims out of an impacted area and the delivery of necessary personnel and medical supplies to local medical facilities and shelters.

CHP specific surface transportation responsibilities:
• Act as the Director of the State Motor Transport Division during times of emergency;
• Perform tasks assigned in the California Emergency Resources Management Plans for transportation during times of a war emergency;
• Continue emergency traffic regulation and control procedures as required;
• Assist Caltrans with traffic route restoration;
• Provide police escorts on closed routes;
• Activate appropriate CHP Emergency Resource Centers to coordinate resources and ensure the timely dissemination of intelligence information;
• Secure routes, regulate traffic flow, and enforce safety standards for evacuation and re-entry into evacuated area;
• Coordinate interstate highway movement on regulated routes with adjoining states;
• Establish highway safety regulations consistent with location, type and extent of emergency conditions; and
• Support Caltrans with traffic route re-establishment and continue emergency traffic regulation and control procedures as required.

Hazardous Materials Transport
Industrial hazardous materials that are flammable, corrosive, toxic, explosive, or infectious play a vital role in the US economy. They are used by industries from farming and mining to manufacturing and pharmaceuticals, and come in the form of raw materials, fertilizers, fuels, constituent parts, and other essential inputs. Of all hazardous materials, Toxic Inhalation Hazard (TIH) chemicals are among the most dangerous. Chlorine gas and anhydrous ammonia are the most common TIH chemicals; others include sulfur dioxide, ethylene oxide, hydrogen fluoride, and a variety of other products that are important manufacturing inputs. The potential consequences of a TIH release depend on the severity of the accident or event.

One widely discussed risk-mitigation proposal involves re-routing trains containing TIH tank car loads, for example, by choosing a route with less population exposure. TIH tank cars passing through major population centers were recognized as potential chemical weapons. Proponents of mandatory re-routing of TIH products argued that diverting trains around cities would place fewer people at risk of a terrorist attack and/or collisions.

Many hazardous chemicals transported over long distances by rail, and for shorter distances by truck, may be particularly vulnerable to sabotage and disruption. At the federal level, the U.S. DOT and Transportation Security Administration (TSA) have sought to reduce the risk of terrorist attacks on freight. TSA worked with railroad carriers to implement a security program,
the TIH Risk Reduction Program. TSA assumes that the risk of hazardous materials transport is directly proportional to the dwell time (the length of time that a rail car sits at a particular location), volume, and type of materials transported through densely populated areas. First implemented in New Jersey and New York, the program seeks to establish secure storage areas for TIH materials and to expedite their movement through the system.

**Rail Freight**

California has increased state-level oversight of rail freight and strengthened the regulation of railroad security. In addition to its role enforcing federal rail safety regulations, the California Public Utilities Commission (CPUC) is developing the capacity to improve rail security. The CPUC was charged with enforcing the provisions of AB 3023 requiring railroad operators to conduct risk assessments of their facilities and to develop and implement infrastructure protection programs. CPUC has more than 40 federally certified inspectors who are authorized to issue security enforcement recommendations under the auspices of federal law. Additionally, California actively seeks to bring State-level knowledge regarding rail safety and security to short line rail carriers that may not have the resources to establish robust safety and security programs on their own.

**Positive Train Control Program**

Positive Train Control (PTC) systems are integrated command, control, communications, and information systems for controlling train movements with safety, security, precision, and efficiency. PTC systems improve railroad safety by significantly reducing the probability of collisions between trains, casualties to railway workers, damage to equipment, and overspeed accidents. The system can recognize a threat of collision or accident and slow or stop a train automatically to avoid the incident. The National Transportation Safety Board (NTSB) has named PTC as one of its "most-wanted" initiatives for national transportation safety.

The Rail Safety Improvement Act of 2008 required all Class I railroads (the largest) and intercity passenger and commuter railroads to implement a PTC system on main line track carrying either passengers or TIH materials by December 31, 2015. Currently PTC is completely implemented in all Class I railroads in California.

**Trucks**

Trucks can weigh more than 30 times more than passenger vehicles and requires more stopping distance, especially when loaded. When involved in a collision, the size and weight of large trucks increases the severity of impact when a passenger vehicle is involved. Furthermore, truck crashes are more likely to result in severe injuries or fatalities than those involving only passenger cars. For example, between 2013 to 2017, the number of collisions involving trucks increased by 23 percent. Also, during this period, statewide truck VMT increased by 15 percent, followed by an overall increase in the number of collisions per one million VMT. Truck-related fatalities increased by 30 percent and injuries by 21 percent the
same year. However, commercial truck collisions resulting in no injury or death increased only by four percent and injuries by 24 percent though the number of commercial truck collisions resulting in a fatality decreased by eight percent.

Another safety concern is distracted driving and driver inattention. A distraction is anything that diverts the driver’s attention from his or her primary tasks of navigating the vehicle and responding to critical events. According to an in-cab driving study of commercial truck drivers by the Virginia Technical Institute, the most dangerous distraction observed was texting. Truck drivers who texted while driving had 23 times the risk of being involved in a crash or a near crash incident. However, texting and phone calls are not the only distractions. Others may include eating, drinking, grooming, handling in-vehicle navigation systems, and conversing with other passengers.

The FMCSA and the PHMSA have published rules specifically prohibiting interstate truck drivers, bus drivers, and drivers who transport quantities of “placards”, which are large amount of hazardous materials, from texting or using hand-held mobile phones while operating their vehicles. The joint rules are the latest actions by the U.S.DOT to end distracted driving. Violations can result in fines and/or driver disqualifications and will impact a motor carrier’s and/or driver’s Safety Measurement System results.

With new electronic logging device rules, the monitoring of drivers’ adherence to the hours of service rules will become more rigorous because computer programs will be tracking the driving and work activity of truck drivers. The California Trucking Association (CTA) has a long history of supporting truck safety initiatives, such as banning radar detectors, prohibiting the use of mobile phones while driving, and administering mandatory drug and alcohol testing. CTA is now calling for several additional safety improvements, such as mandatory use of devices to limit maximum truck speed and a national clearinghouse to track positive drug and alcohol test results and refusals to test.

Commercial Vehicle Enforcement

The CHP provides safety oversight of approximately 8.5 million commercial vehicles. Currently, there are 54 commercial vehicle enforcement facilities (CVEF) located throughout the state. The CHP has jurisdictional authority over the CVEFs and maintains responsibility for commercial enforcement.

CHP mobile road enforcement units are used within their eight divisions throughout California’s highways and county roadways (county roadways are often not necessarily seen as commercially traveled routes). The CHP conducts over 500,000 inspections annually in accordance with the California Vehicle Safety Alliance standards set forth in the North American Standard Out-of-Service Criteria. The CHP also provides off-highway enforcement utilizing the Motor Carrier Safety Unit, which comprises over 300 non-uniformed motor carrier specialists assigned to one of the eight field divisions throughout the state.
The CHP and Caltrans are the State agencies designated by the Governor’s Office as the certifying officials for size and weight regulations and enforcement. The CHP is the primary agency responsible for the enforcement of size and weight statutes and regulations, pursuant to the California Vehicle Code (CVC) and Title 13, California Code of Regulations.

**Trucks Weight Limits**

California follows federal law by placing weight limits on trucks to protect pavement and bridges from damage and excessive wear and tear. Truck weight is also a major factor in the severity of truck-passenger vehicle incidents. Heavier trucks and trucks carrying loads exceeding maximum weight limits can be more difficult for the driver to control because they require increased stopping distance, have an increased potential to roll due to a higher center of gravity, generate higher speeds when traveling downhill, and have decreased steering capability, especially at higher speeds.

*Table I.1* shows a summary of the CVC weight limits. (Note: The information in this table is paraphrased for brevity. Refer to CVC Weight Sections 35550 – 35558 for more detailed information.\(^4\)

<table>
<thead>
<tr>
<th><strong>Unit</strong></th>
<th><strong>Maximum Weight</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Combination Gross Weight</td>
<td>80,000 pounds</td>
</tr>
<tr>
<td>Single Axle</td>
<td>20,000 pounds</td>
</tr>
<tr>
<td>Axle Group: less than 8'-6&quot; (8-feet-6-inches) between outer axles</td>
<td>34,000 pounds</td>
</tr>
<tr>
<td>Axle Group: 8'-6&quot; (8-feet-6-inches) or more between outer axles</td>
<td>Varies by distance between axle groups</td>
</tr>
</tbody>
</table>

Caltrans often receives requests to increase truck (or axle) weight limits, or to implement programs that would collect additional fees for compensation of overweight loads. There are several reasons for these requests. Hauling larger loads with fewer trucks can help some industries reduce transportation costs and increase efficiency. Competition and changing market conditions puts pressure on freight-dependent industries to lower costs in an effort to provide greater efficiencies and increase service quality. Transportation costs and flexibility for load size can have a significant effect on economic sustainability, particularly for heavy bulk commodities and highly priced sensitive goods, such as agriculture, lumber and timber, and construction materials. It is paramount to the economic vitality of California that it maintains an efficient freight transportation system and support freight-dependent industries. It is also vital that decision makers and the public understand the trade-offs between economic benefits with increased infrastructure and safety costs that occur when increasing load limits.
To support cleaner truck technologies, California passed in 2018, AB 2061, to the extent expressly authorized by federal law, authorizes a near-zero-emission vehicle or a zero-emission vehicle, as defined in subdivisions (c) and (d) of Section 44258 of the Health and Safety Code, to exceed the weight limits on the power unit by up to 2,000 pounds.\(^5\)

**Truck Parking**

The demand for commercial vehicle parking far exceeds capacity in California. When originally conceived, public rest areas were meant to be temporary rest areas for short-term safety breaks for the traveling public. As the trucking industry expanded, these rest areas began to serve as long-term, overnight parking for long-haul commercial vehicle operators, thereby contributing to overcrowding. The availability of parking is not just an issue for truck drivers who struggle to secure parking but also for neighborhoods adjacent to freight facilities such as ports, intermodal facilities, warehouse and distribution centers, and manufacturing. Besides creating safety hazards, neighborhoods frequently must contend with noise, smell, vibration, degradation of air quality, loss of viewshed, and disruption to community cohesion.

Because of the limits on stays in public facilities, parking space shortages, and hours of service regulations, truck drivers have few alternatives. He or she may park underneath overpasses, on roadway access ramps or roadway shoulders to rest. However, in most cases, these parking locations are unauthorized as they create safety risks for the driver and other users of the highway or road. Particularly challenging for a truck driver is accelerating quickly enough to merge into the traffic stream from a parked position on the side of the road. Additionally, “errant vehicles” may stray into these areas and strike parked commercial vehicles. Private truck stops are not always available to provide long-term parking. A lack of facilities can influence which route is taken based on the availability of amenities, whether the trip is a long or short haul, the time of day, and the need for staging areas. Just-in-time delivery scheduling and “rolling warehouse logistics” put even greater demand on drivers and on truck parking facilities.

According to the MAP-21 Jason’s Law highway bill, DOTs are required to address the national truck parking shortage at public and private facilities along U.S. highways. The first round of the Jason’s Law Truck Parking survey was conducted in 2015. The survey identified several parking indicator metrics to evaluate the supply and demand for truck parking in each state. With 11,892 private and 1,252 public truck parking spaces, California ranked fifth among all states in terms of parking supply (see Table I.2). However, California has very high demand for truck parking, and about 40 percent of truck drivers indicated that they perceive a shortage of truck parking in the state. California ranked in the lower quartile among all states for five metrics:
- Public Spaces per 100K Daily Truck VMT
- Private Spaces per 100K Daily Truck VMT
- All Spaces per 100K Daily Truck VMT
- Public Spaces per 100 miles of NHS
- Spaces per Million GDP
In response to this critical need, Caltrans initiated a truck parking advisory working group in 2017 to identify needs and priority areas and conducted a survey from all Caltrans districts. The next step is to conduct a comprehensive California statewide truck parking study to identify existing truck parking shortages and new potential locations, and to develop public and private partnerships for enhanced truck parking supply. The study is scheduled to be completed by 2022.

### Table I.2. Results of Assessment of Key Indicators

<table>
<thead>
<tr>
<th>Unit</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Facilities</td>
<td>87</td>
</tr>
<tr>
<td>Public Truck Parking Spaces</td>
<td>1,252</td>
</tr>
<tr>
<td>Private Truck Stops</td>
<td>197</td>
</tr>
<tr>
<td>Private Truck Parking Spaces</td>
<td>11,892</td>
</tr>
<tr>
<td>Ratio of Private to Public Truck Parking Spaces</td>
<td>9.5 : 1</td>
</tr>
<tr>
<td>Total Truck Parking Spaces</td>
<td>13,144</td>
</tr>
<tr>
<td>Public Spaces per 100k Daily Truck VMT</td>
<td>5.1</td>
</tr>
<tr>
<td>Private Spaces per 100k Daily Truck VMT</td>
<td>48.6</td>
</tr>
<tr>
<td>All Spaces per 100k Daily Truck VMT</td>
<td>53.7</td>
</tr>
<tr>
<td>Public Spaces per 100 Miles of NHS</td>
<td>8.6</td>
</tr>
<tr>
<td>Private Spaces per 100 Miles of NHS</td>
<td>82.0</td>
</tr>
<tr>
<td>All Spaces per 100 Miles of NHS</td>
<td>90.6</td>
</tr>
</tbody>
</table>

Source: Jason’s Law Truck Parking Survey Results

**Drug and Alcohol Prevention**

The CHP continues to work closely with the trucking industry to educate and reduce impaired driving to maintain the highest level of compliance. The goal of the program is to ensure all motor carriers located in the state are inspected for continued compliance with state and federal drug and alcohol testing requirements. These inspections are necessary in the continued efforts to reduce the number of impaired drivers on the road.

**Air Freight**

**Freight Security**

As with its passenger counterpart, the airline freight industry is pressured to comply with stringent security requirements. As part of the 9/11 Commission Act of 2007, Congress requires all cargo transported in the holds of passenger airplanes originating in the US to be screened at a level commensurate with passenger luggage. Since 2010, TSA regulations mandates the screening of all cargo before it is to be loaded and carried by air both within the US and
As a solution to bottlenecks experienced at airports which further impacts the global supply chain due to the complex screening processes for both passenger and cargo packages, TSA devised the Certified Cargo Screening Program (CCSP). Under the CCSP, shippers, freight forwarders, logistics services providers, indirect air carriers, independent cargo screening firms, and air carriers can screen cargo via a secure chain of custody and pass it along where it can go directly onto the aircraft without undergoing additional screening. This approach effectively creates a distributed screening network, allowing screening to be performed at the most cost-effective point in the supply chain and mitigating the impact on system performance, thereby expediting the flow of commerce. The CCSP is a flexible, voluntary program specifically designed to allow shippers with unique requirements to find the approach that best meets their needs. The CCSP requires airlines, freight forwarders, and shippers to assume the costs of these security measures and to establish a secure air freight transport chain. 

**NextGen**

The Next Generation Air Transportation System (NextGen) modernization of the US air traffic system is due for implementation across the country in stages between 2007 and 2025. NextGen aims to transform America’s air traffic control system from a ground-based system to a satellite-based system. Global Positioning System (GPS) technology will be used to shorten routes, save time and fuel, reduce traffic delays, increase capacity, and permit controllers to monitor and manage aircraft with greater safety margins. Planes will be able to fly closer together, take more direct routes, and avoid delays caused by airport “stacking” as planes wait for an open runway.

The FAA is undertaking a wide-ranging transformation of the entire US air transportation system through the NextGen program, which is developed to reduce gridlock both in the sky and at the airports. In 2017, FAA published an Implementation Plan Update, including a summary of accomplishments and the NextGen priorities annual plan through 2019. The NextGen Integration Working Groups have successfully completed 52 commitments in fiscal year 2017, advancing operational improvements to the National Airspace System (NAS) in all areas. In February 2017, the NAC chairman proposed that the NAC focus on implementing NextGen in the Northeast Corridor, recognizing that making continuous improvements to the system in the Northeast Corridor operationally benefits the entire US aviation system. Although this national effort focuses more on flight improvement across NAS, operational improvements provide benefits to the air cargo industry as well.

**Maritime Freight**

The maritime industry has always placed a high priority on security. Terrorism, weapons and drug smuggling, customs duty evasion, and piracy have been some of the most important concerns. The international dimensions of the shipping industry, the large number of maritime ports, the vast fleet of global shipping, the range of products carried in vessels, and the
difficulty of detection has made the issue of security in shipping a persistent concern. For ports, vulnerabilities can range in levels of exploitation from land and water side. Recently, more scrutiny from customs officials has focused on containers to identify illicit and/or dangerous cargoes. All containers imported to U.S. seaports are scanned through radiation portal monitors (RPM) prior to leaving a marine terminal on trucks or rail cars. Other selected containers are also scanned or manually inspected by US Customs and Border Protection (CBP) based on their assessment of risk or by random selection. The United States Coast Guard (USCG) inspects cargos and containers for compliance with the Federal Hazardous Materials Transportation Law (FHMTL) and the International Safe Container Act of 1977 (ISCA) (46 U.S.C. 80501-80509). Regulations implementing the FHMTL are codified in 49 CFR 107-180. Regulations implementing the ISCA can be found in 49 CFR 450-453. The Coast Guard inspects containers of general cargo to ensure hazardous materials are being shipped legally. Undeclared hazardous material shipments are a leading cause of transportation incidents.

The USCG also has responsibility for the Transportation Worker Identification Credential (TWIC) program. The TWIC program was developed following the legislative provision of the Maritime Transportation Security Act (2002, 2010) and the Security and Accountability for Every Port Act of 2006. The TWIC identification card is a tamper-resistant credential that contains biometric information about the holder, rendering the card useless to anyone other than the rightful owner.

Vessel Safety and Security
The Maritime Transportation Security Act of 2002 (P.L. 107-295) was designed to protect the nation’s ports and waterways from terrorist attacks. The basic elements of this legislation were adopted by the International Maritime Organization (IMO) in 2002 as the International Ship and Port Security code (ISPS). There are three important features of these interventions. First is the requirement for an Automated Identity System (AIS) to be fitted on all vessels from 300 gross tonnage and upward. The AIS requires vessels to have a permanently marked and visible identity number, and there must be a record maintained of its flag, port of registry, and address of the registered owner. Second, each port must undertake a security assessment of its assets and facilities, quantifying the effects of damages caused. The port must then evaluate the risks to its physical security, communication systems, and utilities. Lastly, all cargoes destined for the US must receive customs clearance prior to the departure of the ship. It is proposed that biometric identification for seafarers are implemented and that a national database of sailors be maintained.

The ISPS code is being implemented in ports around the world. Without certification, a foreign port would have difficulty in trading with the US. Thus, it is becoming a factor in a port’s competitiveness. The need to comply with ISPS has become an urgent issue in ports of various cargo volumes around the world. The costs of securing sites, undertaking risk assessments, and monitoring ships all represent an additional cost of doing business without any commercial return. US ports have been able to tap funding from the Department of Homeland Security, but foreign ports must comply or else risk the loss of business. In 2008, legislation in the US
required that all containers being shipped to the US undergo screening. Foreign ports will be expected to purchase gamma-ray and x-ray scanners, and undertake screening of all US-bound containers, regardless of the degree of the security threat. This is a further financial and operational cost for foreign ports to comply with. Security has become an additional element in determining competitive advantage.

Land Ports of Entry Freight

Border Safety and Security
California and Mexico share over 130 miles of international border. The border is a vital economic gateway for international trade and a key contributor to the economic well-being of both countries. Under the auspices of the Department of Homeland Security, the US Customs and Border Protection (CBP) safeguards the US-Mexico Border. Its top priority is “keeping terrorists and their weapons out of the US while facilitating lawful international travel and trade.” Regarding to freight, the CBP’s primary responsibility is to “safeguard America’s borders thereby protecting the public from dangerous people and materials while enhancing the Nation’s global economic competitiveness by enabling legitimate trade and travel.”

The CBP creates and implements programs using sophisticated technologies, and trains personnel to help achieve the goals of securing US ports and borders while supporting and expediting trade. Initiated after 9/11, the Free and Secure Trade (FAST) Program is a commercial clearance program for known low-risk shipments entering the US from Mexico and Canada. FAST allows for expedited processing for commercial carriers who have completed background checks and certain eligibility requirements. Participation in the “trusted trader” program requires that “every link in the supply chain, from manufacturer to maritime freight carrier to driver to importer, is certified under the Customs-Trade Partnership program, or C-TPAT.”

C-TPAT is a voluntary government-business initiative intended to build cooperative relationships that strengthen and improve the overall international supply chain and US border security. Nationwide, there are over 78,000 commercial drivers enrolled in the program and 10,000 companies worldwide are certified under C-TPAT. FAST membership is $50 US or Canadian currency and covers five years. One of the key benefits of enrollment for carriers is “access to dedicated lanes for greater speed and efficiency in processing transborder shipments.” For the US, Mexico, and Canada, the program helps to support supply chain security while promoting economic prosperity.

In 2016, the US CPB announced the full implementation of Automated Commercial Environment (ACE). As the platform that enables the United States’ Single Window, ACE provides a single, centralized access point for the trade community to connect with CBP and its Partner Government Agencies. ACE is the system of record by which electronic trade transactions are conducted and recorded by CBP. ACE has streamlined collection and improved enforcement. With the ACE cargo processing system, trade transactions are more efficient, standardized, simplified, less costly, and more predictable for importers and exporters.
CBP has also been working to design a government-wide ‘trusted trader’ partnership program that would integrate CBP’s C-TPAT and the Importer Self-Assessment with other US government trusted trader programs. In July 2016, CBP published the draft “Trusted Trader Strategy Framework” whose objective is to co-create a strategy in terms and practice, one which acknowledges the significant commitment of partnership between the US government and trade, in global trade and security. The Trusted Trader framework begins with a foundation of security and continues through current certified membership in C-TPAT baseline of engagement. This Trusted Trader pilot program was announced on June 16, 2014 in Federal Register 79FN13992 to transform the existing Importer Self-Assessment program into the new Trade Compliance Program, which provides importers and exporters a platform to achieve an integrated partnership for security and compliance. The pilot program has since been continued and expanded. In January 2018, CBP, the Trusted Trader Subcommittee members, and the Trusted Trader Pilot participants met in Long Beach, California.

**Freight Transportation Resiliency**

“Freight resiliency” is the ability for the freight system to quickly detect, absorb, and recover from disruptions and return to normal operating levels. These disruptions can range in severity and scale, and from small-scale events with a localized impact (such as a power outage at a distribution center), to large events with far-reaching effects (such as earthquakes, mudslides, or terrorist attacks). The ability of a system to rebound depends on many factors, including: the structure of the specific freight system (manufacturing, shipping, processing, delivery), personnel training, transportation redundancies (such as having multiple options, modes, or routes), and public and private actions taken to preserve or restore service in case of a disaster or disruption.

Resilience in the state’s freight system is needed for California to meet its growing needs for efficient freight mobility, as well as to help meet challenges presented by California’s changing climate. Without resiliency, infrastructure will be subjected to faster deterioration due to extreme weather events. The public will be faced with increases in system disruptions, and private enterprises may lose competitiveness. The 2018 update to California’s Fourth Climate Change Assessment has shown a dramatic shift in California’s climate future that will affect people, the natural landscape, and infrastructure. Table I.3 shows the key findings from the Fourth Climate Change Assessment for statewide climate trends that are expected to occur between 2050 and 2100. Effects on freight are added to this summary table to illustrate potential outcomes because of these changing climate conditions.

**Table I.3. Key Findings Adapted from California’s Fourth Climate Change Assessment to Include Potential Impacts to Freight Systems**

<table>
<thead>
<tr>
<th>Climate Stressor</th>
<th>Future Change</th>
<th>Impacts to Freight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td><strong>By 2100:</strong> 5.6°-8.8° increase in daily temperature</td>
<td>Increase in daily temperatures can lead to hotter warehouses and damage to truck tires and engines. Workers will need more protections from overheating (e.g. access to air conditioning, more frequent breaks, and shorter shifts).</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Water</td>
<td><strong>By 2050:</strong> Water supply from snowpack is projected to decline by two-thirds</td>
<td>Agricultural shortages could arise from the limited water supply, which would change patterns of freight from California’s Central Valley to more reliance on food imports from other countries.</td>
</tr>
<tr>
<td>Wildfire</td>
<td><strong>By 2100:</strong> Average land area burned will increase by 77%</td>
<td>Road closures from damaged highways could result in freight trucks needing to be rerouted to other highways that may be further away, thus increasing delivery and shipping costs and times.</td>
</tr>
<tr>
<td>Sea Level Rise</td>
<td><strong>By 2100:</strong></td>
<td>Inundation could cause relocation of container yards, commercial buildings, and warehousing, especially those found in coastal areas that have not implemented adaptation measures. Flooding of highways will lead to road closures which could affect the trucking industry.</td>
</tr>
<tr>
<td></td>
<td>- 31%-67% of Southern California beaches may completely erode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- $17.69 billion worth of residential and commercial buildings could be inundated statewide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- The number of highway miles exposed to coastal flooding will triple</td>
<td></td>
</tr>
</tbody>
</table>

Source: California’s Fourth Climate Change Assessment

The projected changes in California’s climate highlight the need for transportation systems to be resilient and quickly regain “business as usual” operations despite changing circumstances. System disruptions are almost impossible to predict with accuracy because they can stem from many sources and have many different types of impacts. This highlights the need for the freight system to be flexible and be able to swiftly recover from shocks. Table I.4 shows disruption events and possible corresponding freight impacts to illustrate unpredictability the freight system faces.
The wildfires that now occur nearly year-round in California are recent examples highlighting the need for resiliency. From 2017 to 2019, California experienced some of the most devastating fires in its history, whether in terms of acres burned, structures destroyed, or lives lost. These fire events interrupted freight rail and roadway mobility and closed freight-related businesses. The interruptions, though necessary to save lives and speed up emergency crew movements, impede freight movements and shipments of goods, both perishable and shelf-stable. The rate of natural disasters is predicted to increase due to California’s changing climate.

**Table I.4. Event Types and Possible System Failures**

<table>
<thead>
<tr>
<th>Source of Disruption</th>
<th>Event Type</th>
<th>Possible System Failures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Climate Change</strong></td>
<td>Wildfires</td>
<td>• Downed powerlines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Road closures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Damage to infrastructure</td>
</tr>
<tr>
<td></td>
<td>Increased Tornado/Hurricane Strength</td>
<td>• Downed powerlines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Damaged or destroyed buildings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inaccessible roads</td>
</tr>
<tr>
<td></td>
<td>Sea Level Rise/Storm Surge</td>
<td>• Flooding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Salt water intrusion and corrosion of electronic systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Damage to rail, highway, seaport, airport infrastructure</td>
</tr>
<tr>
<td></td>
<td>Intense Precipitation</td>
<td>• Flooding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Low visibility</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Washout of roads and rail substrates</td>
</tr>
<tr>
<td></td>
<td>High Winds</td>
<td>• Downed power lines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Vehicles blown off roadways or overturned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Increased threats to bridges</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Delays to air freight flights</td>
</tr>
<tr>
<td></td>
<td>Increased Temperatures</td>
<td>• Vehicles overheating</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Tire blowouts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Rail track expansion and buckling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Thermal expansion of bridge joints</td>
</tr>
<tr>
<td></td>
<td>Cliff Retreat</td>
<td>• Unstable roadways</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Inaccessible roads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Loss of connectivity between cities</td>
</tr>
<tr>
<td><strong>Geophysical</strong></td>
<td>Tsunamis</td>
<td>• Flooding</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Saltwater intrusion and corrosion</td>
</tr>
</tbody>
</table>
The rapid development of e-commerce, economic globalization, just-in-time production, and logistics and supply chain systems over the past decades has led to a significant need for efficient and effective management of freight movements. Businesses and consumers have become increasingly dependent on the freight transport system to deliver their goods with far less inventory stored in regional warehouses and stores. Freight movement in the US has increased dramatically over the past 20 years. Highway vehicle miles traveled grew by approximately 98 percent; however, the highway network expanded less than 5 percent between 1980 and 2007. Significantly more freight is being moved on the same relative number of lane miles, which results in increased delays from higher traffic volumes and more maintenance needs on the road network.

Weather-related events have increased dramatically during that same period through 2014. Individuals, businesses, industries, and public sector government agencies are not immune to sudden events that disrupt normal daily activities. Trucking companies, rail carriers, infrastructure managers, and terminal and port operators must invest to prevent or mitigate the effects of disasters. Whether attributable to acts of nature, human error, mechanical failure, or intentional disruptions, awareness of future threats and the ability to quickly respond to them is needed.

Due to increased goods movement activity, it is imperative for the freight system to be equipped to handle climate, environmental, human, and geophysical events. While it is difficult
to predict when an event may occur, it is important for the system, both the public and private sectors, to be prepared for its eventuality. Failure to adapt can be disastrous to individuals, businesses, governments, and the economy.

**Importance of Resiliency in Freight**

**Effects to a Non-Resilient System**

The impacts of a freight system unprepared for climate resiliency have far-reaching consequences outside of private industry profit margins. Disruptions in freight movements can mean freight industry workers are unable to reach their jobs, thus a loss in wages. Agricultural crops can decline in quality or even spoil if trucks are delayed between farms and distribution points. Delays in shipping products to consumers could have disastrous consequences, such as diabetic patients not receiving their insulin shipments on time, or that stores not stocked with goods necessary for helping residents weather a severe storm event. Local, regional, state, and federal governments can be severely affected fiscally if the freight system is not adequately prepared for a major climate, human, or geophysical event. Ignoring repairs, retrofitting, or adaptation measures could accelerate the failure of vital infrastructure, thereby substantially increasing the costs to repair after an event more than proactively maintaining it.

**Benefits of a Resilient System**

A freight system that has been successfully adapted to the upcoming climate changes will be better suited to quickly recover from disaster events, thus saving time, money, and lives. Private industries and public agencies can ensure a resilient system by adapting infrastructure to withstand greater shifts in climate.

Public incentives are available to private businesses, such as rebates for installing solar infrastructure to ensure the transition to climate adaptation is achievable. Other public funding may be used for elevating bridges over bodies of water to accommodate increases in precipitation or sea level rise, identifying areas prone to rockslides or mudslides and fortifying the area to protect the roadways and traveling public, and by communicating road closures and openings quickly so that truckers and delivery trucks can get back on their regular routes.

Accommodating disruptions within the freight transportation system often needs a variety of measures. Reliable freight transportation is a prerequisite for an efficient supply chain. As ground transportation systems have become more congested and less able to accommodate shifting demands, improving resilience of the transportation system itself becomes a priority. Two important points should be taken from the earlier paragraphs:

- Public-private relationships are integral to building and supporting a resilient system.
- Communication is critical to saving lives in case of a catastrophe.

The next section will take a closer look at specific programs and policies both public and private sectors are leading to be resilient in the face of a changing climate system.
Current Efforts

Private Sector
The Burlington Northern Santa Fe (BNSF) rail line publicly releases its yearly “Corporate Responsibility and Sustainability Report,” which outlines the continuing efforts to, “…enhance safety, including efforts to reduce energy consumption and carbon emissions with more sustainable operations.” As a rail operator that carries more than 40 percent of America’s freight and as North America’s second largest freight railroad network operating over 32,500 miles of track, BNSF has been striving to ensure its operations are resilient. The largest concern for BNSF is the event of a hazardous waste spill, since the company operates under “Common Carriage” responsibilities, meaning that it is required to make reasonable accommodations for the transportation of any hazardous material or commodity. In 2017, BNSF carried over 1.3 million customer hazmat shipments across its network. To reduce the risk of accidents, BNSF uses, “…wayside detectors, track inspections, reduced speeds, positive train control, and stronger tank cars.” Crude oil and ethanol are among the hazardous materials BNSF transports, and BNSF requires that trains travel no faster than 50 miles per hour (mph), with speeds under 35 mph in areas with 100,000 or greater inhabitants.

Union Pacific Railroad (UP), the largest railroad operator in the United States after BNSF, is also concerned with the human element of potential disruptions. A 2016 report published by UP, the “2016 Building America Report - A Report to Communities on Our Social, Environmental, and Economic Sustainability Progress” addresses a variety of concerns the company faces during its day-to-day operations, such as environmental health, employee and customer safety, and resource management. UP, similar to BNSF, is also highly concerned with hazardous material transportation safety. The UP report stresses emergency response trainings for first responders, UP employees, and volunteers.

By offering paid employee training on safety procedures while transporting hazardous materials, BNSF and UP set an example of how private responsibility is taking the lead to benefit public well-being. Employee, volunteer, and first responder training directly increases resiliency in an emergency because well-organized and orchestrated disaster relief actions can respond to events and efficiently assess situations. Also, the practice of using new technology, stronger equipment, and reductions in train speeds reduces the vulnerability of the freight system to accidents that can contribute to spills, injuries, or deaths.

Public Sector
Caltrans is currently conducting statewide vulnerability assessments to learn the extent to which the SHS will be affected by a changing climate by horizon years 2025, 2055, and 2085. These vulnerability assessments explore how rising temperatures, sea level rise, storm surge, and rates of wildfire may impact the SHS. The outcomes of these vulnerability assessments will lead each of the 12 Caltrans districts to develop their own Climate Adaptation Strategy. These strategies will guide decisions to address the vulnerable areas of highways, with the aim to develop design changes to help protect users from potential hazards.
Caltrans has administered the Climate Adaptation Planning Grants for three fiscal years (2017-2020). These grants, totaling $20 million, are funded through SB 1, a transportation funding bill passed by the California legislature and backed by voters in 2018. Adaptation Planning Grants aim to advance climate planning on California’s transportation infrastructure, including roads, railways (public railways that both private and public rail lines use), bikeways, trails, transit lines, bridges, bus terminals, seaports, and airports.

The Climate Adaptation Grants awarded to regional and local governments within California have helped communities plan for improvements made to their transportation infrastructure in the face of increased extreme heat events, precipitation, drought, storm surges, sea level rise, and wildfires due to climate change. To date, over 40 planning grants have been awarded, empowering communities throughout California to safeguard their transportation systems against disruptions caused by a changing climate. Findings from these plans aid local, regional, and state efforts of increasing climate and system resiliency while decreasing vulnerabilities regardless of source type. These efforts ensure that the freight system (and by extension California’s economy), environment, and residents are resilient to any disasters that may disrupt normal life.
Endnotes

   https://www.caloes.ca.gov/PlanningPreparednessSite/Documents/01%20Executive%20Summary%20Transportation.pdf
   https://dot.ca.gov/programs/traffic-operations/legal-truck-access/ex-zero-emission-vehicle
6 “Jason's Law Truck Parking Survey Results and Comparative Analysis.” Jason's Law Truck Parking Survey Results and Comparative Analysis - FHWA Freight Management and Operations,
8 BNSF Railway. Corporate Responsibility and Sustainability Report. BNSF Railway, 2017,
Appendix J. Smart Growth and Urban Freight Considerations

Recent and impending technological advancements stand to revolutionize urban transportation. From autonomous vehicles and intelligent transportation systems to shared- and micro-mobility (i.e., electric scooters, bikeshare), many facets of urban transportation are evolving, and urban goods movement is no exception. The rapid increase of e-commerce as a share of global retail sales has reduced the number of trips that households must make to buy goods, but this reduction in trips has been offset in many metropolitan areas by increases in package delivery trips. The wide availability of many commonly demanded products through online retailers like Amazon resulted in large increases in rapid direct-to-consumer package deliveries. Online retailers like Amazon can deliver many products the same day they are ordered by consumers. The resulting increase in delivery trips has increased competition for limited curb space in many metropolitan areas, as goods movers must share the curb with Transportation Network Companies (TNCs), transit vehicles, parked automobiles, bicyclists, and pedestrians.

As the global transportation and goods movement industries evolved over time, cities rapidly grew and are expected to continue this trend in the future. According to the World Bank, 55 percent of the global population lives in urban areas today; by 2050, 68 percent of the global population will be urban. In California, 95 percent of the population lived in urban areas in 2010, compared to 94 percent in 2000. As the world becomes more urbanized, the demand for commercial activity will continue to increase as people consume more goods and services than ever before, driving up competition for both space and resources.

From an urban planning perspective, the growth of cities has resulted in many negative consequences, including increases in greenhouse gas emissions from automobile use and industrial activity, and sprawling development patterns that consume large quantities of land. This has led to the adoption of ‘smart growth’ as a planning philosophy, which aims to promote “compact development (moderate to modestly high density), a mixture of land uses in that development, and a range of feasible transportation options that promote and facilitate the use of modes of travel other than the automobile (e.g., transit, bicycles, and walking)”.

While the achievement of smart growth goals may ultimately serve to make cities more livable for people, it also presents challenges to the urban goods movement industry, which has historically been overlooked in metropolitan planning processes. While the achievement of smart growth goals will undoubtedly supply many benefits to urban populations, urban planners and local governments must be mindful of the needs of the goods movement industry and urban consumers and businesses, which are all central to the urban economy.
Smart Growth

Urban areas in the United States have historically been automobile-centric environments, and the urban planning profession has contributed to this through the development of such policies as minimum parking requirements, minimum lot sizes, and restrictions on development density. Automobile dominance in the United States has been intensified since the 1950s by the interstate highway network, which served to improve connectivity within and between urban areas, making extensive automobile travel both possible and attractive. However, population density has been increasing in most California cities over the past thirty years as an increasing share of the state’s population is choosing to live in urban areas, which is increasing competition for road infrastructure, as the urban goods movement industry must share the road with an increasing number of personal automobile users.

Figure J.1. shows a map of the percent change in urban population density from 1990-2019 (in people per square mile) for California cities with a population of 100,000 or more; 35% of those cities experienced an increase in population density of 1-25%, and 31% experienced an increase of 25-50%. Three cities experienced an increase in population density of 200-500%, and two cities experienced an increase greater than 500%, suggesting that little or no development existed in those areas prior to 1990. The areas with the largest increases in population density are in the Sacramento area and in Southern California between Riverside and Carlsbad.

Expansion of the roadway infrastructure in urban areas has facilitated economic growth, including within the freight industry; however, the widespread adoption of automobile-oriented urban development results in many negative consequences, including increased greenhouse gas emissions and associated reductions in air quality due to automobile dependence, increased quantities of impervious surfaces and associated degradation of water quality due to polluted runoff, and loss of open space due to increased land consumption, to name a few.

As awareness of the impacts of automobile dependency has grown, urban planners and policy makers have increasingly looked to policies under the umbrella of ‘smart growth’ to enhance the livability of cities and curtail the negative impacts of automobile dependency. In California, several pieces of legislation (AB 32, SB 375, SB 743, SB 50) have been passed to advance smart growth priorities. SB 375 requires the California Air Resources Board to set regional targets for greenhouse gas emissions reductions and requires metropolitan planning organizations to include a ‘Sustainable Communities Strategy’ detailing how those reductions will be achieved. Once fully implemented, SB 743 will change the way transportation impact analysis is conducted in California, shifting the focus from measuring traffic congestion to measuring the impacts of driving using key metrics such as Vehicles Miles Travelled (VMT) per capita, VMT per employee, and net VMT, which will disincentivize driving. SB 50 seeks to incentivize residential development projects that provide high job accessibility or transit accessibility, both of which would reduce the need for vehicle trips.
Historical urban development patterns in the United States have often been characterized as ‘sprawling,’ which is indicative of an increase in per capita land consumption and an increase in the distance between trip origins and destinations, both of which drive up the cost of providing urban services. In contrast to sprawling development patterns, smart growth policies result in more compact, multimodal development, reduce per capita land consumption and the
distances between common destinations, which reduces the costs of providing public infrastructure and services, and improves accessibility and reduces per capita motor vehicle travel, which in turn provides economic, social and environmental benefits. In its 2006 report, This Is Smart Growth, the U.S EPA identified ten fundamental principles of smart growth to guide metropolitan planning and development decisions.

**U.S. EPA Smart Growth Principles**

1. Mix land uses
2. Take advantage of compact building design
3. Create a range of housing opportunities and choices
4. Create walkable neighborhoods
5. Foster distinctive, attractive communities with a strong sense of place
6. Preserve open space, farmland, natural beauty, and critical environmental areas
7. Strengthen and direct development towards existing communities
8. Provide a variety of transportation choices
9. Make development decisions predictable, fair, and cost effective
10. Encourage community and stakeholder collaboration in development decisions

Source: This Is Smart Growth (US EPA 2006)

Implementation of the Smart Growth principles impacts planning and development decisions by increasing urban building density and reducing car dependency by mixing residential, retail, office, and light manufacturing land uses, reducing street widths, and supplying a wide range of destination types within walking or bicycling distance of residential locations across the socioeconomic spectrum. Although this has far-reaching benefits for livability and quality of life in urban areas, several of the Smart Growth principles present challenges for the urban goods movement industry.

Several studies have attempted to quantify the benefits of smart growth compared to the costs of sprawl. Ewing and Hamidi created an index to measure urban compactness. The index was constructed using data from the Census and the U.S. Geological Survey’s National Land Cover Database and involved principal component analysis of six weighted factors: gross population density in persons per square mile; the percentage of the county population living at low suburban densities of 100 to 150 persons per square mile, corresponding to less than one housing unit per acre; the percentage of the county population living at medium to high urban densities of more than 12,500 persons per square mile, corresponding to roughly 8 housing units per acre; the net population density of urban places within a county; the average block size; and the percentage of blocks with areas less than 1/100 square miles, corresponding to the average size of an urban block. The authors found that nationally, a 10 percent increase in an urban area’s compactness score was associated with a 0.6 percent decline in average household vehicle ownership and a 7.8 – 9.5 percent decline in vehicle miles travelled, while walking commute mode share increased by 3.9 percent and public transit commute mode share increased by 11.5 percent. The San Francisco-Oakland, Oxnard, and Los Angeles-Long Beach-Anaheim urbanized areas ranked among the top ten most compact urbanized areas in the nation according to the study.
In a meta review of 300 academic papers studying the impacts of compact urban forms, Ahlfeldt and Pietrostefani (2017) found that 69 percent of the studies reviewed uncovered positive effects associated with increases in compactness, including higher wages, increases in local public spending, pollution and energy use reduction, and increases in non-car mode choice, among others. More than 70 percent of the studies reviewed attributed positive impacts to increased economic density, while 56 percent attributed positive impacts to increased built environment density and 58 percent attributed positive impacts to an increase in the proportion of mixed land uses.

While a large body of literature has examined the benefits of smart growth for personal travel and livability, relatively little work has been done to examine the impacts of smart growth on urban goods movement. The existing body of knowledge concerning the impacts of smart growth on urban goods movement is presented in detail in later in this chapter.

**Urban Goods Movement**

Urban goods movement refers broadly to the movement of products, including package delivery and waste management, throughout urban areas. More specifically it is “the complex network of vehicular modes, technological systems and physical structures controlled by people that are responsible for sending and receiving goods”. Given that urban areas are major sources of demand for goods and many freight trips originate or end in an urban area (first mile/last mile), urban goods movement is a major part of the broader freight industry and the economy at large.

Figure 1.1. provides a map of urban population density in 2019 for California cities that have a population of 100,000 or more, highlighting the geographic locations throughout the state that support the urban goods movement industry. In California, ninety-five percent of the population lives in urban areas (including outlying suburban areas), and the state’s annual gross domestic product (GDP) of more than 2.4 trillion dollars accounts for approximately 14% of the nation’s GDP; goods production and movement within and between urban areas throughout the state undoubtedly plays a major role in the economic growth of California and the country. Ultimately, goods movement forms the backbone of California’s economy, as every California resident and business depends on the prompt delivery of various goods from their place of manufacture to where they are consumed.

Urban goods movement as an industry has undergone rapid change in recent years and is expected to continue at a similar pace as new technologies reach widespread adoption. Within the past decade, e-commerce has exerted a strong influence on urban goods movement, affecting both the quantity and the timing of deliveries. According to market research firm eMarketer, e-commerce accounted for 7.3% of global retail sales in 2015 and is expected to account for 12.4% by 2019. The majority of e-commerce establishments and employees are located in California. Additionally, the top five buying markets in the country in terms of price for industrial commercial real estate are located in California (Los Angeles, San Francisco, San Diego, San Jose, and Oakland).
Oakland, Sacramento, and San Jose), and this is connected to the increase in demand from big box retailers for fulfillment centers used to ship online orders.\textsuperscript{26}

**Figure J.2. 2019 California Urban Population Density in Major Cities**

Source: Map created by Fehr & Peers, Data from U.S. Census Bureau, 2019
While the shift toward e-commerce has had a large impact on deliveries to private residences, requiring more frequent deliveries and a greater number of delivery vehicles to meet the demand, commercial businesses have also been affected. According to the Volvo Research and Educational Foundations, “Online sales are growing three times faster than traditional retail sales and companies have shifted to just-in-time deliveries – receiving goods only as they are needed to reduce inventory cost – requiring more frequent and customized deliveries”. This has become standard practice for many businesses as they look to maximize revenue in the face of increasing urban rents. Shifting to just-in-time deliveries has also increased the frequency of deliveries and the number of delivery vehicles needed.

A burgeoning technology that stands to radically transform the entire transportation industry – including goods movement – is vehicle automation. While substantial investments have been made in vehicle automation for personal transportation, the goods movement industry will be impacted as well. Companies like Tesla have already developed prototype autonomous semi-trucks that may someday be manufactured at scale to meet the needs of the freight industry.  

Autonomous vehicles (AVs) are projected to supply several benefits: safety improvements, congestion reduction, and greater fuel efficiency. According to Bucsky (2018), “the associated benefits of AV technologies in goods transport can be categorized into three groups: (1) traffic related gains (lower travel time, shrinking costs, less traffic), (2) economic (financial benefits for transport companies, e.g. lower costs, restructuring of market), (3) safety and environment.” Bucsky notes the many potential implications of shifting to AV technology to the goods movement industry, one of which is the displacement of a human driver.

Alternatively, other automation scenarios may be adopted including truck platooning, in which a convoy of several trucks would be operated by a single human driver in the lead truck; highway automation with drone operation, in which a human operator would remotely control trucks on local streets, but allow the truck to operate autonomously on highways; and highway exit-to-exit automation, in which a human driver would navigate a load through local streets and complex driving situations such as congested urban freeways with many on and off ramps and then attach the load to a self-driving truck for long-haul travel on the freeway.

While much research has focused on the potential benefits of AV technology to the transportation industry and the goods movement industry specifically, widespread adoption of the technology may also create significant challenges for goods movement. According to a report by Viscelli (2018), adoption of autonomous trucks for long-haul deliveries will potentially have major implications for employment in the freight industry, threatening nearly 300,000 trucking jobs. Without policy intervention to protect jobs, “the most likely scenario for widespread adoption involves local human drivers bringing trailers from factories or warehouses to ‘autonomous truck ports’ (ATPs) located on the outskirts of cities next to major interstate exits. Here, they will swap the trailers over to autonomous tractors for long stretches of highway driving. At the other end, the process will happen in reverse: a human driver will pick up the trailer at an ATP and take it to the destination”.

California Freight Mobility Plan 2020

Appendix J. Smart Growth and Urban Freight Considerations

J-7
This scenario would likely retain most trucking jobs in urban areas, but currently most of the best trucking jobs – those with the highest pay and the best working conditions – are those related to long-distance goods movement. With long distance goods movement being handled by autonomous trucks, 83,000 high quality jobs would be lost along with 211,000 jobs with “moderate wages but high turnover rates and poor working conditions”. From the perspective of goods movement firms, reducing the need to employ human labor will ultimately drive up revenues and the shift to AV technology will be a net benefit. As Flamig (2016) notes, “transport itself adds no value to the product. For this reason, applications where transport could take place without a driver were developed for in-house logistics as early as the 1950s.” Despite the benefit to firms of reducing labor costs, policy interventions may become necessary to balance the benefits of AV technology with the economic needs of workers in the freight industry.

**Smart Growth & Urban Goods Movement**

Smart growth goals and urban goods movement priorities often appear to be at odds with one another. From a smart growth perspective, the increase in delivery vehicle trips that has resulted from the growth of e-commerce and just-in-time deliveries stands in stark contrast to the goals of reducing vehicle miles travelled, greenhouse gas emissions, and automobile congestion on urban streets. The mechanics of goods movement is often taken for granted by urban planners, local governments, and consumers alike because goods are expected to be delivered on time and in enough quantities to keep the economy running. However, the process of moving goods where they need to go is often seen as a nuisance.

According to the Guidebook for Understanding Urban Goods Movement (Rhodes et al. 2012), “Cities are quickly becoming the most concentrated, dense consumer market in history. Meanwhile, the capacity of urban transportation infrastructure has increased only modestly. Urban design and regulations affecting how freight moves in modern cities have failed to keep pace with the growing demand for goods and services, and the transportation systems that support modern logistics and supply chain management.”

Concrete steps must be taken to align smart growth and urban goods movement priorities to ensure that the economic engine of the goods movement industry is able to perform at its peak ability while simultaneously improving the livability of cities and reducing their environmental impacts. Seven key stakeholders will be needed to make this happen:

- government (including transportation planning agencies),
- communities and residents,
- shippers,
- truckers,
- distribution and warehouse facilities,
- property owners and managers, real estate developers,
- commercial establishments

**Policy and Infrastructure Impacts**
Delivery trucks contribute to and are affected by congestion in metropolitan areas. This creates significant economic inefficiencies for the urban goods movement industry while also hindering the achievement of smart growth goals by worsening congestion and causing increases in greenhouse gas emissions. According to the report, Urban Freight for Livable Cities, urban goods movement—which constitutes the ‘last mile’ of the logistics chain—accounts for more than a quarter of the total cost of freight transport. The Texas A&M Transportation Institute states that trucks generate 17 percent of the cost of congestion in the United States but represent only 7 percent of all traffic.

Because urban roads are narrower than freeways and serve more user types, deliveries within cities typically cannot be made using full-size trucks. Instead, deliveries are made by trucks that are approximately one-third of the size of a full-size truck, which necessitates the use of more delivery vehicles and increases inefficiency in the logistics chain—including additional miles travelled and land use compatibility issues associated with freight transfers from line haul to local trucks. Compounding the problem, many trucks on urban roadway networks are only partially loaded or may be empty. According to the Volvo Research and Educational Foundations, “in the U.S. trucks generate 20 billion miles each year while driving empty.”

Implementation of Principles 2 and 4 of the US EPA Smart Growth principles could present direct challenges for truck movement in urban areas since it may result in the narrowing of urban streets. Considering this, planners and policy makers should consider the turning radius requirements at intersections of urban freight delivery vehicles when evaluating projects that narrow streets by adding pedestrian and bicycle safety infrastructure and amenities. In some cases, alternative goods movement routes can be chosen to ensure that delivery vehicles can access the destinations they need to access, while still improving walkability and compactness in strategically chosen locations.

Many urban road narrowing projects are undertaken to provide ‘complete streets’ that serve all users instead of focusing on maximizing efficiency for motor vehicles at the expense of other travel modes. A growing body of research is now exploring how urban goods movement can be integrated into the complete streets conceptual framework. Alison Conway of the City College of New York recommends conducting corridor studies to identify where urban bicycle and freight networks overlap, as these can be key points of conflict for infrastructure design. In addressing specific goods movement needs when designing or changing infrastructure, Conway recommends adhering to seven overarching themes:

- selecting a design and control vehicle;
- supplying adequate space for safe large vehicle turns;
- reducing the frequency of severity of conflicts between large vehicles and vulnerable roadway users;
- reducing speeds without unintended detrimental impacts on operations and safety; supplying network connectivity and redundancy;
- supplying adequate space for vehicle parking, loading, and delivery operations; and
- supplying safe access to sidewalks and buildings
Teran (2015) notes several areas of overlap where urban goods movement and complete streets design can coexist. Implementing road diets, for example, can increase traffic flow while reducing vehicle speeds and providing space for walking, bicycling, transit, and parking. When addressing complete streets design, planners and designers should identify the intersections that are most often used for goods movement and design the curb radius to suit the needs of trucks. Even intersections in locations with less goods movement traffic can be designed with multimodal considerations in mind, ensuring that adequate infrastructure is provided for all users, including trucks. In dense downtown areas, parallel streets can be designed as one-way couplets, with one street serving slower-moving traffic such as bicycles and pedestrians and the other serving trucks and other less vulnerable roadway users. Truck-serving streets would supply better curb access to allow for efficient loading and unloading.

Four of the US EPA Smart Growth principles pose notable safety challenges when urban goods movement is considered. Implementation of Principles 1 through 4 (Mix land uses; Take advantage of compact design; Create a range of housing opportunities and choices; Create walkable neighborhoods) could result in the closer proximity of pedestrians and bicyclists to delivery trucks. Most bicycle-truck collisions occur in urban areas, suggesting that the higher collision rate is a function of greater exposure of bicyclists to truck activity in urban areas. By increasing the density of urban environments, mixing land uses, increasing housing supply, and enhancing walkability and bicycle access through smart growth initiatives, planners and policy makers may ultimately increase the exposure of bicyclists and pedestrians to trucks. Careful consideration must be taken to manage interactions between trucks and the most vulnerable roadway users to maximize safety for everyone. As previously mentioned, designated truck routes may be helpful in achieving this end. Figure J.3 shows the proximity between bicycles and trucks that can occur in urban areas, even when dedicated bicycle infrastructure is provided.

Figure J.3. Bicycle-Truck Proximity on Urban Streets

Source: Transportation Research Procedia
A major barrier for the urban goods movement industry that contributes to traffic congestion and safety concerns is access to the curb for freight loading and unloading. The demand for curb space has increased in recent years considering the advent of TNCs such as Uber and Lyft and the growing volume of package deliveries spurred by the e-commerce boom. When delivery trucks are unable to access the curb or loading zone at their destination, they often double park and occupy a travel lane, which increases congestion and potentially reduces safety by limiting visibility in the roadway and forcing cars to travel around double-parked trucks. On streets with bicycle lanes, delivery trucks may effectively block these lanes when double-parked or may be required to pass through them to access the curb, posing safety concerns for bicyclists in both cases by increasing collision risk and forcing bicyclists to mix with vehicular traffic (Figure J.4).

Figure J.4. Curbside Bicycle Lane Complicates Truck Access to the Curb

These problems are compounded in the case of destinations with high curbside delivery demand and vehicle turnover, such as multi-tenant buildings, which typically generate more deliveries than single-tenant buildings. If multi-tenant buildings do not have internal logistics staff to manage deliveries, drivers must deliver goods to wherever recipients are located within the building. This may add to the expected delivery time while also increasing emissions associated with vehicle idleness, and further blocks lane access. Additionally, in situations where double-parking is not possible and the curb or loading zone is occupied, delivery trucks may take unnecessary trips around the block while waiting for delivery access, resulting in an increase in greenhouse gas emissions. According to the Institute of Transportation Engineers (ITE), “it is becoming increasingly important to designate loading zones not only in commercial or industrial areas, but also in residential areas where the frequency of package deliveries may result in blockages for other curbside uses”.

Source: Santa Monica Next
iven the increasing competition for curb space and the negative impacts it has had on urban goods movement, urban planners and policy makers are increasingly looking towards tools under the umbrella of ‘curbside management’ to reduce these impacts while simultaneously working toward achieving smart growth goals. In the Curbside Management Practitioners Guide, the Institute of Transportation Engineers (ITE) recommends several strategies for ensuring the availability of curb space for urban goods deliveries:

**Freight Zone Pricing**
Requiring payment for access to freight loading and unloading zones has the dual effect of reducing the duration of loading zone occupancy and increasing the likelihood that loading space will be available when needed.

**Off-peak Delivery and Congestion Pricing**
By charging delivery vehicles a fee to deliver goods during peak periods, cities may effectively incentivize delivery during off-peak periods, thus reducing peak-period congestion. Potential benefits to delivery carriers of switching to off-peak delivery include increased parking/loading zone availability, reduced traffic congestion, and faster travel times with attendant reductions in the time needed to complete delivery routes.

**Delivery Vehicle Staging Zones**
Providing time-limited on-street queueing areas for delivery trucks at high-demand locations can prevent trucks from blocking travel lanes or driving unnecessarily while waiting for access to the loading/unloading zone.

**Urban Consolidation Centers for Last Mile Delivery**
The rapid increase in e-commerce deliveries in recent years has worsened problems related to last-mile deliveries, which increase competition for road space between urban passenger and freight traffic. To address this, Urban Consolidation Centers (UCCs) bring together packages from a multitude of delivery companies and provide last-mile delivery service using relatively smaller, low-emission vehicles that reduce competition for road space. UCCs are often formed through public-private partnerships between local governments and delivery companies.

- **Moving Loading and Access Around the Corner**
  Many delivery drivers are willing to park farther away from their delivery destination if it means they will not have to waste time waiting for loading space to become available. By moving loading and unloading zones at a reasonable distance away from delivery destinations, cities can preserve curb space for high-turnover parking and transit use while reducing goods movement inefficiencies.

Much of the guidance from the Transportation Research Board (TRB) about curbside management overlaps with that of the ITE. However, TRB also recommends allowing delivery vehicles to use off-street parking, setting up appointment- or reservation-based systems for deliveries, and using zoning to increase loading bay sizes to accommodate larger trucks and
greater truck volumes. Leonardi et al. (2014) recommends using joint procurement and internal logistics operations for large multi-tenant buildings to reduce delivery vehicle dwell times.

New York City has had remarkable success in using curbside management and other policies to manage urban goods movement and achieve smart growth goals. After forming the New York City Department of Transportation (NYCDOT) Office of Freight Mobility in 2007, the City created a Commercial Vehicle Parking Plan which recommended allocating more curb space for commercial vehicles and using a pricing strategy with an escalating rate structure to maximize turnover of commercial vehicle parking. Combined, these measures have reduced commercial vehicle double-parking and dwell times and have increased parking availability, effectively reducing the need for delivery vehicles to circulate around the block while waiting for loading/unloading space to become available. In addition to curbside management policies, NYCDOT established the ‘THRU Streets’ program in 2002, which designates certain streets in midtown Manhattan for cross-town travel while other streets are reserved for truck loading and unloading. This is similar to the idea of ‘layered networks,’ which is based on the recognition that streets cannot always prioritize all users. Instead, the layer networks concept “envisions streets as systems, each street type designed to create a high-quality experience for its intended users.” Implementation of the ‘THRU Streets’ program resulted in major improvements to traffic flow in congested Manhattan and has improved safety by reducing conflicts between turning vehicles and pedestrians.

The City of Portland has implemented truck signal priority along major urban freight corridors to improve safety by reducing the likelihood of trucks running red lights and enhancing the efficiency of freight movement by reducing delay experienced at traffic signals. Additionally, the City collects city-wide freight logistics data that it plans to use to develop a coordinated freight management system to manage deliveries and prevent double-parking of trucks at the curbside.

National Cooperative Highway Research Program (NCHRP) Report 844 presents case studies of the integration of goods and services movement by commercial vehicles in smart growth environments for six metropolitan areas in the United States across six key smart growth classifications: industrial areas transitioning to housing and entertainment districts; working waterfronts transitioning to mixed-use and/or recreation; older commercial and neighborhood areas being revitalized; retrofitting aging commercial corridors; greenfield new communities; and large scale construction. In the Brady Arts District in Tulsa, Oklahoma, a former rail-served industrial and commercial area transitioned into an arts and entertainment district over a period of 20 years and faced challenges in the form of increased truck traffic during construction, reluctance from residents to retain freight-serving uses in the area, and conflicts between residential and commercial uses. In addressing these challenges, the City found that developing delivery and loading regulations could be useful for managing conflicts at the curbside in the future and innovative funding strategies such as tax increment financing could be used to improve walkability and safety with limited other financial resources. The City also
determined that certain industrial uses could be used as buffers between municipal land uses and more intense industrial uses.\textsuperscript{54}

In the Ballard neighborhood of Seattle, Washington, what was once a major hub for the maritime industry has recently been a site of major population growth with attendant increases in land and housing prices, which has created challenges for the maritime industry and the working-class neighborhoods that have historically existed in the area. Additionally, the street network is ill-equipped to accommodate freight delivery to new businesses in the neighborhood, creating challenges for shippers. To address these challenges, the City has chosen to prioritize which streets in the neighborhood should be ‘Complete Streets,’ enhancing some streets for industrial and commercial needs and others for multimodal transportation. Additionally, the City is using zoning to ensure that the neighborhood can keep important industries like the maritime industry while barring incompatible uses.\textsuperscript{55}

**Technological Impacts**

In addition to policy-based tools like curbside management, technological and logistical innovations may also play a role in aligning smart growth goals with urban goods movement priorities. From a logistical perspective, two innovations that promise to reduce delivery vehicle volumes, dwell times, and demand for curb space are: 1) the use of neighborhood pickup points, and 2) automated parcel systems as alternatives to home deliveries. Neighborhood pickup points are typically local shops or other convenient destinations where customers can receive and/or return deliveries.

Automated parcel systems are locker banks that are typically found in shopping centers or large easily accessible public destinations. Carriers leave packages in secured lockers which customers can unlock to receive their delivery using a digital code provided by the carrier. Advantages of neighborhood pickup points and automated parcel systems include eliminating instances of missed deliveries and consolidation of shipments from a carrier to a single location, which maximizes time and financial efficiency.\textsuperscript{56} While the implementation of these logistical innovations could supply multiple benefits to the goods movement industry while advancing smart growth goals, their widespread adoption is not guaranteed.

In addition to neighborhood pickup points and automated parcel systems, several new startup companies have emerged with the goal of optimizing package delivery in large urban developments, especially in multifamily developments where tenants are increasingly demanding secure package delivery. Many of these companies are using the model of partnering with multifamily property owners and managers to install secure lockers within buildings and providing tenants with personal access codes to retrieve their deliveries.\textsuperscript{57, 58} Independently of these companies, many multifamily buildings are installing their own ground floor package rooms or lockers where tenants can pick up their deliveries. Figure 5 shows an example of an Amazon Hub package locker in a multifamily development.\textsuperscript{59}
From a technological perspective, several new innovations hold promise for aligning smart growth and urban goods movement goals:

1. The use of local, alternatively-fueled autonomous vehicles for making deliveries has been promising. A startup called Udelv began testing grocery delivery using autonomous vehicles in San Mateo, California in partnership with Draeger’s, a local grocery store chain, in 2018 and will soon deploy autonomous delivery vehicles in Oklahoma City as well.\textsuperscript{60, 61} National grocery store chain Kroger has also been testing unmanned AVs to deliver groceries to customers in Arizona.\textsuperscript{62} By serving multiple customers with a single autonomous delivery vehicle, both traffic congestion and greenhouse gas emissions can be reduced.

2. 3D printing allows certain goods to be effectively manufactured at or near the place where they will be consumed, thus reducing delivery trip length or eliminating the need for delivery altogether. German logistics carrier DHL states that the “future commercial viability of 3D printing and its mainstream adoption will be dependent on critical success factors such as affordability, material versatility, and the speed and quality of the print,” but maintains that many companies are showing growing interest in this burgeoning technology as part of their future business models.\textsuperscript{63}

3. The use of bicycling to carry cargo in inner cities is being tested. In its European operations, DHL is piloting a model that relies on a DHL van to deliver trailers full of goods to the city-center, where containers with packages can be attached to cargo bicycles for delivery, reducing VMT and associated noise and emissions.
4. Amazon and other companies are testing the use of unmanned aerial vehicles, or drones, for deliveries. The company’s first fully autonomous home delivery without the use of a human pilot was conducted in 2017, but the timing of widespread implementation of the service is not yet publicly known. Amazon’s tests have used battery powered drones, which will need frequent battery recharging if the service is deployed on a large scale. If the company switches to using fossil fuels to power its drones, the emissions consequences of the service could outweigh the benefits. Despite the potential negative consequences of drone deliveries, modifications to the building stock to accommodate drone delivery has already begun in some metropolitan areas. In Miami, Florida, for example, a developer is designing a 60-story residential tower to include a rooftop takeoff and landing strip for drones.

Research Gaps
Several important research gaps exist that merit future exploration. The first pertains to the lack of California-specific information concerning the intersections of smart growth and urban goods movement. Currently, few case studies have been conducted that examine California cities. Future studies that focus on California could inform policy and planning decisions in ways that maximize smart growth and urban goods movement outcomes within the state’s unique context.

Another important research gap pertains to the safety implications of new technologies like autonomous vehicles. Existing research and technological development have focused on ensuring that autonomous vehicles can detect other vehicles and key infrastructural features such as traffic signals, signs, and roadway striping. However, comparatively little investment has been made in ensuring that autonomous vehicles can operate safely in truly multimodal environments where pedestrians and bicyclists share the road with motor vehicles. As autonomous vehicle technology is adopted by the urban goods movement industry, safety in urban environments will become an important consideration, and future research should specifically examine the intersections between technology, urban goods movement, and safety.

Lastly, future research would do well to examine intersections between smart growth, urban goods movement, and disaster resilience and emergency response. The existing literature on the subject offers competing claims about the vulnerability of dense urban areas to natural disasters and emergency response situations. Some studies have concluded that higher density in urban areas leads to greater vulnerability to natural disasters, while others have concluded that increases in infrastructure density reduce vulnerability. At least one study has concluded that the agglomeration economies found in dense urban areas lead to improved risk management and preparedness for emergency situations. Importantly, many of California’s densest cities are in coastal areas, which increases their vulnerability to sea level rise, and suggests that the location, as well as the form, of cities affects their vulnerability. Additionally, if the frequency and intensity of wild fires in California continue to increase, there may be impacts on urban goods movement including delivery delays and implications for the siting of fulfillment centers and route choices. Research into
these impacts could help the urban goods movement industry take a proactive approach in planning for emergency preparedness and reducing negative impacts.

As previously mentioned, National Cooperative Highway Research Program Report 844 presents case studies of the integration of goods and services movement by commercial vehicles in smart growth environments for six metropolitan areas in the United States.69

Importantly, none of the case study metropolitan areas are in California. Pilot studies in California cities covering some or all the smart growth classifications presented in NCHRP Report 844 would allow for the preparation of recommendations and guidance that are specific to the California context and would help the urban goods movement industry navigate smart growth challenges in California.

Conclusions and Recommendations

As the global trend toward urbanization continues, urban transportation is evolving at a rapid rate, and this has important implications for urban goods movement and the achievement of smart growth goals. The demand for goods in urban areas is greater than ever and shows signs of further growth as e-commerce continues to increase its share of the retail industry. Most e-commerce institutions and employees are in California, underscoring the importance of efficient urban goods movement to the health of the state’s economy. However, despite the economic importance of urban goods movement, the aims of the goods movement industry have often been seen by urban planners and policy makers as being at odds with smart growth goals. Recently, with growth of TNCs and their approach to maximize the utilization of vehicles, there are new opportunities to integrate small urban deliveries with passenger transportation services. However, this is a still a new concept and require further investigation to evaluate its benefits and impacts.

To this end, the needs of the urban goods movement industry have often been overlooked in planning decisions, and this has the potential to be detrimental to the industry and to the economy. With new technological advancements like autonomous vehicles and other innovations on the horizon, urban transportation and the goods movement industry will both be transformed in foreseeable and unforeseeable ways, making the alignment of smart growth and urban goods movement goals fundamental to ensuring that California’s cities maximize livability and economic health in the future. A summary of issues and associated recommendations for making smart growth and goods movement more compatible, as discussed in this paper is presented in Table J.1.
### Table J.1. Key Issues and Solutions Associated with Aligning Smart Growth and Urban Goods Movement Priorities and Outcomes

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Issues Addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planners and policy makers can take the needs of goods movers into account more explicitly when making infrastructure decisions (i.e., choose alternate freight routes where appropriate, supply adequate space for large vehicle turns and loading/unloading, provide network connectivity and redundancy)</td>
<td>✓</td>
</tr>
<tr>
<td>Implement road diets</td>
<td>✓</td>
</tr>
<tr>
<td>Prioritize certain intersections for freight movement</td>
<td>✓</td>
</tr>
<tr>
<td>Utilize off-peak delivery and congestion pricing</td>
<td>✓</td>
</tr>
<tr>
<td>Utilize urban consolidation centers for last mile delivery</td>
<td>✓</td>
</tr>
<tr>
<td>Move loading and curbside access around the corner</td>
<td>✓</td>
</tr>
<tr>
<td>Allow delivery vehicles to use off-street parking</td>
<td>✓</td>
</tr>
<tr>
<td>Develop neighborhood package pickup points, multifamily residential package rooms, and automated parcel systems</td>
<td>✓</td>
</tr>
<tr>
<td>Develop neighborhood 3D printing centers</td>
<td>✓</td>
</tr>
<tr>
<td>Utilize drone deliveries</td>
<td>✓</td>
</tr>
<tr>
<td>Conduct corridor studies to find places where the urban freight and bicycle networks overlap</td>
<td>✓</td>
</tr>
<tr>
<td>Implement truck signal priority and/or bicycle signal priority</td>
<td></td>
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<tr>
<td>Use low-intensity industrial land uses as buffers between high-</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>Implement freight zone pricing</td>
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<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>intensity industrial land uses and municipal land uses</td>
<td></td>
</tr>
<tr>
<td>Implement freight zone pricing</td>
<td>✅</td>
</tr>
<tr>
<td>Develop delivery vehicle staging zones</td>
<td>✅</td>
</tr>
<tr>
<td>Implement appointment- or reservation-based systems for deliveries</td>
<td>✅</td>
</tr>
<tr>
<td>Utilize joint procurement and internal logistics operations in large multi-tenanted buildings</td>
<td></td>
</tr>
<tr>
<td>Allocate added curb space for commercial vehicles</td>
<td></td>
</tr>
<tr>
<td>Utilize alternatively-fueled delivery vehicles and/or autonomous delivery vehicles</td>
<td></td>
</tr>
</tbody>
</table>

Source: Summary Analysis by Fehr and Peers
Endnotes


15 Ibid. xiii


Ibid.


Ibid.

Ibid.


Ibid.


42 Ibid.


54 Ibid.

55 Ibid.


Appendix K. Future Freight System Scenarios

During the outreach and engagement process, stakeholders voiced concerns about the volume, impact, and conflicts of disruptive trends facing the freight industry. These trends (described in Chapter 4) create challenges for making long-term public and private investments in California’s freight industry. From jobs to parking – robotics and automation are likely to result in reductions of both, which will generate opportunities to reduce parking supplies and a need to retrain our workforce. The uncertainty of future conditions in our era requires creative thinking for effective long-range planning. Shifts in societal and/or technological standards may drastically alter freight dynamics and volume. Accurate planning requires an understanding of the impacts to prepare for the “what if” scenario.

Pursuant to the CFAC members’ recommendation, a Freight Scenario Modeling Technical Advisory Subcommittee was formed to discuss the most relevant trends and identify scenarios for further analysis. Four meetings were held with the Subcommittee to discuss the necessity and importance of evaluating several possible scenarios as the context for the CFMP. Pursuant to NCHRP Report 750: Scenario Planning for Freight Transportation Infrastructure, the Subcommittee discussed how different trends could impact freight flows from various aspects, such as cargo sourcing, a destination of the cargo, mode and routing, total volume and shipment size (see Table K.1). Based on this guidance, the following scenarios were developed based on the following recommended characteristics:

- Decision making: capture the right decision
- Plausibility: within realistic limits
- Alternatives: no favorites or preferences (unofficial/official)
- Consistency: internal logic is aligned
- Differentiation: structurally different
- Memorability: easy to recall (name helps)
- Challenge: push against established

Scenario Evaluation Methodology and Available Tools

The Subcommittee’s selection of the CFMP 2020 scenarios focused on the ability to quantitatively analyze, compare, and contrast differences using available data and tools.

The California Statewide Freight Forecasting Model and the California Statewide Travel Demand Model (CS2FDM, 2019) were integrated in 2020. The integrated model is validated for base year 2015 and future base year 2040 and provides a consistent platform for statewide analysis. The CS2FDM will be the main tool to evaluate these scenarios. This is a transportation model; therefore, the economic elasticity of the supply chain to various factors– such as impacts of immigration or housing policies on population and job market or impacts of trade policies on import and export flows– needs to be evaluated in advance. Economic conditions of each scenario must be studied carefully and translated into basic
model indicators such as population, employment, the capacity of facilities, the tonnage of goods to/from ports, a payload of trucks for different commodities, etc.

It is also important to consider available data, technical tools and resources, and the schedule for developing the most relevant alternative future scenarios and their respective analyses. Each scenario includes several elements. These elements are highly correlated and assumed to generate similar impacts on freight flows. The dynamic nature of the multifaceted freight industry complicates a scenario analysis, as some trends will create contradicting impacts on freight flows. To conduct meaningful analysis, it is important to clearly define the assumptions in each scenario and only change the specified elements with all else remaining constant.

Table K.1. Freight Flow Patterns

| How can an event impact Freight Flows? | • Impact on sourcing patterns: Where are raw products and WIP sourced from? Are materials sourced in or out of the region? |
| | • Impact on flow destination: Where is the demand located? How are final destination locations distributed? |
| | • Impact on routing: How is freight moved within the region? Are there intermediate shipment points or mode switches? |
| | • Impact on flow volume: How will the total volume of freight shipped in and through the region change? |
| | • Impact on value density: How will the product characteristics change? How does the value density change? |

Source: National Academies of Science, Engineering, and Medicine 2013

Final CFMP 2020 Scenarios

The Subcommittee identified the following three scenarios to analyze:

- Land Use and Workforce Shift
- Trucking Operation on Freight Highway Network
- Emerging Modes in the Multimodal Freight System

The next steps involve clarifying and defining the assumptions and boundaries for each scenario, preparing input data, and identifying the methodology to evaluate each scenario in
The baseline assumptions for evaluating all scenarios are Existing Conditions (2015) and Future Baseline Conditions (2040).

The “Future 2040 Baseline Conditions” scenario includes:
- All RTP infrastructure projects
- MPOs’ projections for employment and population
- Historic patterns of household characteristics and industry mix in each region
- Historic growth of the state, national economy, jobs and GDP
- Historic trends of imports and export from each gateway

The results of the Subcommittee survey used for the selection process was shared with all CFAC members at the January 8, 2019, CFAC meeting. The three scenarios recommended by CFAC for analysis are described below.

**Scenario 1: Land Use and Workforce Scenario**

In this scenario, demand for the freight highway network deviates significantly from historic trends. The evaluation factors include changes in population and job balance for various industry sectors, which is anticipated to result in a severe workforce shortage in transportation and warehousing in dense, urban areas. Under this scenario, workforces are predicted to migrate to lower density regions where housing is cheaper and more available. Conversely, urban areas would continue to reduce and restrict industrial development and shift wholesale and transport jobs to lower density rural areas. The focus areas would be (Figure K.1):
- In the Bay Area, the workforce and jobs are shifted from zones with high-median home value in Alameda, Contra Costa, San Mateo, Santa Cruz, and Santa Clara to the northern part of San Joaquin Valley
- In Southern California, the workforce and jobs are shifted from the densest areas within Los Angeles County to the eastern edge of Los Angeles County, and to the surrounding, more affordable areas in San Bernardino County, Riverside County, and northern San Diego County

**Input:**

- Household candidates for migration were selected using the criteria detailed in Table K.2, wherein 25 percent to 100 percent of the new households (with at least one member working in blue-collar jobs) added between 2015 and 2040 are relocated based on household incomes.
- The new home location Traffic Analysis Zone (TAZ) is probabilistically chosen by random drawings from a probability distribution with weights based on the proportion of low-income households (<$35k) – higher the proportion of low-income households, more likely it is to receive the migrating households.
Table K.2. Classification of Migration Candidates

<table>
<thead>
<tr>
<th>Home County</th>
<th>Household Income (In 2010 $$)</th>
<th>Worker Condition</th>
<th>% of (2015-2040) Moved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alameda, Contra Costa, San Mateo, Santa Cruz, Santa Clara</td>
<td>HH Income &lt;$35k</td>
<td>At least one member working in occ Group</td>
<td>100%</td>
</tr>
<tr>
<td>Alameda, Contra Costa, San Mateo, Santa Cruz, Santa Clara</td>
<td>HH Income in ($35k, $75k)</td>
<td>At least one member working in occ Group</td>
<td>50%</td>
</tr>
<tr>
<td>Alameda, Contra Costa, San Mateo, Santa Cruz, Santa Clara</td>
<td>HH income &gt;=$75k</td>
<td>At least one member working in occ Group</td>
<td>25%</td>
</tr>
<tr>
<td>Los Angeles, Orange</td>
<td>HH income &lt;$35k</td>
<td>At least one member working in occ Group</td>
<td>100%</td>
</tr>
<tr>
<td>Los Angeles, Orange</td>
<td>HH Income in ($35k, $75k)</td>
<td>At least one member working in occ Group</td>
<td>50%</td>
</tr>
<tr>
<td>Los Angeles, Orange</td>
<td>HH income &gt;=$75k</td>
<td>At least one member working in occ Group</td>
<td>25%</td>
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<tr>
<td>Medium</td>
<td>Workforce Issues</td>
<td>Changes in housing in California</td>
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<tr>
<td>Medium</td>
<td>Workforce Issues</td>
<td>Workforce retraining and education</td>
<td>3</td>
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<tr>
<td>Low</td>
<td>Workforce Issues</td>
<td>Retention of workforce/businesses in California</td>
<td>7</td>
</tr>
<tr>
<td>Low</td>
<td>Workforce</td>
<td>Land use changes</td>
<td>14</td>
</tr>
</tbody>
</table>

Source: Caltrans
Figure K.1. The Shift of Workforce and Jobs from Dense, Urban Areas (Orange) to Rural Areas (Blue)

Source: Analysis and map created by Fehr & Peers, 2019; U.S. Census Bureau TIGER Traffic Analysis Zones, 2017; Esri base map, 2019.
### Table K.3. Original Home Locations and Changed Home Location of Relocated Households (County-Level Stats)

<table>
<thead>
<tr>
<th>Old Home County</th>
<th>Merced</th>
<th>Sacramento</th>
<th>San Joaquin</th>
<th>Solano</th>
<th>Stanislaus</th>
<th>Yolo</th>
<th>San Bernardino</th>
<th>Riverside</th>
<th>Grand total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alameda</td>
<td>155</td>
<td>1050</td>
<td>415</td>
<td>148</td>
<td>185</td>
<td>150</td>
<td></td>
<td></td>
<td>2103</td>
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<tr>
<td>Contra Costa</td>
<td>76</td>
<td>545</td>
<td>224</td>
<td>70</td>
<td>135</td>
<td>81</td>
<td></td>
<td></td>
<td>1131</td>
</tr>
<tr>
<td>San Mateo</td>
<td>65</td>
<td>421</td>
<td>156</td>
<td>41</td>
<td>78</td>
<td>56</td>
<td></td>
<td></td>
<td>817</td>
</tr>
<tr>
<td>Santa Clara</td>
<td>189</td>
<td>1199</td>
<td>520</td>
<td>186</td>
<td>260</td>
<td>209</td>
<td></td>
<td></td>
<td>2563</td>
</tr>
<tr>
<td>Santa Cruz</td>
<td>22</td>
<td>115</td>
<td>44</td>
<td>18</td>
<td>21</td>
<td>12</td>
<td></td>
<td></td>
<td>232</td>
</tr>
<tr>
<td>Los Angeles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18132</td>
<td>18755</td>
<td>36887</td>
</tr>
<tr>
<td>Orange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4183</td>
<td>4259</td>
<td>8442</td>
</tr>
<tr>
<td>Grand Total</td>
<td>507</td>
<td>3330</td>
<td>1359</td>
<td>463</td>
<td>679</td>
<td>508</td>
<td>22315</td>
<td>23014</td>
<td>52175</td>
</tr>
</tbody>
</table>

Source: Caltrans

Table K.3 shows the original and new home locations (county-level changes) of the 52,175 households that would be relocated.  

- The growth in wholesale and transport jobs between 2015 and 2040 in Northern California counties (Alameda, Contra Costa, San Mateo, Santa Cruz, Santa Clara) and Southern California counties (Los Angeles, Orange) is reduced by 50 percent.
- These jobs are then apportioned to the beneficiary counties (Merced, Stanislaus, San Joaquin, Sacramento, Solano, Yolo in the north and San Bernardino, Riverside in the south) using a proportion of 2040 jobs before the migration.
- These changes are also reflected in the occupation listing - blue-collar by adjusting the counts by delta (wholesale jobs + transport jobs), assuming all the wholesale and transport jobs fall under the blue-collar category.
- The total number of population and jobs remain as the 2040 Baseline Conditions proposed by MPOs. This scenario only shifts the lower income households and transportation jobs.
- The import and export distribution from major gateways are also shifted proportionally to these new TAZs since the warehousing capacity at new TAZs has increased and while
it is relatively decreased in other TAZs. The total volume of imports and exports via each gateway remains like the 2040 Baseline Conditions.

Output

The following metrics would be evaluated for the percentage change at the regional, corridor or statewide level before and after:

- Population by income group
- Employments by industry
- Total VMT/truck VMT
- Volume on selected corridors (I-80, I-580, I-710 and I-605, I-10, I-5)
- Travel time/delay > Emissions/GHG

Scenario 2: Trucking Operations on the Freight Highway Network

This scenario assumes a freight highway network that deviates significantly from historic trends. This scenario anticipates a large-scale impact on the planning and implementation of regional or statewide infrastructure projects or policies that affect trucking operations on the Freight Highway Network. When focusing on delivery, the majority of the costs consist of fuel and wages – both of which are heavily influenced by prevailing market forces.

One solution to reduce the cost and to increase the efficiency is dedicated truck facilities which allow truck platooning and autonomous trucks. Based on previous studies, the use of cooperative adaptive cruise control (CACC) by platooning and autonomous trucks could increase highway capacity and decrease traffic congestion. With 50 percent market penetration, highway capacity could increase by 22 percent, and with 80 percent penetration, it could increase by 50 percent.

This scenario assumes two major truck corridors have dedicated truck lanes between major freight hubs, and these dedicated lanes primarily serve platooning and autonomous trucks. These corridors are shown in Figure K.2.

- Truck routes in Northern California, connecting Port of Oakland and Port of Stockton with I-580, I-205, I-5 and SR 4.
- Truck routes in Southern California, connecting San Pedro Bay Ports of Long Beach and Los Angeles and the World Logistic Center in Moreno Valley with I-710 and SR 60.

Input

Network change to allow 100 percent platooning and autonomous trucks

- On the above truck routes, change one of the existing general-purpose lanes to permanently dedicated truck lanes
- Increase the capacity for the new truck only lanes by 50 percent to represent the change of vehicle mix in these lanes
- Decrease the cost of trucking by reducing the travel time by 30 percent
Output:

Changes at the regional, corridor or statewide level before and after are anticipated to be measurable in these four categories:

- Travel time/Delay
- Total and Truck VMT/VHT
- Regional traffic volume
- Mode split

Figure K.2. Truck Routes for Platooning and Autonomous Trucks
Scenario 3: Emerging Modes in Multimodal Freight System

This scenario assumes alternative cargo movers are introduced into the multimodal freight system. The purpose is to evaluate the impact of policies that encourage modal shifts between trucking, maritime, rail, air and other urbanized modes, on the performance and operation of the highway system. This scenario analyzes the anticipated migration to electric trucks, the implementation of drone and robot deliveries, and the introduction of autonomous trucks.

Input

Update Origin-Destination Matrix and shift hours of service:
- The Bay area and Southern California are selected as the dense urban areas.
- 50 percent of light duty trucks that travel less than 10 miles are replaced by another mode of transport; this part of the trip is eliminated from the O/D matrix
- 50 percent of light- and medium- duty trucks that travel 10-50 miles will be replaced with autonomous cargo handling trucks that operate during off-peak periods. To implement this change in the model, 50 percent of trucks that fit this description are shifted to the off-peak period, which represents fewer congestion conditions. See Figure K.3. for a map showing the 50 mile buffer area from the Bay area and Southern California.

Output

Source: Caltrans
Following metrics would be evaluated for the percentage change at regional, corridor or statewide level before and after:

- Regional wide volume
- Travel time/Delay
- VHT/VMT
- Mode split

**Figure K.3. Defense urban Areas with Alternative Cargo Movers That Travel Less Than 50 Miles**

Source: Caltrans
Endnotes


2 Caltrans, Division of Transportation Planning, 2019. Analysis, summaries, and Mapping by Fehr & Peers

3 Caltrans, Division of Transportation Planning, 2019. Analysis, summaries, and Mapping by Fehr & Peers

4 Caltrans, Division of Transportation Planning, 2019. Analysis, summaries, and Mapping by Fehr & Peers

5 Caltrans, Division of Transportation Planning, 2019. Analysis, summaries, and Mapping by Fehr & Peers
### Appendix L: 2018 California Freight Investment Plan

#### Trade Corridor Enhancement Program (Trade Corridor Enhancement Account and National Highway Freight Program)

<table>
<thead>
<tr>
<th>CO</th>
<th>Routes</th>
<th>Project Title</th>
<th>Description</th>
<th>2017-18</th>
<th>2018-19</th>
<th>2019-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLA</td>
<td>SR 115</td>
<td>SR 115/Grade Separation (Phase 1)</td>
<td>Construct a new interchange at SR 115/Grade Separation (Phase 1)</td>
<td>$520,000</td>
<td>$77,000</td>
<td>$175,000</td>
</tr>
<tr>
<td>RLA</td>
<td>Various</td>
<td>Freight Intelligent Transportation System</td>
<td>Install and implement ITS elements and other technologies, which include changeable message signs, closed circuit TV, fiber optic and Wi-Fi communications, traffic signal enhancements, vehicle and vehicle detection, train queue detection, weigh-in-motion, information application, and smart parking systems.</td>
<td>$300,000</td>
<td>$18,144</td>
<td>$124,954</td>
</tr>
<tr>
<td>RLA</td>
<td>Various</td>
<td>Guest Zone Safety Engineering Measures</td>
<td>Install 4 quadrants, raised median, and sidewalks at all at grade railroad crossings.</td>
<td>$54,800</td>
<td>$2,748</td>
<td>$4,152</td>
</tr>
<tr>
<td>RRA</td>
<td>SR 38/99</td>
<td>SR 38/99 California Freeway Connector</td>
<td>Grade separate exit and entry ramps, construct railroad auxiliary lane, 2-lane collector distributor road, retaining walls, and sound barriers.</td>
<td>$50,000</td>
<td>$31,000</td>
<td>$19,000</td>
</tr>
<tr>
<td>VEA</td>
<td>SR 99</td>
<td>SR 99 (0.2 Mile Widening, South Bound)</td>
<td>Widens 0.2 mile to 3 lanes, non-motorized facility only.</td>
<td>$37,400</td>
<td>$8,315</td>
<td>$20,000</td>
</tr>
<tr>
<td>VEA</td>
<td>SR 99</td>
<td>SR 99 And Grade Separation</td>
<td>Replace all at-grade crossing in new grade separated overpass.</td>
<td>$11,000</td>
<td>$4,000</td>
<td>$7,000</td>
</tr>
<tr>
<td>VEA</td>
<td>SB 205</td>
<td>SB 205 (International Park and Ride Improvements)</td>
<td>Widens ramps, construct turn pockets, install bike/pedestrian improvements, and signal modifications.</td>
<td>$15,000</td>
<td>$4,000</td>
<td>$7,000</td>
</tr>
<tr>
<td>VEA</td>
<td>SB 680</td>
<td>SB 680 (International Park and Ride Improvements)</td>
<td>Widens ramps, construct turn pockets, install bike/pedestrian improvements, and signal modifications.</td>
<td>$9,000</td>
<td>$3,000</td>
<td>$3,000</td>
</tr>
<tr>
<td>VEA</td>
<td>SB 205/33</td>
<td>SB 330/33/205 Interchange Improvements</td>
<td>Construct/modify interchange (SB) of the existing location by replacing as SB bridge with 4m bridge, construct aux as SB, modify construct frontage roadway, install bi lateral, sidewalks, and traffic signals.</td>
<td>$65,000</td>
<td>$60,000</td>
<td>$4,100</td>
</tr>
<tr>
<td>EOL</td>
<td>SR 80/68/12</td>
<td>SR 80/68/12 Interchange, Package 2A</td>
<td>Implement a fiber optic cable network to facilitate an advanced traveler information and border wait time system.</td>
<td>$39,175</td>
<td>$27,206</td>
<td>$11,969</td>
</tr>
<tr>
<td>EOL</td>
<td>SR 80/68</td>
<td>Fyffe Avenue, Package 2A</td>
<td>Replace an at-grade crossing with a new grade separated overpass.</td>
<td>$13,000</td>
<td>$4,000</td>
<td>$9,000</td>
</tr>
<tr>
<td>EOL</td>
<td>SR 80/68</td>
<td>Otay Mesa East POE</td>
<td>Begin site preparations which include drainage and utilities.</td>
<td>$40,350</td>
<td>$35,300</td>
<td>$5,050</td>
</tr>
<tr>
<td>EOL</td>
<td>SR 101</td>
<td>US 101 Multimodal Corridor</td>
<td>Construct HOV lanes between Carpentaria and Santa Barbara, reconstruct or replace bridges and overcrossing, install 276,575</td>
<td>$225,575</td>
<td>$51,000</td>
<td></td>
</tr>
<tr>
<td>EOL</td>
<td>SR 101</td>
<td>LA Metro Pier G &amp; J Double Track</td>
<td>Add 9,000 feet of double track.</td>
<td>$25,000</td>
<td>$11,000</td>
<td>$14,000</td>
</tr>
<tr>
<td>EOL</td>
<td>SR 80/68</td>
<td>Etiwanda Avenue, Package 2A</td>
<td>Replace an at-grade crossing with a new grade separated overcrossing. Add 1,700 feet of sidewalks/bike lanes</td>
<td>$60,000</td>
<td>$-</td>
<td>$60,000</td>
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<tr>
<td>EOL</td>
<td>SR 11</td>
<td>7th Street, Package 2A</td>
<td>Reconstruct existing 4-lns underpass at the UPRR mainline tracks to meet current geometric standards.</td>
<td>$252,000</td>
<td>$77,000</td>
<td>$175,000</td>
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<tr>
<td>EOL</td>
<td>SR 11</td>
<td>115/240 Interchange Improvements</td>
<td>Add 300-feet of mainline track.</td>
<td>$9,900</td>
<td>$-</td>
<td>$9,900</td>
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<tr>
<td>EOL</td>
<td>SR 11</td>
<td>Otay Mesa East POE</td>
<td>Segment 3A</td>
<td>$40,350</td>
<td>$35,300</td>
<td>$5,050</td>
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<tr>
<td>EOL</td>
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<td>$225,575</td>
<td>$51,000</td>
<td></td>
</tr>
</tbody>
</table>

**Total Project Cost**: $4,050,587

**Match Funds**: $2,657,481

**TECE Funds**: $875,013

**NHFP Funds**: $518,093

**2017-18**: $194,516

**2018-19**: $288,917

**2019-20**: $154,660

* Matching funds include state and local funds.

# Appendix L. 2018 California Freight Investment Plan

L-1