Appendix E

Importance of Goods Movement

THE IMPORTANCE AND BENEFITS OF GOODS MOVEMENT FOR ALAMEDA COUNTY, THE BAY AREA, AND THE NORTHERN CALIFORNIA MEGAREGION

Final White Paper

prepared for

Alameda County Transportation Commission and

Metropolitan Transportation Commission

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1.0 WHAT IS GOODS MOVEMENT?

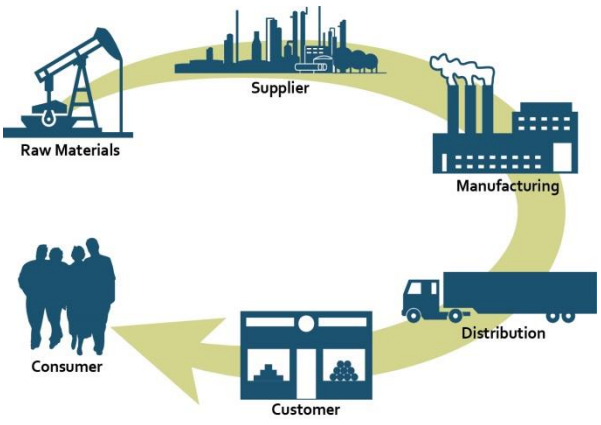
Goods movement refers to the transportation and logistics processes that are involved in moving products from raw materials producers to industry to consumers – and all the steps in-between. This includes everything from supplies moving to a manufacturing facility for processing, to consumer goods being delivered to retail outlets. As such, goods movement and the industries that rely on it form the backbone of the national, regional, and local economies. Goods movement is worth $626 billion in domestic and international trade for the San Francisco Bay Area, and provides employment to millions in the region in those businesses that rely on or provide goods movement services.

Alameda County enjoys one of the most strategic trade locations in the world; and with its connections to national and international markets, the County serves as a natural hub for goods movement throughout the Bay Area and the surrounding Northern California megaregion. Goods movement in Alameda County includes diverse elements of the supply chain – everything from local trucks delivering groceries to area residents, to electronics components that serve as inputs to the County's and region's manufacturers, to California-produced wine, nuts, and cheeses that utilize the Port of Oakland as an agricultural export gateway.

The *goods movement system* refers to the infrastructure that makes these supply chains possible – the roads, rail lines and terminals, air and seaports, and intermodal connectors that allow businesses to ship their goods from business to business, to wholesalers and retailers, and eventually, to the consumer. Warehouses, transloading facilities, manufacturing plants, and even farms and vineyards are all pieces of the supply chain system that must be connected to one another through an efficient, effective, and reliable goods movement system for trade to flourish, and to sustain the high quality of life that is a hallmark of Northern California.

Alameda County at a Glance

- A major producer and consumer of goods, Alameda County has:
  - *21 percent of the region's population; and*
  - *25 percent of the region's manufacturing employment.*
- As a provider of transportation services, Alameda County has:
  - *39 percent of the region's employment in freight transportation and warehousing industries.*
- The County is home to transportation infrastructure vital to the local, regional, and national economy, including:
  - *The Port of Oakland and Oakland International Airport;*
  - *The Union Pacific's (UP) Railport and BNSF Railway's Oakland International Gateway and supporting rail lines; and*
  - *Major truck routes I-80, I-580, I-880, I-238, and SR 92.*



The goods movement system provides connections between each step of this conceptual supply chain.

2.0 THE NORTHERN CALIFORNIA MEGAREGION, BAY AREA AND ALAMEDA COUNTY

Alameda County and its goods movement system are integral elements of the San Francisco Bay Area, the nine-county region on the Pacific Coast extending from Sonoma County to Santa Clara County. In turn, the Bay Area is part of the larger Northern California megaregion, which comprises the Bay Area, Sacramento region, Northern San Joaquin Valley, and the Central Coast. Together, these regions form a highly dynamic economically and geographically linked "mega" region, whose component region's share influence over each others' local industrial, commercial, and consumer activities. Table 2.1 shows a profile of each of the major regions within the megaregion.

The megaregion includes some of California's most populous and fastest growing areas. For instance, Alameda County, whose population is 1.6 million in 2013, had the fastest growing population in the Bay Area from 2010 to 2013, at 1.4 percent growth annually. Goods movement plays a critical role in supporting this growing population, as well as increasing imports and exports, and the changing manufacturing base of the megaregion.

Within the megaregion, a combination of relatively inexpensive land in the inland regions, major industrial and agricultural centers throughout the megaregion, interregional highway and rail corridors, and ports and airports works together with the local and intraregional transportation infrastructure to support the megaregion's goods movement industries. The maintenance of an efficient and effective goods movement system that serves the needs of industries and residents is essential to the economy and way of life of the megaregion.

> Alameda County has the fastest growing population (1.4 percent annually) of the nine-county Bay Area.

Table 2.1 Regional Profiles within the Northern California Megaregion

Regional Population & Growth

Bay Area **7.44 Million**	**Sacramento** **2.12 Million**
• International trade hub – Port of Oakland, SFO • Fuels producer • High-value manufactured products • Consumer center • Agricultural and food products • Major highways include I-880, I-80, I-580, U.S. 101; key rail corridor include UP and BNSF rail lines on routes parallel to I-80, northern Contra Costa County, the I-880 corridor, and the Altamont Pass	• Agricultural and food products – domestic and exports • Consumer center • High-value manufactured products • Regional warehouse center • Bay Area connection via I-80 and UP rail

Regional Population & Growth

N. San Joaquin Valley **3.14 Million**	**N. Central Coast** **0.735 Million**
• Agricultural/food products – domestic and export • Regional distribution center for Bay Area and Sacramento • Bay Area connection via I-580, SR 12, SR-152, and M-580 Marine Highway	• Wine, fish, and agricultural products – domestic and export • Critical agricultural linkages with San Joaquin Valley • Bay Area connection via U.S. 101

Source: Population data from U.S. Census Population Estimates for July 2013.

To do this well, and to integrate these needs with those of passenger movement, while achieving safety, environmental, and equity goals, will require increasing amounts of coordination and careful planning by Alameda County and its neighbors. Goods movement by nature must transcend jurisdictional borders to simultaneously provide connectivity to local markets and consumers while supporting global logistics and supply chains for major industries located elsewhere.

2.1 A Highly Integrated Megaregion Economy

The Northern California megaregion is an economic powerhouse, with more than $953 billion in freight flows moving to, from, within, and through the megaregion in 2012. This is expected to grow by 168 percent to $2.6 trillion by 2040. About $387 billion, or 40 percent, of freight flows move within the megaregion, an amount growing to almost $1 trillion annually by 2040. This underscores the growing importance of inter- and intraregional trade to the megaregion's economy.

Goods movement-dependent industries in the Bay Area account for $490 billion (51 percent of total regional output); and provide over 1.1 million jobs (32 percent of total regional employment).

Each of the four regions within the megaregion has separate characteristics and regional strengths, yet they are tied together through the goods movement system and the patterns of domestic and international trade. Exports of high value, specialty agricultural products from the San Joaquin Valley and wine from the North Bay move through the Bay Area's ports. Medical supplies and precision instrumentation, products of a growing high-technology manufacturing sector in the Bay Area, traverse through domestic and international air cargo centers for shipment all over the world.

Megaregion Exports: Almonds

The U.S. produced about $7 billion worth of edible tree nuts in 2013. About 60 percent or $4.2 billion worth were produced in California. By value, almonds are California's top export and the nation's top horticultural export, representing $2.8 billion in 2011.

According to the 2007 USDA Census of Agriculture, there are around 6,500 California almond farms, many of which are located in the Northern California megaregion and the surrounding counties. Of those, 72 percent are family owned and 51 percent are less than 50 acres. California production of almonds has roughly doubled in the last decade, with the 2013 crop year reaching 1.9 billion pounds, worth over $2.8 billion. There also are 100 almond handlers and processors in the State

The U.S. is the largest market for almonds, accounting for about 30 percent of the crop sold each year. About 70 percent of the U.S. almond crop is shipped internationally with Spain, Germany, Japan, and India being the leading export markets. Nuts bound for export primarily move by containers trucked to and from the Port of Oakland.

Nut crops have a complex, seasonal supply chain, with September and October being peak months, but supplies moving to and from the groves year-round. Growers receive nursery stock, fertilizers, chemicals, and other supplies by truck. Beekeepers bring hives to the almond groves in pick-up trucks. At harvest time, mobile harvesters travel to the grove to shake the trees and convey the nuts into bins for truck transport to the processor.

Both imports coming through the Bay Area global gateways and domestically produced consumer goods are shipped to large warehousing facilities in the Northern San Joaquin Valley region, where they are consolidated and distributed around the megaregion and beyond. From these facilities, goods move to retail outlets and wholesale trade businesses, or are delivered to homes and offices. Interregional truck and rail corridors serve to connect the megaregion to other California and U.S. markets.

The Bay Area is at the heart of the megaregion economy, with almost 50 percent of the trade flow in the megaregion moving to, from, or through the region. Within the Bay Area, $235 billon, about 38 percent of trade are intraregional flows. Approximately 11 percent the Bay Area's trade is with other parts of the megaregion. The other regions in the megaregion are highly tied to the Bay Area, both through utilizing the region's global gateways, such as the Port of Oakland and San Francisco International Airport, or to reach the region's manufacturing centers and consumer economy. The North Central Coast sends 45 percent of its outbound trade (by value) to the Bay Area or through its gateways. The San Joaquin Valley and Sacramento areas also send about 15 percent of their outbound trade to the Bay Area.

Figure 2.1 shows the freight flows moving within the megaregion, illustrating the critical roles that each region plays as trading partner to the other regions.

2.2 Goods Movement Functions, Corridors and Facilities

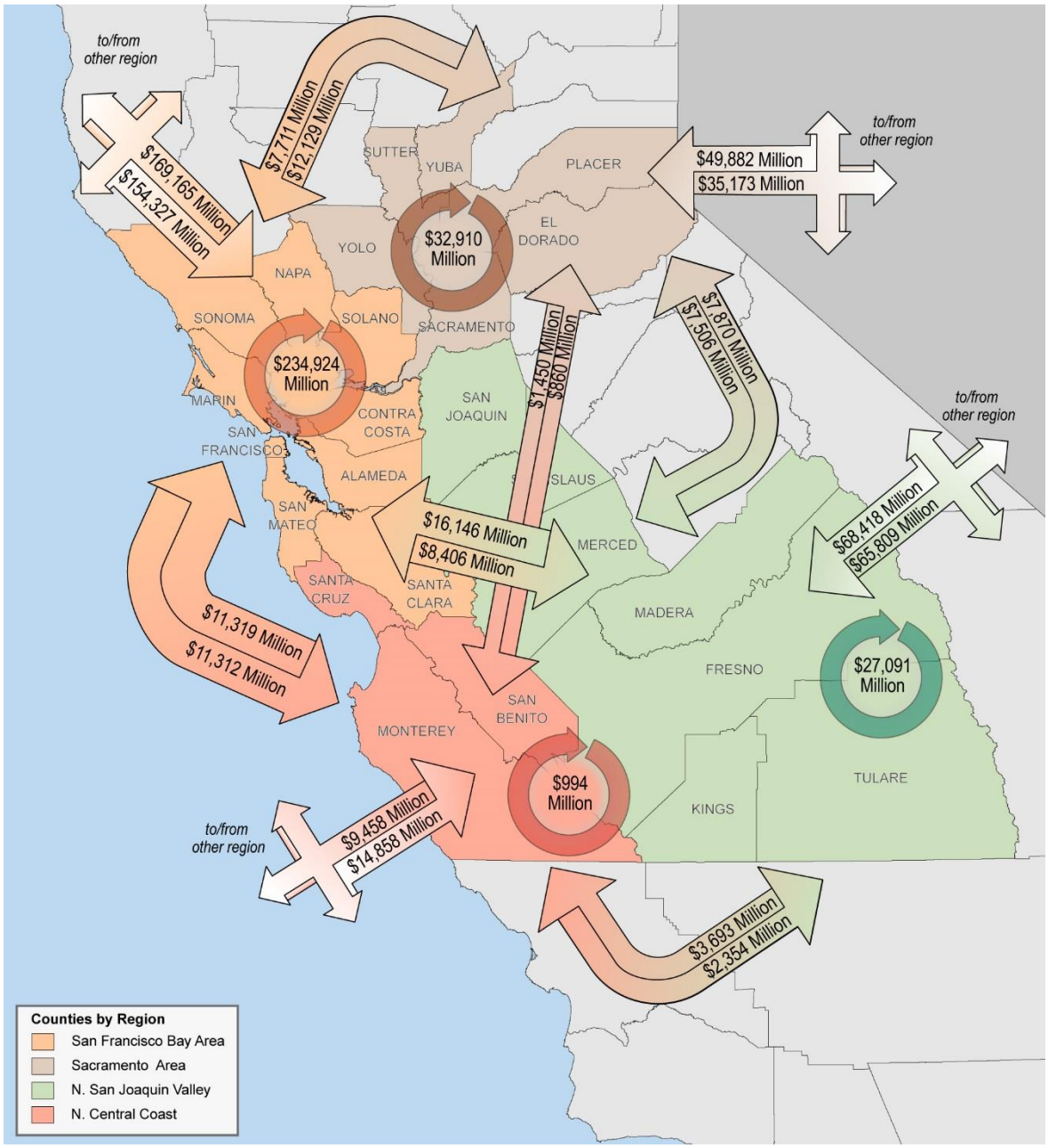
The multimodal goods movement system in the Northern California megaregion consists of highways, rail lines, airports, seaports, and warehousing facilities, each performing specific functions related to goods movement. It provides trade connections with the rest of Northern California, Southern California, the rest of the U.S., and internationally. A pipeline system also exists, though it is limited to the transport of crude petroleum and refined petroleum from/to Bay Area refineries located in Rodeo, Richmond, Benicia, and Martinez.

Alameda County plays a key role in the megaregion's goods movement system. The County's primary global gateway, the Port of Oakland, is a major facility for importing and exporting goods destined for the County, Bay Area, megaregion, and beyond. In addition, many of the key inter- and intraregional corridors, such as I-880, I-580, I-680, as well as UP and BNSF rail lines, also reside in the County. The Oakland International Airport handled 55 percent of Bay Area air cargo in 2012 and is the megaregion's largest domestic air cargo airport.[1] Alameda County's goods movement system also contains designated truck routes on arterial corridors and major collectors, truck terminals, much of the region's industrial land uses, and other key freight infrastructure.

The goods movement system is comprised of various infrastructure elements that serve a number of different yet interrelated functions for the megaregion's economy. Additionally, a route or corridor may play multiple roles on the goods movement system by serving a number of users simultaneously. The following subsections provide a brief overview and characterization of the functions of a goods movement system. Table 2.2 summarizes some of the major trends for Alameda County (and surrounding megaregion) that influence goods movement for each of these functional areas.

[1] Caltrans, *California Air Cargo Groundside Needs Study*, July 2013.

Figure 2.1 Northern California Megaregion Inter- and Intraregional Goods Movement Trade, 2012

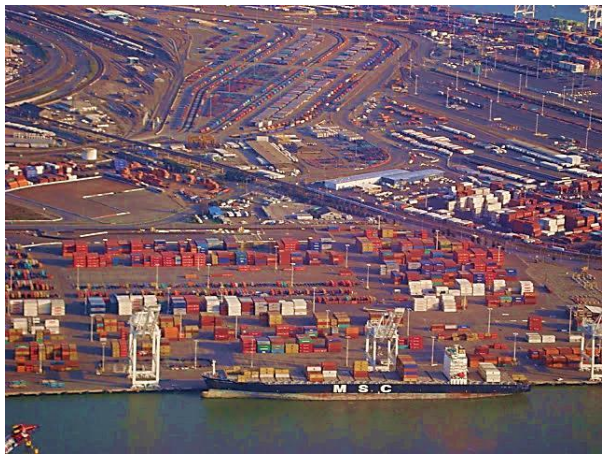


Source: Freight Analysis Framework (FAF) 3.5 Provisional Data and Forecasts.

Table 2.2 Goods Movement System Needs and Issues by Functional Area

Function	Needs and Issues
Global Gateways: *Major maritime facilities and international airports that handle freight, as well as passenger cargo*	• Port of Oakland land constraints, deficiencies in cargo handling equipment • Intensifying port competition • Marine terminal congestion and its associated impacts on drayage drivers and neighborhoods • Need for improved communication between truck drivers and marine terminal operators • Impacts and opportunities for heavy haul networks around ports • Expanding demand for bulk export facilities • Conflicts between industrial/warehouse space needs to support growth and impacts on neighborhoods • Changing mix of air cargo (less computer-related exports) and uncertain growth in domestic markets
Interregional and Intraregional Corridors: *Primary highways and rail lines that serve to connect the megaregion to the rest of the State and to domestic markets beyond*	• Congestion and delay on shared use freight corridors with passenger traffic, such as I-880 and I-580, and Capitol Corridor • Truck safety issues along freight corridors due to merging and weaving • Pavement and bridge condition issues along freight corridors • Rail bottlenecks, especially along Martinez Subdivision • Safety issues at rail-highway grade crossings • Increasing need for third party logistics space and local access to integrator (e.g., Federal Express, UPS) hubs at OAK, Port of Oakland and connections to inter and intraregional corridors
Local Goods Movement System: *Roads that support local pickup and delivery, and last-mile connectors – roads that provide critical connections between major freight facilities (global gateways, domestic rail terminals, warehouse/industrial centers, and industrial parks) and the interregional and intraregional systems*	• Public health impacts on neighborhoods with intense freight activities • Land use conflicts in traditional industrial corridors • Lack of truck parking/neighborhood parking encroachment • Conflicts between trucks and other street users (autos, pedestrians, bikes, transit) on collector routes and in commercial areas • Cut through traffic to avoid congestion on major corridors • Lack of truck route connectivity across city boundaries • Local road and street pavement damage • Problems with roadway and street design that impedes truck deliveries

2.2.1 Global Gateways



The global gateways that make up the megaregion's freight transportation system consist of the major maritime facilities and international airports that handle freight, as well as passenger cargo. They include those entry and exit points that are essential to moving high volumes of trade into and out of the region. The modal elements that make up the global gateways function include maritime ports (such as the Port of Oakland, Port of Richmond, and Port of Benicia) along with their associated inland connections.

The Port of Oakland is Alameda County's principal global gateway and is the megaregion's main container handling port. The Port of Oakland is distinguished from other major West Coast ports as it handles more exports than imports. This means that the goods moving through the Port of Oakland represent jobs and economic activity in California and the U.S., not just from the handling and transport of goods, but also from their manufacture and production domestically. Exports flowing through the Port are also important contributions to maintaining and reducing the nation's foreign trade deficits.

Other pieces of the global gateway system include the region's international airports that handle both belly freight (i.e., freight carried in the belly of passenger aircraft) and dedicated freight aircraft, particularly the San Francisco International Airport (SFO) and the Oakland International Airport (OAK), the latter of which is in Alameda County.

2.2.2 Interregional and Intraregional Corridors

The inter- and intraregional corridors consist of primary highways and rail lines that serve to connect the megaregion and Alameda County to the rest of the State and to domestic markets beyond. This network provides primary access to major facilities, such as the Port of Oakland, rail yards, and warehouse/ industrial districts. Key interregional and intraregional truck corridors in the Bay Area include I-80, I-580, I-680, I-880, and U.S. 101. The highest volumes of truck traffic in the Bay Area are found on Alameda County's principal inter- and intraregional corridors: I-580 and I-880, which are profiled in the next section. UP rail connections along the Martinez Subdivision and Oakland Subdivisions, as well as BNSF TRANSCON line are important interregional rail corridors serving the megaregion, with important elements of the Martinez and Oakland Subdivisions traversing portions of Alameda County.

The inter- and intraregional corridor system in the megaregion provides linkages to specific goods movement-dependent industries. For instance, SR 4 in Contra Costa County provides

connections to petroleum refining, chemicals, pharmaceutical, and other industrial businesses with the rest of the network and customers; and SR 152 provides connections between agricultural producers and processed food manufacturers in the Central Coast with those of the San Joaquin Valley. Products such as wine, electronics, and medical equipment utilize these corridors to reach the global gateways for export, as well as to reach local consumers. Imported consumer products, parts, and automobiles also utilize these routes to reach distribution facilities in the San Joaquin Valley to be delivered to consumers in the megaregion and beyond.

2.2.3 Local Goods Movement System

The local goods movement system refers to networks of city streets that move freight to and from its origins/destinations. Last-mile connectors, which are also part of the local goods movement system, provide the critical connections between major freight facilities (global gateways, domestic rail terminals, warehouse/industrial centers, and industrial parks) and the interregional and intraregional systems. Increasing use of e-commerce and the expanding knowledge-based sectors that characterize the Bay Area economy are leading to growth in parcel service and deliveries to commercial and residential areas along major arterial corridors and local streets and roads. Major arterial truck routes are often used as alternatives to congested freeways for city to city truck movements. Farm-to-market roads in the rural parts of the megaregion are also elements of the local goods movement system that serve important economic functions.

2.3 Modal Freight Corridors and Gateways Connect Alameda County to the World

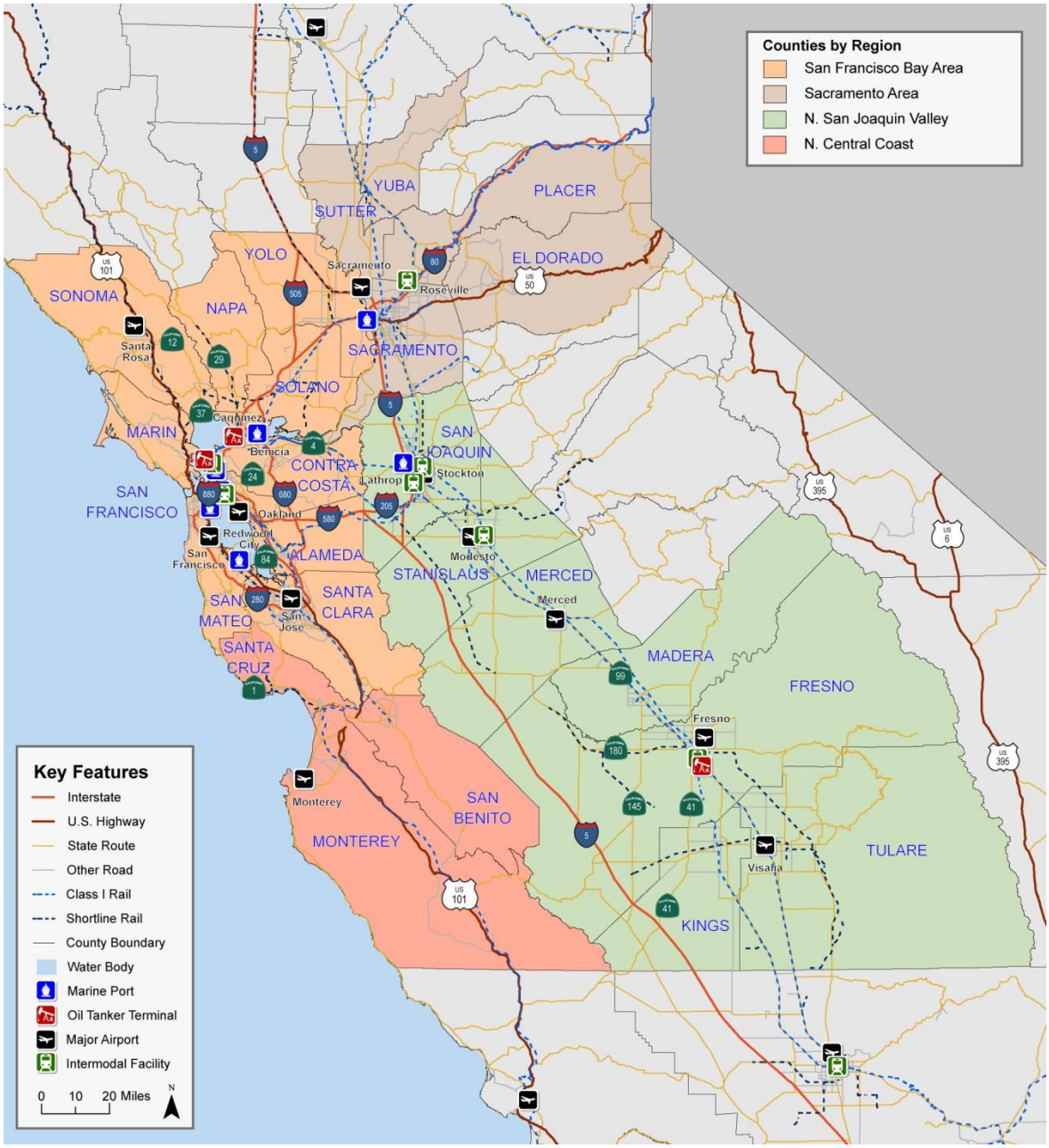
The modal corridors and gateways of Alameda County and the surrounding megaregion are key to connecting the County's goods movement industry to domestic and international markets, as well as providing access for goods moving in and out of the County. Figure 2.2 details the multimodal components of the goods movement system in the megaregion. Figure 2.3 zooms in on the multimodal freight system of Alameda County, and Figure 2.4 illustrates the rail network in the megaregion. The following subsections describe these modal facilities – highways, rail, ports and airports – in greater detail.

2.3.1 Highways

The highway system for the megaregion consists of Caltrans-managed roadways on which trucks compliant with the Federal Surface Transportation Assistance Act (STAA) of 1982 and/or California-legal trucks are allowed. Alameda County is a hub connecting the megaregion to global gateways and the greater Bay Area. I-80, which runs through northern Alameda County, is one of the major transcontinental trade corridors in the Northern California megaregion, connecting north through Sacramento. The County's primary east-west interregional goods movement connectivity is provided by the I-880/I-238/I-580[2]/I-205 corridor, which also connects to the Southern California markets via I-5. Other major interstate connections include I-880 and I-680. In addition, there are a number of other highways providing regional goods movement connectivity, state-managed roadways with special restrictions, and local truck routes.

[2] Although parts of I-580 provide connectivity for trucks, commercial vehicles are prohibited to travel on I-580 north of the I-580/I-238 interchange.

Figure 2.2 The Northern California Megaregion Goods Movement System



Source: Caltrans District 4 Geographic Information System (GIS), July 2013.

Major Highway Facility Profile: I-880

I-880 is the key access highway for the Port of Oakland and Oakland International Airport; it also provides regional goods movement connectivity throughout the Bay Area. Daily truck volumes range between 15,000 and 20,000 trucks per day north of the junction with I-238, nearly 65 percent, of which are 4- or more axles. Trucks compete for highway capacity with commuter traffic during peak hours in both directions.

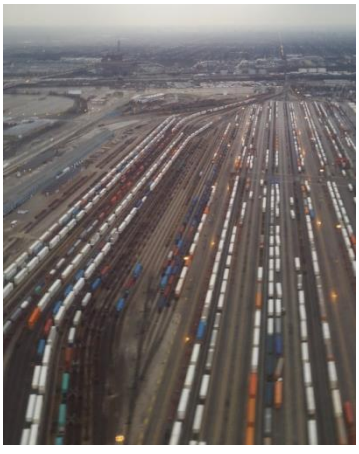
A majority of the warehousing facilities in the East Bay Area are located along this highway. Future growth will necessitate infrastructure projects, such as redesign of the interchanges on I-880 , as many have low vertical clearances and short weaving lengths. There is also significant bridge and pavement maintenance needed in this heavy truck corridor. The I-880 corridor is also supported by a network of parallel arterial routes and access routes to freight facilities and industrial areas. Some of these arterials are major commercial zones that are also rapidly growing transit routes, creating potential conflicts between freight and other modal users. Several UP rail subdivisions also run parallel to this corridor.

Major Highway Facility Profile: I-580

I-580 is the most heavily used truck route in the Bay Area, and provides connectivity between Alameda County and the San Joaquin Valley. It has daily truck volumes in excess of 10,000 trucks per day east of the junction with I-238, nearly 70 percent of which are 4- or more axles. Trucks compete for highway capacity with commuter traffic in the westbound direction in the AM peak period and in the eastbound direction in the PM peak period.

With a continued shift in warehousing facilities from the Bay Area to the San Joaquin Valley and expanding agricultural exports moving from the Valley to the Port of Oakland, the usage of I-580 will continue to grow. Challenges on the system include the high grade near the Altamont Pass, and the fact that trucks are prohibited from travel on I-580 in Alameda County north of the I-580/I-238 Interchange. Currently, there are no major highway alternatives to I-580. However, there are modal alternatives – both the UP's Oakland/Niles rail subdivisions and the M-580 marine highway pilot project run along the corridor.

2.3.2 Rail



The megaregion is served by two Class I railroads, UP and BNSF, both of which run through Alameda County, and several shortline railroads. The Class I railroads operate main lines originating near the Port of Oakland and are supported by near-dock rail terminals[3] for intermodal, auto and bulk cargo, and inland rail classification yards. Railroads travel out from Alameda County, largely paralleling the major highway infrastructure. East-west connections from Oakland to Stockton are provided by UP and BNSF. The UP Martinez Subdivision is the busiest rail corridor in the megaregion. The UP Coast and Niles Subdivisions provide north-south connections along the East Bay. Figure 2.4 shows the Class I and short line railroads in the megaregion. The major Class

[3] Near-dock rail terminals are facilities outside of the port in which containers are loaded or transloded for rail shipment. Containers must be drayed from the port to the near-dock facilities, in opposition to an on-dock facility, in which the containers can be directly loaded onto railcars. "Near-dock" is a term used for terminals that are generally within a few miles of a port as opposed to "off-dock" terminals which may be much further away.

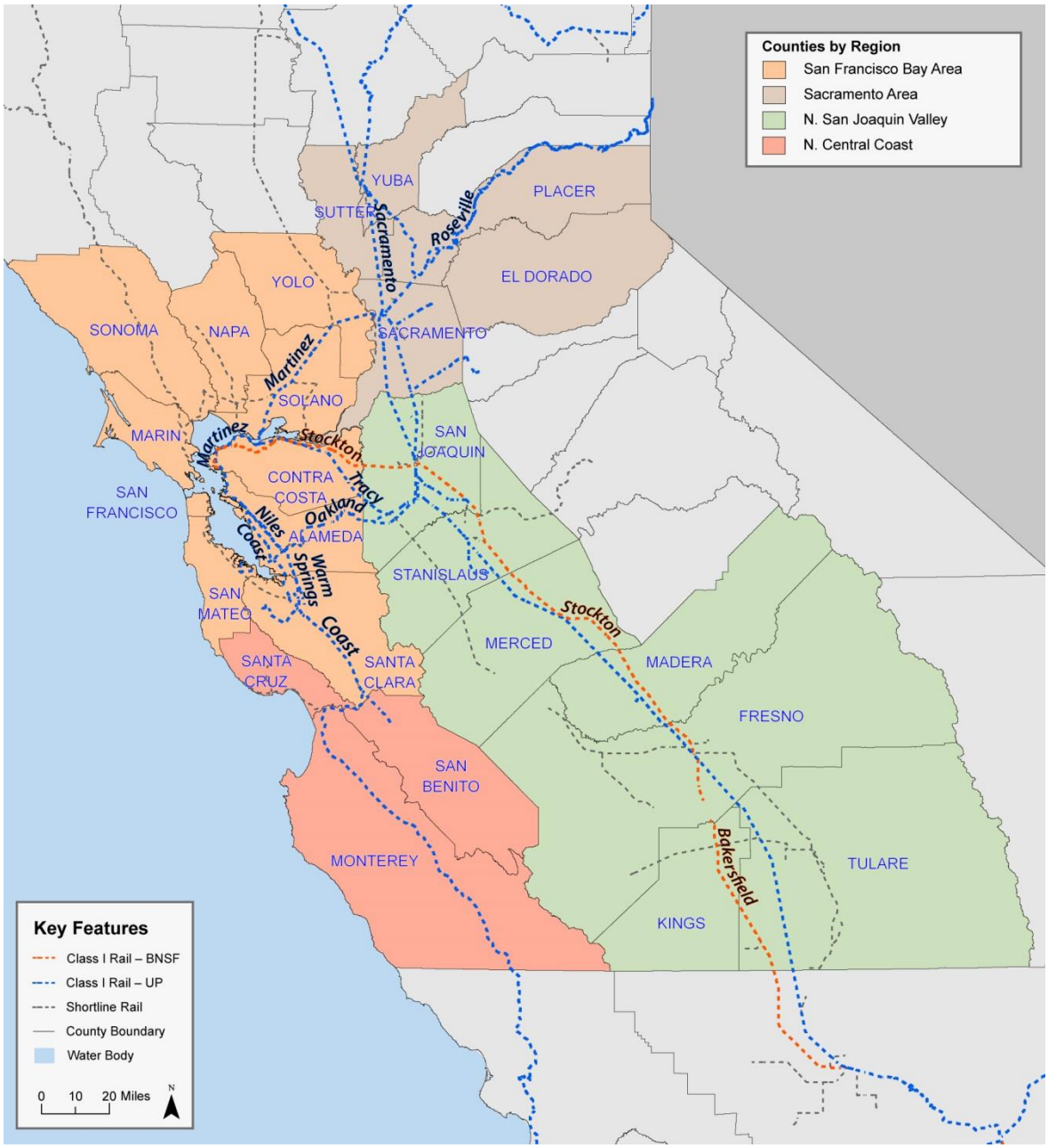
I subdivisions are also called out. The Oakland International Gateway and Railport are the near-dock rail intermodal terminals of the Port of Oakland, handling international shipments of containers and automobiles.

Nearby, the Port of Richmond and Port of Benicia also handle major international shipments. In the Sacramento region, UP's Roseville rail yard, and in the San Joaquin Valley, BNSF's Stockton intermodal rail yard, UP's Lathrop intermodal rail yard and BNSF's Fresno intermodal rail yard focus on serving domestic container and bulk traffic in the Northern California megaregion, including those goods destined for the Bay Area's consumer markets. The Central Coast has no intermodal facilities, and so the region relies on connections through the Bay Area to provide rail access. Short line railroads are spread throughout the megaregion; and many are colocated with agricultural production and food processing industry centers, especially wine, grain, nuts, canned or frozen fruits, and vegetables.

Figure 2.3 Alameda County Goods Movement System

Source: Caltrans District 4 GIS, July 2013.

Figure 2.4 The Northern California Megaregion's Rail System



Source: Caltrans District 4 GIS, July 2013, Cambridge Systematics.

2.3.3 Ports and Airports

The megaregion's access to global gateways through ports and airports is centered around Alameda County, which has two of its three primary gateways – the Port of Oakland and Oakland International Airport. Along with nearby San Francisco International Airport, these serve as the primary links between the megaregion and global markets. Other nearby ports, such as the Ports of Stockton and West Sacramento, which act as export centers for bulk commodities, and the Ports of Richmond and Benicia, which support crude petroleum and automobile imports, also serve to facilitate goods movement in the region. Other major ports and airports in the megaregion include the Port of San Francisco and the Port of Redwood City, which are smaller ports that service niche commodity markets (tallow ,vegetable oil, steel products, boats/yachts, wind turbines, aggregate, and sand at the Port of San Francisco and construction materials, scrap metal exports, construction debris for recycling, and chemicals at the Port of Redwood City), and the Sacramento International Airport, Mineta San Jose International Airport, and Sacramento Mather Airport, which primarily serve passenger traffic but do have some domestic air-freight (for example, UPS has moved its operation from Sacramento International Airport to Mather).

The Port of Oakland

The Port of Oakland is the fifth busiest container port in the U.S., handling more than 2.3 million twenty-foot equivalent units (TEU) in 2012 and almost 100 percent of the containerized goods moving through Northern California.

In recent decades, the Port of Oakland has been the only major container port in California where exports consistently exceed imports, providing a unique international trade gateway. Northern California's export economy will continue to be an important demand factor at the Port, and in particular, expanding agricultural export activity from the Central Valley is likely to drive growth. The Port is also investing in opportunities for export bulk products, such as waste, scrap, and recycled products, demand for which is expanding throughout the Pacific Rim.

The Port of Oakland will also continue to be a gateway for imports (largely consumer goods from Asia). Growth will depend to some degree on expansion of rail facilities, balancing growing export traffic with import traffic to attract more vessels making Oakland a first port of call, and development of nearby container transloading warehouses. Transloading is the practice of transferring goods from smaller twenty and forty-foot international containers to domestic containers up to 53 feet long for shipment via rail or truck. Transloading can result in consolidation of shipments into fewer containers and also presents an opportunity for value-added activities. As transloading has become more common, large importers are increasingly drawn to ports with nearby transload warehouses, and a combination of changing railroad operating practices and the development of new facilities are helping increase the attractiveness for imports.

3.0 Goods Movement Flows and the Economy – Focus on the Bay Area and Alameda County

Alameda County is the third largest county in the Bay Area as measured economically, with 15 percent of the total output and 20.5 percent of employment in the region.

The robust industrial sectors and consumer economy of the Bay Area and Alameda County necessitate a strong goods movement system. The nine-county Bay Area was home to more than 7 million people in 2010 and provided jobs for almost 3.4 million people who live in the region or neighboring counties.[4] In the future, the Bay Area is projected to remain California's second largest population and economic center, with 2.1 million residents forecasted to be added to the region by 2040, and a per-capita income well above the California average. As such, the Bay Area boasts one of the largest economies in the U.S., and ranks 19th in the world when compared to national economies, with a Gross Regional Product (GRP) of $539 billion in 2011.[5] In 2011, goods movement-dependent industries in the Bay Area spent $20 billion on transportation. This is equivalent to 2 percent of regional output and represents 64 percent of all business spending on transportation services in the region.

Alameda County represented 21 percent of the Bay Area's population and employment in 2010 and has the region's fastest growing population and job markets. As measured by total economic output, Alameda County is the third largest economy of all Bay Area counties, with economic output equivalent to 15 percent of the region's total output.[6] The County has a diverse manufacturing base that includes high-technology sectors, such as electronics, precision instrumentation, and medical supplies, yet also includes traditional manufacturing operations in metal products, food products, and machinery. Located at the geographic center of the region, Alameda County is home to major freight facilities that provide connections to California and beyond.

3.1 Goods Movement Flows in the Bay Area

Goods movement, including imports, exports, and domestic movements to consumer markets, plays a significant role in the Bay Area economy. Goods movement-dependent industries in the Bay Area account for $490 billion in total output (51 percent of total regional output); and provide over 1.1 million jobs (32 percent of total regional employment).

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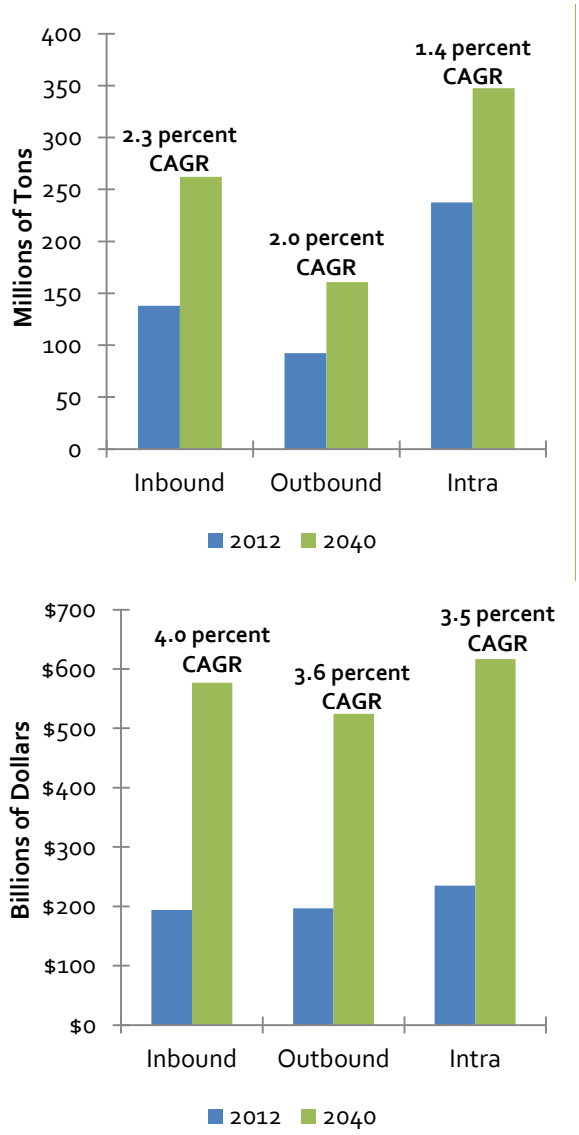
4 *Plan Bay Area*, Association of Bay Area Governments (ABAG), 2013.

5 Ibid, ABAG.

6 Regional and county GRP and value-added estimates were developed from the county input-output tables in the IMPLAN economic model, Minnesota IMPLAN Group (MIG), 2012.

Figure 3.1 **Bay Area Freight-Flow Volumes by Movement Type**
2012 and 2040



Source: FAF3.5 Provisional Data and Forecasts.

CAGR = Compound Annual Growth Rate.

Bay Area Industries: Wine

California is known worldwide for the production of high quality wines, and the Bay Area is one of the State's premier wine-producing regions. Major centers of wine growing and production in the Bay Area include the renowned Napa and Sonoma Counties. In 2013, Napa County reported 175,000 tons of grapes crushed, and Sonoma and Marin Counties reported 271,000 tons of grapes crushed; about 10 percent of the California total. The Central Valley region, however, is the largest producer of wine. San Joaquin, Stanislaus, Merced Counties (and parts of Sacramento County) generated 1.2 million tons of crushed grapes in 2013, making up 27 percent of the state total. Wine and other alcoholic beverages was the fourth highest export at the Port of Oakland by value in 2012.

Vintners receive many types of shipments, from grapes to bottles and other packaging materials. U.S. 101 and SR 12 in the Bay Area provide major trucking connections between the wine-producing regions in the North Bay and the interstate highway network. While much of the wine product and supplies are moved to and from wine growers and vintners by truck, an increasing number of bottlers are taking advantage of short-line and intermodal rail services when they can. Lack of access to intermodal rail was a major factor in the relocation of at least one major bottler from the Central Coast region to the Central Valley during the last decade.

In 2012, the predominant freight movements by weight in the Bay Area were intraregional commodity flows (i.e., flows that have both an origin and a destination within the Bay Area), as shown in Figures 3.1 and 3.2. These short-haul freight movements include freight moving along local supply chains – including consumer goods moving from local warehouse and distribution facilities to retailers and wholesalers, heavy construction materials that are produced and consumed locally (such as sand and gravel or concrete), raw materials and component parts moving among facilities within a manufacturing cluster for production and assembly, and waste and scrap materials moving to/from transfer facilities and recycling industries. Intraregional

freight flows also include locally produced products that are moved to the seaports and airports for export, or from the region's seaports and airports to local consumers and industries.

Nevertheless, imports are projected to increase as the Bay Area continues to be a net consumer of goods produced outside of the region. Inbound commodities to the Bay Area accounted for 30 percent (138 million tons) by weight of total non-through flows in 2012. The inbound flows include supplies for local industries, consumer goods distributed from Central Valley warehouses, and products shipped into the region's seaports and airports for export. About 92 million tons (or 20 percent) of goods are transported outbound from the region; mostly destined for areas outside of California. This is a combination of goods produced by local manufacturers and products moving through the region's international gateways, but destined for locations in other parts of the country.

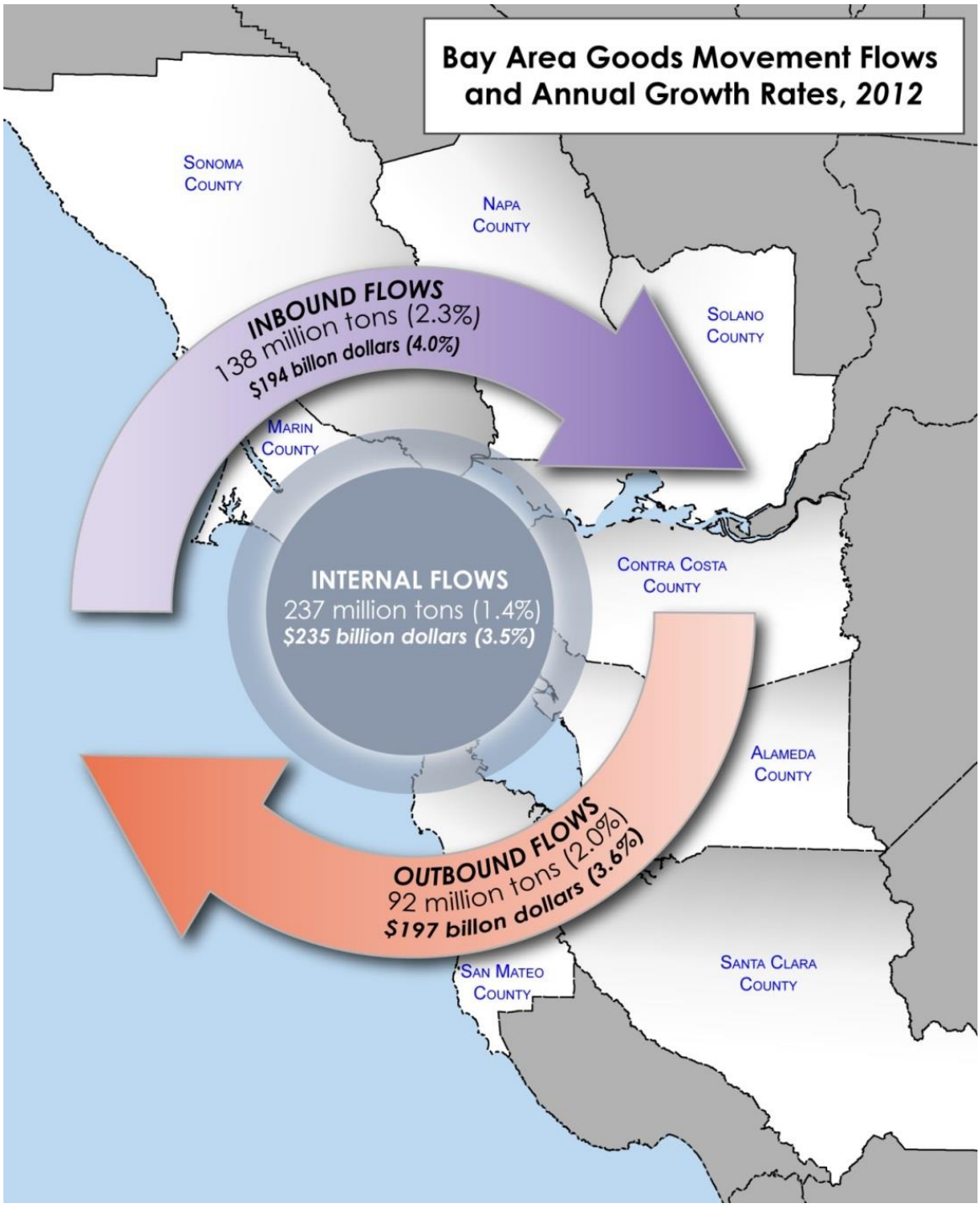
Alameda County's Biotech Sector

California has more biotech jobs than any other state, and its companies have developed upwards of 60 percent of the biologic drugs on the market today. Biotech sectors such as precision instrument manufacturing are some of the strongest growth sectors in the regional economy. Biotech companies producing advanced medical products continue to expand their high-technology manufacturing facilities in the Bay Area, creating demand for specialized goods movement services for these high-value products.

The supply chains of these companies are diverse and utilize inputs ranging from chemical or agricultural feed stocks to electronic components and parts. Alameda County biotech manufacturers rely on the seaport, airport, and rail network, as well as trucking for these inputs. Finished products travel to domestic markets by truck, are shipped overseas by ocean container, and travel to both markets using air cargo.

Consumer goods, i.e. those that are sold to households and residents through retail stores or online retailers, are perhaps for many people the most visible part of the goods movement chain. Demographic and socioeconomic factors suggest continued and increasing demand in Alameda County for consumer goods; many of which will be manufactured and distributed from outside of the area. One path by which consumer goods move into the region is through container imports through the Port of Oakland, which typically includes imports for "big box" retailers, such as Wal-Mart or Home Depot. Another way goods enter the region is from warehouses and distribution centers in the Northern San Joaquin Valley . Many companies and retailers use facilities in both Alameda County and inland locations for distribution. At the local level, significant amounts of consumer retail goods and small parcel packages will move through the Oakland International Airports, on inter- and intraregional highways, and on local arterial routes.

Figure 3.2 Bay Area Freight-Flow Volumes, 2012



Source: Freight Analysis Framework (FAF) 3.5 Provisional Data and Forecasts.

3.2 Key Commodities and Major Industries Supported

In the Bay Area in 2011, the top commodities by tonnages moved include waste and scrap, petroleum products, crude petroleum, and gasoline. Other top commodities – foodstuffs, construction materials, and containerized consumer products – are used or produced by manufacturing companies in the region. Some of the region's top manufacturers are Bayer Corporation, Seagate Technology, Tesla, Sara Lee Foods, Schnitzer Steel, and Pacific Steel Casting. Products manufactured by such companies can be exported or distributed locally through retail outlets, such as Wal-Mart; Office Depot, Inc.; Home Depot, Inc.; or Safeway, Inc. There are also some wholesale trade and distribution-related activities for chemical companies, such as Clorox, medical devices companies such as Boston Scientific Corporation, and food services companies such as Sysco and U.S. Foods. Apart from waste and scrap, other key exports moving through the Port of Oakland include agricultural products, nonmetallic minerals, mixed freight[7], and alcoholic beverages (wine).

In terms of value, commodity moves are dominated by electronics, machinery, and motorized vehicles, which are much more valuable on a per-unit weight basis. Electronics, machinery, precision instruments, foodstuffs, and pharmaceuticals are all products that are manufactured locally or, as in the case of electronics, provide inputs to other products produced assembled locally. Movement of these products relies heavily on the region's goods movement corridors and gateways.

Similar to the region as a whole, goods movement-dependent industries make up a significant percentage of the employment and economic output of Alameda County. Manufacturing dominates these figures with 26 percent of total output, valued at $37.5 billion. The County's diverse manufacturing sector employs almost 68,000 people; and that includes high-technology sectors, such as electronics, precision instrumentation, and medical supplies, but also includes more traditional manufacturing in metal products, food products, and machinery. Alameda County's international trade is likely proportionally higher than the Bay Area as a whole, as businesses with international supply chains or customers would be more likely to locate their business near the Port of Oakland and Oakland International Airport.

3.3 Employment in Goods Movement-Dependent Industries

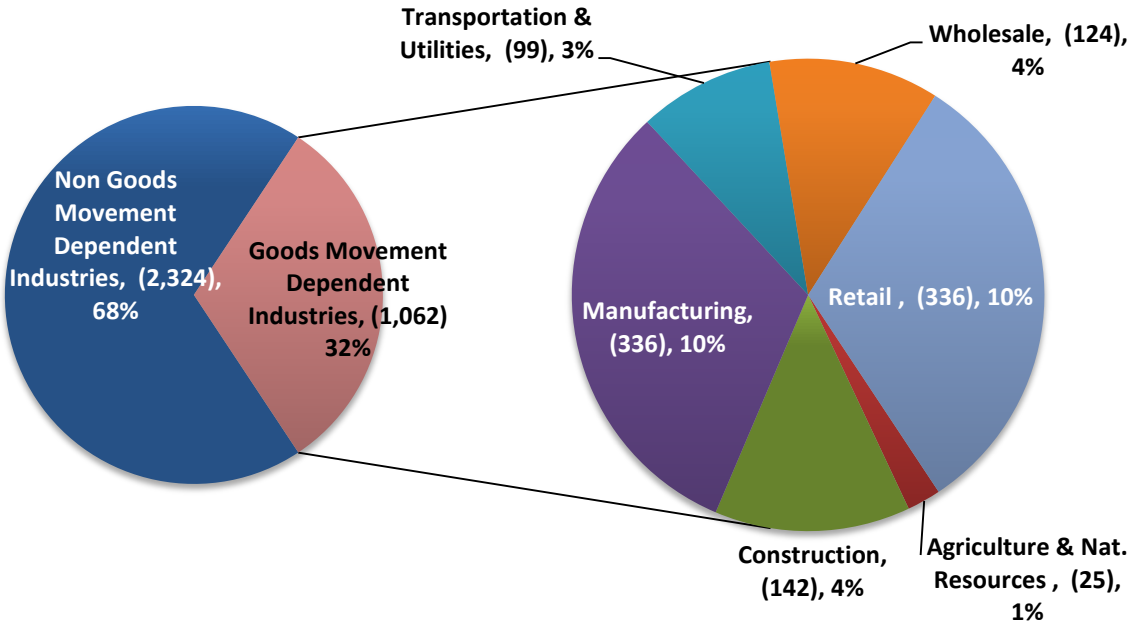
Over 1 million people were employed in goods movement-dependent industries in the Bay Area in 2010 (Figure 3.3). The region has more than 300,000 jobs in the manufacturing sector and in the retail trade sector, illustrating the region's status as a powerhouse in both the producing and consuming economy. Agriculture, most notably artisanal products, is a small

Alameda County comprises 22 percent of the employment in all goods movement-dependent industries and 25 percent of employment in manufacturing in the Bay Area

[7] Mixed freight is a designation for a mixture of items or items not elsewhere classified. "Mixed freight" is a category often used by a freight consolidator, distributor, or forwarder who combines a number of types of commodities into a single shipment. This can include items such food for delivery to grocery and convenience stores, supplies for department or electronics stores, or other miscellaneous shipments.

but growing sector, and although it represented just about one percent of Bay Area employment, it saw a 42 percent growth in employment between 2001 and 2012. Transportation and warehousing employed almost 100,000 workers in the Bay Area in 2010. [8]

Figure 3.3 Bay Area Employment in Goods Movement-Dependent Industries, 2010 (in Thousands of Employees)



Source: ABAG *Plan Bay Area Economic Forecasts*; factors from CCSCE; and Cambridge Systematics Analysis.

Freight transportation service providers (trucking, rail, maritime, and air cargo industries) and their supporting service industries and equipment manufacturers provide approximately 79,300 jobs in the Bay Area and contribute significantly to job diversity in the region. Within the region, Alameda County provided 26 percent of the region's jobs in this sector in 2010; and this share is expected to grow to 30 percent in 2040 and represent 14 percent of the County's total employment . Many jobs in the transportation, warehousing, and logistics industries do not require high levels of education yet provide good wages, and are

[8] ABAG *Plan Bay Area Economic Forecasts*

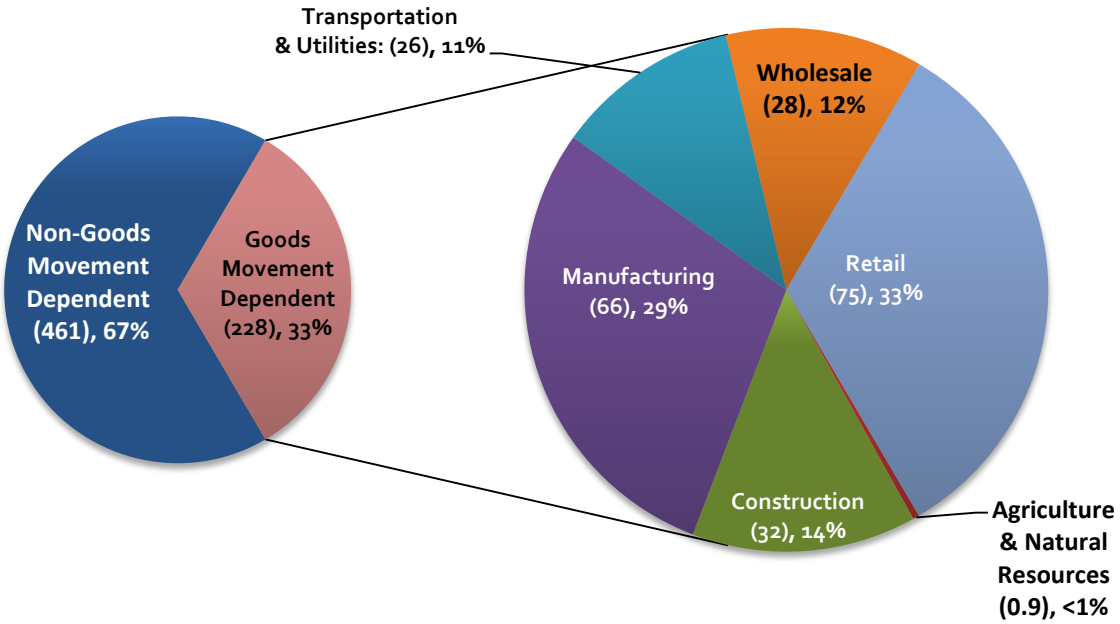
The Changing Face of the Trucking Industry Means New Job Opportunities

Currently, the U.S. has more trucking jobs open than licensed commercial drivers. According to the American Trucking Association, there is currently a shortfall of over 30,000 truck driver jobs. This shortage is only projected to grow as older drivers retire. Industry changes such as the Federal Motor Carrier Safety Administration's (FMCSA) new hours of service regulations also play a part in increasing the numbers of drivers needed. Industry is turning to innovative solutions – from technology and efficiency improvements, to improved scheduling and quality of life – to improve the attractiveness of the trucking occupation. This will lead to opportunities for future job growth in this industry, for both the Bay Area and nationally.

often discussed as potential replacements for declining manufacturing employment. Across the region, goods movement occupations that have these lower educational requirements constitute 14 percent of the total jobs in occupations that do not require a college degree.

Alameda County comprises 22 percent of the employment in all goods movement-dependent industries and 25 percent of regional employment in manufacturing in the Bay Area, which is a slightly higher share than its total employment and population. Additionally, goods movement-dependent industries supported one-third of all jobs in the County in 2010 (Figure 3.4). Although steady, future growth in goods movement-dependent industries is expected to be more moderate than overall employment growth for both Alameda County and the region as a whole.

Figure 3.4 Alameda County Employment in Goods Movement-Dependent Industries, 2010 (in Thousands of Employees)



Source: ABAG *Plan Bay Area Economic Forecasts*; factors from CCSCE; and Cambridge Systematics Analysis.

A Direct Link between Transportation Investment and Jobs

Investment in the transportation sector creates economic growth for the region and employment opportunities for residents. Citing analysis of Bureau of Labor Statistics Data, the President's 2014 report, *An Economic Analysis of Transportation Infrastructure Investment,* documents that 68 percent of the jobs created by investing in infrastructure are in the construction sector, 10 percent in the manufacturing sector, and 6 percent in retail trade. Alameda County's 30-year, $8 billion 2014 Transportation Expenditure Plan is expected to yield $20 billion in economic activity, including 150,000 full-time equivalent jobs in construction; transit operation and maintenance; professional, scientific, and technical services, and manufacturing, as reported by the Bay Area Council Economic Institute in the 2014 report, *In the Fast Lane.*

4.0 Future Goods Movment System Challenges and Opportunities for Positive Policy Change

Alameda County, the Bay Area, and the surrounding megaregion play an important role in local, national, and international commerce; and thus are continuously faced with goods movement-related opportunities and challenges. Although some are unique to the area, many of these are the same challenges other urban areas are confronted with in the State and nation, and the area has an opportunity to learn from its peers. Multijurisdictional and integrated planning efforts, whether countywide or among the larger region, are necessary to develop and implement goods movement strategies.

As part of ongoing planning efforts, the Alameda County Transportation Commission has developed a goods movement-specific vision and goals, illustrated in Figure 4.1. The vision lays out strategic direction for the agency, and both the vision and goals were developed to align with higher-level goals developed for the Countywide Transportation Plan and the Regional Transportation Plan, but also reflect the need to address critical issues and opportunities focused specifically on the freight system as identified by stakeholders and prior studies.

Figure 4.1 Alameda County's Goods Movement Vision

This following subsections outline the future needs of the County's goods movement system as they relate to Alameda County's goals, and how the County can take a national leadership role.

4.1 A Healthy Environment and High Quality of Life

Goal: Reduce and mitigate impacts from goods movement operations to create a healthy and clean environment, and support improved quality of life for people most burdened by goods movement.

The Bay Area serves as a national leader in efforts to identify and implement strategies to improve public health by reducing air pollution and improving water quality, as well as strategies to protect the environment and infrastructure by reducing greenhouse gases (GHG) and preparing for sea-level rise and significant weather events.

Perhaps the most critical air quality and public health issues surrounding goods movement in the Bay Area are related to impacts of goods movement-related emissions on the health and safety of communities directly adjacent to major goods movement facilities and connecting infrastructure. These communities experience some of the highest exposure levels to pollution that causes asthma and other respiratory ailments, heart disease, and other health problems. While future planning efforts should look to create buffers between goods movement activity and neighborhoods wherever possible, this may be more difficult in some locations and may require new goods movement technologies or other mitigation measures such as building design to reduce exposure to public health risks.

Improving air quality at the regional level is also a priority of the Bay Area. California's air quality standards are the most stringent and health-protective standards in the nation; and are designed to provide additional protection for those segments of the population who are most sensitive to the effects of air pollution. Although the Bay Area does not yet attain all national and state standards for pollutants that cause health impacts, specifically particulate matter (PM), the Bay Area Air Quality Management District (BAAQMD) and the California Air Resources Board (CARB) are actively seeking to reduce emissions from key sources.[9]Many California programs and policies are in place to address goods movement and environmental issues. These include CARB's Low Carbon Fuel Standard (LCFS) program, which requires producers of petroleum-based fuels to reduce the carbon intensity of their products by 10 percent by 2020[10], and CARB's On-Road Heavy-Duty Diesel Vehicles regulation. The Maritime Air Quality Improvement Plan (MAQIP) developed by the Port of Oakland and the BAAQMD. Through MAQIP, the Port has committed to a goal of reducing diesel PM from seaport sources by 85 percent between 2005 and 2020 in order to reduce the health impacts on local area residents. Finally, the BAAQMD has adopted several mobile source and transportation control measures as part of the 2010 Clean Air Plan, including incentives to accelerate replacement of heavy-duty on-road diesel engines and installation of low nitrogen oxide (NO_x) engine retrofits.

Additional efforts are underway to continue working towards emissions reductions in the region. As an example, in order to comply with CARB regulations, the Port of Oakland no longer allows trucks with pre -2007 engines to access the Port. Yet much remains to be done to actively work towards emission reduction beyond simply meeting CARB standards.

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9 Bay Area Air Quality Management District (BAAQMD), http://www.baaqmd.gov/Divisions/Planning-and-Research/Particulate-Matter.aspx#dpm.

10 California Energy Commission, http://www.energy.ca.gov/low_carbon_fuel_standard/

Low Emission Locomotive in Roseville, CA.
Source: The International Railway Journal

In recent years, there has been renewed interest in the use of low-emission, alternative fuels, such as biodiesel and natural gas, including compressed natural gas (CNG) and liquefied natural gas (LNG) for trucking and port operations. The new sources of low-cost natural gas in the U.S. have made natural gas a very competitively priced option for trucking fleets. Initial applications have focused on captive fleets that have their own fueling networks at truck terminals, but for alternative fuels to have broader applicability; networks of public fueling infrastructure would need to be developed throughout the Bay Area. There is also much research and demonstration around the country looking for ways to electrify trucks leading to potential zero-local emission technologies. Intelligent Transportation Systems (ITS; see Section 4.3) are another method for improving the efficiency of and reducing the impact of goods movement on residents and communities. As a leader in technology innovation, the Bay Area and Alameda County can play a major role in advancing these technologies.

Reducing emissions from the diesel locomotive fleet operating in the megaregion is also important, as locomotives can have a service life of up to 50 years, and older locomotives that predate U.S. Environmental Protection Agency (EPA)-mandated emissions controls make up a large share of emissions attributable to train operations. One strategy is to encourage rail operators to purchase new locomotives for switching. New, cleaner locomotive technology has been tested in areas such as Roseville, California, where the SD59MX locomotive was rebuilt from an Electro-Motive Diesel SD60M. It began service in 2010 with a range of up to 200 miles from its base at UP's Roseville yard.[11]

Currently, the California Air Resources Board (CARB) is developing a Sustainable Freight Strategy. The purpose of the Strategy is to identify and prioritize actions to move California towards a sustainable freight transport system that is characterized by improved efficiency, zero or near-zero emissions, and increased competitiveness of the logistics system. The strategy is designed to reduce localized health risk near freight facilities, reach air quality standards, and reduce California's contributions to global climate change. One particularly innovative part of the development process will be technological assessments across transportation modes for ability to implement low-emission strategies. [12] Alameda County and Bay Area goods movement planning will benefit significantly from these technological assessments and other outcomes of state freight air quality planning.

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[11] Barrow, Keith, "Union Pacific tests low-emission locomotive." *The International Railway Journal*, September 2012, http://www.railjournal.com/index.php/locomotives/union-pacific-tests-low-emissions-locomotive.html.

[12] California Air Resources Board (CARB), http://www.arb.ca.gov/gmp/sfti/sfti.htm

4.2 Safe, Reliable, Well-Maintained Goods Movement Facilities and Corridors

Goal: Provide safe, reliable, efficient, resilient, and well-maintained goods movement facilities and corridors.

The interregional and intraregional corridors of the region carry the highest volumes of truck traffic. Most of the traffic is carried on high-volume shared-use commuter routes with passenger routes as well, including I-880, I-580, I-80, and U.S. 101. The high volumes of traffic, heterogeneous traffic mix, frequent weaving and merging around interchanges, and designs that pre-date modern interstate standards on facilities such as I-880 and U.S. 101 also create safety issues. Thus, ensuring the efficiency and safety of freight movement on these routes is a significant need for the region's transportation system.

While the largest truck volumes on regional roadways are found on the interregional corridors and the intraregional core system, there is a network of major arterial truck routes that provide an important function for urban goods delivery, particularly to retailers, commercial businesses, and residences. These arterial corridors are critical to "first-mile" (pick up) and "last-mile" (delivery) goods movement and local truck movement. They provide access to industries and warehouse facilities and truck amenities, such as gas stations, rest areas, and parking. These arterial roadways are primarily city and county roads that cross jurisdictional boundaries, and although most cities have designated "local truck routes," there is a need for cross-jurisdictional coordination and a program for regularly updating truck routes to adapt to changes in land use patterns (e.g. construction of a new freight generator). Inconsistencies such as size and weight restrictions or time-of-day controls; lack of signal coordination, and street design features hinder the movement of goods on the system.

Deterioration is an issue across the megaregion's highways, roadways, bridges, and local streets, in part due to heavy-truck movement growth that is increasing the need for maintenance and preservation projects. Corridors such as the I-580 interregional corridor, which has the highest truck volumes in the region, will require significant investment in long-term maintenance and preservation, as well as for capacity enhancements, in coming years. The integrated nature of the megaregion and presence of global gateways within Alameda County means that the County bears the burden of global goods movement activities on its streets, yet currently funds maintenance and repaving of local streets out of local funds. Additionally, many municipalities do not or are unable to adequately maintain local streets with heavy truck use, particularly in industrial districts.

Ports and airports are also crucial pieces of the goods movement system in Alameda County and beyond. The Port of Oakland will continue to play a large part of Alameda's goods movement future. Success at the Port will require continued improvement in the frequency and reliability of rail services so that the Port can serve a larger market area and continue to grow as an attractive import port and increase the economic benefits for the Bay Area residents through increased marine terminal capacity and new transload warehouses, such as the Oakland Global Trade and Logistics Center. Additional connectivity, especially east-west connectivity, will be needed on the inter- and intraregional corridors to provide more transbay access, critical to growth at the region's cargo airports. These steps, along with other efforts underway or envisioned, are crucial to support the goal of safe, reliable, efficient, resilient, and well-maintained goods movement facilities and corridors.

4.3 Technology and Innovation

Goal: Promote innovative technology and policy strategies to improve the efficiency of the goods movement system.

The Bay Area is a leading national and international center of technology and innovation. Although significant goods movement, environmental, and economic challenges exist, the culture and innovative abilities of the Bay Area serve as an excellent incubator for businesses and public agencies trying to solve these problems. As funding for expanding transportation infrastructure has become more constrained, there has been increasing interest in technologies such as intelligent transportation systems (ITS) for improving the efficiency of freight operations, a number of which are currently being tested or applied around the nation and could be considered in Alameda County. A particularly relevant technological application is to increase port efficiency through the Freight Advanced Traveler Information Systems (FRATIS) concept (a web-based software system that provides terminal operators with a "prenotification" of trucks arriving at the Port for a specific load – see callout).

Corridor improvements, such as adjusted signal timing or signal prioritization for trucks, are other strategies that can help increase efficiency and minimize impacts of freight movements. "Connected vehicles" is a third area of technology that could be applied to improve freight operations in the Bay Area. Linking on-board vehicle information systems and roadside systems, connected vehicles provide drivers with information, such as location of parking, safety problems, and traveler information; and can provide information to traffic managers and dispatchers on emerging traffic problems, regulatory enforcement needs, or input to routing decisions. Connected vehicles can also provide vehicle-to-vehicle communications to allow for autonomous vehicle operations that improve safety or allow for truck "platooning" (which can increase both safety and capacity of a roadway without building new roadway infrastructure).

Some fundamental shifts in the nature of goods movement, particularly at the local level, will need to be addressed through innovative policy strategies. The rise of e-commerce illustrates these shifts, as the trend has led to an overall decrease in package size and an increase in the volume of small packages moving through arterial networks, exacerbating "last-mile" delivery issues like inadequate delivery van parking space in concentrated urban centers. Policy strategies , such as breakpoints to enable transfer of goods to smaller vehicles or overnight delivery programs can help to reduce impacts on urban residents and improve goods movement efficiency. New York City's recently implemented off-hours delivery pilot program was found to increase productivity and reduce illegal parking, resulting in a win-win for the City and participating businesses. [13] Such strategies may have a place in the Bay Area's policy toolkit.

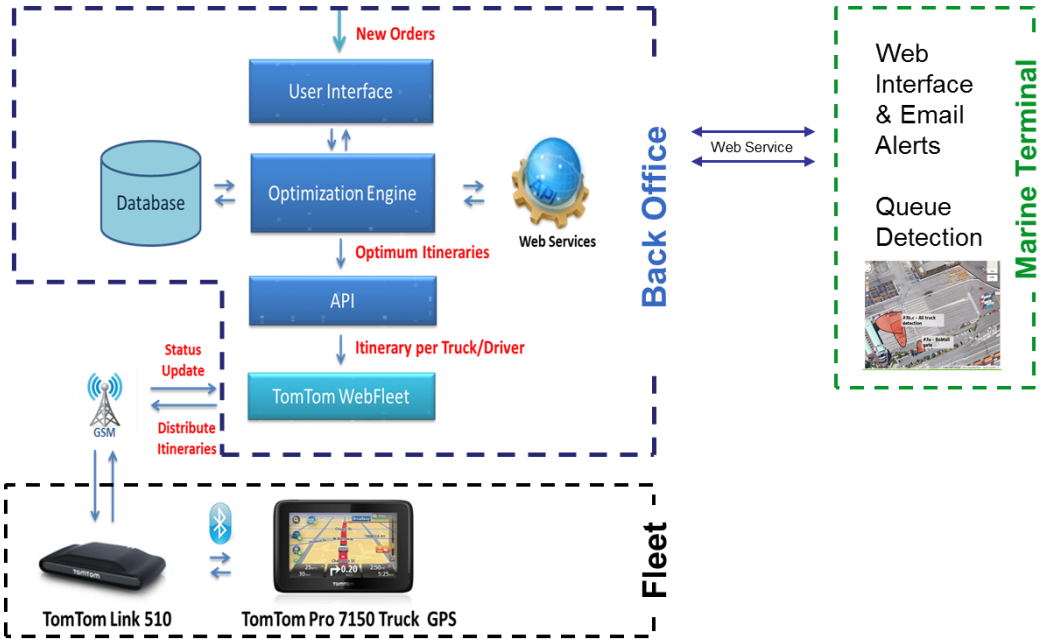
[13] New York Department of Transportation Off-Hours Delivery Program
http://www.nyc.gov/html/dot/html/motorist/offhoursdelivery.shtml

FRATIS

U.S. Department of Transportation (DOT) Research and Innovative Technology Administration (RITA) – Demonstration Project in Los Angeles and Gateway Cities

The FRATIS Demonstration Project is a private and public collaborative effort funded by U.S.DOT-RITA. Its development is centered on the U.S. DOT's Dynamic Mobility Application bundles, including Freight Dynamic Route Guidance, Freight Real-Time Traveler Information with Performance Measures, and Intermodal Drayage Operations Optimization. The FRATIS applications are designed to work together synergistically to improve terminal visit pre-trip planning and dynamic routing around congestion, to arrive at the gate at less congested times, and to promote reductions in missed container trips (i.e., "bobtail" reductions) at the terminals; all supporting reductions in truck travel times and trips, translating directly into regional mobility and air quality improvements. A conceptualization of the testing components are illustrated in the figure below.

Currently, this system is being pilot-tested in three locations, including as part of the Los Angeles/ Gateway project. The FRATIS test includes two primary private sector participants – Port Logistics Group (a Harbor Trucking Association drayage fleet) and Yusen Terminals, Inc. (a marine terminal operator). Two key public sector agencies are also supporting the test –the Los Angeles Metropolitan County Transportation Authority (Metro) and the Gateway Cities Council of Governments. The regional public-private joint goal behind forming this partnership is to reduce truck traffic congestion during peak hours.



4.4 Preparing for Future Goods Movement Trends

Goal: Preserve and strengthen an integrated and connected, multimodal goods movement system that supports freight mobility and access, and is coordinated with passenger transportation systems and local land use decisions.

As the regional economy grows and changes, goods movement-dependent industries will continue to place increasing demands on the region's goods movement system. From intraregional movements of consumer products, foods, packages and parcels; to exports of high-technology manufacturing products, agricultural commodities from the San Joaquin Valley and Central Coast; to exported waste and scrap (which are expected to quadruple in volume by 2040), the goods movement system in the County is essential to the daily livelihoods of its residents, and to ensure a thriving economy. Although it cannot be known exactly what the future will hold for Alameda County, it is important to prepare for and support goods movement-dependent industries – the manufacturers, transportation providers, and others that drive one-third of jobs within the County.

E-commerce has led to a fundamental shift in the nature of goods movement, exacerbating "last-mile" delivery issues, such as delivery van parking in urban areas.

One aspect of today's economy changing the nature of goods movement demand is the rise of e-commerce and the changing ways that consumers purchase goods. According to the Bureau of Economic Analysis, U.S. personal consumption has risen 10 percent between 2005 and 2012 (from $9,500 billion to $10,500 billion, in 2009 dollars), while consumption of goods has risen 11 percent (from $3,200 billion to $3,500 billion, in 2009 dollars).[14] On-line shoppers in the United States are projected to spend $327 billion in 2016, up 62 percent from $202 billion in 2011. In 2016, e-retail will account for 9 percent of total retail sales, up from 7 percent in 2011.[15] Given the rising incomes of many Bay Area residents and the region's high density residential and commercial development, these trends are likely to be aggravated in this region, as retailers continue to market to consumers using e-commerce as an alternative to visiting brick-and-mortar retail stores. Sellers are fulfilling these e-commerce orders from their own distribution centers or stores, or through the distribution centers of resellers like Amazon.com. This results in a decrease in package size and an increase in the volume of small packages moving through arterial networks, a fundamental shift in the nature of goods movement. This shift may lead to have several results, from an exacerbation of "last-mile" delivery issues like inadequate delivery van parking space in concentrated urban centers, to a synergistic shift to smaller vehicles which have an easier time traveling on city streets, to the creation of regional economic growth due to increased volume through the region's airports and distribution centers.

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[14] Table 2.4.6, Real Personal Consumption Expenditures by Type of Product, Chained Dollars (2009),last revised on August 7, 2013, www.bea.gov.

[15] Reuter, Thad, "U.S. consumers will spend $327 billion on-line in 2016, Forrester Research says." *Internet Retailer,* February, 2012, http://www.internetretailer.com/2012/02/27/e-retail-spending-increase-45-2016.

The economies of Alameda County and the surrounding megaregion have continuing land use and development challenges. In particular, industrial land in and around Alameda County is under threat due to a combination of high land costs and a shifting economic base, leading to conversions of historically industrial land to alternative uses. A 2008 study of goods movement and land use in central Bay Area corridors (I-880 and U.S. 101) found that if existing land development trends continue, over 63,000 jobs in goods movement-dependent industries that would otherwise have been available in cities along these corridors will move to outlying locations. The impact of longer truck trips under this scenario will be felt the most on I-580 and I-880, increasing truck vehicle mile travelled (VMT) by as much as 250,000 daily VMT – 27 percent higher on I-580 and 12 percent higher on I-880. In addition to increasing the cost of goods, this increased, concentrated truck VMT would negatively impact health in neighboring communities.

The Bay Area and Alameda County have both made major commitments to denser residential and commercial development and the expansion of transit, bike, and pedestrian facilities along the major corridors serving this development. Several of the Priority Development Areas and many of the Growth Opportunity Areas nominated by Alameda County jurisdictions to take on additional housing and employment overlap with industrial areas. However, this changing land use leads to conflicts between industrial users and residents, both in those neighborhoods historically located along goods movement corridors and those more recently designated as residential. Existing rapid transit and commuter rail lines sharing right of way and track with freight railroads, and highways and arterials serve as major commuter, bus, and truck routes simultaneously cause a significant amount of overlap between freight and passenger travel. The County must work in conjunction with other agencies to preserve existing resources and access to goods movement facilities, while continuing to pursue best-use strategies and practices to support and maintain a high quality of life for residents.

Another emerging area of transportation planning that represents potential opportunities for a connected, integrated goods movement system is complete streets. A complete streets approach involves, planning, designing, and operating transportation facilities and networks to serve all modes and all users. All Alameda County jurisdictions have adopted complete streets policies and are now moving into implementation phases. Complete streets designs frequently seek to make streets more compact in or der to reduce vehicle speeds, improving safety of all users and comfort of active transportation modes. The emphasis on more compact streets that may impede maneuverability of trucks has resulted in concern from some carriers. However, to the extent that a complete streets philosophy encourages planners and engineers to resolve modal conflicts at a network level (e.g. prioritizing some streets for trucks and others for biking and walking) as well as to consider how a facility design will serve all users, complete streets designs present an opportunity for incorporating goods movement needs into urban street networks and designs. Moreover, many examples exist of streets that can accommodate trucks along with other modes without compromising safety or convenience.

Complete streets concepts can be applied to industrial districts *(Source: Alameda CTC, 2012).*

Shared-use issues are not unique to urban roadways, however. Passenger railroads operate on many corridors shared with freight railroads in Alameda County. The shared-use of tracks affects operations and can reduce flexibility in train scheduling, as well as introducing potential delays and safety issues due to freight-passenger conflicts. Strategies and investments to mitigate delays at grade crossings will be necessary to ensure efficient movement of both passenger travel and goods movement on the roads and rails, especially in areas of the Oakland, Coast, and Niles Subdivisions, as well as in areas designated for future high-speed rail service. Careful attention to shifting economic development patterns and subsequent infrastructure and land use in the County and megaregion will be necessary to identify and resolve these potential conflicts – between the desire for passenger travel, goods movement mobility, and changing land use. New solutions and funding sources will be needed in the future to continue to strengthen and support the goods movement system while coordinating with passenger transportation systems and local land use strategies.

4.5 Economic Opportunities

Goal: Increase jobs and economic opportunities that support residents and businesses.

Over the last 20 years, there have been significant changes in the Bay Area economy that are reflected in employment trends for Bay Area goods movement-dependent industries. In the 1980s and 1990s, a major force behind growth in the region was the development and manufacturing of computer hardware driven by the growing demand for personal computer systems, creating substantial demand for high-cost goods movement services (air cargo and trucking). As these industries grew and changed their product mix, much of the manufacturing activities moved off-shore, while engineering, design, and other technical activities remained and expanded in the Bay Area. Another trend that impacted goods movement industries in the Bay Area was the movement of older, traditional manufacturing activities and warehousing and distribution jobs out of the Bay Area and overseas, primarily due to availability of cheaper land, lower labor costs, and better access to the interstate highway system from locations in the San Joaquin Valley. Employment in the transportation sector overall has remained relatively stable in the last two decades, and declined less than the average among all industries during the 2008 to 2009 recession. This is partially due to tradeoffs made as decreases in some industries and shipping volumes have been replaced by increasing Pacific Rim trade through the Port of Oakland, and supporting rail and trucking activities.

While some of these trends have moderated, on the whole, they are likely to continue into the future as the region continues to shift away from major manufacturing and towards software development and information services companies in the Bay Area, with increased specialty manufacturing in the biotech, and other high-technology industries that want to take advantage of the region's highly skilled workforce. Clean energy technology is another area of growth in Alameda County, as well as in the greater region. Tesla, headquartered in Palo Alto and with a major manufacturing facility in Fremont, is an international leader in electric personal vehicles. Startups such as LS9 in San Francisco are working in partnership with companies such as Proctor and Gamble and Chevron to produce renewable fuels and sustainable chemicals for consumer goods and fuels. These innovators are contributing to a shift in local manufacturing and employment, as well as influencing transportation systems and operations worldwide through development of new technology.

In the future, Alameda County and the Bay Area will continue to be closely linked to the surrounding region, such as the farm-to-market economies of the nearby San Joaquin Valley or North Bay. An important component of the region's economic development plans is to move up the agricultural and food product value chain, especially for exports. This will require strong industrial lands supply, logistics centers, and maintaining access to the regional and global gateways of Alameda County.

In the next 30 years, major industry job trends in the Bay Area are expected to mirror national trends. Nearly 73 percent of total employment growth is projected to be in the professional services, health and education, and leisure and hospitality sectors. Construction and manufacturing jobs are projected to remain stable and/or grow slightly through 2040. Industry sectors contain a wide spectrum of wages, which correspond to the skill levels and training needed for different occupations. Goods movement-dependent industries provide a number of jobs for middle-income and low-income workers, and often require only a high school education. The construction, manufacturing and wholesale sectors have significant numbers of jobs in middle-income occupations, while the retail sectors have higher shares of low-income jobs.[16] Supporting these types of goods-dependent industries will be crucial to fulfill the County's goals of developing jobs at all income and skill levels and providing economic opportunities to its residents.

Oakland Global Trade and Logistics Center

In April 2011, the Oakland Redevelopment Agency led a joint planning effort along with the Port for a master planned development of both the Port of Oakland and city-owned Oakland Army Base lands. Receiving a $15 million TIGER grant in 2012, the first phase of the plan, currently underway, includes a new rail yard with plans to stage railcars for new and existing customers. The Port Rail Yard will significantly increase rail capacity from approximately 17 rail cars to 200 cars at a time.

Future phases include an intermodal rail terminal, a new bulk marine terminal, 30 acres of truck parking and service areas, 2 million square feet of new warehousing space, and a new recycling center. The new facilities will provide unparalleled multimodal connectivity and a high level of service to tomorrow's logistics providers and industries. Rail, truck, and intermodal transfers will be streamlined to meet the needs of agricultural, manufacturing, and other industries.

As of February 2014, the City and the Port have identified $500 million in funding. For each dollar of investment, the project is forecast to generate $2.16 in value-added to the public in the form of lower cost goods, and air quality, traffic, and safety benefits. Through December 2013, 328 local employees have been hired for the project. The project is expected to eventually bring over $2 billion in business revenue and wages and salaries to the region, and is projected to create over 28,000 direct and indirect jobs.

[16] ABAG *Plan Bay Area Economic Forecasts.*

5.0 CONCLUSIONS

Goods movement is a critical element of the transportation system in Alameda County, the San Francisco Bay Area, and the larger Northern California megaregion. Because the markets and the infrastructure systems that comprise the goods movement system extend well beyond county, metropolitan planning organization (MPO), and even megaregion boundaries, Alameda County, Metropolitan Transportation Commission (MTC), and all of the Northern California transportation agencies need to work together to plan for and advocate on behalf of goods movement needs that affect their citizens and businesses.

With the continuing focus at the national level on rebuilding the U.S. position as a major exporter and manufacturer, investments in the Northern California goods movement system are critical to meeting national economic and trade goals, and is worthy of state and federal support. Aside from the economic linkages among the regions that comprise the Northern California megaregion and that are supported by local goods movement infrastructure, the Northern California goods movement system serves important functions for the state and national economy. Ports and airports in the Bay Area, for example, are leading exporters of a wide range of products, including bulk exports, high-value agricultural and food products, and high-value manufacturing products. In addition, the Bay Area continues to be a world leader in high-technology systems development and is applying its technology innovation skills to clean energy products, advanced biomedical and pharmaceutical development, and advanced transportation technology.

Alameda County sits at the heart of this dynamic economy and goods movement system. Much of the megaregion's critical port, airport, interregional highway and rail, and intraregional highway infrastructure is located in Alameda County. While the County reaps many benefits from its role as a goods movement service and infrastructure provider, it also pays a price in terms of public health impacts on communities adjacent to the goods movement facilities, costs to maintain the infrastructure, and impacts the County's environment. But even these challenges can create opportunities.

Addressing regional issues requires working together at all levels of government and across jurisdictional boundaries. Alameda County is working to develop partnerships with state and federal agencies and the private sector to implement innovative approaches to addressing its goods movement challenges, and to continue to provide high-quality freight transportation to local, regional, state, and national economies. These pursuits also have co-benefits in terms of providing diverse job opportunities, building a cleaner environment, and creating healthier neighborhoods. Nevertheless, the ongoing need for freight-focused funding and attention to goods movement related issues at all levels will continue to challenge Alameda County and its partners in the future. The Alameda Countywide Goods Movement Plan and Collaborative, in partnership with the MTC regional goods movement plan, will provide the foundation for ongoing improvements to the goods movement system and will forge lasting partnerships involving all of the key stakeholders in the Northern California megaregion.