Appendix G

Freight Demand Forecasts

ALAMEDA COUNTY/REGIONAL GOODS MOVEMENT PLAN

Task 3b – Freight Forecast and Growth in Freight Demand

Final Technical Memorandum

prepared for

Alameda County Transportation Commission

and

Metropolitan Transportation Commission

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1.0 INTRODUCTION

Long-term freight forecasts were developed for the Alameda Countywide / Metropolitan Transportation Commission (MTC) Regional Goods Movement Plans. These forecasts represent a "business as usual" (or a baseline) scenario that takes into account some of the effects of known investments, such as the Oakland Army Base Development, but in general may be subject to change based on other local and regional investments and policies. These forecasts will help to understand future industry needs for the transport of goods to help assess the market and modal investment needs.

Section 2.0 of this report describes the data collected, an assessment of its appropriateness for use in forecasting, and the forecasting methodology used to estimate the future growth in demand for the transport of goods. The demand forecast is presented in both tons and value of goods moved. The primary data source for the freight forecast is the Federal Highway Administration's (FHWA) Freight Analysis Framework version 3 (FAF3) forecast. The FAF3 data is used for several reasons: 1) It is the most comprehensive publicly available data on commodity flows that is used throughout jurisdictions in the United States, 2) it is built using various robust base data sources, including the commodity flow survey, and it is updated regularly to reflect the most accurate economic trends (the latest forecast data takes into account the effect of the recession), 3) it is available at a geographic level of detail that would allow us to perform a sound disaggregation. Other data sources and studies, including the 2013 Oakland Army Base Development Environmental Impact Report (OAB EIR)[1] and the 2013 Caltrans air cargo groundside needs study[2], were also used to develop shares and "control totals" for cargo related to ports and airports in the Bay Area, and make adjustments to specific commodity flows disaggregation and rail carload/truck modal splits for counties in the Bay Area.

This report provides a variety of summaries of the freight forecast. In particular, Section 3.0 of this report provides various summaries and brief descriptions of the freight forecast for the Bay Area and its nine counties; it shows the expected growth in the national and global markets (origins and destinations) and mode splits by county. This section also shows the future key commodities from/to/within the Bay Area, from/to counties in the Bay Area, and those comprising inter-regional freight flows. Additional summaries of this data are also used in various reports of this study, including Task 2c: Infrastructure, Services and Demographics/Freight Flow Trends, Task 2d: The importance and benefits of freight movement, and Task 3c: Needs, Issues and Opportunities.

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[1] http://www2.oaklandnet.com/Government/o/PBN/OurServices/Application/DOWD009157 (last accessed on July 15, 2014)

[2] Caltrans, *Air Cargo Groundside Needs Study*, Final report, July 2013.

Section 4.0 of this report provides information on the 2014 Alameda County Transportation Commission's (Alameda CTC) Travel Demand Model[3] that will be used in studying the current and forecast corridor level truck volumes, and how the disaggregated FAF3 freight forecast is used to vavlidate/calibrate the model. Travel demand models in general cannot estimate truck volumes as well as auto volumes, and thus truck volumes usually needs to be validated using additional data sources. This section also provides a comparison of the 2013 California State Rail Plan[4] train volume forecasts and Union Pacific Railroad's train volume forecasts presented in August 2013[5]. Simple arithmetic adjustments will be made to train volumes by corridor based on these comparisons.

For corridor level traffic forecasting, it was determined necessary to formalize the Alameda CTC model adjustments in the form of a technical memorandum, and to further review train volume forecasts that are included in the OAB EIR to identify appropriate adjustments to the California Rail Plan train volume forecasts.

1.1 Key Findings

This section summaries the key findings from each of the freight flow forecast sections:

1.1.1 Total Freight Flows

By 2040, Alameda County, Contra Costa County and Santa Clara County will continue to dominate freight flows by tonnage; By value, Alameda County, Santa Clara County, and San Mateo County will dominate freight flows. The Compound Annual Growth Rate (CAGR) of freight flows by tonnage in various counties in the Bay Area is expected to range between 1.3-1.8%, while that in freight value is expected to range between 2.1-3.5%. This trend is similarly shared by other regions in the United States, where growth in terms of value generally will outpace growth by tonnage. Specifically for Alameda County, a CAGR of 1.7% is estimated for tonnage, and a CAGR of 2.7% is estimated for value. The implications of the expected growth in freight flows will generate both positive benefits in terms of GDP and employment, as well as negative effects such as congestion, pollution and others. Thus, strategies to promote positive benefits while mitigating the negative consequences will be key importance.

[3] http://www.alamedactc.org/app_pages/view/8079 (last accessed on July 15, 2014)

[4] Caltrans, *California State Rail Plan*, Final document, April 2013.

[5] Union Pacific Railroad, Presentation titled "Northern California UP Unified Service Concept Analysis" made on August 2, 2013.

1.1.2 Freight Flows by Direction of Movement and Market

Among the international trade flows both for the Bay Area and Alameda County, exports are expected to grow faster than imports for both tonnage and value. Both exports and imports are also expected to grow faster than domestic trade. An increasing share of the Bay Area imports are likely to use gateways outside the Northern California mega-region, while an increasing share of the Bay Area exports are likely to use trade gateways inside the Northern California mega-region. In contrast to rest of the Bay Area, Alameda County is projected to make slightly better utilization of the gateways inside the Northern California mega-region, which is reasonable given the closeness to two major international trade gateways, and availability of support infrastructure for the port operations in the nearby cities such as Oakland, San Leandro, Hayward.

1.1.3 Freight Flows by Trading Partner

The major trading partners to the Bay Area by tonnage are expected to be Eastern Asia, Northern San Joaquin Valley region, Rest of California, Sacramento Metropolitan Statistical Area, Northern Central Coast region of California and Los Angeles Combined Statistical Area. On the other hand, the major trade partners to the Bay Area by value are expected to be Eastern Asia, Los Angeles Combined statistical Area, East North Central and Mountain regions of the U.S. For Alameda County, the growth patterns for the various groups of trading partners are very similar to that of the entire Bay Area. However, the specific major trade partners differ slightly.

1.1.4 Freight Flows by Trade Gateway (Port/Airport)

Among the seaports, the ports of Oakland, Richmond and San Francisco are expected to be the busiest in terms of total tonnage and value. The Port of Oakland is expected to handle a substantial share of the international trade by tonnage and value. Among the airports, San Francisco International Airport is projected to grow in air cargo tonnage and value at a faster pace than Oakland International Airport and Mineta San Jose International Airport. San Francisco International Airport is expected to continue handling a majority of the international air cargo, while Oakland International Airport is expected to continue handling a majority of the domestic air cargo.

1.1.5 Freight Flows by Mode

Considering the freight flows for the Bay Area, truck only and rail only modes are likely to grow at about the same moderate growth rate both in terms of tonnage and value, while the multiple modes and mail mode, which includes truck-to-rail intermodal, is projected to grow rapidly. Increasing use of third-party logistics providers (3PLs) and partnerships between trucking firms and railroads will likely enable this growth. Air cargo in the Bay Area is also projected to have a moderate-to-high growth.

1.1.6 Freight Flows by Commodity

A few groups of commodities will likely experience the highest growth rate by value in the future, and thus will likely have significant impact on the region's economy and goods movement infrastructure. Their key characteristics are described below:

- **High-valued and Time-sensitive products**: A significant number of businesses that trade high-valued electronics, precision instruments, pharmaceuticals and other chemicals are located in the Bay Area, and also in Alameda County. The light density, compact, fragile and time-sensitive nature of these commodities require high expenditure on logistics services including the use of the air mode for international trade, use of less-than-truckload trucks, short-distance haul, and frequent trips between the related business locations or between a business location and the regional international airports.

- **Containerized imports through the Port**: These are often a wide mix of household and office products, also called mixed freight. They are usually stored at warehouses or distribution centers prior to reaching a wholesale or retail outlet. Economic benefits of the growth in international containerized imports to the Bay Area will mainly come from the Port of Oakland operations, and some of the logistics businesses serving the port and located in the Bay Area. The economic benefits are also likely to increase due to the completion of Oakland Army Base Development project and associated rail improvements, which includes the construction of trade and logistics facilities for handling freight.

- **Containerized exports through the Port**: The Port of Oakland will continue to capture a majority of the growth in containerized exports in Northern California. Agriculture related products (such as nuts, canned and frozen vegetables and fruits, rice, etc.) contribute the most to the growth in containerized exports through the port; the production of these will remain mostly outside the Bay Area, with the exception of wine. The effects of Oakland Army Base development project on containerized exports will also be similar to that for the containerized imports. Due to a relatively high usage of freight storage in locations in the mega-region but outside the Bay Area, some of the economic benefits will remain uncaptured.

In addition, a few groups of commodities will likely experience the highest growth rate by tonnage in the future, and thus will likely have the most impact on the goods movement system infrastructure in the region. Their key characteristics are described below:

- **International bulk imports/exports**: The bulk marine terminals and refineries in the Bay Area, particularly in the counties of Contra Costa and Solano, and a proposed bulk terminal facility at the Port of Oakland as part of the Oakland Army Base Development project will contribute the most growth in international tonnage. The high density commodities of

waste/scrap metals are moved mostly by truck from recycling facilities in different parts of the Bay Area and mostly by rail from outside the Bay Area. Although the growth rate in freight tonnage of the crude petroleum imports and exports of petroleum-based products such as gasoline will not be high, the absolute increase in freight tonnage will still be high. In addition, with the refineries shifting their crude oil intake from international imports through marine terminals towards North Dakota's Bakken crude oil supply, the transportation system will likely face some rail capacity and rail safety issues, and possible some underutilization of oil terminals.

- **Domestic consumption of fuels and construction related products:** The presence of refineries in the Contra Costa Counties and Solano Counties will continue to position them as the primary supplier of gasoline and other fuels throughout Northern California. The growth in domestic transportation of gasoline and other fuels is higher for the movements to outside the Bay Area than the movements within the Bay Area. Aside from gasoline and other fuels, the growth in housing and businesses, and several brownfield development projects in the Bay Area and Alameda County will result in a significant increase in the demand for construction related gravel and non-metallic mineral products.

With limited alternative interregional routes to carry freight flows, the I-580 corridor will become even more critical in the future: The analysis of freight flows in the Bay Area and Alameda County indicate that providing good east-west connectivity along the I-580 corridor will be critical in the future. A concerted effort would be needed along with partners in the mega-region to determine strategies and investments for this corridor.

1.1.7 Inter-Regional Freight Flows

Top commodities that move between the mega regions include mixed freight, agriculture products, waste/scrap, foodstuffs and construction materials. The growth rate of movements to/from the Sacramento metropolitan statistical area is higher than that of other neighboring region.

2.0 DATA AND METHODOLOGY FOR FREIGHT FORECASTING

This section provides a description of the data and methods used to develop the freight forecast for the Alameda Countywide/MTC Regional Goods Movement Plans. The purpose of freight forecasting is to understand the freight flows traveling into/out of the San Francisco Bay Area[6], and its individual counties (including Alameda County) and how the region and the county trades goods with MTC's neighboring regions (including the Sacramento[7], Northern San Joaquin Valley[8], and Northern Central Coast[9] regions), and with national and global markets. The Bay Area and the three neighboring regions together are also called the "Northern California mega-region" in this report.

The freight flows database developed for this Plan consists of base year (2012) and future year (2040) multimodal and multi-commodity tonnages and values for domestic and various types of international trade flows, such as seaport exports/imports, airport exports/imports, and border crossing exports/imports. The knowledge of the current and future freight demand by origin-destination pair, by mode, and by commodity, helps to identify the goods movement needs, investments and strategies for the Plan. It is important to note that the freight forecast developed for the Plan only includes freight flows that move within, into, or out of the region and does not include pass through freight flows or their growth that may exist in the Northern California mega-region, especially on corridors such as I-5 and US-101. It is likely that the only major facility within the Bay Area that carries pass through freight is US-101 and this pass through traffic is considered negligible relative to freight flowing within/to/from the region..

2.1 Data and Data Assessment

For the Plan, the Federal Highway Administration's (FHWA) Freight Analysis Framework version 3 (FAF3) commodity flows database[10] was used as the primary data source, as mentioned earlier. The FAF3 database is also commonly used by many state and regional agencies for freight planning. The FAF3 database is available in Microsoft Access (MS Access) format, and is accompanied by a network assignment of freight flows in geographical information system (GIS) format.

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[6] The MTC's planning region or the San Francisco Bay Area consists of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma Counties.

[7] The Sacramento region consists of El Dorado, Placer, Sacramento, Sutter, Yolo and Yuba Counties.

[8] The Northern San Joaquin Valley region consists of Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare Counties.

[9] The Northern Central Coast region consists of Monterey, San Benito and Santa Cruz Counties.

[10] http://www.ops.fhwa.dot.gov/freight/freight_analysis/faf/ (last accessed on July 15, 2014)

FAF3 provides estimates for tonnage, value, and domestic ton-miles by origin and destination zone[11], commodity type, and mode[12] for 2007, the most recent year (the current version includes 2012 data), and forecast through 2040. It integrates data from a variety of sources including the 2007 Commodity Flow Survey (CFS), U.S. border crossings data, PIERS[13] imports/exports data and others, to create a comprehensive picture of freight movement among states and major metropolitan areas by all modes of transportation. In the most recent version of FAF3, (i.e., version 3.5 released on May 8, 2014) regional provisional annual data for 2012 were included. In an earlier version of FAF3, (i.e., version 3.4 released on January 10, 2013) the regional forecast data for the years 2015-2040 in five year increments were revised. The provisional estimates and the forecast for 2012 take into account the effect of the 2008-2009 global recession, and the economic recovery that has occurred since then.

The FAF3 database was assessed to determine if it could meet the purpose of a freight forecast for the Plan. Key observations that were critical in understanding if additional data and methods would be needed for freight forecasting, include:

1. **Commodity level detail in the FAF3 database is generally sufficient to identify needs, investments and strategies for the Plan.** Commodities in the FAF3 database are classified at the 2-digit level of the Standard Classification of Transported Goods (SCTG) as shown in Table 2.1.

[11] A FAF zone is typically a combined statistical area, or a metropolitan statistical area, or remaining parts of a State. However, in some cases, it can also represent an entire State.

[12] For international trade, FAF provides the inland transportation mode. For example, FAF provides data on whether imports to the Port of Oakland leave the port via rail or truck.

[13] Port Import-Export Reporting System (PIERS) is a data product of the Journal of Commerce and is based on analysis of customs data.

Table 2.1 FAF3 Database Commodity Codes and Names

SCTG	Full Commodity Name	FAF3 Abbreviation
01	Live animals and live fish	Live animals/fish
02	Cereal grains	Cereal grains
03	Other agricultural products	Other ag prods.
04	Animal feed and products of animal origin, not elsewhere classified (n.e.c.)	Animal feed
05	Meat, fish, seafood, and their preparations	Meat/seafood
06	Milled grain products and preparations, bakery products	Milled grain prods.
07	Other prepared foodstuffs and fats and oils	Other foodstuffs
08	Alcoholic beverages	Alcoholic beverages
09	Tobacco products	Tobacco prods.
10	Monumental or building stone	Building stone
11	Natural sands	Natural sands
12	Gravel and crushed stone	Gravel
13	Nonmetallic minerals n.e.c.	Nonmetallic minerals
14	Metallic ores and concentrates	Metallic ores
15	Coal	Coal
16	Crude Petroleum	Crude petroleum
17	Gasoline and aviation turbine fuel	Gasoline
18	Fuel oils	Fuel oils
19	Coal and petroleum products, n.e.c. (Note: This includes primarily natural gas, selected coal products, and products of petroleum refining, excluding gasoline, aviation fuel, and fuel oil.)	Coal-n.e.c.
20	Basic chemicals	Basic chemicals
21	Pharmaceutical products	Pharmaceuticals
22	Fertilizers	Fertilizers
23	Chemical products and preparations, n.e.c.	Chemical prods.
24	Plastics and rubber	Plastics/rubber
25	Logs and other wood in the rough	Logs
26	Wood products	Wood prods.
27	Pulp, newsprint, paper, and paperboard	Newsprint/paper
28	Paper or paperboard articles	Paper articles
29	Printed products	Printed prods.
30	Textiles, leather, and articles of textiles or leather	Textiles/leather
31	Nonmetallic mineral products	Nonmetal min. prods.
32	Base metal in primary or semi-finished forms and in finished basic shapes	Base metals

SCTG	Full Commodity Name	FAF3 Abbreviation
33	Articles of base metal	Articles-base metal
34	Machinery	Machinery
35	Electronic and other electrical equipment and components and office equipment	Electronics
36	Motorized and other vehicles (including parts)	Motorized vehicles
37	Transportation equipment, n.e.c.	Transport equip.
38	Precision instruments and apparatus	Precision instruments
39	Furniture, mattresses and mattress supports, lamps, lighting fittings	Furniture
40	Miscellaneous manufactured products	Misc. mfg. prods.
41	Waste and scrap	Waste/scrap
43	Mixed freight (Note: This includes items for grocery and convenience stores, supplies and food for restaurants and fast food chains, hardware and plumbing supplies, office supplies, and miscellaneous.)	Mixed freight
99	Commodity unknown	Unknown

Source: FHWA FAF3 User's Guide, June 2012.

2. **Market level detail (i.e., geographic) in the FAF3 database is not aligned with the Plan geographies but can be transformed to the latter using a disaggregation method and some adjustments.** The FAF3 database has the advantage of identifying freight flows that are domestic (national markets) and international (global markets). However, there is difficulty in directly using the FAF3 database for the Plan. FAF3 divides the U.S. geography into 123 domestic goods movement zones. The San Francisco Bay Area is a single zone in the FAF3 database, and the FAF3 definition of this zone includes not only the counties in the MTC's planning region but also San Benito and Santa Cruz counties. As a corollary, FAF3 is also not directly useful to understand Alameda Countywide goods movement, as Alameda County is not defined as a stand-alone county. Additionally, most of the neighboring regions in the Northern California mega-region are not presented separately in the FAF3 database. These difficulties were overcome by applying a disaggregation method on the FAF3 database and making some adjustments as discussed in Sections 2.2 of this report.

3. **Mode definitions in the FAF3 database limit the ability to fully understand mode splits but can be complemented with additional data.** The various definitions of modes in the FAF3 data are shown in Table 2.2 below. The mode "multiple modes and mail" in the FAF3 database includes truck-to-rail intermodal and mail (or parcel delivery) freight demand. The breakdown of this mode to its constituent sub-modes cannot be determined, however instead, local information on truck-to-rail intermodal traffic data and forecast was used as discussed later in this report.

Table 2.2 FAF3 Database Mode Definitions

Code	Mode	Description
1	Truck	Includes private and for-hire trucks. Does not include trucks that are part of Multiple Modes and Mail or truck moves in conjunction with domestic air cargo.
2	Rail	Includes any common carrier or private railroad. Does not include rail that is part of Multiple Modes and Mail.
3	Water	Includes shallow draft, deep draft, Great Lakes and intra-port shipments. Does not include water that is part of Multiple Modes and Mail.
4	Air (includes truck-air)	Includes shipments typically weighing more than 100 pounds that move by air or a combination of truck and air in commercial or private aircraft. Includes air freight and air express. Does not include shipments weighing 100 pounds or less which are typically classified with Multiple Modes and Mail. In the case of imports and exports by air, domestic shipments move by ground to and from the port of entry or exit and are categorized with Truck.
5	Multiple Modes and Mail	Includes shipments by multiple modes and by parcel delivery services, U.S. Postal Service, or couriers. This category is not limited to containerized or trailer-on-flatcar shipments.
6	Pipeline	Includes crude petroleum, natural gas, and product pipelines. Note: Does include flows from offshore wells to land which are counted as Water moves by the U.S. Army Corps of Engineers. Does not include pipeline that is part of Multiple Modes and Mail.
7	Other and unknown	Includes movements not elsewhere classified such as flyaway aircraft, and shipments for which the mode cannot be determined.
8	No Domestic Mode	Includes shipments that have an international mode, but no domestic mode and is limited to import shipments of crude petroleum transferred directly from inbound ships to a U.S. refinery at the zone of entry. This is done to ensure a proper accounting of import flows, while avoiding assigning flows to the domestic transportation network that does not use it.

Source: FHWA FAF3 User's Guide, June 2012.

4. **FAF3 is not a chained trip model, thus portions of international flows can be counted as domestic if a transfer happened within the study region.** While advanced methods can be used to separate out domestic from international, this is an intensive process that cannot be realistically done for this project. Thus, the results are reported as in the original FAF3 version. This can be potentially confusing and thus careful interpretation needs to be made. For instance, outbound domestic flows from Alameda County to San Joaquin County can both be "true" domestic flows, or international flows that moved from a temporary storage area in Alameda County, to a warehouse in San Joaquin County.

5. **FHWA provides FAF3 based corridor level freight flows that are only for the truck mode, are limited to long-distance trucks, and are assigned to a limited set of freeways; hence, alternate corridor traffic estimation models were used for which the disaggregated FAF3 database provided a broad verification dataset.** FHWA provides assignments of long-distance trucks (as a combined total of loaded and empty trucks) to a national highway network based on FAF3 truck tonnage, however, the traffic assignment is crude and

restricted to a limited set of freeways. This may not be sufficient to understand future corridor level traffic and performance of modes other than truck (e.g., rail), and also not sufficient to identify investment needs on the different classes of truck roadways (freeways, arterials, collectors and local streets). Hence, alternate corridor traffic models and forecasts are suggested later in this report; the disaggregated FAF3 database served as a tool to verify data in those models and forecasts, as discussed later in this report.

Despite these limitations the FAF3 database, with enhancements described in the following section, was utilized as a key dataset for the Plan.

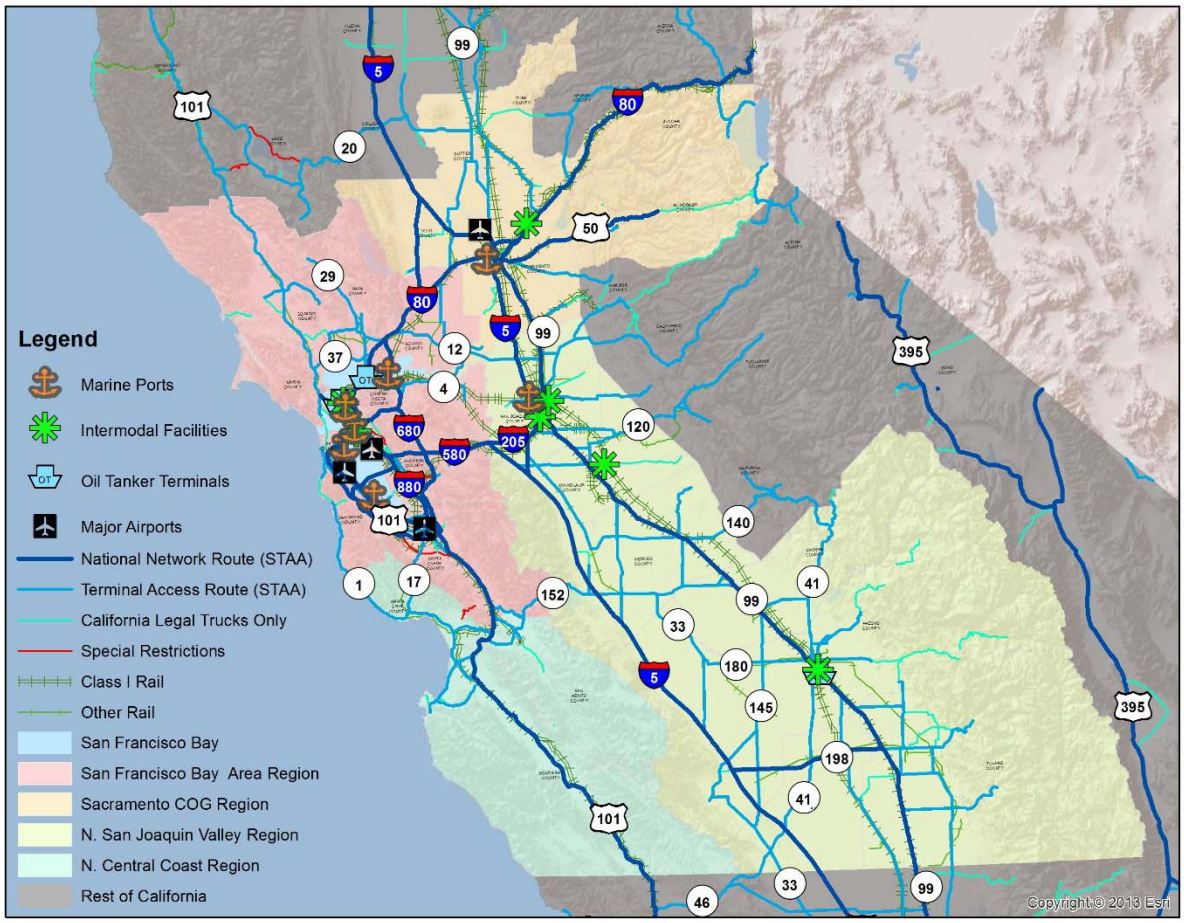
2.2 Methods and Assumptions

The methods and assumptions applied to the FAF3 database to develop a freight forecast for the Alameda Countywide / MTC Regional Goods Movement Plans are described in the following sections.

2.2.1 Market wise Disaggregation of FAF3 Database

A disaggregation method that is based on econometric relationships and trade data was applied on the FAF3 database to estimate market flows, including Bay Area county-to-county flows, Bay Area county-to-trade gateway (e.g., ports and airports) flows and vice versa, Bay Area county and trade gateway-to-neighboring region (i.e., multi-county zones in the Northern California mega-region) flows and vice versa, and Bay Area county and trade gateway-to-rest of the regions in the U.S. (that are partial or whole FAF3 zones) flows and vice versa. In other words, the disaggregation method estimates shares of FAF3 zone-to-FAF3 zone flows by market to the Plan geographies and its trade gateways shown in Figure 2.1.

Figure 2.1 Map of Alameda Countywide/MTC Regional Goods Movement Plan Geographies (or the Northern California Mega-region)



Source: Caltrans GIS data as of July 2013; Cambridge Systematics.

The disaggregation method is based on the fundamental understanding of how the economic sectors and households in a county or a region produce and consume different commodities. Econometric relationships took the shape of computerized regression equations developed and estimated by Cambridge Systematics in a 2009 study for the Federal Highway Administration for FAF version 2 (FAF2) disaggregation.[14] The equations relate production and consumption tonnages and dollars of the commodities to the amount of employment that each county has in each of the producing and consuming sectors, and for some products or commodities other variables including population, farm acres, livestock, and electricity generation capacity also

[14] Federal Highway Administration, Development of a Computerized Method to Subdivide the FAF2 Regional Commodity OD Data to County Level OD Data, Final Report, January 2009.

explained the productions and consumptions. Through applying data[15] by county for the explanatory variables, the share of the region's (i.e., FAF3 zone that is underlying the county) production and consumptions of each commodity that occurs in that county in both tonnages and dollars were estimated. In the case of flows sent or received at a trade gateway, commodity wise trade data[16] in tonnage and dollars was used to estimate the share of the region's (i.e., FAF3 zone that is underlying the trade gateway) trade of each commodity by direction of movement that occurs at that trade gateway in both tonnages and dollars.

Although the commodity production and consumption shares for Bay Area counties were kept at county levels, in order to control the size of the disaggregated FAF3 database, the shares for the counties in the neighboring regions to the Bay Area were aggregated to the regional level[17]. To demonstrate the disaggregation method, consider an example of a market flow of Port of Oakland imports to Contra Costa County of the commodity of "articles of base metal" in 2012. The tons of imports of this commodity from the international trade gateways in the Bay Area FAF3 zone to the Bay Area FAF3 zone is estimated to be approximately 533,500 annual tons in 2012. Based on trade data, 91.46% of the articles of base metal imports in the Bay Area come from Port of Oakland, whereas based on regression equation for the same commodity, 6.14% of the total flows of the Bay Area FAF3 zone are expected to be consumed at Contra Costa County. The market flow is thus estimated as the product of the number and the two percentages as about 30,000 annual tons in 2012.

2.2.2 Aggregation of FAF3 Database

The FAF3 zones outside the Plan geographies were aggregated to trading partner regions as shown in Table 2.3. The aggregation helped reduce the dimensionality of the commodity flow database.

Table 2.3 Trading Partner Region Definition for FAF3 Zones outside the Plan Geographies

Trade Partner Region Name	Geography to which FAF3 Zone belongs to

[15] For estimating the region's share of a county, County Business Pattern sector wise employment data, and U.S. Census population data in the Northern California mega-region that is compatible with FAF3 base year of 2007 was used as data. Other data is based on the 2009 FHWA study.

[16] For estimating the region's share of a trade gateway, USA Trade Online data was used for international trade through the trade gateways in the Northern California mega-region, 2012 U.S. Corps of Engineers' Waterborne Commerce data was used for domestic trade through the ports in the Northern California mega-region, and a less detailed 2013 Caltrans Air Cargo Groundside Needs Study data was used to collect domestic trade through the airports in the Northern California mega-region.

[17] The production and attraction factors used for the different markets are included in the MS Access database that accompanies this report.

Trade Partner Region Name	Geography to which FAF3 Zone belongs to
East North Central	IL, IN, MI, OH, WI
East South Central	AL, KY, MS, TN
Middle Atlantic	NJ, NY, PA
Mountain	AZ, CO, ID, MT, NM, NV, UT, WY
New England	CT, MA, ME, NH, RI, VT
Pacific (Except CA)	AK, HI, OR, WA
South Atlantic	DC, DE, FL, GA, MD, NC, SC, VA, WV
West North Central	IA, KS, MN, MO, ND, NE, SD
West South Central	AR, LA, OK, TX
Canada	Canada
Mexico	Mexico
Rest of Americas	Rest of Americas
Europe	Europe
Africa	Africa
SW & Central Asia	SW & Central Asia
Eastern Asia	Eastern Asia
SE Asia & Oceania	SE Asia & Oceania
Los Angeles Combined Statistical Area, CA	FAF3 Zone "061"
San Diego Metropolitan Statistical Area, CA	FAF3 Zone "063"
Rest of Sacramento Combined Statistical Area, CA	Rest of FAF3 Zone "062"
Rest of Remainder of California	Rest of FAF3 Zone "069"

Source: Cambridge Systematics

Note: Plan geographies include Bay Area and rest of the mega-region. Nevada County belonging to the FAF3 zone "062" is not part of the mega-region. This represents Rest of Sacramento CSA, CA.

2.2.3 Revision of Production and Attraction Factors for Specific Commodities

While the production and attraction regression equations in the disaggregation method have statistically the best fit, comparisons of the estimated disaggregated freight flows of some commodities showed a strong deviation from the employment base and population base in the Plan geographies. In particular, the commodities of textiles/leather, crude petroleum and coal and petroleum products including gasoline, aviation turbine fuel, fuel oils, lubricants and other products seemed to be inappropriately disaggregated to the Plan geographies. For example, Alameda County was estimated to contribute only 3.5% of textiles/leather (SCTG 30) production by value in the FAF3 zone of Bay Area despite being the second highest among counties in terms of textile products output (see Task 2C report, insert name); and, Contra Costa County was

estimated to contribute only 33% of coal and petroleum products other than gasoline, aviation fuel, and fuel oils (SCTG 19) production by tonnage in the FAF3 zone of Bay Area despite the fact that a majority of refineries are located in Contra Costa County. These production factors appeared inappropriate.

In order to overcome this, the production and attraction factors for these commodities were revised. Based on U.S. Bureau of Economic Analysis's national commodity make-use tables and knowledge about the region's production and uses of these commodities, the basis and source for revision of the disaggregation factors was selected as shown in Table 2.4[18]. As a result of this revision, the particular commodity flows were more reasonably distributed among the various Plan geographies. Looking at the earlier examples, the production factor for textiles/leather (SCTG 30) by value for Alameda County was revised to 25%, second only to San Francisco County. The production factor for coal and petroleum products other than gasoline, aviation fuel, and fuel oils (SCTG 19) by tonnage for Contra Costa County was revised to 89%, consistent with the county's share of the total crude petroleum refining capacity in the Bay Area.

[18] Even though IMPLAN based employment data for the Bay Area counties was available, to ensure consistent industry employment information for all Plan geographies, U.S. County Business Pattern data was used. And, although population forecasts for 2040 were also available at the mentioned sources, the shares of population in any Plan geography as the total for a FAF3 Zone did not change much. Therefore, the year of data disaggregation factors were also applied to FAF3's 2012 provisional data and 2040 forecast.

Table 2.4 Basis and Source for Revision of Production and Attraction Factors for Particular Commodities

Commodity	Basis for Adjustment of Production Factor	Source of Production Factor Calculation	Basis for Adjustment of Attraction Factor	Source of Attraction Factor Calculation
Textiles/Leather	Employment in Textile mills, Apparel, Leather and Allied Products Manufacturing by County	U.S. Census's 2012 County Business Pattern Employment Data	Total Population by County	Association of Bay Area Governments 2010 Population Data for Bay Area Counties; California Department of Finance 2010 Population Data for Counties outside Bay Area
Crude Petroleum	Employment in Oil and Gas Extraction by County	U.S. Census's 2012 County Business Pattern Employment Data	Refining Capacity by County	U.S. Energy Information Administration's Refineries' Total Operable Atmospheric Crude Oil Distillation Capacity as of January 1, 2014
Coal and Petroleum Products	Employment in Coal & Petroleum Products Manufacturing by County	U.S. Census's 2012 County Business Pattern Employment Data	Total Population by County	Association of Bay Area Governments 2010 Population Data for Bay Area Counties; California Department of Finance 2010 Population Data for Counties outside Bay Area

Source: Cambridge Systematics

2.2.4 Truck-to-Rail Intermodal Traffic Growth, Port related Mode Share and County wise Rail Carload/Truck Mode Share Adjustments

As noted earlier, shares of truck-to-rail intermodal traffic are difficult to identify using the FAF3 database. Local data and long-term forecasts of truck-to-rail intermodal traffic related to the Port of Oakland and other domestic truck-to-rail intermodal traffic using the rail yards near the port were therefore collected from the 2013 OAB EIR. Since the Port of Oakland loads and discharges more than 99 percent of the containerized goods moving through Northern California[19], this information was considered to be a sufficient proxy estimate of the truck-to-rail intermodal traffic in the Bay Area. Table 2.5 shows the data and forecast obtained from the OAB EIR. This shows a transformation in the mode shares of the port related truck over road and truck-to-rail intermodal, with the latter increasing from 21% to 40% in terms of annual container lifts. This local information on the growth in truck-to-rail intermodal traffic and the port related mode share transformation was used to adjust the FAF3 database.

[19] http://www.portofoakland.com/maritime/factsfigures.aspx (last accessed on July 15, 2014)

Table 2.5 Current and Future Port of Oakland Mode wise Traffic in Lifts based on OAB EIR

Port Market	2011 Traffic (Existing)	2035 Traffic (Proposed)
Ship-to-Truck or Truck over road haul	1,063,278 Lifts	1,350,000 Lifts
Ship-to-Rail via Truck (under Constrained Rail Capacity at the Port of Oakland) to Intermodal Rail Yards of Oakland Global Trade and Industry Center (OGTIC), Oakland International Gateway (OIG) and UP Terminal	282,644 Lifts (21% of Port Throughput)	900,000 Lifts (40% of Port Throughput)
Other Domestic Truck-to-Rail to Intermodal Rail Yards of Oakland Global Trade and Industry Center (OGTIC), Oakland International Gateway (OIG) and UP Terminal	338,136 Lifts	160,000 Lifts
Additional Capacity Needed to Handle Other Domestic Truck-to-Rail to Intermodal Rail Yards	N/A	371,000 Lifts

Source: 2013 Oakland Army Base Environmental Impact Report – Proposed Project Plan. NOTE: Lift refers to an intermodal unit, container or trailer lift activity.

The rail (carload service only) mode usage by industries in a county is dependent on the availability and ease of access to markets, and it affects the rail/truck mode splits. However, this is not accounted for by the disaggregation methods. Therefore, the rail carload traffic was re-allocated using county level production and attraction factors developed using the base year (2007) carload sample (traffic distribution) data in the 2013 California State Rail Plan. A change in rail freight tonnage and value in a county was accompanied by an equal and opposite change in the truck freight tonnage and value in that county, in order to keep the total freight flows estimated using the various disaggregation methods conserved within the county. This resulted in a more realistic rail carload/truck mode splits and rail utilization.

The disaggregated FAF3 database after adjustments described in the preceding sections is the designated FAF3 based freight forecast for the Alameda Countywide / MTC Regional Goods Movement Plans, and is included in the MS Access database accompanying this report. It is also provided in a MS Excel spreadsheet format. In the next section, summaries of the FAF3 based freight forecast are provided.

3.0 FREIGHT FORECAST FOR THE BAY AREA AND ALAMEDA COUNTY

This section provides summaries of the FAF3 based freight forecast for the Bay Area as a whole, and for Alameda County. Also, some comparisons are made between counties in the Bay Area. The freight forecast includes only flows that are coming into (inbound), coming out of (outbound) and traveling within (intra) a given geography; through movement flows for the geographies are not estimated. In most summaries, a compound annualized growth rate (CAGR) is computed between 2012 freight flow data/estimates and 2040 freight flow forecast. The summaries include the following:

- Total freight flows by direction of movement and market (domestic/international) for the Bay Area, Alameda County and comparisons between Bay Area counties
- Freight flows between the Bay Area and its trading partner regions (local, interregional, national, global) and between Alameda County and its trading partner regions
- Freight flows by trade gateway (port/airport only) and market (domestic/international)
- Freight flows by mode of transportation for the Bay Area, Alameda County and comparisons between the Bay Area counties. In the case of international trade flows, the mode refers to the mode used in the domestic portion of the freight flow
- Freight flows by direction of movement and commodity (2-digit SCTG level) for the Bay Area and Alameda County
- Top 10 future commodities originating in the Bay Area and Alameda County and the initial market that they would likely come from
- Top 10 future commodities terminating in the Bay Area and Alameda County and the final market that they would likely go to
- Top 3 future commodities originating from and terminating at each county in the Bay Area
- Freight flows and top commodities between grouped counties and Northern California mega-region trading partners, where the county grouping is based on originating/terminating corridor and proximity to direct access routes to trading partner regions, including:
    - San Francisco, San Mateo and Santa Clara Counties – these counties are along the US-101 corridor, which connects to SR-152 and the San Joaquin Valley region, as well as the northern central coast region;
    - Alameda and Contra Costa Counties – these counties are along the I-880, I-80, I-680 and I-580 corridors, and via I-580 connect to the San Joaquin Valley region; and
    - Marin, Napa, Solano and Sonoma Counties – these counties are along the US-101, SR-37, SR-29, SR-12 and I-80 corridors, and via I-80 connect to the Sacramento region and via SR-12 to the San Joaquin Valley region.

3.1 Total Freight Flows

Table 3.1 shows the growth in total tonnage and value of goods for the Bay Area, Alameda County and other counties in the Bay Area. A diagrammatic representation of this table is also shown in Figures 3.1 and 3.2. The tonnage and value numbers for each county should not be added together, as this would result in double counting the movements between the counties. To avoid this, the numbers corresponding to the entire Bay Area must be directly used.

The tonnage and value growth rates for Alameda County are very similar to the entire Bay Area. Although, Alameda County is growing at about the same pace as other counties in the Bay Area in terms of tonnage, several other counties are growing faster than Alameda County in terms of value. This may be attributed to the differences in the sector mixes as shown in the Task 2C report. Although Alameda County has some high-valued goods producing sectors such as high-technology products manufacturing and chemical products, it also has a high concentration of low-to-medium valued goods producing sectors such as food and beverage products packaging and distribution of coal and petroleum products.

In all of the counties in the Bay Area, the growth rate in value is higher than tonnage. There can be several reasons for this, one of the key reasons among them is the faster growth in containerized traffic for both domestic and international trade than bulk cargo movements. Containers enable fast and secured transportation of high-valued and time-sensitive products and consumer goods.

Table 3.1 Current and Future Total Freight Flows Annual Tonnage and Value Summary for Entire Bay Area and Its Constituting Counties

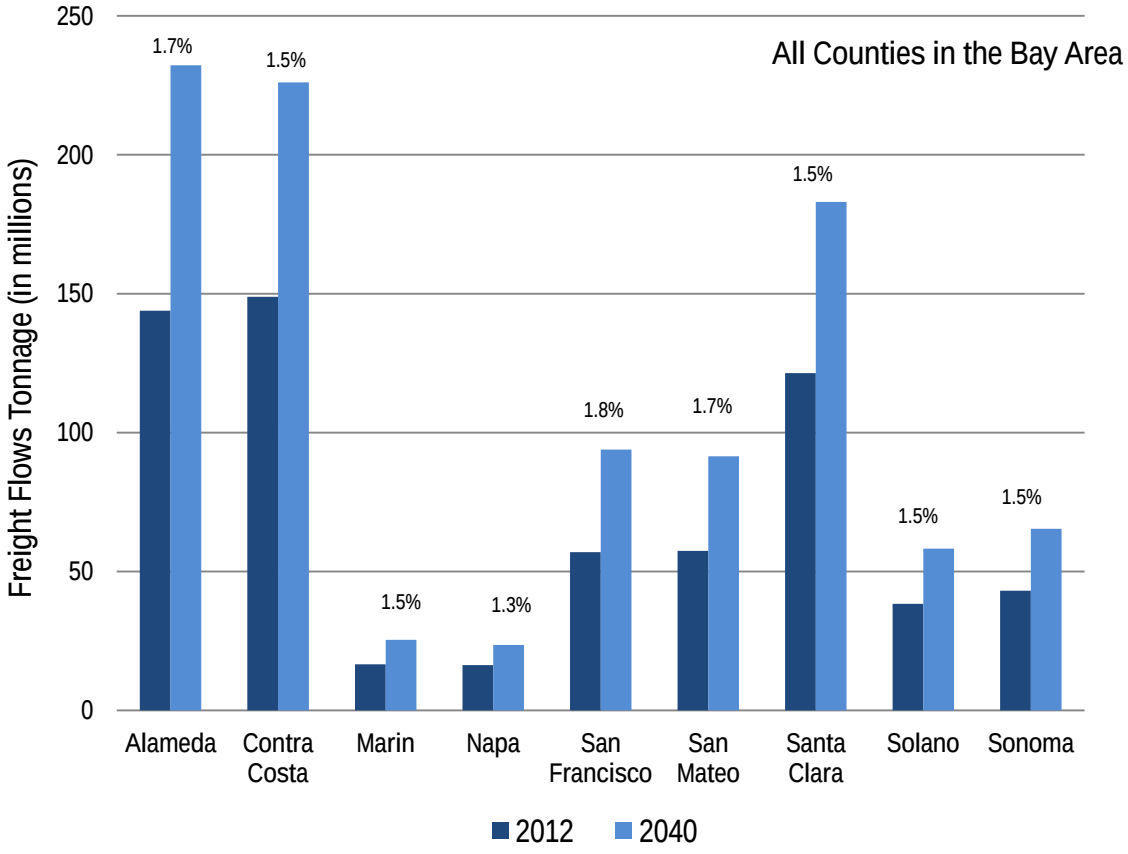
County/Region	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR (2012-40) Value
Entire Bay Area	454,146	728,767	1.7%	643,836	1,484,944	3.0%
Alameda	143,863	232,239	1.7%	234,667	497,577	2.7%
Contra Costa	148,901	226,063	1.5%	105,306	206,682	2.4%
Marin	16,602	25,388	1.5%	13,454	30,466	3.0%
Napa	16,276	23,557	1.3%	17,847	32,302	2.1%
San Francisco	56,946	93,872	1.8%	56,501	129,022	3.0%
San Mateo	57,399	91,445	1.7%	109,489	286,650	3.5%
Santa Clara	121,423	183,044	1.5%	211,955	493,986	3.1%
Solano	38,340	58,216	1.5%	31,192	71,241	3.0%
Sonoma	43,089	65,344	1.5%	43,756	98,137	2.9%

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The freight flows shown include only inbound, outbound and intra directions of movement with respect to the county/region, through movements are not included. The freight flows for the entire Bay Area does not equal the sum for all counties because when adding together the freight flows for the counties, intra-Bay Area movements are counted twice. The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040.

Figure 3.1 Current and Future Freight Flows Annual Total Tonnage

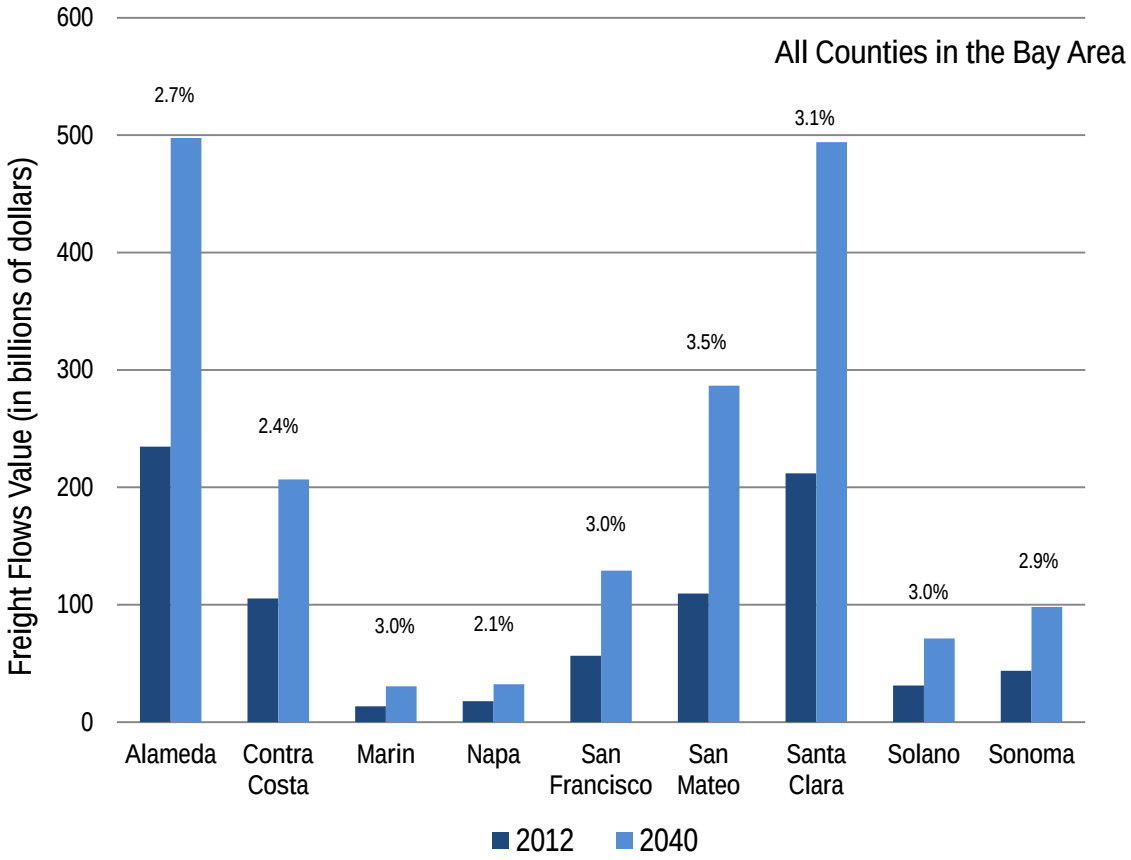
All Counties in the Bay Area



Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. The freight flows shown include only inbound, outbound and intra directions of movement with respect to the county, through movements are not included.

Figure 3.2 Current and Future Freight Flows Annual Total Value
All Counties in the Bay Area



Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. The freight flows shown include only inbound, outbound and intra directions of movement with respect to the county/region, through movements are not included.

3.2 Freight Flows by Direction of Movement and Market

To illustrate the relative growth in freight flows by direction of movement and market (domestic/international) for the Bay Area and Alameda County and to make comparisons between Bay Area counties, Figure 3.3-3.8 are used.

International trade flows for the Bay Area are projected to increase in share by tons from 14% in 2012 to 22% by 2040, and by value from 24% in 2012 to 31% by 2040. In comparison, international trade flows for Alameda County are projected to increase in share by tons from 16% in 2012 to 24% by 2040, and by value from 25% in 2012 to 33% by 2040.

Among the international trade flows both for the Bay Area and Alameda County, exports are expected to grow faster than imports in both tonnage and value. An increasing share of the Bay Area imports are likely to use gateways outside the Northern California mega-region, while an increasing share of the Bay Area exports are likely to use trade gateways inside the Northern California mega-region. International containerized imports strongly require support infrastructure, including warehouses and distribution centers. The supply of this type of infrastructure is much higher in Southern California than in Northern California, and is likely the reason for a higher growth rate in imports. Given that the San Joaquin Valley region and Reno metropolitan area in Nevada will continue to add warehouse and distribution center capacity, over the long run, the operational efficiencies of the ports, the ease of rail access and relative increases in rail and highway congestion would play an important role in deciding whether the projected growth will remain the same, or imports would shift to trade gateways inside the mega-region.

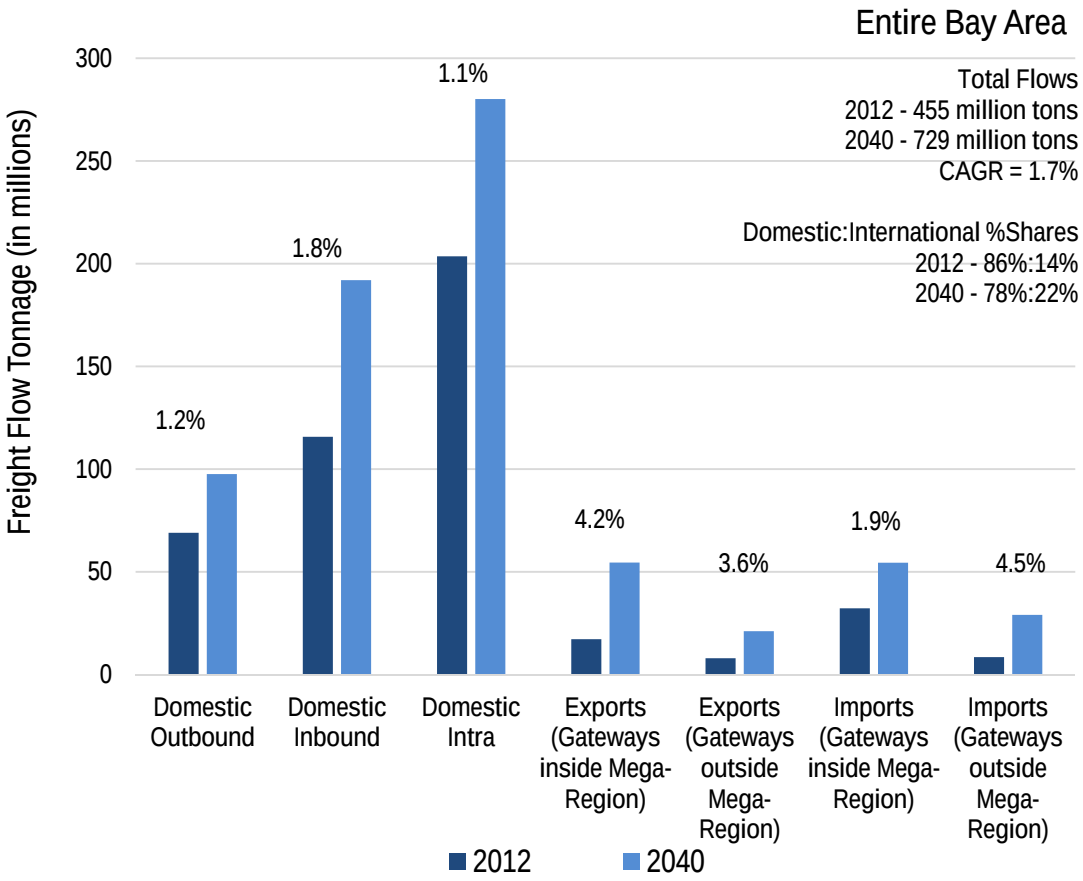
In contrast to rest of the Bay Area, Alameda County is projected to make slightly better utilization of the gateways inside the Northern California mega-region, which is reasonable given the closeness to two major international trade gateways, and availability of support infrastructure for the port operations in the nearby cities such as Oakland, San Leandro, Hayward.

Among the domestic trade flows for the Bay Area, intra-Bay Area movements are likely to dominate in tonnage in the future, however, they are not expected to have a high growth rate. The slow growth in intra-Bay Area movements is likely due to a conversion of industrial land uses that are logistics businesses (that are truck-intensive or heavily rail dependent) to less goods movement dependent industrial land uses, such as clean technology centers and business parks. The goods movement needs for the existing and newly formed residential communities and businesses will therefore be increasingly met by logistics businesses located outside the Bay Area. Domestic inbound tonnage is expected to grow the fastest. In the case of Alameda County, the highest growth rate is seen with domestic inbound tonnage from outside the Bay Area, however, the trade tonnage with the rest of the Bay Area is expected to remain the highest. In terms of value, however, domestic inbound value is expected to grow the fastest and is also projected to become the highest contributor of future total freight flows. Aside from a growth in consumption of finished products, this high growth rate can also possibly be explained on the basis that some of these freight flows that are considered domestic inbound are indeed imports from trade gateways that are stored temporarily at warehouses and distribution centers outside the Bay Area, and afterwards delivered to the Bay Area as a domestic move. There are two reasons why this currently happens in the Bay Area: shortages in large facilities for storage and high rents within the Bay Area. This trend is expected to continue into the future. Due to a high value per ton and growth rate of imported goods value, the growth rate for domestic inbound trade value consisting of a mix of "true" domestic and international traffic would also become high. Considering domestic trade value for Alameda County, the trade with areas outside the Bay Area is expected to be higher than that with rest of the Bay Area, with I-580 as the dominant corridor of trade.

Comparing market splits and changes across different counties in the Bay Area, it is understood that Alameda County is expected to be among the top in terms of international trade market share by tonnage, while it will remain in the mid-range in terms of international trade market share by value.

Figure 3.3 Current and Future Freight Flows Annual Tonnage by Direction of Movement and Market

Domestic/International), Entire Bay Area

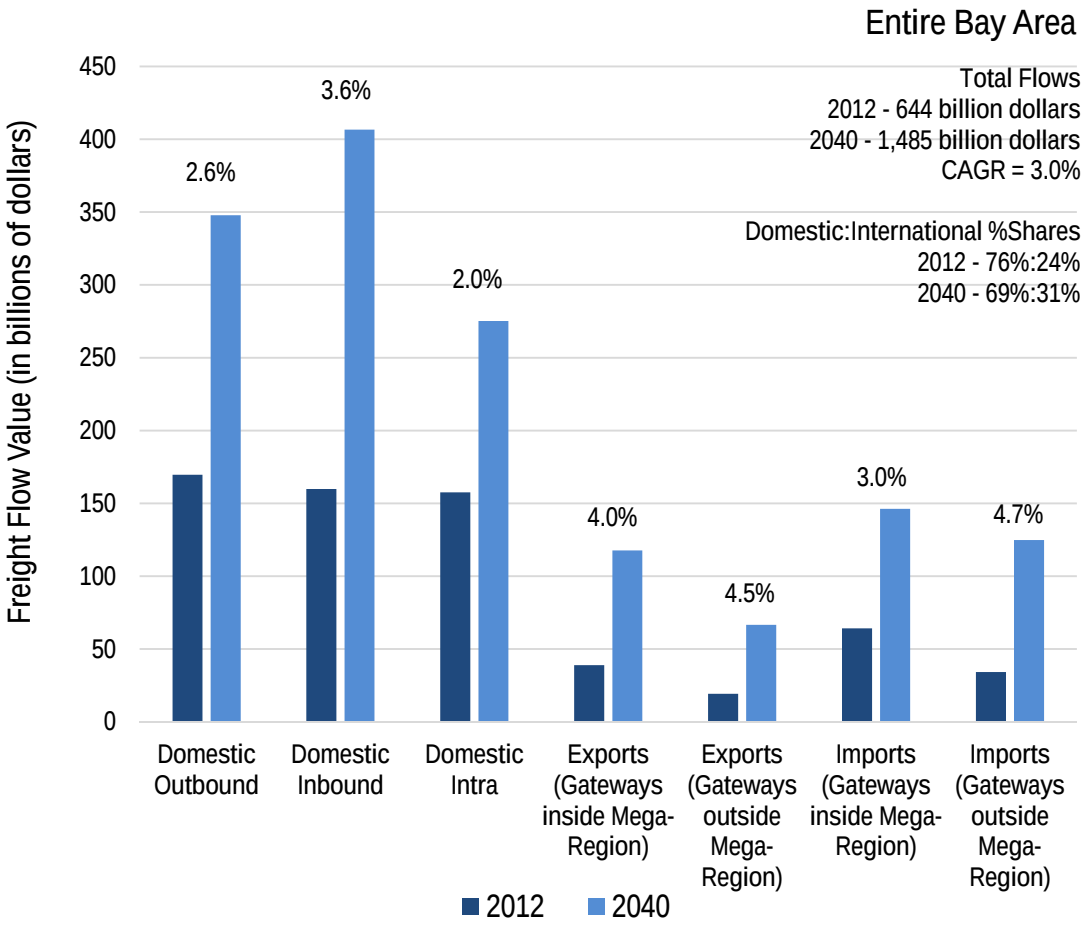


Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. "Exports (Gateways inside Mega-Region)" includes inbound exports from Bay Are as well as exports from interior U.S. Similarly, "Imports (Gateways inside Mega-Region)" includes imports to Bay Area as well as imports to interior U.S. However, "Exports (Gateways outside Mega-region)" includes exports only from Bay Area and "Imports (Gateways inside Mega-region)" includes imports only to Bay Area.

Figure 3.4 Current and Future Freight Flows Annual Value by Direction of Movement and Market

Domestic/International), Entire Bay Area

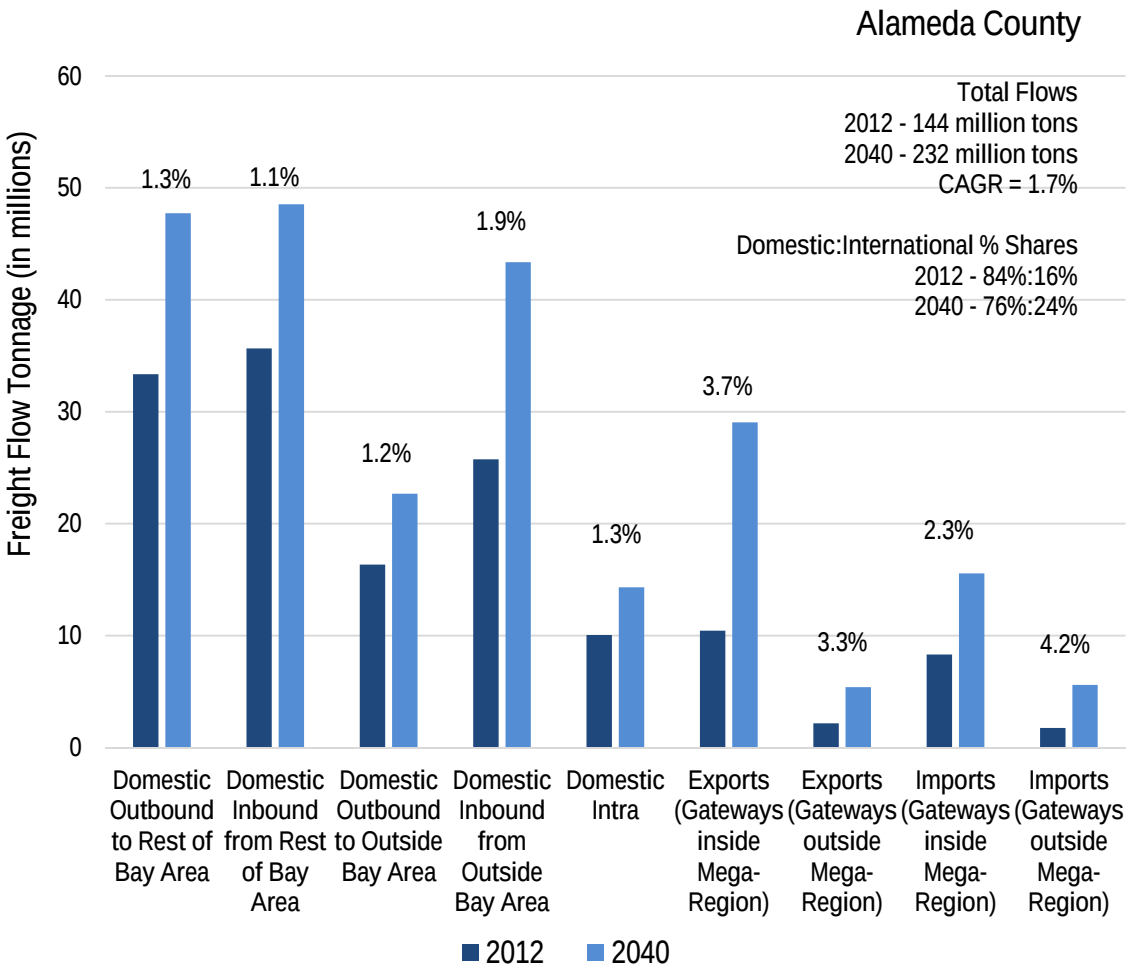


Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. "Exports (Gateways inside Mega-Region)" includes inbound exports from Bay Are as well as exports from interior U.S. Similarly, "Imports (Gateways inside Mega-Region)" includes imports to Bay Area as well as imports to interior U.S. However, "Exports (Gateways outside Mega-region)" includes exports only from Bay Area and "Imports (Gateways inside Mega-region)" includes imports only to Bay Area.

Figure 3.5 Current and Future Freight Flows Annual Tonnage by Direction of Movement and Market (Domestic / International)

Alameda County

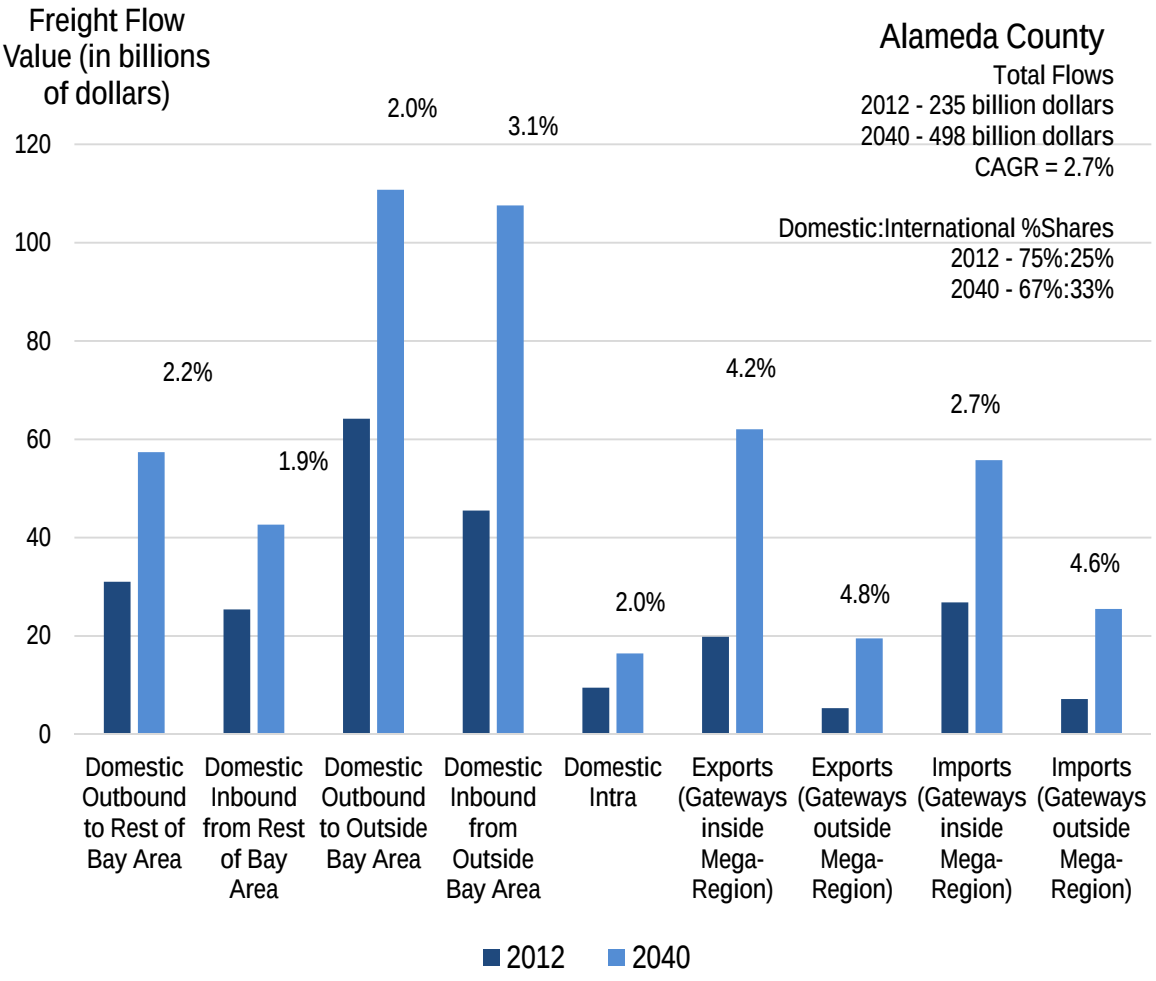


Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. "Exports (Gateways inside Mega-Region)" includes inbound exports from Bay Are as well as exports from interior U.S. Similarly, "Imports (Gateways inside Mega-Region)" includes imports to Bay Area as well as imports to interior U.S. However, "Exports (Gateways outside Mega-region)" includes exports only from Bay Area and "Imports (Gateways inside Mega-region)" includes imports only to Bay Area.

Figure 3.6 Current and Future Freight Flows Annual Value by Direction of Movement and Market (Domestic / International)

Alameda County

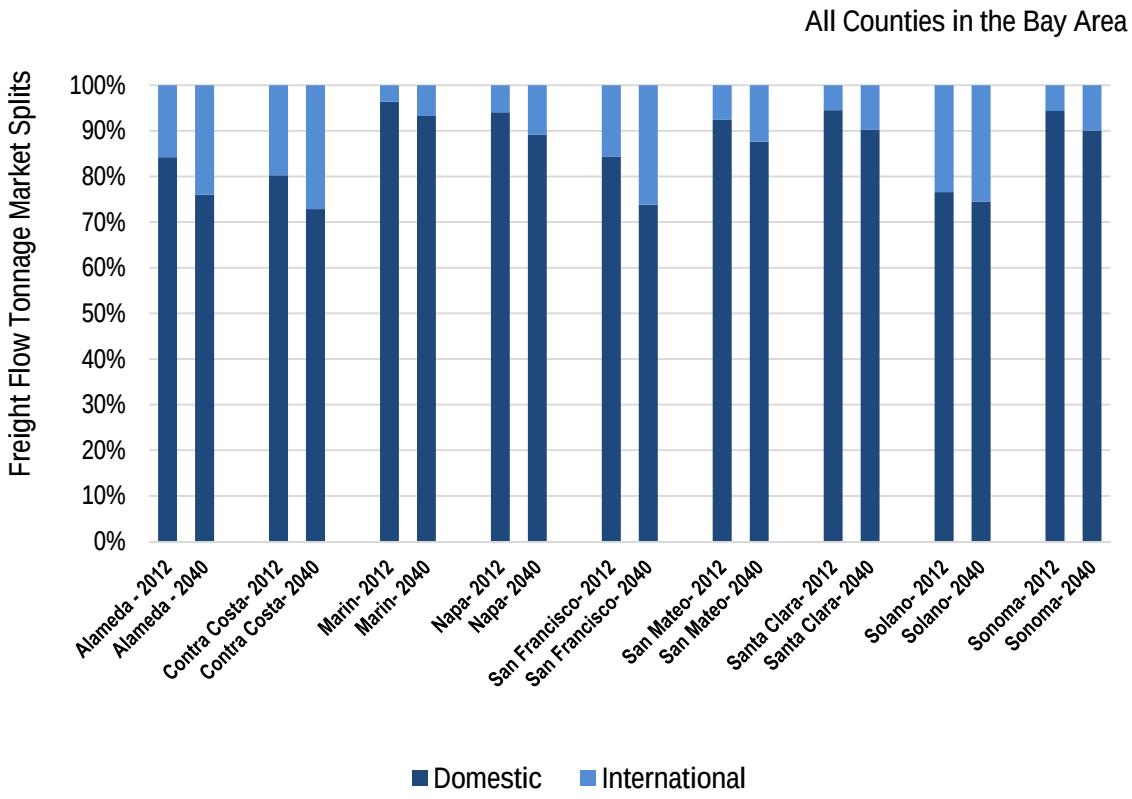


Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. "Exports (Gateways inside Mega-Region)" includes inbound exports from Bay Are as well as exports from interior U.S. Similarly, "Imports (Gateways inside Mega-Region)" includes imports to Bay Area as well as imports to interior U.S. However, "Exports (Gateways outside Mega-region)" includes exports only from Bay Area and "Imports (Gateways inside Mega-region)" includes imports only to Bay Area.

Figure 3.7 Current and Future Freight Flows Annual Tonnage based Market Splits

All Counties in the Bay Area

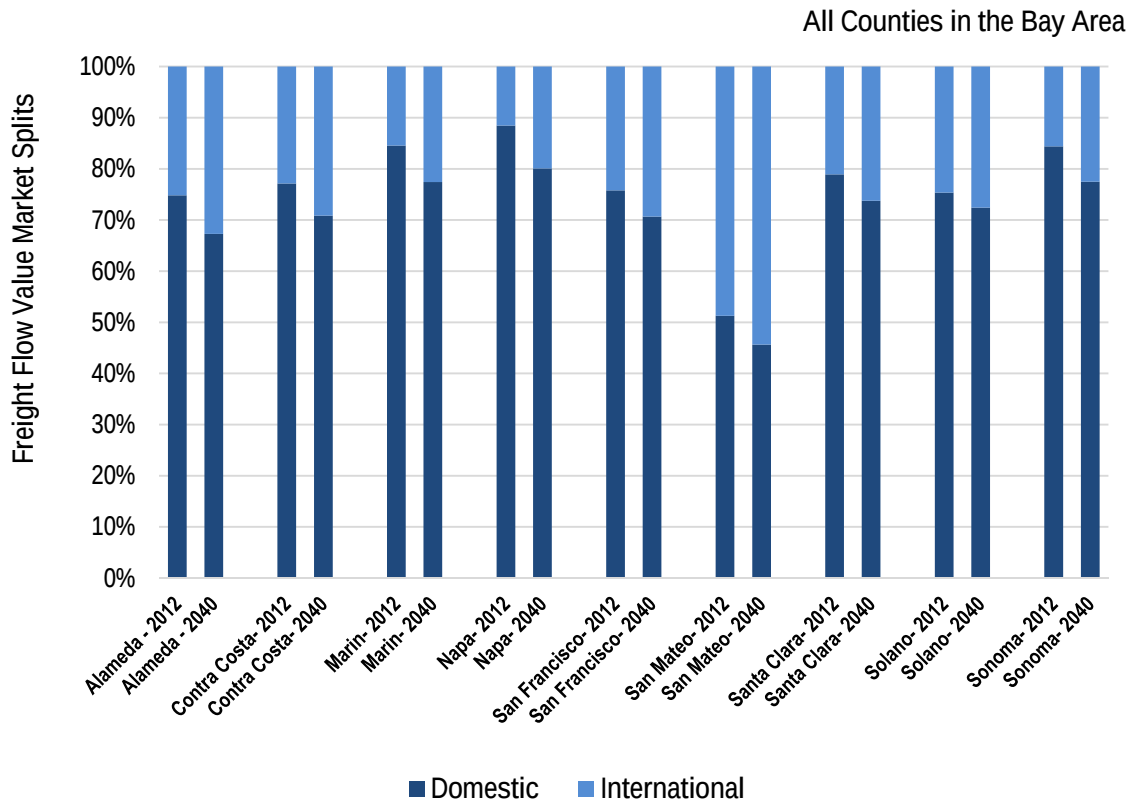


Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The freight flows shown include only inbound, outbound and intra directions of movement with respect to the county/region, through movements are not included.

Figure 3.8 Current and Future Freight Flows Annual Value based Market Splits

All Counties in the Bay Area



Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The freight flows shown include only inbound, outbound and intra directions of movement with respect to the county/region, through movements are not included.

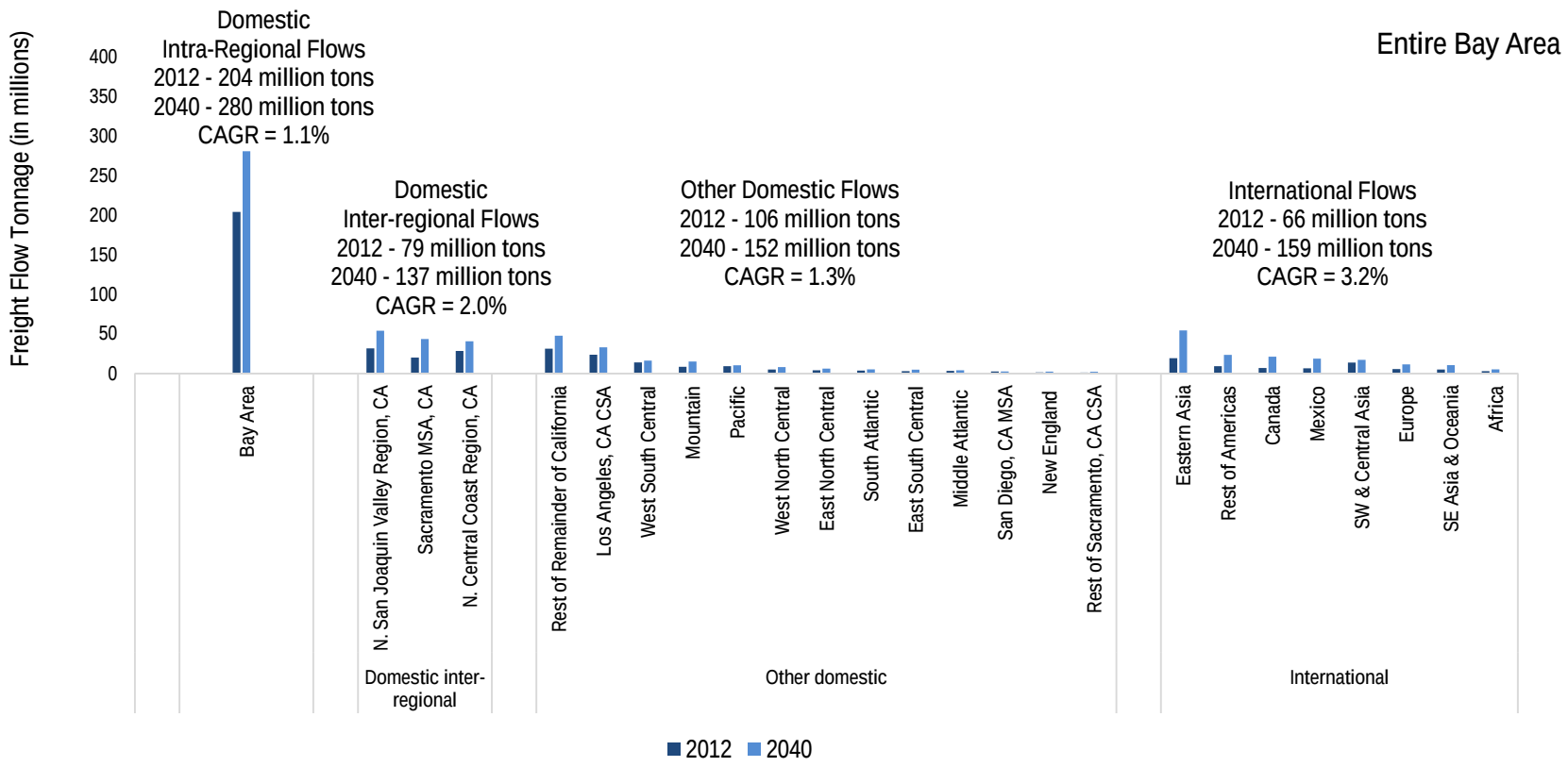
3.3 Freight Flows by Trading Partner

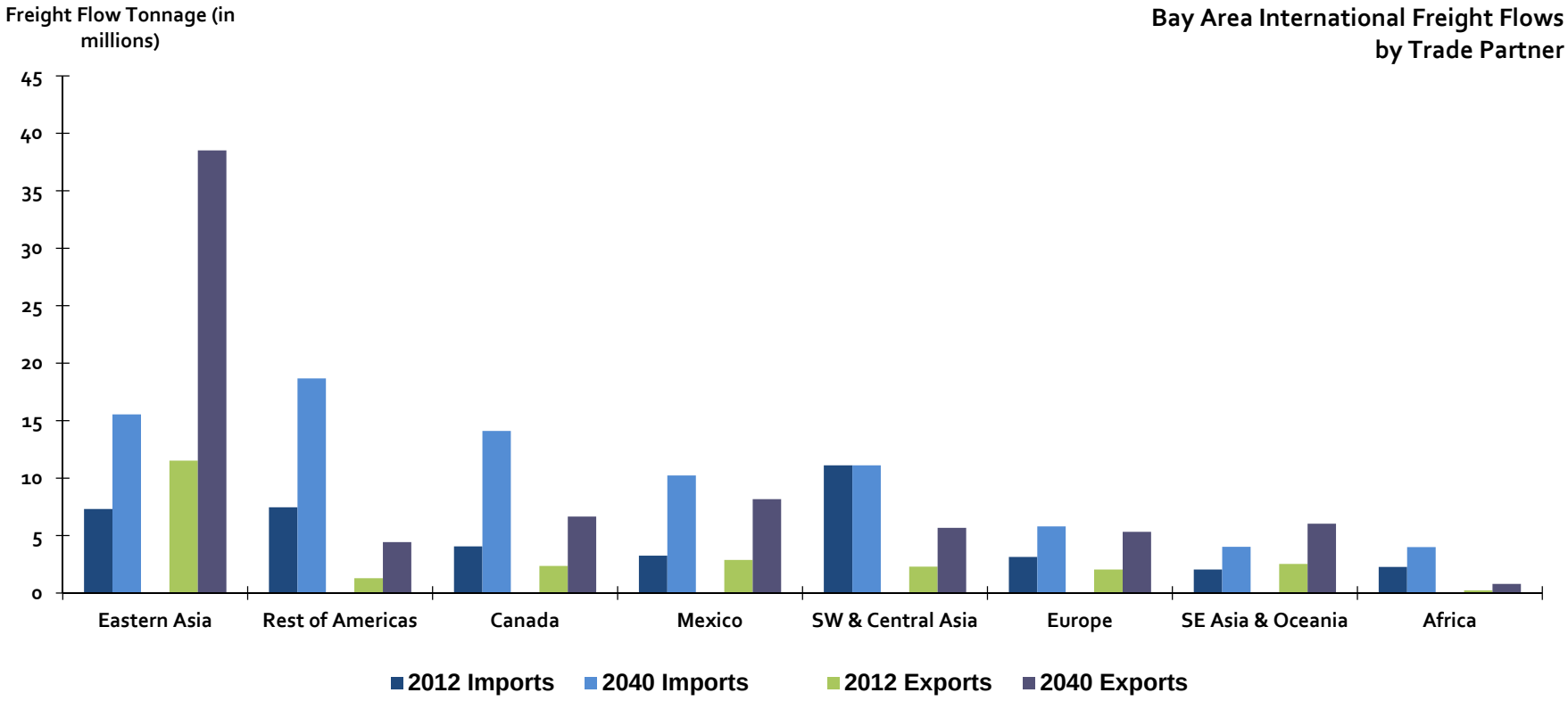
Figures 3.9-3.12 show the growth in total tonnage and value of goods by trading partner for the Bay Area and Alameda County. The trading partners are grouped into domestic intra-regional, domestic inter-regional, other domestic and international to understand the trade by distance.

For the Bay Area, intra-regional flows would continue to be the highest in share by tonnage and other domestic flows would continue to be the highest in share by value in the future. On the other hand, international trade flows are expected to grow the fastest in both tonnage and value. The major trade partners to the Bay Area by tonnage are expected to be Eastern Asia, Northern San Joaquin Valley region, Rest of California, Sacramento Metropolitan Statistical Area, Northern Central Coast region of California and Los Angeles Combined Statistical Area. On the other hand, the major trade partners to the Bay Area by value are expected to be Eastern Asia, Los Angeles Combined statistical Area, East North Central and Mountain regions of the U.S.

For Alameda County, the growth patterns for the various groups of trading partners are very similar to that of the entire Bay Area. However, the specific major trade partners differ slightly. The major trade partners to Alameda County by tonnage are expected to be Eastern Asia, Santa Clara County, Contra Costa County, and Northern San Joaquin Valley region. Internal trade to Alameda County is also significant. On the other hand, the major trade partners to Alameda County by value are expected to be Eastern Asia, Santa Clara County, East North Central, West South Central and Mountain regions of the U.S., and Los Angeles Combined statistical Area.

Figure 3.9 Current and Future Freight Flows Annual Tonnage by Trading Partner for the Bay Area

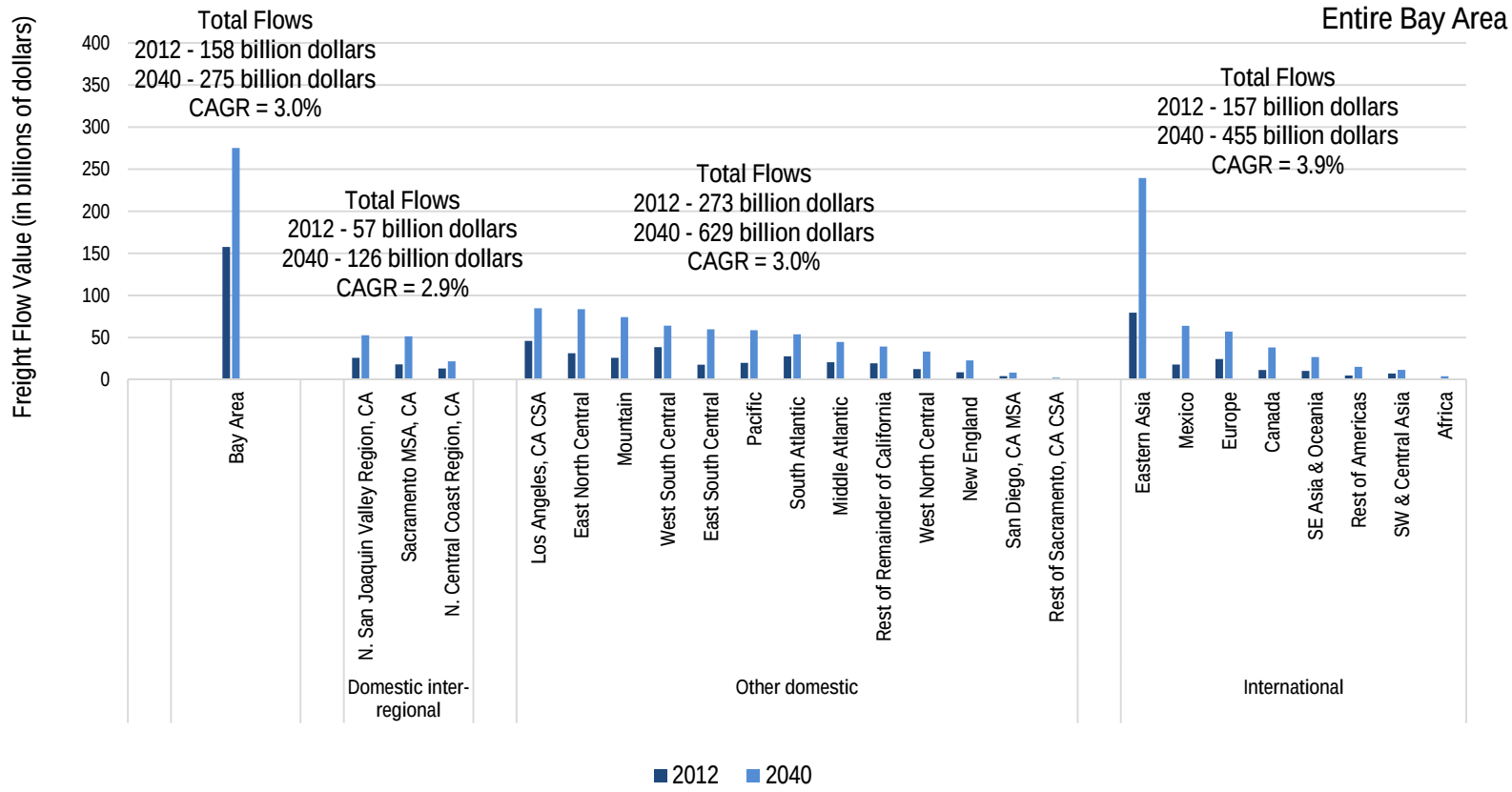


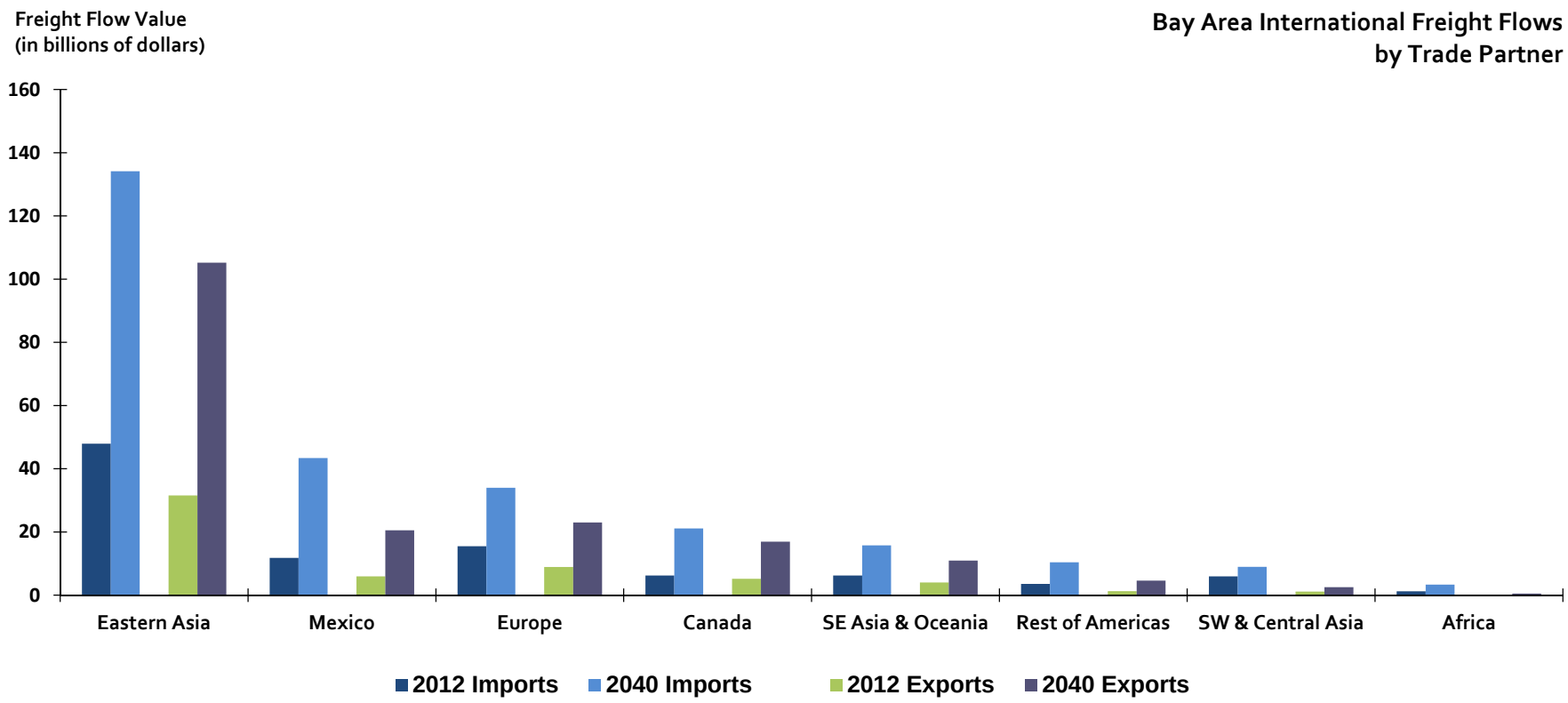


Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. International flows use both trade gateways in the mega-region and trade gateways outside the mega-region.

Figure 3.10 Current and Future Freight Flows Annual Value by Trading Partner for the Bay Area

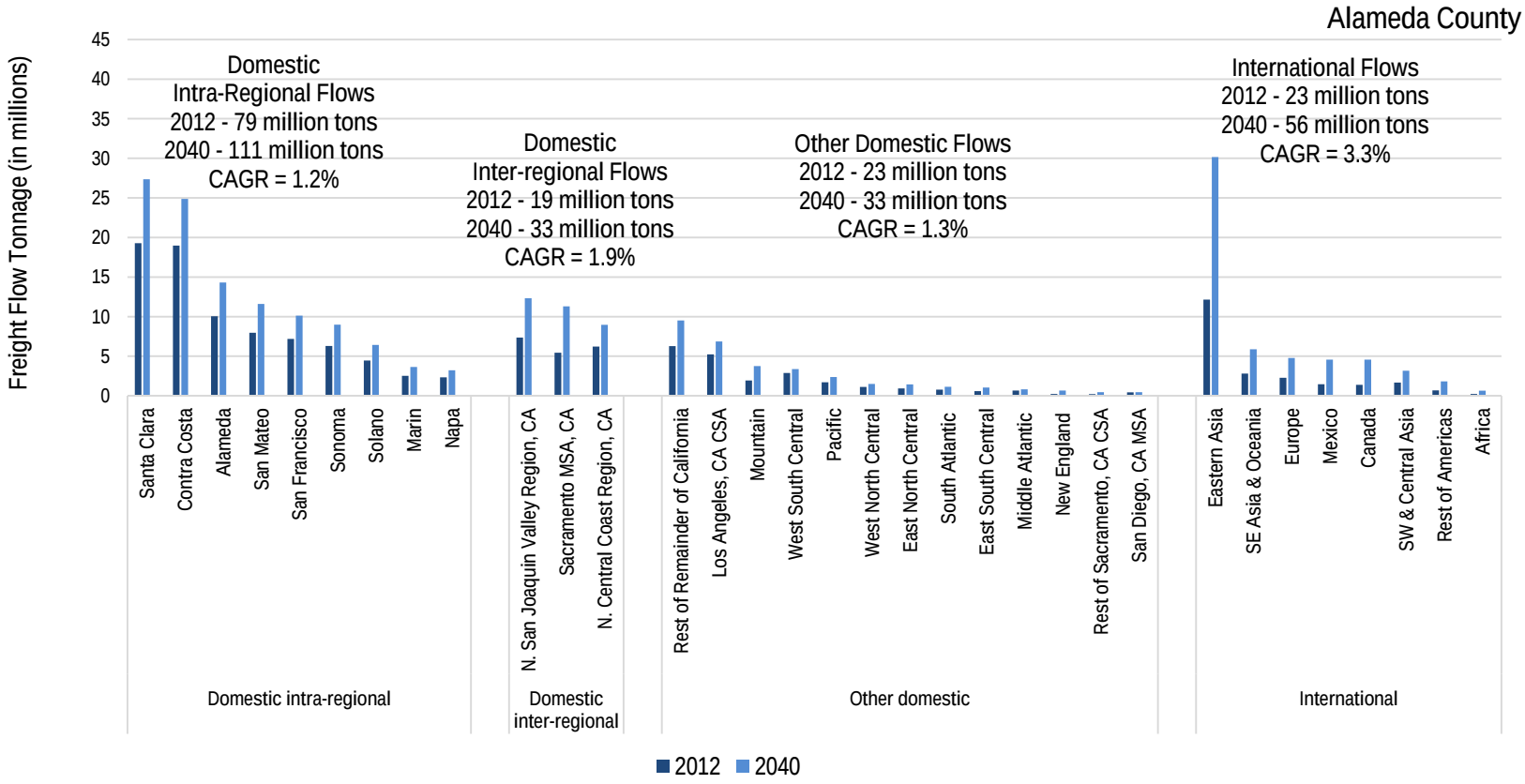




Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

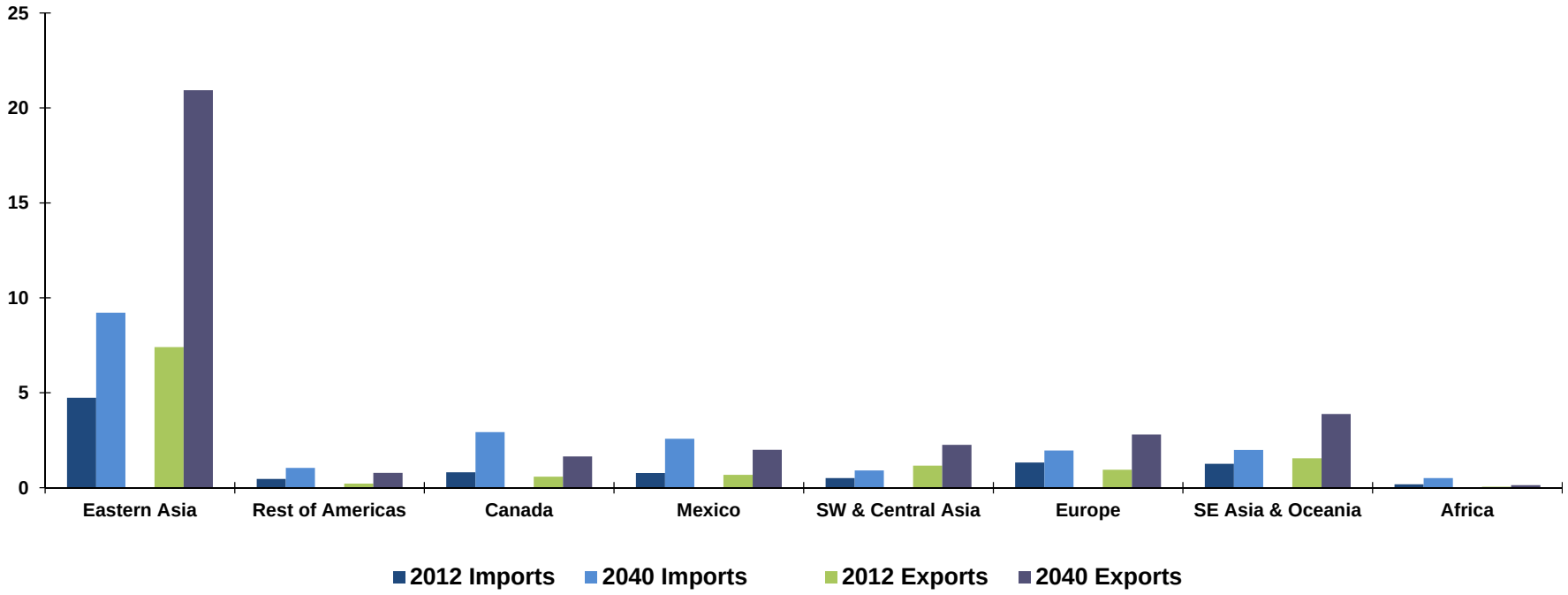
Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. International flows use both trade gateways in the mega-region and trade gateways outside the mega-region.

Figure 3.11 Current and Future Freight Flows Annual Tonnage by Trading Partner for Alameda County



Freight Flow Tonnage
(in millions)

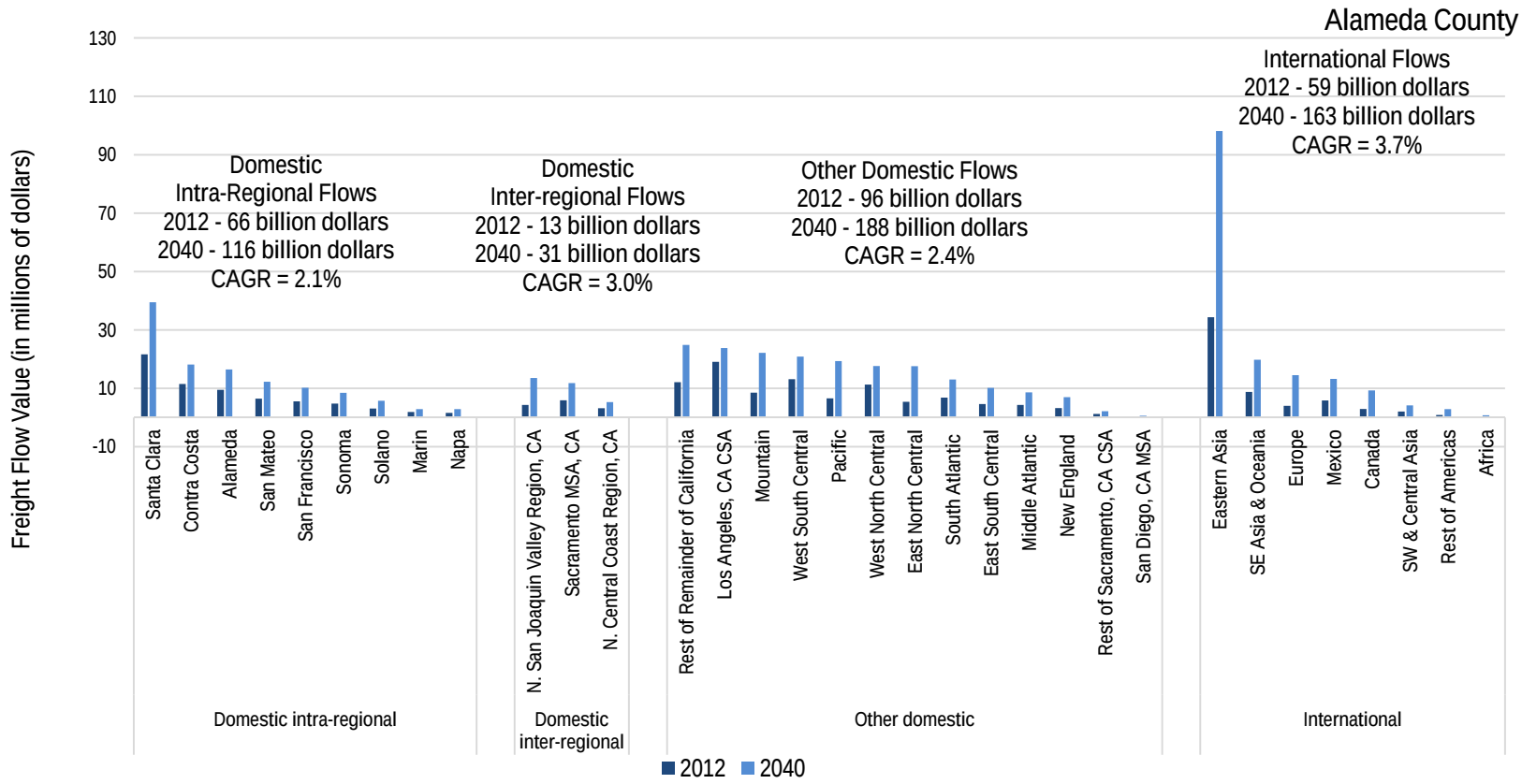
Alameda County International Freight Flows by Trade Partner

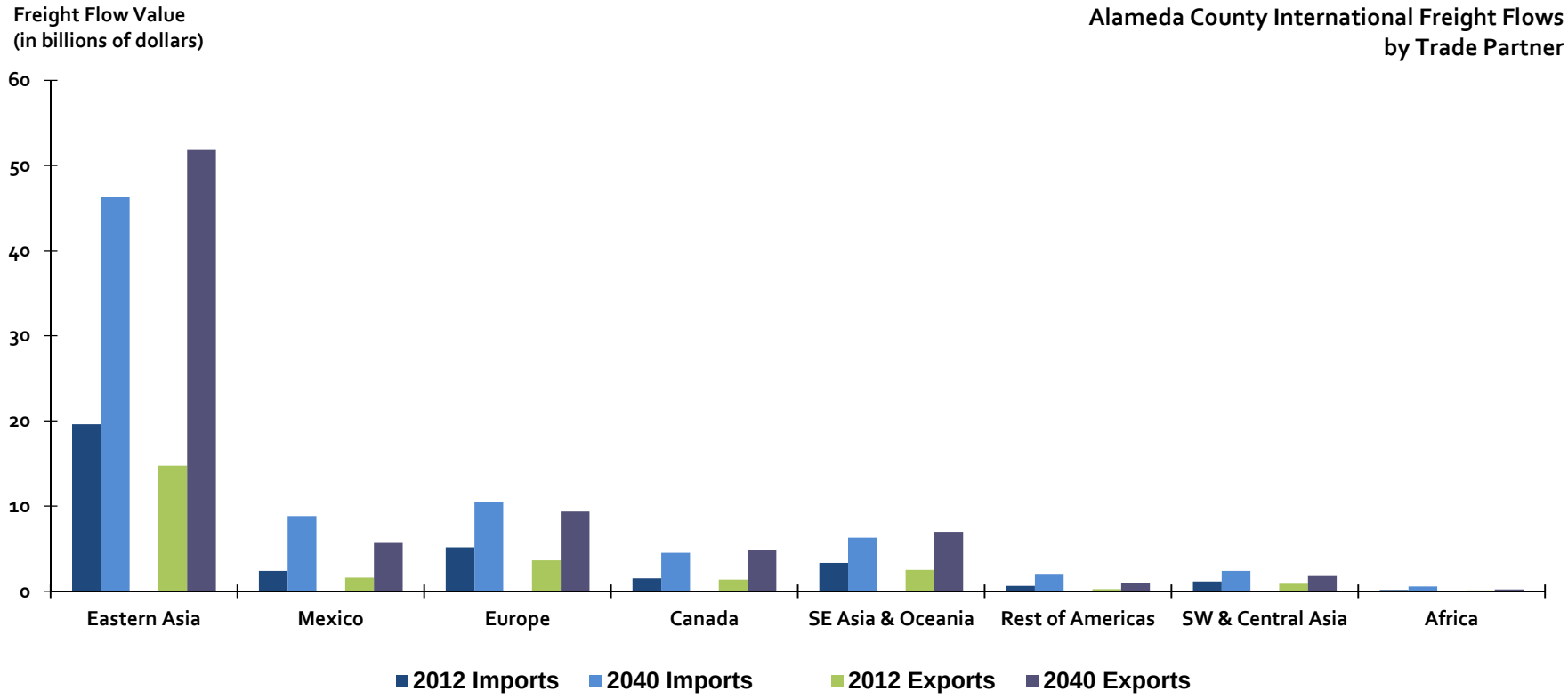


Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. International flows use both trade gateways in the mega-region and trade gateways outside the mega-region.

Figure 3.12 Current and Future Freight Flows Annual Value by Trading Partner for Alameda County





Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. International flows use both trade gateways in the mega-region and trade gateways outside the mega-region.

3.4 Freight Flows by Trade Gateway (Port/Airport)

Tables 3.2 and 3.3 provide freight flows in tonnage and value in the context of individual trade gateways in the Bay Area. The flows are broken into domestic and international trade.

Among the seaports, the ports of Oakland, Richmond and San Francisco are expected to be the busiest in terms of total tonnage and value. The Port of Oakland is expected to handle a substantial share of the international trade by tonnage and value. Despite some loss in domestic outbound traffic, the Port of Richmond is still expected to handle the majority of the domestic trade by tonnage and value.

Among the airports, San Francisco International Airport is projected to grow in air cargo tonnage and value at a faster pace than Oakland International Airport and Mineta San Jose International Airport. San Francisco International Airport is expected to continue handling a majority of the international air cargo, while Oakland International Airport is expected to continue handling a majority of the domestic air cargo.

Table 3.2 Current and Future Exports Annual Tonnage Summary by Trade Gateway for the Bay Area

Trade Gateway (Port / Airport)	2012 Tons (in thousands)					2040 Tons (in thousands)					CAGR (2012-2040) Tons
	Domestic Inbound	Domestic Outbound	Exports	Imports	Total	Domestic Inbound	Domestic Outbound	Exports	Imports	Total	
Port of Oakland	109	22	9,799	7,450	17,381	208	15	26,884	13,338	40,445	3.1%
Port of Richmond	1,017	4,443	1,341	10,004	16,804	1,239	3,388	8,247	16,013	28,887	2.0%
Marine Terminals at Martinez	0	0	1,410	5,899	7,310	0	0	3,800	8,868	12,668	2.0%
Port of San Francisco	0	0.810	3,717	2,752	6,469	0	1.115	12,854	5,730	18,586	3.8%
Marine Terminals at Carquinez Strait	0	0	327	4,715	5,042	0	0	890	7,084	7,974	1.7%
Port of Redwood City	0	0.095	1.34	747.53	749	0	0.150	4.38	1,744.29	1,749	3.1%
Marine Terminals at San Pablo Bay	0	0	470	4	474	0	0	1,411	13	1,424	4.0%
Marine Terminal at Selby	0	0	7	111	118	0	0	19	354	373	4.2%
Port of Alameda, CA	0	0	0.005	0.078	0.083	0	0	0.013	0.279	0.292	4.6%
Other Bay Area Ports	5,352	8	0	0	5,360	6,574	13	0	0	6,586	0.7%
Oakland International Airport, CA	252	240	8	1	502	260	499	18	2	779	1.6%
San Francisco International Airport, CA	17	16	146	206	385	28	53	333	567	980	3.4%
Mineta San Jose International Airport, CA	16	16	6	0	38	13	25	11	0	49	0.9%

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: A majority of marine terminals on the channels of Carquinez Strait, San Pablo Bay, Selby are crude petroleum importers, and exporters of petroleum products, chemicals and other bulk cargo. Port of Benicia is most likely included under the Marine Terminals at Carquinez Strait.

Table 3.3 Current and Future Exports Annual Value Summary by Trade Gateway for the Bay Area

Trade Gateway (Port / Airport)	2012 Value (in thousands of dollars)					2040 Value (in thousands of dollars)					CAGR (2012-2040) Value
	Domestic Inbound	Domestic Outbound	Exports	Imports	Total	Domestic Inbound	Domestic Outbound	Exports	Imports	Total	
Port of Oakland	41	8	13,808	21,219	35,076	35	3	46,153	38,737	84,928	3.2%
Port of Richmond	496	2,143	546	7,053	10,239	612	1,643	3,326	11,558	17,138	1.9%
Marine Terminals at Martinez	0	0	596	2,541	3,137	0	0	1,781	4,059	5,840	2.2%
Port of San Francisco	0	0.112	1,134	4,692	5,826	0	0.152	4,848	8,962	13,810	3.1%
Marine Terminals at Carquinez Strait	0	0	24	2,044	2,068	0	0	74	3,267	3,341	1.7%
Port of Redwood City	0	0.012	0.12	5.39	6	0	0.019	0.46	11.45	12	2.8%
Marine Terminals at San Pablo Bay	0	0	272	6	277	0	0	1,341	18	1,359	5.8%
Marine Terminal at Selby	0	0	3	149	152	0	0	8	484	492	4.3%
Port of Alameda, CA	0	0	0.098	0.437	0.535	0	0	0.273	1.585	1.858	4.5%
Other Bay Area Ports	33	1	0	0	34	41	2	0	0	42	0.8%
Oakland International Airport, CA	31,485	14,793	1,021	65	47,363	26,382	32,676	2,152	119	61,329	0.9%
San Francisco International Airport, CA	2,064	970	20,169	26,019	49,222	2,800	3,467	55,379	77,662	139,308	3.8%
San Jose International Airport, CA	2,044	961	1,410	18	4,433	1,309	1,622	2,644	27	5,602	0.8%

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The freight flows shown include only inbound, outbound and intra directions of movement for Bay Area, through movements are not included. The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040.

3.5 Freight Flows by Mode

Figures 3.13-3.16 show the mode wise growth in tonnage and value of freight for the Bay Area and Alameda County. Figure 3.17 and 3.18 provide a comparison of forecast mode splits across the counties in the Bay Area.

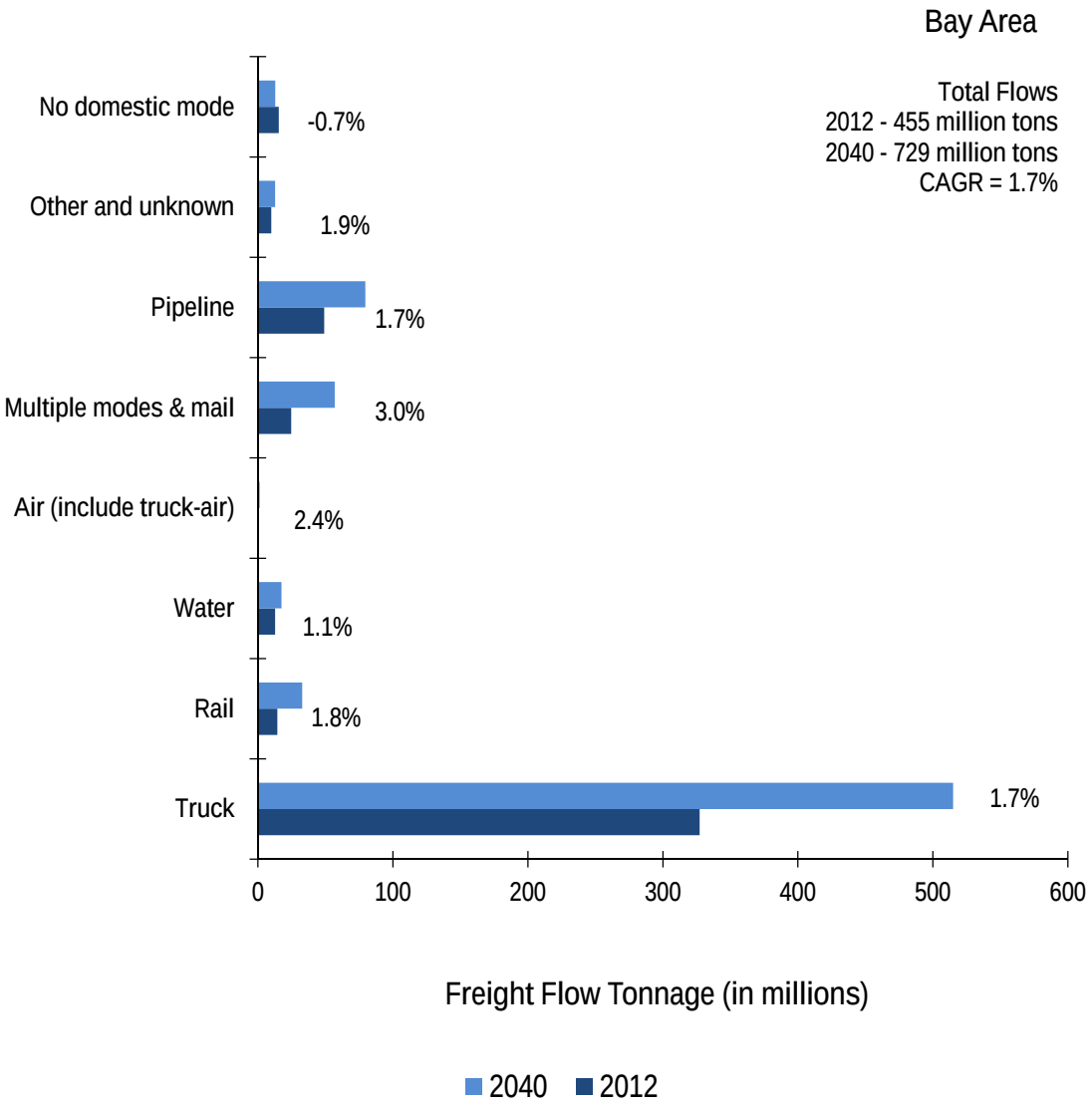
Considering the freight flows for the Bay Area, truck only and rail only modes are likely to grow at about the same moderate growth rate both in terms of tonnage and value, while the multiple modes and mail mode, which includes truck-to-rail intermodal, is likely to rapidly grow. Increasing use ofthird-party logistics providers (3PLs)and partnerships between trucking firms and railroads will likely enable this growth. Air cargo in the Bay Area is also projected to have a moderate-to-high growth. Water based transportation for domestic movements is an uphill challenge. In the last year, the Port of Stockton started barge service between the Port of Oakland and the Port of Stockton, which, in spite of receiving a federal grant, is currently being suspended due to lack of sufficient demand. With the ongoing growth in oil moved by rail cars from North Dakota's Bakken fields[20], pipeline transportation of crude oil may see some slowing in the short-term, while rail volumes may increase over the short-term. Over the long-term, depending on future safety policies on oil by rail and changes in Bay Area Air Quality Management District's (BAAQMD's) regulations on refinery operations, the mode share of pipelines could change.

Based on Alameda County's freight flows by mode, most of the discussions for the Bay Area are also applicable to Alameda County. The key difference in Alameda County's forecast is that air cargo from/to this county is not likely to grow as quickly as other parts of the Bay Area; in other words, air cargo at Oakland International Airport is not likely to grow as fast as air cargo through San Francisco International Airport.

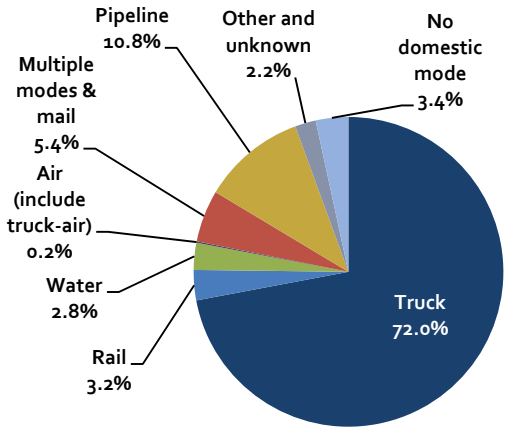
Comparing mode splits and changes across counties in the Bay Area, the pattern seen in Alameda County is similar to several other counties. However, the growth in truck-to-rail intermodal traffic and mail is heightened in this county by the presence of a major container port and ongoing rail developments. Contra Costa County and Solano County have atypical mode splits due to presence of multiple crude oil refineries, and automobile and parts import facilities that are suited to rail transport. The decline in the dependence on foreign crude oil is showing up as a decline in "no domestic mode" tonnage and value.

[20] https://www.aar.org/safety/Pages/crude-by-rail-facts.aspx (last accessed on July 15, 2014)

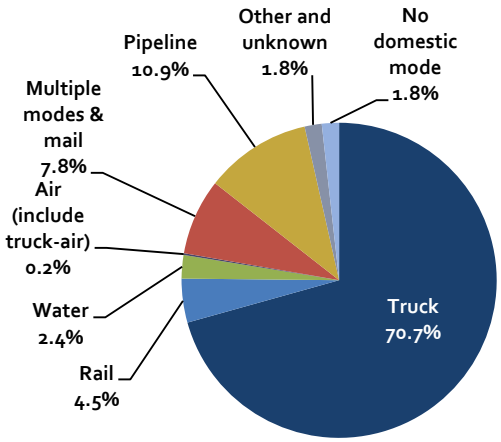
Figure 3.13 Current and Future Freight Flows Annual Tonnage by Mode
Bay Area



Bay Area Freight Flow Tonnage Modal Share
2012 Total - 455 million tons



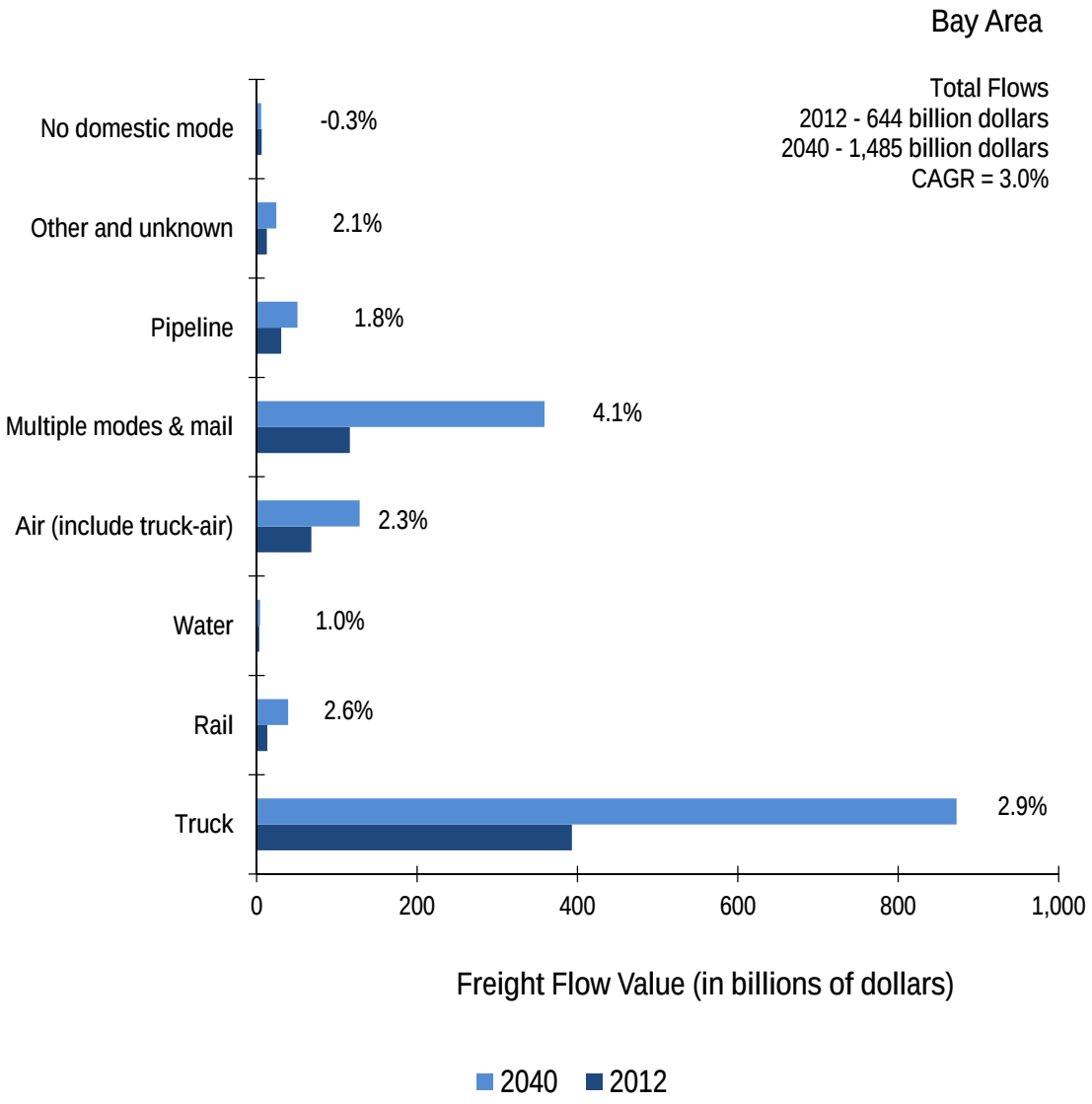
Bay Area Freight Flow Tonnage Modal Share
2040 Total - 729 million tons



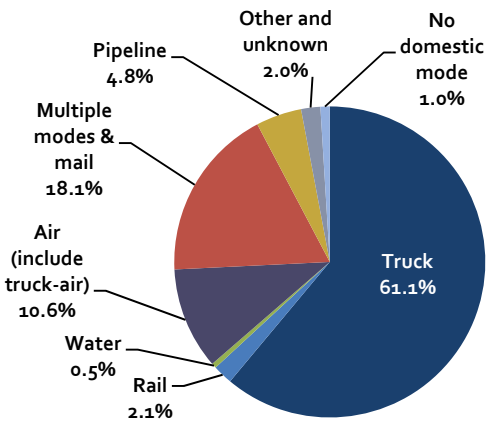
Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. In case a freight flow is international trade type, "mode" represents the mode used only in the domestic portion of the freight movement, the mode used for international portion is not included in the chart. As mentioned in Table 2.2 of this Report, "No domestic mode" includes shipments that have an international mode, but no domestic mode and is limited to import shipments of crude petroleum transferred directly from inbound ships to a U.S. refinery at the zone of entry.

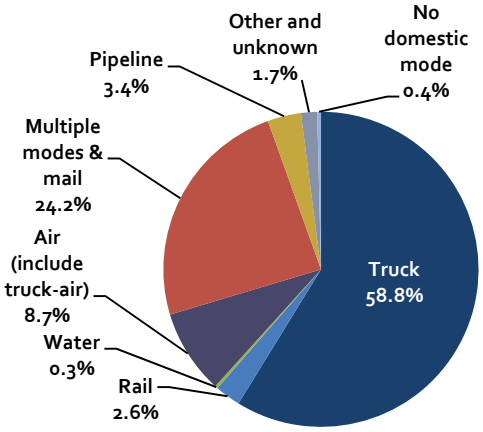
Figure 3.14 Current and Future Freight Flow Annual Value by Mode
Bay Area



Bay Area Freight Flow Value Modal Share
2012 Total - 644 billion dollars



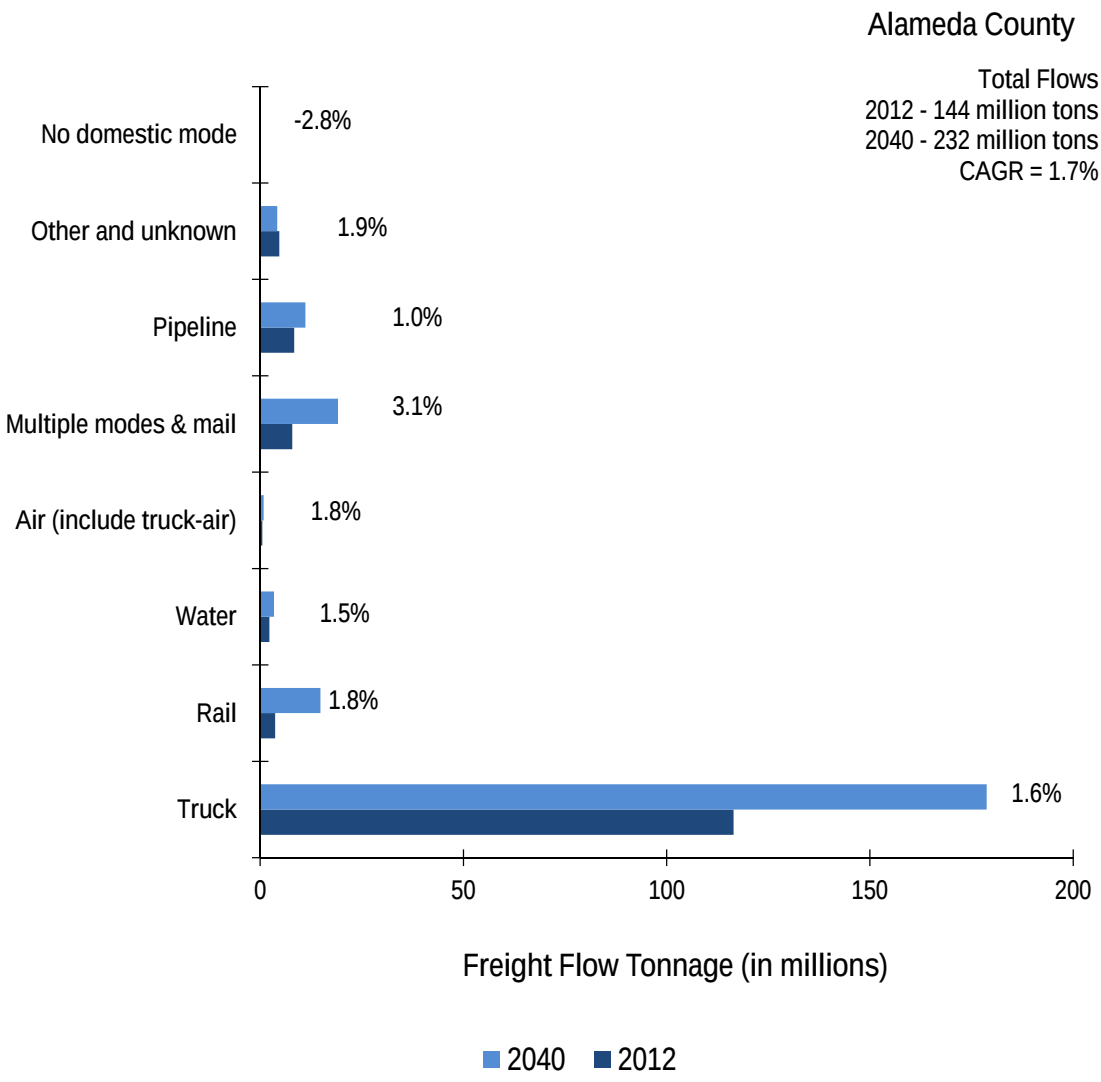
Bay Area Freight Flow Value Modal Share
2040 Total - 1,485 billion dollars



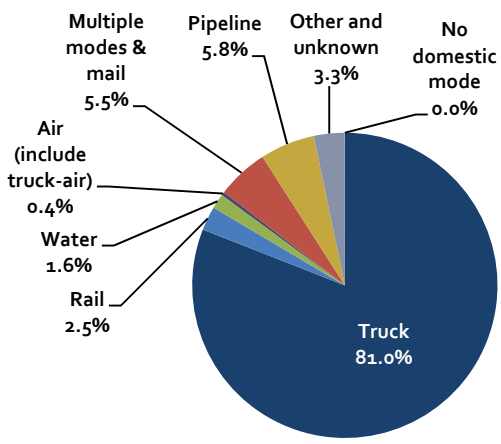
Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. In case a freight flow is international trade type, "mode" represents the mode used only in the domestic portion of the freight movement, the mode used for international portion is not included in the chart. As mentioned in Table 2.2 of this Report, "No domestic mode" includes shipments that have an international mode, but no domestic mode and is limited to import shipments of crude petroleum transferred directly from inbound ships to a U.S. refinery at the zone of entry.

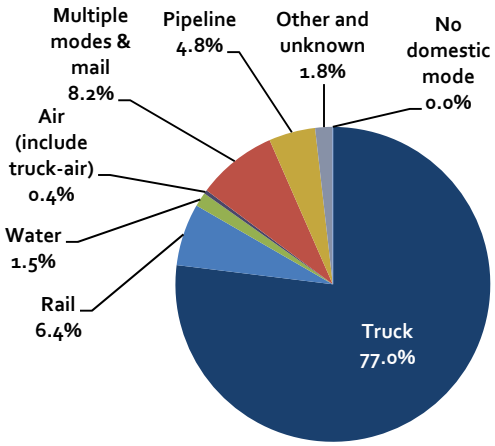
Figure 3.15 Current and Future Freight Flows Annual Tonnage by Mode
Alameda County



Alameda County Freight Flow Tonnage Modal Share
2012 Total - 144 million tons



Alameda County Freight Flow Tonnage Modal Share
2040 Total - 232 million tons

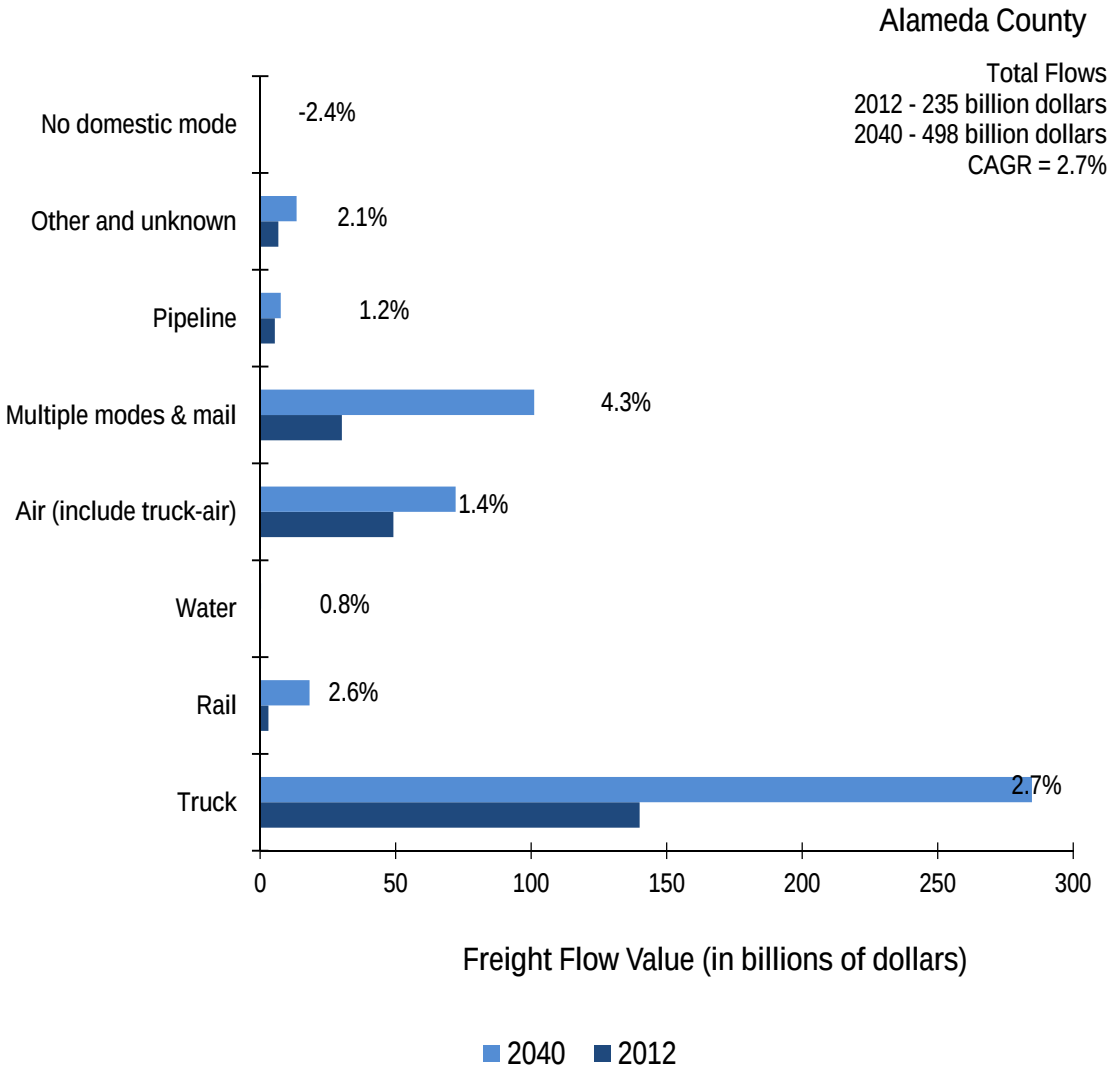


Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

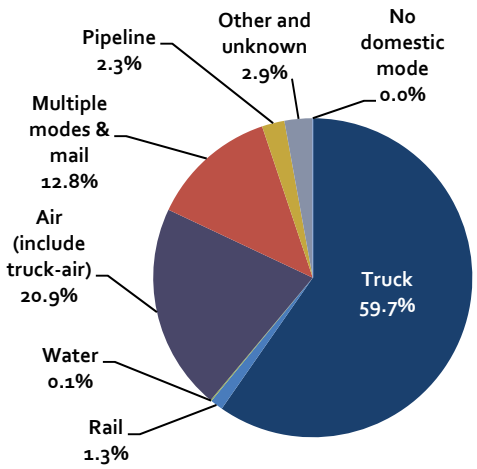
Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. In case a freight flow is international trade type, "mode" represents the mode used only in the domestic portion of the freight movement, the mode used for international portion is not included in the chart. As mentioned in Table 2.2 of this Report, "No domestic mode" includes shipments that have an international mode, but no domestic mode and is limited to import shipments of crude petroleum transferred directly from inbound ships to a U.S. refinery at the zone of entry.

Figure 3.16 Current and Future Freight Flow Annual Value by Mode

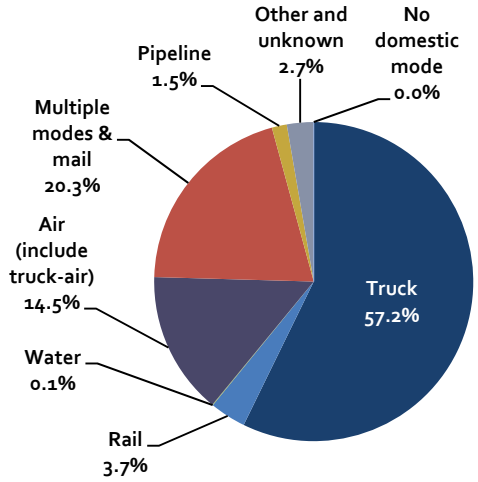
Alameda County



Alameda County Freight Flow Value Modal Share
2012 Total - 235 billion dollars



Alameda County Freight Flow Value Modal Share
2040 Total - 498 billion dollars

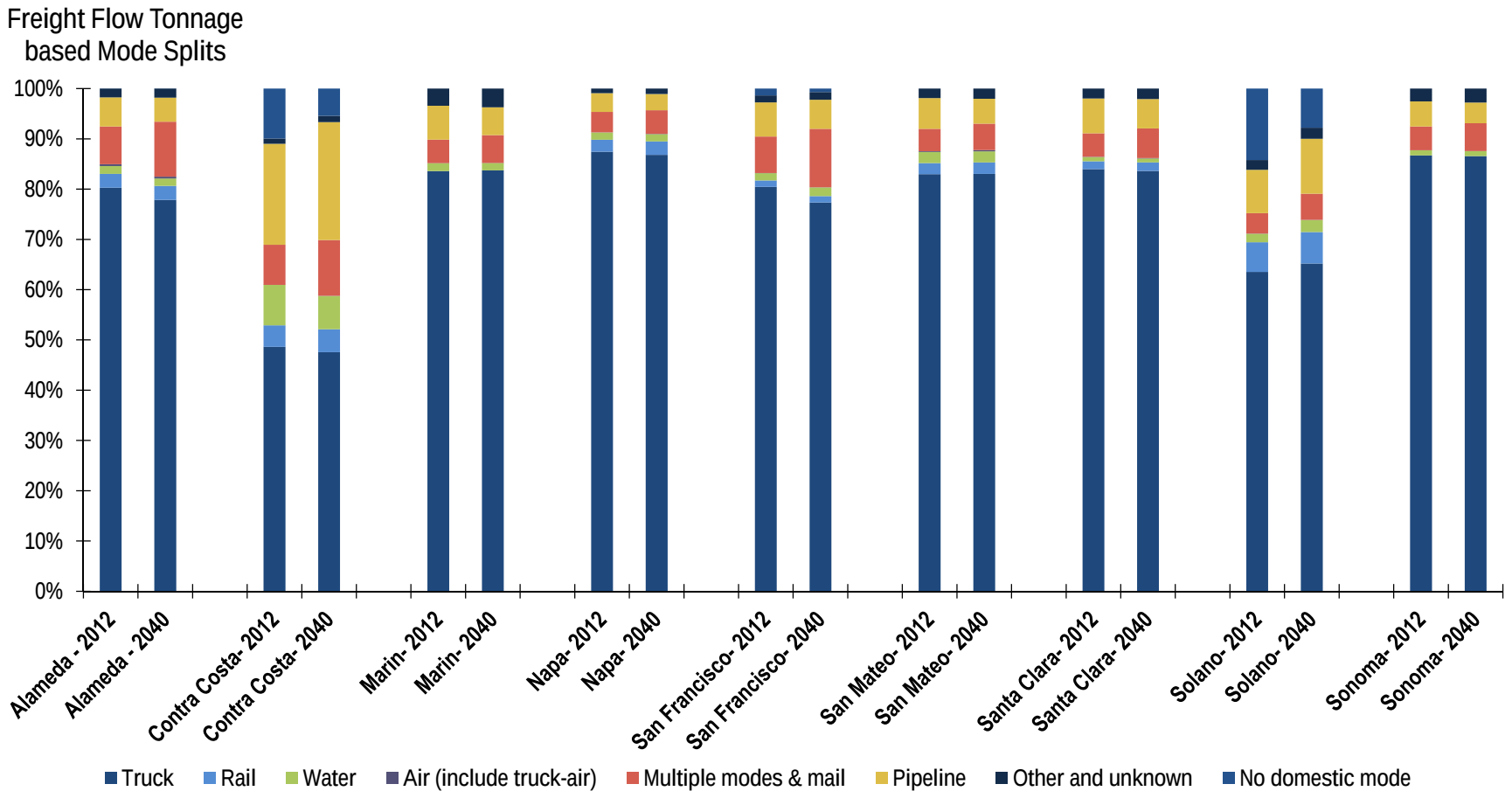


Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Note: The percentages represent Compound Annualized Growth Rates (CAGR) between 2012 and 2040. In case a freight flow is international trade type, "mode" represents the mode used only in the domestic portion of the freight movement, the mode used for international portion is not included in the chart. As mentioned in Table 2.2 of this Report, "No domestic mode" includes shipments that have an international mode, but no domestic mode and is limited to import shipments of crude petroleum transferred directly from inbound ships to a U.S. refinery at the zone of entry.

Figure 3.17 Current and Future Freight Flow Annual Tonnage Mode Splits

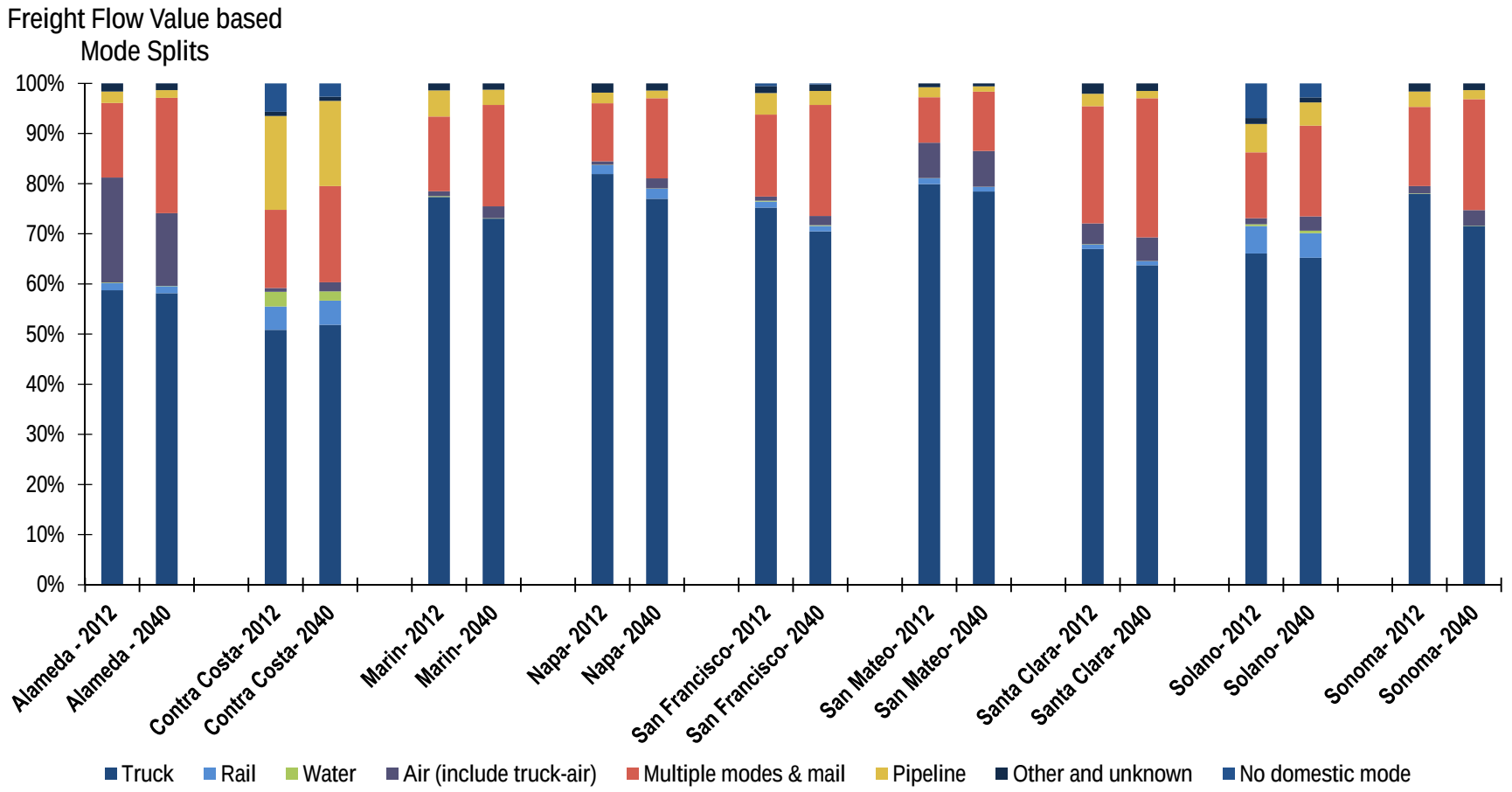
Bay Area Counties



Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Figure 3.18 Current and Future Freight Flow Annual Value Mode Splits

Bay Area Counties



Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

3.6 Freight Flows by Commodity

Tables 3.4-3.9 contain commodity wise detailed summaries of current and future demand and growth rates for the Bay Area and Alameda County, and commodity wise quick summaries for all counties in the Bay Area. Under the detailed summaries, commodity wise demand is also broken into direction of movement and market (domestic/international). These tables are included as reference for later tasks in this Plan.

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Table 3.4 Current and Future Freight Flows Annual Tonnage Summary by Commodity

Direction of Movement and Market, Entire Bay Area

SCTG2	SCTG2 Commodity	Domestic Outbound		Domestic Inbound		Domestic Intra		Exports to Trade Gateways inside Mega-Region		Exports to Trade Gateways outside Mega-Region		Imports from Trade Gateways inside Mega-Region		Imports from Trade Gateways outside Mega-Region		Total		CAGR (2012-40) Tons
		2012 Tons (in thousands)	2040 Tons (in thousands)	2012 Tons (in thousands)	2040 Tons (in thousands)	2012 Tons (in thousands)	2040 Tons (in thousands)	2012 Tons (in thousands)	2040 Tons (in thousands)	2012 Tons (in thousands)	2040 Tons (in thousands)	2012 Tons (in thousands)	2040 Tons (in thousands)	2012 Tons (in thousands)	2040 Tons (in thousands)	2012 Tons (in thousands)	2040 Tons (in thousands)	
08	Alcoholic beverages	2,025	1,806	1,302	2,216	2,469	2,136	338	489	172	340	719	1,292	246	702	**7,272**	**8,982**	**0.8%**
04	Animal feed	52	75	822	1,314	576	979	895	6,250	394	694	18	321	244	1,993	**3,002**	**11,627**	**5.0%**
33	Articles-base metal	620	760	789	871	1,986	2,367	86	118	145	435	937	1,232	168	503	**4,731**	**6,285**	**1.0%**
32	Base metals	1,522	1,427	1,950	2,827	939	863	141	1,198	170	483	487	2,443	309	780	**5,518**	**10,022**	**2.2%**
20	Basic chemicals	1,039	2,008	1,014	1,014	906	1,501	773	1,613	145	570	404	997	210	855	**4,491**	**8,558**	**2.3%**
10	Building stone	156	127	379	732	714	793	0	2	90	217	214	508	40	95	**1,594**	**2,474**	**1.6%**
02	Cereal grains	574	1,835	8,610	13,730	336	843	233	1,037	1,292	679	4	19	17	29	**11,066**	**18,172**	**1.8%**
23	Chemical prods.	1,466	4,300	954	2,756	753	2,029	95	209	296	1,348	81	175	109	483	**3,754**	**11,299**	**4.0%**
15	Coal	3	4	6	10	17	22	112	1,915	0	0	0	0	0	0	**139**	**1,952**	**9.9%**
19	Coal-n.e.c.	5,149	4,541	19,478	21,016	14,815	13,068	3,138	7,027	753	3,554	318	1,080	147	605	**43,797**	**50,889**	**0.5%**
16	Crude petroleum			5,535	5,967							17,804	24,390	1,037	4,823	**24,376**	**35,180**	**1.3%**
35	Electronics	809	746	777	2,232	710	1,064	48	114	329	771	379	671	488	1,795	**3,540**	**7,393**	**2.7%**
22	Fertilizers	280	326	326	216	1,656	1,753	0	0	17	30	73	45	47	91	**2,399**	**2,460**	**0.1%**
18	Fuel oils	1,355	3,096	142	81	10,256	15,236	1,221	3,114	3	22	1,335	3,075	765	1,873	**15,075**	**26,496**	**2.0%**
39	Furniture	243	150	582	891	474	370	11	18	27	51	449	1,156	176	1,087	**1,962**	**3,722**	**2.3%**
17	Gasoline	11,692	22,963	2,046	1,701	21,808	28,823	355	1,077			1,185	2,473	51	133	**37,137**	**57,171**	**1.6%**
12	Gravel	1,145	1,562	15,992	25,427	20,088	27,791	1	3	1	1	0	0	0	0	**37,226**	**54,784**	**1.4%**
01	Live animals/fish	77	201	53	86	10	21	1	1	4	22	5	67	31	848	**180**	**1,246**	**7.1%**
25	Logs	453	608	177	202	585	755	45	713	4	16	8	20	0	0	**1,273**	**2,315**	**2.2%**
34	Machinery	290	680	584	1,192	3,202	6,759	107	224	233	1,146	315	1,262	149	1,290	**4,881**	**12,553**	**3.4%**
05	Meat/seafood	220	675	1,121	1,531	1,092	2,604	747	1,513	43	298	123	96	103	233	**3,449**	**6,949**	**2.5%**
14	Metallic ores	21	13	6	8	1	1	84	4,925	66	79	182	279	47	82	**406**	**5,387**	**9.7%**
06	Milled grain prods.	240	333	1,164	2,191	646	914	281	381	82	146	252	526	95	502	**2,760**	**4,993**	**2.1%**
40	Misc. mfg. prods.	227	585	819	4,015	1,401	4,918	20	29	39	87	264	398	112	367	**2,881**	**10,399**	**4.7%**
43	Mixed freight	854	2,685	5,812	13,402	2,152	6,562	0	1	6	23	5	9	63	201	**8,893**	**22,883**	**3.4%**
36	Motorized vehicles	773	290	2,010	4,549	1,774	890	101	224	155	109	837	1,057	565	1,043	**6,216**	**8,160**	**1.0%**
11	Natural sands	1,092	3,613	7,163	6,473	8,074	15,319	0	1	13	22	1	2	0	0	**16,344**	**25,430**	**1.6%**
27	Newsprint/paper	386	215	1,111	2,054	300	227	175	224	256	312	176	121	40	68	**2,445**	**3,221**	**1.0%**
31	Nonmetal min. prods.	7,760	9,532	7,034	13,601	26,785	37,309	75	170	150	370	857	1,137	268	816	**42,928**	**62,936**	**1.4%**
13	Nonmetallic minerals	1,671	1,347	848	3,604	6,597	8,421	294	2,493	76	62	1,912	5,713	501	1,528	**11,899**	**23,167**	**2.4%**
03	Other ag prods.	2,759	3,311	5,367	10,894	3,209	3,122	1,301	2,104	1,139	3,098	396	584	685	2,176	**14,857**	**25,289**	**1.9%**
07	Other foodstuffs	8,439	12,535	3,320	5,938	5,251	8,274	612	698	380	970	1,007	1,697	333	932	**19,341**	**31,043**	**1.7%**
28	Paper articles	588	970	545	1,028	560	714	40	129	154	906	55	48	213	493	**2,155**	**4,288**	**2.5%**
21	Pharmaceuticals	111	427	109	291	89	290	2	5	3	17	6	17	2	8	**323**	**1,056**	**4.3%**
24	Plastics/rubber	821	1,462	897	1,769	874	1,521	159	363	314	1,368	455	641	239	836	**3,759**	**7,961**	**2.7%**
38	Precision instruments	238	1,582	94	1,038	155	1,419	19	55	20	73	51	86	42	141	**619**	**4,394**	**7.3%**
29	Printed prods.	389	358	367	338	509	454	7	8	28	132	68	68	25	61	**1,393**	**1,418**	**0.1%**
30	Textiles/leather	552	965	402	620	390	699	59	89	75	256	376	477	311	878	**2,165**	**3,985**	**2.2%**
09	Tobacco prods.	46	18	8	2	152	48	10	0	12	14	0	0	0	0	**227**	**82**	**-3.6%**
37	Transport equip.	1	5	46	121	8	52	3	9	8	31	19	39	43	174	**129**	**430**	**4.4%**
41	Waste/scrap	12,174	8,739	12,741	29,319	59,166	77,073	5,579	15,865	645	1,966	12	49	9	69	**90,326**	**133,080**	**1.4%**
26	Wood prods.	695	678	3,264	4,709	2,075	2,147	61	65	187	414	414	170	522	451	**7,218**	**8,635**	**0.6%**
	TOTAL	**69,008**	**97,554**	**115,766**	**191,974**	**203,560**	**280,149**	**17,233**	**54,474**	**7,921**	**21,131**	**32,205**	**54,441**	**8,453**	**29,044**	**454,146**	**728,767**	**1.7%**

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics. Note: "Exports (Gateways inside Mega-Region)" includes inbound exports from Bay Are as well as exports from interior U.S. Similarly, "Imports (Gateways inside Mega-Region)" includes imports to Bay Area as well as imports to interior U.S. However, "Exports (Gateways outside Mega-region)" includes exports only from Bay Area and "Imports (Gateways inside Mega-region)" includes imports only to Bay Area.

Table 3.5 Current and Future Freight Flows Annual Value Summary by Commodity

Direction of Movement and Market, Entire Bay Area

SCTG2	SCTG2 Commodity	Domestic Outbound		Domestic Inbound		Domestic Intra		Exports to Trade Gateways inside Mega-Region		Exports to Trade Gateways outside Mega-Region		Imports from Trade Gateways inside Mega-Region		Imports from Trade Gateways outside Mega-Region		Total		CAGR (2012-40) Value
		2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	
08	Alcoholic beverages	6,332	5,460	2,114	2,757	6,947	6,046	594	845	122	258	1,577	2,700	295	872	**17,981**	**18,938**	**0.2%**
04	Animal feed	35	42	524	869	188	322	771	7,163	85	163	26	374	50	426	**1,681**	**9,359**	**6.3%**
33	Articles-base metal	2,563	3,209	3,762	4,303	6,161	7,363	280	444	406	1,446	1,716	2,439	472	1,468	**15,359**	**20,670**	**1.1%**
32	Base metals	2,310	2,129	2,926	4,116	1,930	1,847	442	4,014	338	990	462	2,198	438	1,051	**8,846**	**16,344**	**2.2%**
20	Basic chemicals	650	1,190	1,970	3,348	490	829	992	2,015	158	583	929	1,779	348	1,209	**5,537**	**10,953**	**2.5%**
10	Building stone	182	132	90	236	187	214	0	0	26	71	4	17	1	3	**491**	**674**	**1.1%**
02	Cereal grains	302	970	1,060	1,487	171	423	173	975	227	128	3	15	6	10	**1,942**	**4,009**	**2.6%**
23	Chemical prods.	1,955	5,255	2,643	6,853	1,686	4,589	892	2,534	677	3,263	976	2,377	321	1,536	**9,151**	**26,407**	**3.9%**
15	Coal	0	0	0	0	1	1	7	133	0	0	0	0	0	0	**8**	**134**	**10.8%**
19	Coal-n.e.c.	2,108	1,879	8,748	8,736	5,014	4,525	577	1,363	233	899	61	221	64	255	**16,805**	**17,877**	**0.2%**
16	Crude Petroleum			2,504	2,710							7,187	10,837	428	2,115	**10,120**	**15,663**	**1.6%**
35	Electronics	63,660	48,679	27,697	67,116	20,158	30,756	9,904	24,284	5,077	8,918	15,370	31,848	9,788	36,538	**151,653**	**248,139**	**1.8%**
22	Fertilizers	86	104	76	47	239	255	36	52	7	13	29	21	12	26	**486**	**518**	**0.2%**
18	Fuel oils	954	2,153	73	49	7,837	11,578	513	1,620	1	10	1,449	2,583	4,376	7,588	**15,203**	**25,580**	**1.9%**
39	Furniture	916	586	2,923	5,053	2,580	2,016	82	159	134	255	898	2,573	514	3,354	**8,048**	**13,996**	**2.0%**
17	Gasoline	9,058	18,052	1,345	1,114	16,140	21,280	532	1,787			538	1,111	88	153	**27,700**	**43,497**	**1.6%**
12	Gravel	14	20	220	356	294	456	0	2	0	0	0	0	0	0	**528**	**834**	**1.6%**
01	Live animals/fish	105	272	164	270	53	113	5	13	8	58	50	682	172	4,646	**557**	**6,054**	**8.9%**
25	Logs	9	14	42	44	29	39	24	491	1	3	3	7	0	0	**107**	**599**	**6.3%**
34	Machinery	5,839	13,783	7,685	13,974	27,151	57,482	6,722	18,414	3,912	21,541	10,747	49,799	2,899	25,087	**64,955**	**200,080**	**4.1%**
05	Meat/seafood	929	2,869	3,262	4,625	3,881	9,269	1,391	2,877	84	664	423	356	363	868	**10,332**	**21,528**	**2.7%**
14	Metallic ores	51	39	49	58	21	14	39	4,117	9	13	2	6	4	6	**175**	**4,252**	**12.1%**
06	Milled grain prods.	519	731	1,594	2,835	1,131	1,600	155	233	75	169	189	418	114	654	**3,777**	**6,641**	**2.0%**
40	Misc. mfg. prods.	4,369	9,432	8,916	38,998	2,834	9,931	540	911	504	1,273	1,927	3,315	942	3,273	**20,033**	**67,133**	**4.4%**
43	Mixed freight	2,742	8,730	17,440	39,092	7,225	22,074	17	54	40	171	1,056	1,847	612	2,017	**29,132**	**73,985**	**3.4%**
36	Motorized vehicles	4,336	1,560	14,254	33,556	12,400	6,224	743	1,927	738	568	7,979	11,320	4,530	7,474	**44,980**	**62,630**	**1.2%**
11	Natural sands	46	160	98	135	148	338	0	0	2	3	0	0	0	0	**294**	**637**	**2.8%**
27	Newsprint/paper	419	241	885	1,709	456	346	53	81	108	170	170	132	26	44	**2,117**	**2,723**	**0.9%**
31	Nonmetal min. prods.	2,669	2,434	3,340	6,893	3,091	4,445	220	485	136	380	775	1,168	232	734	**10,464**	**16,539**	**1.6%**
13	Nonmetallic minerals	173	111	123	445	185	261	42	456	11	10	26	74	15	35	**573**	**1,391**	**3.2%**
03	Other ag prods.	2,408	3,004	3,551	6,312	2,891	2,806	3,485	12,460	1,317	3,641	789	1,227	710	2,325	**15,151**	**31,774**	**2.7%**
07	Other foodstuffs	9,088	13,134	4,218	7,842	5,649	8,953	756	889	541	1,468	927	1,640	396	1,180	**21,575**	**35,106**	**1.8%**
28	Paper articles	909	1,452	999	1,832	1,076	1,378	66	236	189	1,260	103	99	259	550	**3,601**	**6,807**	**2.3%**
21	Pharmaceuticals	12,203	62,289	6,439	19,141	2,589	8,421	566	1,592	290	1,520	548	1,713	423	2,500	**23,057**	**97,176**	**5.3%**
24	Plastics/rubber	1,962	3,503	3,643	7,327	2,367	4,121	621	1,537	854	3,371	1,155	1,821	625	2,216	**11,227**	**23,897**	**2.7%**
38	Precision instruments	18,901	118,842	7,677	84,786	3,320	30,336	3,908	12,142	1,693	8,549	2,204	4,405	1,060	3,713	**38,763**	**262,773**	**7.1%**
29	Printed prods.	2,787	2,637	2,761	2,482	1,374	1,228	103	148	102	510	224	250	80	209	**7,431**	**7,464**	**0.0%**
30	Textiles/leather	6,666	10,814	8,478	12,444	3,817	6,833	316	468	496	1,850	2,996	4,110	2,894	8,960	**25,662**	**45,480**	**2.1%**
09	Tobacco prods.	175	115	157	30	1,269	391	59	0	59	80	0	0	1	1	**1,720**	**618**	**-3.6%**
37	Transport equip.	261	787	2,100	6,104	126	826	921	2,229	414	1,676	242	570	355	1,445	**4,419**	**13,637**	**4.1%**
41	Waste/scrap	191	192	790	2,578	2,582	3,330	2,396	8,505	150	438	12	54	1	11	**6,122**	**15,107**	**3.3%**
26	Wood prods.	765	766	2,534	3,887	1,870	1,924	40	52	99	233	431	173	336	284	**6,074**	**7,320**	**0.7%**
	TOTAL	**169,649**	**347,771**	**159,873**	**406,551**	**157,557**	**275,184**	**38,982**	**117,707**	**19,321**	**66,614**	**64,204**	**146,281**	**34,250**	**124,835**	**643,836**	**1,484,944**	**3.0%**

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics. Note: "Exports (Gateways inside Mega-Region)" includes inbound exports from Bay Are as well as exports from interior U.S. Similarly, "Imports (Gateways inside Mega-Region)" includes imports to Bay Area as well as imports to interior U.S. However, "Exports (Gateways outside Mega-region)" includes exports only from Bay Area and "Imports (Gateways inside Mega-region)" includes imports only to Bay Area.

Table 3.6 Current and Future Freight Flows Annual Tonnage Summary by Commodity

Direction of Movement and Market, Alameda County

SCTG2	SCTG2 Commodity	Domestic Outbound to Rest of Bay Area		Domestic Outbound to outside Bay Area		Domestic Inbound from Rest of Bay Area		Domestic Inbound from outside Bay Area		Domestic Intra		Exports to Trade Gateways inside Mega-Region		Exports to Trade Gateways outside Mega-Region		Imports from Trade Gateways inside Mega-Region		Imports from Trade Gateways outside Mega-Region		Total		CAGR (2012-40) Tons
		2012 Tons (in thous.)	2040 Tons (in thous.)	2012 Tons (in thous.)	2040 Tons (in thous.)	2012 Tons (in thous.)	2040 Tons (in thous.)	2012 Tons (in thous.)	2040 Tons (in thous.)	2012 Tons (in thous.)	2040 Tons (in thous.)	2012 Tons (in thous.)	2040 Tons (in thous.)	2012 Tons (in thous.)	2040 Tons (in thous.)	2012 Tons (in thous.)	2040 Tons (in thous.)	2012 Tons (in thous.)	2040 Tons (in thous.)	2012 Tons (in thous.)	2040 Tons (in thous.)	
08	Alcoholic beverages	220	191	274	221	408	353	218	278	50	44	336	487	18	34	608	933	43	116	**2,176**	**2,656**	**0.7%**
04	Animal feed	37	63	4	6	108	183	164	267	10	16	589	5,320	31	55	17	317	52	529	**1,012**	**6,757**	**7.0%**
33	Articles-base metal	462	552	206	251	407	485	242	259	207	248	81	109	47	139	866	1,053	50	145	**2,568**	**3,241**	**0.8%**
32	Base metals	262	240	656	626	189	175	648	1,005	141	128	114	1,101	71	200	438	2,357	111	304	**2,629**	**6,136**	**3.1%**
20	Basic chemicals	193	321	320	612	194	322	294	257	88	146	511	832	40	147	196	317	58	211	**1,894**	**3,165**	**1.9%**
10	Building stone	102	113	28	22	117	130	75	146	26	29	0	2	16	39	37	133	8	20	**409**	**635**	**1.6%**
02	Cereal grains	75	188	193	616	75	188	2,878	4,680	38	97	207	996	440	254	4	19	6	12	**3,916**	**7,050**	**2.1%**
23	Chemical prods.	175	471	460	1,330	131	352	235	635	59	160	85	179	91	404	61	109	26	108	**1,321**	**3,748**	**3.8%**
15	Coal	3	4	1	1	1	1	0	1	0	0	17	309	0	0	0	0	0	0	**21**	**315**	**10.1%**
19	Coal-n.e.c.	906	789	383	310	2,775	2,427	3,974	4,351	234	204	193	445	65	282	55	195	25	74	**8,610**	**9,077**	**0.2%**
16	Crude Petroleum													60	133	8	6			**68**	**139**	**2.6%**
35	Electronics	107	161	198	157	116	173	190	461	27	41	29	64	60	133	311	519	95	347	**1,133**	**2,056**	**2.2%**
22	Fertilizers	404	429	87	101	242	256	70	44	109	116	0	0	5	9	55	27	7	8	**981**	**990**	**0.0%**
18	Fuel oils	613	906	102	232	1,994	2,955	30	17	163	241	91	238	0	2	233	560	162	394	**3,387**	**5,545**	**1.8%**
39	Furniture	121	94	77	47	68	53	127	188	33	26	10	18	9	16	438	1,099	36	219	**917**	**1,760**	**2.4%**
17	Gasoline	1,289	1,704	875	1,723	4,145	5,462	432	359	335	443	29	86			216	473	11	28	**7,332**	**10,279**	**1.2%**
12	Gravel	2,867	3,906	212	294	3,594	5,005	3,455	5,482	780	1,033	1	3	0	0	0	0	0	0	**10,908**	**15,724**	**1.3%**
01	Live animals/fish	1	1	6	16	2	5	15	24	0	0	0	0	0	2	1	16	9	229	**34**	**293**	**8.0%**
25	Logs	68	89	68	92	110	142	40	45	19	25	44	710	1	2	7	20	0	0	**358**	**1,125**	**4.2%**
34	Machinery	802	1,697	98	229	541	1,140	147	285	274	581	82	160	77	372	258	966	36	297	**2,314**	**5,728**	**3.3%**
05	Meat/seafood	289	689	75	231	165	392	255	340	86	207	746	1,509	15	99	123	95	23	51	**1,776**	**3,614**	**2.6%**
14	Metallic ores	0	0	4	2	0	0	3	4	0	0	1	89	11	15	62	171	21	46	**103**	**328**	**4.2%**
06	Milled grain prods.	178	252	83	115	84	119	240	425	44	63	280	379	28	48	238	465	18	83	**1,193**	**1,949**	**1.8%**
40	Misc. mfg. prods.	304	1,068	66	163	216	758	195	882	82	290	18	26	10	23	252	369	23	76	**1,167**	**3,655**	**4.2%**
43	Mixed freight	655	2,001	331	1,029	274	834	1,200	2,757	171	525	0	0	2	9	2	3	12	39	**2,648**	**7,196**	**3.6%**
36	Motorized vehicles	556	279	343	129	294	147	568	1,130	238	120	99	218	72	46	288	223	147	195	**2,605**	**2,487**	**-0.2%**
11	Natural sands	1,133	2,154	194	640	1,410	2,672	1,523	1,378	307	585	0	1	2	4	0	0	0	0	**4,569**	**7,436**	**1.8%**
27	Newsprint/paper	48	37	95	52	79	59	379	597	26	20	175	223	62	72	176	121	13	18	**1,055**	**1,199**	**0.5%**
31	Nonmetal min. prods.	8,419	11,739	3,251	3,993	3,907	5,436	1,748	3,249	2,836	3,974	74	168	61	145	803	1,000	65	192	**21,164**	**29,896**	**1.2%**
13	Nonmetallic minerals	215	361	241	176	1,994	2,504	279	1,197	100	169	293	2,493	13	12	291	1,399	165	520	**3,592**	**8,831**	**3.3%**
03	Other ag prods.	806	785	940	1,118	558	542	1,427	2,879	290	284	1,168	1,710	390	1,034	383	547	178	561	**6,140**	**9,461**	**1.6%**
07	Other foodstuffs	1,384	2,185	2,781	4,112	707	1,113	653	1,127	349	554	586	643	121	292	530	612	60	158	**7,172**	**10,796**	**1.5%**
28	Paper articles	152	194	223	367	99	126	156	292	61	78	39	123	58	323	52	44	53	98	**892**	**1,645**	**2.2%**
21	Pharmaceuticals	22	71	36	133	13	43	31	77	6	19	2	3	1	5	6	15	0	2	**117**	**368**	**4.2%**
24	Plastics/rubber	298	520	387	684	127	220	241	452	113	197	137	280	145	613	435	586	60	187	**1,942**	**3,739**	**2.4%**
38	Precision instruments	34	313	97	520	23	206	47	406	9	79	10	29	5	19	40	66	8	27	**273**	**1,665**	**6.7%**
29	Printed prods.	128	114	124	114	73	65	83	69	34	30	5	5	8	40	66	64	5	12	**526**	**514**	**-0.1%**
30	Textiles/leather	76	136	177	270	62	111	87	125	20	37	56	83	18	60	352	436	65	181	**914**	**1,439**	**1.6%**
09	Tobacco prods.	14	5	5	2	17	5	1	0	2	1	10	0	1	1	0	0	0	0	**51**	**14**	**-4.4%**
37	Transport equip.	3	19	1	2	1	6	10	24	1	5	3	6	4	14	18	37	8	33	**48**	**145**	**4.0%**
41	Waste/scrap	9,601	12,535	2,499	1,794	9,989	13,008	2,711	6,221	2,600	3,409	4,265	9,950	129	362	11	39	2	13	**31,807**	**47,330**	**1.4%**
26	Wood prods.	339	351	144	140	349	361	678	952	91	95	60	63	38	76	383	145	100	64	**2,181**	**2,247**	**0.1%**
	TOTAL	**33,359**	**47,729**	**16,344**	**22,674**	**35,659**	**48,537**	**25,748**	**43,365**	**10,059**	**14,320**	**10,446**	**29,058**	**2,225**	**5,535**	**8,322**	**15,559**	**1,761**	**5,597**	**143,922**	**232,372**	**1.7%**

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics. Note: "Exports (Gateways inside Mega-Region)" includes inbound exports from Bay Are as well as exports from interior U.S. Similarly, "Imports (Gateways inside Mega-Region)" includes imports to Bay Area as well as imports to interior U.S. However, "Exports (Gateways outside Mega-region)" includes exports only from Bay Area and "Imports (Gateways inside Mega-region)" includes imports only to Bay Area.

Table 3.7 Current and Future Freight Flows Annual Value Summary by Commodity

Direction of Movement and Market, Alameda County

SCTG2	SCTG2 Commodity	Domestic Outbound to Rest of Bay Area		Domestic Outbound to outside Bay Area		Domestic Inbound from Rest of Bay Area		Domestic Inbound from outside Bay Area		Domestic Intra		Exports to Trade Gateways inside Mega-Region		Exports to Trade Gateways outside Mega-Region		Imports from Trade Gateways inside Mega-Region		Imports from Trade Gateways outside Mega-Region		Total		CAGR (2012-40) Value
		2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	
08	Alcoholic beverages	625	543	759	627	1,091	948	359	386	134	118	584	832	13	27	1,419	2,192	49	141	**5,032**	**5,813**	**0.5%**
04	Animal feed	12	21	3	3	35	60	106	176	3	5	611	6,576	7	14	18	345	10	112	**806**	**7,311**	**8.2%**
33	Articles-base metal	1,505	1,800	904	1,103	1,130	1,353	1,141	1,212	577	695	217	327	137	486	1,566	2,088	129	393	**7,306**	**9,456**	**0.9%**
32	Base metals	489	448	857	792	384	363	959	1,490	219	200	340	3,651	124	368	371	2,078	142	389	**3,886**	**9,779**	**3.4%**
20	Basic chemicals	105	178	204	360	105	178	771	1,800	48	81	875	1,645	44	162	454	759	100	333	**2,705**	**5,496**	**2.6%**
10	Building stone	18	21	20	14	20	23	11	28	2	3	0	0	3	8	2	10	0	0	**76**	**108**	**1.3%**
02	Cereal grains	39	96	103	332	38	94	358	513	20	50	160	951	76	47	3	15	2	5	**799**	**2,103**	**3.5%**
23	Chemical prods.	399	1,088	634	1,658	279	758	749	1,767	126	347	461	1,198	209	1,003	377	819	76	350	**3,311**	**8,988**	**3.6%**
15	Coal	0	0	0	0	0	0	0	0	0	0	1	17	0	0	0	0	0	0	**1**	**17**	**10.5%**
19	Coal-n.e.c.	298	255	156	126	932	799	1,754	1,782	75	65	36	87	12	52	9	37	9	26	**3,283**	**3,229**	**-0.1%**
16	Crude Petroleum													786	1,376	5	4			**791**	**1,380**	**2.0%**
35	Electronics	2,591	3,958	30,134	16,672	2,921	4,468	10,177	18,944	536	823	2,209	5,034	786	1,376	5,709	10,892	1,645	6,150	**56,710**	**68,318**	**0.7%**
22	Fertilizers	59	63	27	33	35	37	16	9	16	17	36	52	2	4	24	14	2	3	**217**	**232**	**0.2%**
18	Fuel oils	466	689	72	162	1,529	2,259	15	10	125	184	40	126	0	1	286	515	925	1,603	**3,457**	**5,548**	**1.7%**
39	Furniture	659	515	294	187	371	290	642	998	179	141	65	127	43	82	843	2,347	109	689	**3,205**	**5,376**	**1.9%**
17	Gasoline	951	1,258	678	1,357	3,096	4,078	284	235	249	331	44	143			93	209	18	32	**5,414**	**7,643**	**1.2%**
12	Gravel	51	67	3	4	53	77	44	63	13	17	0	2	0	0	0	0	0	0	**164**	**229**	**1.2%**
01	Live animals/fish	2	4	5	12	14	30	49	76	1	1	0	0	0	3	10	141	48	1,284	**129**	**1,551**	**9.3%**
25	Logs	1	1	0	1	6	9	10	10	0	0	23	488	0	0	2	7	0	0	**43**	**517**	**9.3%**
34	Machinery	6,949	14,725	2,184	4,907	4,334	9,194	2,157	3,465	2,208	4,712	2,645	6,870	1,319	7,257	3,794	16,913	694	5,912	**26,286**	**73,953**	**3.8%**
05	Meat/seafood	1,069	2,545	320	987	501	1,191	752	904	263	631	1,387	2,865	29	227	420	353	70	166	**4,812**	**9,868**	**2.6%**
14	Metallic ores	2	2	10	7	6	4	18	21	1	1	12	2,368	1	2	1	6	1	3	**53**	**2,413**	**14.6%**
06	Milled grain prods.	316	447	179	252	139	196	428	577	73	104	155	232	25	57	182	389	20	110	**1,517**	**2,364**	**1.6%**
40	Misc. mfg. prods.	617	2,165	1,293	2,676	437	1,534	2,957	9,956	167	591	244	380	139	352	1,311	2,153	200	686	**7,365**	**20,493**	**3.7%**
43	Mixed freight	2,211	6,763	1,087	3,394	912	2,786	3,609	8,054	573	1,764	7	22	16	66	188	340	124	404	**8,727**	**23,591**	**3.6%**
36	Motorized vehicles	3,971	1,993	1,968	709	1,997	1,004	4,095	8,579	1,662	840	689	1,775	336	255	1,958	1,698	1,223	1,713	**17,898**	**18,566**	**0.1%**
11	Natural sands	26	59	10	36	26	60	22	31	8	18	0	0	0	1	0	0	0	0	**93**	**205**	**2.9%**
27	Newsprint/paper	131	99	181	104	87	66	287	502	66	50	53	80	47	73	170	132	8	13	**1,029**	**1,120**	**0.3%**
31	Nonmetal min. prods.	931	1,339	1,179	1,038	507	730	1,021	1,974	369	534	181	397	57	158	659	929	65	202	**4,969**	**7,301**	**1.4%**
13	Nonmetallic minerals	35	50	56	36	43	59	41	161	16	24	41	455	3	3	10	46	5	14	**249**	**848**	**4.5%**
03	Other ag prods.	798	776	864	1,053	371	361	718	1,247	195	191	3,334	11,649	453	1,240	718	1,076	138	451	**7,589**	**18,043**	**3.1%**
07	Other foodstuffs	1,496	2,371	2,993	4,298	725	1,147	816	1,470	354	565	721	818	165	444	552	697	72	206	**7,895**	**12,016**	**1.5%**
28	Paper articles	268	343	318	508	201	258	287	524	109	140	60	212	66	437	93	86	69	133	**1,471**	**2,642**	**2.1%**
21	Pharmaceuticals	635	2,068	3,888	19,535	380	1,234	1,730	4,594	172	565	184	420	90	473	365	1,187	90	528	**7,535**	**30,604**	**5.1%**
24	Plastics/rubber	594	1,032	678	1,207	421	730	1,029	1,944	222	389	496	1,122	289	1,134	1,055	1,583	161	543	**4,943**	**9,684**	**2.4%**
38	Precision instruments	756	6,915	8,210	41,834	427	3,906	3,396	26,660	164	1,503	1,180	3,595	468	2,365	766	1,436	185	649	**15,552**	**88,863**	**6.4%**
29	Printed prods.	350	313	927	868	203	182	674	550	99	89	49	65	33	166	205	224	17	44	**2,556**	**2,500**	**-0.1%**
30	Textiles/leather	743	1,331	2,714	3,414	608	1,089	1,984	2,656	200	360	263	375	122	454	2,585	3,467	608	1,859	**9,826**	**15,005**	**1.5%**
09	Tobacco prods.	158	49	28	19	243	75	43	7	47	15	59	0	9	12	0	0	0	0	**589**	**177**	**-4.2%**
37	Transport equip.	34	223	104	288	17	110	1,274	2,839	9	57	291	755	137	553	167	374	71	287	**2,103**	**5,485**	**3.5%**
41	Waste/scrap	452	584	43	43	428	553	168	552	123	160	2,029	6,277	32	93	12	49	0	2	**3,287**	**8,311**	**3.4%**
26	Wood prods.	198	204	103	103	345	355	557	808	54	56	37	48	13	31	402	154	65	49	**1,774**	**1,808**	**0.1%**
	TOTAL	**31,009**	**57,401**	**64,189**	**110,756**	**25,397**	**42,646**	**45,513**	**107,575**	**9,475**	**16,435**	**19,821**	**62,035**	**6,094**	**20,859**	**26,805**	**55,762**	**7,150**	**25,483**	**235,453**	**498,953**	**2.7%**

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics. Note: "Exports (Gateways inside Mega-Region)" includes inbound exports from Bay Are as well as exports from interior U.S. Similarly, "Imports (Gateways inside Mega-Region)" includes imports to Bay Area as well as imports to interior U.S. However, "Exports (Gateways outside Mega-region)" includes exports only from Bay Area and "Imports (Gateways inside Mega-region)" includes imports only to Bay Area.

Table 3.8 Current and Future Freight Flows Annual Tonnage Summary by Commodity and County

All Counties in the Bay Area

		Entire Bay Area			Alameda			Contra Costa			Marin			Napa			San Francisco			San Mateo			Santa Clara			Solano			Sonoma		
SCTG2	SCTG2 Commodity	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR	2012 Tons (in thous.)	2040 Tons (in thous.)	CAGR
38	Alcoholic beverages	7,272	8,982	0.8%	2,176	2,656	0.7%	669	1,237	2.2%	178	193	0.3%	2,060	1,945	-0.2%	841	1,001	0.6%	546	679	0.8%	1,175	1,435	0.7%	335	438	1.0%	1,945	1,839	-0.2%
34	Animal feed	3,002	11,627	5.0%	1,012	6,757	7.0%	641	2,074	4.3%	69	136	2.5%	328	889	3.6%	178	389	2.8%	216	550	3.4%	491	1,213	3.3%	182	560	4.1%	675	1,816	3.6%
35	Articles-base metal	4,731	6,285	1.0%	2,568	3,241	0.8%	378	498	1.0%	45	58	0.9%	69	89	0.9%	275	457	1.8%	571	739	0.9%	2,220	2,906	1.0%	265	340	0.9%	194	250	0.9%
21	Base metals	5,518	10,022	2.2%	2,629	6,136	3.1%	827	1,220	1.4%	36	47	0.9%	45	71	1.6%	137	285	2.7%	298	467	1.6%	1,802	2,714	1.5%	368	556	1.5%	266	364	1.1%
43	Basic chemicals	4,491	8,558	2.3%	1,894	3,165	1.9%	456	1,106	3.2%	11	22	2.3%	146	268	2.2%	369	1,119	4.0%	1,615	3,027	2.3%	223	410	2.2%	572	1,092	2.3%	91	173	2.3%
40	Building stone	1,594	2,474	1.6%	409	635	1.6%	324	468	1.3%	131	170	0.9%	27	40	1.4%	306	518	1.9%	285	438	1.5%	489	706	1.3%	128	167	1.0%	229	294	0.9%
36	Cereal grains	11,066	18,172	1.8%	3,916	7,050	2.1%	1,134	1,465	0.9%	140	248	2.1%	370	606	1.8%	795	1,320	1.8%	1,572	2,586	1.8%	1,204	1,931	1.7%	831	1,214	1.4%	1,391	2,460	2.1%
03	Chemical prods.	3,754	11,299	4.0%	1,321	3,748	3.8%	381	1,168	4.1%	46	135	3.9%	125	375	4.0%	153	445	3.9%	1,388	4,188	4.0%	444	1,316	4.0%	413	1,257	4.1%	141	419	4.0%
30	Coal	139	1,952	9.9%	21	315	10.1%	79	1,164	10.1%	12	139	9.1%	1	7	9.4%	51	748	10.1%	11	150	9.8%	18	237	9.7%	20	271	9.8%	18	252	9.8%
07	Coal-n.e.c.	43,797	50,889	0.5%	8,610	9,077	0.2%	25,093	29,706	0.6%	1,175	1,220	0.1%	643	669	0.1%	4,971	6,644	1.0%	3,662	3,853	0.2%	8,853	9,256	0.2%	2,236	2,764	0.8%	2,253	2,338	0.1%
05	Crude petroleum	24,376	35,180	1.3%	8	6	-1.0%	22,965	30,409	1.0%							891	1,221	1.1%							6,886	8,867	0.9%			
32	Electronics	3,540	7,393	2.7%	1,133	2,056	2.2%	278	620	2.9%	72	180	3.3%	50	115	3.0%	390	1,025	3.5%	397	864	2.8%	1,663	3,090	2.2%	87	192	2.9%	200	410	2.6%
24	Fertilizers	2,399	2,460	0.1%	981	990	0.0%	397	421	0.2%	77	77	0.0%	98	104	0.2%	259	261	0.0%	926	988	0.2%	582	599	0.1%	333	356	0.2%	176	178	0.0%
33	Fuel oils	15,075	26,496	2.0%	3,387	5,545	1.8%	12,742	22,096	2.0%	430	696	1.7%	232	375	1.7%	1,922	3,610	2.3%	1,382	2,251	1.8%	3,267	5,315	1.8%	1,068	1,999	2.3%	825	1,335	1.7%
23	Furniture	1,962	3,722	2.3%	917	1,760	2.4%	230	369	1.7%	64	112	2.0%	30	54	2.2%	273	479	2.0%	213	353	1.8%	490	848	2.0%	124	174	1.2%	159	240	1.5%
41	Gasoline	37,137	57,171	1.6%	7,332	10,279	1.2%	31,723	49,728	1.6%	871	1,149	1.0%	464	610	1.0%	2,980	4,224	1.3%	2,887	3,914	1.1%	6,777	9,117	1.1%	1,665	2,429	1.4%	1,670	2,203	1.0%
17	Gravel	37,226	54,784	1.4%	10,908	15,724	1.3%	9,588	13,629	1.3%	2,861	4,124	1.3%	792	1,156	1.4%	4,055	5,995	1.4%	5,517	8,024	1.3%	10,984	16,112	1.4%	4,481	6,365	1.3%	5,206	7,508	1.3%
04	Live animals/fish	180	1,246	7.1%	34	293	8.0%	13	78	6.6%	3	28	8.1%	22	81	4.7%	11	118	9.0%	22	209	8.4%	27	229	7.9%	7	51	7.4%	52	222	5.3%
31	Logs	1,273	2,315	2.2%	358	1,125	4.2%	172	227	1.0%	95	122	0.9%	145	201	1.2%	51	69	1.1%	154	198	0.9%	256	345	1.1%	155	199	0.9%	423	584	1.2%
08	Machinery	4,881	12,553	3.4%	2,314	5,728	3.3%	412	974	3.1%	58	138	3.2%	265	634	3.2%	231	628	3.6%	631	1,608	3.4%	2,644	6,382	3.2%	324	750	3.0%	499	1,178	3.1%
18	Meat/seafood	3,449	6,949	2.5%	1,776	3,614	2.6%	319	732	3.0%	98	205	2.7%	120	268	2.9%	526	1,046	2.5%	548	1,203	2.8%	663	1,388	2.7%	196	457	3.1%	434	1,004	3.0%
20	Metallic ores	406	5,387	9.7%	103	328	4.2%	131	4,893	13.8%	3	6	3.0%	0	1	1.5%	1	1	0.9%	124	125	0.0%	10	18	2.1%	33	41	0.9%	5	11	3.1%
37	Milled grain prods.	2,760	4,993	2.1%	1,193	1,949	1.8%	277	499	2.1%	88	159	2.1%	85	146	1.9%	454	869	2.3%	391	668	1.9%	589	1,071	2.2%	148	257	2.0%	291	476	1.8%
39	Misc. mfg. prods.	2,881	10,399	4.7%	1,167	3,655	4.2%	358	1,340	4.8%	106	405	4.9%	57	217	4.9%	342	1,335	5.0%	328	1,235	4.8%	1,238	4,509	4.7%	155	581	4.8%	319	1,163	4.7%
19	Mixed freight	8,893	22,883	3.4%	2,648	7,196	3.6%	1,097	2,874	3.5%	355	933	3.5%	229	618	3.6%	1,403	3,659	3.5%	1,296	3,495	3.6%	2,476	6,392	3.4%	507	1,373	3.6%	698	1,870	3.6%
28	Motorized vehicles	6,216	8,160	1.0%	2,605	2,487	-0.2%	693	1,141	1.8%	92	116	0.8%	58	90	1.6%	797	1,183	1.4%	368	529	1.3%	2,592	2,933	0.4%	119	198	1.8%	239	258	0.3%
29	Natural sands	16,344	25,430	1.6%	4,569	7,436	1.8%	3,530	6,018	1.9%	1,397	2,535	2.2%	307	456	1.4%	1,829	2,652	1.3%	2,458	4,067	1.8%	5,004	7,949	1.7%	1,690	2,950	2.0%	2,545	4,613	2.1%
14	Newsprint/paper	2,445	3,221	1.0%	1,055	1,199	0.5%	232	295	0.9%	81	119	1.4%	81	108	1.0%	276	357	0.9%	356	463	0.9%	417	591	1.3%	110	118	0.2%	154	195	0.8%
06	Nonmetal min. prods.	42,928	62,936	1.4%	21,164	29,896	1.2%	5,700	8,397	1.4%	2,254	3,258	1.3%	4,135	5,762	1.2%	4,136	6,245	1.5%	5,694	8,485	1.4%	13,349	19,272	1.3%	4,348	6,271	1.3%	4,578	6,564	1.3%
02	Nonmetallic minerals	11,899	23,167	2.4%	3,592	8,831	3.3%	6,586	9,040	1.1%	607	898	1.4%	337	600	2.1%	1,446	3,305	3.0%	2,326	4,444	2.3%	1,531	2,428	1.7%	908	1,448	1.7%	1,051	1,533	1.4%
26	Other ag prods.	14,857	25,289	1.9%	6,140	9,461	1.6%	1,707	2,944	2.0%	364	591	1.7%	482	744	1.6%	1,539	2,494	1.7%	2,310	3,593	1.6%	2,655	4,350	1.8%	960	1,498	1.6%	1,969	3,006	1.5%
01	Other foodstuffs	19,341	31,043	1.7%	7,172	10,796	1.5%	2,398	4,232	2.0%	470	778	1.8%	689	1,099	1.7%	2,364	3,945	1.8%	4,527	7,120	1.6%	3,319	5,475	1.8%	1,517	2,449	1.7%	1,965	3,125	1.7%
16	Paper articles	2,155	4,288	2.5%	892	1,645	2.2%	190	371	2.4%	198	377	2.3%	63	117	2.3%	266	496	2.2%	286	531	2.2%	537	1,011	2.3%	58	112	2.4%	159	287	2.1%
27	Pharmaceuticals	323	1,056	4.3%	117	368	4.2%	37	119	4.3%	7	23	4.1%	9	33	4.5%	24	72	4.0%	100	349	4.6%	62	186	4.0%	29	107	4.7%	17	54	4.2%
13	Plastics/rubber	3,759	7,961	2.7%	1,942	3,739	2.4%	357	827	3.0%	118	246	2.7%	107	226	2.7%	227	472	2.6%	363	758	2.7%	772	1,635	2.7%	311	675	2.8%	421	891	2.7%
25	Precision instruments	619	4,394	7.3%	273	1,665	6.7%	40	319	7.7%	13	112	7.8%	8	69	7.8%	61	503	7.8%	73	466	6.8%	242	1,921	7.7%	14	117	7.9%	51	412	7.7%
22	Printed prods.	1,393	1,418	0.1%	526	514	-0.1%	124	124	0.0%	65	64	0.0%	46	47	0.1%	292	293	0.0%	255	255	0.0%	406	399	-0.1%	28	28	-0.1%	101	101	0.0%
12	Textiles/leather	2,165	3,985	2.2%	914	1,439	1.6%	217	399	2.2%	78	154	2.4%	24	46	2.3%	598	1,177	2.5%	156	284	2.2%	437	847	2.4%	108	190	2.0%	115	227	2.4%
11	Tobacco prods.	227	82	-3.6%	51	14	-4.4%	7	2	-3.9%	2	1	-3.8%	121	44	-3.6%	6	2	-3.9%	8	3	-3.8%	16	5	-3.8%	11	4	-3.5%	112	40	-3.6%
09	Transport equip.	129	430	4.4%	48	145	4.0%	11	40	4.6%	4	13	4.5%	2	7	4.5%	20	69	4.5%	13	44	4.4%	40	145	4.7%	4	13	4.5%	6	22	4.6%
10	Waste/scrap	90,326	133,080	1.4%	31,807	47,330	1.4%	15,546	21,826	1.2%	3,572	5,096	1.3%	3,008	4,110	1.1%	20,259	31,986	1.6%	12,555	17,539	1.2%	39,336	53,777	1.1%	6,287	8,899	1.2%	9,995	13,743	1.1%
15	Wood prods.	7,218	8,635	0.6%	2,181	2,247	0.1%	840	977	0.5%	253	307	0.7%	395	461	0.6%	943	1,153	0.7%	573	704	0.7%	2,122	2,581	0.7%	321	392	0.7%	1,451	1,684	0.5%
	TOTAL	**454,146**	**728,767**	**1.7%**	**143,863**	**232,239**	**1.7%**	**148,901**	**226,063**	**1.5%**	**16,602**	**25,388**	**1.5%**	**16,276**	**23,557**	**1.3%**	**56,946**	**93,872**	**1.8%**	**57,399**	**91,445**	**1.7%**	**121,423**	**183,044**	**1.5%**	**38,340**	**58,216**	**1.5%**	**43,089**	**65,344**	**1.5%**

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics. Note: The freight flows shown include only inbound, outbound and intra directions of movement with respect to the county/region, through movements are not included.

Table 3.9 Current and Future Freight Flows Annual Value Summary by Commodity

Direction of Movement and County, All Counties in the Bay Area

SCTG2	SCTG2 Commodity	Entire Bay Area			Alameda			Contra Costa			Marin			Napa			San Francisco			San Mateo			Santa Clara			Solano			Sonoma		
		2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR
38	Alcoholic beverages	17,981	18,938	0.2%	5,032	5,813	0.5%	1,417	1,980	1.2%	463	460	0.0%	5,883	5,239	-0.4%	2,091	2,180	0.1%	1,322	1,395	0.2%	2,872	2,961	0.1%	841	893	0.2%	5,535	4,958	-0.4%
34	Animal feed	1,681	9,359	6.3%	806	7,311	8.2%	288	968	4.4%	37	84	3.0%	128	526	5.2%	90	204	3.0%	107	298	3.7%	229	608	3.5%	78	228	3.9%	290	1,142	5.0%
35	Articles-base metal	15,359	20,670	1.1%	7,306	9,456	0.9%	1,774	2,353	1.0%	293	379	0.9%	316	413	1.0%	923	1,360	1.4%	1,876	2,507	1.0%	6,544	8,634	1.0%	1,048	1,387	1.0%	807	1,050	0.9%
21	Base metals	8,846	16,344	2.2%	3,886	9,779	3.4%	1,118	1,654	1.4%	95	128	1.1%	124	172	1.2%	319	642	2.5%	902	1,280	1.3%	3,221	4,485	1.2%	623	890	1.3%	344	465	1.1%
43	Basic chemicals	5,537	10,953	2.5%	2,705	5,496	2.6%	384	750	2.4%	12	23	2.3%	153	279	2.2%	107	313	3.9%	2,229	4,375	2.4%	256	495	2.4%	623	1,147	2.2%	98	186	2.3%
40	Building stone	491	674	1.1%	76	108	1.3%	10	15	1.5%	4	5	1.2%	243	313	0.9%	11	18	1.7%	14	20	1.3%	26	37	1.3%	19	25	1.1%	221	291	1.0%
36	Cereal grains	1,942	4,009	2.6%	799	2,103	3.5%	199	285	1.3%	24	47	2.4%	64	114	2.1%	143	267	2.3%	276	497	2.1%	199	367	2.2%	145	224	1.6%	240	467	2.4%
03	Chemical prods.	9,151	26,407	3.9%	3,311	8,988	3.6%	847	2,572	4.0%	158	442	3.7%	269	794	3.9%	521	1,457	3.7%	3,832	11,158	3.9%	1,344	3,713	3.7%	905	2,748	4.0%	404	1,150	3.8%
30	Coal	8	134	10.8%	1	17	10.5%	5	97	11.1%	1	8	10.1%	0	0	10.2%	2	39	11.0%	1	8	10.1%	1	13	10.1%	1	15	10.7%	1	14	10.1%
07	Coal-n.e.c.	16,805	17,877	0.2%	3,283	3,229	-0.1%	8,947	9,711	0.3%	450	447	0.0%	255	259	0.0%	1,648	1,903	0.5%	1,423	1,450	0.1%	3,406	3,423	0.0%	824	900	0.3%	863	857	0.0%
05	Crude petroleum	10,120	15,663	1.6%	5	4	-0.7%	9,534	13,579	1.3%							359	541	1.5%							2,759	3,874	1.2%			
32	Electronics	151,653	248,139	1.8%	56,710	68,318	0.7%	7,328	14,604	2.5%	1,054	2,472	3.1%	616	1,418	3.0%	5,611	13,208	3.1%	26,612	57,314	2.8%	78,564	139,698	2.1%	1,279	2,808	2.8%	4,788	9,141	2.3%
24	Fertilizers	486	518	0.2%	217	232	0.2%	69	74	0.2%	12	12	0.0%	18	19	0.4%	44	45	0.1%	170	191	0.4%	96	100	0.1%	61	68	0.4%	29	30	0.1%
33	Fuel oils	15,203	25,580	1.9%	3,457	5,548	1.7%	10,181	17,036	1.9%	481	764	1.7%	260	413	1.7%	1,780	3,125	2.0%	1,485	2,369	1.7%	3,564	5,677	1.7%	1,097	1,812	1.8%	922	1,465	1.7%
23	Furniture	8,048	13,996	2.0%	3,205	5,376	1.9%	996	1,457	1.4%	299	478	1.7%	136	225	1.8%	1,261	1,951	1.6%	1,020	1,617	1.7%	2,303	3,675	1.7%	556	736	1.0%	754	1,045	1.2%
41	Gasoline	27,700	43,497	1.6%	5,414	7,643	1.2%	23,825	38,089	1.7%	628	822	1.0%	338	440	0.9%	2,218	3,308	1.4%	2,110	2,865	1.1%	4,924	6,601	1.1%	1,137	1,577	1.2%	1,203	1,576	1.0%
17	Gravel	528	834	1.6%	164	229	1.2%	174	294	1.9%	24	37	1.5%	21	34	1.8%	57	85	1.4%	70	112	1.7%	143	228	1.7%	73	121	1.8%	46	69	1.5%
04	Live animals/fish	557	6,054	8.9%	129	1,551	9.3%	72	637	8.1%	22	172	7.6%	14	151	8.8%	44	552	9.5%	125	1,391	9.0%	86	1,040	9.3%	73	446	6.7%	72	658	8.2%
31	Logs	107	599	6.3%	43	517	9.3%	16	26	1.7%	5	7	0.8%	5	9	2.2%	7	11	1.5%	15	24	1.6%	16	21	0.9%	14	23	1.8%	14	25	2.0%
08	Machinery	64,955	200,080	4.1%	26,286	73,953	3.8%	8,234	24,029	3.9%	1,744	5,178	4.0%	1,402	4,045	3.9%	4,620	13,988	4.0%	19,765	71,403	4.7%	26,486	74,092	3.7%	4,477	12,659	3.8%	5,793	16,459	3.8%
18	Meat/seafood	10,332	21,528	2.7%	4,812	9,868	2.6%	1,117	2,587	3.0%	354	754	2.7%	362	842	3.1%	1,749	3,694	2.7%	1,635	3,767	3.0%	2,296	4,879	2.7%	641	1,531	3.2%	1,268	3,028	3.2%
20	Metallic ores	175	4,252	12.1%	53	2,413	14.6%	50	1,736	13.5%	8	16	2.6%	2	2	0.5%	1	2	1.6%	30	95	4.1%	18	32	2.0%	16	26	1.6%	15	30	2.5%
37	Milled grain prods.	3,777	6,641	2.0%	1,517	2,364	1.6%	401	708	2.1%	132	238	2.1%	124	209	1.9%	649	1,195	2.2%	567	951	1.9%	855	1,535	2.1%	218	371	1.9%	424	691	1.8%
39	Misc. mfg. prods.	20,033	67,133	4.4%	7,365	20,493	3.7%	1,816	7,311	5.1%	530	2,109	5.1%	286	1,105	5.0%	1,719	6,925	5.1%	2,672	8,226	4.1%	6,573	22,068	4.4%	782	3,117	5.1%	1,595	5,527	4.5%
19	Mixed freight	29,132	73,985	3.4%	8,727	23,591	3.6%	3,537	9,155	3.5%	1,150	3,001	3.5%	752	2,024	3.6%	4,697	12,168	3.5%	5,161	12,985	3.4%	8,148	20,799	3.4%	1,621	4,357	3.6%	2,233	5,970	3.6%
28	Motorized vehicles	44,980	62,630	1.2%	17,898	18,566	0.1%	6,866	11,510	1.9%	659	802	0.7%	461	749	1.7%	6,798	10,393	1.5%	2,885	4,354	1.5%	16,432	18,367	0.4%	1,222	2,273	2.2%	1,588	1,720	0.3%
29	Natural sands	294	637	2.8%	93	205	2.9%	65	142	2.9%	19	43	2.9%	11	25	2.9%	35	74	2.7%	42	94	2.9%	95	208	2.9%	23	49	2.8%	37	82	2.9%
14	Newsprint/paper	2,117	2,723	0.9%	1,029	1,120	0.3%	141	201	1.3%	235	221	-0.2%	49	74	1.5%	184	279	1.5%	233	327	1.2%	455	565	0.8%	48	58	0.7%	128	167	1.0%
06	Nonmetal min. prods.	10,464	16,539	1.6%	4,969	7,301	1.4%	1,061	1,793	1.9%	442	706	1.7%	792	1,125	1.3%	725	1,288	2.1%	1,364	2,374	2.0%	2,343	3,585	1.5%	839	1,327	1.7%	869	1,350	1.6%
02	Nonmetallic minerals	573	1,391	3.2%	249	848	4.5%	102	155	1.5%	24	40	1.8%	25	41	1.8%	54	90	1.8%	114	191	1.8%	80	131	1.8%	50	84	1.9%	40	65	1.8%
26	Other ag prods.	15,151	31,774	2.7%	7,589	18,043	3.1%	1,437	2,720	2.3%	305	464	1.5%	1,218	1,908	1.6%	1,267	1,993	1.6%	2,017	2,994	1.4%	2,208	3,367	1.5%	862	1,295	1.5%	2,316	3,495	1.5%
01	Other foodstuffs	21,575	35,106	1.8%	7,895	12,016	1.5%	2,496	4,494	2.1%	534	907	1.9%	762	1,222	1.7%	2,610	4,472	1.9%	5,331	8,398	1.6%	3,703	6,220	1.9%	1,818	2,934	1.7%	1,947	3,126	1.7%
16	Paper articles	3,601	6,807	2.3%	1,471	2,642	2.1%	351	620	2.1%	228	414	2.2%	128	227	2.1%	502	890	2.1%	565	1,003	2.1%	846	1,504	2.1%	125	213	1.9%	338	582	2.0%
27	Pharmaceuticals	23,057	97,176	5.3%	7,535	30,604	5.1%	2,178	8,587	5.0%	377	1,296	4.5%	650	2,833	5.4%	1,147	3,884	4.5%	7,533	33,420	5.5%	3,071	11,084	4.7%	2,305	10,233	5.5%	966	3,678	4.9%
13	Plastics/rubber	11,227	23,897	2.7%	4,943	9,684	2.4%	1,167	2,625	2.9%	256	529	2.6%	360	756	2.7%	587	1,262	2.8%	2,900	6,181	2.7%	1,722	3,574	2.6%	1,094	2,351	2.8%	719	1,496	2.7%
25	Precision instruments	38,763	262,773	7.1%	15,552	88,863	6.4%	1,554	13,017	7.9%	485	3,909	7.7%	314	2,480	7.7%	1,897	15,874	7.9%	7,246	31,284	5.4%	15,703	117,838	7.5%	567	4,500	7.7%	2,746	19,951	7.3%
22	Printed prods.	7,431	7,464	0.0%	2,556	2,500	-0.1%	543	546	0.0%	332	333	0.0%	196	201	0.1%	1,227	1,228	0.0%	1,213	1,252	0.1%	2,043	2,010	-0.1%	133	132	0.0%	468	471	0.0%
12	Textiles/leather	25,662	45,480	2.1%	9,826	15,005	1.5%	2,639	4,878	2.2%	910	1,742	2.3%	313	573	2.2%	6,308	12,224	2.4%	2,258	3,891	2.0%	5,399	9,948	2.2%	1,205	2,227	2.2%	1,403	2,671	2.3%
11	Tobacco prods.	1,720	618	-3.6%	589	177	-4.2%	414	144	-3.7%	152	54	-3.6%	69	24	-3.8%	343	122	-3.6%	289	102	-3.7%	571	196	-3.7%	179	65	-3.5%	203	70	-3.7%
09	Transport equip.	4,419	13,637	4.1%	2,103	5,485	3.5%	255	1,006	5.0%	54	226	5.2%	44	177	5.0%	277	1,157	5.2%	797	2,536	4.2%	1,366	4,387	4.3%	129	490	4.9%	115	459	5.1%
10	Waste/scrap	6,122	15,107	3.3%	3,287	8,311	3.4%	947	1,677	2.1%	245	429	2.0%	127	222	2.0%	1,162	3,711	4.2%	726	1,276	2.0%	2,114	3,780	2.1%	400	703	2.0%	496	869	2.0%
15	Wood prods.	6,074	7,320	0.7%	1,774	1,808	0.1%	750	861	0.5%	217	269	0.8%	556	617	0.4%	706	900	0.9%	557	677	0.7%	1,632	2,042	0.8%	280	324	0.5%	1,416	1,592	0.4%
	TOTAL	**643,836**	**1,484,944**	**3.0%**	**234,667**	**497,577**	**2.7%**	**105,306**	**206,682**	**2.4%**	**13,454**	**30,466**	**3.0%**	**17,847**	**32,302**	**2.1%**	**56,501**	**129,022**	**3.0%**	**109,489**	**286,650**	**3.5%**	**211,955**	**493,986**	**3.1%**	**31,192**	**71,241**	**3.0%**	**43,756**	**98,137**	**2.9%**

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics. Note: The freight flows shown include only inbound, outbound and intra directions of movement with respect to the county/region, through movements are not included.

Figures 3.19-26 graphically illustrate the top 10 originating and top 10 terminating future commodities for the Bay Area and Alameda County and examine the markets to which the commodity flows belong. Some of the highlights of these charts are as follows:

1. In the Bay Area, the top commodities by weight are mostly related to domestic trade; the trade is also mostly within the Bay Area.

2. On the other hand, the top commodities by value have a larger catchment area; there is substantial interregional and international trade of these commodities.

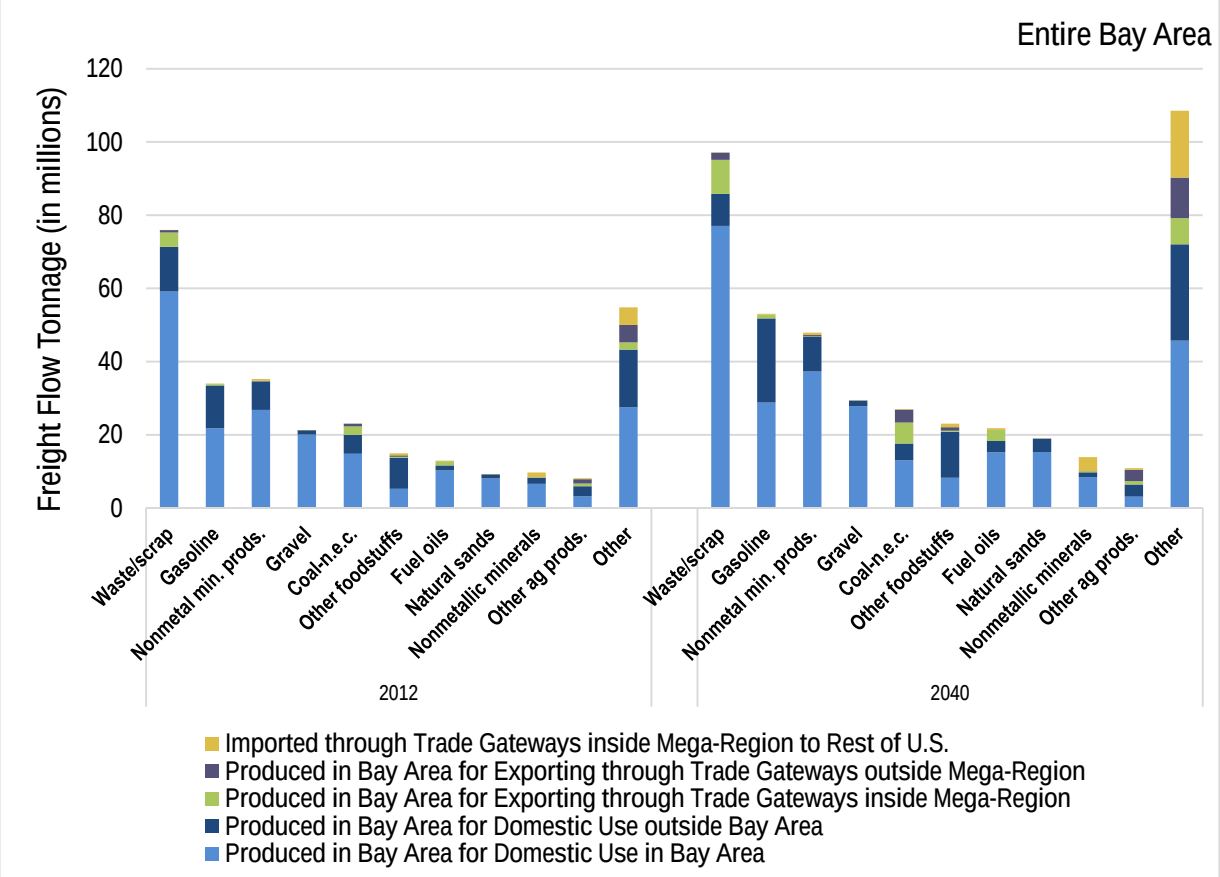
3. Among the commodities originating in the Bay Area as well as Alameda County, waste / scrap is expected to dominate in terms of weight in the future. Other important originating products are fuel distribution and food manufacturing related items.

4. The key future commodities by weight terminating in the Bay Area are mainly related to crude petroleum and chemical products needed for refineries, building and road construction materials, and consumer goods in the form of mixed freight and textiles/leather.

5. Commodities that are likely to see growth in international trade include waste/scrap, electronics, and machinery; these products are expected to grow rapidly. Electronics and machinery products have bi-directional trade flows, mainly between the manufacturing centers in Eastern Asia and design and testing facilities in the Bay Area. Some of the manufacturing relating to these industries is expected to re-shore to Mexico, the U.S. or Canada, which may affect the trade pattern.

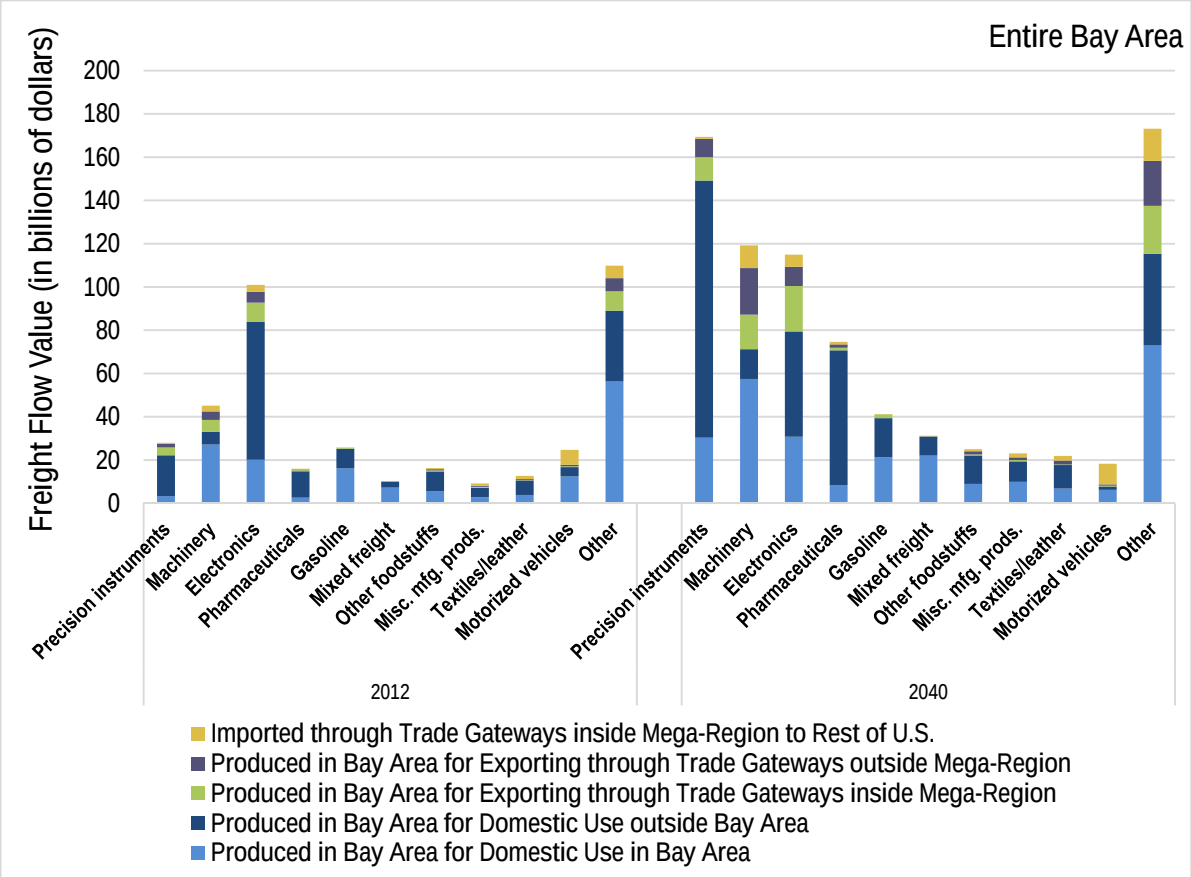
6. Alameda County is similar in many trade characteristics to the Bay Area as a whole.

Figure 3.19 Future Top Commodities Originating in the Bay Area by Annual Tonnage and by Market



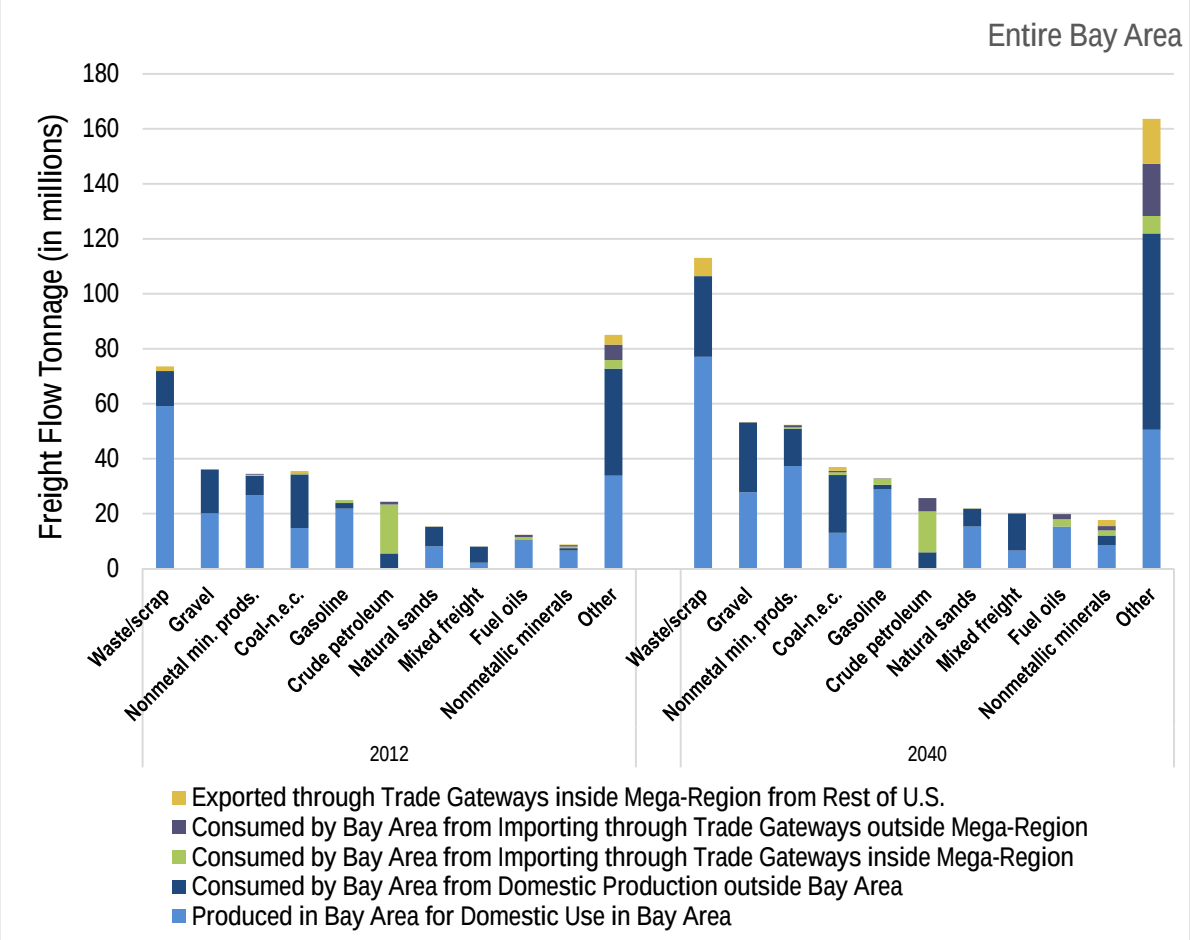
Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Figure 3.20 Future Top Commodities Originating in the Bay Area by Annual Value and by Market



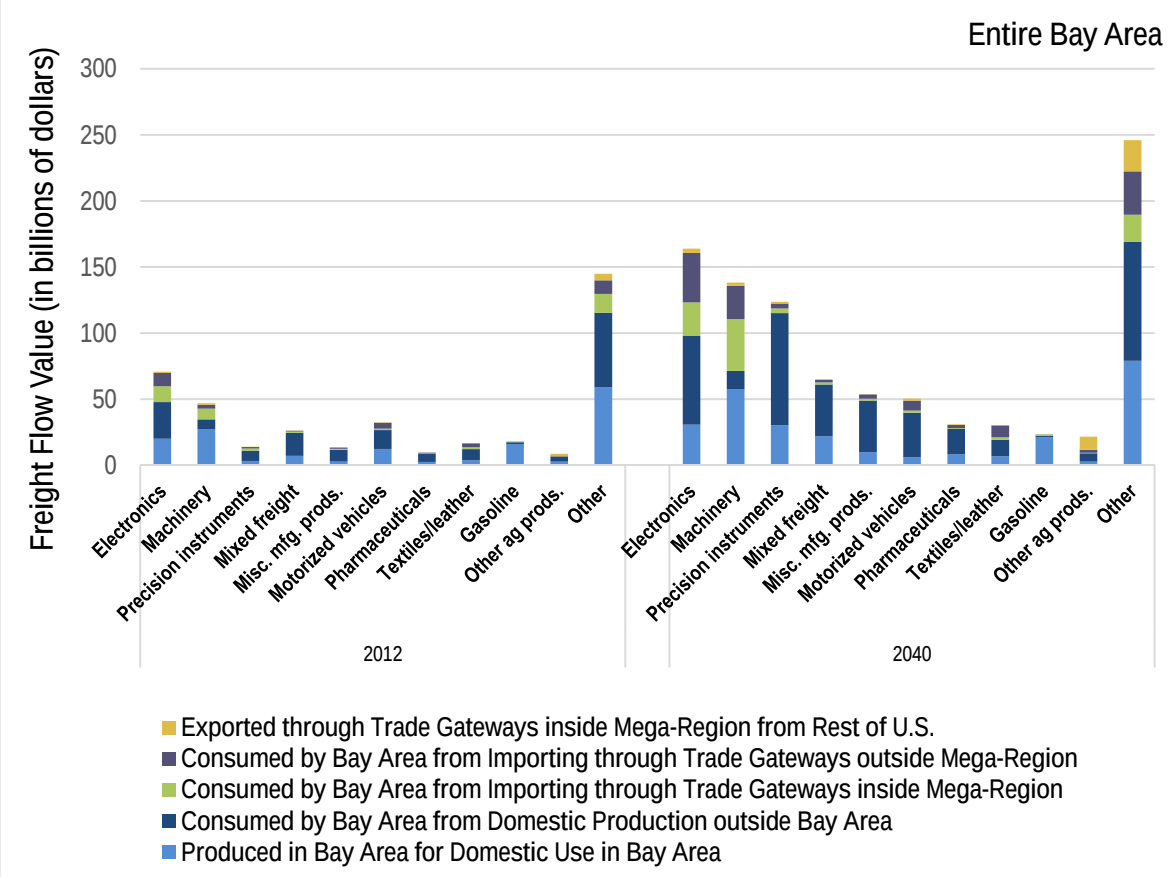
Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Figure 3.21 Future Top Commodities Terminating in the Bay Area by Annual Tonnage and by Market



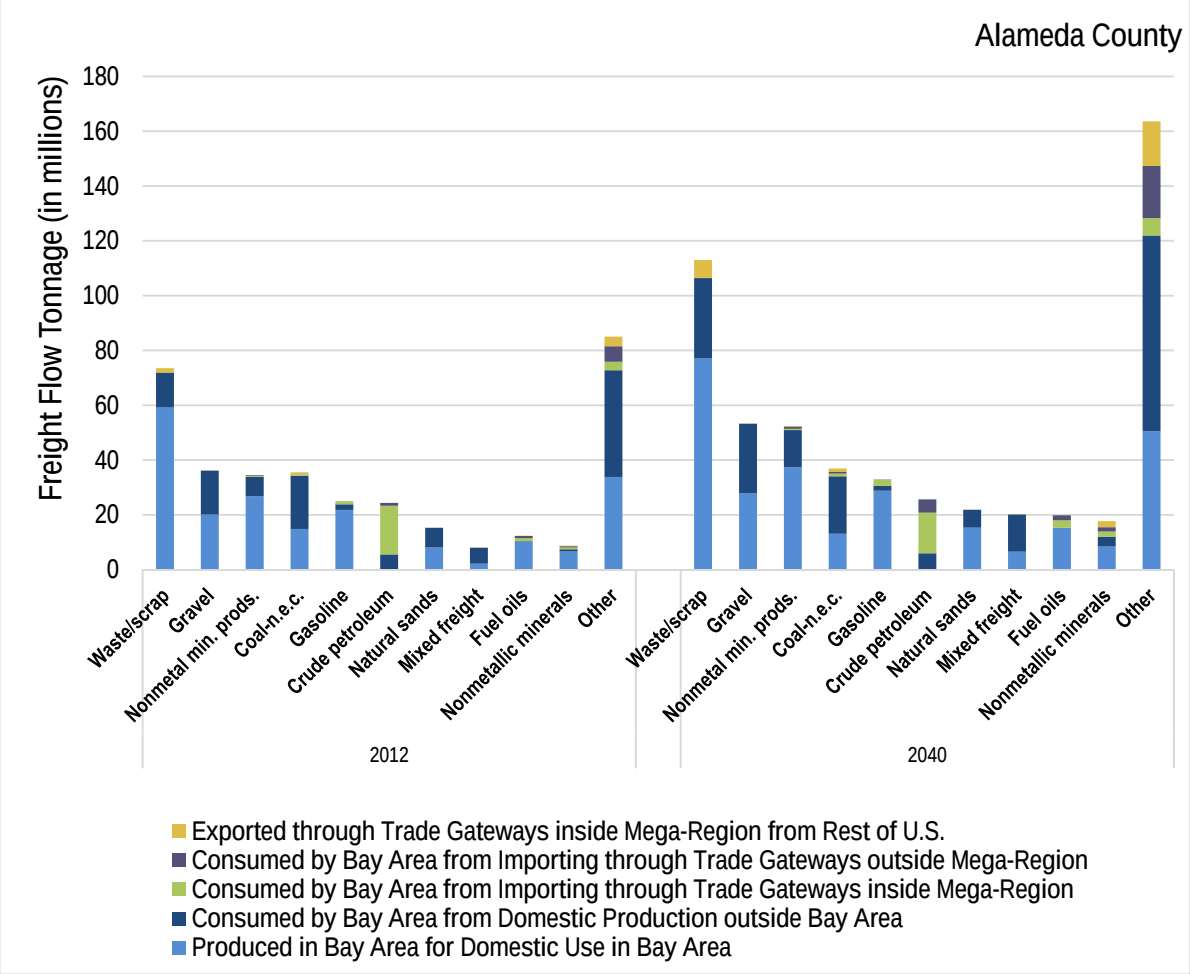
Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Figure 3.22 Future Top Commodities Terminating in the Bay Area by Annual Value and by Market



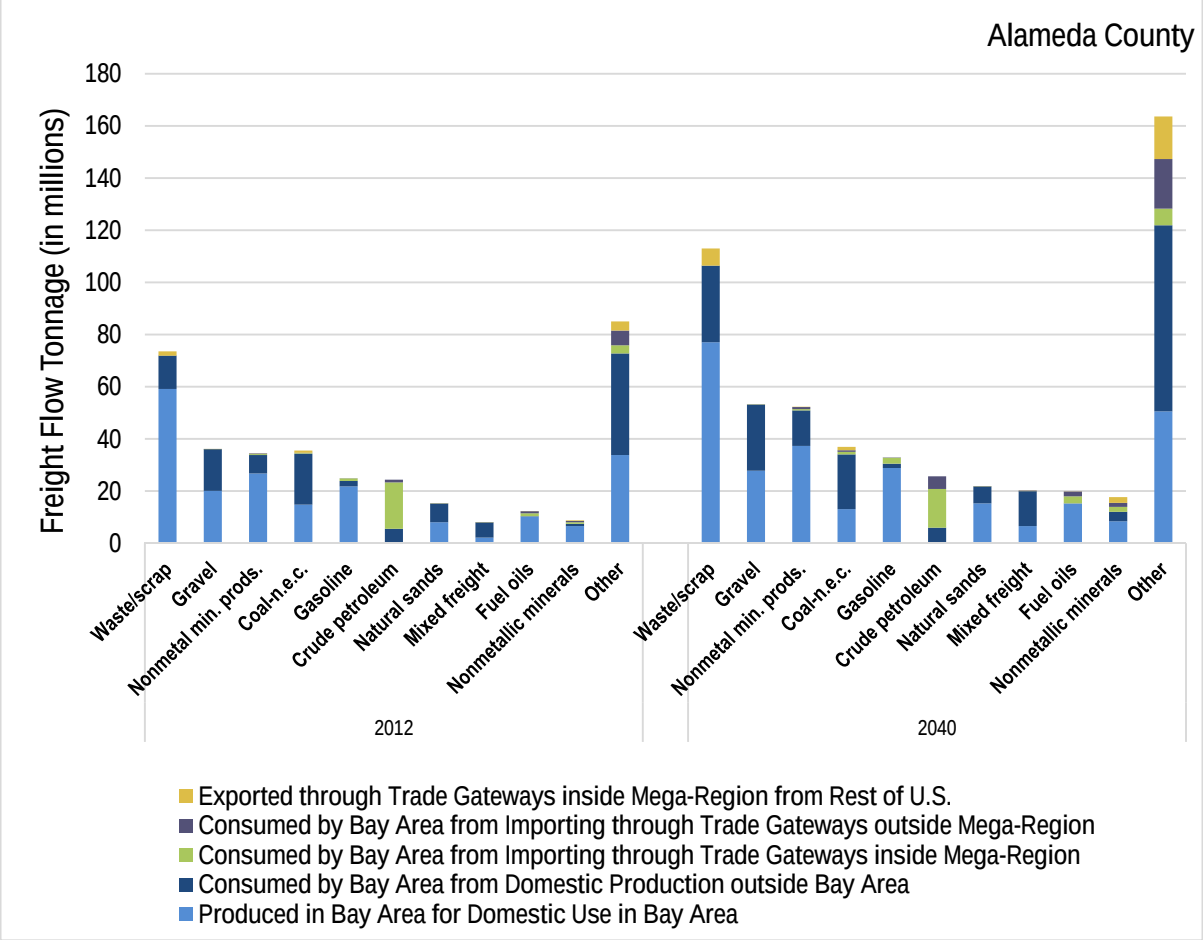
Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Figure 3.23 Future Top Commodities Originating in Alameda County by Annual Tonnage and by Market



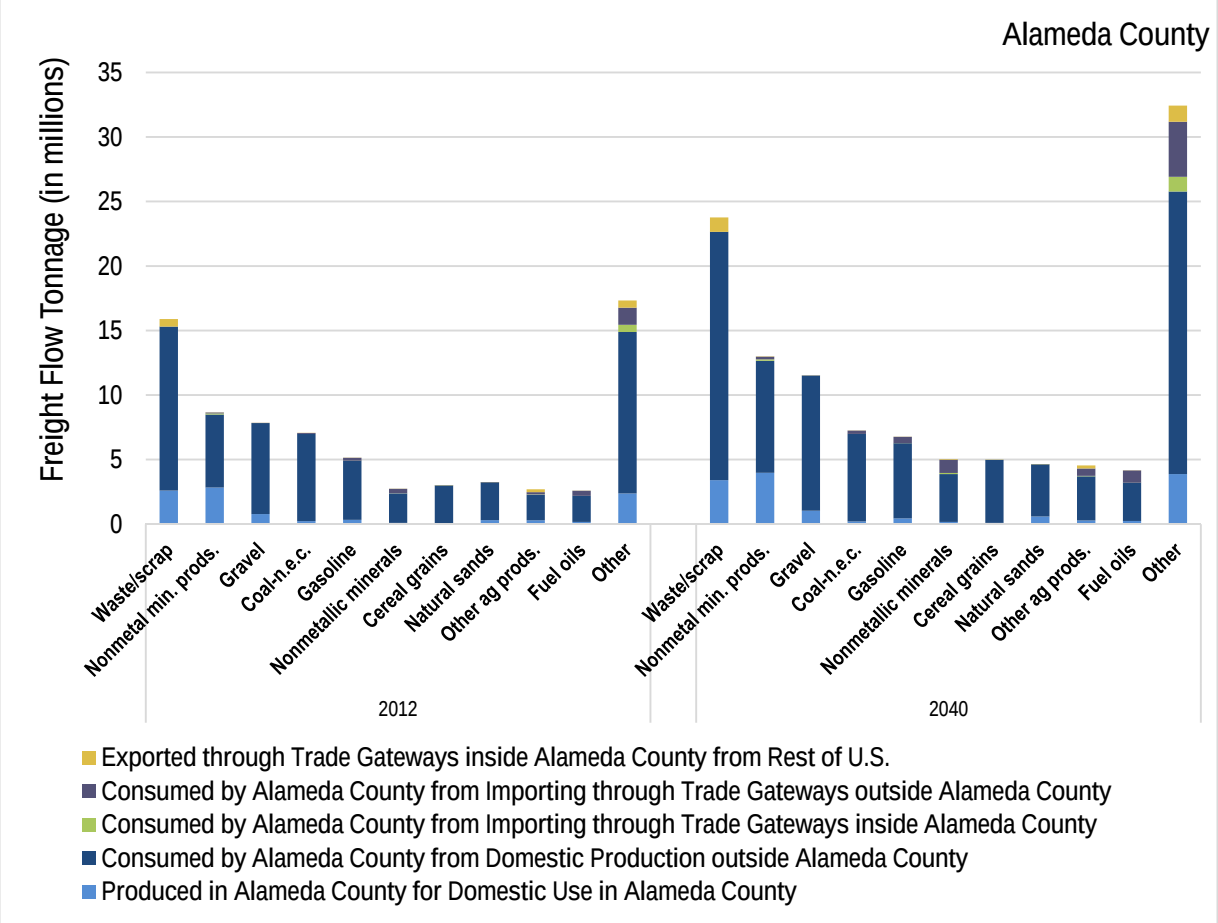
Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Figure 3.24 Future Top Commodities Originating in Alameda County by Annual Value and by Market



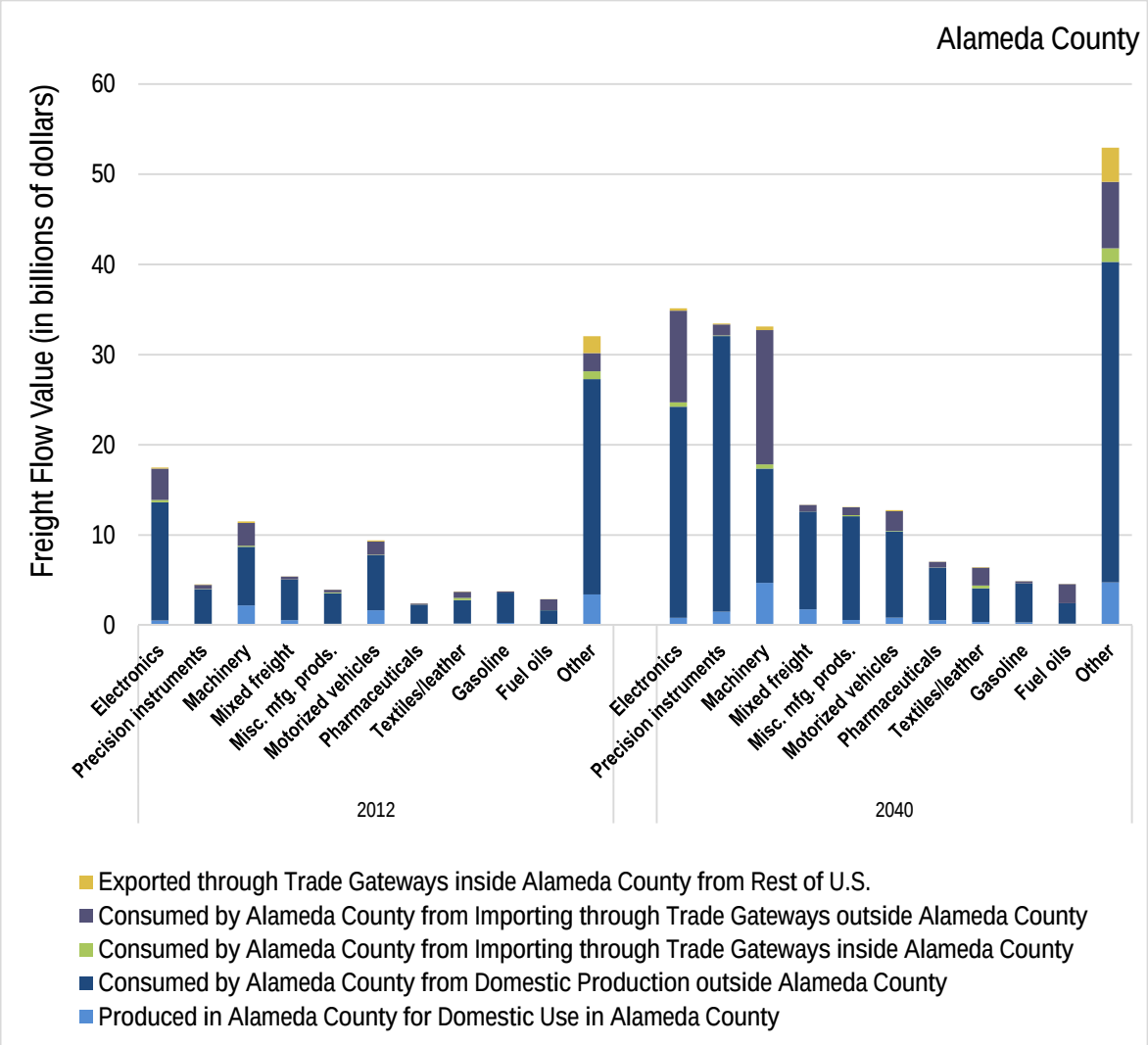
Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Figure 3.25 Future Top Commodities Terminating in Alameda County by Annual Tonnage and by Market



Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Figure 3.26 Future Top Commodities Terminating in Alameda County by Annual Value and by Market



Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

Table 3.10 provides a summary of the top 3 originating and terminating commodities by tonnage and value for all counties in the Bay Area. Alameda County and many other counties are similar in their top commodities – waste/scrap, gasoline and fuel oils, electronics and machinery. The top originating commodities sometimes differ based on the industry sector mixes in the counties, for example, refineries in Contra Costa County and Solano, and wineries in Napa and Sonoma County.

Table 3.10 Current and Future Key Commodities Originating and Terminating in Bay Area Counties by Annual Tonnage and Value

	Alameda				Contra Costa				Marin			
	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons
Originating Tons	Nonmetal min. prods.	15,319	20,773	1.1%	Gasoline	31,179	49,125	1.6%	Gasoline	704	953	1.1%
	Waste/scrap	15,380	19,252	0.8%	Coal-n.e.c.	20,948	25,084	0.6%	Fuel oils	347	542	1.6%
	Other foodstuffs	5,148	7,599	1.4%	Fuel oils	11,681	19,266	1.8%	Coal-n.e.c.	464	430	-0.3%
	Top Commodity	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**	**Top Commodity**	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**	**Top Commodity**	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**
Originating Value	Machinery	15,908	48,444	4.1%	Gasoline	23,299	37,510	1.7%	Precision instruments	277	1,962	7.2%
	Precision instruments	6,634	34,783	6.1%	Fuel oils	8,772	13,862	1.6%	Mixed freight	247	767	4.1%
	Electronics	17,854	26,031	1.4%	Crude petroleum	5,234	7,894	1.5%	Textiles/leather	360	707	2.4%
	Top Commodity	**2012 Tons (in thousands)**	**2040 Tons (in thousands)**	**CAGR (2012-40) Tons**	**Top Commodity**	**2012 Tons (in thousands)**	**2040 Tons (in thousands)**	**CAGR (2012-40) Tons**	**Top Commodity**	**2012 Tons (in thousands)**	**2040 Tons (in thousands)**	**CAGR (2012-40) Tons**
Terminating Tons	Waste/scrap	18,033	31,020	2.0%	Crude petroleum	20,879	21,799	0.2%	Waste/scrap	2,624	3,887	1.4%
	Nonmetal min. prods.	8,721	13,142	1.5%	Waste/scrap	10,068	14,921	1.4%	Nonmetal min. prods.	1,297	1,974	1.5%
	Gravel	7,754	11,420	1.4%	Coal-n.e.c.	7,662	9,623	0.8%	Gravel	1,328	1,956	1.4%
	Top Commodity	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**	**Top Commodity**	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**	**Top Commodity**	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**
Terminating Value	Machinery	11,957	44,498	4.8%	Machinery	6,543	25,145	4.9%	Machinery	1,733	6,659	4.9%
	Electronics	11,648	30,192	3.5%	Electronics	4,717	12,932	3.7%	Electronics	1,032	2,828	3.7%
	Precision instruments	2,430	19,413	7.7%	Crude petroleum	8,682	9,712	0.4%	Mixed freight	917	2,320	3.4%

Table 3.10 Current and Future Key Commodities Originating and Terminating in Bay Area Counties by Annual Tonnage and Value (continued)

	Napa				San Francisco				San Mateo			
	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons
Originating Tons	Gasoline	381	515	1.1%	Gasoline	2,373	3,428	1.3%	Gasoline	2,003	2,711	1.1%
	Fuel oils	188	293	1.6%	Coal-n.e.c.	2,293	3,395	1.4%	Fuel oils	988	1,542	1.6%
	Nonmetallic minerals	208	264	0.9%	Fuel oils	1,503	2,807	2.3%	Coal-n.e.c.	1,322	1,224	-0.3%
	Top Commodity	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**	**Top Commodity**	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**	**Top Commodity**	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**
Originating Value	Alcoholic beverages	5,738	5,080	-0.4%	Textiles/leather	4,613	9,095	2.5%	Machinery	13,760	100,598	7.4%
	Pharmaceuticals	486	2,330	5.8%	Precision instruments	851	5,966	7.2%	Electronics	18,065	59,249	4.3%
	Precision instruments	198	1,401	7.2%	Motorized vehicles	3,716	5,788	1.6%	Pharmaceuticals	6,407	30,797	5.8%
	Top Commodity	**2012 Tons (in thousands)**	**2040 Tons (in thousands)**	**CAGR (2012-40) Tons**	**Top Commodity**	**2012 Tons (in thousands)**	**2040 Tons (in thousands)**	**CAGR (2012-40) Tons**	**Top Commodity**	**2012 Tons (in thousands)**	**2040 Tons (in thousands)**	**CAGR (2012-40) Tons**
Terminating Tons	Waste/scrap	1,318	1,953	1.4%	Waste/scrap	9,710	18,447	2.3%	Waste/scrap	7,502	11,115	1.4%
	Nonmetal min. prods.	892	1,357	1.5%	Coal-n.e.c.	5,061	6,785	1.1%	Nonmetal min. prods.	4,550	6,926	1.5%
	Gravel	667	983	1.4%	Gravel	4,171	6,142	1.4%	Gravel	3,798	5,592	1.4%
	Top Commodity	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**	**Top Commodity**	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**	**Top Commodity**	**2012 Value (in millions of dollars)**	**2040 Value (in millions of dollars)**	**CAGR (2012-40) Value**
Terminating Value	Machinery	1,081	4,153	4.9%	Machinery	4,248	16,328	4.9%	Electronics	14,901	60,284	5.1%
	Electronics	578	1,583	3.7%	Electronics	5,113	14,020	3.7%	Machinery	10,833	50,724	5.7%
	Other ag prods.	953	1,544	1.7%	Precision instruments	1,091	10,487	8.4%	Precision instruments	5,504	36,431	7.0%

Table 3.10 Current and Future Key Commodities Originating and Terminating in Bay Area Counties by Annual Tonnage and Value (continued)

	Santa Clara				Solano				Sonoma			
	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons
Originating Tons	Gasoline	4,968	6,724	1.1%	Crude petroleum	2,064	1,725	-0.6%	Gasoline	1,349	1,826	1.1%
	Fuel oils	2,451	3,824	1.6%	Gasoline	1,173	1,623	1.2%	Fuel oils	666	1,039	1.6%
	Coal-n.e.c.	3,277	3,035	-0.3%	Fuel oils	633	1,063	1.9%	Coal-n.e.c.	890	824	-0.3%
	Top Commodity	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR (2012-40) Value	Top Commodity	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR (2012-40) Value	Top Commodity	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR (2012-40) Value
Originating Value	Electronics	51,406	84,881	1.8%	Pharmaceuticals	1,830	8,774	5.8%	Precision instruments	2,357	16,710	7.2%
	Precision instruments	11,059	78,319	7.2%	Machinery	2,126	6,213	3.9%	Machinery	2,343	6,849	3.9%
	Machinery	17,782	51,971	3.9%	Precision instruments	364	2,580	7.2%	Alcoholic beverages	5,204	4,607	-0.4%
	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons	Top Commodity	2012 Tons (in thousands)	2040 Tons (in thousands)	CAGR (2012-40) Tons
Terminating Tons	Waste/scrap	17,851	26,446	1.4%	Waste/scrap	4,186	6,201	1.4%	Waste/scrap	4,865	7,208	1.4%
	Gravel	9,036	13,306	1.4%	Crude petroleum	3,469	3,834	0.4%	Gravel	2,463	3,627	1.4%
	Nonmetal min. prods.	7,000	10,649	1.5%	Nonmetal min. prods.	2,220	3,376	1.5%	Nonmetal min. prods.	2,302	3,502	1.5%
	Top Commodity	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR (2012-40) Value	Top Commodity	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR (2012-40) Value	Top Commodity	2012 Value (in millions of dollars)	2040 Value (in millions of dollars)	CAGR (2012-40) Value
Terminating Value	Electronics	34,008	93,509	3.7%	Machinery	2,677	10,287	4.9%	Machinery	3,778	14,519	4.9%
	Precision instruments	5,373	51,658	8.4%	Misc. mfg. prods.	701	3,018	5.4%	Electronics	2,574	7,051	3.7%
	Machinery	12,123	46,627	4.9%	Electronics	1,096	3,001	3.7%	Precision instruments	482	4,633	8.4%

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

3.7 Inter-regional Freight Flows

Lastly, counties were grouped together to study pairs of inter-regional freight flows in Northern California. The county grouping is based on originating/terminating corridor and proximity to direct access routes to trading partner regions as follows:

- San Francisco, San Mateo and Santa Clara Counties – these counties are along the US-101 corridor, which connects to SR-152 and the San Joaquin Valley region, as well as the northern central coast region;
- Alameda and Contra Costa Counties – these counties are along the I-880, I-80, I-680 and I-580 corridors, and via I-580 connect to the San Joaquin Valley region; and
- Marin, Napa, Solano and Sonoma Counties – these counties are along the US-101, SR-37, SR-29, SR-12 and I-80 corridors, and via I-80 connect to the Sacramento region and via SR-12 to the San Joaquin Valley region.

Although many top commodities are similar, the order in which they rank for the different pairs of county groups and neighboring regions of the mega-region is different. Irrespective of the county group, the growth rate of movements to/from the Sacramento metropolitan statistical area is higher than that of other neighboring regions.

Table 3.11 Current and Future Key Commodities for Interregional Freight Flows

Between Bay Area and three neighboring regions, by Annual Tonnage and Value

	Commodity (In order By Tonnage)	2012 Tons (In thousands)	2040 Tons (In thousands)	CAGR (2012-40) Tons	Commodity (In order by Value)	2012 Value (In millions of dollars)	2040 Value (In millions of dollars)	CAGR (2012-40) Value
Between Counties along US-101 Corridor - San Francisco / San Mateo / Santa Clara Counties and								
Northern San Joaquin Valley region	Mixed freight	1,263	3,125	3.3%	Mixed freight	3,299	8,229	3.3%
	Other ag prods.	1,521	2,573	1.9%	Machinery	584	1,846	4.2%
	Waste/scrap	1,161	2,359	2.6%	Other foodstuffs	940	1,664	2.1%
	Cereal grains	1,428	2,317	1.7%	Other ag prods.	854	1,446	1.9%
	Other foodstuffs	1,193	2,048	1.9%	Motorized vehicles	618	1,189	2.4%
	Total	10,872	18,970	2.0%	Total	10,243	22,544	2.9%
Sacramento MSA Region	Gravel	965	3,418	4.6%	Pharmaceuticals	1,839	10,082	6.3%
	Waste/scrap	1,105	2,810	3.4%	Mixed freight	1,788	3,684	2.6%
	Nonmetal min. prods.	1,648	2,783	1.9%	Machinery	377	1,138	4.0%
	Cereal grains	581	1,582	3.6%	Precision instruments	74	967	9.6%
	Other ag prods.	544	1,463	3.6%	Electronics	528	909	2.0%
	Total	7,893	17,439	2.9%	Total	7,992	23,381	3.9%
Northern Central Coast Region	Gravel	3,163	4,331	1.1%	Machinery	1,355	5,799	5.3%
	Waste/scrap	2,869	3,903	1.1%	Electronics	1,124	2,949	3.5%
	Natural sands	1,278	2,279	2.1%	Mixed freight	478	1,380	3.9%
	Nonmetal min. prods.	1,150	1,597	1.2%	Precision instruments	185	1,229	7.0%
	Other foodstuffs	352	568	1.7%	Meat/seafood	248	585	3.1%
	Total	11,187	16,508	1.4%	Total	6,691	16,726	3.3%

	Commodity (In order By Tonnage)	2012 Tons (In thousands)	2040 Tons (In thousands)	CAGR (2012-40) Tons	Commodity (In order by Value)	2012 Value (In millions of dollars)	2040 Value (In millions of dollars)	CAGR (2012-40) Value
Between Counties along I-880, I-80, I-580, I-680 and SR-4 Corridors – Alameda/Contra Costa Counties and								
Northern San Joaquin Valley region	Gasoline	4,573	8,387	2.2%	Gasoline	3,363	6,165	2.2%
	Cereal grains	1,794	2,914	1.7%	Mixed freight	2,096	5,286	3.4%
	Other ag prods.	1,669	2,863	1.9%	Other ag prods.	1,066	1,949	2.2%
	Mixed freight	833	2,076	3.3%	Machinery	526	1,613	4.1%
	Other foodstuffs	1,151	1,940	1.9%	Other foodstuffs	817	1,410	2.0%
	Total	15,626	26,872	2.0%	Total	12,277	24,502	2.5%
Sacramento MSA Region	Nonmetal min. prods.	2,293	3,590	1.6%	Pharmaceuticals	1,299	5,091	5.0%
	Gravel	734	2,585	4.6%	Mixed freight	1,195	2,621	2.8%
	Waste/scrap	743	2,076	3.7%	Gasoline	290	1,138	5.0%
	Cereal grains	736	2,001	3.6%	Machinery	315	807	3.4%
	Other ag prods.	583	1,544	3.5%	Plastics/rubber	304	807	3.6%
	Total	8,246	18,600	2.9%	Total	6,703	16,523	3.3%
Northern Central Coast Region	Gravel	2,543	3,484	1.1%	Gasoline	1,143	1,753	1.5%
	Waste/scrap	1,811	2,523	1.2%	Machinery	725	1,600	2.9%
	Gasoline	1,564	2,407	1.6%	Mixed freight	331	959	3.9%
	Nonmetal min. prods.	1,378	1,899	1.2%	Meat/seafood	248	613	3.3%
	Natural sands	1,031	1,862	2.1%	Fuel oils	383	574	1.5%
	Total	12,566	18,901	1.5%	Total	6,444	10,984	1.9%

	Commodity (In order By Tonnage)	2012 Tons (In thousands)	2040 Tons (In thousands)	CAGR (2012-40) Tons	Commodity (In order by Value)	2012 Value (In millions of dollars)	2040 Value (In millions of dollars)	CAGR (2012-40) Value
Between Counties along US-101, I-80 and SR-12 corridors - Marin / Napa / Solano / Sonoma Counties and								
Northern San Joaquin Valley region	Cereal grains	1,111	1,804	1.7%	Mixed freight	1,002	2,522	3.4%
	Other ag prods.	846	1,378	1.8%	Other ag prods.	839	1,453	2.0%
	Mixed freight	405	1,006	3.3%	Other foodstuffs	415	716	2.0%
	Other foodstuffs	594	997	1.9%	Machinery	205	626	4.1%
	Waste/scrap	360	858	3.2%	Nonmetal min. prods.	209	358	1.9%
	Total	5,473	9,281	1.9%	Total	4,348	8,784	2.5%
Sacramento MSA Region	Nonmetal min. prods.	1,226	1,912	1.6%	Mixed freight	1,002	2,522	3.4%
	Gravel	381	1,327	4.6%	Other ag prods.	839	1,453	2.0%
	Cereal grains	452	1,230	3.6%	Other foodstuffs	415	716	2.0%
	Waste/scrap	361	1,015	3.8%	Machinery	205	626	4.1%
	Other ag prods.	296	752	3.4%	Nonmetal min. prods.	209	358	1.9%
	Total	4,109	8,540	2.6%	Total	4,348	8,784	2.5%
Northern Central Coast Region	Gravel	1,476	2,025	1.1%	Machinery	263	561	2.7%
	Waste/scrap	855	1,148	1.1%	Mixed freight	150	432	3.9%
	Natural sands	603	1,114	2.2%	Alcoholic beverages	307	276	-0.4%
	Nonmetal min. prods.	731	1,007	1.2%	Meat/seafood	109	259	3.2%
	Logs	298	386	0.9%	Other foodstuffs	140	226	1.7%
	Total	5,257	7,619	1.3%	Total	2,070	3,386	1.8%

Source: FAF3 Database, 2009 FHWA FAF2 Disaggregation study, USA Trade Online data, US Army Corps of Engineers' Waterborne Commerce data, 2013 Oakland Army Base Development EIR, 2013 California Air Groundside Needs study, 2013 California State Rail Plan, Cambridge Systematics.

4.0 Models and Forecasts For Corridor Level Traffic Forecasting And Their Assessment

4.1 Alameda Countywide Travel Demand Model and Truck Model Component

Although the disaggregated and adjusted FAF3 provides projections on truck tonnages at the county level, to analyze truck flows at the corridor level, additional tools are necessary. The Alameda Countywide Travel Demand Model is an essential tool for Alameda County's congestion management program (CMP) and other long-range planning processes. The model allows Alameda CTC to anticipate and forecast the potential impacts of local land development decisions and transportation investments on transportation system performance in the county. The model is periodically updated to be consistent with the most recent land use and socio-economic database of the Association of Bay Area Governments (ABAG) and assumptions of MTC's regional travel demand model. The most recent Alameda countywide travel demand model, completed in mid-2014[21], includes land use assumptions updated to ABAG's Plan Bay Area Sustainable Communities Strategy land use data). The model forecasts four types of truck trips: (a) Very Small Trucks, (b) Small Trucks, (c) Medium Trucks, and (d) Large or "Combo" Trucks. The trip generation rates for Very Small trucks (e.g., pickup trucks) are consistent with the MTC model. The Very Small trucks are modeled as passenger autos for the purposes of traffic assignment and capacity calculations. The trip generation rates for the other three types of trucks were updated based on the Alameda CTC truck modeling study completed in early 2010. These updated truck rates were based on new research and a series of detailed truck classification counts throughout Alameda County. The model is capable of producing network outputs for 2010 (baseline year and the most recent year for which the county model is validated), and 2040. The model is also capable of estimating vehicle miles travelled, vehicle hours travelled, delay and emissions by time period of day and vehicle type.

MTC's Travel One Model[22] is also a travel demand model, with similar data and capabilities as the Alameda Countywide travel demand model, but with less detail in Alameda County. In addition, the truck modeling and validation work conducted for the Alameda CTC model was considered to be more robust.

The disaggregated FAF3 based freight forecast developed in this report and the raw data used in the FAF3 database adjustments were used to adjust the origin-destination truck trip tables in the

[21] The most recent Alameda Countywide travel demand model update was made in mid-2014 by the Santa Clara Valley Transportation Authority (VTA) modelers for the Alameda CTC.

[22] http://dataportal.mtc.ca.gov/users-guide-1.aspx (last accessed on July 15, 2014).

Alameda CTC model in two ways: (1) the growth in truck trips between zones within the Bay Area to zones outside the Bay Area in the Alameda CTC model (that is, internal-to-external and external-to-internal truck trips) was adjusted using the FAF3 database growth factors for "equivalent"[23] truck mode freight flows; and (2) the truck trips originating or terminating at the zones designated for the Port of Oakland in the Alameda CTC model were adjusted using the OAB EIR truck trip data and projections. Truck trips that are not related to the port and are only between zones within the Bay Area (that is, internal-to-internal truck trips) and truck trips through the Bay Area (that is, external-to-external truck trips) were not adjusted. These adjustments are done to ensure the model growth is consistent with the growth reported in the memo.

4.2 California State Rail Plan Train Volumes Forecast

The California State Rail Plan, completed in mid-2013, provided a wealth of information on rail movements, in particular it provided train volume estimates and forecasts. Freight train volumes were estimated by rail segment for 2007, and forecast for 2020, 2025 and 2040, and by total and train service type (trains can carry intermodal, automobiles, bulk, and general merchandise as categories of train type). In addition, passenger train forecasts were also available by segment up to 2025. This was done through the use of the 2007 Surface Transportation Board (STB) confidential waybill sample tonnage data, FAF version 3.2 forecasts (then available), a waybill records data processing tool, a process for assigning the trains to a rail network based on shortest distance path, and actual train counts for adjustments to train volumes on specific lines (validation). Use of detailed data or the train volumes estimation model are subject to confidentiality restrictions, hence only the train volumes reported in the State Rail Plan will be used in the Alameda CTC Countywide Goods Movement Plan. The train volumes for rail segments in the Bay Area are indicated in Table 4.7.

[23] The zone definitions and their representations in the FAF3 database differ from that in the Alameda CTC model.

Table 4.1 Train Volumes by Rail Segment Estimate and Forecast based on the 2013 California State Rail Plan

Rail Subdivision[a]	From	To	Class I Freight Rail Services	Passenger Rail Services	2012 Daily Train Volumes					2020 Passenger Train Volumes					2040 Daily Train Volumes				
					Intermodal Freight Daily Trains[b]	Non-Intermodal Freight Daily Trains[b]	Freight Daily Trains[b]	Passenger Daily Trains[c]	Total Daily Trains	Intermodal Freight Daily Trains[b]	Non-Intermodal Freight Daily Trains[b]	Freight Daily Trains[b]	Passenger Daily Trains[c]	Total Daily Trains	Intermodal Freight Daily Trains[b]	Non-Intermodal Freight Daily Trains[b]	Freight Daily Trains[b]	Passenger Daily Trains[c]	Total Daily Trains
Coast	San Jose	Santa Clara	UP	CC-AMTRK, CAL-JPBX, ACE-SJRRC, CS-AMTRK	0	8	8	108	116	0	10	10	138	148	0	12	12	N/A	N/A
Coast	Santa Clara	Niles	UP	CC-AMTRK, ACE-SJRRC, CS-AMTRK	0	8	8	22	30	0	10	10	32	42	0	12	12	N/A	N/A
Martinez	Sacramento	Martinez	UP	CC-AMTRK, CS-AMTRK, ZE-AMTRK	10	8	18	34	52	12	10	22	34	56	24	12	36	N/A	N/A
Martinez	Martinez	Richmond	BNSF, UP	CC-AMTRK, SJ-AMTRK, CS-AMTRK, ZE-AMTRK	10	8	18	42	60	12	10	22	44	66	24	12	36	N/A	N/A
Martinez	Richmond	Emeryville	BNSF, UP	CC-AMTRK, SJ-AMTRK, CS-AMTRK, ZE-AMTRK	14	10	24	42	66	18	12	30	44	74	34	16	50	N/A	N/A
Martinez	Emeryville	Oakland	BNSF, UP	CC-AMTRK, SJ-AMTRK, CS-AMTRK	14	10	24	40	64	18	12	30	42	72	34	16	50	N/A	N/A
Niles	Niles	Oakland	UP	CC-AMTRK, CS-AMTRK	2	6	8	16	24	4	6	10	24	34	6	8	14	N/A	N/A
Oakland	Niles	Stockton	UP	ACE-SJRRC	2	2	4	6	10	4	2	6	8	14	6	2	8	N/A	N/A
Peninsula	Santa Clara	San Francisco	UP	CAL-JPBX	0	1	1	86	87	0	1	1	106	107	0	1	1	N/A	N/A
Stockton	Stockton	Port Chicago	BNSF	SJ-AMTRK	6	4	10	8	18	8	4	12	10	22	14	6	20	N/A	N/A
Stockton	Port Chicago	Richmond	BNSF	None	6	4	10	0	10	8	4	12	0	12	14	6	20	N/A	N/A
Tracy	Stockton	Port Chicago	UP	None	0	0	0	0	0	0	0	0	0	0	0	0	0	N/A	N/A
Tracy	Port Chicago	Martinez	UP	SJ-AMTRK	0	0	0	8	8	0	0	0	10	10	0	0	0	N/A	N/A

Source: California State Rail Plan, May 2013.

Key: CD-AMTRK: Amtrak's Coast Daylight Passenger Rail Service; ZE-AMTRK: Amtrak's Zephyr Passenger Rail Service; CC-AMTRK Amtrak's Capital Corridor Passenger Rail Service; SJ-AMTRK: Amtrak's San Joaquin Passenger Rail Service; CAL-JPBX: Peninsula Corridor Joint Powers Board's Caltrain Passenger Rail Service; ACE-SJRRC: San Joaquin Regional Rail Commission's Altamont Commuter Express Passenger Rail Service

Notes:

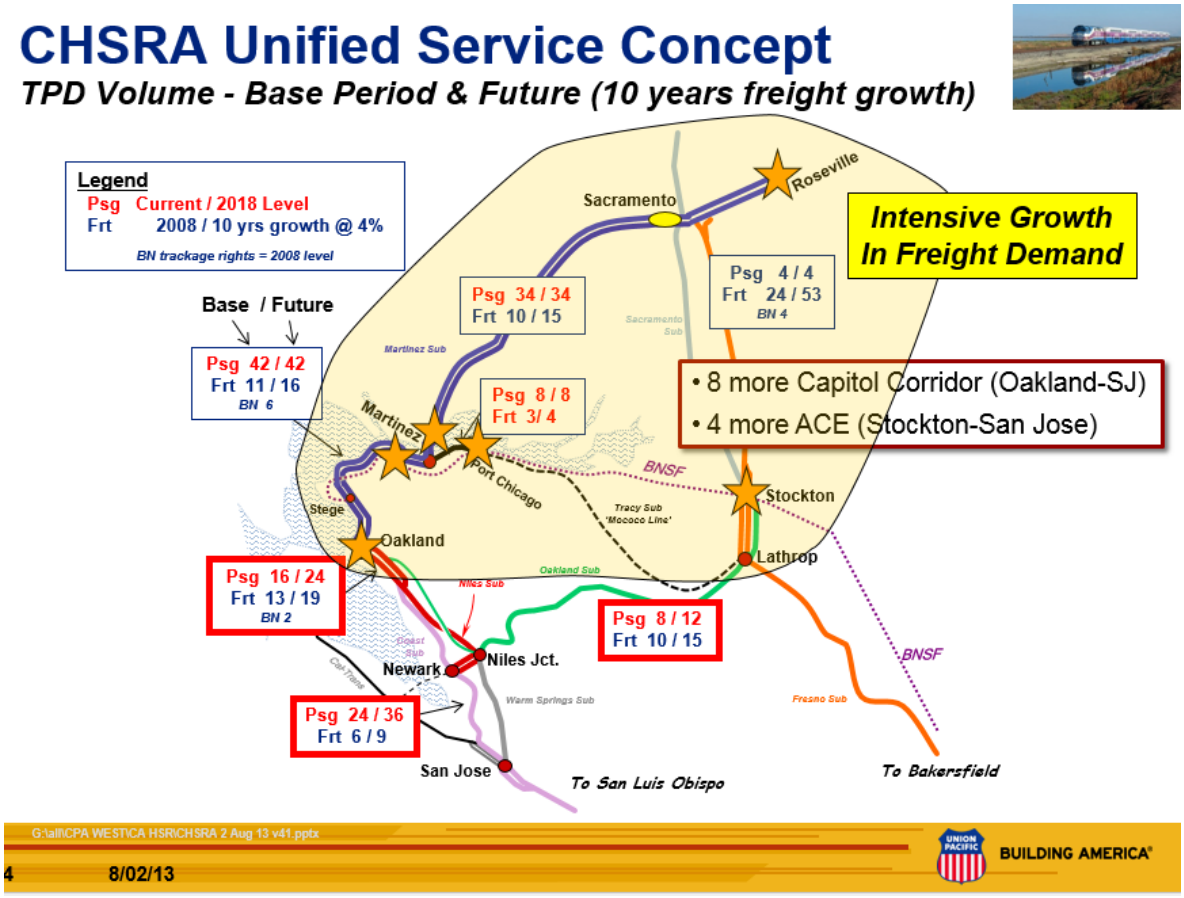
[a] A rail subdivision is a defined rail segment that railroad companies use to manage their rail system.

[b] Freight Daily Trains are based on 2010 BNSF train counts data, UP train counts and 2007 Carload Waybill based train volume estimates.

[c] Passenger Daily Train are based on Passenger Rail Service Weekday Schedule published online in 2012.

In addition to the State Rail Plan forecasts, UP has provided results from their August 2013 Northern California Service Concept Analysis conducted as part of a Memorandum of Understanding with Northern California passenger rail service providers. This analysis provides estimates of future year freight train volumes (see Figure 4.4) on UP's mainline tracks throughout Northern California and analyzes capacity needs under various levels of passenger service. The train forecasts used in the Northern California analysis were used as a point of comparison with the State Rail Plan forecasts.

Figure 4.1 UP's 2018 Train Volume Forecast for Analysis of California High Speed Rail Authority's Unified Service Concept



Source: Presentation by Union Pacific Railroad titled: "Northern California Unified Service Concept Analysis," dated August 2, 2013.

Note: TPD = Trains Per Day, Psg = Passenger rail service, Frt = Freight rail service, UP = Union Pacific Railroad, BN = BNSF (Burlington Northern and Santa Fe) Railway

Take the example of UP's Martinez subdivision between Sacramento and Martinez, according to UP this line carried only 10 daily freight trains as opposed to the estimate of 18 daily freight trains in the base year in the State Rail Plan. The growth by 2020 was projected as 4 additional daily

freight trains in the State Rail Plan, whereas the growth projected by UP is 5 additional daily freight trains. No growth in passenger rail services was assumed in both forecasts.

Similarly, on the segment between Stege (near Richmond)/Emeryville and Oakland, the estimate in the State Rail Plan was 24 daily freight trains becoming 30 daily freight trains by 2020, however, as per UP the base number is 11 daily UP freight trains and 6 daily BNSF freight trains, and the projected number is 16 daily UP freight trains and likely a proportionate increase in BNSF freight trains by 2018. The base and projected passenger train volumes are consistent in both forecasts.

As a last example, UP's Oakland subdivision between Niles and Lathrop was estimated to have 4 daily freight trains becoming 6 daily freight trains by 2020. As opposed to this, UP was running 10 daily freight trains and expect to increase to 15 daily freight trains by 2018 on this rail segment.

Together the lines of the UP Martinez and UP Oakland subdivisions comprise UP's key freight rail access routes to the Bay Area; the State Rail Plan projected the lines to carry 28 daily freight trains (=22+6) by 2020, compared to 30 daily freight trains (=15+15) by 2018.

The needs assessment used base year and forecast train volumes that are largely consistent with that from the State Rail Plan, with spots adjustments made using the Oakland Army Base EIR from 2012. For more information, please refer to the ACTC Task 3c memo: Needs, Issues and Opportunities.