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16. ABSTRACT

Growth in recent decades has put pressure on industrial land owners to convert prime areas along the waterfront to residential and office uses, despite vacancy rates of just five percent. As of the late 2000s, 38% of industrial land in selected Bay Area sub-regions was already planned for new office, residential, or mixed uses. Although demand from industrial businesses is steady or growing, the amount of warehouse and manufacturing space in central areas is declining: in a recent five-year period in the East Bay, about seven percent of building space was lost or converted. Even if this land remains industrial, the supply will still be insufficient to house demand by 2035. This will cause many PDR (Production, Distribution and Repair) businesses to shift location to the region's periphery, or even adjacent lower-cost regions (in this case, the Central Valley), with increasing VMT (Vehicle Miles Traveled) and its implications for greenhouse gas (GHG) emissions.

This Industrial Land and Jobs Study provides an analysis of the demand for and supply of industrially zoned land in the nine-county region, both now and in the future. The study was conducted by UC Berkeley and funded by Caltrans, via the University of California Transportation Center. Throughout the course of the study, UC-Berkeley researchers coordinated closely with the staff of ABAG, as well as a Technical Advisory Committee consisting of city officials in economic development and planning, as well as business associations focused on industrial businesses or real estate.

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Center for Community Innovation

INDUSTRIAL LAND AND JOBS STUDY FOR THE SA

FINAL REPORT

Professor Karen Chappl

with Evelyne St.-Louis, Sa

Mitchell Crispell, Erin La

and Abigail Cochran

Authors
Karen Chapple
with Evelyne St.-Louis, Sarah Ritter, Ángel Ross, Elizabeth Mattiuzzi, Mitchell Crispell, Erin Lapeyr-olerie, Rebecca Coleman, and Abigail Cochran

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The Center for Community Innovation (CCI) at UC-Berkeley nurtures effective solutions that expand economic opportunity, diversify housing options, and strengthen connection to place.

Report prepared for the Association of Bay Area Governments/Metropolitan Transportation Commission

Contents

PART I: INTRODUCTION

In order to meet the requirements of California's landmark 2008 Senate Bill 375 to accommodate future growth and reduce greenhouse gas emissions from cars and light trucks, the San Francisco Bay Area engages in long-range planning on an ongoing basis: every four years, the Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments prepare a Sustainable Communities Strategy (SCS), called Plan Bay Area. Surprisingly absent from the SCS is an effort to plan for jobs. Though Plan Bay Area attempts to direct job growth to job centers near transit in order to reduce vehicle miles traveled, it does not address the needs of the many industries that are not readily oriented to transit. These range from information technology businesses that occupy flexible space for production, research, and deliveries to industries like construction which may need land for staging areas but send their workers out to dispersed sites, among others.

The location of industrial businesses (or more broadly, businesses in the production, distribution, and repair sector), and the related patterns of goods movement, affect the region's ability to meet greenhouse gas reduction targets. The 2015 MTC's San Francisco Bay Area Goods Movement Plan identifies critical areas for goods movement in the region, finding concentrations of economic activity and congestion—and resultant need for investment—particularly in the East and South Bay. The Plan suggests the need for a goods movement strategy that supports global competitiveness, smarter delivery systems, and modernized infrastructure via public-private partnerships that invest particularly in rail infrastructure and the Port of Oakland.

This Industrial Land and Jobs Study complements that plan with an analysis of the demand for and supply of industrially zoned land in the nine-county region, both now and in the future. The study was conducted by UC Berkeley and funded by Caltrans, via the University of California Transportation Center. Throughout the course of the study, UC-Berkeley researchers coordinated closely with the staff of ABAG, as well as a Technical Advisory Committee consisting of city officials in economic development and planning, as well as business associations focused on industrial businesses or real estate. The Study consists of five technical memos, the findings from which are summarized below.

PART II: CHARACTERIZING THE DEMAND FOR AND SUPPLY OF INDUSTRIAL LAND

MEMO 1

THE DEMAND FOR INDUSTRIAL LAND

Interviews with 12 experts in real estate and logistics, and a review of earlier studies provided an overview of existing demand for industrial space and how it may change. The overall demand for warehousing space is increasing dramatically due to the rise of just-in-time delivery. This has led in two divergent directions. Closer to dense urban centers, the trend in warehousing is toward demand for smaller spaces. Yet large warehouses generally located further away from the urban core are still in demand for e-commerce giants. Manufacturing employment demand is growing more gradually, but the need for space continues with existing, expanding or new firms, in varied location types. Trends in the maker movement, sustainability, technology, and productivity create a demand for smaller spaces, particularly in the urban core. More centralized locations close to customers are also an advantage for businesses that service other industries (e.g., repair shops, machining). To the extent that manufacturing firms are starting to in-source employment that had been headed offshore, demand would be for land in the less built-out parts of the region. Finally, for many businesses, transport and shipping needs are generally demanding more space in more urbanized areas, for both loading and parking.

THE SUPPLY OF INDUSTRIAL LAND

Another goal of the study was to determine the supply of industrially zoned land in the nine-county Bay Area. The nine-county region has almost 98,000 acres of industrially zoned land, of which we estimate 6,780 acres is vacant (Table 1 and Figure 1a/1b). The study categorizes industrially zoned land as either mixed-use (allowing office, commercial, or residential as of right), or exclusive industrial (allowing only light, medium, heavy, or transportation uses). Notable differences among sub-regions are the concentration of heavy industrial land in the East Bay, the reliance on mixed-use commercial zones in the Peninsula, and in general, the mixture of industrial and office uses (hereafter called industrial-office) in both the Peninsula and the South Bay. Alameda County has the most industrial land, followed by Contra Costa, Santa Clara, and Solano; of particular note are the concentrations of industrial land adjacent to I-880. Yet, despite this concentration, market activity is largely concentrated in San Francisco and Santa Clara counties.

	Total Land in County (acres)	Total Industrial Land (acres)	Exclusive Industrial Land (acres)	Vacant Industrial Land (acres)+	Percent Industrial Land of Total Land
East Bay					
Alameda	476,064	24,192	20,656	578	5.10%
Contra Costa	477,745	20,206	16,237	2,012	4.20%
West Bay					
San Mateo	291,520	10,845	646	0	3.70%
San Francisco	30,427	1,971	972	0	6.50%
South Bay					
Santa Clara	830,787	18,501	2,395	145	2.20%
North Bay					
Solano	543,426	14,432	986	2764	2.70%
Napa	504,137	3,931	6,240	997	0.80%
Sonoma	1,016,546	1,996	8,662	170	0.20%
Marin	337,158	1,750	9,975	115	0.50%
Total	**4,507,811**	**97,823**	**66,769**	**6,781**	**2.20%**

Table 1. Amount and distribution of industrial land in the Bay Area*

Source: County Assessors' DataQuick Database; See Technical Memo #1: Industrial Land Supply and Demand for notes on how total acreage was calculated

* Calculations based on gross regional land area.

+ Estimated based on use code VIND (vacant industrial) in county tax assessor database.

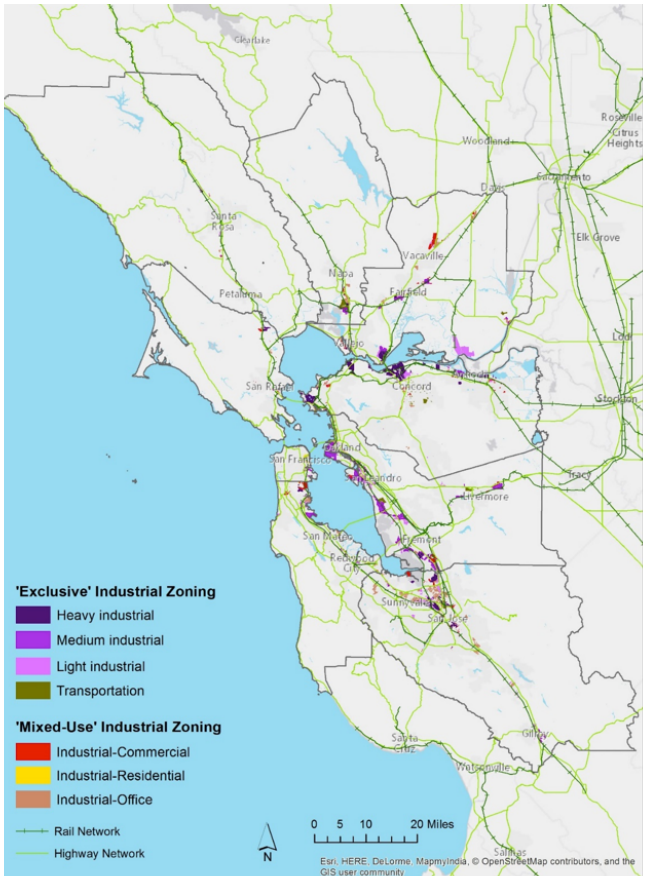

Figure 1a. Industrial land by zoning classification (nine-county region)

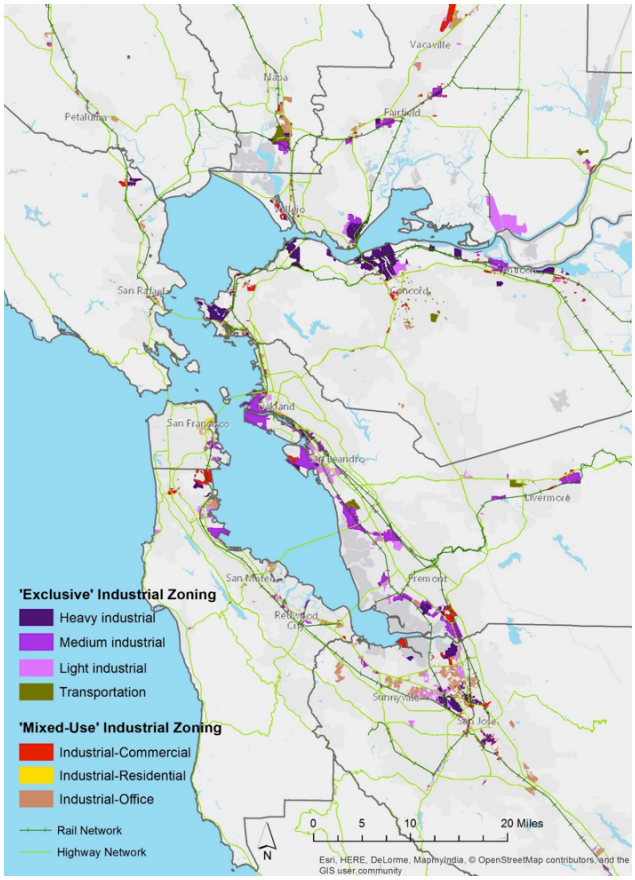

Figure 1b. Industrial land by zoning classification (inner Bay)

BUILDINGS ON INDUSTRIAL LAND

Statistics on industrial space marketed through commercial brokers provide indicators of how industrial land is used and space availability. Outside of San Francisco, much of the Bay Area's industrial land is occupied at very low densities, perhaps to accommodate parking, loading, and other surface uses. Warehouses comprise half of the region's leased stock tracked by CB Richard Ellis, with R&D comprising another 30%. Warehouse development dominates in every sub-region except the South Bay, where R&D is concentrated. New construction is occurring mostly in the East and North Bay. There is a significant amount of older stock, particularly in San Francisco, Alameda, San Mateo, and Marin counties, some of which may be appropriate for demolition and reuse. Rents are generally high and have recovered from the recession, particularly in San Francisco and the Peninsula, and for R&D. Vacancy rates are now reaching historic lows; the exception is R&D in the East and North Bay, which continues to experience vacancy rates of about 10% (Figure 2).

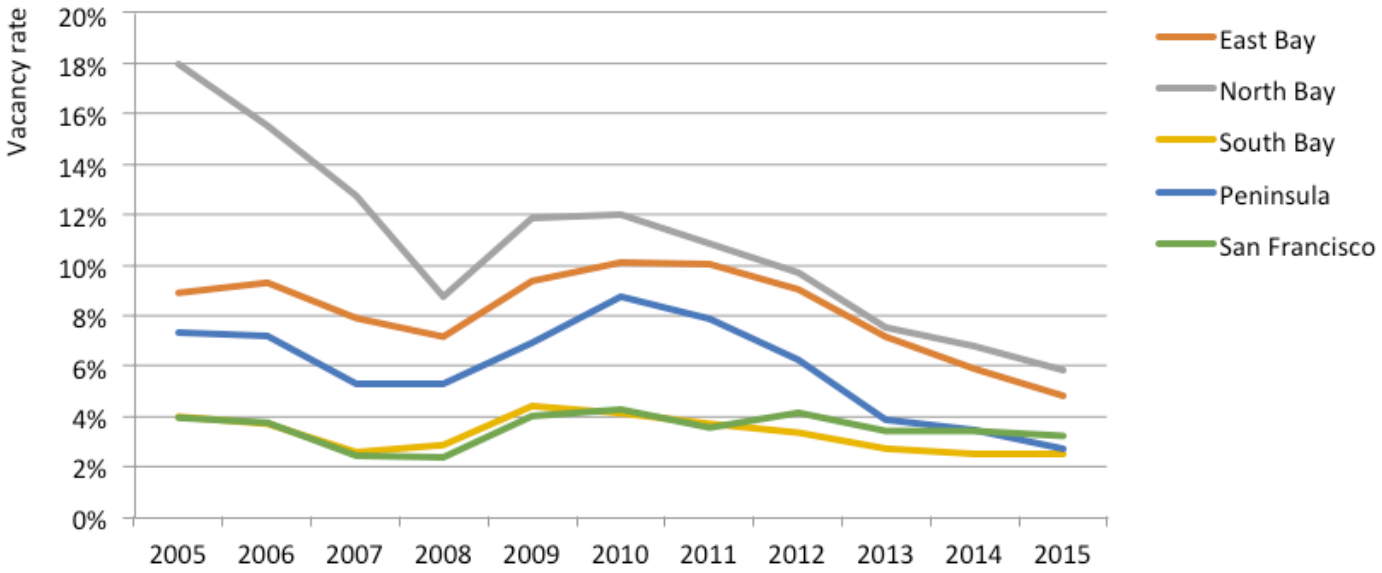

Figure 2. Vacancy rates for industrial buildings, 2005 -2015
Source: CBRE; See Technical Memo #1: Industrial Land Supply and Demand.

BUSINESS TRENDS ON INDUSTRIALLY ZONED LAND

Using data from the U.S. Census Bureau's County Business Patterns, we examined employment in the nine county Bay Area region at the most detailed industry category available (6-digit NAICS) from 1990 to 2012, using the definition of industrial developed by San Francisco (production, distribution, and repair or PDR sectors). Overall, there were 1,176,770 jobs in PDR industries in 1990, and 1,047,441 in 2012, a decline of 11% in a region where the economy overall grew by 14%.

We defined industries as highly dependent on exclusive industrial zoning based on the location quotient, which measures the concentration of industries in a particular area relative to the larger reference region within which it sits (in this case, California). Figure 3 maps the sum of Dun & Bradstreet/NETS employment (for 2011) by block group. Altogether, the region is home to 600,824 jobs in industries that concentrate on industrially zoned land; of these, about one-third locate on industrial land and two-thirds locate in nearby commercial zones. The greatest concentrations of employment

dependent on industrial land occur in southern Alameda County (from San Leandro to Fremont) and northern Santa Clara County (primarily San Jose). Other concentrations occur near the San Francisco Airport, along the Northern Waterfront, and near Livermore. These concentrations suggest where the region might want to consider more stringent protections or proactive policies for industrial land and firms in the future, in order to support regional economic growth.

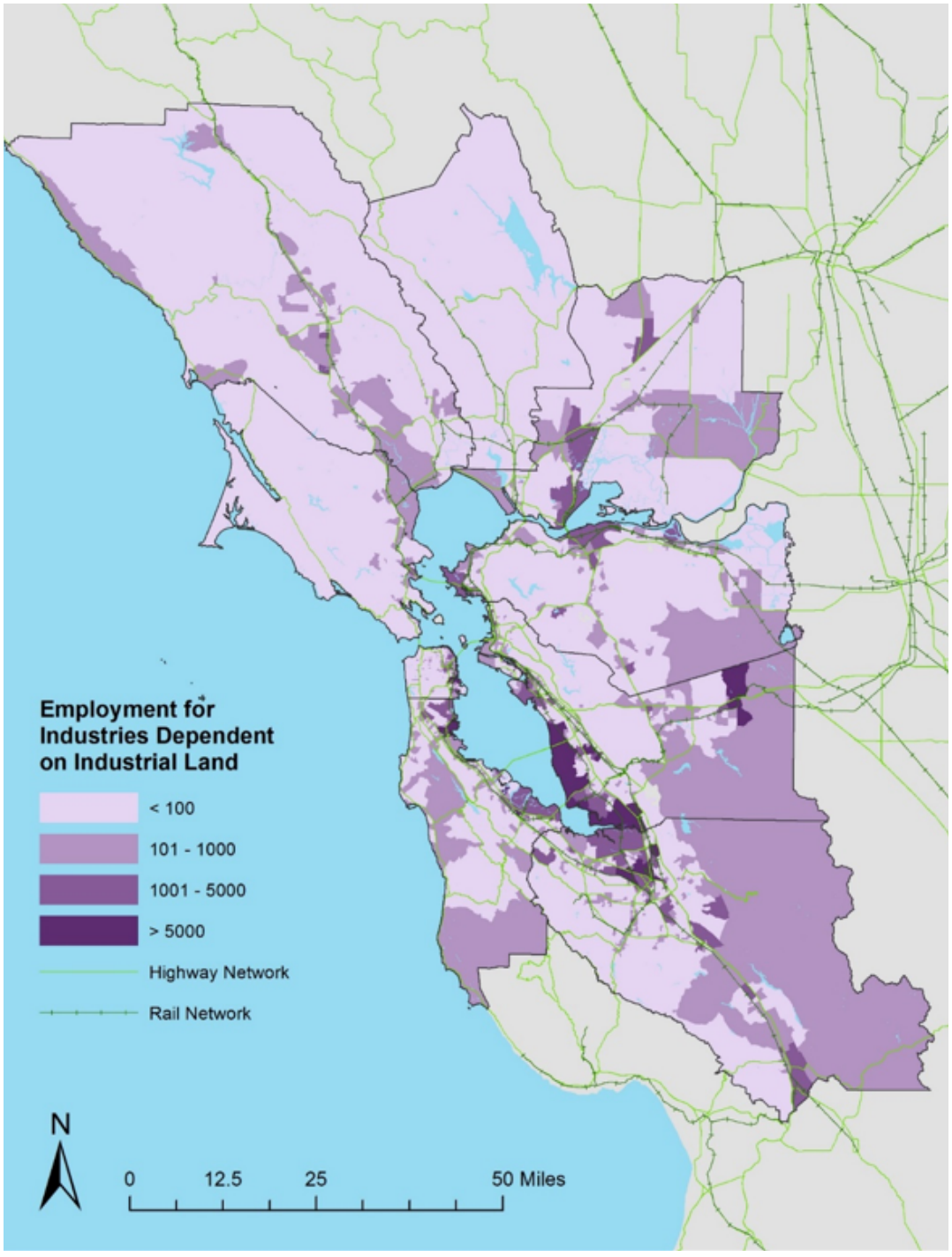

Figure 3. Employment in industries dependent on exclusive industrial land.
Source: See Technical Memo #1: Industrial Land Supply and Demand.
*Note: Block groups vary in size based on population density: smaller in dense areas, larger in less dense areas, which may distort the map.

The demand for industrially zoned land varies by sub-region. In general, mixed-use industrial land is in demand from businesses that are compatible with other users, while exclusive industrially zoned areas are required for businesses with externalities of noise and traffic. In the South Bay, high-tech manufacturers, as well as building contractors, are concentrated on mixed-use land (typically permitting office as well as industrial uses). On exclusive industrial land is where heavier users such as machine shops and other manufacturers, often suppliers to high-tech, are found. In the East Bay, the industrial clusters are quite different. Light manufacturing, contractors, and solid waste collection are concentrated on mixed-use land, while heavy manufacturing, trucking and logistics tend towards exclusive industrial zones. According to the San Francisco Bay Area Goods Movement Plan, the majority of goods moving into and out of the Bay Area are coming from these two sub-regions (South and East). The North Bay hosts light manufacturing like quick printing or metalworking, as well as wholesaling, on its mixed-use industrial land, while businesses such as contractors and industrial suppliers tend to locate on the exclusive industrial land. San Francisco is quite unique, with service industries such as software, publishing, and advertising on mixed-use land, while sectors such as construction, communications, and auto repair tend to locate on exclusive industrial land.

Although the movement of industrial firms out of urban areas garners much media attention, firms are actually quite stable. About 9% of industrial land-dependent jobs move in an average year, with most moves occurring within the nine-county region. In general, suburban jurisdictions on the region's periphery are gaining the most jobs from moves, while the inner core cities are losing the most. Cities experiencing the most overall churn include Santa Clara, San Jose, Fremont, Milpitas, and San Francisco, with San Francisco industrial areas more likely to experience move-outs than move-ins. Areas that are top job gainers and not losers include Hayward, SFO, Oakland, and Pleasanton.

PART III: THE CONVERSION OF INDUSTRIALLY ZONED LAND

MEMO 2

Next, the study assessed how much industrially zoned land has already been converted, how much is likely to be converted in the near future, and whether there is likely to be sufficient industrial land to accommodate demand in 2040.

Overall, a small but significant share of exclusive industrial land (i.e. industrial land that does not allow mixed-use or office) has been converted to other uses. Our fieldwork estimated that 10% of industrial land had been converted, but an analysis of assessor data suggested a lower conversion rate, about 1% over a six year period. There has been little encroachment of new housing on exclusive industrial land: in the cities where it is most likely, San Jose and Oakland, about 1-3% of units have been built on industrial land.

Overall, about 7% of the industrially zoned land in the region is vacant. However, vacancy varies throughout the region, with very little vacant acreage in the urban core, and large reservoirs of industrial land in the North Bay.

This analysis also examines the extent to which industrially zoned land is designated for other uses according to the general plan, or overlaps with Priority Development Area (PDA) designation. This land would be more easily converted to other uses. In the nine-County Bay Area region, a total of 15,084 acres of industrial land are in categories that would allow conversion to non-industrial uses, comprising about 17% of current industrial zones. The percentage of industrial land susceptible to

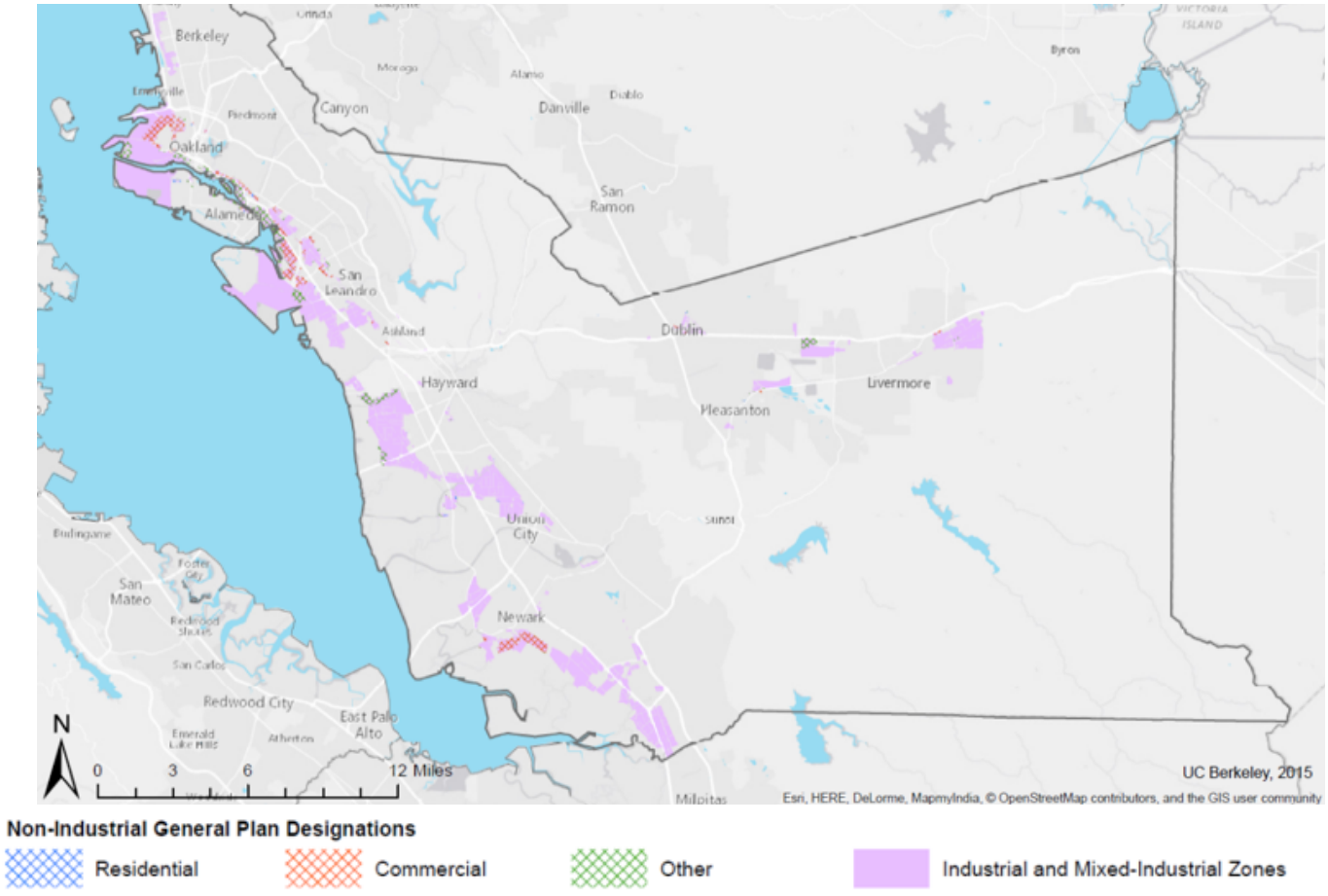

Figure 4. Industrial land susceptible to conversion in Alameda County
Source: See Technical Memo #2: Understanding the Conversion of Industrially Zoned Land.

conversion varies significantly across the different counties. In Napa County, which has a small share of the region's industrial land, only 1% is susceptible to conversion, most likely because much of its stock has already been rezoned to nonindustrial uses, such as office and commercial development. On the other extreme, almost half of all industrial land in San Francisco is susceptible to conversion because the introduction of industrial-only zones in late 2000s only covered half of the city's industrially-zoned lands (the other half remaining mixed-use industrial). In Alameda County, which has the highest share of industrial land in the region, a more moderate 14% of industrial land is susceptible to conversion (Figure 4). However, much of the land is adjacent to critical freight facilities, including the Port of Oakland.

Across all nine counties, about 16,700 acres out of approximately 97,600 acres of industrially zoned land overlap with PDAs—about 17% (Figure 5). Nearly half of this overlap is exclusive industrial land, and half is mixed-use industrial land.

Based on this analysis, we estimate in the next section the amount of industrially zoned land available in the future, after accounting for land that is already converted and/or susceptible to conversion. Comparing the available land to the employment projections for 2040, we can evaluate whether there is sufficient land to meet future demand.

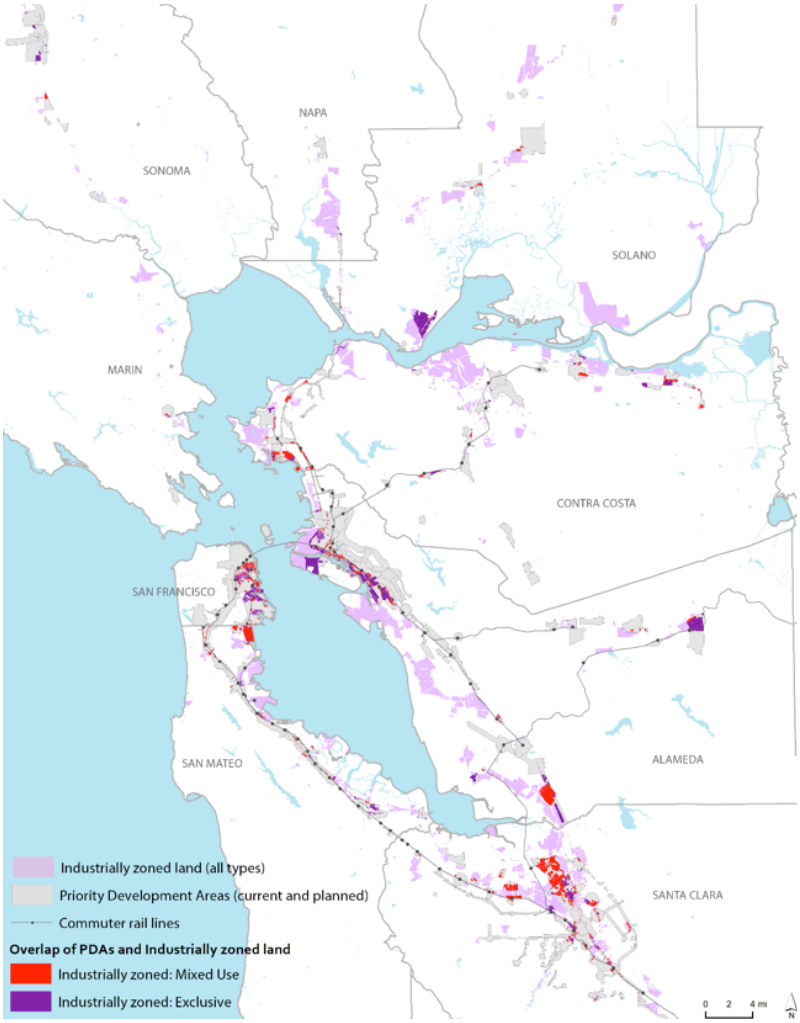

Figure 5. Overlap of PDA designation and industrial land.
Source: See Technical Memo #2: Understanding the Conversion of Industrially Zoned Land.

PART IV: FUTURE DEMAND FOR AND SUPPLY OF INDUSTRIALLY ZONED LAND

MEMO 2

There were 600,824 jobs in the Bay Area in 2011 in the industries that tend to concentrate on industrial land. Just 205,561 of these jobs were actually located on exclusive or mixed-use industrial land; the remaining jobs might be considered the latent demand for industrial land, since these jobs concentrate when possible (Figure 6). Projecting out to 2040—assuming existing patterns of distribution remain constant—a 24% growth is expected, resulting in about 747,301 jobs overall in the Bay Area, and 254,966 jobs actually located on industrial parcels. We anticipate that areas of growth will be found throughout the Bay Area, with a few pockets throughout the region experiencing a small net job loss, but no distinct areas of heavily concentrated decline.

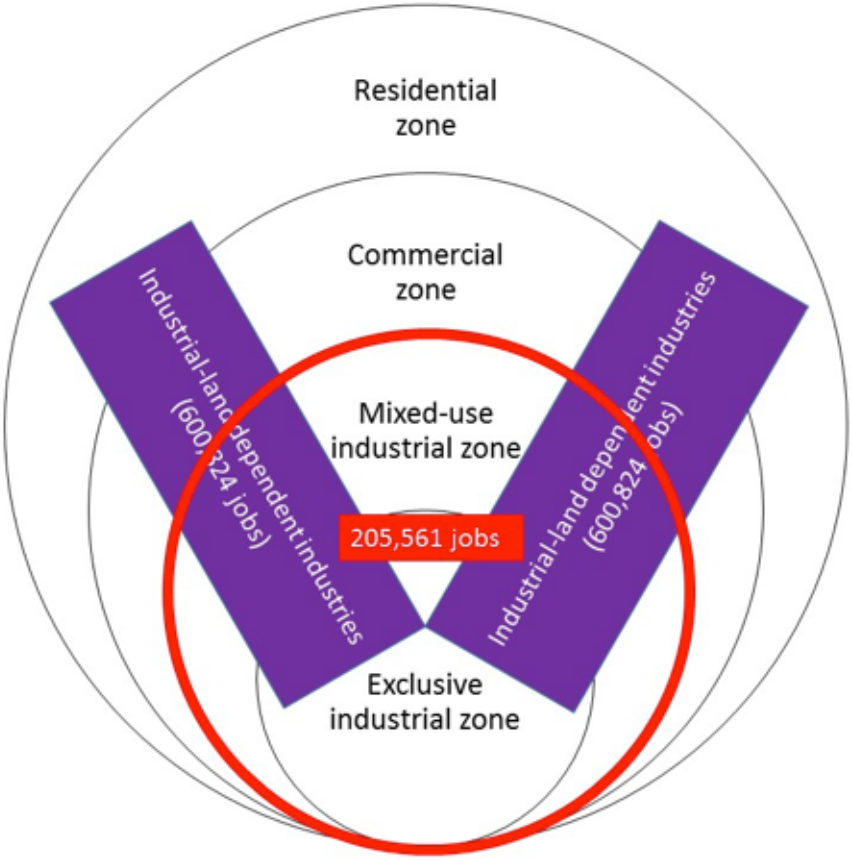

Figure 6. Location of industrially zoned land and industrial land-dependent jobs.

For the analysis of future land supply, we conservatively use the lower range of the projections (254,966 jobs). With about 1,650 acres of industrial land needed to accommodate new growth between 2011 and 2040, the majority of counties—particularly Santa Clara, San Mateo, and Alameda—could experience a significant shortage of industrially zoned land, offset by considerable surpluses in Contra Costa, Napa, and Solano counties. Altogether, a surplus of almost 2,000 acres of industrially zoned land is anticipated in 2040, but much is located far from the greatest demand for industrial land, in the urban core (Figure 7). These areas of demand are also where the majority of the region's goods movement takes place.

Given current rates of industrial land conversion, as well as susceptibility to future conversion, there will likely also be some displacement of industrial jobs. Based on current occupancy, we estimate that over the decades some 50,000 jobs on industrial land will be displaced because of planned conversions of industrially zoned land to other uses. In order to accommodate these displaced jobs, an additional 2,152 acres of land would be needed. By 2040, this would result in an overall deficit of 208 acres in the region, concentrated in Alameda, San Mateo, and Santa Clara counties.

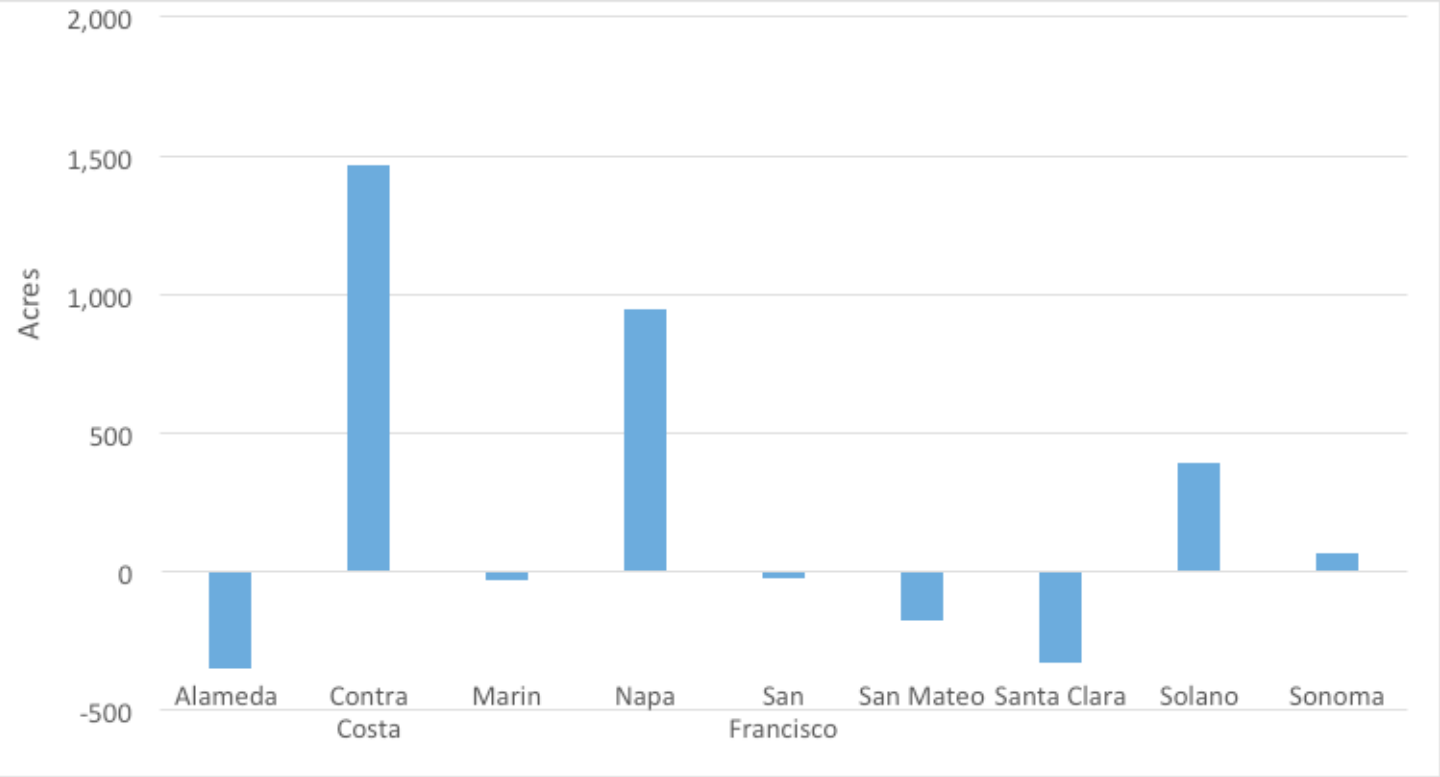

Figure 7. Projected industrial land surpluses and deficits by county
Source: See Technical Memo #2: Understanding the Conversion of Industrially Zoned Land.

PART V: IMPACTS OF CHANGES IN INDUSTRIAL EMPLOYMENT ON JOB QUALITY

MEMO 3

Photo Courtesy of Marika on Flickr

In 2011, middle-wage jobs counted for a near-majority (44%) of jobs on exclusive industrial land, while low-wage jobs counted for 28%, and high-wage jobs for 28% of jobs (Figure 8). This is a favorable distribution considering that only about a quarter (27%) of total jobs in the Bay Area offer middle wages, while a third (36%) offer low wages, and 38% offer high wages, according to the Regional Economic Prosperity Strategy (2014). In other words, middle-wage jobs are sixty percent more concentrated on industrial land as in the region generally.

If we apply employment growth rates for 2040 proportionately to the existing jobs estimated to be on industrial land (assuming that wages remain constant), the distribution of low-, medium-, and high-wage employment remains surprisingly similar. The share of middle-wage jobs is projected to increase only slightly to 45%, at the expense of a one-percentage point decrease in the share of high-wage jobs. Furthermore, in 2040, the share of jobs that pay more than $18/hour and that require less than a bachelor's degree or five years' experience increases slightly from 57% to 60% of total industrial jobs.

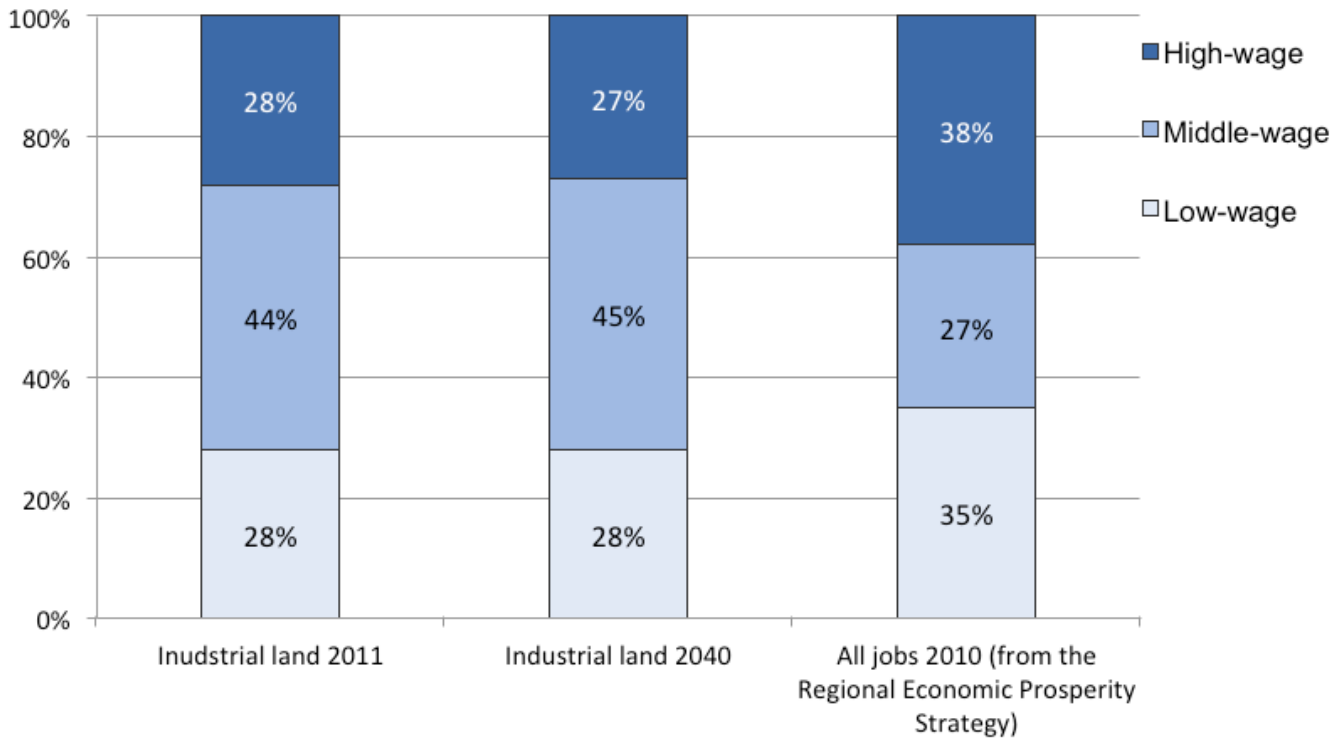

Figure 8. Wage distribution of jobs on industrial land in 2011 and 2040, compared to the wage distribution for all jobs in the Bay area in 2010
Source: See Technical Memo #3: Assessing the impacts of changes in industrial employment on job quality and commuter patterns.

PART VI: THE EFFECTIVENESS OF INDUSTRIALLY ZONED LAND AT RETAINING AND CREATING JOBS

MEMO 4

In order to determine whether zoning makes a difference for employment growth on industrial land, we compared job growth countywide from 1990 to 2012 to job growth specifically on industrial land, for all employment versus production, distribution and repair industries (Figure 9). This analysis focuses on just three counties—Alameda, San Francisco, and Santa Clara—that offer a contrast in the flexibility of their industrial zoning. For employment overall, the rate of job growth on industrial land is higher than the rate of job growth for those same sectors across the county. Looking just at production, distribution, and repair sectors, the rate of job retention or growth was also higher on industrial land.

Interviews conducted with cities across the region revealed that planning and economic development professionals considered certain zoning designations superior in their capacity to retain and prevent crowding out of industrial uses due to increasing rents or encroachment of non-industrial uses. Exclusively zoned industrial land – in contrast to mixed-use IL – is considered one of the most effective ways of controlling market forces, ensuring job growth, and influencing the type of businesses that locate in industrial areas. Although our analysis shows that this is true of San Francisco's zoning, in Alameda and Santa Clara counties, job growth has been most rapid in mixed-use zones.

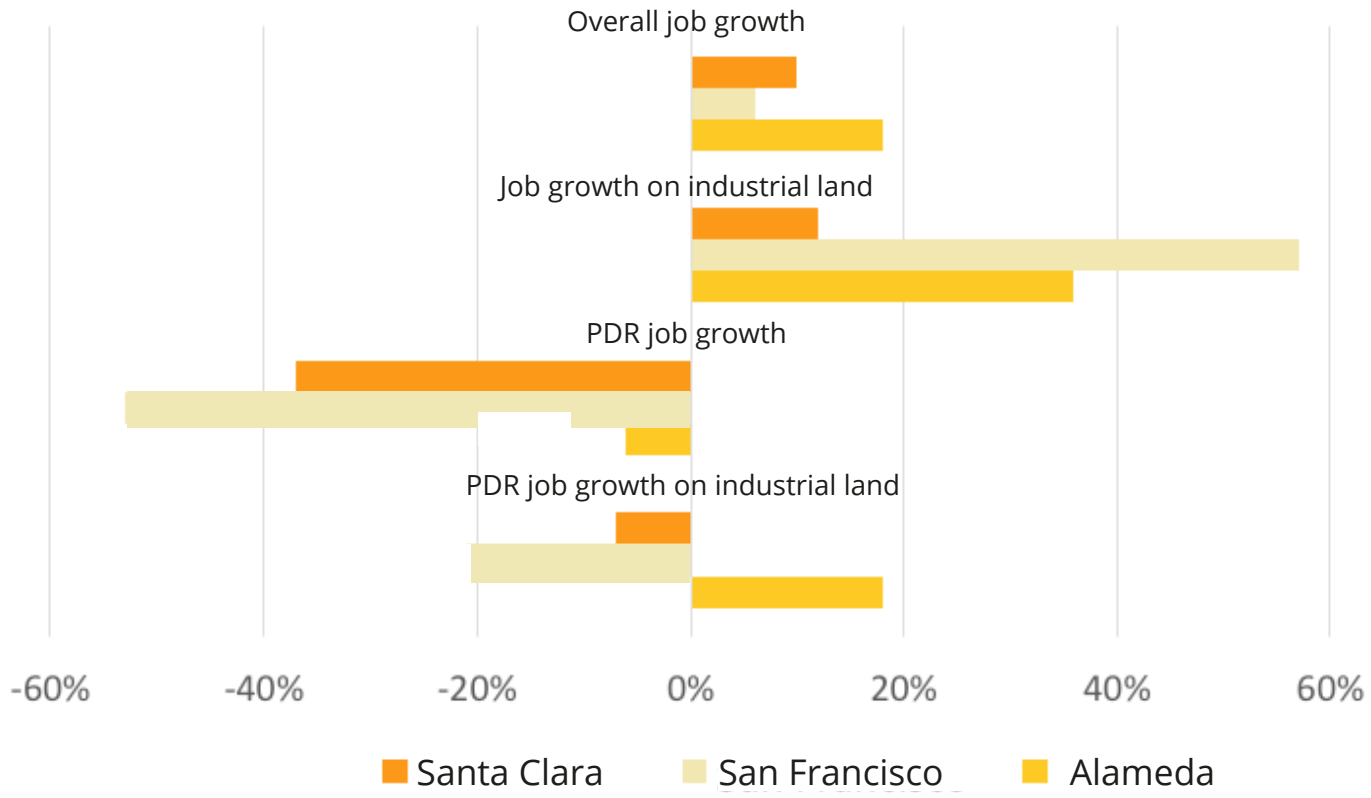

Figure 9. Job growth countywide vs. on industrial land, for all sectors and production, distribution and repair, 1990-2012.
Source: See Technical Memo #4: Assessing the Effectiveness of Industrial Zoning Designations in the San Francisco Bay Area.

PART VII: WHAT DO BUSINESSES WANT? SURVEY AND INTERVIEW RESULTS

MEMO 5

To better understand why businesses want to locate on industrial land, as well as the challenges they experience, we conducted a survey and interviews of local businesses. Our final survey sample consisted of 94 respondents, concentrated in the East Bay; for most questions, 35 to 60 were usable responses. In addition, we conducted informal business interviews at two local economic development events focused on manufacturing.

The industrially zoned land in the San Francisco Bay Area houses a variety of businesses, primarily in production, distribution, and repair. Local firms export nationally and internationally, but also act as a key support to other companies in the local and regional economy by supplying them with necessary goods or services. Our analysis found local networks of customers and suppliers clustered in sub-regions; for example, Figure 10 depicts the location of suppliers listed by respondents (shown with dots color-coded to the location of the firm to which they provide supplies). Firms located on industrial land possess multiple regional suppliers from across the Bay Area, as well as very local suppliers—often even within the same city. Though we focus on the East Bay, such clusters exist throughout the region.

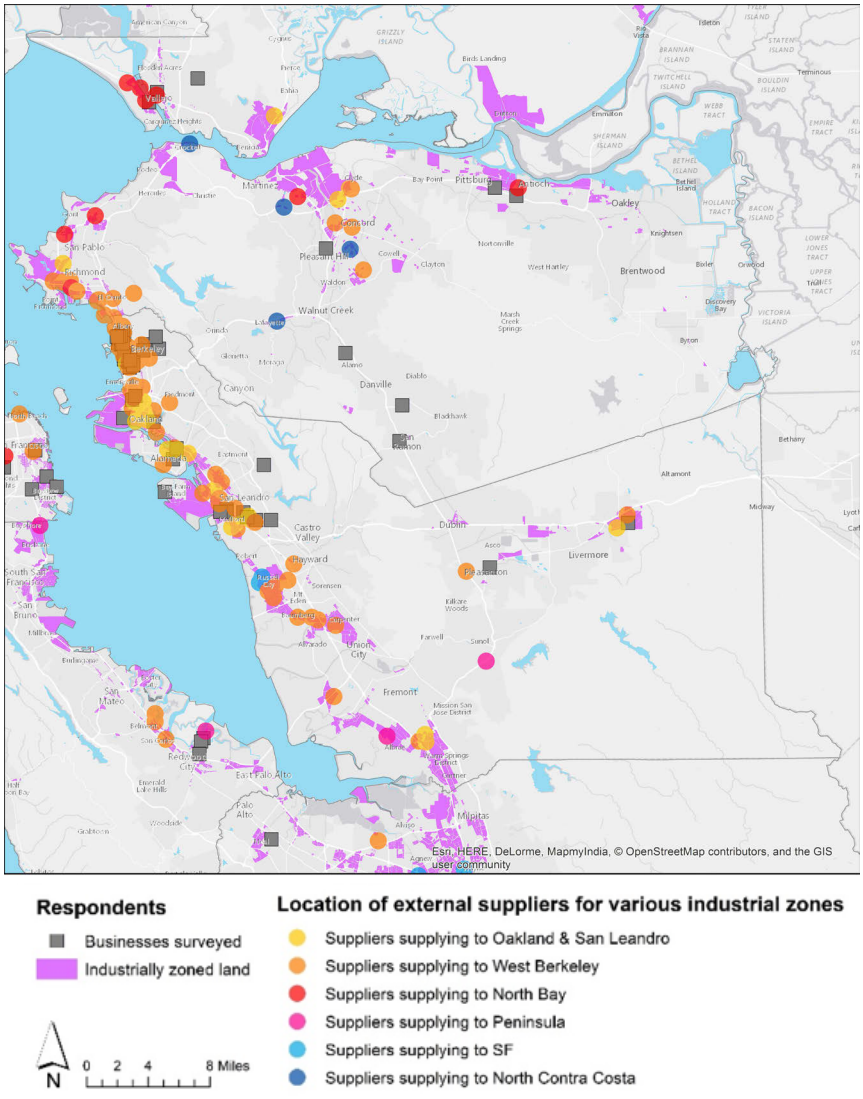

Figure 10. Location of respondents' suppliers across the region
Source: See Technical Memo #5: What Do Businesses Want? Findings from Surveys and Interviews of Businesses Located on Industrial Land.

The survey found that businesses seek improvements to transportation – roads and transit – as well as higher-speed internet access. The most pressing infrastructure needs, as perceived by business located on industrial land, are summarized in Figure 11.

Most businesses on industrially zoned land expect stable or positive growth in the next five years, and few wish to move from their current location. However, surveys and interviews surfaced several overall concerns.

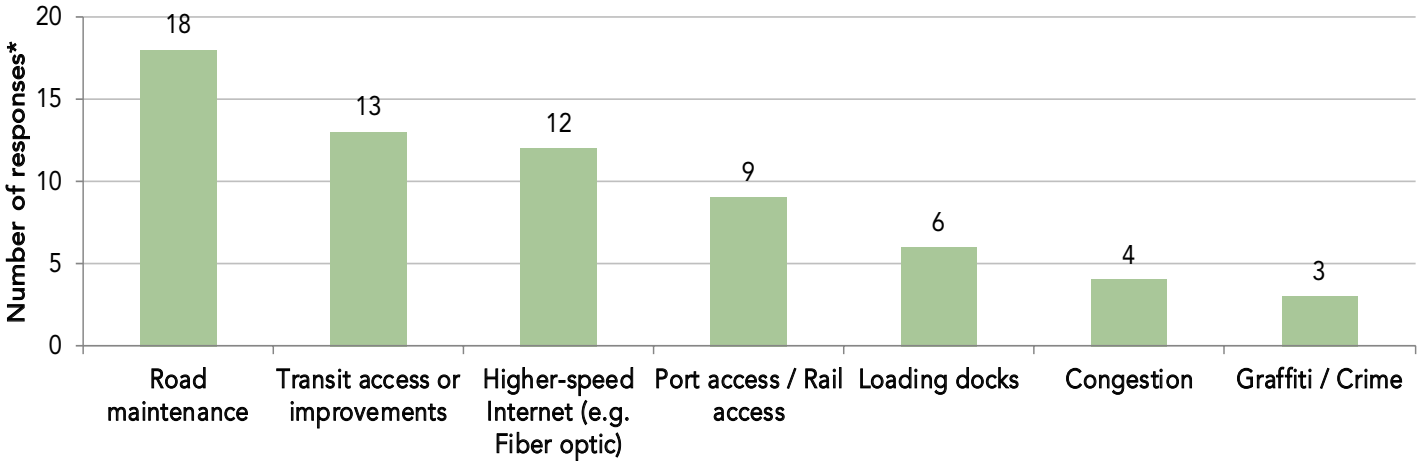

Figure 11. Frequency of infrastructure needs, according to businesses located on industrial land
Source: See Technical Memo #5: What Do Businesses Want? Findings from Surveys and Interviews of Businesses Located on Industrial Land.

One major theme was the lack of industrial space, the inability to find suitable expansion space, or the inappropriateness of available space for business needs. "We need to be by major highway entrances. We need enough warehouse space to store pallets of refrigerated fruits and vegetables. We need dock space to back 48' trailers into. This is a challenge in an urban center, especially where PDR spaces are limited (San Francisco business)."

Businesses also reported concerns with the ineffectiveness of zoning to protect against encroachment by other uses. Market pressure from residential demand was a particular concern: "Once an industrial property goes to residential, it will never produce even one good job. It is like building homes on fertile cropland—you will never get another harvest (Oakland business owner)," and: "We need to preserve our city's PDR space. More and more residential and mixed-use facilities are encroaching on these areas (San Francisco business)."

Some respondents championed zoning that permits concentrations of production-related businesses: "We know that even with suburban office parks, these spaces can create community and energy (Fremont business)," and: "Due to the lower concentration of industrial businesses there is less synergy between companies in our area, higher transportation costs, and shortage of workers (West Berkeley business)."

A further theme is the importance of retaining industrial land in order to facilitate goods movement: "Ports-related waterborne commerce and rail-borne commerce, and related industrial companies,

need to be kept in place in order to keep product prices low and minimize truck trips on the freeways (Peninsula business)".

Businesses mentioned many other infrastructure needs, from electrical supply in Berkeley, to traffic congestion in San Leandro, to storm water infrastructure in Fremont.

Above all, businesses spoke of the need to deal with land use conflicts, through buffer zones, exclusive zoning, or more effective mixed-use zones: "We are in an industrial zone, but all around this zone are residences that built up after we were here, and this poses problems for noise and light in the area (Oakland business)," and: "We have industrial uses adjacent to our complex, and we have parkland. There have been lots of fights between the parkland users and the industrial users. The commercial users didn't feel impacted and supported the industrial uses continuing where they are (Petaluma business)."

Special advantages and complications came with mixed-use locations: "The opportunity to work, reach suppliers and materials and live where we work is unmatched (Vallejo business)." "We need a MIX of truck access, large production space AND office/R&D in ONE location. Zoning rules and development trends mean it is becoming very hard to operate a small high tech manufacturing and R&D company like ours in the Bay Area which also depends on proximity to retail, transit, restaurants, food markets and other amenities in order to attract and retain highly educated and talented staff (Berkeley business)." "Incursion of residential to our mixed-use area discourages trucking, which we rely on for our business. The big opportunity is that our location puts us centrally located to our prime market area (Oakland business)." "It's good that we have the downtown and the BART coming up, but how is the cost, developers going to play out. My neighbor is moving out this month because the landlord raised the rent fifty percent, the next move may be to Nevada, because the market pressure is coming up, and he is a solar innovator (Fremont business)."

PART VIII: POTENTIAL CONSIDERATIONS FOR THE RETENTION AND CONVERSION OF INDUSTRIAL LAND

MEMO 2

Looking at different examples from around the Bay suggests criteria for when to redevelop industrial land, and when to preserve it. For example, in San Francisco, Mission Bay illustrates a clear case for redevelopment, due to the long-term decline of industrial uses surrounding the site, as well as specific site characteristics (e.g., very few land owners). At the other end of the spectrum are areas like San Jose and Contra Costa's Northern Waterfront that are making the case for industrial land preservation because housing growth is hindering significant opportunities for economic development. In contrast, industrial land in West Oakland illustrates the complications of conversion. Though the area is clearly undergoing a transition away from industrial land-dependent uses to a more mixed-use economy, the City is not providing the support and infrastructure that businesses will need to survive. Without such actions, the area will likely lose much of its employment base in years to come, becoming exclusively residential. This is likely to increase conflicts with the Port of Oakland, which, as outlined in the San Francisco Bay Area Goods Movement Plan, is critical to the region's future competitiveness. In deciding where to preserve and where to redevelop industrial land, cities must balance criteria related to the economy, the environment, and equity, from both a regional and local perspective.

Overall, quantitative analysis and case studies suggest that the conversion of industrial land is proceeding at a slow pace, but is likely to accelerate in coming years due to the visions put forward in general plan and PDA designations. To guide city decision-making about where to preserve industrial land and where to convert it, MTC/ABAG should develop specific criteria. Below are potential criteria in terms of transportation, economy, equity, site characteristics, and environment. These may serve as the basis for designating Priority Production Areas in the future.

	Retain as Industrial	*Convert to Residential or Mixed-use*
Transportation	• Proximity to freight and/or port facilities • Low VMT for workers on industrial land	• Proximity to transit • High VMT for workers on industrial land
Economy	• Production or related employment • Proximity to business clusters/suppliers/markets • Critical supplier to local businesses • Industry stable or growing	• High-density non-production employment • Proximity to markets/customers • Limited linkages to local economy • Industry in decline
Equity	• Offers middle-wage jobs for less-skilled workers	• Potential for affordable housing
Land use/zoning compatibility	• Surrounded by medium/heavy industrial zoning	• Adjacent to residential
Environment	• Brownfield site, remediation infeasible	• Environmental health hazard for surrounding communities (especially if historically disadvantaged)
Adequacy of supply	• In areas with projected deficit of industrial land • Low vacancy rates for industrial buildings	• In areas with projected surplus of industrial land • High vacancy rates for industrial buildings

Table 2. Suggested characteristics for industrial land retention and conversion.

Other characteristics may warrant further consideration. For instance, projected sea level rise may interplay with decisions regarding industrial, residential or mixed-use development. Additionally, different characteristics may be appropriate depending on location, type of industry, and special concerns such as those that arise when designating buffer zones.

PART IX: CONCLUSION

With the advent of regional sustainability planning across California, its regions have begun to develop strategies to accommodate future growth while meeting greenhouse gas reduction goals. Until now, there was insufficient data on the location and conversion of industrial land to plan comprehensively for job growth. The Industrial Land and Jobs Study for the San Francisco Bay Area shows that it is possible not only to identify industrial areas with economic vitality, but also pinpoint critical areas at risk now and in the future. Future Sustainable Communities Strategies should incorporate planning for industrial jobs in order to ensure that "smart growth" planning for housing and job centers does not shift economic activity in a way that results in net increases in vehicle miles traveled. In the Bay Area, cities have adopted Priority Development Areas on a voluntary basis in order to concentrate future growth near transit. In a similar vein, a local Priority Production Area program would help ensure that the region develops a smart growth strategy for economic activity as well.

Technical Memo #1

Center for Community Innovation
INDUSTRIAL LAND AND JOBS STUDY FOR THE SAN FRANCISCO BAY AREA

INDUSTRIAL LAND SUPPLY AND DEMAND

Professor Karen Chapple
with Sarah Ritter, Angel Ross, Elizabeth Mattiuzzi, Erin Lapeyrolerie, and Evelyne St.-Louis

Berkeley

Authors
Karen Chapple
with Sarah Ritter, Angel Ross, Elizabeth Mattiuzzi, Erin Lapeyrolerie, and Evelyne St.-Louis

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Source: Center for Community Innovation

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The Center for Community Innovation (CCI) at UC-Berkeley nurtures effective solutions that expand economic opportunity, diversify housing options, and strengthen connection to place.

Report prepared for the Association of Bay Area Governments/Metropolitan Transportation Commission

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INTRODUCTION

This Technical Memo is the first product from the Industrial Land and Jobs Study, which complements the 2015 MTC Goods Movement Needs Assessment. This study analyzes the demand for and supply of industrially zoned land in the nine-county region, both now and in the future.

CHARACTERIZING THE DEMAND FOR INDUSTRIAL LAND

The demand for industrial land has shifted dramatically as the economy has restructured from manufacturing to services. This section examines the trends in industrial land demand, based on both interviews with 12 experts in real estate and logistics, and a review of relevant literature. Trends in industrial space and logistics add up to a mixed picture in terms of the need for and location of industrial land. Changes in warehousing are generally leading to smaller spaces, except for the large warehouses on the periphery demanded by e-commerce giants. Yet, the overall demand for warehousing space is increasing dramatically due to the rise of just-in-time delivery. Likewise, trends in the maker movement, sustainability, technology, and productivity are also creating a demand for smaller spaces, mostly in the core, but to the extent that manufacturing firms are in-sourcing, impacts are likely to be in the periphery. At the same time, transportation needs are generally demanding more space in core areas, for both loading and parking.

INDUSTRIAL LANDS INVENTORY

The goal of the analysis in this section is to determine the supply of industrially zoned land in the nine-county Bay Area. The analysis found almost 98,000 acres of industrially zoned land located in the nine-county region (Figure A). Notable differences among sub-regions are the concentration of heavy industrial land in the East Bay, the reliance on mixed use-commercial zones in the Peninsula, and in general, the mixture of industrial and office uses (industrial-office) in both the Peninsula and the South Bay. Alameda County has the most industrial land, followed by Contra Costa, Santa Clara, and Solano. Yet, despite this concentration, market activity is largely concentrated in San Francisco and Santa Clara counties.

BUILDINGS ON INDUSTRIAL LAND

This section describes built space and occupancy patterns on industrial land based on private real estate data from CBRE that captures the amount of industrial space available and the value of those spaces. In sum, outside of San Francisco much of the Bay Area's industrial land is occupied at very low densities, perhaps to accommodate parking, loading, and other surface uses. Warehouses comprise half of the region's stock, with R&D comprising another 30% (Table A). Warehouse development dominates in every sub-region except the South Bay, where R&D is concentrated. New construction is occurring mostly in the East and North Bay. There is a significant amount of older stock, particularly in San Francisco, Alameda, San Mateo, and Marin counties. Rents are generally high and have recovered from the recession, particularly in San Francisco and the Peninsula, and for R&D (Figure B). Vacancy rates are now reaching historic lows, except for R&D (Figure C).

	Total Stock (sqft)	% R&D	% Warehouse	% Manufacturing	% Other
East Bay	247,027	20%	60%	19%	1%
South Bay	180,702	**53%**	29%	14%	4%
North Bay	54,189	7%	76%	16%	1%
Peninsula	50,220	26%	54%	15%	5%
San Francisco	30,444	23%	64%	7%	7%

Table A. Industrial Building Stock by Type (2015)
Source: CBRE

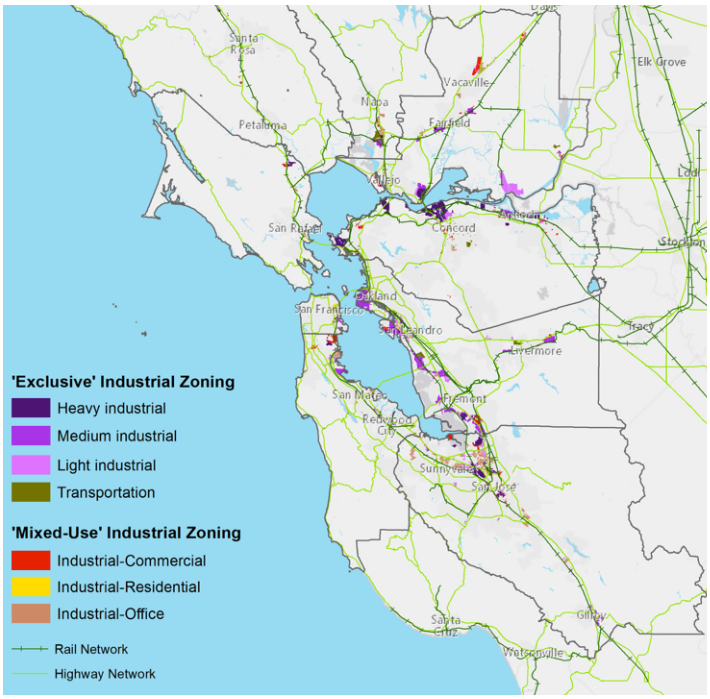


Figure A. Industrially zoned land in the San Francisco Bay Area (nine counties and inner Bay Area).

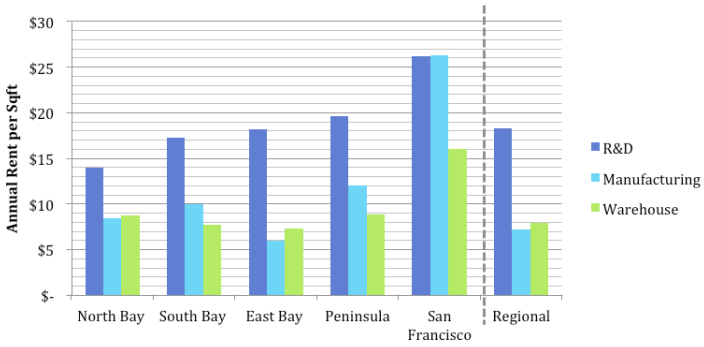


Figure B. 2014 Annual Industrial Rents[1]
Source: CBRE

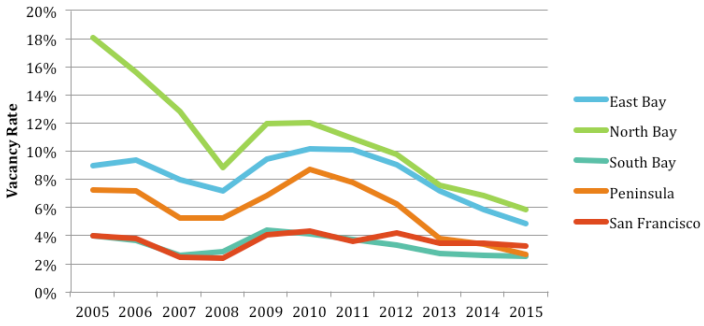


Figure C. Vacancy Rates, 2005 -2015
Source: CBRE

BUSINESS TRENDS ON INDUSTRIALLY ZONED LAND

Industrial businesses locate in many different zones. For instance, a small construction contractor might operate out of a home in a residential district. Larger contractors are more likely to be dependent on industrially zoned land. Likewise, auto repair shops can be found as readily in commercial zones as on industrial land. Tech businesses are found throughout all types of zones, depending on their size and production process (e.g., whether they are conducting manufacturing, software design, research and development, or some combination). At the same time, industrial land, whether exclusive or mixed-use, also houses many types of businesses. For instance, older retail establishments such as corner stores or diners may be grandfathered into industrial zones. Flexible zoning regulations on industrial land may permit a great variety of uses, from government offices to professional services.

For this analysis we examined the distribution of businesses across industrially zoned and other land in all nine counties, to determine what type of industries were concentrated on industrial land. We develop a typology based on the location quotient (LQ), which measures the concentration of industries in a particular area relative to the larger region within which it sits (the reference region).

This analysis differentiates between the industrial land-dependent industries that are located throughout the region, and the industrial land-dependent businesses that are actually located on industrially zoned land (Figure D). As this diagram illustrates, the industrial land-dependent businesses on industrial land are a subset of the industrial land-dependent businesses throughout the region. For our projections of industrial land demand, we analyze both trends in these businesses on industrial land and the larger set of industrial land-dependent businesses. This latter group of businesses may be considered the latent demand for industrially zoned land. Overall, our analysis found that in 2011, there were 205,561 jobs in industrial land-dependent industries actually located on industrially zoned land, and 600,824 industrial land-dependent jobs overall in the region.

Figure E maps the location of the industries identified as highly dependent on exclusive industrial

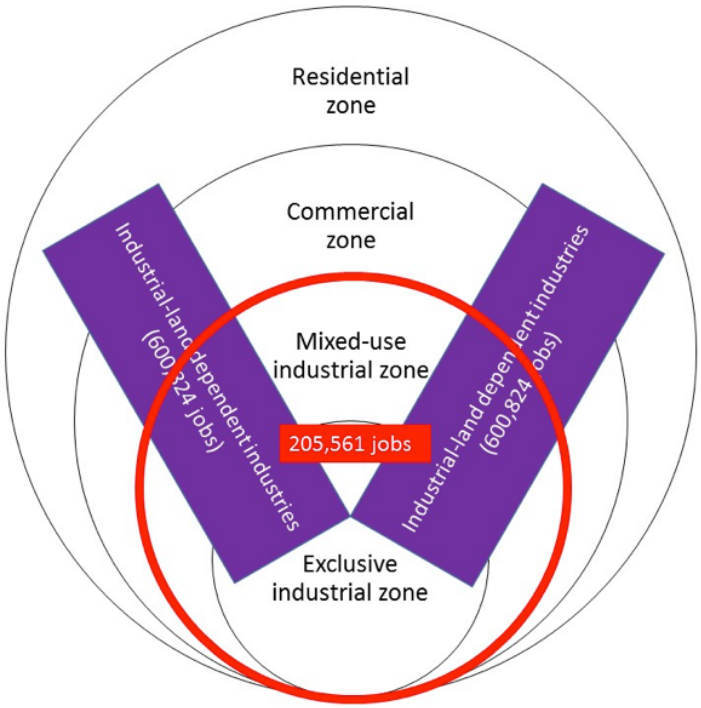


Figure D. Location of industrially zoned land and industrial land-dependent jobs.

zoning in the region (based on the location quotient, which measures the concentration of industries in a particular area relative to the larger region within which it sits, or the reference region). This map sums Dun & Bradstreet/NETS employment (for 2011) by block group. The greatest concentrations of industrial land-dependent employment occur in southern Alameda County (from San Leandro to Fremont) and northern Santa Clara County (primarily San Jose). Other concentrations occur near SFO, along the Northern Waterfront, and near Livermore. These concentrations suggest where the region might want to consider more stringent protections for industrial land in the future, in order to support regional economic growth.

About 9% of industrial-land dependent jobs move in an average year, with most moves occurring within the nine-county region. : Overall, the Bay Area experienced a net gain of industrial land-dependent jobs from 1990 to 2012. Cities experiencing the most churn include Santa Clara, San Jose, Fremont, Milpitas, and San Francisco. San Francisco industrial areas are more likely to experience move-outs than move-ins. Areas that are top job gainers and not losers include Hayward, SFO, Oakland, and Pleasanton. Figure F shows the net change in industrial land-dependent jobs due to moves in the Bay Area from 1990 to 2012.

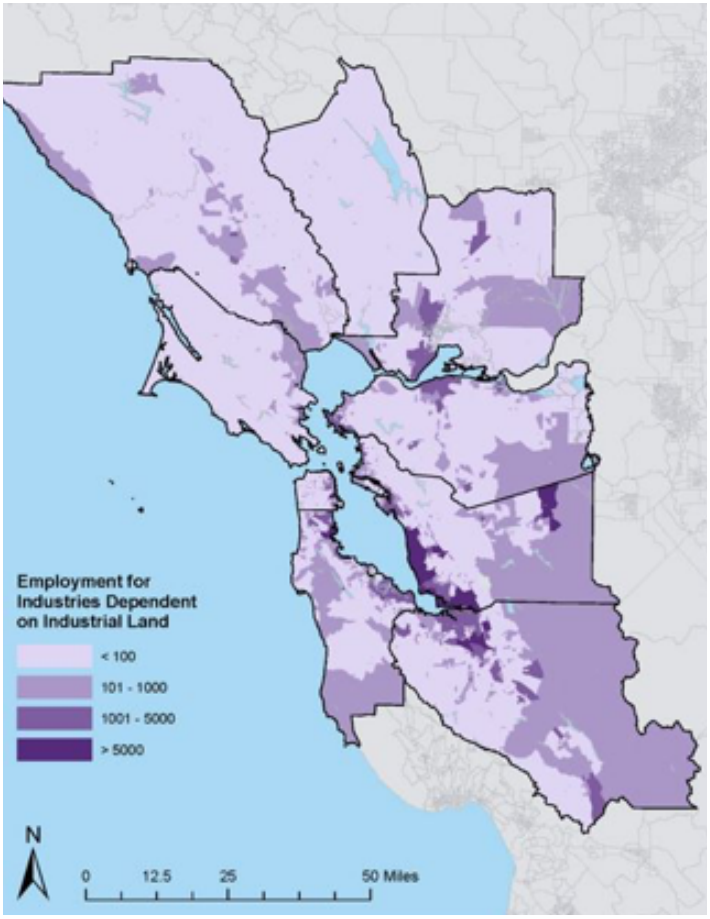


Figure E. Employment in Industries Dependent on Exclusive Industrial Land.

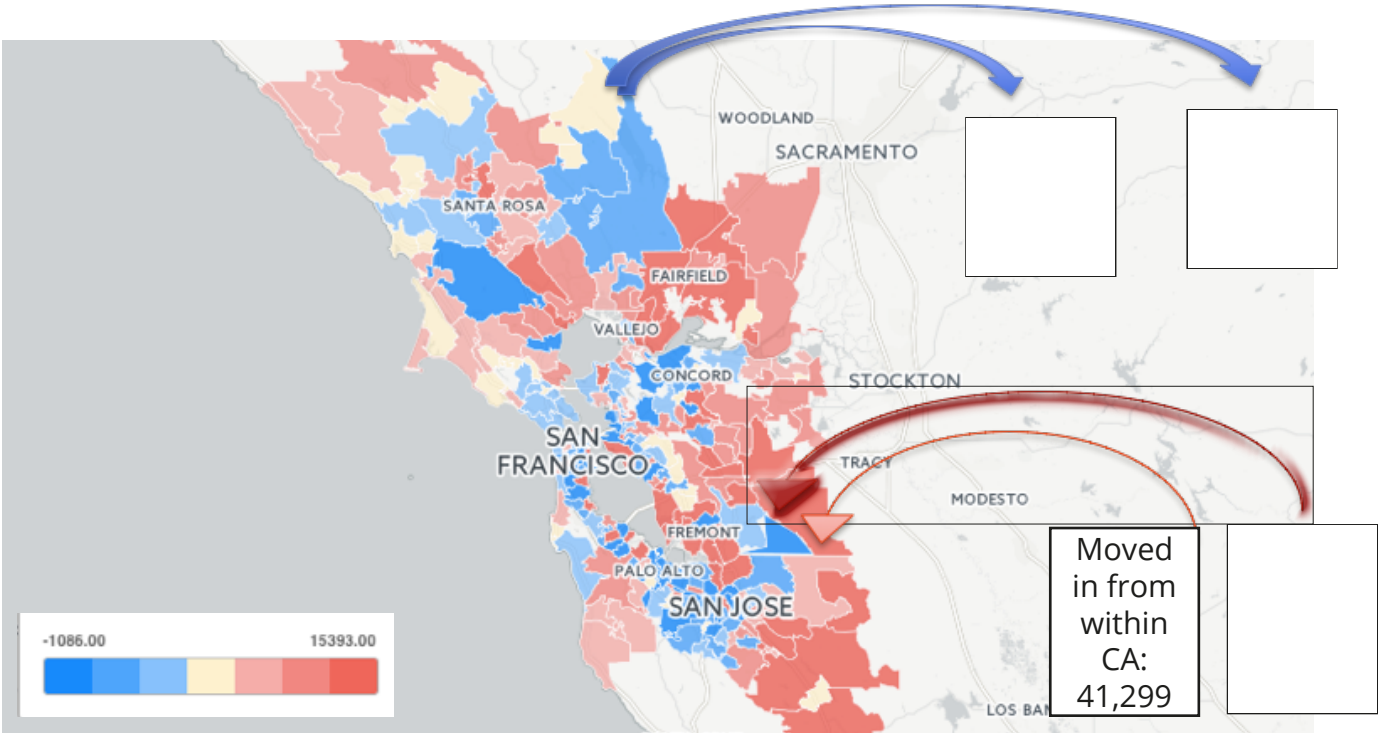


Figure F. Net industrial land-dependent jobs from moves, San Francisco Bay Area, 1990-2012


REPORT

PART I: INTRODUCTION

This Technical Memo is the first product from the Industrial Land and Jobs Study, which complements the 2015 MTC Goods Movement Needs Assessment. This study analyzes the demand for and supply of industrially zoned land in the nine-county region, both now and in the future.

The next section of this report describes the current and future demand for industrial land, and also provides a brief overview of the Bay Area economy. Section III provides the inventory of industrial land, describing its extent, type, and location throughout the nine-county region. Section IV then examines market trends, including both occupancy and new completions, for the built industrial stock in the region, most of which is located on industrial land. Section V examines the location and trends of businesses on industrial land, identifying what we call "industrial land-dependent" industries.

For this report, we have compiled the most up-to-date information available on industrial zones within the Bay Area's 101 jurisdictions and unincorporated areas. Bay Area jurisdictions had the opportunity to review and correct the data, and about one-third offered minor corrections to the inventory.

PART II: CHARACTERIZING THE DEMAND FOR INDUSTRIAL LAND

The demand for industrial land has shifted dramatically as the economy has restructured from manufacturing to services. This section first examines the trends in industrial land demand, based on both interviews with 12 experts in real estate and logistics, and a review of relevant literature.[2] Then we examine economic trends specific to the Bay Area, using County Business Patterns from 1990 to 2012.

TRENDS SHAPING INDUSTRIAL LAND DEMAND

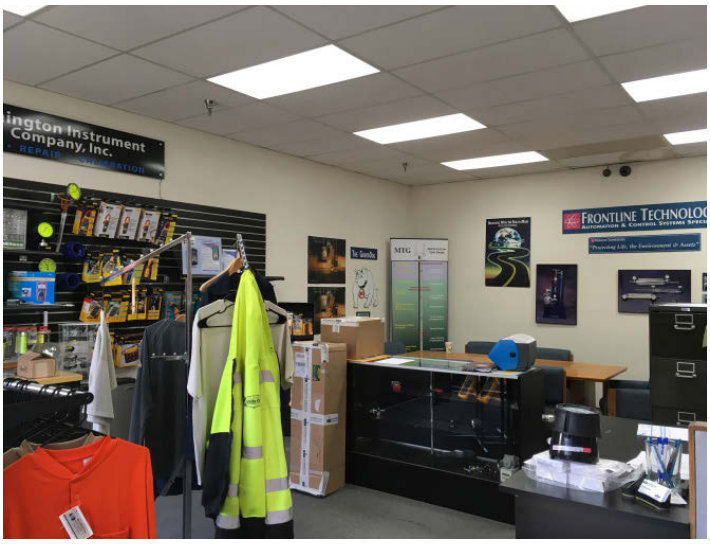
In this section we examine trends in the use of industrial land and space in order to determine how demand is shifting in both the region's core and its periphery. After providing an overview of the role of industrial land in the regional economy, we look at trends in both industrial space—specifically, warehousing and storage, manufacturing, and R&D—and freight logistics. Although some trends, particularly those reported by trade publications, might be more speculative than evidence-based, reporting them is useful to get a sense of what stakeholders in the field are thinking about today. We focus mainly on U.S. trends and hypothesize on what these trends imply for space and location of industrial uses in metropolitan regions.

Industrial Land

Zoning land for industrial use performs two different functions. Separating lower (agricultural, industrial) uses from higher (commercial, residential), prevents the negative externalities associated with production from impacting less noxious uses. Further, it signals the types of physical and legal improvements that will be appropriate to maximize the land's productive capacity—i.e., the land's highest and best use.[3]

Two types of industrial zones are common: exclusive and mixed. Exclusive zoning preserves industrial zoning by prohibiting higher uses despite market interest.[4] Exclusive zoning is particularly appropriate when (1) the industrial district is economically viable, functioning as a business incubator or housing businesses linked to other local clusters; or (2) negative externalities are an issue. Mixed use zoning allows higher uses, either commercial, residential, or both. Since higher uses pay higher rents, this can put pressure on industrial businesses, who may eventually need to leave for lower-cost locations.

Recent work highlights the contribution of industrial areas and their activities to the regional economy: as job generators; as providers of supplies and services, such as back-office functions or automobile repair, to businesses and households; and as reservoirs of low-cost space that can incubate startup businesses.[5] Industrially zoned land performs a role in the regional economy as a reserve of relatively low-cost land and large buildings with potentially flexible use: many industrial sites can accommodate not just production but also back-office functions, storage, loading, parking, and even research and development.[6] They can also be subdivided when firms decrease in size. In contrast to more modern office buildings, this type of space offers firms the flexibility they seek in today's economy, with the ability to shift between vertical and horizontal organization, and to easily add or shed employees.



Across the U.S., many municipalities and counties have recently undertaken studies of industrial land supply, typically in response to developer pressures to convert the land to residential,

commercial, or mixed use. It is mostly the strong market regions that are re-evaluating how much industrial land they need. A 2010 review of over twenty such studies found three general concerns leading to industrial land preservation: the recognition that industrial businesses (or more broadly, production, distribution and repair firms) support both the residential sector and other businesses, that they need to be located close by their customers, and that the availability of affordable land is key to maintaining these businesses.[7] Just in the past couple of years, New York City, Washington DC, Montgomery County, MD, and the Puget Sound Region have produced updated industrial land studies.

Industrial Space

The market for industrial space in the Bay Area has evolved and matured considerably in the recent decades. Earlier real estate cycles saw the out-migration of many large-scale industrial users from San Francisco and the Peninsula to the outer areas of the region, mostly to the south and east (for instance, to the Livermore Valley area). This out-migration continues, but is increasingly likely to leapfrog out of the region into the Central Valley, with its abundant supply of developing land. At the same time, however, job growth in the core has created new demand for land in the region's core, close to the workforce. The largest segment of demand is for distribution space, since companies still prefer to locate their warehouse space within 15 miles of the corporate office. For instance, both Philz and Peet's coffee companies have recently acquired large warehouse spaces in Oakland.

Much of this market is seeking new generation space, warehouse buildings with high ceilings, in order to stack goods higher. Older industrial buildings in the core – even from as recently as the 1960s – do not work well for distribution functions, so this older stock tends to be torn down rather than converted. The market for this stock is largely companies like Apple or Tesla, who are willing to pay a premium for warehouse space in proximity to their headquarters or manufacturing, not so much to store finished products but rather supplies or even office furniture from their campuses. Because of the lack of land and challenges of dealing with existing buildings in the core, developers are building new industrial developments on spec, to the extent possible in desirable areas such as the 880 corridor, and if not, the Central Valley.

Interviewees suggested that the greatest pressure for the conversion of industrial land to housing or higher commercial uses will occur near transit. The areas experiencing most conversion are those that allow office construction alongside industrial; the differential in land prices often leads to the redevelopment of the industrial parcels for office. In some cases, cities also allow nonconforming uses, such as schools or churches, to be built in industrial areas, which changes the character of the area and sets the stage for future conversion.

Warehousing and Storage

Warehouse location is fundamental to transporting goods to consumers both in a competitive time frame and in a cost effective manner. Housing inventory in close proximity to the company's consumers reduces delivery costs and permits companies to store product mixes more appropriate for specialized market segments.[8]

E-commerce is expected to quadruple its share of retail trade in the next ten years, with 30% of all retail online by 2025.[9] The increase in e-commerce influences business decisions about optimal warehouse location, inventory management, and amount of warehouse space. Companies consider these factors in attempt to minimize travel time and shipping expenses, both to satisfy customers and to reduce the shipping cost absorbed by the company.

In general, companies are moving their inventory to smaller distribution centers close to their consumer base. Amazon Prime's Same Day delivery is an example of a delivery option that caters to consumers' desire for "instant delivery gratification."[10] As part of this effort, Amazon is leasing very large warehouse spaces on the periphery of the region, while also investing in the last mile

of delivery, in a modification of the traditional hub-and-spoke arrangement that involves smaller regionalized warehouses.[11] With regards to inventory management, companies such as Wal-Mart are opting to put more inventory in their distribution centers as opposed to their stores.[12]

Thus, the demand for just-in-time delivery is leading to a new kind of fulfillment center which is using predictive analytics to move goods closer to markets. Fulfillment facilities differ from traditional warehouses; often built to custom specifications, they allow faster processing of orders through technology, and tend to be located in higher population (and cost) areas than the larger distribution centers.

New warehouse buildings, particularly fulfillment centers for e-commerce, include more parking than in the past because of the "high touch" nature of e-commerce, which results in higher employment densities. The new generation of space has wider aisles; minimum 30 feet clear heights in order to stack higher; and high sprinkler capacity in order to be able to stack plastic, rubber, or flammable materials to the ceiling. Cross-dock facilities, which allow loading on two sides of the building, are increasingly in demand from users like Amazon, and many of the warehouses are flow-through facilities that require more truck bays. In general, these buildings utilize much more land for these transportation functions.

Yet, while the shift in consumer behavior has increased demand for warehousing space, the increase in supply is not comparable; the rise in demand for instant delivery has occurred more quickly than developers can build space in the core.[13] Moreover, the demand from e-commerce is putting pressure on warehouse space throughout the region: even areas like the North Bay report a lack of small, centralized warehouse spaces. Further, demand for traditional types of spaces remains strong, particularly storage yards and truck yards. Many businesses are also demanding hybrid spaces that combine office and warehouse, with perhaps some space for small-scale production. This type of space is particularly in demand in the South Bay.

A future trend to watch is shared space for warehousing. One company has created an internet market that connects warehouse space users in need of space with those in possession of excess capacity.[14] This should allow for higher occupancy rates and more efficient use of space.

Manufacturing and R&D

With a growing "maker movement", on-demand production, and the productivity increases made possible by the Internet of Things (IoT), or what some are calling the 4th Industrial Revolution, the role of manufacturing in cities today looks quite different from the way it did just a few decades ago. In 2006, the first Maker Faire, held in San Mateo, attracted around 20,000 people. This year, over 140,000 people attended the annual event, and the "maker movement" has gone international.[15] The more sustainable, locally-sourced and produced, highly customized products of today's manufacturing sector rely on industrial and mixed-use land in the region's core. This suggests the new viability of walkable, amenity-rich, urban industrial neighborhoods.[16]

This new movement, because of its smaller scale, does not have the negative environmental and traffic impacts of the older manufacturing sector. As Ilana Preuss, founder of Re-Cast City, writes, "The new definition of modern manufacturing can be done in close proximity to other uses. New urban manufacturers make better neighbors because their processes create less noise and fewer environmental impacts." At the same time, many are small: brokers report the greatest demand for spaces as small as 1,000 square feet, housing just a couple workers in a small office, plus a small warehouse space with a roll door. Subdividing buildings is expensive and landlords prefer to rent entire buildings, creating a shortage of such spaces. Due to high land costs, many of San Francisco's makers conduct their actual production in cheaper areas in the East Bay while headquartered in the City. Subletting or sharing a lease is another approach commonly used.

More advanced technologies, like 3D printing, have also influenced the industry by removing some barriers to entry for firms who otherwise lacked access to financial capital. Many expect reliance on 3D printing to lead to new demand for industrial land within more urban areas.

Another industry trend is in-sourcing, or moving the production or warehousing process closer to the consumer because it reduces delivery costs and allows for more late-stage customized product variation. Many of these manufacturers are also selling direct to consumer. As one industrial real estate expert put it, "Domestic manufacturers today are a different breed than their predecessors, often working with low overhead and looking to sell small batches of product directly to consumers."[17] Reshoring of selective types of manufacturing (often machine-based) is often occurring through contract manufacturing, which allows companies to prototype products and protect intellectual capital while decreasing turnaround time relative to offshore operations.

In order to cut costs, some manufacturing firms are also experimenting with on-demand production. By keeping a very low inventory, smaller manufacturers can customize products without running into overstock issues and avoiding extra supply chain costs.[18] This additional value created through flexibility and on-demand production requires proximity to the market.

Productivity improvements made possible through the IoT also create what some call "mass craftsmanship."[19] This "smart manufacturing" uses embedded sensors and integrated software to collect plant operations and supply chain data, analyze that data and drive real-time improvements in production and procurement processes.[20] This allows for greater speed and flexibility, in what one supply chain professional calls "demand-driven on steroids."[21] It may also allow manufacturers to replace retiring workers with technology, reducing labor demand. Because this new manufacturing mode requires modernized infrastructure, and converting older buildings to modern manufacturing and distribution standards is prohibitively expensive, these high-tech businesses disproportionately tend to locate outside of the older core industrial areas. One way that cities stay competitive is through offering low power rates through independently owned utilities (as in Santa Clara, which is attracting data centers).
Historically, manufacturing space included 5-10%

office space, e.g., for design and R&D. Now, more high tech companies are moving towards manufacturing close to larger office operations to enable quicker response time and more collaboration between design, production, and marketing.

Freight and logistics

Intermodal freight seems to be regaining importance in the United States, particularly on the West Coast.[22] According to the American Railroad Association, the domestic share of total U.S. rail intermodal traffic has increased in the last few years, with a portion of truck freight now being moved by a mix of both rail and truck.[23] Not only is increased cost-effectiveness generating new interest in freight hubs, but also new technologies are making rail freight more innovative; for instance, one company offers the possibility to store food on the train, with each train unit acting as mini-warehouses.[24,25]

Thus it seems that *intermodal hubs* – that is, spaces for merchandise-transfer from truck to rail, or from ship to rail – will gain importance in upcoming years.[26] Intermodal freight creates a need for more efficient coordination of transfers from one mode to another. For this reason, experts in the industry anticipate that intermodal hubs will focus their efforts on becoming logistics hubs as well.[27] This involves either making use of a third-party logistics firm (3PL), or integrating a transportation management system (TMS) to make shipping more efficient.[28]

We hypothesize that increased intermodal freight implies a need for *more space* for these transfers, as well as off-site storage, to occur, and that this would occur in urban cores due to railroad stations and ports that are usually already centrally located. However, this trend might also mean the consolidation of transportation and logistics spaces in fewer, more concentrated intermodal hubs. (And in fact, interviewees suggest that the Oakland port is already losing out to the Southern California ports as an intermodal hub.)

Relatedly, improving port management is a growing concern within the industry – not only to accommodate the demand for intermodal freight, but also to reduce port congestion.[29] In the Californian context, the Port of Los Angeles/Long Beach and the Port of Oakland have both recently looked into port management strategies, including implementation of off-peak programs and the extension of port hours, respectively.[30] We hypothesize that this will imply a plateau or a decreased need for port space in the urban core, as these strategies seek to optimize existing infrastructure and land.

In terms of air travel, airports are steadily expanding, often surrounded by related new industrial, commercial, and residential development.[31] Airports appear to be particularly strong candidates for expansion when they are situated in proximity to rail or major connecting highways, for instance in the case of Dallas-Fort Worth Airport.[32] Air cargo is increasingly demanding space, often from large delivery companies managing their own distribution facilities (e.g., FedEx and UPS). This would imply a need for more land. In most (though not all) cases, airports are located in the periphery of cities or of metropolitan regions, which would thus create higher demand for industrial land at the fringes rather than in the core.

Much speculation is occurring about the potential role of drones.[33] While it remains unclear how drone regulation and risk will be managed, sever-

al articles suggest drones' imminent importance for shipping and delivery.[34] By potentially altering the cost of transportation of goods, drones might have an impact on firms' logistics planning, as well as on the location and type of industrial space needed in urban cores. Currently, drones are being tested not just for delivery, but also replacing labor within fulfillment facilities. Nevertheless the implications still remain unclear, and new regulations will need to address routing and delivery.

It is worth touching again on same-day delivery trends (mentioned above). Possible implications of this tendency are, on the one hand, a decrease in the use of third-party delivery trucks for large providers, and on the other hand, an increase in use of third-party delivery trucks by small providers.[35] Innovations are also emerging to respond to this demand. For example some firms are thinking of using private transportation network companies for home delivery[36] or are looking to the addition of urban fulfillment centers in their supply chain, which means that "inventory-replenishment trucks, en-route to brick-and-mortar's stores from a distribution center can stop by a fulfillment center to pick up customers' online orders."[37] Overall, the increased efficiency of shipping and delivery is also linked to the "Internet of Things" (see above), as it allows for more demand-responsive, postponed freight and logistics planning.[38]

Conclusion

In sum, trends in industrial space and logistics add up to a mixed picture in terms of the need for and location of industrial land. As Table II.1 describes, changes in warehousing are generally leading to smaller spaces, except for the large warehouses on the periphery demanded by e-commerce giants. Yet, the overall demand for warehousing space is increasing dramatically due to the rise of just-in-time delivery. Likewise, trends in the maker movement, sustainability, technology, and productivity are also creating a demand for smaller spaces, mostly in the core, but to the extent that manufacturing firms are in-sourcing, impacts are likely to be in the periphery. At the same time, transportation needs are generally demanding more space in core areas, for both loading and parking.

Industrial sector	Business trends	Demand for space	Location of demand
Warehousing	Inventory management	--	Periphery
	E-commerce	++	Core/periphery
	Warehouse "sharing"	--	Core
Manufacturing	Maker movement	--	Core
	Sustainability	--	Core
	3D printing, DYI manufacturing	--	Core
	In-sourcing	++	Periphery
	On-demand	++	Core
	Productivity improvements	--	Periphery
Freight/logistics	Intermodal freight	++	Core
	Management of port space	--	Core
	Drones	??	Core
	Airports	++	Periphery

Table II.1: Business trends and their implications for industrial space in urban cores and peripheries

NAICS Code	Industry Title	Jobs	% Change 1990-2012	LQ 2012
423690	Other Electronic Parts and Equipment Merchant Wholesalers	53,101	239%	2.37
423430	Computer and Computer Peripheral Equipment and Software Merchant Wholesalers	20,964	-4%	2.03
334413	Semiconductor and Related Device Manufacturing	12,595	-70%	2.74
325412	Pharmaceutical Preparation Manufacturing	11,991	182%	2.13
334516	Analytical Laboratory Instrument Manufacturing	7,419	12%	2.70
336414	Guided Missile and Space Vehicle Manufacturing	6,989	-76%	3.25
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	6,341	-26%	2.11
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	5,445	-71%	2.39
333242	Semiconductor Machinery Manufacturing	4,095	18%	3.43
334412	Bare Printed Circuit Board Manufacturing	3,862	-56%	2.04

Table II.2. Top 10 Industrial Sectors by Employment – Bay Area, 2012

BUSINESS TRENDS IN THE BAY AREA

As discussed in ABAG's 2015 State of the Region report, the Bay Area is continuing its long-term restructuring, with steady growth in health, social services and education, and leisure and hospitality. Although more volatile, regional economic boom periods also see growth in professional services, business services, and information. Longer term, there are declines in manufacturing and financial services, particularly pronounced during economic busts. San Francisco is currently dominating in professional and technical job growth, while the information sector continues to grow in Santa Clara County. Distributed more evenly throughout the region is growth in health, social services, accommodation, and food.

Using data from the U.S. Census Bureau's County Business Patterns, we examined employment in the nine county Bay Area region at the most detailed industry category available (6-digit NAICS) from 1990 to 2012 , using the definition of industrial developed by San Francisco (production, distribution, and repair or PDR sectors). Overall, there were 1,176,770 jobs in PDR industries in 1990, and 1,047,441 in 2012, a decline of 11% in a region where the economy overall grew by 14%.

There are several large industries in the Bay Area with a location quotient greater than 2 that likely rely on industrial land—mainly wholesale and manufacturing industries. Many are also industries that show long-term growth trends from 1990 to 2012 as well as short-term growth trends from 2005 to 2012 (Table II.2). Other Electronic Parts and Equipment Merchant Wholesalers added over 16,000 jobs from 2005 to 2012, and Analytical Laboratory Instrument Manufacturing added more than 2,000 jobs.

There are many industries, particularly in manufacturing, that have declined since 1990. Those industries experiencing the largest long term declines are Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing, which employed 1,700 people in 1990 and is nonexistent today; Boat Building, which employed 5,400 people in 1990 and only 24 people today; and Blank Magnetic and Optical Recording Media Manufacturing, which employed 6,100 people in 1990 and 57 people today. Among manufacturing industries, semiconductor, electrical instrument measuring, computer storage device, and electronic computer manufacturing are in decline. Drywall and installation contractors, commercial printing, specialty trade contractors, highway and bridge construction, and electric power distribution are also experiencing job losses. Growing industries are mostly in wholesaling, transportation, and logistics services, such as Other Electronic Parts and Equipment Merchant Wholesalers. Electronic shopping generates additional demand for logistics and transportation industries, while passenger air transportation is likely to add jobs as well. Part V of this report explores these trends in more detail.

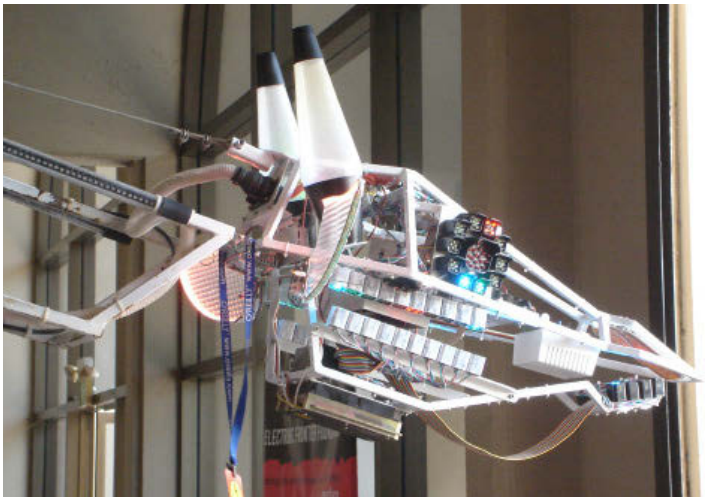
PART III: INDUSTRIAL LANDS INVENTORY

The goal of the analysis in this section is to determine the supply of industrially zoned land in the nine-county Bay Area. But because land use and zoning can differ despite requirements for them to align, and because much of the land identified may be undeveloped, these zoning numbers only provide a baseline understanding of where there is opportunity for industrial activity. Subsequent analysis (beginning with the information provided in Part IV) will look to understand the use and occupancy of this industrial land, as well as recent development activities.

The following begins with a description of our research approach, including the collection and analysis of primary and secondary data on zoning at the parcel level. The next section describes the amount and distribution of industrially zoned land across counties, looking specifically at seven categories that range from heavy industrial to mixed-use residential and industrial. Maps display the location of industrially zoned land in more detail. A final section examines recent sales transactions of industrial parcels.

METHODOLOGY AND DEFINITIONS

For this analysis we draw on 2014 county tax assessor parcel data for each of the nine counties, linked to shapefiles in ArcGIS.[39] From the assessor data, we obtained lot square footage, sales transactions, and select data about buildings, described in Part IV. Neither the county tax assessors nor the regional agencies (MTC/ABAG) had a reliable and current database of zoning by parcel that we could use, so we collected the most up-to-date zoning information available as of June 2015 from all cities and unincorporated areas in the nine-county region.[40] Some cities and areas were able to provide us with digital zoning files in ArcGIS format, while others only had zoning available in PDF format. For these, our research team had to enter the data manually into tables and GIS. Cities were given the opportunity to correct the zoning designations we collected and entered via the project website (www.bayareaindustrialland.com). In addition,



we conducted fieldwork in all nine counties to verify the accuracy of the database (described more in Appendix II).

Common categorizations for industrial land were identified across different zoning codes. These commonalities were then used to create a regional classification of industrial lands for this analysis (Table III.1). Because this study seeks ultimately to determine where best to preserve and convert industrially zoned land, it is important to distinguish between industrial zones that are dedicated only to industrial uses—henceforth the "exclusive" industrial categories—and those that allow a mixture of uses and/or activities. The exclusive industrial designation typically is for industrial uses which could be incompatible with other uses, because of impacts of noise, traffic, or odor. It also encompasses light industrial uses such as light manufacturing, wholesale, and repair, which are not necessarily noxious, but are typically characterized by a different type of economic activity than in offices or stores. We also include special districts designated for transportation or utility in this category. Mixed-use categories include both designated mixed-use zones allowing industrial, commercial, and/or residential, and industrial zones that allow office buildings as of right (not as an ancillary use), without a quota or limit. Appendix I provides some sample zoning codes by category by way of illustration, and a full list of the zoning categorizations can be found at the project website.

EXCLUSIVE INDUSTRIAL CATEGORIES	
Heavy Industrial	The heavy industrial category refers to the highest impact uses in terms of noise, smells, traffic and emissions. They are the most incompatible with other uses and require the greatest amount of separation from residential areas. These uses include junkyards and recycling centers, wrecking, and refining.
Medium Industrial	The medium industrial category includes industrial uses that have a medium level of impact in terms of noise, traffic, and odor. These include truckyards, construction operations, machine shops; medium-high impact auto repair. Areas zoned medium industrial often allow light industrial uses as well. Some cities use the term 'heavy' industrial in their zoning code, but do not specifically allow for the most intensive uses; we classify these as 'medium' industrial.
Light Industrial	The light industrial category applies to industrial uses which are relatively low impact on their surrounding areas and do not require a large buffer with residential uses. This category encompasses light manufacturing, as well as the categories of light industrial referred to collectively as production, distribution and repair or PDR industrial. Light industrial also includes heavy commercial, commercial supporting industrial uses, bulk commercial, and service commercial. Wholesale and storage activities that are related to manufacturing or PDR fall into this category.
Transportation and utilities	The transportation category includes zoning designations that are exclusively related to transportation and utilities. Uses include bus or rail yards, power generation and other utilities, airport-related facilities, and related corridors. Corridors allow some industrial uses that will not conflict with future transportation and utility expansion.
MIXED USE INDUSTRIAL CATEGORIES	
Industrial-Office	This category captures the zones where offices, including business services, administrative activities, and research and development (R&D), could potential edge out higher impact industrial uses. In these zones, which may be either medium or light industrial, office is allowed as-of-right and is not considered an ancillary use
Mixed use industrial-residential	Residential uses in industrial areas are a special category of interest to this study. Converting industrial land to residential has become an attractive option for some cities to alleviate the housing shortages. In some cases, rehabilitating underutilized or polluted industrial land for housing has been a successful strategy. There are also successful cases of industrial land preservation. This category quantifies the industrial land that allows non ancillary housing uses. This includes live work units and other residential housing types.
Mixed use industrial-commercial	This category includes zones that allow industrial uses as well as commercial. Commercial uses include restaurants, hotels, and big box retail.

Table III.1. Regional Zoning Classifications and Descriptions
Note that agricultural designations are not included. See Appendix II for more details

	Total (Acres)	Total IL (Acres)	Percent IL of Total
East Bay			
Alameda	476,064	24,192	5.1%
Contra Costa	477,745	20,206	4.2%
Peninsula			
San Mateo	291,520	10,845	3.7%
South Bay			
Santa Clara	830,787	18,501	2.2%
North Bay			
Solano	543,426	14,432	2.7%
Napa	504,137	3,931	0.8%
Sonoma	1,016,546	1,996	0.2%
Marin	337,158	1,750	0.5%
San Francisco			
San Francisco	30,427	1,971	6.5%
Total	**4,507,811**	**97,823**	**2.2%**

Table III.2. Amount and Distribution of Industrial Land*
Source: County Assessors' DataQuick Database; See Appendix II for methodological notes on how total acreage was calculated

* Calculations based on gross regional land area.

AMOUNT AND DISTRIBUTION OF INDUSTRIAL LANDS

The gradual urbanization and industrialization of the Bay Area, particularly since 1850, has led to a distinct pattern of industrial land location. Initially, industrial uses were confined to the core city and port areas, mostly in San Francisco and the East Bay. In the early to mid-20th century, industrial uses expanded into the South Bay. Most recently, parts of the North Bay have industrialized as well, typically on large lots with convenient highway access. Meanwhile, some of the older industrial land in the core has undergone conversion to commercial and residential use.

Given these waves of industrialization, the amount of industrial land is not evenly distributed across counties (Figure III.1). While some of this distribution may be attributed to the overall size of each county, several counties that have a significantly higher share of land zoned for industrial use (e.g. 4.2% of land in Contra Costa County has industrial zoning—see Table III.2). The share of land zoned for industrial use corresponds roughly to goods movement patterns: as discussed in the MTC Regional Goods Movement Plan Task 2C Technical Memorandum (2015), the leading counties in terms of output of goods movement dependent industries are Santa Clara, Contra Costa, Alameda, and Solano counties. Meanwhile, in many of the North Bay counties less than 1% of land is zoned for industrial uses —this may be partially attributed to the regional zoning classifications excluding agricultural uses for methodological purposes (see Appendix II).

TYPE OF INDUSTRIAL LANDS

The type of industrial land also varies from county to county (Figure III.2). East Bay counties have significant land zoned for heavy and medium industrial uses that could potentially conflict with their surroundings. For example, in Contra Costa County the City of Antioch's M-2 Heavy Industrial allows for: "production of and extraction of metals or chemical products from raw materials, steel works and finishing mills, chemical or fertilizer plants, petroleum and gas refiners, paper mills, lumber mills, asphalt, concrete and hot mix batch plants, power generation plants, glassworks, textile mills, concrete products manufacturing and similar uses."[41]

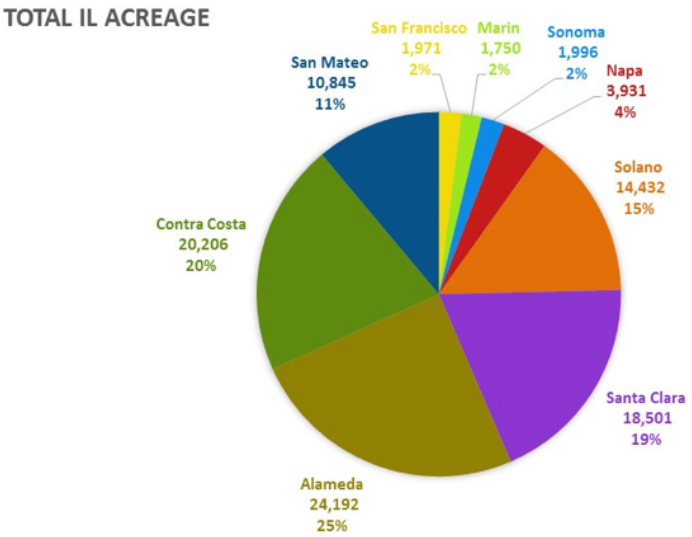


Figure III.2. Distribution of Industrial Land Categories
Source: County Assessors' DataQuick Database

North Bay counties have a large share of land for transportation, which includes land zoned for bus or rail yards, power generation and other utilities, airport-related facilities, and related corridors. For example, in Solano County, the City of Rio Vista's zoning C-2A Airport Commercial District was included in this total. The C-2A zoning designation is intended to "supply a complete range of airport related services at the airport."[42]

Combining the seven categories above into the broader classifications described in Table III.1 (Exclusive and Mixed-Use) we see additional patterns of how industrial land is distributed. In Figure III.3 the Exclusive Industrial classification is zoned for more intense industrial activities while the Mixed-Use zoning provides the potential for multiple kinds of activities on the land. A table that includes these numbers by individual counties can be found in the Appendix III.

These broader classifications give a sense of the different intensities of industrial land across the

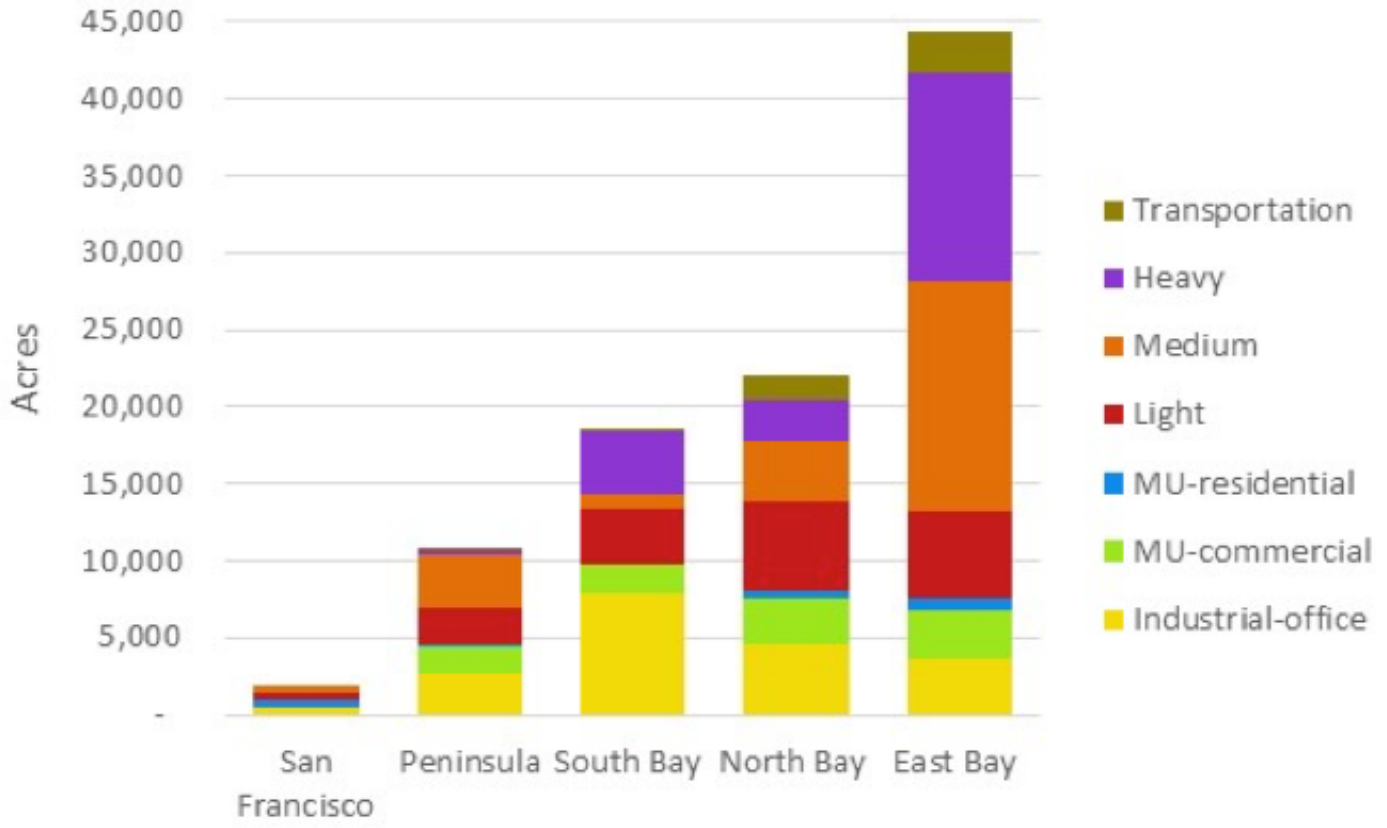


Figure III.2. Distribution of Industrial Land Categories[43]
Source: County Assessors' DataQuick Database

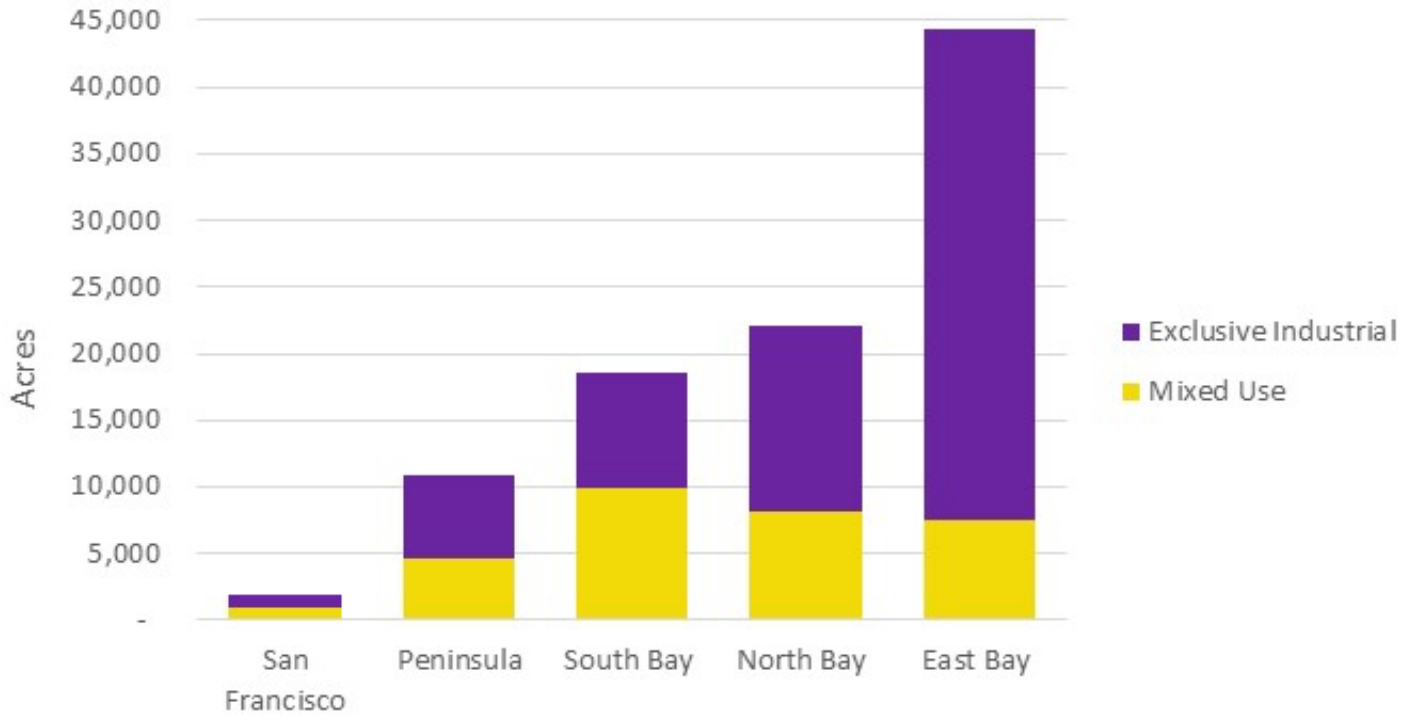


Figure III.3. Distribution of Consolidated Industrial Land Categories
Source: County Assessors' DataQuick Database

region and the kinds of activities that this land supports. For example East Bay counties have significantly more land zoned for exclusive industrial uses, while the South Bay has a more even balance of exclusive industrial and mixed-use. The zoning patterns seen in Figure III.2 and III.3 may be an indication of the kinds of industries that have already concentrated in different areas, and/or it may point to cities' efforts to attract new/additional businesses with specific industrial land use needs or position the land for non-industrial uses.

INDUSTRIAL LAND BY CITY

The assessors' data also allowed us to determine the amount of industrial land available in cities. Table III.3 shows the 'top ten' cities with the most land zoned for industrial activities. Appendix III provides a list of the top fifty cities.

Oakland and San Jose top the list, each with over 6,000 acres of industrially zoned land. Figures III.4-III.8 map the land in these areas (see Appendix IV for maps of the rest of the region). The majority of Oakland's industrial zoning allows for exclusive industrial uses (e.g. heavy, medium, or light industry), while San Jose has a higher proportion of mixed-use industrial zoning, or industrial zones where office uses are allowed.

County	City	Total IL Acres
Alameda	Oakland	6,999
Santa Clara	San Jose	6,410
Contra Costa	Martinez	4,956
Contra Costa	Richmond	4,919
Solano	Unincorporated Area	4,487
Alameda	Fremont*	4,180
Alameda	Hayward	3,610
San Mateo	Unincorporated Area	3,143
Contra Costa	Concord	2,722
Solano	Benicia	2,702

Table III.3. Cities with Highest Amount of Industrially Zoned Land
Source: County Assessors' DataQuick Database
* According to Fremont's own inventory of industrially zoned land, the total is slightly higher: 4,360 acres.

Oakland and San Jose top the list, each with over 6,000 acres of industrially zoned land. Figures III.4-III.8 map the land in these areas (see Appendix IV for maps of the rest of the region). The majority of Oakland's industrial zoning allows for exclusive industrial uses (e.g. heavy, medium, or light industry), while San Jose has a higher proportion of mixed-use industrial zoning, or industrial zones where office uses are allowed.

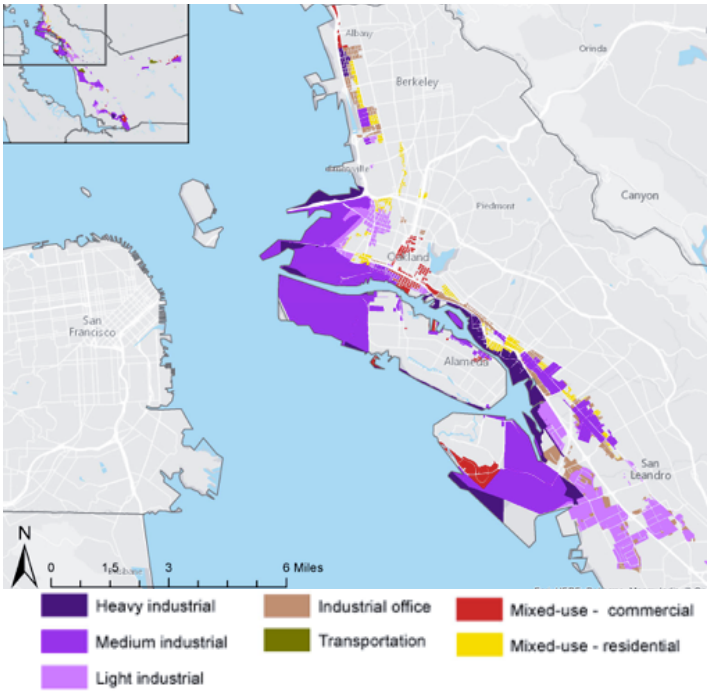


Figure III.4. Industrially Zoned Land in Oakland, Emeryville, Berkeley, Alameda, San Leandro

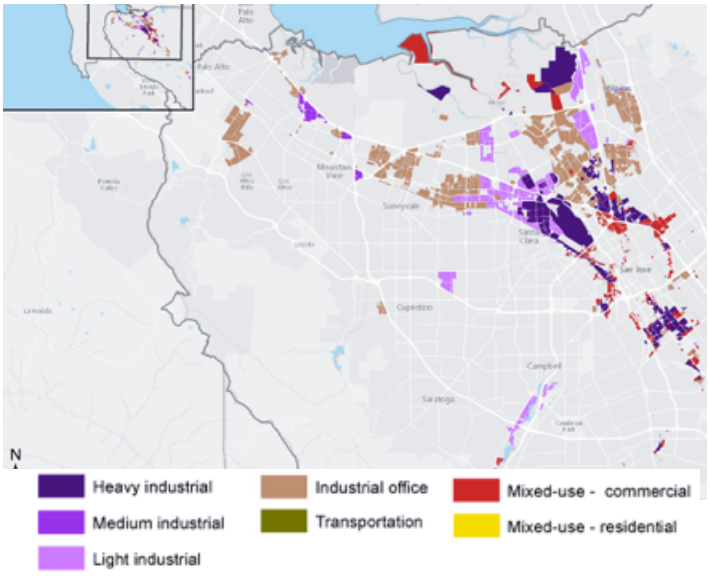


Figure III.5. Industrially Zoned Land in San Jose, Milpitas, Santa Clara, Sunnyvale, Mountain View, and nearby cities

With the exception of South San Francisco—where the majority of land is zoned for light industrial—the industrial land in San Mateo cities are also primarily zoned for mixed-use activities (Figure III.6). In contrast, most industrial land in Contra Costa County is zoned heavy industrial, as shown in Figure III.7. Solano County, with 16% of the region's industrial land, is mostly medium industrial and industrial-office.

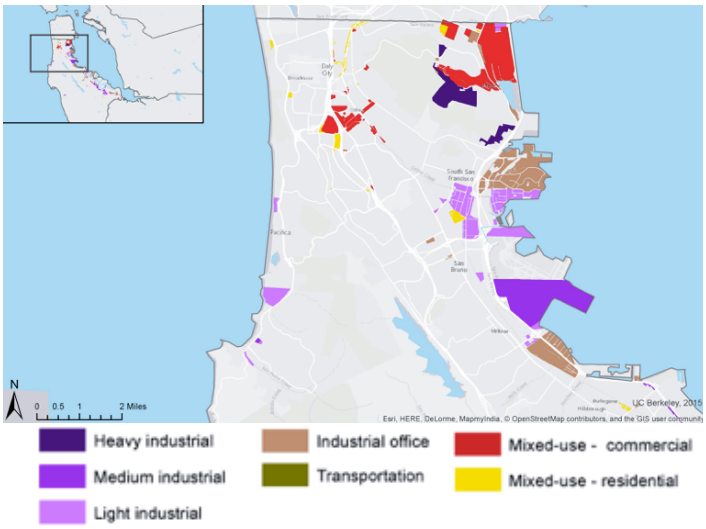


Figure III.6. Industrially Zoned Land in northern San Mateo County

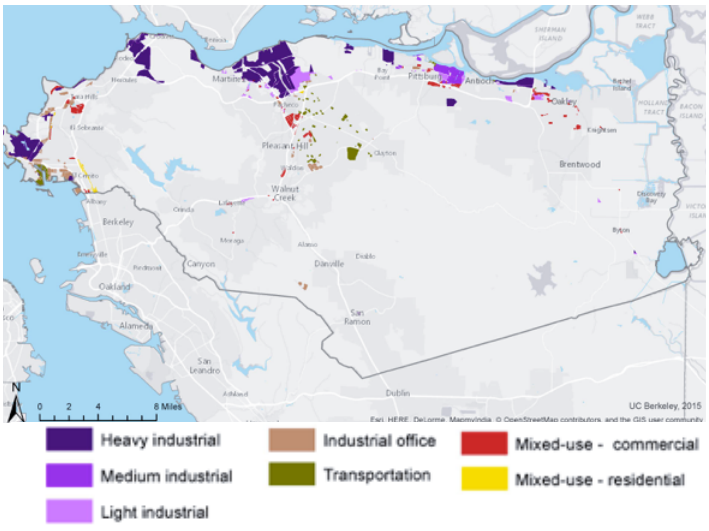


Figure III.7. Industrially Zoned Land in Contra Costa County

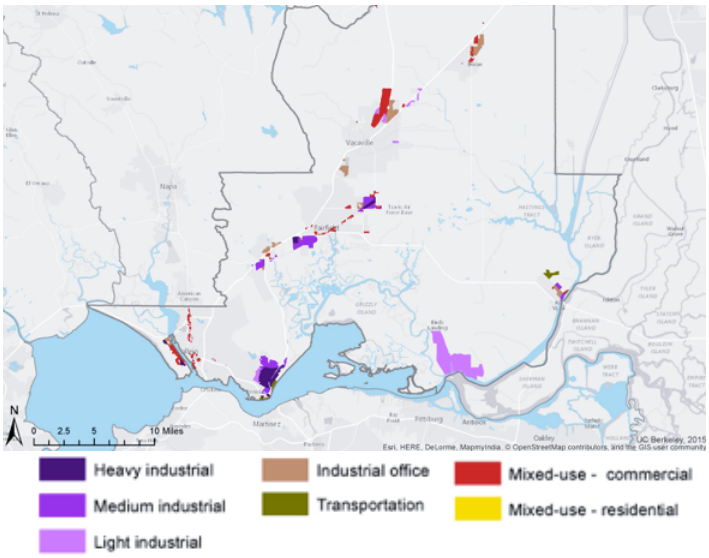


Figure III.8. Industrially Zoned Land in Solano County

SALES TRANSACTIONS

Another indicator of the market for industrial land is the frequency of sales transactions. Sales of industrial parcels may indicate strong business demand, or could be occurring because of intentions to convert the land to other uses. Based on an analysis of assessors' data, we found that over the last ten years the most active and volatile markets for industrial land were: Alameda, Santa Clara and San Francisco Counties. This is most likely due to the faster rate of urbanization in these areas. Of particular note is the high volume of transactions in San Francisco, given the relatively small amount of industrial land.

Yet, while the number of transactions (depicted above) is about equal in Santa Clara and San Francisco, Santa Clara outpaces all counties in terms of the total acreage of industrial land transacted over the last five years (Table III.4). Solano County in the North Bay saw a small number of transactions, but a relatively high amount of square footage as a result of several larger transactions (ranging from 25-300 acres) in the cities of Fairfield, Rio Vista, and unincorporated areas.

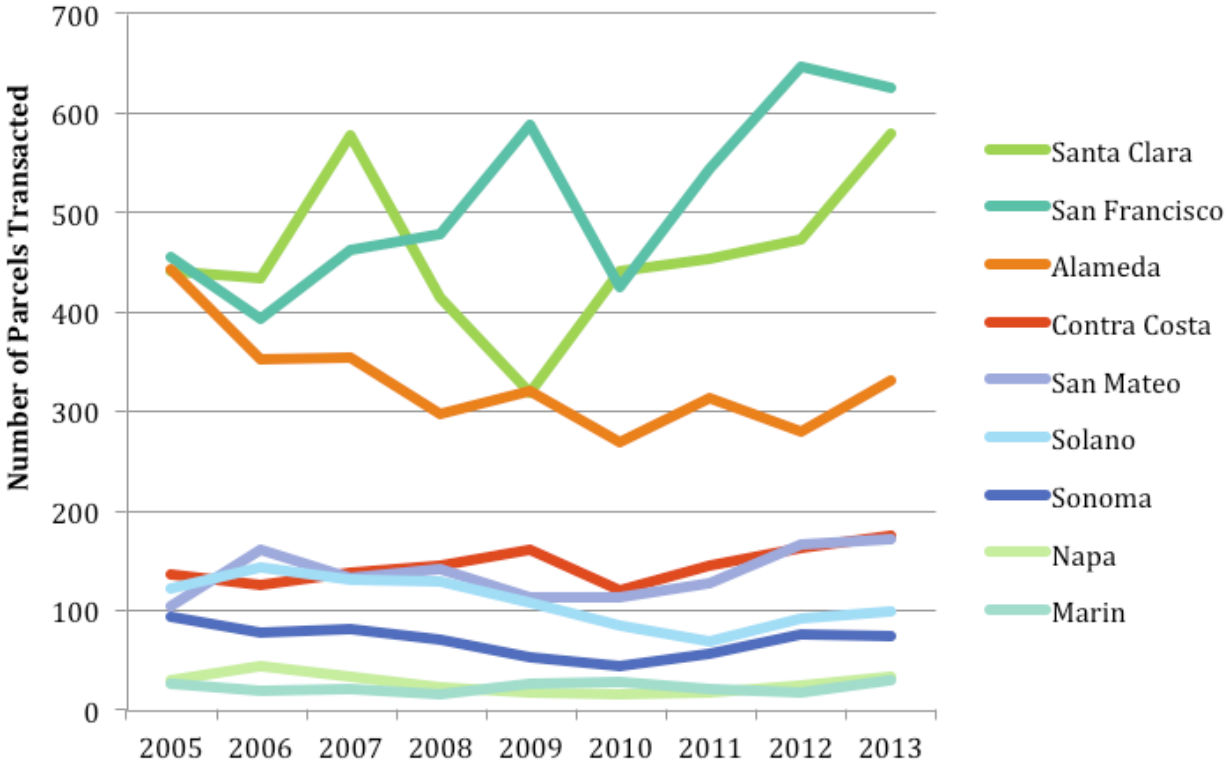


Figure III.9. Transactions of Industrially Zoned Parcels (by number of parcels)

County	Total Acreage
South Bay	
Santa Clara	4,037
North Bay	
Solano	2,940
Napa	800
Sonoma	330
Marin	98
East Bay	
Alameda	3,150
Contra Costa	1,349
Peninsula	
San Mateo	1,274
San Francisco	
San Francisco	146

Table III.4. Transaction of Industrially Zoned Land from 2010-2014[44]
Source: County Assessors' Dataquick Database

CONCLUSION

In sum, the analysis found almost 98,000 acres of industrially zoned land located in the nine-county region. Notable differences among sub-regions are the concentration of heavy industrial land in the East Bay, the reliance on mixed use-commercial zones in the Peninsula, and in general, the mixture of industrial and office uses (industrial-office) in both the Peninsula and the South Bay. Alameda County has the most industrial land, followed by Contra Costa, Santa Clara, and Solano. Yet, despite this concentration, market activity is largely concentrated in San Francisco and Santa Clara counties.

PART IV: BUILDINGS ON INDUSTRIAL LAND

BACKGROUND, METHODOLOGY AND DEFINITIONS

To accompany the zoning analysis in Part III that identifies the opportunities under existing regulations for industrial activity, this research also sought to understand occupancy patterns.

As an initial step towards understanding the built space and its utilization, we used private real estate data from CBRE that captures the amount of industrial space available and the value of those spaces.[45] We relied on the following CBRE data points addressing the questions of space and value:

- **Stock**: The total amount of competitive single-tenant and multi-tenant space (in square feet) (also known as net rentable area, or NRA)
- **Completions**: The amount of new space open for occupancy (in square feet) during a period. The figure includes both single and multi-tenant completions.
- **Asking Rents**: Average gross or net asking rents weighted by the number of square feet available for lease.
- **Vacancy Rate**: The total vacant space available for lease divided by the total stock.[46]

The CBRE data also segment industrial spaces by several different use types. This allowed us to develop a deeper understanding of the actual supply and demand for industrial land in the nine-county region using the following categories:

- **Manufacturing**: Industrial buildings with less than 3 stories and a parking ratio less than 2.5:1 for which less than 25% of the NRA is demised or planned as office space.
- **Warehouse/Distribution**: Industrial buildings with the same criteria as Manufacturing buildings and for which at least 50% of "non-office" space has a clear height of 18 feet or greater.
- **Research & Development**: Industrial buildings with one to three stories for which at least 25% but less than 75% of the NRA is demised or planned as office space or highly improved, and have a parking ratio greater than or equal to 2.5:1. Flex space is included in this category.[47]

Note that this dataset does not include some older, multi-story industrial buildings. Also, CBRE does not track industrial real estate in Sonoma and Marin Counties. We sought an alternative data source for these counties from Colliers International, but they also do not track this data. A representative from Colliers explained that there is not sufficient commercial real estate in Sonoma and Marin for them to comprehensively track industrial activity in these counties. Thus, these counties are excluded from this analysis.

AVAILABLE INDUSTRIAL SPACE

The CBRE database found 562,582,000 square feet (12,915 acres) of industrial stock in the nine-county region. This is significantly less than the 97,823 acres of industrially zoned land found in Part III (repeated in Table IV.1). This difference occurs because the Assessors' data includes total land area, while CBRE only calculates the square footage. Thus the industrial space calculations exclude vacant land, parking, loading areas, trailers, older industrial buildings, and so forth.[48]

	Industrial Building Stock in Acres (CBRE)	Acres Zoned Industrial (Assessors)	Industrial Building Stock per Land Available
San Francisco	699	1,971	35%
South Bay	4,148	18,501	22%
East Bay	5,671	44,398	13%
Peninsula	1,153	10,845	11%
North Bay	1,244	22,109	6%
Total	**12,915**	**97,823**	**14%**

Table IV.1. Comparison of Zoning with Actual Stock
Source: County Assessors' DataQuick Database and CBRE

Regionally we see that the East Bay has both the highest amount of industrial building stock and acres zoned for industrially uses, while San Francisco has the least (Figure IV.1). With these calculations, it should also be noted that the North Bay excludes Marin and Sonoma Counties, but there is likely limited industrial activity occurring there.

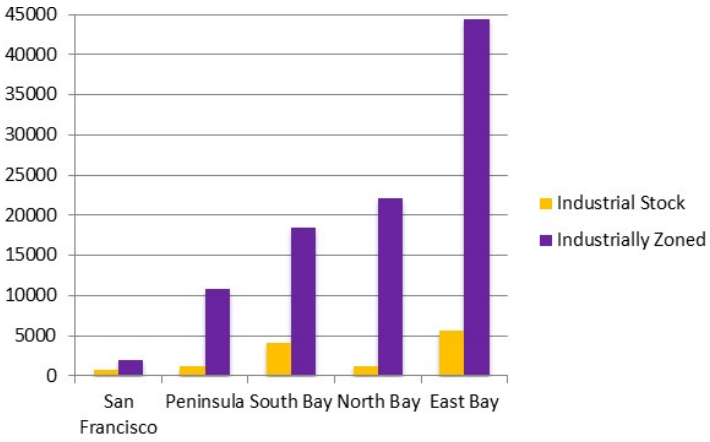


Figure IV.1. Regional Total Industrial Stock, 2015[49]
Source: County Assessors' DataQuick Database and CBRE

BUILDING COVERAGE

Another way to assess the intensity of development is to look at floor area ratios, or building coverage. For this calculation, we returned to the Assessors' data collected on building square footage, excluding vacant lots and potential industrial activity on other, unidentified parcels. The building coverage calculations in Table IV.2 are the result of dividing the building square footage by the total lot size of parcels where development has occurred. Over 100% suggests a high floor area ratio because of multi-story buildings. In Sonoma and Marin, ratios are very low, probably due to parking or other surface uses.

Solano County in the North Bay had the highest intensity developments on industrial lands (138% of the developed land covered by buildings). Yet the standard deviation was very high, indicating that some buildings on industrial lands are multiple stories, while others are much less dense. In addition to showing the large range in intensity for industrial buildings, these coverage calculations may be an indication that industrial land is being developed for other non-industrial uses that lends itself to denser building types.

	Average Building Coverage	Standard Deviation	IL Parcels Counted	Total IL Parcels
North Bay				
Solano	138%	662%	698	2493
Napa	51%	43%	306	818
Sonoma	38%	35%	585	1554
Marin	31%	16%	32	843
San Francisco				
San Francisco	110%	282%	9608	10563
Peninsula				
San Mateo	55%	64%	664	3882
East Bay				
Alameda	52%	51%	5019	9297
Contra Costa	44%	46%	2326	4043
South Bay				
Santa Clara	50%	50%	5727	9029

Table IV.2. Percent of IL Covered by a Building[50]
Source: County Assessors' DataQuick Database

Solano County in the North Bay had the highest intensity developments on industrial lands (138% of the developed land covered by buildings). Yet the standard deviation was very high, indicating that some buildings on industrial lands are mul-

tiple stories, while others are much less dense. In addition to showing the large range in intensity for industrial buildings, these coverage calculations may be an indication that industrial land is being developed for other non-industrial uses that lends itself to denser building types.

TYPE OF INDUSTRIAL USES

Real estate databases can give us a sense of the type of space available. Regionally, warehouse space takes up the most land area at 51% of all industrial stock. Manufacturing demands the least space at 16% of the total stock (Figure IV.2). The 'Other' category includes special use and space that is non-classifiable.

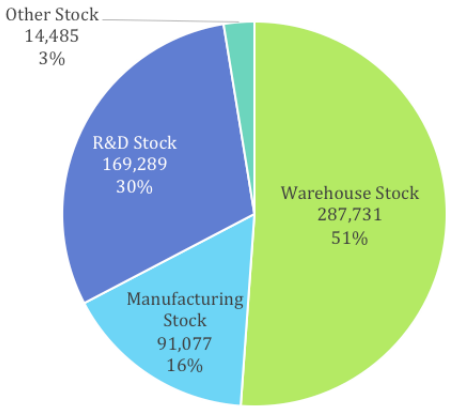


Figure IV.2. 2015 Total Regional Stock (SFx1000)

Source: CBRE

In most counties, warehouse space comprises 50%-75% of the total industrial stock. The exception is the South Bay where R&D is the dominant industrial uses (Table IV.3).

	Total Stock (sqft)	% R&D	% Warehouse	% Manufacturing	% Other
East Bay	247,027	20%	60%	19%	1%
South Bay	180,702	**53%**	29%	14%	4%
North Bay	54,189	7%	76%	16%	1%
Peninsula	50,220	26%	54%	15%	5%
San Francisco	30,444	23%	64%	7%	7%

Table IV.3. Industrial Building Stock by Type (2015)
Source: CBRE

CONSTRUCTION ACTIVITY

In general, construction activity of industrial space has slowed over the last ten years. The exceptions are in the Peninsula from 2005-2009 and San Francisco from 2010- 2015 (Table IV.4). This decrease in construction is likely the result of the recession, and a lag time over the last five years in real estate cycles as new construction is still in the process of coming online now that the market has recovered.

Solano County in the North Bay had the highest intensity developments on industrial lands (138% of the developed land covered by buildings). Yet the standard deviation was very high, indicating that some buildings on industrial lands are multiple stories, while others are much less dense. In addition to showing the large range in intensity for industrial buildings, these coverage calculations may be an indication that industrial land is being developed for other non-industrial uses that lends itself to denser building types.

	2000-2004	2005-2009	% Change	2010-2015	% Change
Peninsula	1,029	1,170	14%	327	-72%
North Bay	5,975	5,131	-14%	1,436	-72%
East Bay	12,365	4,601	-63%	3,682	-20%
South Bay	10,769	923	-91%	880	-5%
San Francisco	1,096	63	-94%	110	75%
Total Completions (SF x 1000)	31,234	11,888	-62%	6,435	-46%

Table IV.4. Total Industrial Completions (SF x 1000)
Source: CBRE

Despite this slowdown, over the last ten years the largest amount of new industrial square footage has been constructed in the East Bay (8,283,000 square feet completed). The North Bay has also seen a significant amount of industrial construction.

In the East Bay the largest share of new construction is for warehouse use (Table IV.5). Yet the high amount of R&D construction from 2005-2009 and the increase in manufacturing completions may point to a new demand for 'flex' and 'maker' spaces. The majority of East Bay R&D and manufacturing completions occurred

along the 880 corridor, which includes the cities of Hayward, Union City, and Fremont. More than a third (545,000 sqft) of the East Bay R&D space completed from 2005-2009 was along the 880 corridor, while all of the East Bay manufacturing space was completed along 880 from 2010-2015. Warehouse completions were more evenly distributed across the East Bay.

In the North Bay, the construction activity appears to be driven primarily by demand for warehouse space (Table IV.6). This activity was evenly distributed across Solano and Napa counties (Marin and Sonoma counties are not included by CBRE).

Year	Warehouse	Manufacturing	R&D	Other	Total
2005-2009	2,617	223	1,566	195	4,601
2010-2015	2,006	892	509	275	3,682

Table IV.5. East Bay Completions by Building Type (SF x 1000)
Source: CBRE

Year	Warehouse	Manufacturing	R&D	Other	Total
2005-2009	4,715	99	252	65	5,131
2010-2015	1,064	330	42	0	1,436

Table IV.6. North Bay Completions by Building Type (SFx1000)
Source: CBRE

BUILDING AGE

In addition to completion data from CBRE, the Assessors' data allowed us to look at the average age for all building stock located on industrially zoned land. For those buildings that the Assessor had data, the averages for each county are shown in Table IV.7. An interesting trend to observe is the concentration of older buildings in the core (particularly San Francisco and Alameda), due most likely to the urbanization of these counties earlier in the region's development. In Napa and Solano counties, buildings tend to be much newer.

	Years
San Francisco	
San Francisco	72.3
East Bay	
Alameda	60.6
Contra Costa	45.6
North Bay	
Marin	49.2
Sonoma	41.8
Solano	38.4
Napa	28.1
Peninsula	
San Mateo	48.0
South Bay	
Santa Clara	40.2

Table IV.7. Average Building Age
Source: County Assessors' DataQuick Database

INDUSTRIAL RENT

Gross rents for all industrial spaces in San Francisco and the Peninsula are higher than regional averages (Figure IV.3). Rents at the core of San Francisco are of particular note: in SOMA the current average gross industrial rents are $41.53/sqft/year and North of Market gross rents are $40.34/sqft/year. Because these rent numbers only include space that is currently available for lease, however, these rent numbers don't factor in industrial tenants with long-term leases at lower rates.

The smaller total land areas of San Francisco and the northern Peninsula likely plays an important role in restricting the supply of industrial lands and raising the demand/willingness to pay. A supplemental explanation may be the higher proportion of mixed-use zoning in these areas, identified in Part III (Figure III.3), which allows a greater variety of uses and thus attracts a larger market.

Rents for available R&D space in the North, South, and East Bays are below the regional average. For manufacturing space, the East Bay is the only area in the region where rents are below the regional average ($7.22/sqft/year regionally, $6.01/sqft/year in the East Bay). Warehouse rents appear to be the most consistent across the region (Figure IV.3). This consistency of rent may be one reason that over half of the regional industrial stock (seen in Figure IV.2) is warehouse space.

Over the last ten years industrial rents have remained relatively stable—decreasing during the recession, but making a steady comeback since 2012 (Figure IV.4). Rents for R&D have risen the most.

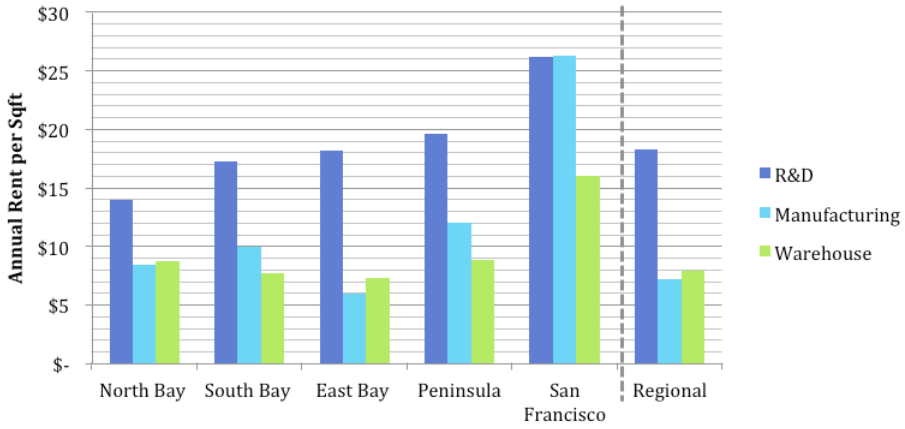


Figure IV.3. 2014 Annual Industrial Rents[51]
Source: CBRE

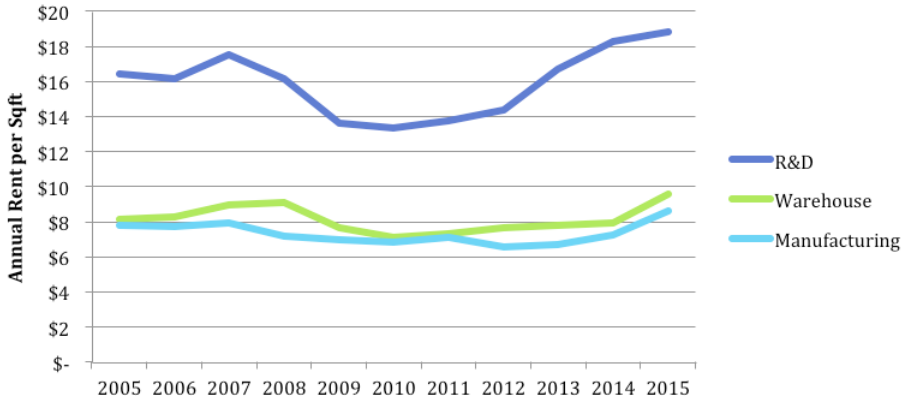


Figure IV.4. Annual Industrial Rents, 2005-2015
Source: CBRE

OCCUPANCY TRENDS

Similar to historic rent trends, industrial vacancy rates have been steadily recovering post-recession (Figure IV.5). Vacancy rates in the South Bay, the Peninsula, and San Francisco are all approximately 3% for data collected in 2015. For the East and North Bay, vacancy rates in 2015 are slightly higher (4% and 5% respectively). In San Francisco, vacancy rates are still slightly higher than in the 2007 peak, but all other regions are currently experiencing lower vacancy.

While warehouse and manufacturing vacancy rates are similar to aggregate trends depicted in Figure IV.5, R&D vacancy rates in the East and North Bay have been significantly higher over the last ten years (Figure IV.6). R&D vacancy rates are currently dropping regionally, but are still quite high in the East and North Bay at approximately 10% in both areas.

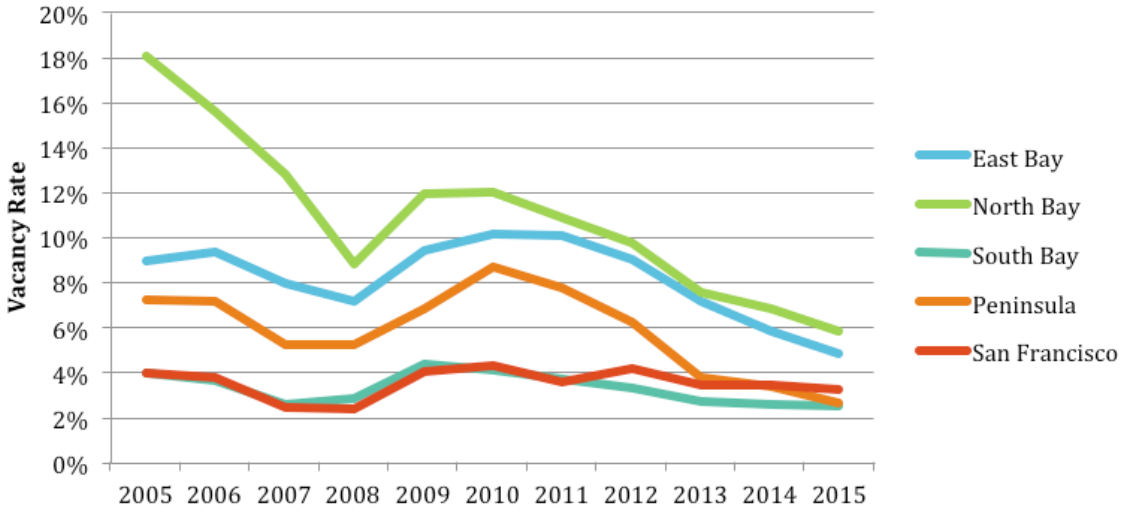


Figure IV.5. Vacancy Rates, 2005 -2015
Source: CBRE

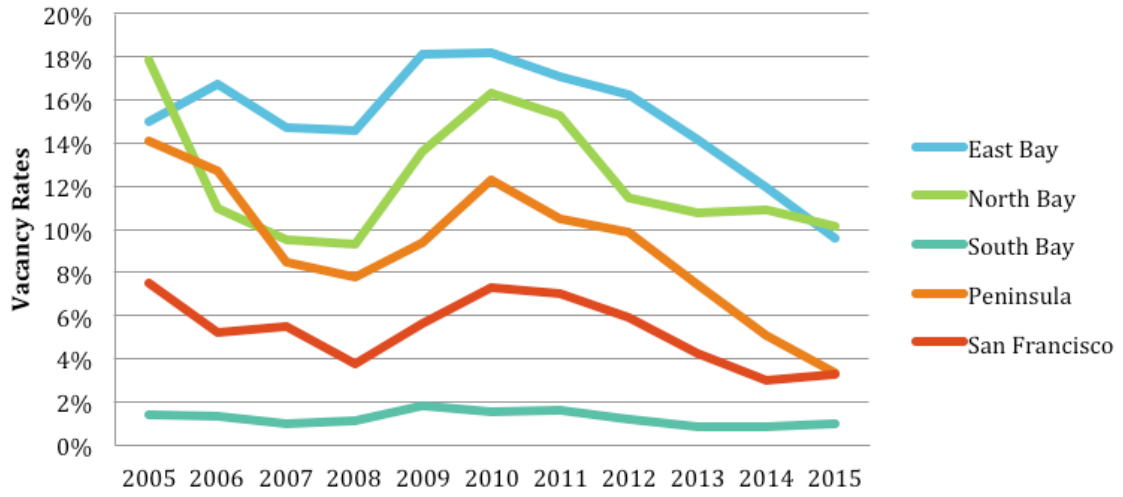


Figure IV.6. R&D Vacancy Rates, 2005-2015
Source: CBRE

CONCLUSION

In sum, outside of San Francisco, much of the Bay Area's industrial land is occupied at very low densities, perhaps to accommodate parking, loading, and other surface uses. Warehouses comprise half of the region's stock, with R&D comprising another 30%. Warehouse development dominates in every sub-region except the South Bay, where R&D is concentrated. New construction is occurring mostly in the East and North Bay. There is a significant amount of older stock, particularly in San Francisco, Alameda, San Mateo, and Marin counties. Rents are generally high and have recovered from the recession, particularly in San Francisco and the Peninsula, and for R&D. Vacancy rates are now reaching historic lows, except for R&D.

PART V: BUSINESS TRENDS ON INDUSTRIALLY ZONED LAND

For this analysis we examined the distribution of businesses across industrially zoned and other land in all nine counties, to determine what type of industries were concentrated on industrial land. We develop a typology based on the location quotient (LQ), which measures the concentration of industries in a particular area relative to the larger region within which it sits (the reference region). If an LQ is greater than 1, it is considered relatively concentrated; if it is less than 1, then it is underrepresented.

We are particularly interested in determining which industries are actually dependent on industrially zoned land, in other words, that seem to avoid locating in other types of zones. For a conservative estimation of such industries, we use a LQ of greater than 2. By using this threshold, we were able to exclude a number of industries that seemed to be locating on industrial land more out of convenience than necessity (e.g., professional service firms, which do not have much impact in terms of noise, traffic, and odor and thus are not incompatible with other uses).

We linked Dun and Bradstreet employment data (from the National Establishment Time Series data) for businesses by address to county assessor data at the parcel level for all nine counties in order to determine which industries in each county are thus heavily dependent on industrially zoned land. For each county, we summed the jobs in each industry by zoning type. Then we created two final groupings: Exclusive Industrial Land and Mixed-Use Industrial Land. Exclusive industrial land includes light, medium, heavy, and transportation zones. Mixed-use (MU) industrial land includes light-office, heavy-office, mixed-use residential, and mixed-use commercial.

Industrial businesses locate in many different zones. For instance, a small construction contractor might operate out of a home in a residential district. Larger contractors are more likely to be dependent on industrially zoned land. Likewise, auto repair shops can be found as readily in commercial zones as on industrial land. Tech businesses are found throughout all types of zones, depending on their size and production process (e.g., whether they are conducting manufacturing, software design, research and development, or some combination). At the same time, industrial land, whether exclusive or mixed-use, also houses many types of businesses. For instance, older retail establishments such as corner stores or diners may be grandfathered into industrial zones. Flexible zoning regulations on industrial land may permit a great variety of uses, from government offices to professional services.

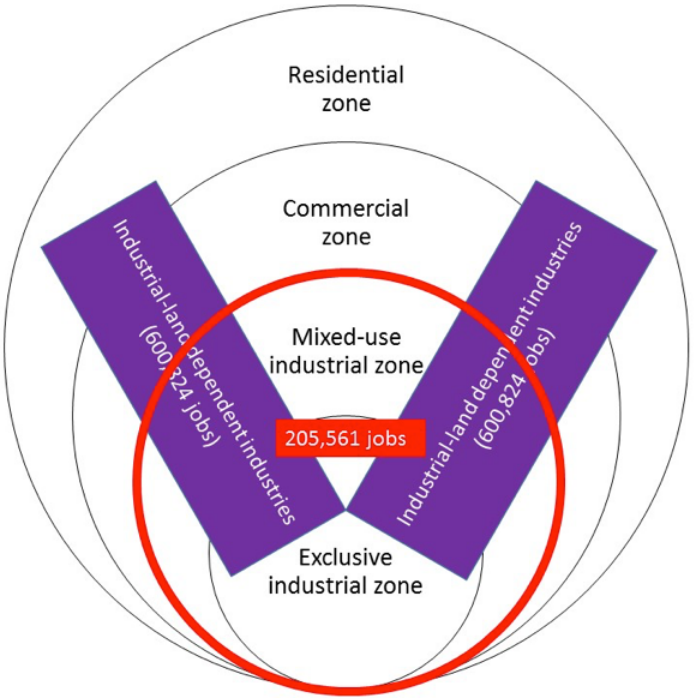


Figure V.1. Location of industrially zoned land and industrial land-dependent jobs.

Thus, this analysis differentiates between the industrial land-dependent industries through the LQ method that are located throughout the region, and the industrial land-dependent businesses that are actually located on industrially zoned land (Figure V.1). As this diagram illustrates, the industrial land-dependent businesses on industrial land are a subset of the industrial land-dependent businesses throughout the region. For our projections of industrial

land demand, we analyze both trends in these businesses on industrial land and the larger set of industrial land-dependent businesses. This latter group of businesses may be considered the latent demand for industrially zoned land. Overall, our analysis found that in 2011, there were 205,561 jobs in industrial land-dependent industries actually located on industrially zoned land, and 600,824 industrial land-dependent jobs overall in the region.

LOCATION OF INDUSTRIES DEPENDENT ON INDUSTRIAL LAND

Figure V.2 maps the location of the industries identified as highly dependent on exclusive industrial zoning in the region (more detailed maps are in Appendix V). This map sums Dun & Bradstreet/NETS employment (for 2011) by block group. The greatest concentrations of industrial land-dependent employment occur in southern Alameda County (from San Leandro to Fremont) and northern Santa Clara County (primarily San Jose). Other concentrations occur near SFO, along the Northern Waterfront, and near Livermore. These concentrations suggest where the region might want to consider more stringent protections for industrial land in the future, in order to support regional economic growth.

The following first examines the top 30 industries by employment among those dependent on exclusive industrial land for each of the nine counties. We then provide an overview of the industries dependent on mixed-use industrial land in the following section.

INDUSTRIES DEPENDENT ON INDUSTRIAL LAND

Within Santa Clara, about half the industries dependent on industrial land experienced growth from 1990 to 2012. The largest industry dependent on exclusive industrial land is circuit board manufacturing. There are seven industries, a larger share than other counties, that are dependent on both exclusive and MU industrial land in Santa Clara including Electrical Contractors and Other Wiring Installation Contractors and Plumbing, Heating, and Air-Conditioning Contractors, which combined provide nearly 11,000 jobs. Two of the somewhat unexpected industries that made it to this list are Executive Offices and Other General Government Support. Interviewees noted that public facilities such as these are often built on industrial land out of expediency; thus these uses most likely do not need to be separated on industrial land.

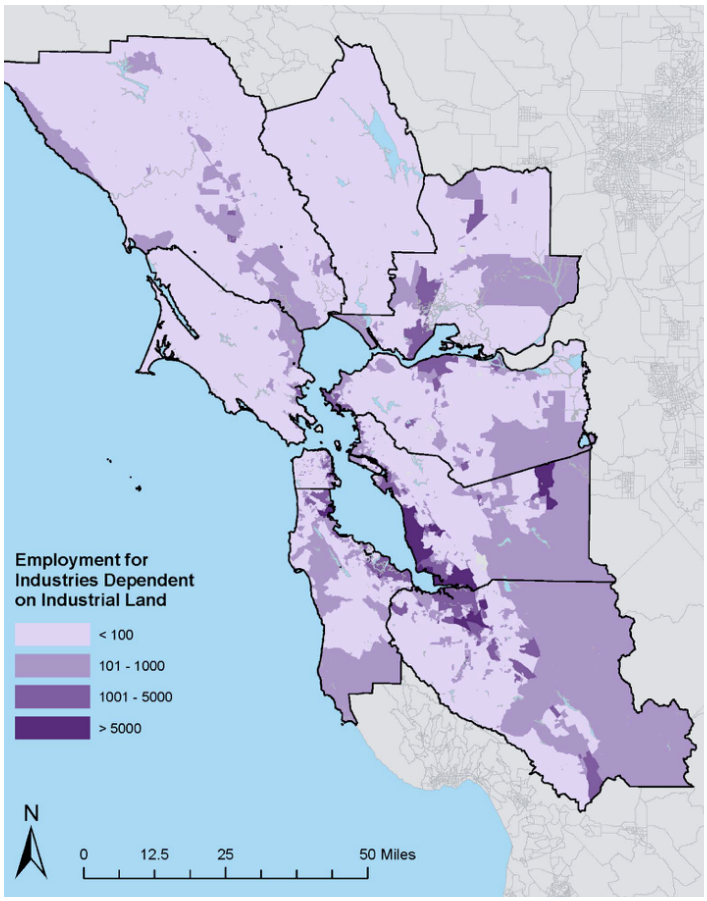


Figure V.2. Employment in Industries Dependent on Exclusive Industrial Land.

MOBILITY OF INDUSTRIES DEPENDENT ON INDUSTRIAL LAND

Moves section

An important indicator of demand for industrial land is the mobility of firms. If more firms and jobs are moving out of industrial areas than are moving in, demand may be declining. More in-moves suggests increasing demand.

Previous research has shown that overall, only about 10% of firms move during their lifetime.[49] Industrial firms, particularly manufacturing, are more likely to move than other types of industries. Looking only at industrial land-dependent jobs, we find that they move in and out in approximately equal numbers, with a slightly greatly share of jobs moving into the Bay Area from the rest of California and the United States than move out.

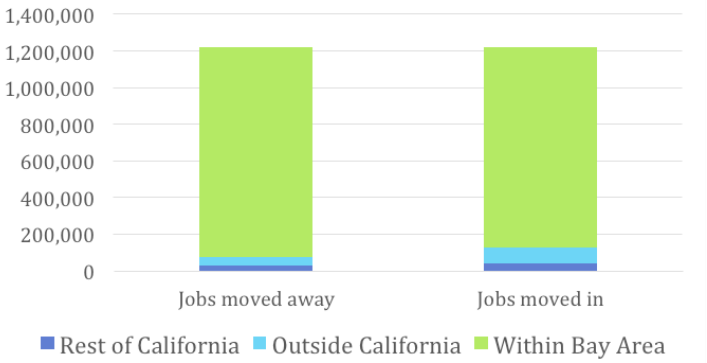


Figure V.3. Moves of industrial land-dependent jobs into and out of the Bay Area, 1990-2012.

In terms of absolute numbers of jobs, the most mobile industries are in just four sectors: high-tech manufacturing, construction, transportation, and wholesale (Table V.2). Again, the vast majority of these moves (80-90%) occur within the Bay Area.

The industrial areas from which jobs move are, for the most part, the same areas as those receiving jobs (Table V.1). Cities experiencing the most churn include Santa Clara, San Jose, Fremont, Milpitas, and San Francisco. San Francisco industrial areas are more likely to experience move-outs than move-ins. Areas that are top job gainers and not losers include Hayward, SFO, Oakland, and Pleasanton. Figure V.4 shows the net change in industrial land-dependent jobs due to moves, from 1990 to 2012.

Areas with most move-outs		Areas with most move-ins	
Zip	City	Zip	City
95054	Santa Clara	95054	Santa Clara
95131	San Jose	94538	Fremont
94043	Mountain View	95134	San Jose
94538	Fremont	95035	Milpitas
95035	Milpitas	95131	San Jose
94103	San Francisco	94105	San Francisco
94105	San Francisco	94103	San Francisco
95112	San Jose	94111	San Francisco
94111	San Francisco	95112	San Jose
94107	San Francisco	94545	Hayward
95134	San Jose	94089	Sunnyvale
94089	Sunnyvale	94128	SFO
94086	Sunnyvale	94043	Mountain View
94080	South San Francisco	94539	Fremont
94101	San Francisco	94107	San Francisco
94577	San Leandro	94612	Oakland
94545	Hayward	95110	San Jose
94102	San Francisco	94080	South San Francisco
94104	San Francisco	94086	Sunnyvale
95050	Santa Clara	94588	Pleasanton

Table V.1. Zip codes with the most industrial land-dependent jobs moving in and out, 1990-2012.

NAICS	Industry description	Total jobs moved, 1990-2012
3344	Semiconductor and Other Electronic Component Manufacturing	74,974
3341	Computer and Peripheral Equipment Manufacturing	50,415
2382	Building Equipment Contractors	41,436
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	37,593
3342	Communications Equipment Manufacturing	35,594
5617	Services to Buildings and Dwellings	34,487
4237	Hardware, and Plumbing and Heating Equipment and Supplies Merchant Wholesalers	27,386
5182	Data Processing, Hosting, and Related Services	21,492
2383	Building Finishing Contractors	19,255
2362	Nonresidential Building Construction	17,951
4881	Support Activities for Air Transportation	17,920
3231	Printing and Related Support Activities	16,267
3254	Pharmaceutical and Medicine Manufacturing	15,868
3333	Commercial and Service Industry Machinery Manufacturing	14,319
4841	General Freight Trucking	11,912
5417	Scientific Research and Development Services	11,240
4238	Machinery, Equipment, and Supplies Merchant Wholesalers	11,104
4235	Metal and Mineral (except Petroleum) Merchant Wholesalers	10,362
4885	Freight Transportation Arrangement	10,020
2381	Foundation, Structure, and Building Exterior Contractors	9,838

Table V.2. Bay Area's 20 most mobile industries (1990-2012) that are dependent on industrial land

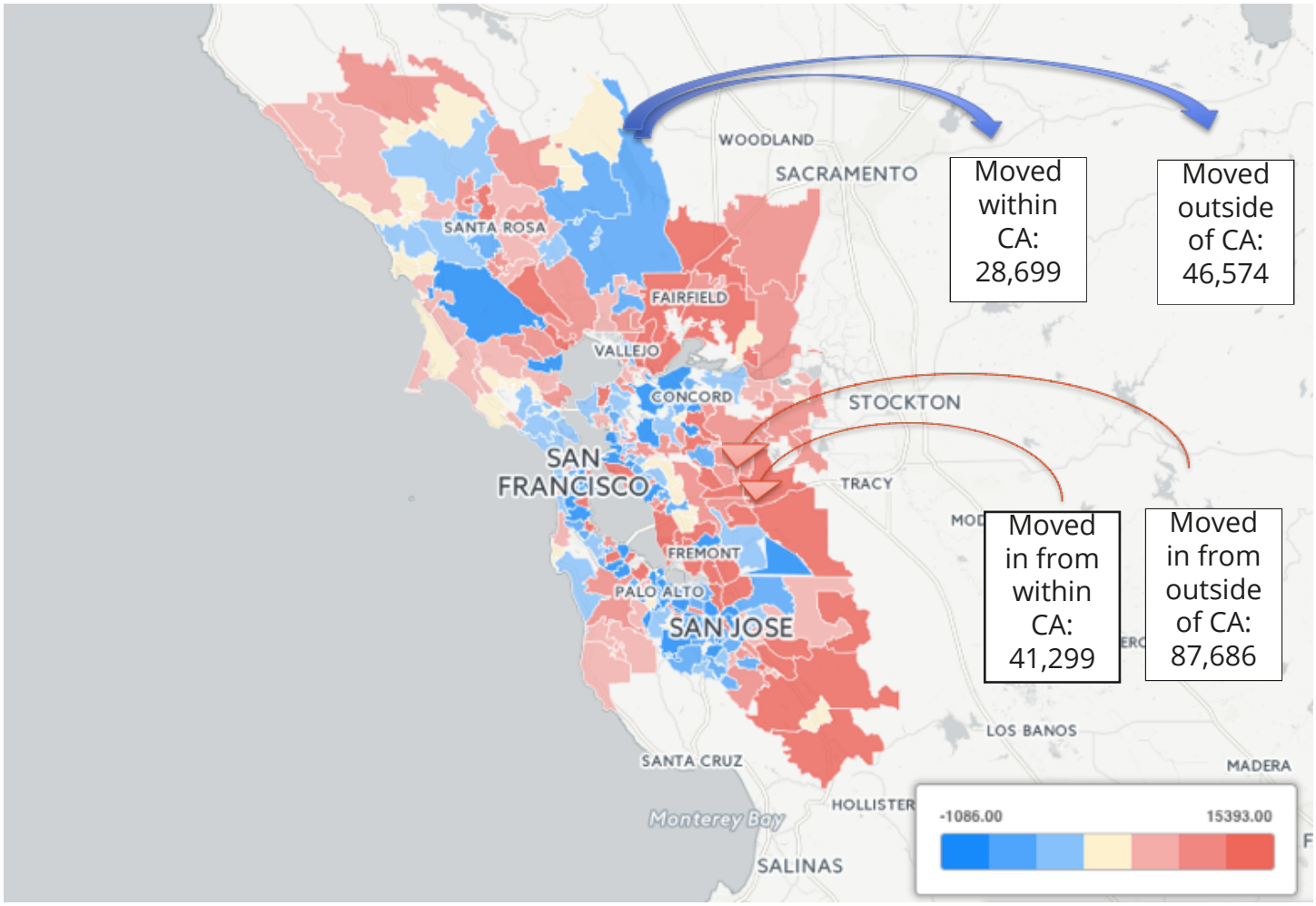


Figure V.4. Net industrial land-dependent jobs from moves, San Francisco Bay Area, 1990-2012.

Zooming in to specific industrial districts reveals distinct mobility patterns. For instance, South of Market in San Francisco saw a net loss of about 4,400 jobs from 1990 to 2012: 24,531 jobs moved out, and 20,102 jobs moved in. But as shown in Figure V.5, jobs moving out of SOMA typically head to other neighborhoods in the south of San Francisco or San Mateo County, while jobs moving into SOMA come from the entire region.

In Fremont, near the future Warm Springs BART station, jobs moving out head almost exclusively to the 580 corridor in the Livermore Valley and Silicon Valley, while jobs move in from much of Silicon Valley (Figure V.6). Overall, the area has experienced a net gain of almost 4,400 jobs, with 12,400 jobs moving out and 16,800 jobs in firms moving in.

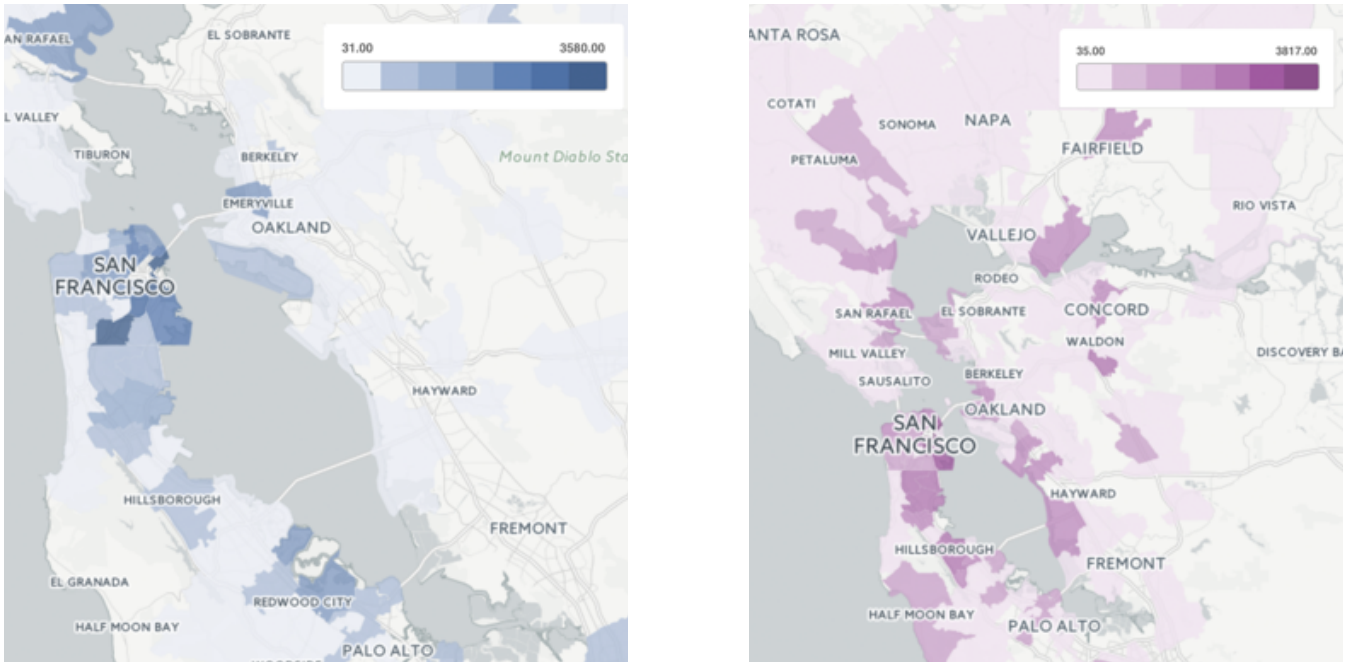


Figure V.5. Destination of jobs moving out of SOMA (left), and origin of jobs moving into SOMA (right), 1990-2012.

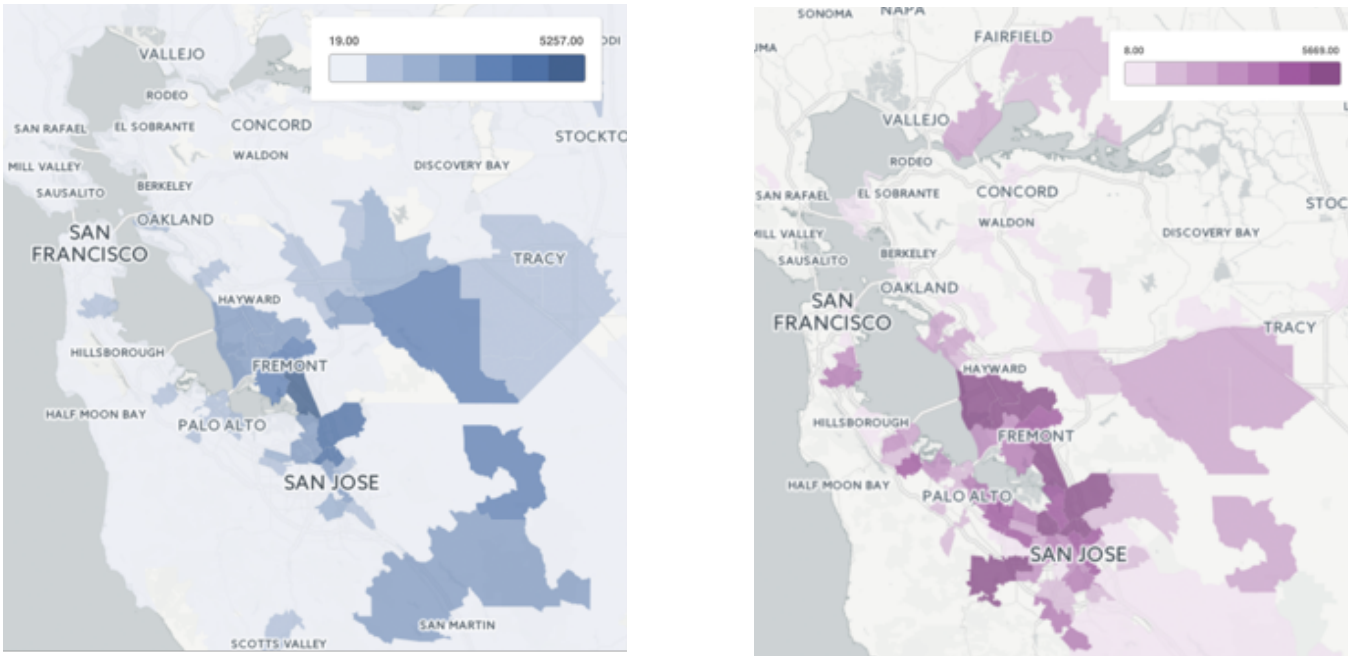


Figure V.6. Destination of jobs moving out of Warm Springs (left), and origin of jobs moving into Warm Springs (right)

The story in West Oakland is more mixed, with a net loss of 2,300 jobs from firm moves (Figure V.7). When firms leave, they go to a variety of locations mostly in the East Bay and Solano County. The firms that move in bring their jobs primarily from San Francisco and the inner East Bay.

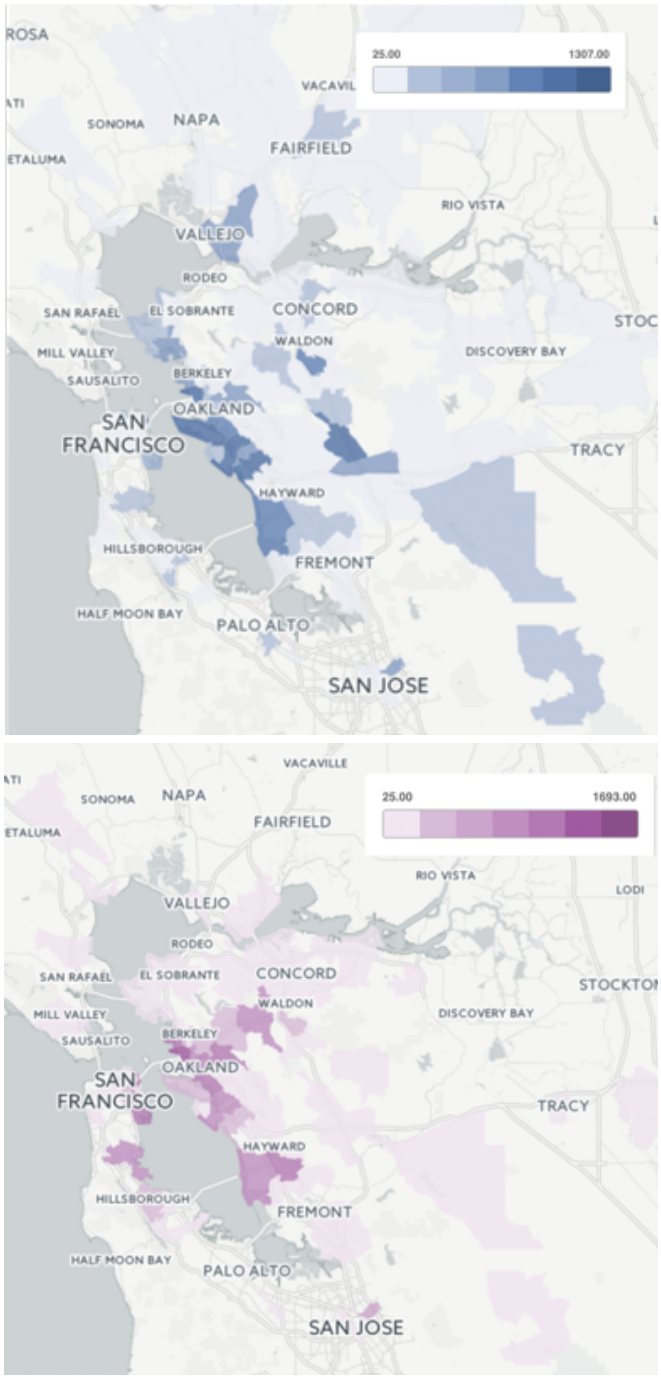


Figure V.7. Destination of jobs moving out of West Oakland (top), and origin of jobs moving into West Oakland (bottom).

INDUSTRIES DEPENDENT ON INDUSTRIAL LAND BY COUNTY

The following first examines the top 30 industries by employment among those dependent on exclusive industrial land for each of the nine counties. We then provide an overview of the industries dependent on mixed-use industrial land in the following section.

Within Santa Clara County, about half the industries dependent on industrial land experienced growth from 1990 to 2012. The largest industry dependent on exclusive industrial land is circuit board manufacturing. There are seven industries, a larger share than other counties, that are dependent on both exclusive and MU industrial land in Santa Clara including Electrical Contractors and Other Wiring Installation Contractors and Plumbing, Heating, and Air-Conditioning Contractors, which combined provide nearly 11,000 jobs. Two of the somewhat unexpected industries that made it to this list are Executive Offices and Other General Government Support. Interviewees noted that public facilities such as these are often built on industrial land out of expediency; thus these uses most likely do not need to be separated on industrial land.

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NAICS	Description	1990-2012 % change	Exclusive Jobs	LQ	Status	MU Jobs	LQ	Status
334412	Bare Printed Circuit Board Manufacturing	-55%	2,826	2.95	Dependent	5,157	2.03	Dependent
924110	Administration of Air and Water Resource and Solid Waste Management Programs	0%	2,118	8.17	Dependent	300	0.44	Occurring
238210	Electrical Contractors and Other Wiring Installation Contractors	53%	1,490	2.18	Dependent	4,895	2.70	Dependent
238220	Plumbing, Heating, and Air-Conditioning Contractors	12%	1,321	2.43	Dependent	3,235	2.24	Dependent
561720	Janitorial Services	137%	1,181	2.20	Dependent	2,110	1.48	Partial
238310	Drywall and Insulation Contractors	-52%	1,157	5.52	Dependent	310	0.56	Occurring
921110	Executive Offices	0%	1,116	4.10	Dependent	53	0.07	Occurring
332710	Machine Shops	6%	1,111	2.82	Dependent	3,054	2.92	Dependent
325412	Pharmaceutical Preparation Manufacturing	-97%	1,018	4.68	Dependent	614	1.06	Partial
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	-65%	1,012	2.67	Dependent	2,057	2.04	Dependent
334112	Computer Storage Device Manufacturing	-82%	962	2.35	Dependent	862	0.79	Occurring
561730	Landscaping Services	85%	895	3.11	Dependent	795	1.04	Partial
334419	Other Electronic Component Manufacturing	-55%	787	2.42	Dependent	2,231	2.58	Dependent
238320	Painting and Wall Covering Contractors	49%	786	3.81	Dependent	291	0.53	Occurring
484121	General Freight Trucking, Long-Distance, Truckload	-64%	675	6.97	Dependent	258	1.00	Partial
237110	Water and Sewer Line and Related Structures Construction	52%	640	9.04	Dependent	222	1.18	Partial
492210	Local Messengers and Local Delivery	-21%	567	6.31	Dependent	144	0.60	Occurring
562111	Solid Waste Collection	360%	548	6.84	Dependent	162	0.76	Occurring
236220	Commercial and Institutional Building Construction	32%	545	2.37	Dependent	788	1.29	Partial
811121	Automotive Body, Paint, and Interior Repair and Maintenance	7%	537	3.70	Dependent	574	1.49	Partial
238330	Flooring Contractors	28%	527	7.55	Dependent	57	0.31	Occurring
811111	General Automotive Repair	13%	526	2.45	Dependent	497	0.87	Occurring
322211	Corrugated and Solid Fiber Box Manufacturing	-76%	506	8.46	Dependent	150	0.94	Occurring
332322	Sheet Metal Work Manufacturing	0%	463	2.95	Dependent	762	1.83	Partial
237310	Highway, Street, and Bridge Construction	-66%	456	5.19	Dependent	276	1.18	Partial
921190	Other General Government Support	0%	451	2.68	Dependent	215	0.48	Occurring
333314	Optical Instrument and Lens Manufacturing	-92%	436	2.04	Dependent	2,269	4.00	Dependent
236210	Industrial Building Construction	62%	434	5.87	Dependent	108	0.55	Occurring
484210	Used Household and Office Goods Moving	-26%	420	6.93	Dependent	24	0.15	Occurring
485999	All Other Transit and Ground Passenger Transportation	278%	408	8.44	Dependent	62	0.48	Occurring

Table V.3. Top 30 Industries Dependent on Exclusive IL - Santa Clara County

In Alameda County as well, half of the industrial land-dependent industries are experiencing growth, while the other half are in decline. Car transmission and shipping boxes manufacturing both provide over 2,000 jobs and are highly dependent on Exclusive IL. Moreover the top five industries in Alameda County dependent on light, medium, or heavy industrial land have relatively low employment numbers on MU IL, suggesting these industries are particularly reliant on exclusive industrial land. Only a few of the selected industries are dependent on both Exclusive and MU IL. These industries include: Industrial Machinery and Equipment Merchant Wholesalers, Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers, Highway, Street, and Bridge Construction, Poured Concrete Foundation and Structure Contractors, and Commercial Bakeries.

NAICS	Description	1990-2012 % change	Exclusive Jobs	LQ	Status	MU Jobs	LQ	Status
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	17%	2,405	9.31	Dependent	0	0.00	Occurring
322211	Corrugated and Solid Fiber Box Manufacturing	-35%	2,229	7.38	Dependent	4	0.03	Occurring
326199	All Other Plastics Product Manufacturing	15%	1,990	4.16	Dependent	32	0.17	Occurring
238220	Plumbing, Heating, and Air-Conditioning Contractors	16%	1,925	3.17	Dependent	182	0.76	Occurring
484121	General Freight Trucking, Long-Distance, Truckload	-67%	1,727	7.00	Dependent	59	0.60	Occurring
423830	Industrial Machinery and Equipment Merchant Wholesalers	-36%	1,251	4.37	Dependent	329	2.90	Dependent
492210	Local Messengers and Local Delivery	-42%	1,165	5.09	Dependent	17	0.19	Occurring
926120	Regulation and Administration of Transportation Programs	0%	1,060	2.42	Dependent	63	0.36	Occurring
424490	Other Grocery and Related Products Merchant Wholesalers	-6%	1,032	2.80	Dependent	229	1.56	Partial
488510	Freight Transportation Arrangement	207%	898	5.59	Dependent	43	0.67	Occurring
323119	Other Commercial Printing	#N/A	836	4.85	Dependent	28	0.41	Occurring
423610	Electrical Apparatus and Equipment, Wiring Supplies, and Related Equipment Merchant Wholesalers	69%	814	3.46	Dependent	235	2.52	Dependent
336211	Motor Vehicle Body Manufacturing	-21%	733	8.58	Dependent	3	0.09	Occurring
484110	General Freight Trucking, Local	10%	720	2.75	Dependent	82	0.79	Occurring
423510	Metal Service Centers and Other Metal Merchant Wholesalers	-29%	697	4.49	Dependent	7	0.11	Occurring
424430	Dairy Product (except Dried or Canned) Merchant Wholesalers	-61%	679	4.78	Dependent	62	1.10	Partial
423110	Automobile and Other Motor Vehicle Merchant Wholesalers	-71%	668	7.58	Dependent	1	0.03	Occurring
424820	Wine and Distilled Alcoholic Beverage Merchant Wholesalers	127%	654	5.64	Dependent	14	0.30	Occurring
237310	Highway, Street, and Bridge Construction	-2%	647	2.76	Dependent	200	2.15	Dependent
238110	Poured Concrete Foundation and Structure Contractors	-7%	644	3.50	Dependent	234	3.20	Dependent
311812	Commercial Bakeries	19%	576	3.06	Dependent	400	5.34	Dependent
238320	Painting and Wall Covering Contractors	54%	563	2.40	Dependent	69	0.74	Occurring
332312	Fabricated Structural Metal Manufacturing	-64%	551	3.92	Dependent	43	0.77	Occurring
331513	Steel Foundries (except Investment)	74%	550	9.31	Dependent	0	0.00	Occurring
541890	Other Services Related to Advertising	17%	527	6.14	Dependent	6	0.18	Occurring
562910	Remediation Services	171%	523	4.00	Dependent	90	1.73	Partial
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	73%	512	6.69	Dependent	0	0.00	Occurring
423840	Industrial Supplies Merchant Wholesalers	-44%	502	3.55	Dependent	54	0.96	Occurring
336120	Heavy Duty Truck Manufacturing	133%	500	9.26	Dependent	0	0.00	Occurring
238310	Drywall and Insulation Contractors	-40%	489	2.79	Dependent	39	0.56	Occurring

Table V.4. Top 30 Industries Dependent on Exclusive IL - Alameda County

Contra Costa County has slightly more declining than growing industries, and the growing industries are considerably smaller than those in decline. Within Contra Costa County, Petroleum Refineries make up the largest share of employment among industries dependent on industrial land followed by handbag and purse manufacturing. Again, the top five industries have relatively low levels of employment on land zoned MU-industrial and only Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables, the Postal Service, and Other Scientific and Technical Consulting Services are dependent on both Exclusive and MU IL.

NAICS	Description	1990-2012 % change	Exclusive Jobs	LQ	Status	MU Jobs	LQ	Status
324110	Petroleum Refineries	-25%	1,545	6.98	Dependent	350	1.51	Partial
316992	Women's Handbag and Purse Manufacturing	0%	1,020	16.39	Dependent	0	0.00	Occurring
311312	Cane Sugar Refining	#N/A	950	16.41	Dependent	0	0.00	Occurring
331221	Rolled Steel Shape Manufacturing	-99%	750	16.41	Dependent	0	0.00	Occurring
238220	Plumbing, Heating, and Air-Conditioning Contractors	6%	553	3.15	Dependent	197	1.07	Partial
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	-63%	533	9.76	Dependent	330	5.77	Dependent
238310	Drywall and Insulation Contractors	-73%	505	6.80	Dependent	39	0.50	Occurring
238910	Site Preparation Contractors	-2%	415	5.32	Dependent	22	0.27	Occurring
237310	Highway, Street, and Bridge Construction	-51%	408	5.76	Dependent	10	0.13	Occurring
491110	Postal Service	0%	400	2.61	Dependent	448	2.79	Dependent
923120	Administration of Public Health Programs	0%	371	3.34	Dependent	50	0.43	Occurring
541690	Other Scientific and Technical Consulting Services	177%	356	4.65	Dependent	174	2.17	Dependent
334519	Other Measuring and Controlling Device Manufacturing	118%	350	12.85	Dependent	20	0.70	Occurring
423930	Recyclable Material Merchant Wholesalers	-25%	263	9.94	Dependent	1	0.04	Occurring
488490	Other Support Activities for Road Transportation	-44%	251	16.03	Dependent	0	0.00	Occurring
236220	Commercial and Institutional Building Construction	36%	245	2.09	Dependent	73	0.59	Occurring
423220	Home Furnishing Merchant Wholesalers	-48%	223	6.65	Dependent	33	0.94	Occurring
337910	Mattress Manufacturing	28%	200	15.19	Dependent	0	0.00	Occurring
311812	Commercial Bakeries	63%	195	10.13	Dependent	2	0.10	Occurring
238990	All Other Specialty Trade Contractors	-62%	188	3.54	Dependent	67	1.20	Partial
518111	Internet Service Providers	#N/A	187	5.63	Dependent	5	0.14	Occurring
484110	General Freight Trucking, Local	-27%	183	2.84	Dependent	90	1.34	Partial
325188	All other basic inorganic chemical manufacturing	#N/A	177	10.41	Dependent	2	0.11	Occurring
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance	-23%	171	2.99	Dependent	68	1.14	Partial
325211	Plastics Material and Resin Manufacturing	208%	168	12.14	Dependent	7	0.48	Occurring
485113	Bus and Other Motor Vehicle Transit Systems	14135%	164	15.65	Dependent	8	0.73	Occurring
524114	Direct Health and Medical Insurance Carriers	146%	154	3.31	Dependent	74	1.52	Partial
424810	Beer and Ale Merchant Wholesalers	135%	152	16.41	Dependent	0	0.00	Occurring
561920	Convention and Trade Show Organizers	2%	150	13.60	Dependent	0	0.00	Occurring
562920	Materials Recovery Facilities	-61%	149	7.50	Dependent	7	0.34	Occurring

Table V.5. Top 30 Industries Dependent on Exclusive IL - Contra Costa County

In San Francisco County, there are almost twice as many declining industries than growing industries that are dependent on industrial land, and the growing industries are considerably smaller than those in decline. Many of the growing industries are in construction; surprisingly, several of the industries dependent on exclusive industrial land are services.

NAICS	Description	1990-2012 % change	Exclusive Jobs	LQ	Status	MU Jobs	LQ	Status
491110	Postal Service	0%	1,450	11.51	Dependent	0	0.00	Occurring
238210	Electrical Contractors and Other Wiring Installation Contractors	12%	967	5.82	Dependent	405	1.91	Partial
311615	Poultry Processing	0%	847	16.92	Dependent	0	0.00	Occurring
424480	Fresh Fruit and Vegetable Merchant Wholesalers	54%	584	15.23	Dependent	18	0.37	Occurring
315232	Women's and girls' cut and sew blouse and shirt manufacturing	#N/A	575	15.62	Dependent	0	0.00	Occurring
321911	Wood Window and Door Manufacturing	-57%	548	15.58	Dependent	0	0.00	Occurring
922120	Police Protection	0%	506	4.33	Dependent	0	0.00	Occurring
561720	Janitorial Services	69%	445	3.98	Dependent	311	2.18	Dependent
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	-99%	424	11.94	Dependent	122	2.69	Dependent
238220	Plumbing, Heating, and Air-Conditioning Contractors	-45%	421	3.62	Dependent	182	1.23	Partial
452910	Warehouse Clubs and Supercenters	-76%	405	16.92	Dependent	0	0.00	Occurring
812331	Linen Supply	-81%	390	16.62	Dependent	0	0.00	Occurring
926120	Regulation and Administration of Transportation Programs	0%	350	2.73	Dependent	0	0.00	Occurring
236220	Commercial and Institutional Building Construction	26%	348	2.08	Dependent	623	2.92	Dependent
485310	Taxi Service	-7%	346	13.19	Dependent	2	0.06	Occurring
811111	General Automotive Repair	-23%	327	4.02	Dependent	276	2.66	Dependent
541613	Marketing Consulting Services	189%	324	2.42	Dependent	343	2.01	Dependent
238150	Glass and Glazing Contractors	-35%	317	13.61	Dependent	13	0.44	Occurring
424490	Other Grocery and Related Products Merchant Wholesalers	-57%	305	5.28	Dependent	39	0.53	Occurring
922130	Legal Counsel and Prosecution	0%	286	5.07	Dependent	0	0.00	Occurring
4441	Building Material and Supplies Dealers	#N/A	285	8.06	Dependent	57	1.26	Partial
485410	School and Employee Bus Transportation	109%	285	16.86	Dependent	0	0.00	Occurring
423220	Home Furnishing Merchant Wholesalers	-59%	276	5.56	Dependent	117	1.85	Partial
423210	Furniture Merchant Wholesalers	-35%	273	5.51	Dependent	107	1.69	Partial
515120	Television Broadcasting	-8%	269	2.27	Dependent	435	2.87	Dependent
484110	General Freight Trucking, Local	-85%	256	7.60	Dependent	19	0.44	Occurring
424930	Flower, Nursery Stock, and Florists' Supplies Merchant Wholesalers	-45%	255	13.65	Dependent	15	0.63	Occurring
238330	Flooring Contractors	7%	218	10.27	Dependent	11	0.41	Occurring
922190	Other Justice, Public Order, and Safety Activities	0%	217	4.13	Dependent	0	0.00	Occurring
442210	Floor Covering Stores	-69%	213	8.60	Dependent	16	0.51	Occurring

Table V.6. Top 30 Industries Dependent on Exclusive IL - San Francisco County

Of all the Bay Area counties, San Mateo has the greatest share of growing industries and jobs that are dependent on industrial land. Likely because of SFO, the top industry dependent on Exclusive IL is Freight Transportation Arrangement, though it is also dependent on MU IL. Perhaps because so much of the land in the county is mixed-use, many industries are concentrated on both Exclusive and Mixed-Use industrial land. There is very little heavy manufacturing in the county.

NAICS	Description	1990-2012 % change	Exclusive Jobs	LQ	Status	MU Jobs	LQ	Status
488510	Freight Transportation Arrangement	23%	1,109	4.05	Dependent	943	2.21	Dependent
488119	Other Airport Operations	744%	869	3.42	Dependent	7	0.02	Occurring
561720	Janitorial Services	41%	830	3.21	Dependent	310	0.77	Occurring
238220	Plumbing, Heating, and Air-Conditioning Contractors	79%	656	2.87	Dependent	658	1.85	Partial
811111	General Automotive Repair	14%	520	4.05	Dependent	144	0.72	Occurring
236220	Commercial and Institutional Building Construction	12%	493	2.08	Dependent	468	1.27	Partial
424490	Other Grocery and Related Products Merchant Wholesalers	-41%	453	5.11	Dependent	217	1.57	Partial
423830	Industrial Machinery and Equipment Merchant Wholesalers	-73%	439	5.65	Dependent	141	1.16	Partial
518210	Data Processing, Hosting, and Related Services	642%	437	2.39	Dependent	471	1.65	Partial
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	-26%	430	3.44	Dependent	235	1.21	Partial
812320	Drycleaning and Laundry Services (except Coin-Operated)	47%	428	4.43	Dependent	145	0.96	Occurring
335931	Current-Carrying Wiring Device Manufacturing	-100%	423	11.90	Dependent	20	0.36	Occurring
561621	Security Systems Services (except Locksmiths)	-81%	405	6.47	Dependent	44	0.45	Occurring
332710	Machine Shops	-75%	401	4.72	Dependent	123	0.93	Occurring
334113	Computer Terminal Manufacturing	#N/A	400	9.59	Dependent	0	0.00	Occurring
237310	Highway, Street, and Bridge Construction	-71%	376	6.76	Dependent	53	0.61	Occurring
811121	Automotive Body, Paint, and Interior Repair and Maintenance	2%	329	4.41	Dependent	107	0.92	Occurring
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	80%	326	5.34	Dependent	71	0.75	Occurring
325510	Paint and Coating Manufacturing	-70%	323	12.20	Dependent	0	0.00	Occurring
561730	Landscaping Services	159%	308	2.11	Dependent	426	1.87	Partial
335311	Power, Distribution, and Specialty Transformer Manufacturing	28%	295	12.06	Dependent	0	0.00	Occurring
238340	Tile and Terrazzo Contractors	60%	258	7.07	Dependent	32	0.56	Occurring
447110	Gasoline Stations with Convenience Stores	-51%	240	4.22	Dependent	30	0.34	Occurring
323114	Quick printing	#N/A	239	3.39	Dependent	360	3.28	Dependent
238320	Painting and Wall Covering Contractors	46%	238	2.35	Dependent	112	0.71	Occurring
6241	Individual and Family Services	#N/A	228	2.21	Dependent	61	0.38	Occurring
423840	Industrial Supplies Merchant Wholesalers	-76%	210	6.35	Dependent	30	0.58	Occurring
423220	Home Furnishing Merchant Wholesalers	-18%	198	5.52	Dependent	50	0.89	Occurring
424460	Fish and Seafood Merchant Wholesalers	206%	193	5.87	Dependent	6	0.12	Occurring
423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers	29%	189	4.37	Dependent	193	2.86	Dependent

Table V.7. Top 30 Industries Dependent on Exclusive IL - San Mateo County

Like San Mateo County, Solano County has a much larger share of industries dependent on industrial land that are growing, rather than declining. However, the total number of jobs is much lower. Top industries dependent on exclusive industrial land are refineries, construction, heavy manufacturing, and food-related wholesale.

Aside from the expected manufacturing, wholesale, and construction industries that are dependent on exclusive industrial land in the Bay Area, transportation industries also play a prominent role in exclusive industrial land employment. In addition to Freight Trucking and Passenger Air Transportation in a couple of key counties, car and automobile-related industries appear near the top of the list in most of the counties.

NAICS	Description	1990-2012 % change	Pure Jobs	LQ	Status	MU Jobs	LQ	Status
324110	Petroleum Refineries	52%	505	11.02	Dependent	0	0.00	Occurring
238220	Plumbing, Heating, and Air-Conditioning Contractors	-22%	452	3.34	Dependent	245	1.75	Partial
311340	Nonchocolate Confectionery Manufacturing	450%	440	10.94	Dependent	0	0.00	Occurring
424820	Wine and Distilled Alcoholic Beverage Merchant Wholesalers	33933%	435	9.49	Dependent	0	0.00	Occurring
446120	Cosmetics, Beauty Supplies, and Perfume Stores	282%	302	7.11	Dependent	1	0.02	Occurring
423840	Industrial Supplies Merchant Wholesalers	329%	276	8.04	Dependent	6	0.17	Occurring
238210	Electrical Contractors and Other Wiring Installation Contractors	-4%	263	2.74	Dependent	232	2.34	Dependent
561499	All Other Business Support Services	-92%	250	9.23	Dependent	0	0.00	Occurring
332431	Metal Can Manufacturing	0%	231	11.04	Dependent	0	0.00	Occurring
236220	Commercial and Institutional Building Construction	-24%	229	3.09	Dependent	38	0.50	Occurring
325412	Pharmaceutical Preparation Manufacturing	138477%	228	7.28	Dependent	111	3.43	Dependent
562910	Remediation Services	448%	218	8.63	Dependent	53	2.03	Dependent
238120	Structural Steel and Precast Concrete Contractors	712%	213	10.01	Dependent	2	0.09	Occurring
334516	Analytical Laboratory Instrument Manufacturing	1047%	206	2.56	Dependent	650	7.82	Dependent
423450	Medical, Dental, and Hospital Equipment and Supplies Merchant Wholesalers	1943%	198	4.59	Dependent	244	5.48	Dependent
423220	Home Furnishing Merchant Wholesalers	693%	186	5.25	Dependent	147	4.02	Dependent
238140	Masonry Contractors	-92%	183	6.69	Dependent	0	0.00	Occurring
424130	Industrial and Personal Service Paper Merchant Wholesalers	-6%	180	8.99	Dependent	33	1.60	Partial
423120	Motor Vehicle Supplies and New Parts Merchant Wholesalers	14%	168	4.93	Dependent	84	2.39	Dependent
812331	Linen Supply	-100%	164	8.54	Dependent	0	0.00	Occurring
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	34212%	160	11.04	Dependent	0	0.00	Occurring
327991	Cut Stone and Stone Product Manufacturing	15379%	156	10.77	Dependent	0	0.00	Occurring
238910	Site Preparation Contractors	-80%	152	5.93	Dependent	0	0.00	Occurring
332313	Plate Work Manufacturing	7321%	150	11.04	Dependent	0	0.00	Occurring
238390	Other Building Finishing Contractors	-74%	150	7.17	Dependent	5	0.23	Occurring
237310	Highway, Street, and Bridge Construction	-24%	150	2.25	Dependent	61	0.89	Occurring
493110	General Warehousing and Storage	2127%	146	2.60	Dependent	445	7.66	Dependent
484110	General Freight Trucking, Local	16%	139	2.73	Dependent	9	0.17	Occurring
311999	All Other Miscellaneous Food Manufacturing	-96%	130	11.04	Dependent	0	0.00	Occurring
56221	Waste Treatment and Disposal	#N/A	130	8.25	Dependent	3	0.18	Occurring

Table V.8. Top 30 Industries Dependent on Exclusive IL - Solano County

NAICS	Description	MU Jobs	MU LQ	Status	Pure Jobs	County
334413	Semiconductor and Related Device Manufacturing	27,361	2.96	Dependent	4,721	Santa Clara
334119	Other Computer Peripheral Equipment Manufacturing	11,100	3.48	Dependent	690	Santa Clara
423690	Other Electronic Parts and Equipment Merchant Wholesalers	8,603	3.25	Dependent	794	Santa Clara
541618	Other Management Consulting Services	5,510	4.69	Dependent	230	San Mateo
334412	Bare Printed Circuit Board Manufacturing	5,157	2.03	Dependent	2,826	Santa Clara
238210	Electrical Contractors and Other Wiring Installation Contractors	4,895	2.70	Dependent	1,490	Santa Clara
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	3,000	7.97	Dependent	0	San Mateo
622110	General Medical and Surgical Hospitals	2,885	2.58	Dependent	0	San Francisco
923130	Administration of Human Resource Programs (except Education, Public Health, and Veterans' Affairs Programs)	2,750	18.11	Dependent	0	Alameda
561320	Temporary Help Services	2,072	13.90	Dependent	0	Sonoma
524114	Direct Health and Medical Insurance Carriers	1,750	14.21	Dependent	0	Marin
923120	Administration of Public Health Programs	1,657	10.68	Dependent	0	Alameda
511210	Software Publishers	1,560	4.81	Dependent	50	San Francisco
517110	Wired Telecommunications Carriers	1,547	3.58	Dependent	180	San Francisco
236210	Industrial Building Construction	1,279	8.51	Dependent	52	Solano
541511	Custom Computer Programming Services	1,166	2.04	Dependent	380	San Francisco
621610	Home Health Care Services	1,084	7.63	Dependent	134	Contra Costa
511120	Periodical Publishers	1,076	6.71	Dependent	39	San Francisco
441110	New Car Dealers	1,035	4.80	Dependent	4	Contra Costa
511110	Newspaper Publishers	1,000	12.55	Dependent	140	Contra Costa

Table V.9. Top 20 Industries Dependent on MU Industrial Land

INDUSTRIES DEPENDENT ON MIXED-USE INDUSTRIAL LAND

We also looked at the industries dependent on mixed-use (MU) industrial land, which, similar to the pure industrial, we defined as having a location quotient greater than 2. Because MU industrial land includes uses such as light-office, heavy-office, mixed-use residential, and mixed-use commercial, there is a more diverse mix of industries within this grouping. Often they locate on mixed-use land because they encompass a wide variety of functions, from production, to administration and management, to R&D, to distribution. There are fewer manufacturing, wholesale, and transportation industries as a whole compared to those dependent on exclusive industrial land, with notable exceptions in Santa Clara, San Mateo, and Sonoma.

In Santa Clara County, the manufacturing sector plays a dominant role. Semiconductor and Related Device Manufacturing and Other Computer Peripheral Equipment Manufacturing employ a combined 38,000 people on MU industrial land, a significantly higher number than those on exclusive industrial land. Additionally, Other Electronic Parts and Equipment Merchant Wholesalers employ another 8,600 on MU industrial land while Bare Printed Circuit Board Manufacturing employs 5,100. Within San Mateo County, Other Management Consulting Services employs 5,500 on MU industrial land while Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use is the 7th largest industry among all counties in this category, responsible for 3,000 jobs.

In terms of employment, Alameda County does not have many large industries in this category and those industries that are sited on MU industrial land may not necessary require industrial land at all. Administration of Human Resource Programs (except Education, Public Health, and Veterans' Affairs Programs) employs 2,700 people and Administration of Public Health Programs employs another 1,700. Similarly, Sonoma County is home to over 2,000 jobs within the Temporary Help Services industry on land zoned MU industrial. In Marin County, the largest industry is Direct Health and Medical Insurance Carriers, which is also responsible for 1,700 jobs, and in San Francisco, the largest industry is Software Publishers at 1,500 jobs. Interestingly, Contra Costa County also does not have very large industries dependent on MU industrial land. The largest, Home Health Care Services, employs only 1,000 people, though it significantly more likely to site on land zoned MU industrial as opposed to land zoned for other uses.

CONCLUSION

This analysis showed that the Bay Area has 98,000 acres of industrially zoned land, comprising 2% of the land in the region (and 12% of the urbanized land). The demand for industrial land remains robust, with low vacancy rates in part due to the rapid growth of warehousing. Although employment has declined slightly since 1990, the region still has over 600,000 jobs in industrial land-dependent industries. These businesses tend to concentrate in the core of the region near major freight facilities, with major concentrations in the South and East Bay.

NOTES AND APPENDICES

NOTES

1. Rent numbers for the Peninsula and San Francisco are calculated by aggregating CBRE sub-regions regions. In particular, the sub regions that comprised San Francisco are very small so sample sizes are much smaller. As a result, San Francisco and the Peninsula calculations my have higher margins of error. Often in San Francisco there was no data for certain sub-regions because data was not collected or was not available. For the warehouse rent data, the sub-regions San Francisco Downtown, San Francisco Downtown West, and San Francisco Outer Area were excluded from the aggregate. For the manufacturing rent data, San Francisco Downtown and San Francisco Downtown West were excluded from the aggregate. For the warehouse rent data, San Francisco Downtown and San Francisco Outer Area were excluded from the aggregate.
2. Interviews with real estate brokers covered the following areas: East Bay and Central Valley: Alameda and San Joaquin Counties; North Bay: Santa Rosa, Novato Healdsburg; North 880 Corridor: Richmond, Berkeley, Oakland, Alameda, Emeryville; South 880 Corridor: Fremont; San Francisco (large-scale and small-scale industrial); South Bay/Silicon Valley, Northern Waterfront region of Contra Costa County.
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29. http://www.americanshipper.com/Main/News/Report_Increased_industry_engagement_needed_to_add_61314.aspx?source=SpecialCoverageOne and also http://www.americanshipper.com/Main/News/Port_of_Oakland_Ship_queue_has_disappeared_61374.aspx?source=SpecialCoverageOne
30. Find sources from Tom O'Brien (mentions this in his PowerPoint for CP 217) and also sources about Port of Oakland
31. Kasarda, John D., and Greg Lindsay. Aerotropolis: the way we'll live next. Macmillan, 2011.
32. http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=97438561&site=ehost-live
33. http://www.supplychaindigital.com/procurement/3974/REPORT:-Growing-market-usage-for-aerial-drones
34. http://www.industryweek.com/safety/incoming-amazon-wants-air-space-drone-delivery
35. http://www.forbes.com/sites/paulmartyn/2015/08/03/tech-enabling-same-day-delivery-markets/?ss=logistics-transport
36. http://www.industryweek.com/last-mile
37. http://www.logisticsmgmt.com/view/retail_supply_chain_managers_anticipate_new_trend_in_warehousing/warehouse
38. http://www.inboundlogistics.com/cms/article/the-shape-of-things-to-come/
39. The source of the assessors' data was DataQuick, while the shapefiles came from Boundary Shapefiles.
40. Though MTC developed a zoning layer for the last Plan Bay Area, it organized the zoning files by building type, rather than permitted uses, which is the focus of this study.
41. City of Antioch Zoning Code
42. City of Rio Vista Zoning Code
43. Counties were divided into the five geographic groups as follows: San Francisco (San Francisco County), South Bay (Santa Clara County), North Bay (Marin, Napa, Sonoma, and Solano Counties), Peninsula (San Mateo County), East Bay (Alameda and Contra Costa Counties)
44. Methodological Note on Total Land Acreage Transacted: Five large outlier properties were excluded from San Mateo.
45. During the time of research CBRE data was available through Q2 of 2015
46. CBRE EA Industrial Outlook: Methodology, Glossary of Terms, 2013
47. CBRE EA Industrial Outlook: Methodology, Table A.2 Definition of Use Type, 2013
48. We also do not know if the industrial stock counted by CBRE is located on the industrially zoned parcels identified by the Assessors' data.
49. Chapple, Karen & Carrie Makarewicz. 2010. "Is infill bad for business in California?" Access 34: 15-21.
50. Counties were divided into the five geographic groups as follows: San Francisco (San Francisco County), South Bay (Santa Clara County), North Bay (Napa, and Solano Counties), Peninsula (San Mateo County), East Bay (Alameda and Contra Costa Counties). Marin and Sonoma counties are not included in North Bay totals.
51. Methodological Note on Building Coverage: Some entries in the Assessor's data were excluded from this calculation to reduce error. The first exclusion was any lot size entry in the database that was either left blank or was entered as a zero. We assumed that these entries were caused by a reporting error in the Assessor's database. The second exclusion was any entry with a building square footage of zero. These were excluded after spot checking entries using google earth. The spot check found that the majority of the parcels did have a structure on them, despite indicating a building square footage of zero. As a result, the building coverage calculations in Table 2 only include parcels that have already been developed and exclude vacant parcels. This process of excluding entries significantly reduced our sample size (seen in the last two columns).
52. Rent numbers for the Peninsula and San Francisco are calculated by aggregating CBRE sub-regions regions. In particular, the sub regions that comprised San Francisco are

very small so sample sizes are much smaller. As a result, San Francisco and the Peninsula calculations my have higher margins of error. Often in San Francisco there was no data for certain sub-regions because data was not collected or was not available. For the warehouse rent data, the sub-regions San Francisco Downtown, San Francisco Downtown West, and San Francisco Outer Area were excluded from the aggregate. For the manufacturing rent data, San Francisco Downtown and San Francisco Downtown West were excluded from the aggregate. For the warehouse rent data, San Francisco Downtown and San Francisco Outer Area were excluded from the aggregate.

53. Karen Chapple and Carrie Makarewicz. "Restricting New Infrastructure: Bad for Business in California?." *ACCESS Magazine* 1.36 (2010). Jed D. Kolko, David Neumark, and Ingrid Lefebvre-Hoang. *Business location decisions and employment dynamics in California*. (San Francisco, CA: Public Policy Institute of California, 2007).

Category	Example Zoning Codes
Heavy Industrial	Antioch, M-2 Heavy Industrial: "Uses include production of and extraction of metals or chemical products from raw materials, steel works and finishing mills, chemical or fertilizer plants, petroleum and gas refiners, paper mills, lumber mills, asphalt, concrete and hot mix batch plants, power generation plants, glassworks, textile mills, concrete products manufacturing and similar uses."
Medium Industrial	Santa Rosa, IG General Industrial: "Areas appropriate for industrial and manufacturing activities, warehousing, wholesaling and distribution uses. Uses may generate truck traffic and operate 24 hours. Retail and business service that could be more appropriately in another zone are not permitted. Land uses allowed in the IG zoning district have the potential for creating objectionable noise, smoke, odor, dust, noxious gases, glare, heat, vibration, or industrial wastes."
Light Industrial	San Bruno, M-1 Industrial: "Purpose. To establish areas for warehousing, light manufacturing, and fabrication."
Transportation and utilities	San Carlos, A Airport: "The Airport District is established to: A. Protect land uses around the San Carlos Airport from potential hazards of airport operations. B. Identify a range of uses compatible with airport accident hazard and airport noise exposure. C. Prohibit the development of incompatible uses that are detrimental to the general health, safety and welfare and to existing and future airport operations. D. Comply with Federal Aviation Administration (FAA) regulations."
Industrial-Office	Newark, MT Industrial Technology Park District: "reserves appropriately located areas for research and administrative facilities and specialized industries to concentrate in mutually beneficial relationships. Development in all industrial parks should be of the highest quality and should have no significant impacts on adjacent properties."
Mixed use industrial-residential	San Francisco, UMU Urban Mixed Use: "intended to promote a vibrant mix of uses while maintaining the characteristics of this formerly industrially-zoned area."
Mixed use industrial-commercial	San Jose, CIC Combined Industrial/Commercial District: "The CIC Combined Industrial/Commercial zoning designation is intended for commercial or industrial uses, or a compatible mixture of these uses, that support the goals of the combined industrial/commercial general plan designation. The district allows for a broad range of commercial uses with a local or regional market, including big box retail, and a narrower range of industrial uses, primarily industrial park in nature, but including some low-intensity light industrial uses. Assembly uses and day care centers are allowed where they are compatible with and will not impose constraints on neighboring industrial uses."

Appendix II. Methodological Notes on IL Percentage Calculations

Total Acreage
The total acreage used for the calculations in Table 3.2 does not come from the same Assessor's dataset as the industrial parcels. Instead the official land areas were calculated in GIS using the county shapefiles (clipped to exclude water) from MTC. This methodological decision was made because in several counties the total land area from the Assessor's database did not match the official numbers provided by the local governments. Many were in reasonable ranges, but two counties in particular were not close enough to use as denominators for our percentage calculations. In Alameda the Assessor's total was 252 square miles under the official land area, while San Mateo was 599 square miles over the official land area number.

We detected that these discrepancies are a result of several factors in Assessor's data, including: incomplete or misreporting of data, parcels that include land under water, overlaps in parcel boundaries and/or parcels with multi-story buildings being counted several times. Similar issues may exist in the industrial parcels, but because the total number of parcels is much lower we assume the error is also lower. We were also able to spot check many of the industrial parcels using Google maps to determine if the acreage reported by the Assessor seemed reasonable.

Despite these methodological issues, the range of potential percentages for total industrial land is still quite small. When we used the Assessor's total land number as the denominator, we found that 2.2% of land in the nine county region is zoned for industrial.

The acreage for ten industrially zoned parcels in San Mateo county were also recalculated using GIS to determine if their very large size was a result of a data entry error. These recalculated parcel sizes were supplemented for the original Assessor's data in these 10 instances.

Agricultural Designations
Agricultural designations that specifically allow for industrial uses were rare in the city zoning codes reviewed. This made it difficult to separate industrial uses from purely agricultural activity that can take up a significant number of acres. As a result, all agricultural designations were excluded to avoid skewing the results. This may explain why North Bay counties' percent of industrial land was much lower than other counties. For example, areas zoned for wineries were not included because even though there may be industrial uses on that land (e.g. processing the grapes), it is difficult to separate that land area from the larger vineyard land.

Only two counties – Contra Costa (33,708 acres) and San Mateo (1,725 acres) – had parcels that were explicitly zoned for both industrial and/or agricultural uses. Other cities may have had similar zoning 'on the books' but no parcels were found that actually contained that industrial agriculture zoning.

Fieldwork
Many industrial zones allow other uses such as schools or restaurants, or have nonindustrial uses that predate the industrial zoning of the area. We have quantified the amount of land in the Bay Area is zoned industrial, but we also wanted to estimate how much of that land currently has other uses on it in reality.

To estimate the nonindustrial uses on industrial land in the Bay Area, we first took a geographically random sample of fifty industrially zoned parcels for each of the nine counties using GIS software. (This software ensures a geographical spread, because a simple random sample could still be clustered in a few cities or even one city.) The sample includes only light industrial, medium industrial, heavy industrial, and transportation zoning categories, since many mixed-use categories allow a variety of uses.

Second, we looked at the fifty parcels in the sample for each county on Google Maps satellite view and street view, to see if we could tell if the parcel currently has a nonindustrial use (or whenever the most recent Google photos were taken). If it was not clear what the use on the parcel was, we visited the sites in person to make a determination.

Empty lots were considered industrial and were not included in our count of nonindustrial uses on industrial land. However, a parking lot or a construction site that was clearly nonindustrial was counted as a nonindustrial use of industrial land. For example, in Santa Clara County, the Levi Stadium parking lot was zoned industrial but we marked it as having a nonindustrial use in our data.

Across the Bay Area, we found that 10% of the sampled parcels had current nonindustrial uses, or a total of 6.5% of the industrial acreage in the region. The chart below shows the percent nonindustrial use by county. The highest levels of nonindustrial uses on industrial land by county were in Santa Clara and Sonoma Counties. Housing accounted for much of the nonindustrial uses on industrial land, particularly in San Francisco. Other nonindustrial uses included parks, dog parks, cemeteries, schools, and retail. Most of the land with nonindustrial uses was zoned for light industrial.

	Percentage of Industrial Land in Sample with Nonindustrial Uses
Bay Area	**10%**
Alameda	8%
Contra Costa	10%
Marin	6%
Napa	2%
San Francisco	8%
San Mateo	8%
Santa Clara	20%
Solano	4%
Sonoma	24%

Appendix III. Industrial Land by County and City.

Complete Industrial Land Classification by County

	Acres Zoned for Industrial Land						
	Mixed-Use			*100% Industrial*			
	Industrial-office	*MU-commercial*	*MU-residential*	*Light*	*Medium*	*Heavy*	*Transportation*
North Bay							
Marin	780	292	31	21	68	437	120
Sonoma	412	188	372	555	289	181	-
Napa	1,413	92	30	219	860	289	1,028
Solano	1,937	2,520	-	4,953	2,727	1,755	539
East Bay							
Alameda	1,471	1,535	530	4,019	13,523	2,025	1,089
Contra Costa	2,121	1,644	205	1,699	1,365	11,586	1,587
South Bay							
Santa Clara	7,856	1,948	35	3,505	1,023	4,098	36
Peninsula							
San Mateo	2,643	1,721	241	2,299	3,456	398	87
San Francisco							
San Francisco	517	42	426	407	579	-	-

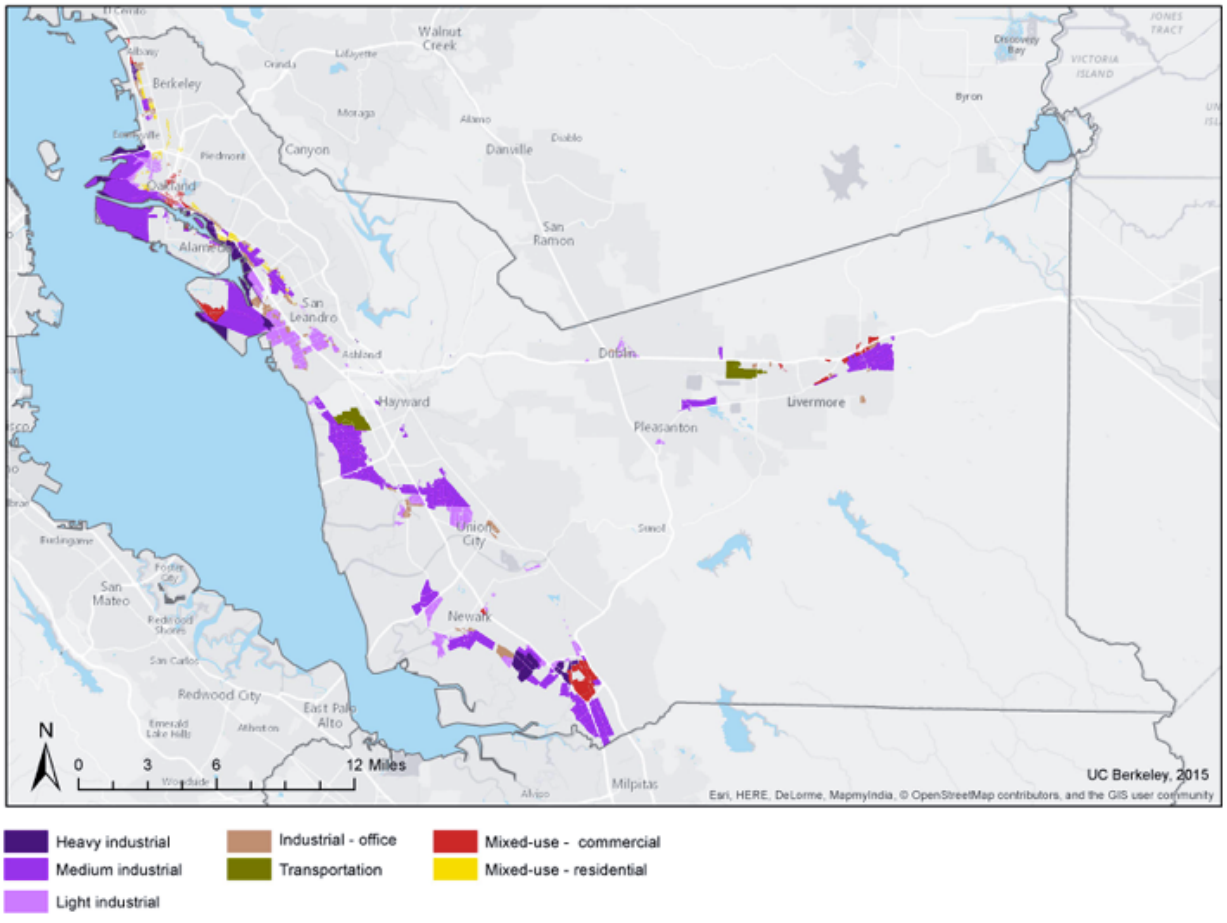
Industrially Zoned Land per City (top 50)

County	City	Acres
Alameda	Oakland	6,999
Santa Clara	San Jose	6,410
Contra Costa	Martinez	4,956
Contra Costa	Richmond	4,919
Solano	Unincorporated Area	4,487
Alameda	Fremont	4,180
Alameda	Hayward	3,610
San Mateo	Unincorporated Area	3,143
Contra Costa	Concord	2,722
Solano	Benicia	2,702
Contra Costa	Pittsburg	2,521
Solano	Fairfield	2,517
Napa	Unincorporated Area	2,354
San Mateo	South San Francisco	2,301
Santa Clara	Santa Clara	2,197
Solano	Vacaville	2,170
Alameda	San Leandro	1,788
Alameda	Livermore	1,762

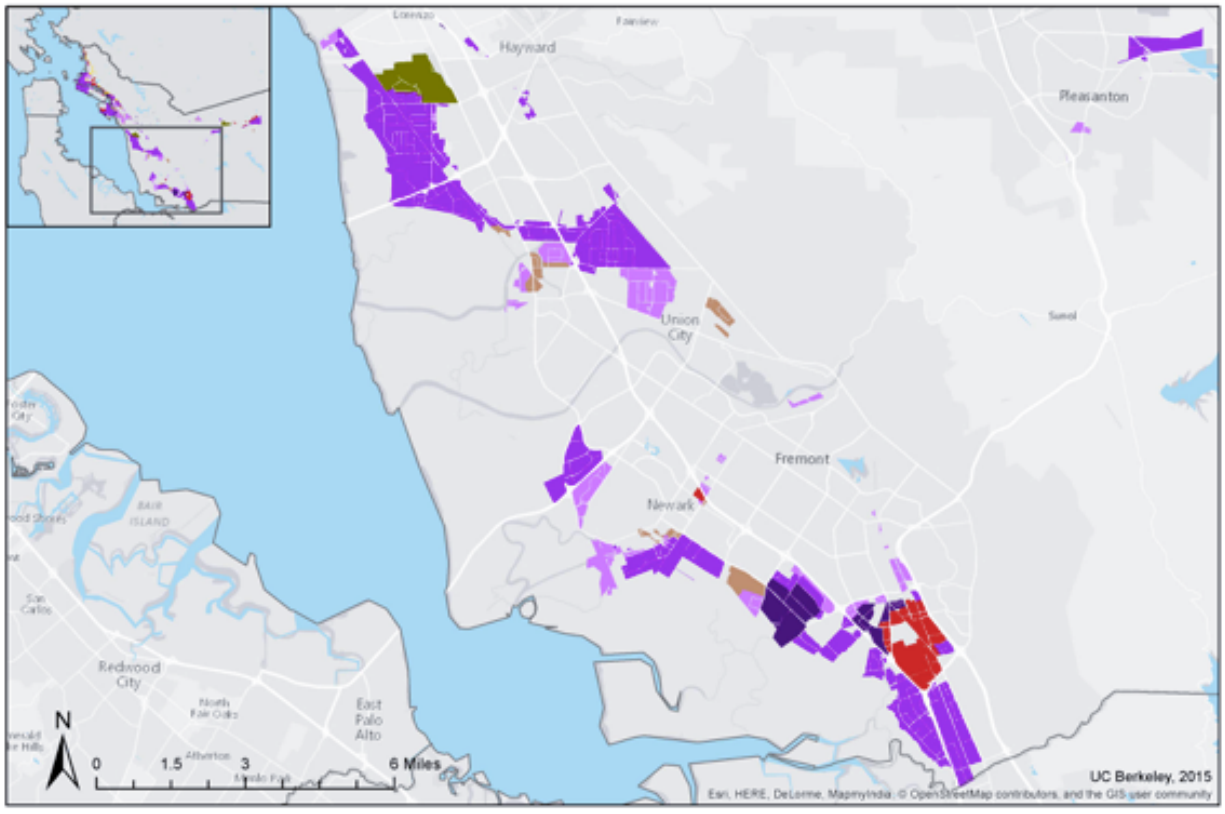
Industrially Zoned Land per City (top 50) contiued

Santa Clara	Palo Alto	1,673
Santa Clara	Sunnyvale	1,585
Contra Costa	RODEO	1,537
Santa Clara	Gilroy	1,496
San Mateo	Brisbane	1,436
Santa Clara	Milpitas	1,374
San Francisco	San Francisco	1,276
Napa	American Canyon	1,110
Alameda	Newark	1,100
Alameda	Union City	1,019
Solano	Vallejo	994
Contra Costa	OAKLEY	862
Marin	Novato	791
Contra Costa	ANTIOCH	770
Solano	Dixon	731
Alameda	Alameda	731
Solano	Rio Vista	680
San Mateo	Foster City	677
San Mateo	Burlingame	618
Santa Clara	Mountain View	589
Contra Costa	CROCKETT	479
San Mateo	Redwood City	461
San Mateo	San Mateo	448
Marin	Unincorporated Area	436
Sonoma	Windsor	418
Santa Clara	Morgan Hill	406
San Mateo	San Carlos	393
Alameda	Berkeley	388
Napa	Napa	373
Sonoma	Petaluma	347
San Mateo	Menlo Park	342
Sonoma	Healdsburg	338

Appendix IV. Industrial Land by County.



Heavy industrial
Medium industrial
Light industrial
Industrial - office
Transportation
Mixed-use - commercial
Mixed-use - residential



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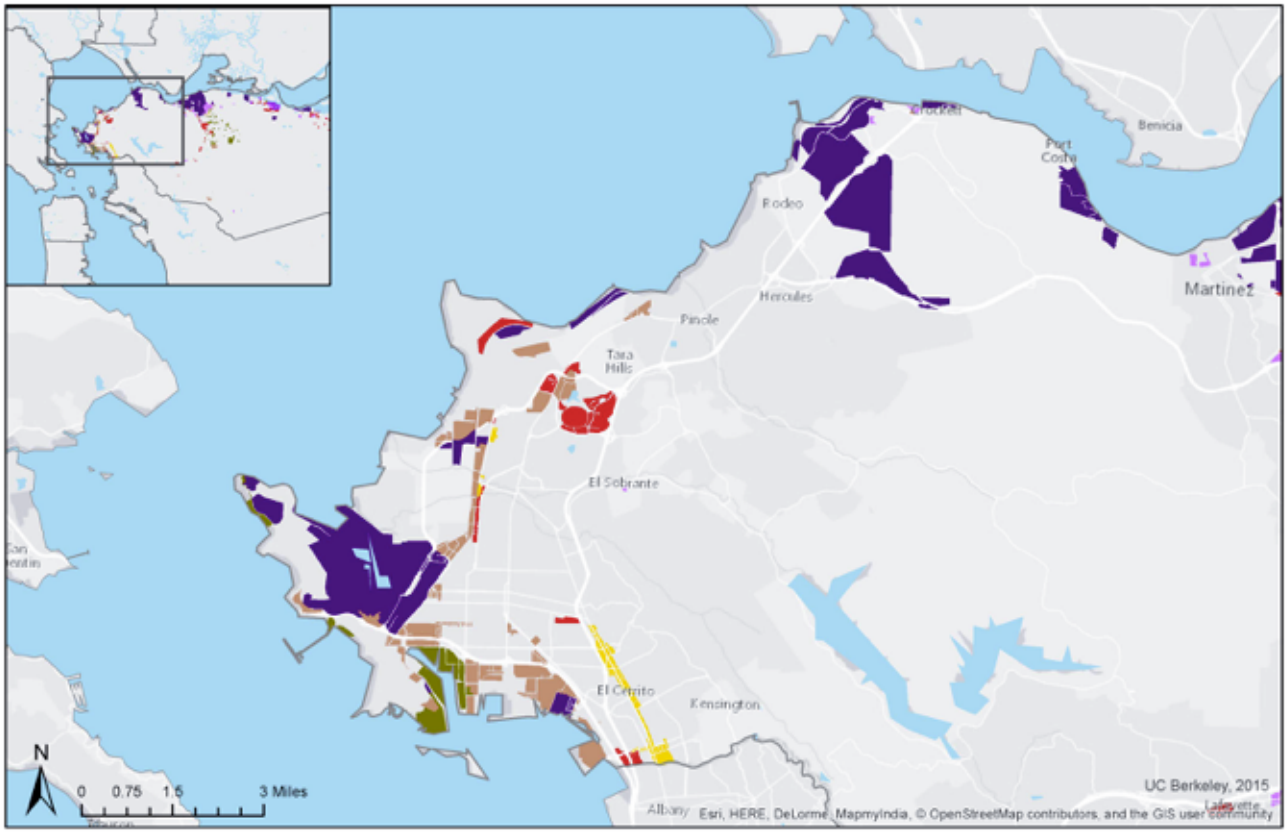
Medium industrial
Light industrial
Industrial office
Transportation
Mixed-use - commercial
Mixed-use - residential



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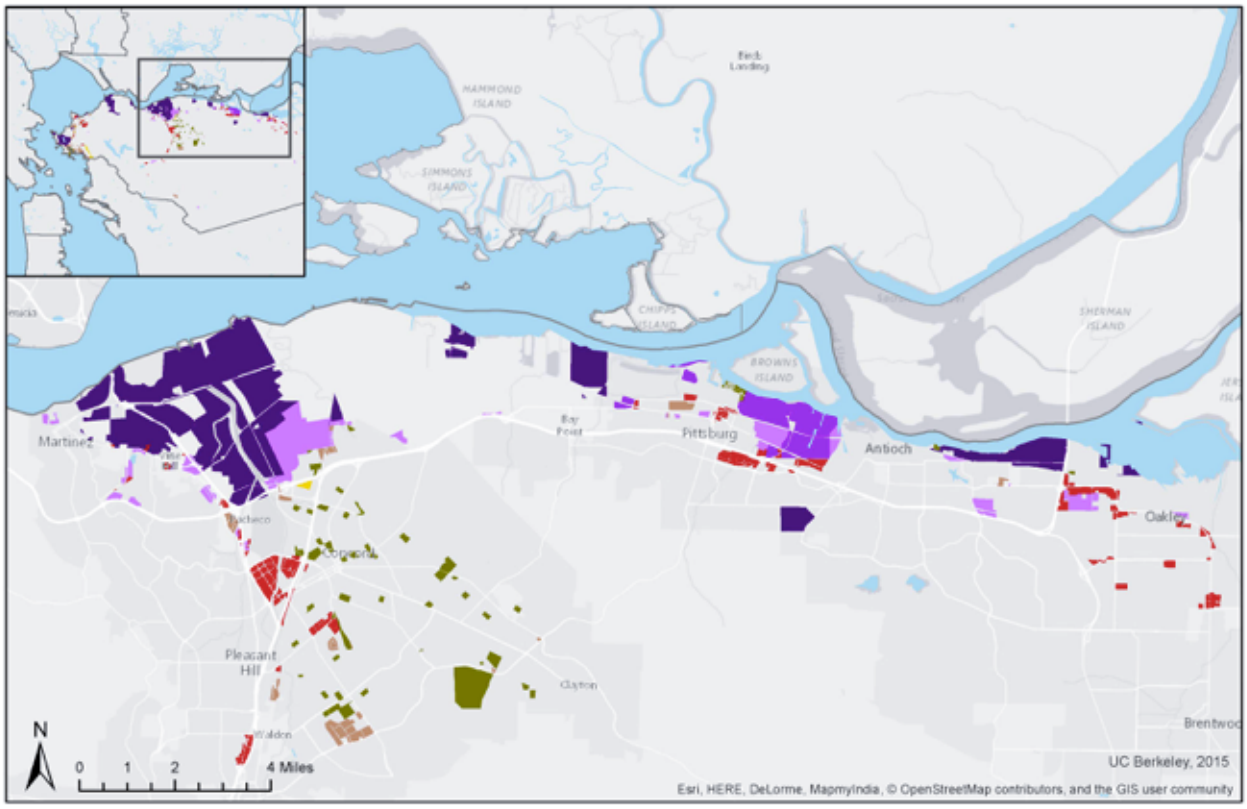
Medium industrial
Light industrial
Industrial-Office
Transportation
Mixed-use - commercial
Mixed-use - residential



Heavy industrial
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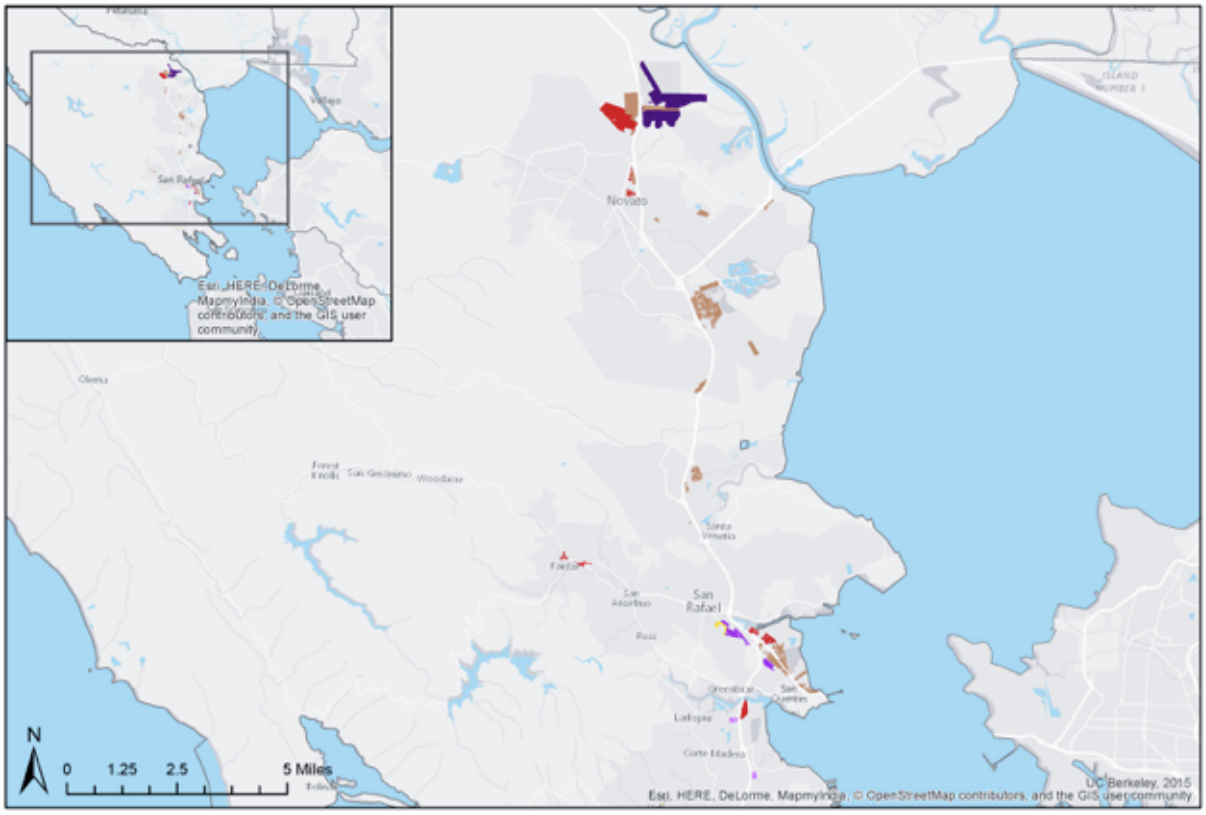
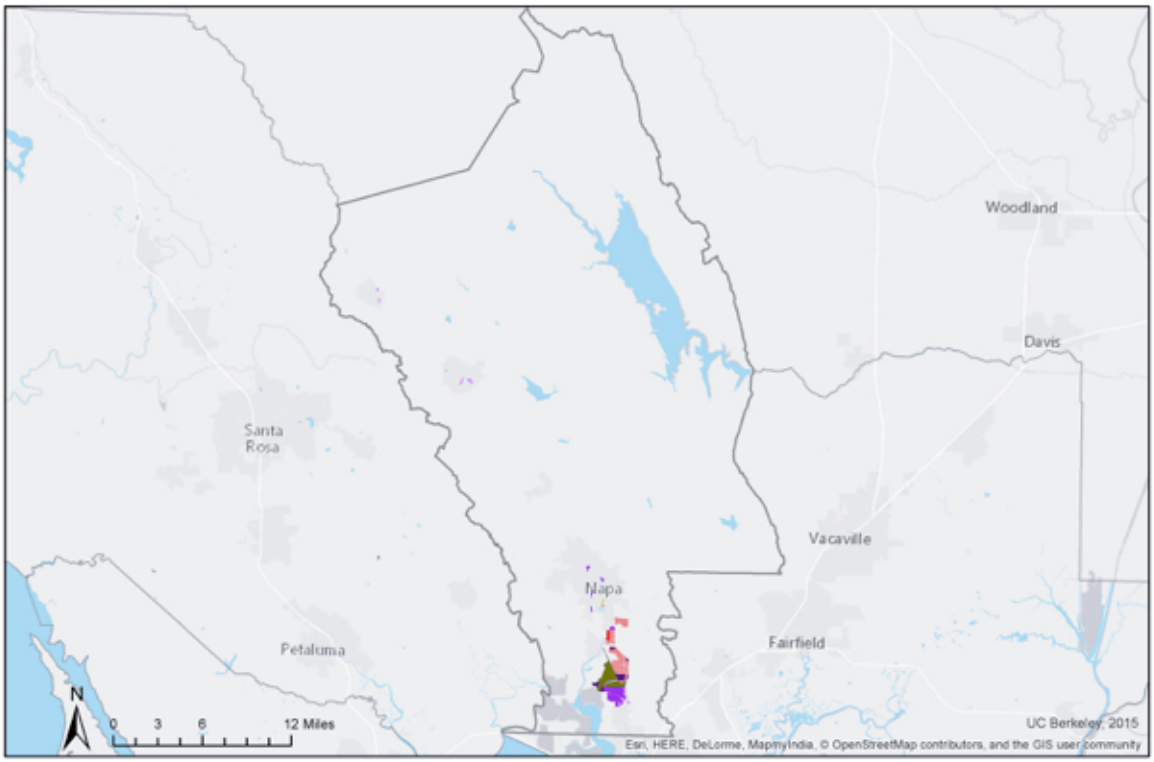
Light industrial
Industrial-Office
Transportation
Mixed-use - commercial
Mixed-use - residential

Heavy industrial
Medium industrial
Light industrial
Industrial office
Transportation
Mixed use - commercial
Mixed use - residential



Heavy industrial
Medium industrial
Light industrial
Industrial office
Transportation
Mixed use - commercial
Mixed use - residential



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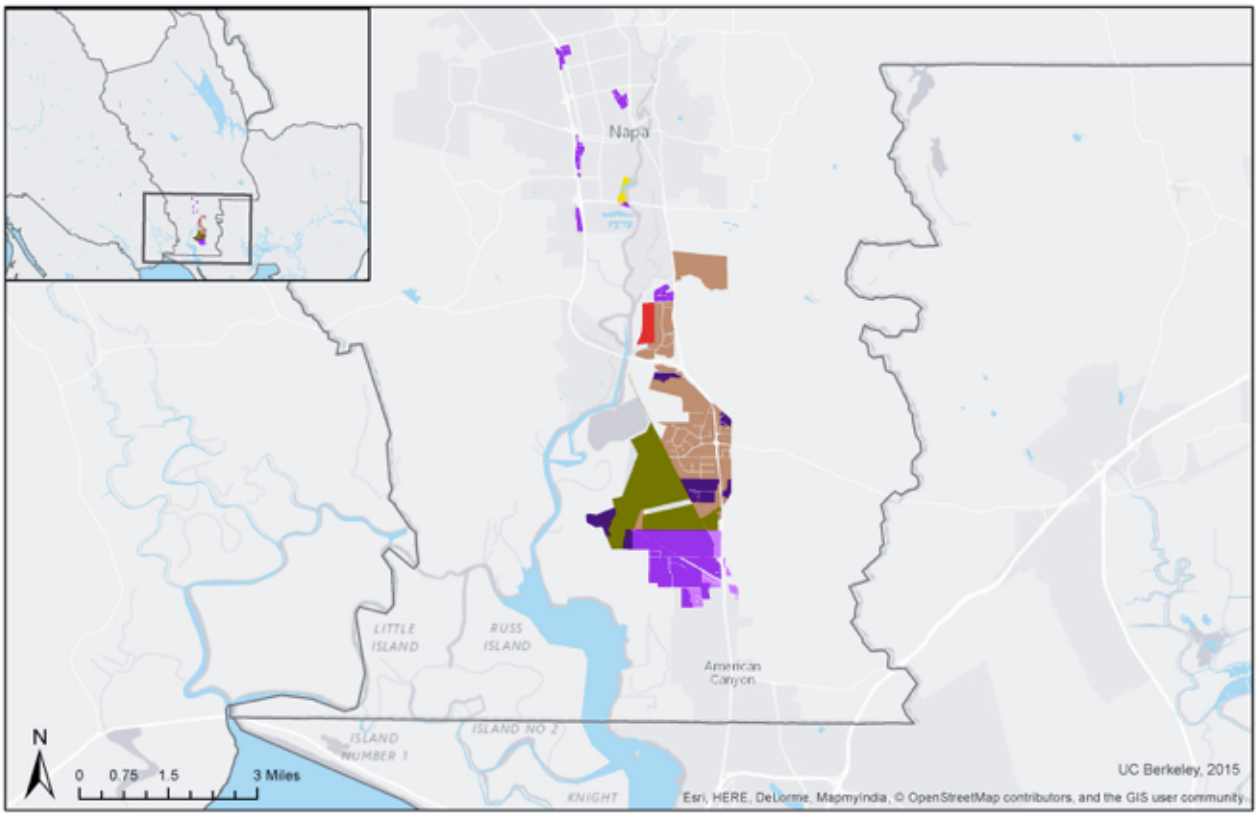
Industrial-Office
Transportation
Mixed-use - commercial
Mixed-use - residential



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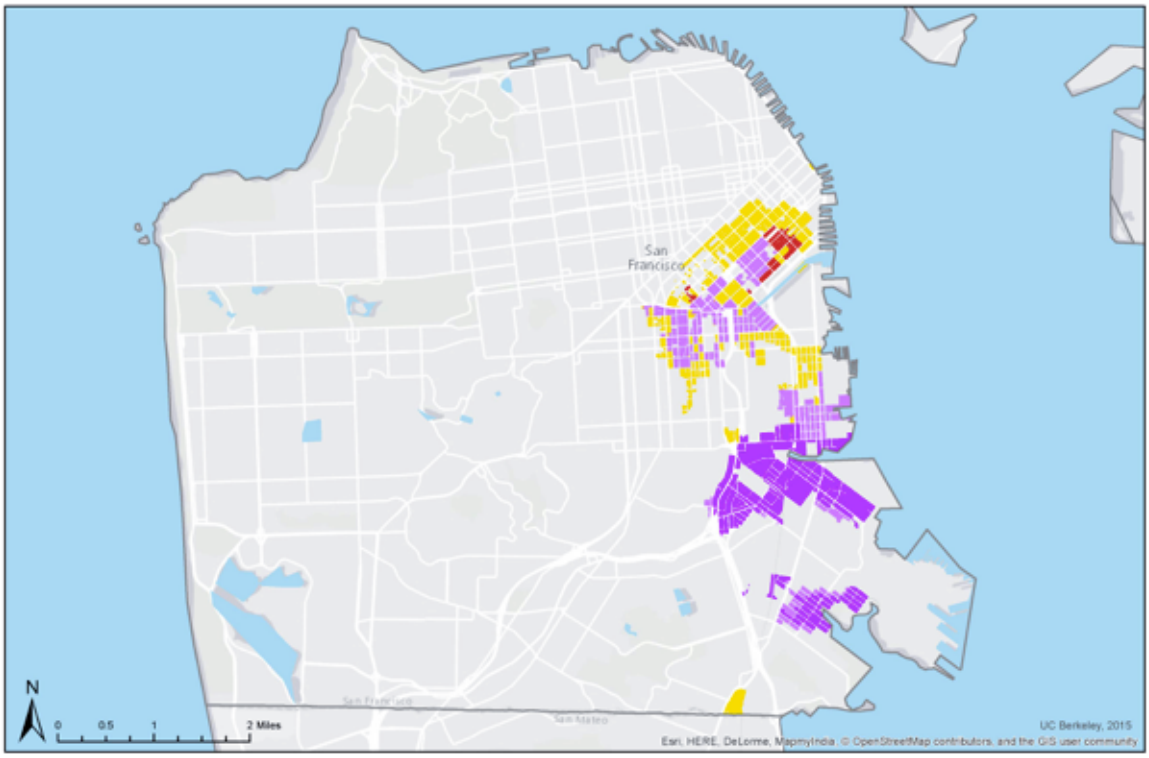

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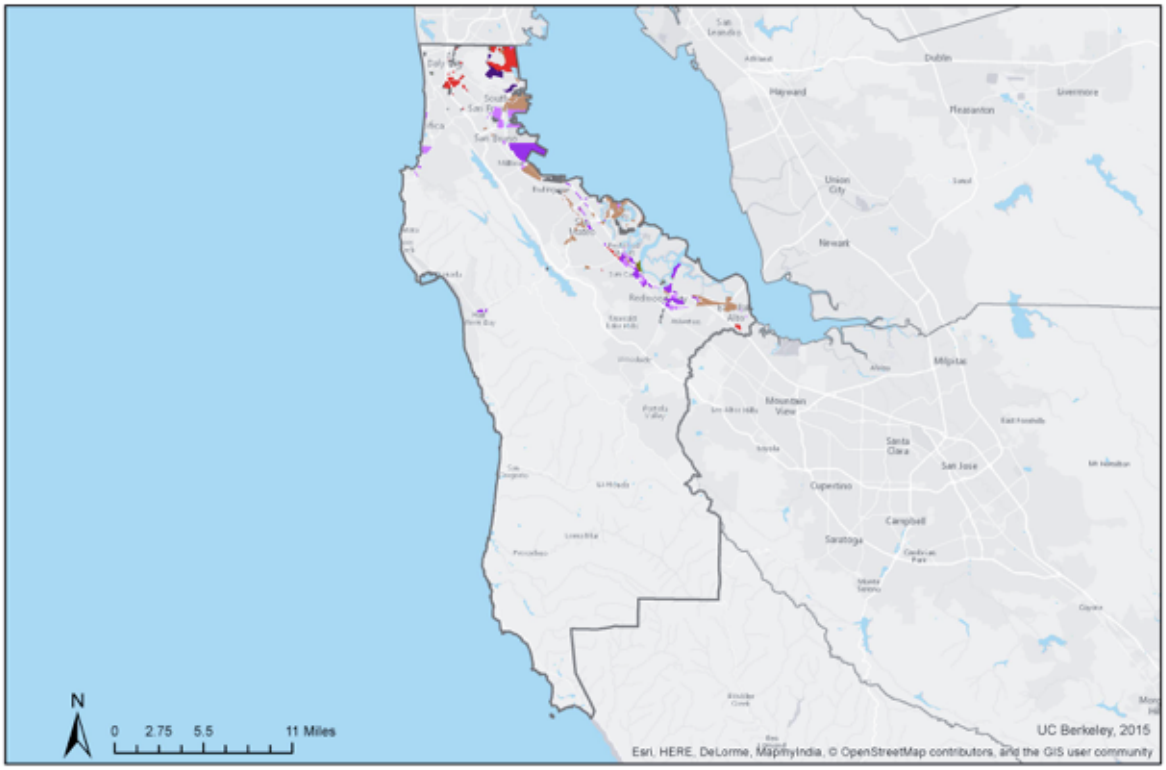

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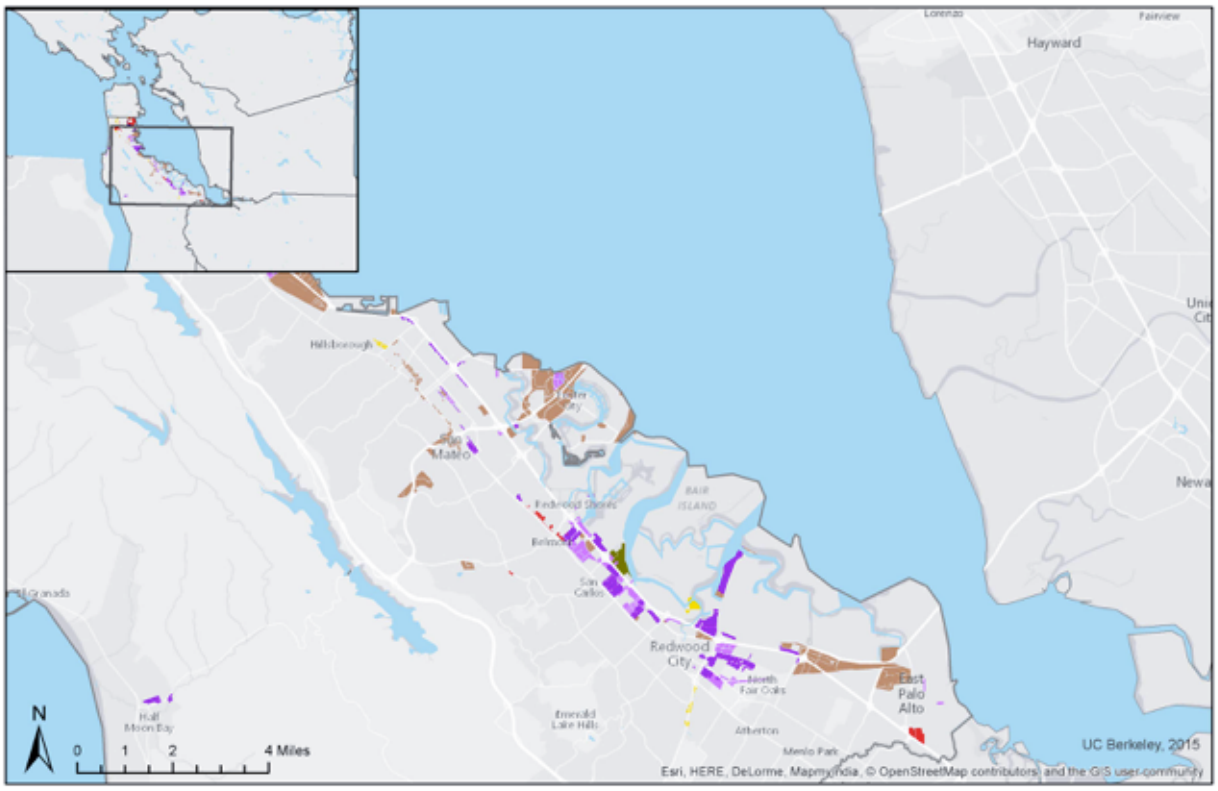
Mixed-use - residential



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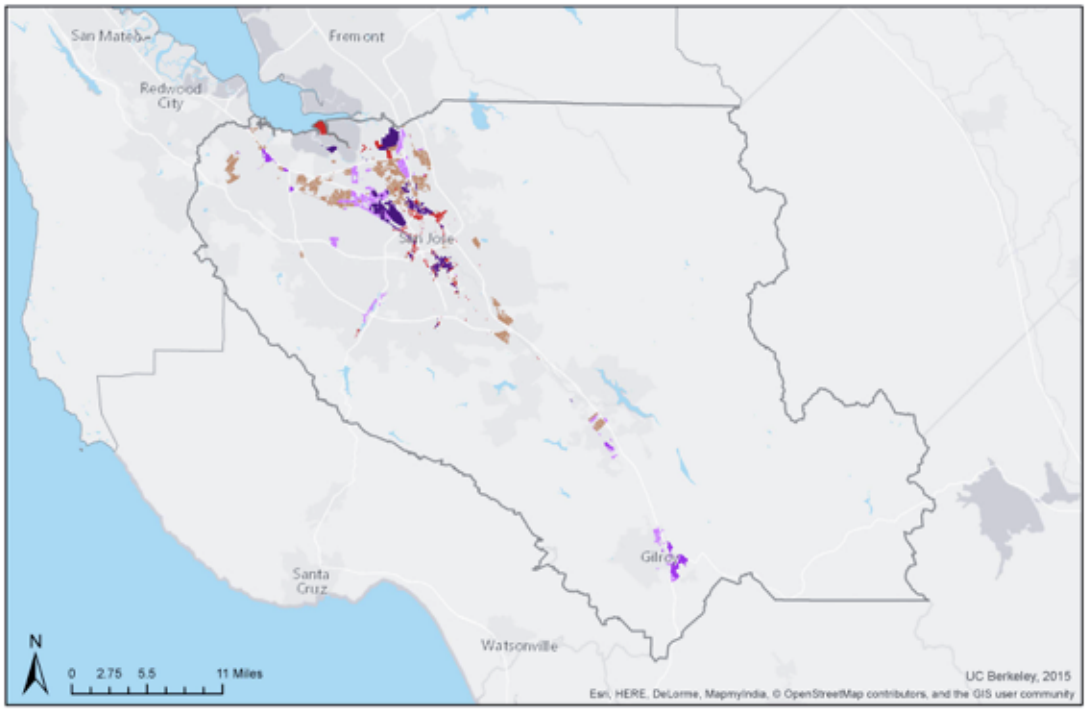

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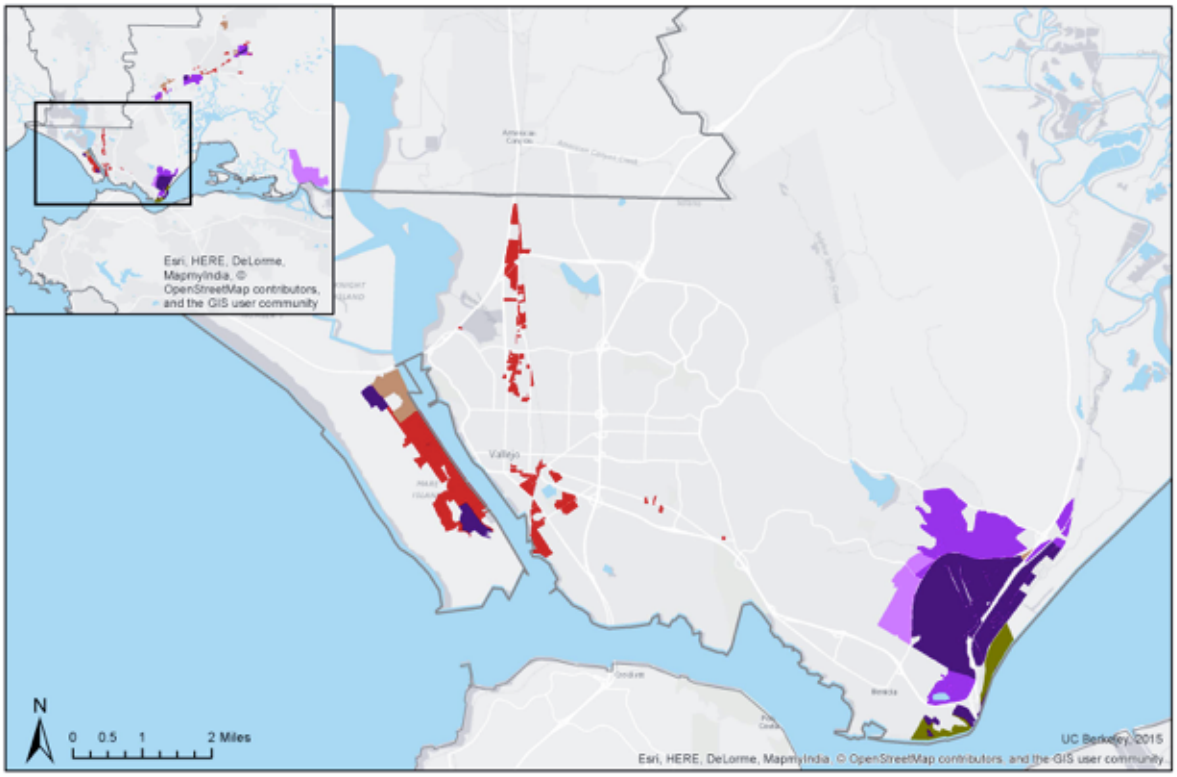

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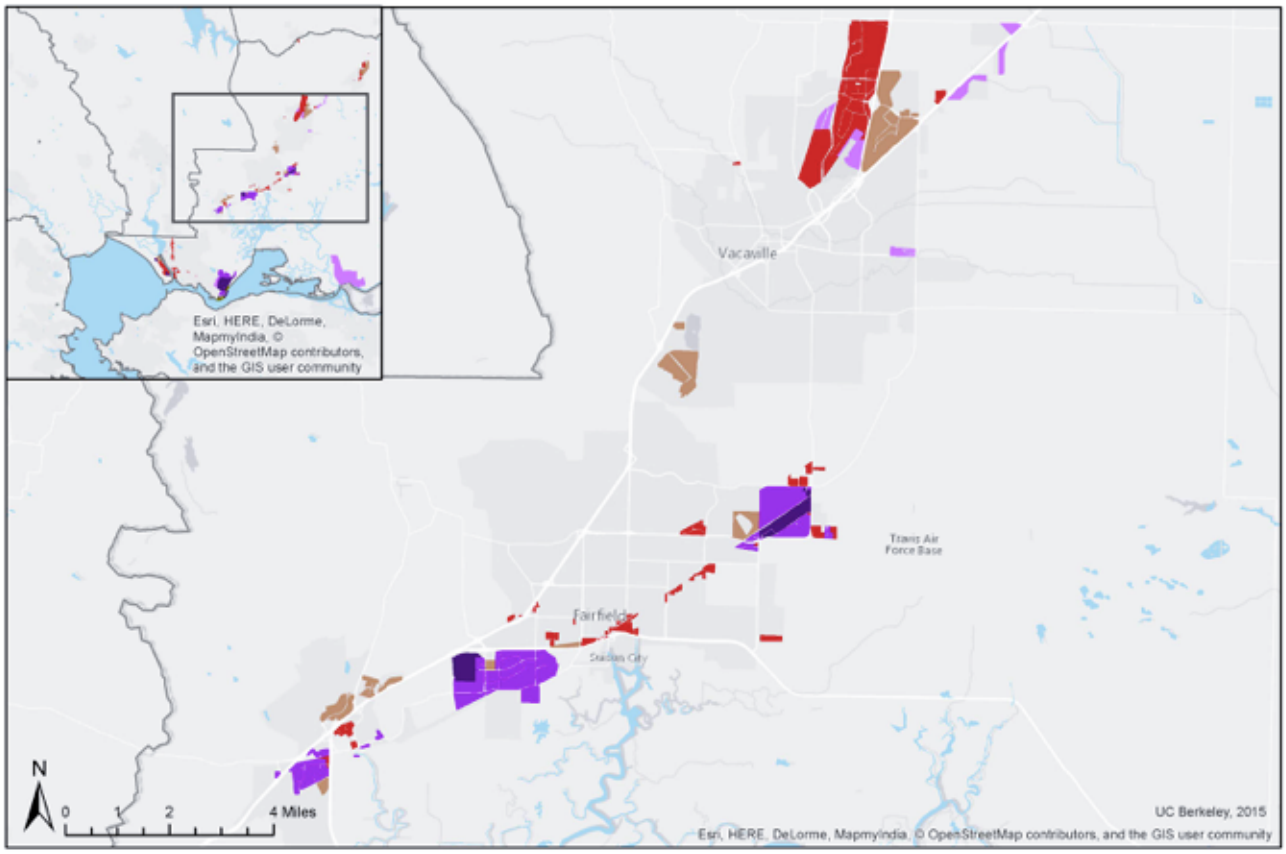
Mixed-use - residential



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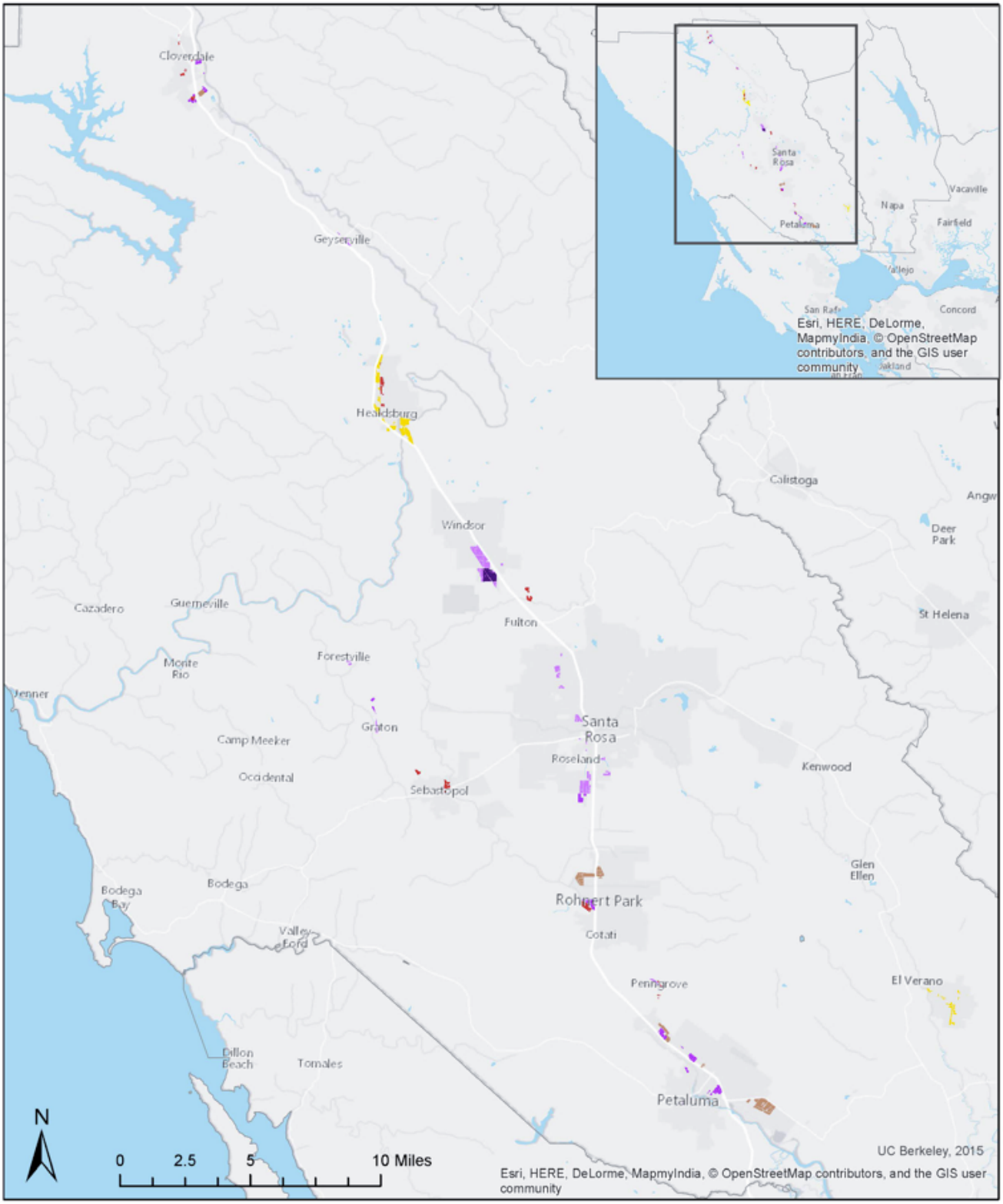
Light industrial
Industrial-Office
Transportation
Mixed-use - commercial
Mixed-use - residential


Cloverdale
Geyserville
Healdsburg
Windsor
Guerneville
Cazadero
Monte Rio
Forestville
Fulton
Jenner
Graton
Camp Meeker
Occidental
Sebastopol
Santa Rosa
Roseland
Kenwood
Glen Ellen
Bodega Bay
Bodega
Valley Ford
Rohnert Park
Cotati
Penngrove
El Verano
Dillon Beach
Tomales
Petaluma
Calistoga
St Helena
Deer Park
Napa
Vacaville
Fairfield
Vallejo
Concord
Oakland
San Rafael
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
N
0
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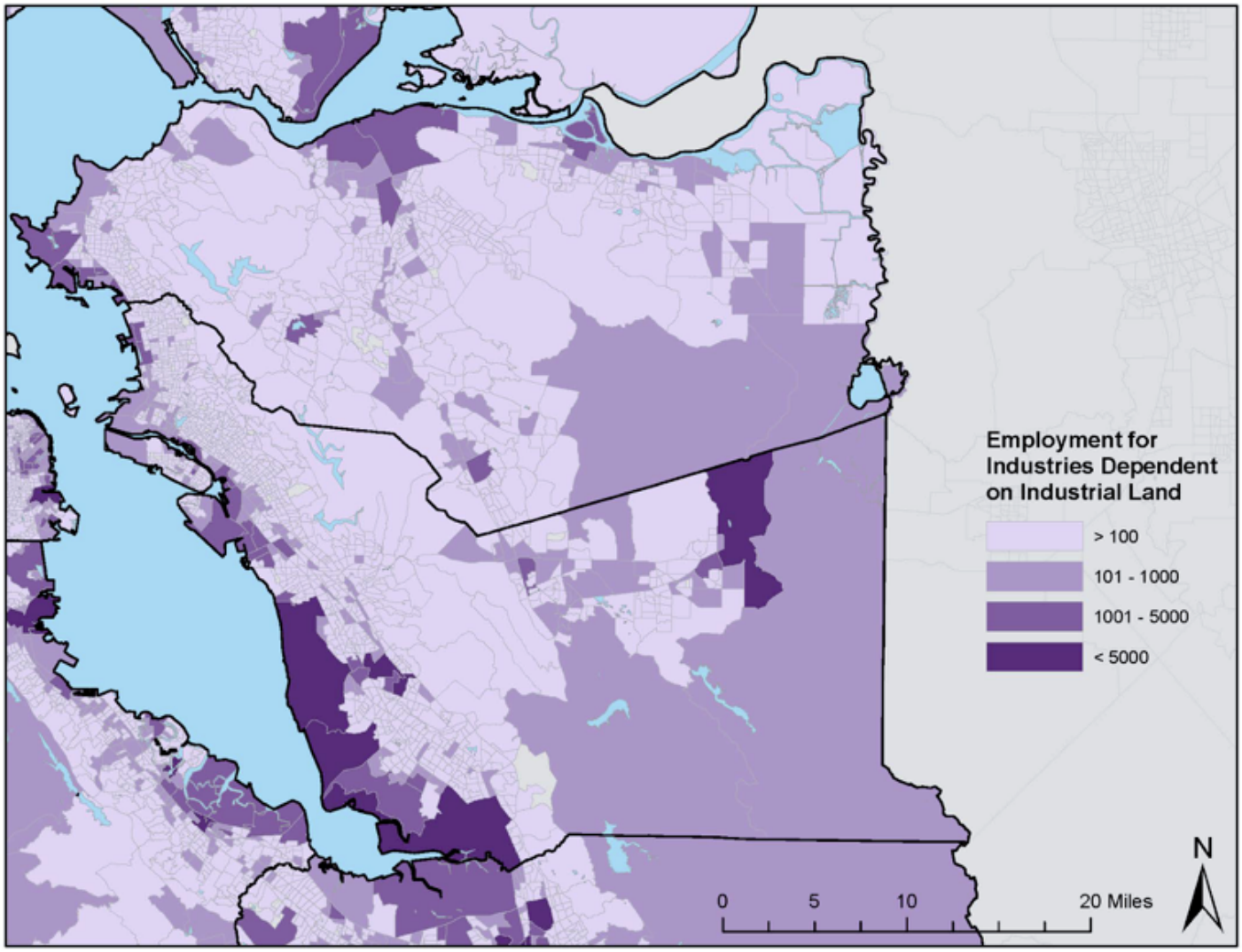
10 Miles
UC Berkeley, 2015
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community
Heavy industrial
Medium industrial
Light industrial
Industrial office
Transportation
Mixed use - commercial
Mixed use - residential

Appendix V. Top Industries Dependent on Industrial Land in Marin, Napa, and Sonoma Counties.

Top 30 Industries Dependent on Exclusive IL – Marin County								
NAICS	Description	1990-2012 % change	Exclusive Jobs	LQ	Status	MU Jobs	LQ	Status
562111	Solid Waste Collection	792%	97	54.78	Dependent	57	6.43	Dependent
562920	Materials Recovery Facilities	-74%	83	76.53	Dependent	0	0.00	Occurring
811121	Automotive Body, Paint, and Interior Repair and Maintenance	-31%	72	15.02	Dependent	134	5.59	Dependent
423990	Other Miscellaneous Durable Goods Merchant Wholesalers	-23%	69	23.53	Dependent	12	0.82	Occurring
488410	Motor Vehicle Towing	91%	64	38.30	Dependent	5	0.60	Occurring
423710	Hardware Merchant Wholesalers	-91%	61	44.09	Dependent	8	1.16	Partial
238220	Plumbing, Heating, and Air-Conditioning Contractors	40%	45	5.32	Dependent	174	4.11	Dependent
561720	Janitorial Services	333%	39	7.18	Dependent	31	1.14	Partial
541710	Research and Development in the Physical, Engineering, and Life Sciences	#N/A	34	4.32	Dependent	0	0.00	Occurring
811310	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance	-7%	30	12.79	Dependent	3	0.26	Occurring
511110	Newspaper Publishers	-43%	29	4.12	Dependent	0	0.00	Occurring
238390	Other Building Finishing Contractors	18%	26	17.15	Dependent	0	0.00	Occurring
621330	Offices of Mental Health Practitioners (except Physicians)	177%	26	6.13	Dependent	2	0.09	Occurring
811111	General Automotive Repair	12%	26	4.40	Dependent	133	4.50	Dependent
423920	Toy and Hobby Goods and Supplies Merchant Wholesalers	-68%	23	27.71	Dependent	0	0.00	Occurring
621310	Offices of Chiropractors	-30%	22	6.29	Dependent	11	0.63	Occurring
236118	Residential Remodelers	35%	22	2.55	Dependent	51	1.18	Partial
523930	Investment Advice	89%	22	2.46	Dependent	8	0.18	Occurring
562991	Septic Tank and Related Services	-92%	20	36.88	Dependent	0	0.00	Occurring
237110	Water and Sewer Line and Related Structures Construction	95%	20	7.93	Dependent	12	0.95	Occurring
424490	Other Grocery and Related Products Merchant Wholesalers	-41%	19	4.36	Dependent	20	0.92	Occurring
337110	Wood Kitchen Cabinet and Countertop Manufacturing	-50%	15	14.89	Dependent	15	2.98	Dependent
813211	Grantmaking Foundations	124%	15	3.89	Dependent	11	0.57	Occurring
541430	Graphic Design Services	9%	15	3.13	Dependent	11	0.46	Occurring
541211	Offices of Certified Public Accountants	8%	15	2.18	Dependent	25	0.72	Occurring
334519	Other Measuring and Controlling Device Manufacturing	61239%	14	30.85	Dependent	0	0.00	Occurring
424480	Fresh Fruit and Vegetable Merchant Wholesalers	-76%	14	21.44	Dependent	3	0.92	Occurring
713930	Marinas	258%	14	13.60	Dependent	0	0.00	Occurring
611620	Sports and Recreation Instruction	1419%	14	6.29	Dependent	5	0.45	Occurring
624310	Vocational Rehabilitation Services	-12%	14	4.29	Dependent	15	0.92	Occurring

Top 30 Industries Dependent on Exclusive IL – Napa County								
NAICS	Description	1990-2012 % change	Exclusive Jobs	LQ	Status	MU Jobs	LQ	Status
811111	General Automotive Repair	-20%	12	4.63	Dependent	0	0.00	Occurring
236220	Commercial and Institutional Building Construction	-63%	9	5.67	Dependent	3	2.70	Dependent
424490	Other Grocery and Related Products Merchant Wholesalers	-47%	9	4.85	Dependent	4	3.08	Dependent
424990	Other Miscellaneous Nondurable Goods Merchant Wholesalers	69%	8	4.14	Dependent	4	2.95	Dependent
4441	Building Material and Supplies Dealer	#N/A	7	5.84	Dependent	1	1.19	Partial
561730	Landscaping Services	166%	7	2.35	Dependent	0	0.00	Occurring
493110	General Warehousing and Storage	25829 %	6	9.12	Dependent	4	8.69	Dependent
531130	Lessors of Miniwarehouses and Self-Storage Units	7519%	6	8.16	Dependent	2	3.89	Dependent
811118	Other Automotive Mechanical and Electrical Repair and Maintenance	-92%	6	7.39	Dependent	0	0.00	Occurring
811420	Reupholstery and Furniture Repair	43%	5	10.77	Dependent	0	0.00	Occurring
444190	Other Building Material Dealers	-18%	5	9.94	Dependent	0	0.00	Occurring
332710	Machine Shops	-45%	4	20.68	Dependent	0	0.00	Occurring
321920	Wood Container and Pallet Manufacturing	62%	4	9.40	Dependent	1	3.36	Dependent
337110	Wood Kitchen Cabinet and Countertop Manufacturing	-9%	4	9.40	Dependent	0	0.00	Occurring
321911	Wood Window and Door Manufacturing	-100%	4	6.46	Dependent	0	0.00	Occurring
811121	Automotive Body, Paint, and Interior Repair and Maintenance	47%	4	6.08	Dependent	1	2.17	Dependent
441310	Automotive Parts and Accessories Stores	-5%	4	5.74	Dependent	0	0.00	Occurring
423840	Industrial Supplies Merchant Wholesalers	-44%	4	4.31	Dependent	6	9.23	Dependent
541710	Research and Development in the Physical, Engineering, and Life Sciences	#N/A	4	3.83	Dependent	2	2.73	Dependent
813910	Business Associations	145%	4	3.23	Dependent	1	1.15	Partial
54121	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	#N/A	4	3.23	Dependent	0	0.00	Occurring
238310	Drywall and Insulation Contractors	-69%	4	2.95	Dependent	1	1.05	Partial
484110	General Freight Trucking, Local	495%	4	2.15	Dependent	4	3.08	Dependent
562991	Septic Tank and Related Services	325%	3	12.93	Dependent	0	0.00	Occurring
321999	All Other Miscellaneous Wood Product Manufacturing	439%	3	11.08	Dependent	2	10.55	Dependent
339950	Sign Manufacturing	209%	3	9.69	Dependent	0	0.00	Occurring
811198	All Other Automotive Repair and Maintenance	1015%	3	8.62	Dependent	0	0.00	Occurring
488510	Freight Transportation Arrangement	177%	3	7.05	Dependent	4	13.42	Dependent
484121	General Freight Trucking, Long-Distance, Truckload	-91%	3	7.05	Dependent	3	10.07	Dependent
485320	Limousine Service	1550%	3	3.69	Dependent	0	0.00	Occurring

Top 30 Industries Dependent on Exclusive IL – Sonoma County								
NAICS	Description	1990-2012 % change	Exclusive Jobs	LQ	Status	MU Jobs	LQ	Status
238220	Plumbing, Heating, and Air-Conditioning Contractors	3%	226	8.10	Dependent	180	1.69	Partial
238310	Drywall and Insulation Contractors	-72%	151	11.94	Dependent	31	0.64	Occurring
721110	Hotels (except Casino Hotels) and Motels	108%	147	2.50	Dependent	48	0.21	Occurring
236220	Commercial and Institutional Building Construction	-54%	140	8.98	Dependent	57	0.96	Occurring
311513	Cheese Manufacturing	-48%	135	50.84	Dependent	0	0.00	Occurring
238130	Framing Contractors	-37%	120	14.94	Dependent	0	0.00	Occurring
238210	Electrical Contractors and Other Wiring Installation Contractors	3%	110	4.83	Dependent	90	1.04	Partial
4441	Building Material and Supplies Dealers	#N/A	91	4.43	Dependent	29	0.37	Occurring
441110	New Car Dealers	-9%	77	3.26	Dependent	173	1.92	Partial
811111	General Automotive Repair	2%	72	5.62	Dependent	71	1.45	Partial
812910	Pet Care (except Veterinary) Services	274%	71	11.94	Dependent	7	0.31	Occurring
811121	Automotive Body, Paint, and Interior Repair and Maintenance	10%	70	6.82	Dependent	32	0.82	Occurring
453998	All Other Miscellaneous Store Retailers (except Tobacco Stores)	-8%	57	3.80	Dependent	25	0.44	Occurring
311712	Fresh and Frozen Seafood Processing	#N/A	56	61.38	Dependent	0	0.00	Occurring
621910	Ambulance Services	401%	55	9.93	Dependent	0	0.00	Occurring
333294	Food Product Machinery Manufacturing	#N/A	50	25.58	Dependent	6	0.80	Occurring
812331	Linen Supply	39%	50	15.12	Dependent	45	3.57	Dependent
562910	Remediation Services	-98%	48	39.81	Dependent	0	0.00	Occurring
811118	Other Automotive Mechanical and Electrical Repair and Maintenance	-65%	48	10.52	Dependent	13	0.75	Occurring
333999	All Other Miscellaneous General Purpose Machinery Manufacturing	569%	47	33.16	Dependent	0	0.00	Occurring
722320	Caterers	184%	44	8.77	Dependent	3	0.16	Occurring
236118	Residential Remodelers	-6%	44	3.96	Dependent	7	0.17	Occurring
238350	Finish Carpentry Contractors	-2%	40	5.75	Dependent	49	1.85	Partial
423720	Plumbing and Heating Equipment and Supplies (Hydronics) Merchant Wholesalers	632%	39	7.62	Dependent	47	2.41	Dependent
532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing	-17%	38	11.16	Dependent	142	10.93	Dependent
238170	Siding Contractors	-92%	35	28.27	Dependent	0	0.00	Occurring
332710	Machine Shops	-3%	35	9.22	Dependent	12	0.83	Occurring
337110	Wood Kitchen Cabinet and Countertop Manufacturing	9%	35	7.93	Dependent	68	4.04	Dependent
334419	Other Electronic Component Manufacturing	-66%	34	3.98	Dependent	71	2.18	Dependent
454210	Vending Machine Operators	-50%	33	27.37	Dependent	0	0.00	Occurring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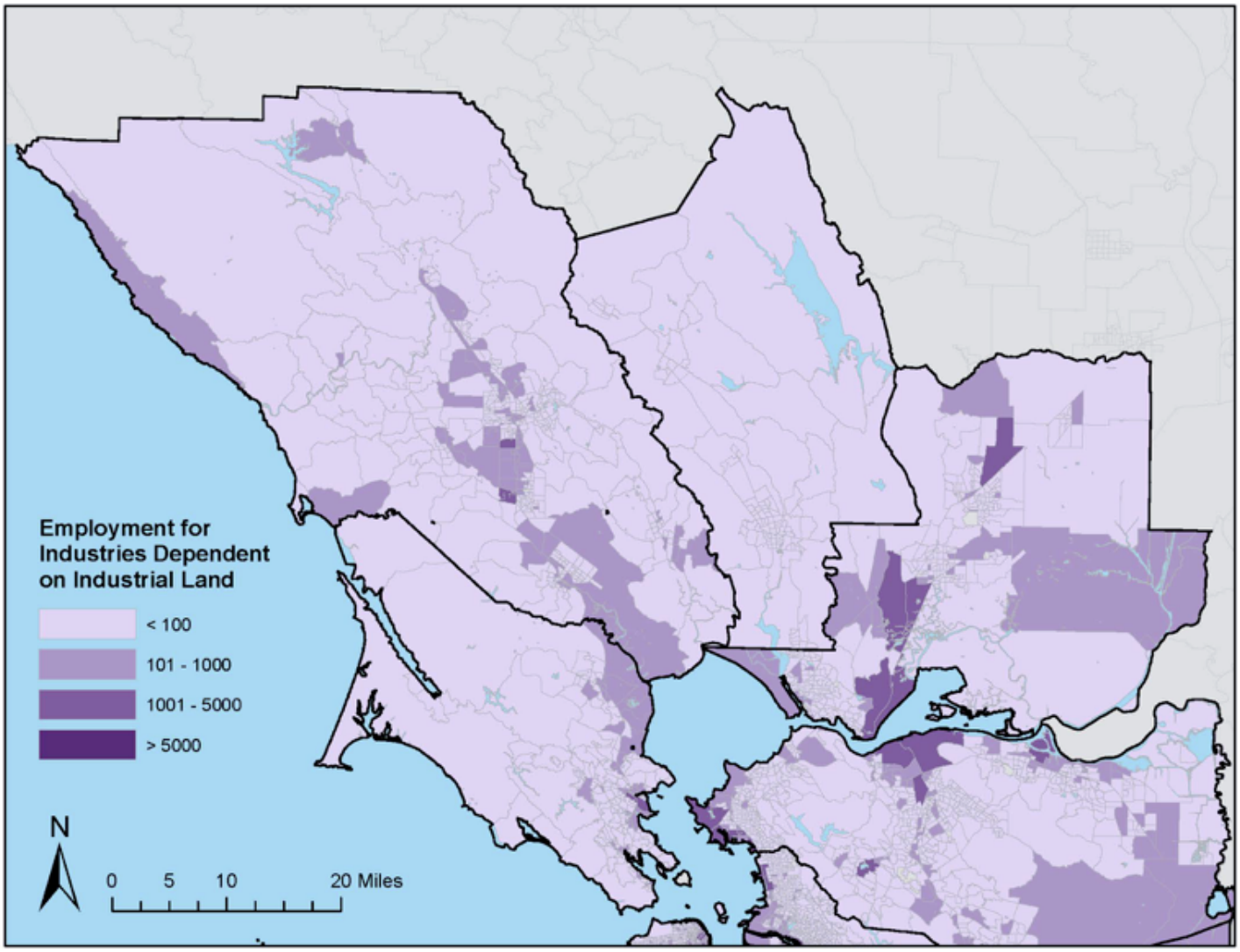
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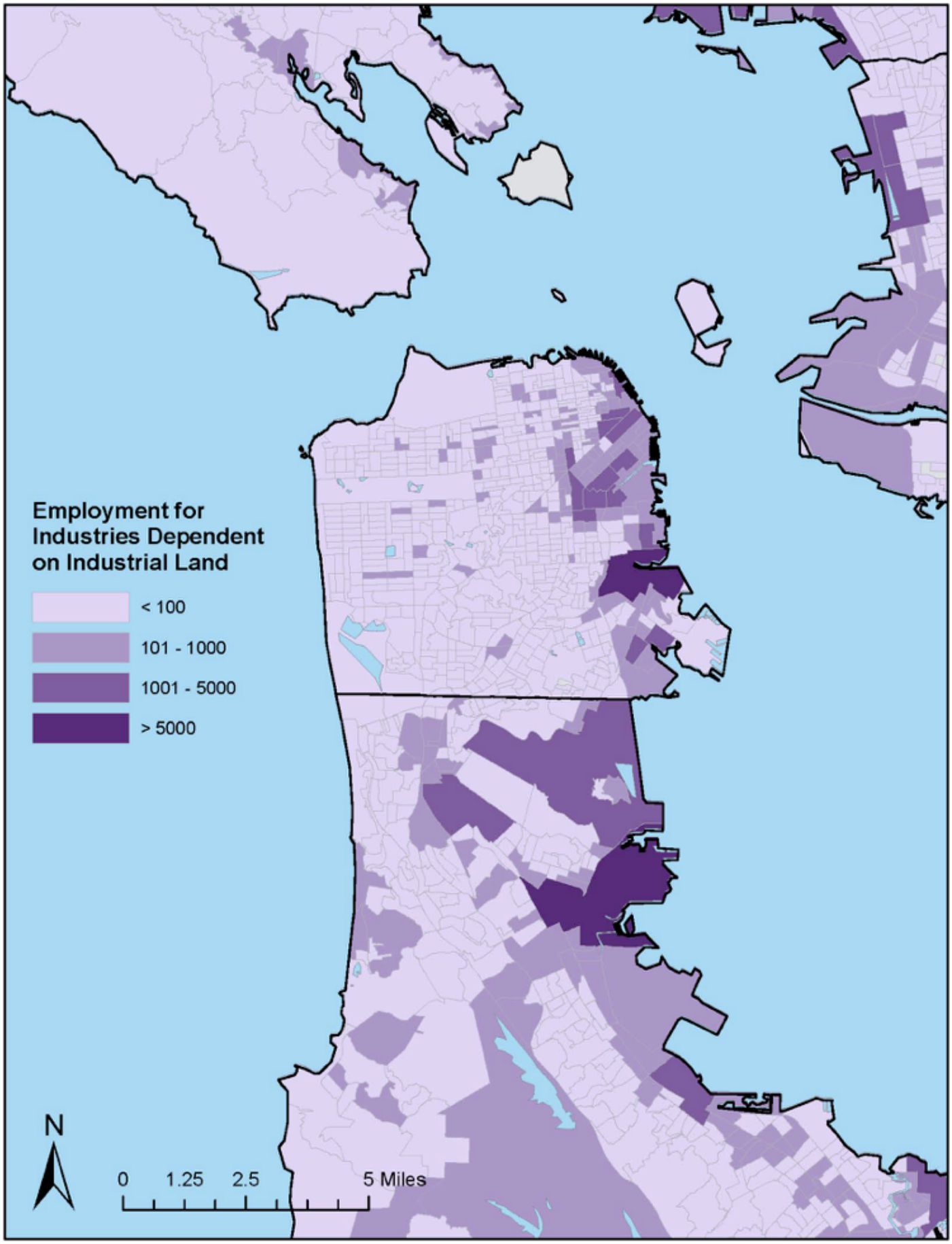
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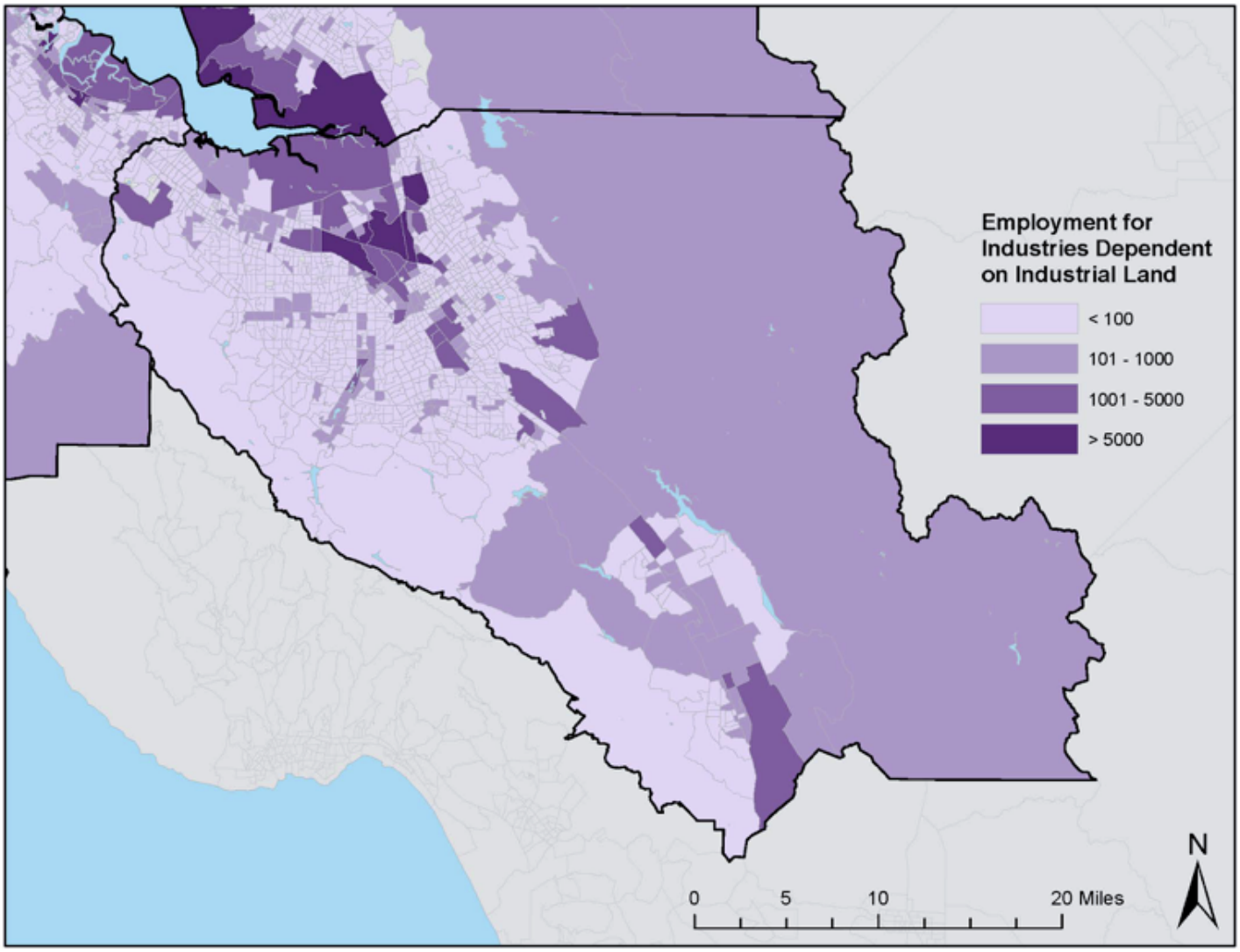
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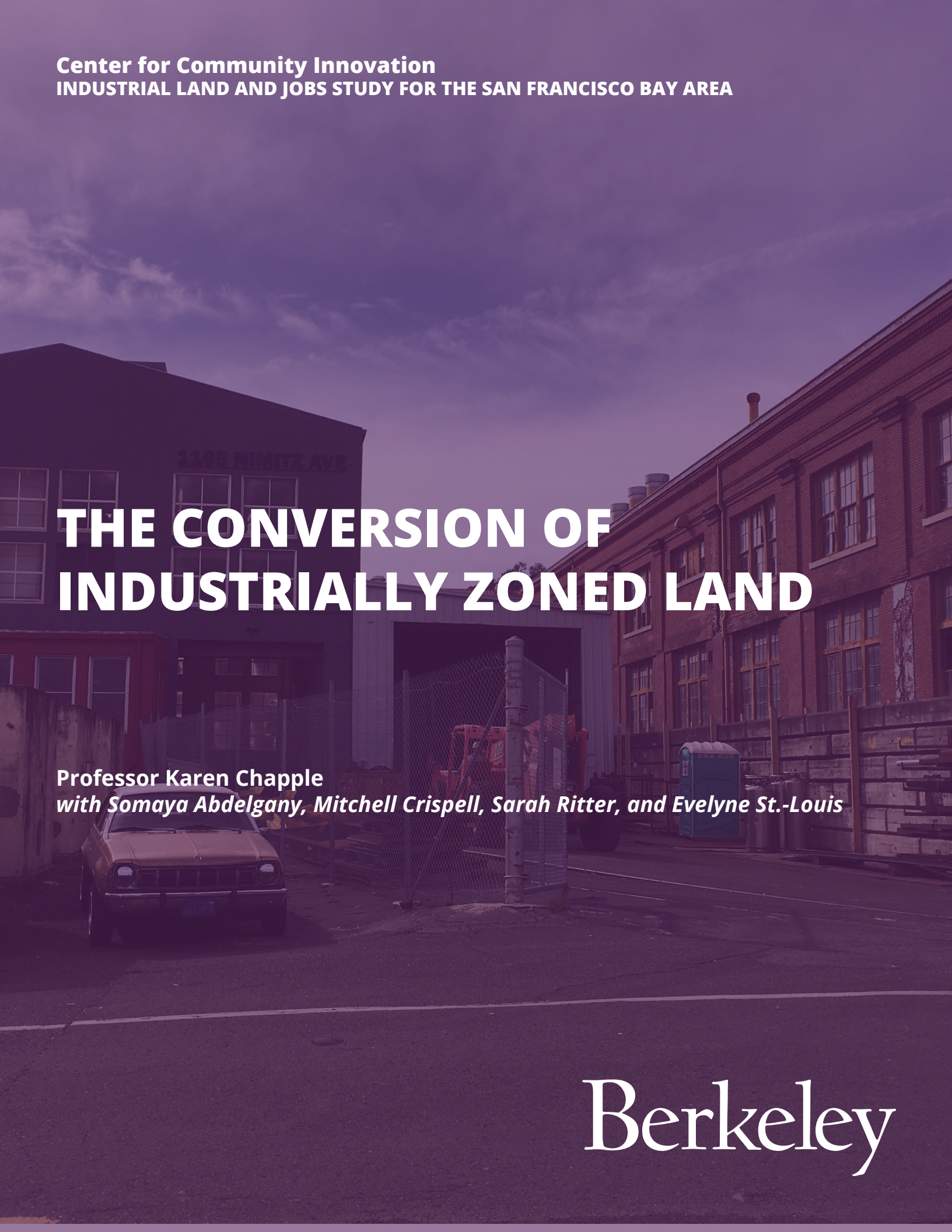
Technical Memo #2

Center for Community Innovation
INDUSTRIAL LAND AND JOBS STUDY FOR THE SAN FRANCISCO BAY AREA



THE CONVERSION OF INDUSTRIALLY ZONED LAND

Professor Karen Chapple
with Somaya Abdelgany, Mitchell Crispell, Sarah Ritter, and Evelyne St.-Louis

Berkeley

Authors
Karen Chapple
with Somaya Abdelgany, Mitchell Crispell, Sarah Ritter, and Evelyne St.-Louis

Cover Photo
Source: Center for Community Innovation

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The Center for Community Innovation (CCI) at UC-Berkeley nurtures effective solutions that expand economic opportunity, diversify housing options, and strengthen connection to place.

Report prepared for the Association of Bay Area Governments/Metropolitan Transportation Commission

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Contents

INTRODUCTION

The intent of this study, the second output from the Industrial Land and Jobs study, is to assess how much of the region's industrially zoned land has already been converted, how much is likely to be converted in the near future, and whether there is likely to be sufficient industrial land to accommodate demand in 2040.

Overall, a small but significant share of exclusive industrial land (i.e., industrial land that does not allow mixed-use or office) has been converted to other uses. Our fieldwork estimated that 10% of industrial land had been converted, but an analysis of assessor data suggested a lower conversion rate, 0.8% over a six year period. There has been little encroachment of new housing on industrial land: in the cities where it is most likely, San Jose and Oakland, about 1-3% of units have been built on industrial land.

Overall, about 7% of the exclusive industrial land in the region is vacant. However, vacancy varies throughout the region, with very little vacant acreage in the core, and large reservoirs of industrial land in the North Bay. As noted in Technical Memo #1, vacancy rates for industrial space are even lower, from 2-6%.

This report also looks at the extent to which industrially zoned land is designated for other uses according to the general plan, or conflicts with a Priority Development Area (PDA) designation. In the nine-County Bay Area region, a total of 15,084 acres of industrially zoned land are potentially in conflict with non-industrial designations, comprising about 17% of the region's current industrially zoned land. The share of industrially zoned land overlapping with non-industrial general plan or PDA designations varies significantly across the different counties. In Napa County, which has a small share of the region's industrial land, there is only a 1% overlap between industrial land (exclusive and mixed-use) and non-industrial general plan or PDA designations. This is most likely because much of its stock has already been rezoned to nonindustrial uses, such as office and commercial development. On the other extreme, almost half of all industrial land in San Francisco is potentially in conflict due to widespread introduction of mixed-use zones throughout the city. In Alameda County, which has the highest share of industrial land in the region, a more moderate 14% of industrial land is overlapping with non-industrial designations.

A considerable amount of industrially zoned land falls within the region's PDAs. Across all counties, about 16,700 acres out of a total 96,700 acres of industrially zoned land overlap with PDAs—about 17%. Nearly half of this overlap is exclusive industrial land, and half is mixed-use industrial land.

Based on this analysis, we next estimate the amount of industrially zoned land available in the future, after accounting for land that is already converted and/or overlapping and in conflict with other designations. Comparing the available land to the employment projections for 2040, we can determine whether there is sufficient land to meet future demand. The majority of counties in the region's core—particularly Santa Clara, San Mateo,

and Alameda—will experience a significant shortage of industrially zoned land, offset by considerable surpluses in more peripheral areas of Contra Costa, Napa, and Solano counties. Altogether, a surplus of 1,944 acres of industrially zoned land is anticipated in 2040, but much is located far from the greatest demand for industrial land, in the core, where there is a deficit of over 900 acres.

Case studies next suggest criteria for when to redevelop industrial land, and when to preserve it. Mission Bay illustrates a clear case for redevelopment, due to the long-term decline of industrial uses surrounding the site, as well as specific site characteristics (e.g., very few land owners). In contrast, Richmond and West Oakland cases illustrate the complications of conversion. For instance, in Oakland, though the area is clearly undergoing a transition away from industrial land-dependent uses to a more mixed-use economy, the City is not providing the support and infrastructure that businesses will need to survive. Without such actions, the area will likely lose much of its employment base in years to come, becoming exclusively residential. In contrast, two cases where housing growth is hindering significant opportunities for economic development make the case for industrial land preservation: San Jose and Contra Costa's Northern Waterfront.

Overall, this analysis suggests that the conversion of industrial land is proceeding at a slow pace, but is likely to accelerate in coming years due to the visions put forward in general plan and PDA designations. To guide city decision-making about where to preserve industrial land and where to convert it, MTC/ABAG should develop criteria. Below are potential criteria in terms of transportation, economy, equity, site characteristics, and environment. These may serve as the basis for designating Priority Production Areas in the future.

CRITERIA FOR INDUSTRIAL LAND PRESERVATION AND CONVERSION

Retain as Industrial ← → *Convert to Residential or Mixed-use*

Transportation	• Proximity to freight and/or port facilities • Low VMT for workers on industrial land	• Proximity to transit • High VMT for workers on industrial land
Economy	• Production or related employment • Proximity to business clusters/suppliers/markets • Critical supplier to local businesses • Industry stable or growing	• High-density non-production employment • Proximity to markets/customers • Limited linkages to local economy • Industry in decline
Equity	• Offers middle-wage jobs for less-skilled workers	• Potential for affordable housing
Land use/zoning compatibility	• Surrounded by medium/heavy industrial zoning	• Adjacent to residential
Environment	• Brownfield site, remediation infeasible	• Environmental health hazard for surrounding communities (especially if historically disadvantaged)
Adequacy of supply	• In areas with projected deficit of industrial land • Low vacancy rates for industrial buildings	• In areas with projected surplus of industrial land • High vacancy rates for industrial buildings

REPORT

PART I: INTRODUCTION

The intent of this study, the second output from the Industrial Land and Jobs study, is to assess how much of the region's industrially zoned land has already been converted, how much is likely to be converted in the near future, and whether there is likely to be sufficient industrial land to accommodate demand in 2040.

To determine the extent of conversion, we use several methods. We first estimate the extent to which the industrially zoned land is occupied by nonconforming uses, through two methods: fieldwork to check land uses on the ground, and analysis of the tax assessor database to determine how many industrial parcels have been recently converted in use. Next, we identify which cities with industrial land have experienced extensive building permit activity, mapping conflicts for the top three: San Jose, Oakland, and San Francisco.

Much industrial land has not been converted, but is underutilized. Building on Memo #1, which found very low industrial vacancy rates, this analysis uses assessor data linked to business data to determine where industrial land is vacant.

Previous work, most notably the Hausrath Economics/Cambridge Systematics report,[1] found that some industrially zoned land was at risk because it had already been designated for other uses in local general plans. Thus, the next section analyzes two kinds of conflicts: conflicts between existing industrial zoning and recent general plans, and conflicts between existing industrial zoning and designation as a Priority Development Area.

Based on the data from these analyses, we estimate for each county how much industrial land remains after removing land that has already been converted or is likely to be converted. We then compare that to the anticipated demand for land based on the 2040 employment forecast.

Finally, we use five cases to illustrate the opportunities and challenges presented by the conversion of industrial land: Mission Bay demonstrates a case where the choice to convert from industrial to mixed use made sense for San Francisco; the City of Richmond debatably also illustrates a case where conversion might work, while West Oakland offers a more complicated set of choices; and the experiences of San Jose and the Northern Waterfront in Contra Costa provide arguments for industrial land preservation. An appendix goes into more detail on Mission Bay and West Oakland.

PART II:
THE CONVERSION OF INDUSTRIALLY ZONED LAND IN THE BAY AREA

In Technical Memo #1, we found 97,823 acres of industrially zoned land in the 9-county Bay Area. Yet, zoning may not reflect what is on the ground. This occurs because many industrial zones have nonindustrial uses that predate the industrial zoning of the area, or simply because the zoning has not been updated as the land has been converted to other uses.

To determine the amount of industrially zoned land that has already been converted, we conducted three analyses: (1) fieldwork to verify zoning; (2) change of use according to historic tax assessor data; and (3) evidence of building activity on industrial land.

CONVERSION: FIELDWORK

To estimate the nonindustrial uses on industrial land in the Bay Area, we first took a geographically random sample of fifty industrially zoned parcels for each of the nine counties using GIS software. We inspected each parcel first via Google Maps satellite view, and if we were not able to verify the site's use, we visited it in person to make a determination.

Across the Bay Area, we found that 10% of the sampled parcels had current nonindustrial uses, or a total of 6.5% of the industrial acreage in the region. The highest levels of nonindustrial uses on industrial land by county were in Santa Clara and Sonoma Counties. Housing accounted for much of the nonindustrial uses on industrial land, particularly in San Francisco. Other nonindustrial uses included parks, dog parks, cemeteries, schools, and retail. Most of the land with nonindustrial uses was zoned for light industrial.

CONVERSION: TAX ACCESSOR DATA

The next step was to examine changes in use over time. The tax assessor data for each county includes a use code that identifies property use based on data provided by jurisdictions from a combination of general plan, zoning, and permit files. Although the data is likely of inconsistent quality between jurisdictions, there is very little missing data and it is updated yearly. Thus we were able to analyze changes in use code on industrially zoned land between 2007 and 2013.

As shown in Table 1, this analysis found that 0.8% of the industrially zoned acreage had changed in use over the six-year period, from a high of 1.5% in Alameda County to no little or no conversion in Napa and Solano counties. Table 2 zeroes in on the cities with the most industrially zoned parcels converted to residential use, finding 97 in Emeryville and 87 in San Francisco, but just a handful in other cities like Oakland, San Jose, Santa Rosa, and Richmond. Overall, just 14 acres of industrially zoned land were converted to residential use in the entire region from 2007 to 2013.

To verify that residential conversion had taken place, we inspected every parcel via Google Maps or fieldwork. In Alameda, San Francisco, and San Mateo counties, most of the parcels with suspected conversion had indeed experienced conversion, most with new residential construction. However, very little actual conversion to residential had occurred in Contra Costa and Sonoma counties; the change of the use code may reflect new residential permitting that has not yet resulted in construction.

	Industrial-Commercial		Industrial-Residential		Industrial-Other		Total		Total Exclusive Industrial Land	Industial Acreage Converted
County	Parcels	Acres	Parcels	Acres	Parcels	Acres	Parcels	Acres		
Alameda	56	132.04	16	9.4	48	220.04	120	361.48	20,656	1.8%
Contra Costa	2	5.16	1	0.25	8	181.01	11	186.42	16,237	1.1%
Marin	2	4.60	--	--	--	--	2	4.60	646	0.7%
Napa	--	--	--	--	--	--	--	--	2,395	0.0%
San Francisco*	5	0.86	87	0.29	1	0.10	93	1.25	986	0.1%
San Mateo	15	24.96	2	0.58	9	15.50	26	41.04	6,240	0.7%
Santa Clara	26	92.19	--	--	15	55.95	41	148.14	8,662	1.7%
Solano	27	2.99	--	--	--	--	27	2.99	9,975	0.0%
Sonoma	3	6.86	17	3.13	1	1.79	3	11.78	972	1.2%
TOTAL	136	269.66	123	13.65	82	474.38	323	757.69	66769	1.1%

Table 1. Conversion of industrially zoned parcels from industrial to other use, 2007-2013.
* Acreage not included for condominium lots.

City	Total Industrial Parcels Converted, 2007-13	Industrial Parcels Converted to Residential, 2007-13
Emeryville	100	97
San Francisco	93	87
Oakland	54	22
San Jose	102	21
Santa Rosa	17	16
Richmond	32	14
Pittsburg	13	8
Berkeley	14	6
Mountain View	26	4
Hayward	61	3
Sunnyvale	21	2
Milpitas	17	2
Alameda	8	2
San Leandro	29	1
Santa Clara	21	1
Antioch	6	1
San Bruno	6	1
North Fair Oaks	2	1
Graton	2	1
Daly City	1	1

Table 2. Conversion of industrially zoned parcels, 2007-2013, cities with residential conversion.

CONVERSION: RESIDENTIAL PERMITS

Many of the cities with concentrations of industrially zoned land also have high levels of housing construction. Most notably, San Jose, with over 6,400 acres of industrially zoned land, gained some 11,000 housing units from 2009 to 2013 (Table 3). Other cities in this category include Oakland, Fremont, Hayward, Pittsburg, Fairfield, Santa Clara, and Vacaville. Overall, the correlation between a city having industrially zoned land and it attracting housing unit construction is positive and significant (r = 0.37), possibly due to new interest in building housing near transit in the region's core—which is also where much of the region's industrial land is located.

County	City	Industrial Acres	Housing units built 2009-2013
Alameda	Oakland	6,999	1,879
Santa Clara	San Jose	6,410	10,937
Contra Costa	Martinez	4,956	16
Contra Costa	Richmond	4,919	326
Solano	Unincorporated Area	4,487	76
Alameda	Fremont	4,180	554
Alameda	Hayward	3,610	1,043
San Mateo	Unincorporated Area	3,143	254
Contra Costa	Concord	2,722	95
Solano	Benicia	2,702	35
Contra Costa	Pittsburg	2,521	853
Solano	Fairfield	2,517	961
Napa	Unincorporated Area	2,354	157
San Mateo	South San Francisco	2,301	126
Santa Clara	Santa Clara	2,197	885
Solano	Vacaville	2,170	1,102
Alameda	San Leandro	1,788	78
Alameda	Livermore	1,762	694
Santa Clara	Palo Alto	1,673	603
Santa Clara	Sunnyvale	1,585	2,229
Contra Costa	Rodeo	1,537	-
Santa Clara	Gilroy	1,496	684
San Mateo	Brisbane	1,436	59
Santa Clara	Milpitas	1,374	1,537
San Francisco	San Francisco	1,276	10,460

Table 3. Relationship between industrially zoned land and housing unit construction.

This relationship raises the question: In these cities with strong residential demand, how much encroachment is there on industrially zoned land? To analyze this, we obtained permit databases for Oakland and San Jose, the two top cities in terms of industrial land, and mapped them against land zoned exclusively industrial (not mixed use). Figure 1 shows the encroachment of residential units on industrially zoned land in Oakland, which is quite minimal: just 3.6% of units were located on industrially zoned land.[2] In San Jose, less than 1% of new housing units were located on industrially zoned land (Figure 2).[3]

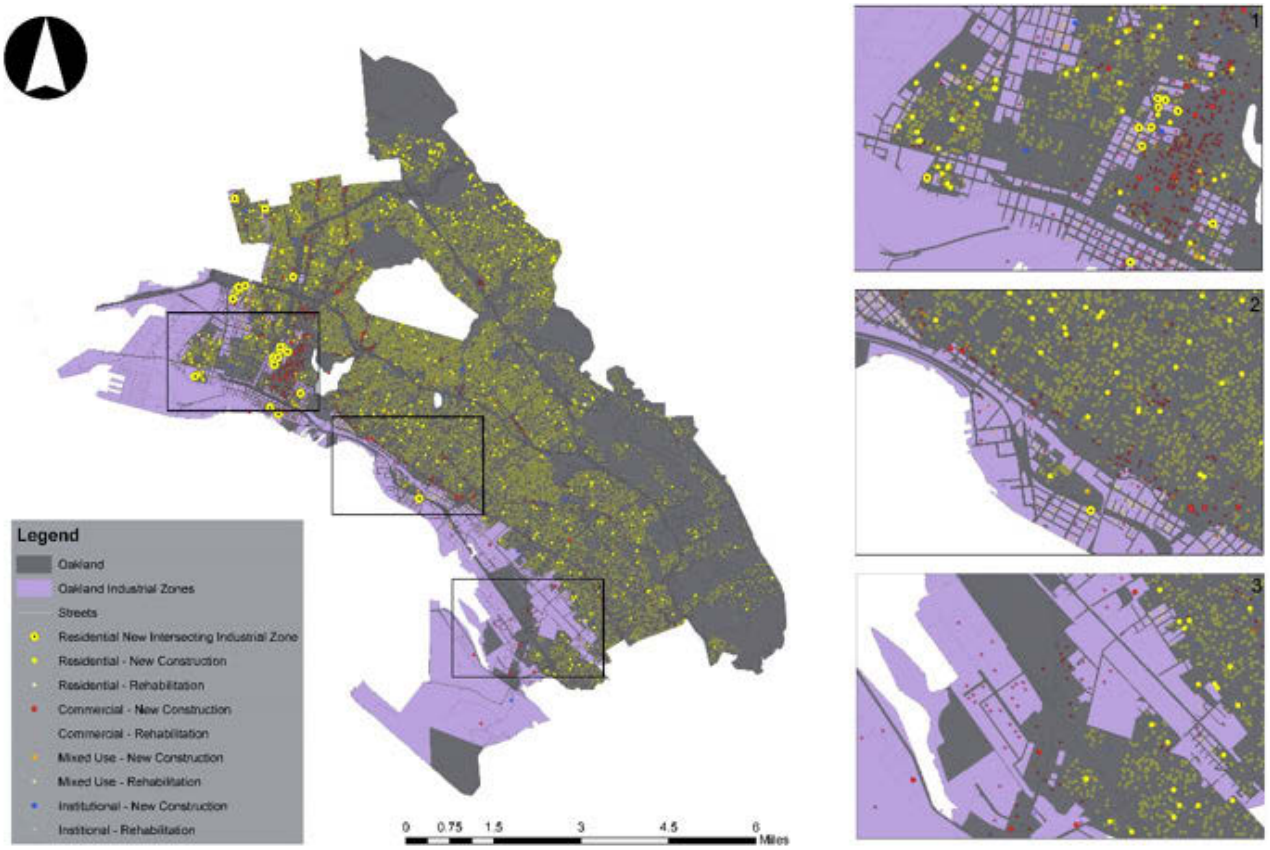


Figure 1. New residential units in Oakland, 2005-2015.

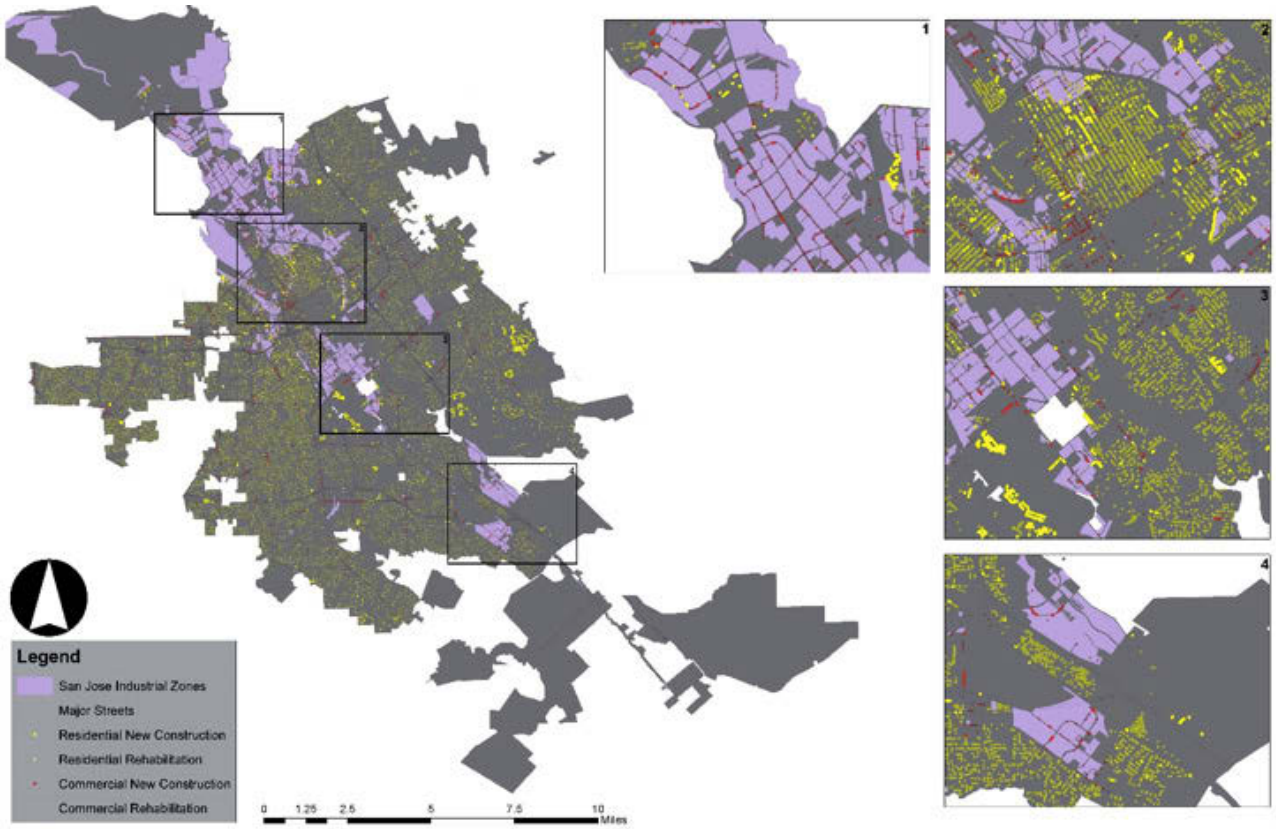


Figure 2. New residential units in San Jose, 2001-2014.

PART III: VACANT LAND IN THE BAY AREA

Technical Memo #1 analyzed vacancy rates for the region's industrial space, finding that building vacancy was reaching historic lows, from 2% in the South Bay to 6% in the North Bay. Here we look at the vacancy on industrially zoned land, based on the use code in the county assessor databases, which indicates whether industrial land is occupied or vacant. Looking only at parcels identified as industrially zoned, we find that 6% of the industrially zoned parcels (and 6.9% of the acreage) in the nine counties is vacant (Table 4). The vacancy rates on industrial land vary widely across the region. San Francisco and San Mateo counties have no vacant industrial land, according to the assessor database, suggesting either that the vacant industrial land in those counties has already been re-programmed for other uses—or that there are problems with the assessor data in those counties. There is very little vacant industrial acreage in Santa Clara and Alameda counties, but high rates in the North Bay, especially Napa (25%) and Solano (19%) counties. This suggests that the region has a potential reservoir of vacant industrial land in the North Bay.[3]

This analysis does not account for underutilization. Significant amounts of industrial land may also be underutilized, with the potential for redevelopment at higher densities.

County	Vacant Industrial Parcels	Vacant Industrial Parcels on Industrially Zoned Land	Vacant Industrial Acreage on Industrially Zoned Land	% Industrial Parcels Vacant	% Industrial Acreage Vacant
Alameda	1196	463	578.1	6.9%	2.4%
Contra Costa	694	338	2011.9	8.1%	10.0%
Marin	115	39	114.7	4.6%	6.6%
Napa	204	156	996.6	19.1%	25.4%
San Francisco	0	N/A	N/A	N/A	N/A
San Mateo	0	N/A	N/A	N/A	N/A
Santa Clara	52	36	145.0	0.4%	0.8%
Solano	557	409	2763.7	16.3%	19.1%
Sonoma	360	92	170.0	5.9%	8.5%
TOTAL	3178	1533	6780.1	6.0%	6.9%

Table 4. Vacant industrially zoned land

PART IV: INDUSTRIAL LAND OVERLAPS WITH OTHER DESIGNATIONS

For this analysis, we examine the extent to which industrially zoned land has conflicting general plan or Priority Development Area (PDA) designations. Because a jurisdiction's general plan and/or PDA designation is intended to guide the long-term development of land, parcels now zoned for industrial activities can be considered overlapping or in conflict if the general plan or PDA proposes future non-industrial activities for that parcel. The analysis of conflicts between industrial zoning and general plans focuses on exclusive industrial land and industrial-office zones, since mixed-use industrial land already permits a variety of uses and thus is not necessarily in conflict with residential or commercial designation. For the analysis of conflict with PDA designations, we include both exclusive and mixed-use industrial land in order to demonstrate the potential conflict with these areas of future concentrated growth.

GENERAL PLAN ANALYSIS: BACKGROUND AND METHODOLOGY

This calculation was conducted through an assessment of the general plan land use designations for each industrially-zoned parcel in the region. In this analysis, general plan designations that move away from industrial uses were coded into the following three categories (Table 5):

Residential	The residential category refers to all single-family and multi-family residential land use designations, as well as mixed-use designations intended to introduce or increase residential uses in particular areas of a jurisdiction. Converting industrial land to residential has become an attractive option for some cities in the face of housing shortages, making this category of special interest to the study.
Commercial	This category includes all commercial designations that support activities such as restaurants, hotels, and retail businesses, as well as mixed-use designations that promote the intensification of these commercial activities in select districts or corridors.
Other	The other category encompasses all land use designations other than residential and commercial ones that also move away from industrial activities. This includes general mixed-use districts, parks and open space, and public and institutional centers. It should be noted that areas designated for use by public and quasi-public agencies for their industrial activities, such as airports and water management facilities, are excluded from the other category.

Table 5. General Plan Designations Conflicting with Industrial Zoning

In order to generate an estimate for the proportion of land that is at risk of conversion, the acreage of parcels with non-industrial general plan categories was divided by the total acreage of parcels with the exclusive industrial and industrial-office zoning categories (outlined in Technical Memo #1). The following analysis breaks these percentages down by county as well as by general plan category.

% of Industrial Land Susceptible to Conversion =

(Acres of industrially zoned land with nonindustrial general plan category (Residential,Commercial,or Other))

(Acres of land with industrial zone category (Heavy,Medium,or Light Industrial or Industrial Office))

**Note: The denominator excludes two industrial zone categories identified in Section 3 – Mixed Use Industrial-Residential and Mixed Use Industrial-Commercial – because these zones are already moving away from traditional industrial activities with the introduction of residential and commercial uses. For industrial-office land, we only consider conversion risk to residential, since most commercial uses are permitted as-of-right.*

Figure 3. Calculation of Industrial Land Susceptible to Conversion

Because San Francisco County's general plan does not include a land use element, its risk percentage was calculated using an alternative method (see Appendix 1).

CONFLICTS BETWEEN GENERAL PLAN AND INDUSTRIAL ZONING DESIGNATIONS, SF BAY AREA

According to our analysis, in the nine-County Bay Area region, a total of 15,084 acres of industrially zoned land are potentially in conflict with non-industrial designations (such as a PDA or a general plan designation), comprising about 17% of the region's current industrial land area. Using a similar methodology, the Hausrath Economics/Cambridge Systematics 2008 report found that 38% of industrial land area was in conflict; however, their analysis looked at two small sub-areas, the 880 and 101 corridors, rather than the whole nine-county region.

As Table 6 shows, the percentage of industrially zoned land overlapping with non-industrial designations varies significantly across the different counties. In Napa County, which has a small share of the region's industrial land, there is only a 1% overlap between industrial land (exclusive and mixed-use) and non-industrial general plan or PDA designations. This is most likely because much of its stock has already been rezoned to nonindustrial uses, such as office and commercial development. On the other extreme, almost half of all industrial land in San Francisco is experiencing new conflict due to the strategic introduction of mixed-use zones in parts of the city (see Appendix 1). In Alameda County, which has the highest share of industrial land in the region, a more moderate 14% of industrial land overlaps with other designations (Figure 4).

Housing is the least likely use to replace industrial land in the region overall.

When the area of land in conflict is broken down by the proposed land uses that are expected encroach on existing industrial uses, one can see that the Other category (mostly parks and public facilities) comprises the majority conflicting land uses (Table 7). This could be due to the fact that the Other category is made up of a wide variety of general plan designations that are not explicitly focused on either residential or commercial, both of which are more narrow and defined uses. Thus, this particular methodology indicates that housing is the least likely to replace industrial land in the region overall.

County	Total Acres of Industrial Land*	Acres of Industrial Land in Conflict	Percentage of Industrial Land in Conflict
Alameda	22,127	3,135	14%
Contra Costa	18,357	4,207	23%
Marin	1,426	410	29%
Napa	3,809	33	1%
San Francisco**	1,971	957	49%
San Mateo	8,883	389	4%
Santa Clara	18,501	1,424	8%
Solano	11,911	4,142	35%
Sonoma	1,437	387	27%
Bay Area	**88,422**	**15,084**	**17%**

Table 6. Industrial Land Conflicting with Other Designations, by County

* Includes exclusive industrial land plus industrial-office land; thus totals differ from Table 9.
**Because the San Francisco General Plan does not include a land use element, acres at risk was calculated using an alternative method described in Appendix 1.

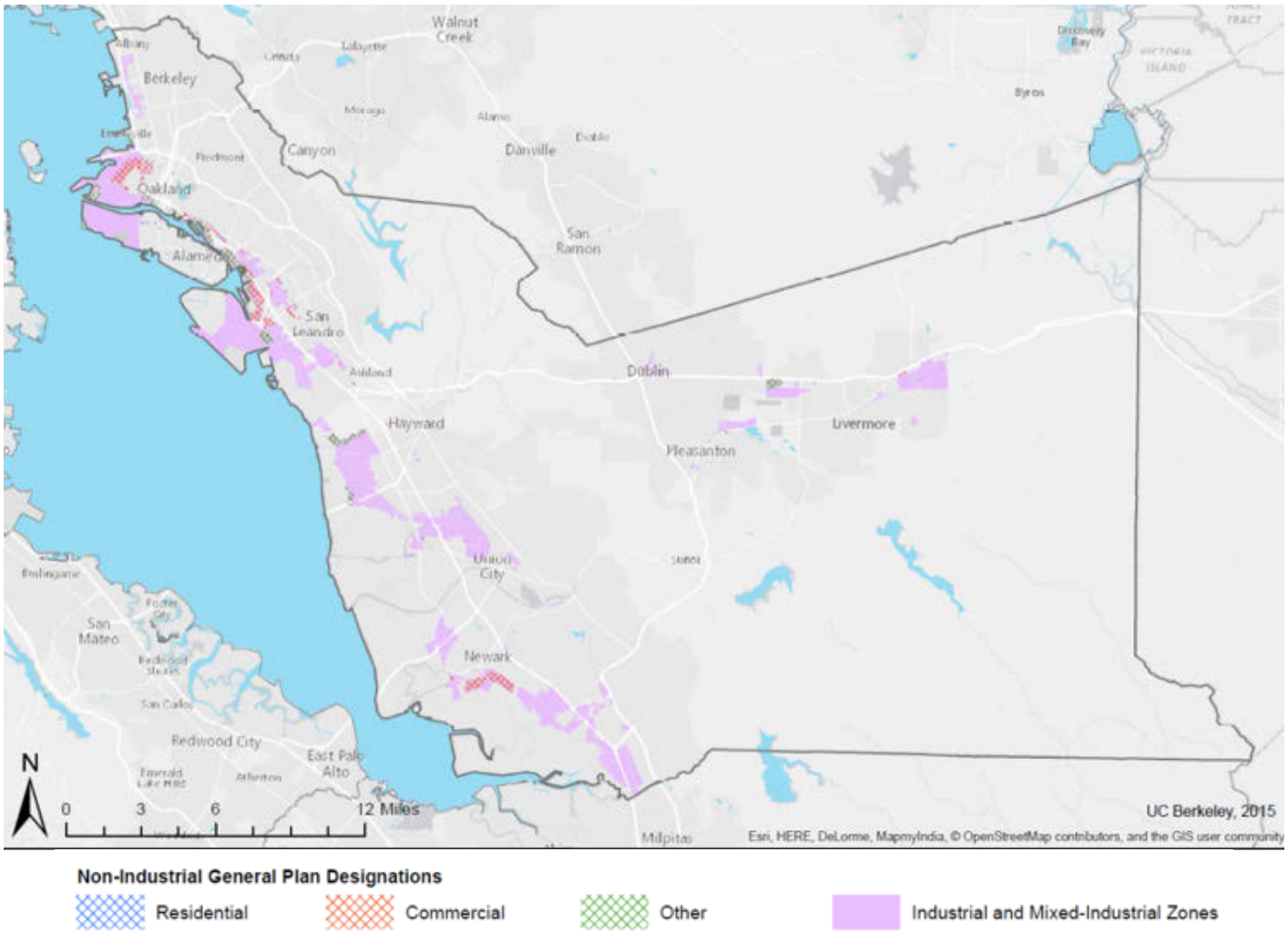


Figure 4. Industrial Land in Conflict with Other Designations in Alameda County.

Land Use Conflicting with Industrial	Total (Acres)	Percentage
Residential	1,124	7%
Commercial	4,031	27%
Other	9,929	66%
Total Acres of Industrial Land at Risk	**15,084**	**100%**

Table 7. Industrial Land in Conflict with General Plan Designations, Bay Area

The proportion of industrial land that is in conflict with a general plan designation varies slightly across each of the counties (Figure 5). The Other category comprises more than half of all general plan conflicts with industrial land in all of the counties except for Sonoma County. Most of the industrial land in Sonoma County (44%) overlaps with new residential designations, and San Francisco and Santa Clara have notable areas of potential conversion to residential as well, both above 20%. The potential conflict to industrial from new commercial designations is most prevalent in Alameda County, San Mateo County, Solano County, and Sonoma County, all of which have commercial conflict percentages over 34%. For more detailed analysis of each county, please see Appendix 1.

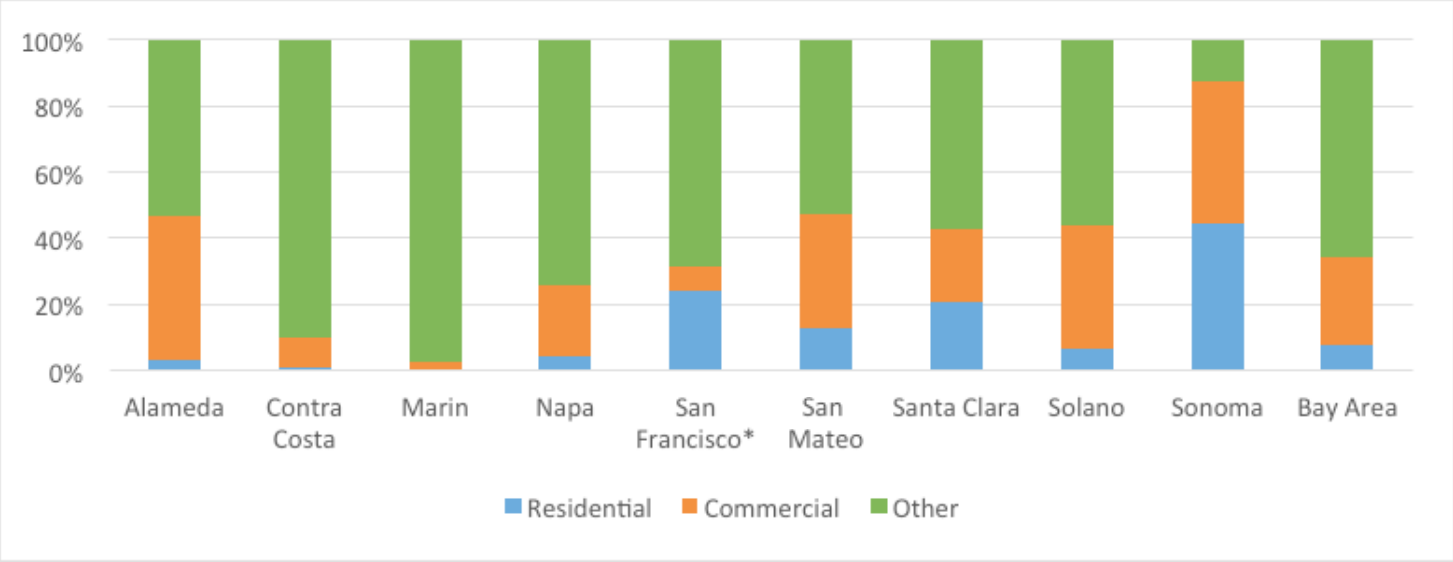


Figure 5. Industrial Land in Conflict with General Plan Designation, Bay Area Counties

*Because the San Francisco General Plan does not include a land use element, the percentage of acres at risk was calculated using an alternative method (see Appendix 1).

CONFLICTS BETWEEN PDA AND INDUSTRIAL ZONE DESIGNATIONS, SF BAY AREA

A considerable amount of industrially zoned land falls within the region's PDAs (Table 8 and Figures 6-9). Across all counties, about 16,700 acres out of a total 97,800 acres of industrially zoned land overlap with PDAs—about 17%, a land area that encompasses about one-fifth of the region's industrial jobs (see Technical Memo #3). Nearly half of this area of overlap is on exclusive industrial land, and half is on mixed-use industrial land. The distinction between exclusive and mixed-use is significant, as mixed-use areas are, by nature of their zoning, more vulnerable to partial or total encroachment from commercial, office, or residential uses. Since higher rent users can outbid industrial users, mixed-use industrial land is usually considered somewhat "already at-risk". Therefore, the overlap of exclusive IL with PDAs, making up 8% of the Bay Area's total industrial land base, is an unexpected finding.

The overlap of exclusive IL with PDAs, making up 8% of the Bay Area's total industrial land base, is an unexpected finding.

County		Total IL	Total exclusive IL	Total mixed IL	Total PDA/IL overlap	Overlap w/ exclusive IL	Overlap w/ mixed IL
Alameda	Acres	**24,192**	20,656	3,535	**5,894**	4,000	1,894
	Percent	**100%**	85%	15%	**24%**	**17%**	**8%**
Contra Costa	Acres	**19,373**	15,645	3,729	**1,909**	616	1,293
	Percent	**100%**	81%	19%	**10%**	**3%**	**7%**
Marin	Acres	**1,744**	639	1,105	**27**	15	12
	Percent	**100%**	37%	63%	**2%**	**1%**	**1%**
Napa	Acres	**3,994**	2,423	1,571	**22**	22	0
	Percent	**100%**	61%	39%	**1%**	**1%**	**0%**
San Francisco	Acres	**1,971**	986	985	**1,939**	976	963
	Percent	**100%**	50%	50%	**98%**	**50%**	**49%**
San Mateo	Acres	**10,853**	6,062	4,791	**1,314**	303	1,011
	Percent	**100%**	56%	44%	**12%**	**3%**	**9%**
Santa Clara	Acres	**18,500**	8,661	9,839	**4,103**	869	3,235
	Percent	**100%**	47%	53%	**22%**	**5%**	**17%**
Solano	Acres	**14,066**	9,742	4,324	**1,267**	1,114	153
	Percent	**100%**	69%	31%	**9%**	**8%**	**1%**
Sonoma	Acres	**2,003**	979	1,024	**307**	214	93
	Percent	**100%**	49%	51%	**15%**	**11%**	**5%**
Total Bay Area	Acres	**96,696**	65,793	30,903	**16,782**	8,129	8,653
	Percent	**100%**	68%	32%	**17%**	**8%**	**9%**

Table 8. Summary data on the amount of industrially zoned land, by county, that overlaps with PDAs

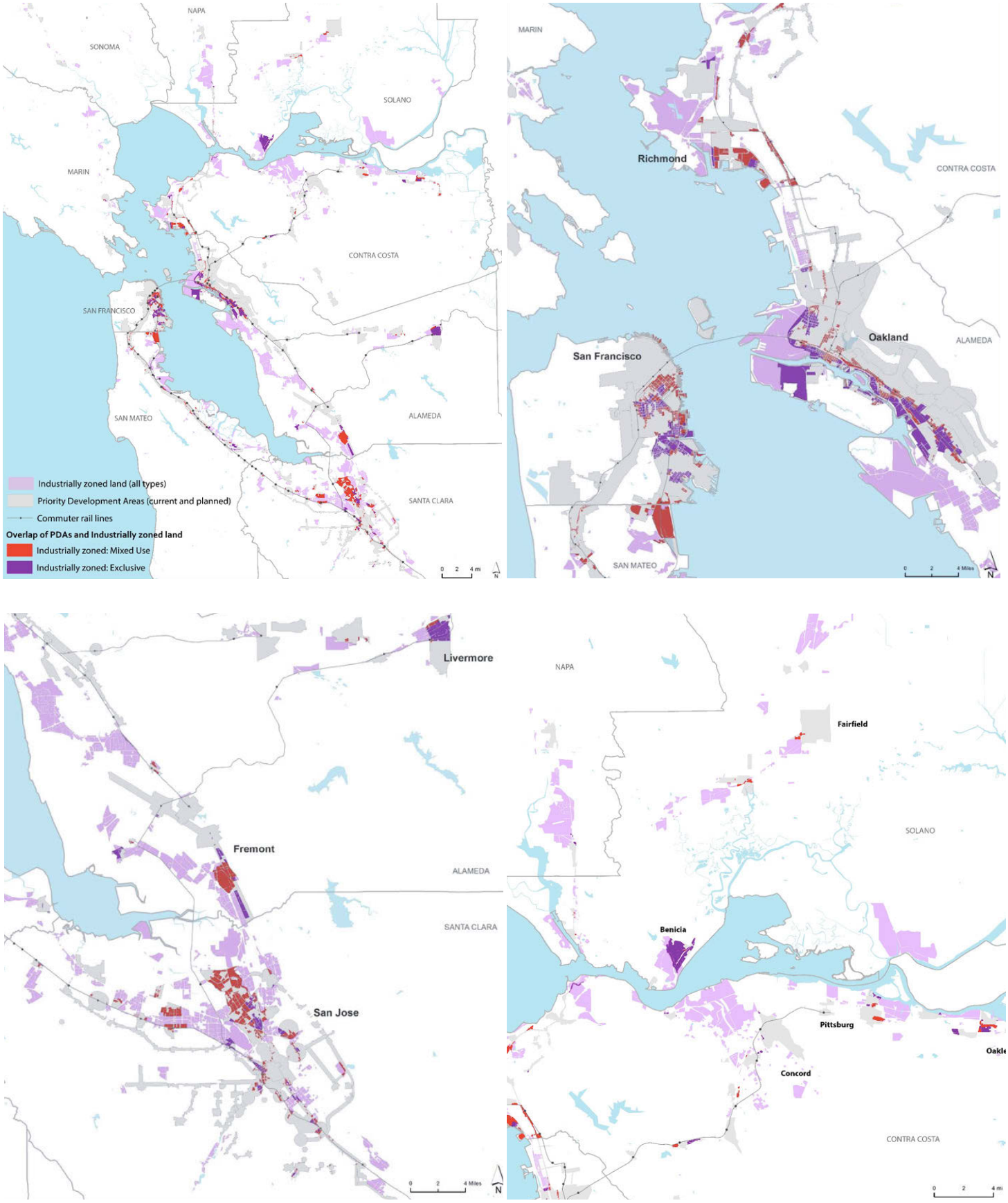
Again, there is extreme variation by county. Most starkly, San Francisco stands out because the near entirety of its IL falls within PDAs. Alameda and Santa Clara are next in terms of highest percentages and acreage of overlap. Both counties have about 22-24% of their industrial land within PDAs. They differ from each other, however, in the breakdown between exclusive and mixed-use industrial land: while a majority of the overlap between industrial land and PDAs in Alameda County is on exclusive industrial land, Santa Clara's overlap is mostly on land that is already zoned mixed-use industrial. This is partly explained by the counties' respective specializations: the South Bay is home to a much larger share of R&D, while the East Bay and Alameda in particular have a larger manufacturing and transportation infrastructure industrial base. Prominent areas of overlap in Alameda County are in Oakland, Fremont, and Livermore, while in Santa Clara County, most of the overlap is in San Jose.

Looking at both percentages and extent of land, the next counties with large amounts of overlap are, in order of acreage, Contra Costa, San Mateo, and Solano. They show between 1,200 and 1,900 acres of IL overlap with PDAs, which represents between 9-12% of all their industrial land. Contra Costa (mostly in Richmond) and San Mateo (in Brisbane) have mostly mixed-use overlap, while Solano has mainly exclusive industrial land overlap. Sonoma County has 15% overlap, the majority of which is on exclusive industrial land.

Unsurprisingly, most of the concentrated pockets of PDA/IL overlap are geographically centered on a mass-transit station, such as a BART or other heavy-rail station. This is the case in San Francisco, Oakland, Livermore, San Jose, and Brisbane, as well as Fremont if considering the future BART station. The areas of overlap in Richmond and Benicia are not located on mass-transit, but on a future ferry stop and a future bus hub, respectively.

Many cities do not have any PDA/industrial land overlap. Examples include Berkeley, certain cities along the I-880 such as San Leandro and Hayward, and portions of the Contra Costa Northern Waterfront. In some cases, this explicit lack of overlap is intentional. For instance, the City of Berkeley has had extensive policy debate on the issue of industrial land conversion and retention, and now closely monitors West Berkeley's industrial zoning and uses. Another good example is the Northern Waterfront in Contra Costa County. The county, several jurisdictions, and private partners have coordinated efforts to plan, at a subregional scale, for the preservation of key areas in relation to existing assets and potential growth areas.

Interviews with city officials about the overlap between industrial zones and PDAs revealed mixed perspectives. For some, overlap means heightened conflict between residential development and industrial businesses and jobs, suggesting that PDA designation should be revisited. For others, overlap is intentional, meant to speed the conversion of industrial land. One interviewee pointed out that PDA designation is not necessarily in conflict with industrial uses, if zoning is used to protect industrial.[5]

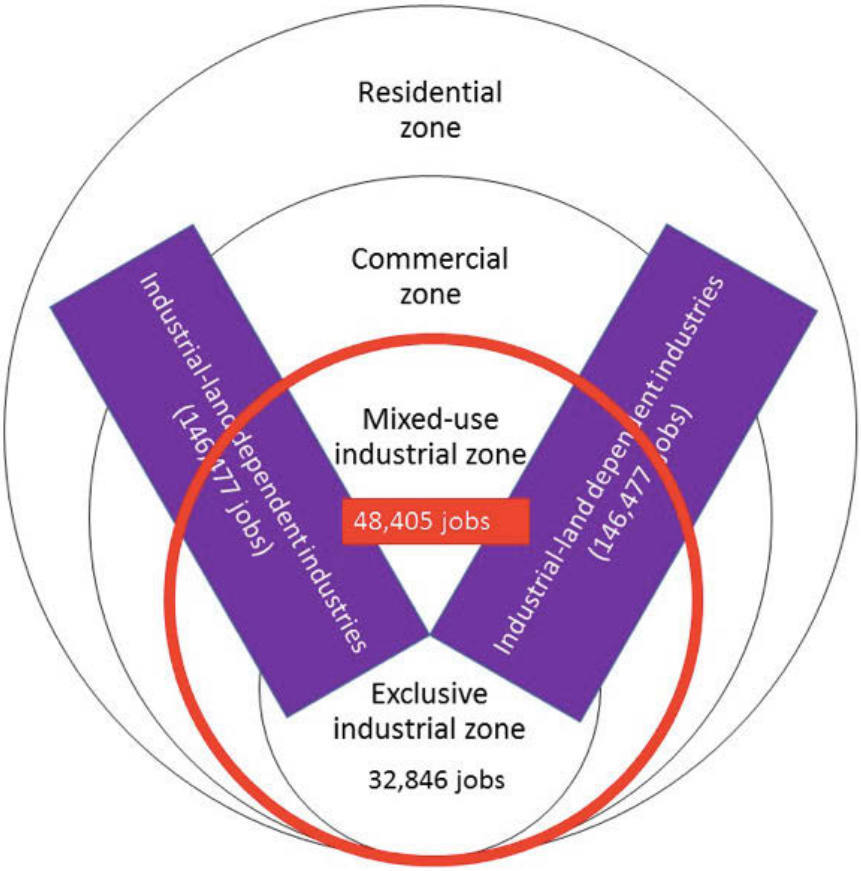


Figures 6-9. Overlap of PDA designation and industrially zoned land

PART V: ESTIMATING FUTURE INDUSTRIAL LAND SUPPLY AND DEMAND

Based on this analysis, we next estimate the amount of industrially zoned land available in the future, after accounting for land that is already converted and/or overlapping and conflicting with other designations. Comparing the available land to the employment projections for 2040, we can determine whether there is sufficient land to meet future demand.

Calculations rely on estimates of industrial land supply from Technical Memo #1, combined with employment forecasts provided by the Association of Bay Area Governments. Technical Memo #3 describes the methodology for allocating countywide forecasts to block groups. But as noted in Technical Memo #1, block groups include land that is zoned commercial and residential as well as industrial; in other words, the industries that prefer to locate on exclusive industrial land (industrial land-dependent industries), from auto repair shops to storage to maker facilities, are also located in a variety of other zones (Figure 9). Thus, the block group estimates, which predict growth of 146,477 jobs, are a high estimate of demand for industrially zoned land. A medium estimate would look only at jobs in the exclusive and mixed-use zones (48,405 jobs), and a low estimate focuses only on exclusive land (32,846 jobs). Figure 9 describes the projected location of these low, medium, and high scenarios.



Figures 6-9. Overlap of PDA designation and industrially zoned land

In order to translate 2040 net new jobs into acreage of industrial land absorbed, it is necessary to make two intermediate calculations: employment density (number of jobs per 1,000 square feet of building space), and floor area ratio (the ratio of built space to lot area). To calculate average employment density, we link the NETS parcel-level business data to assessor parcel data and analyze how many employees per building square foot are on each parcel. Next, to estimate average floor area ratios, we divide average built square footage by average lot size (from the assessor parcel data). Across the nine counties, the majority of tax assessor records for industrial parcels are missing data on building square footage. Because this limits sample size, the analysis combines data for the nine counties into four subregions: San Francisco, North Bay, East Bay, and South Bay.

The analysis uses average employment densities from 2011 to project needs in 2040. However, the number of employees per square foot is gradually changing in some industries. In high tech, there are two divergent trends. On the one hand, growth in software and web-related businesses means more demand for office, rather than R&D flex space, often in urban areas with higher densities. On the other hand, high-tech manufacturing is increasingly automated, reducing the number of employees and thus density. Warehousing and logistics continue to require relative low employment densities, although there is some indication that the transformation of delivery systems will mean more workers. Other sectors are remaining quite stable in employment (e.g., school bus drivers or apparel manufacturing).

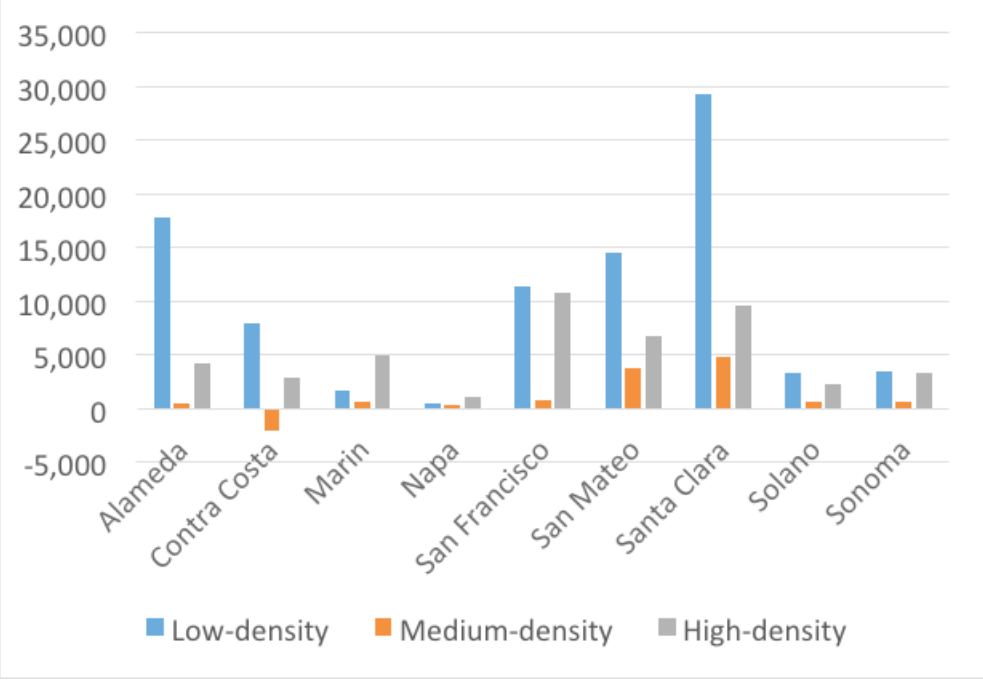


Figure 10. Projected 2011-20140 job growth by employment density

The employment density of businesses located on industrially zoned land varies in each county depending on its mix of industries. To determine whether using average employment densities is more likely to over- or under-estimate densities in the future, we analyzed net job growth in each county to determine whether it was occurring in low-, medium-, or high-density sectors. Low employment density sectors include construction, transportation, utilities, warehousing, and wholesale. Medium density include manufacturing, retail, and waste management/support industries. High density include professional services, arts, education, and health care.

Figure 11 portrays the forecasted employment change by employment density for the nine counties from 2011 to 2040. In most counties, low employment density sectors such as construction or wholesale are projected to add the most jobs, with high density a distant second (in areas adding service sector employment). Growth in medium density industries is relatively stagnant, due to the forecasted decline in manufacturing across the region (but particularly impacting Santa Clara and Alameda counties). This suggests that by using average employment densities, this analysis creates a conservative estimate of the amount of land needed. With fewer employees per square foot, the regional surplus of industrial land will decrease—and with higher employment densities, it will increase. In general, the low-density sectors that are growing in the region will be consuming more square feet per employee, in lots with a relatively lower floor area ratio, than our estimates assume.

As shown in Table 9, the majority of counties—particularly Santa Clara, San Mateo, and Alameda—will experience a significant shortage of industrially zoned land, offset by considerable surpluses in Contra Costa, Napa, and Solano counties. Altogether, a surplus of 1,944 acres of industrially zoned land is anticipated in 2040, but much is located far from the greatest demand for industrial land, in the core. This analysis conservatively assumes that employment densities (square footage per employee) will remain constant in the future.

Below are the calculations and assumptions used to arrive at the estimates.

Step 1. Estimates of industrially zoned acreage developed by gathering zoning data from 101 jurisdictions and county unincorporated areas (see Technical Memo #1).
Step 2. Estimates of exclusive industrial land created via a standard zoning classification system across the nine counties that separates zoning designations that only allow industrial and transportation uses from designations that allow office or other mixed uses (see Technical Memo #1).
Step 3. Fieldwork to check the industrial zoning in Steps 1 and 2 determined that a percentage of the industrially zoned land in each county had already been converted.
Step 4. Analysis of tax assessor data revealed the extent of use conversion in each county during a six-year period (2007-13). This estimate was considerably lower than that identified by fieldwork.
Step 5. To extend the six-year analysis in Step 4 to the 30-year projection period, the conversion rate was multiplied by 5.
Step 6. Multiplies the acreage in Step 2 by the fieldwork estimate in Step 3 to create an estimate based on the high conversion factor.
Step 7. Multiplies the acreage in Step 2 by the tax assessor estimate in Step 5 to create an estimate based on the low conversion factor.
Step 8. Subtracts the fieldwork conversion factor (Step 5) from exclusive industrial land (Step 2) to create a low estimate of net industrial land.
Step 9. Subtracts the assessor conversion factor (Step 6) from exclusive industrial land (Step 2) to create a high estimate of net industrial land.
Step 10. Estimates vacant industrial land based on the assessor data use code for vacant industrial use, when located on industrially zoned parcels.
Step 11. Calculates occupied industrial land based on the high estimate of industrial land (Step 9) minus the vacant land (Step 10).
Step 12. Estimates industrially zoned acreage in conflict with local general plan designation.
Step 13. Estimates industrially zoned acreage in conflict with PDA designation.
Step 14. Subtracts out acreage that falls into both Step 12 and Step 13 categories (both general plan and PDA conflicts).

Step	Variable	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano	Sonoma	TOTAL
1	Total industrial land (acres)	24,192	20,206	1,750	3,931	1,971	10,845	18,501	14,432	1,996	97,824
2	Exclusive industrial land (acres)	20,656	16,237	646	2,395	986	6,240	8,662	9,975	972	66,769
	Likely already converted										-
3	Estimated via fieldwork	8.0%	10.0%	6.0%	2.0%	8.0%	8.0%	20.0%	4.0%	24.0%	9.4%
4	Estimated via use code conversion (6-years)	1.8%	1.1%	0.7%	0.0%	0.1%	0.7%	1.7%	0.0%	1.2%	1.1%
5	Estimated use code conversion over 30 years	9%	6%	4%	0%	1%	4%	9%	0%	6%	6%
	Conversion estimate										
6	Via fieldwork (acres)	1,652	1,624	39	48	79	499	1,732	399	233	6,306
7	Via use code conversion (acres)	1,859	893	23	-	5	218	736	-	58	3,793
	Net exclusive industrial land										
8	Estimate based on fieldwork conversion factor (acres)	19,004	14,613	607	2,347	907	5,741	6,930	9,576	739	60,463
9	Estimate based on assessor conversion factor (acres)	18,797	15,344	623	2,395	981	6,022	7,926	9,975	914	62,976
	Available industrial land (exclusive + mixed-use)										
10	Vacant industrial land (acres)	578	2,012	115	997	-	-	145	2,764	170	6,780
11	Occupied industrial land	18,219	13,332	509	1,398	981	6,115	7,781	7,211	744	56,290
12	Exclusive IL conflicting with General Plan designation	3,135	4,207	410	33	957	389	1,424	4,142	387	15,084
13	Exclusive IL conflicting with PDA designation	4,000	616	15	22	976	303	869	1,114	214	8,129
14	*- PDA conflict/general plan conflict overlap*	1,399	227	0	0		99	464	774	146	3,109
15	Total industrial land susceptible to conversion	5,736	4,596	425	55	976	593	1,829	4,482	455	19,147
	Vacant IL conflicting with GP designation	111	256	80	8	-	-	2	1,758	23	2,238
	Vacant IL conflicting with PDA designation	250	128	2	3	-	-	21	506	38	948
16	Total occupied industrial land remaining	13,061	10,748	199	2,340	5	5,429	6,097	5,493	458	43,830
16	Total vacant industrial land remaining	217	1,628	33	986	-	-	122	500	109	20%
17	Current vacancy rate (built stock)	5%	5%	6%	6%	3%	2%	3%	6%	6%	
18a	IL-dependent jobs on exclusive IL in 2011	51,244	9,976	983	1,619	15,224	16,230	37,317	8,473	2,837	143,853
18b	IL-dependent jobs on exclusive + mixed-use IL in 2011	58,940	16,409	3,304	2,667	20,167	26,677	62,412	10,926	4,059	205,561
18c	All IL-dependent jobs in 2011	129,465	50,046	15,610	6,158	78,151	101,197	164,686	26,534	28,977	600,824
19a	Exclusive IL-dependent jobs forecast for 2040	60,209	11,731	1,371	2,137	19,700	20,270	47,268	10,444	3,567	176,699
19b	Exclusive + mixed-use IL-dependent jobs forecast for 2040	69,252	19,296	4,856	3,520	26,097	33,318	79,056	13,468	5,104	253,966
19c	All IL-dependent jobs forecast for 2040	152,115	58,851	22,943	8,128	101,130	126,387	208,603	32,707	36,435	747,301
20a	Anticipated IL-dependent job growth by 2040: low	8,965	1,755	438	518	4,476	4,040	9,951	1,971	730	32,846
20b	Anticipated IL-dependent job growth by 2040: medium	10,312	2,887	1,552	853	5,930	6,641	16,644	2,542	1,045	48,405
20c	Anticipated IL-dependent job growth by 2040: high	22,650	8,805	7,333	1,970	22,979	25,190	43,917	6,173	7,458	146,477
21	SF per employee on industrially zoned land (current)	387	387	410	410	254	331	331	410	410	3,330
22	Floor area ratio on industrially zoned land	0.16	0.16	0.22	0.22	1.28	0.28	0.28	0.22	0.22	3
23a	Total building square footage required for growth (low)	3,470,725	679,495	179,559	212,186	1,138,743	1,338,857	3,297,738	807,563	299,123	11,423,990
23b	Total building square footage required for growth (medium)	3,991,971	1,117,666	635,865	349,537	1,508,475	2,200,659	5,515,782	1,041,359	427,966	16,789,281
23c	Total building square footage required for growth (high)	8,768,586	3,408,783	3,004,192	807,068	5,845,631	8,348,018	14,554,112	2,528,961	3,055,231	50,320,583
24a	Total industrial land required for growth (acres) (low)	495	97	19	23	20	110	271	86	32	1,152
24b	Total industrial land required for growth (acres) (medium)	569	159	68	37	27	181	453	111	45	1,650
24c	Total industrial land required for growth (acres) (high)	1251	486	319	86	105	685	1195	268	324	4,720
25a	2040 Surplus (deficit) (land required - vacant) (low)	-278	1531	14	963	-20	-110	-149	414	77	2,442
25b	2040 Surplus (deficit) (land required - vacant) (medium)	**(352)**	**1,469**	**(35)**	**949**	**(27)**	**(181)**	**(331)**	**389**	**64**	**1,944**
25c	2040 Surplus (deficit) (land required - vacant) (high)	(1,034)	1,142	(286)	900	(105)	(685)	(1,073)	231	(215)	(1,126)

Table 9. Estimate of future (2040) demand for and supply of industrial land

Step 15. Calculates the total industrial land in conflict: Step 12 (general plan conflict) plus Step 13 (PDA conflict) minus Step 14 (duplicate acreage).
Step 16. Subtracts the total industrial land in conflict (Step 15) from the estimate based on the assessor conversion factor (Step 9).
Step 17. Provides the current vacancy rate in built industrial space by subregion (North Bay, East Bay, South Bay, San Francisco) (informational only, not used in calculations).
Steps 18a-c. Provides the number of jobs currently (2011) on industrial land—including only those that are industrial land-dependent (location quotient over 2 for industrial land—see Technical Memo #1). This includes low (exclusive land only), medium (mixed-use and exclusive land), and high (block groups with industrial land-dependent industries) scenarios.
Step 19a-c. Uses the Plan Bay Area jobs forecast (REMI outputs) to forecast industrial land-dependent jobs in 2040 for low, medium, and high scenarios.
Step 20a-c. Provides the growth increment (Step 19-Step 18).
Step 21. Calculates the average square footage per employee for Bay Area sub-regions (North Bay, East Bay, South Bay, San Francisco) for exclusive industrial land (from tax assessor and REPORT: PART V NETS employment data, as described above).
Step 22. Calculates the floor area ratio for exclusive industrial land for Bay Area subregions (North Bay, East Bay, South Bay, San Francisco) from assessor parcel data).
Step 23a-c. Estimates total building square footage needed by multiplying Step 20 (the growth increment) by Step 21 (square footage per employee). Note that this assumes that square footage per employee remains constant.
Step 24a-c. Estimates exclusive industrial land needed by apply the FAR in Step 22 to the building square footage in Step 23 and converting to acres.
Step 25a-c. Subtracts the land needed for growth (Step 24) from the vacant industrial land (Step 10) to determine whether each county has a surplus or a deficit.

The largest future deficits in industrial land are projected to occur in Alameda and Santa Clara Counties.

Finally, the analysis of the overlap and conflict of industrially zoned land with general plan and PDA designations suggests that a significant number of jobs are at risk of potential displacement. Displacement will occur gradually, as new uses occupy the land cities have designated for commercial and residential development, and new households and service firms move to the high-density PDA growth areas. Demand from these new uses and growth will elevate land prices, and businesses that do not own their land may experience rent increases and thus involuntary displacement. Even those that own their property may decide to profit from the conversion of their land and move away, in a process of voluntary displacement.

Table 10 calculates the resultant surplus or deficit of industrial land in each county, adding the displacement of jobs from general plan redesignation or PDA designation to the job growth projections presented in Table 9. Looking just at conflicts with general plan designation, the projected surplus of land decreases to 665 acres, with deficits projected particularly in Alameda and Santa Clara counties, and surpluses in Contra Costa and Napa counties. Including PDA conflicts as well, the entire region is in a deficit of 208 acres, again with the largest deficits projected to occur in Alameda and Santa Clara counties.

Table 10. Jobs potential displaced by the conversion of industrial land conflicting with general plan or PDA designation

Variable	Alameda	Contra Costa	Marin	Napa	San Francisco	San Mateo	Santa Clara	Solano	Sonoma	TOTAL
Displaced jobs: PDA	11,859	511	105	-	1,210	3,802	6,234	4,360	1,103	29,184
Displaced jobs: GP	17,928	756	321	89		1,350	4,836	521	873	26,674
Total displaced jobs (PDA+GP-overlap)	23,807	1,267	426	89	1,210	5,152	11,070	4,881	1,976	49,878
Total building square footage required for relocation (GP only)	6,940,469	292,670	131,502	36,460	-	447,387	1,602,639	213,435	357,637	10,022,201
Total building square footage required for relocation (PDA+GP)	9,216,407	490,494	174,517	36,460	307,808	1,707,361	3,668,572	1,999,574	809,498	18,410,692
Total industrial land required for relocation (GP only)	990	42	14	4	-	37	132	23	38	1,279
Total industrial land required for relocation (PDA+GP)	1,315	70	19	4	6	140	301	212	86	2,152
2040 surplus (deficit) (GP only)	(1,342)	1,427	(49)	945	(27)	(217)	(463)	366	26	665
2040 surplus (deficit) (PDA+GP)	(1,667)	1,399	(53)	945	(33)	(321)	(632)	177	(22)	(208)

PART VI:
CASE STUDIES

Next we present five brief case studies, based on interviews with local officials complemented by archival research, that illustrate the challenges and opportunities in converting industrially zoned land to other uses. Mission Bay demonstrates a case where the choice to convert from industrial to mixed use made sense for San Francisco. Richmond debatably also illustrates a case where conversion might work, while West Oakland offers a more complicated set of choices. San Jose and the Northern Waterfront in Contra Costa present arguments for industrial land preservation. Detailed case studies of Mission Bay and Oakland can be found in Appendix 2.

MISSION BAY

Mission Bay illustrates how a neighborhood with significant industrial land can be successfully redeveloped into new uses. Understanding why the redevelopment was successful can help us develop criteria for when redeveloping industrial land makes the most sense.

Mission Bay is located very close to the Financial District. In the 1990s, high tech companies began establishing a niche in the South of Market. Just to the south, Mission Bay was experiencing a decline in productive uses, and began transitioning from wholesale uses to professional services and health care.

The 40-acre Mission Bay site was owned by one entity, allowing the site to be entitled by a single master-developer and then subdivided for individual project build-out. With the bulk of the site dedicated to UCSF for a biomedical campus, there was considerable land leftover for other office, residential, and open space uses. Key to the redevelopment's success was the financial viability of the plan. Not only was significant private investment attracted to the site, the potential earnings were so high that the developer was willing to agree to include a relatively high proportion of affordable housing units—28%—and to provide a very generous public benefits package that included infrastructure, parks, shuttle services, and more.

The success of Mission Bay's redevelopment suggests several criteria for when redeveloping industrial land makes sense:

- The land is not substantially in active use for industrial purposes, and is unlikely to be in the future.
- The site is well-located for non-industrial uses, has adequate connectivity for non-industrial uses, and is in the region's core.
- The site is large and has few land-owners. These features make it easier to create a master plan and utilize the tools of (the former) redevelopment agencies, which facilitate redevelopment.
- The community generally agrees that redevelopment is the right step, even if there is disagreement about the specific details of planned uses.
- Having a large institutional user can help spur investment.
- Finally, the market conditions are such that not only is private capital interested in development, but the developer can afford to offer public benefits, including affordable housing, parks, and other improvements.

RICHMOND

Richmond provides an example of a city that is encouraging the restructuring of its economic base away from industrial uses, particularly along the waterfront. Due to a long history of heavy manufacturing, dominated by the Chevron oil refinery, and related environmental justice issues, the city is planning for change, not preservation.

Richmond has gone through significant change since the mid-20th century, but to this day, it still is characterized by an important industrial base. As shown in Memo #1, it has long served as a receiving area for the firms that are exiting East Bay cities in search of cheaper land. Yet, though the city would be interested in high-tech manufacturing firms with high job densities, middle-wage jobs, and manageable environmental impacts, these firms have yet to arrive. As one interviewee told us, "Richmond has held its gate wide open for the past 50 years, anticipating a resurgence in manufacturing," but still, nothing high quality has come. Instead, the city is a magnet for businesses such as "automobile dismantling, recycling, industrial storage, mini storage, truck or container storage, construction yards, refuse collection, debris transfer facilities, and other activities that require substantial space, generate significant environmental impacts and pay low wages."

In response to these patterns, the City of Richmond is considering approaches such as: (1) reducing its industrial land through conversion to other uses (residential, commercial, open space) and (2) consolidating key industrial businesses on contiguous pieces of land (e.g., around the Chevron refinery and a BNSF railroad property). These areas might then be designated for industrial preservation.

In favor of prioritizing industrial:

- Strategic location for industrial businesses
- Reservoir of cheap industrial land for businesses displaced from the core
- Availability of industrial land, either existing or near Chevron and BNSF

Against prioritizing industrial:

- Challenges in attracting high-tech, middle-wage industries
- Environmental justice issues
- Opportunities for conversion to residential

WEST OAKLAND

Oakland has a long history of efforts to preserve industrial land, and since at least the early 2000s, has tried to develop an industrial land conversion policy. However, increasing housing pressure, urban design issues, and new mixed-use zoning designations are creating new challenges to preserving key industrial areas. Thus, the Oakland case demonstrates the gradual transformation of an industrial district and the challenges of resolving conflicts among stakeholders. (The full case study can be found in Appendix X.)

Following national trends, over the last twenty years many large manufacturing companies have left West Oakland. In their place, small, entrepreneurial business and the arts sector have taken over some of the industrial building stock. Although many block groups saw job growth in both 1990-2000 and 2000-2013, significant job loss occurred adjacent to the port in recent years (over 1,100 jobs) and job loss in industrial land-dependent jobs has recently accelerated in the northeastern part of the neighborhood. The majority of the new businesses are service-oriented, able to locate in mixed-use areas.

Over the last twenty years the City has sponsored 36 different planning proposals in the area. Most recently, the West Oakland Specific Plan introduced a new HBX-4 classification that in effect sets a preference for live/work, work/live, and housing in industrial and commercial areas. New CIX classifications were created, in part, to better control for the preservation of unique architecture in certain areas, but inadvertently create an incentive for property owners to let their buildings fall into disrepair as a way to avoid the design review process.

West Oakland is undergoing a transformation to a more mixed-use district. Over time, residential uses threaten the vitality of the entrepreneurial business district. There are pros and cons of prioritizing industrial land in the area.

In favor of prioritizing industrial:

- Businesses are attracted by affordable and large-scale industrial work spaces.
- There is a dearth of space for artists in Oakland who thus gravitate to the lower cost industrial land.
- West Oakland is located at the center of the region adjacent to its major port, providing unparalleled access for businesses.

Against prioritizing industrial:

- Land use conflicts are likely to remain, because the demand for land in the neighborhood is from businesses with delivery needs that conflict with residential uses.
- Safety and infrastructure issues discourage businesses from relocating in the neighborhood.
- Overall, production, distribution and repair uses are slowly declining in the area.

SAN JOSE

Driven by fiscal considerations, the City of San Jose is committed to industrial land preservation, according to the City's Economic Development staff. As a city that has served as the bedroom community for much of Silicon Valley for decades, San Jose is now "hanging onto its employment land with conviction."

Studies have shown that San Jose has enough vacant land for future employment, but this is not likely to be in the area where job growth is likely to happen. This creates a need for the strategic preservation of industrial land. North San Jose is one of the city's main industrial parks and is anticipated to host major growth and development, as it is strategically located along a key light-rail line. To ensure industrial job growth, the city is putting a strict cap on total residential area and on the number of housing units that can be added every year.

San Jose is thus one of the few Silicon Valley/Peninsula cities that are encouraging industrial uses near transit over residential use. At the same time, in order to encourage all types of job growth, San Jose employs some zoning designations, such as industrial park, that are open to every kind of industrial or office user, creating the possibility that higher rent office users will outbid industrial firms.

Thus, in the San Jose context, the focus is more employment preservation than industrial preservation per se. The arguments in San Jose are primarily for preserving industrial land, due to:

- Fiscal issues related to current jobs/housing imbalance
- Location in Silicon Valley
- Anticipated future shortage of industrial land

NORTHERN WATERFRONT

The northeast Bay Area, encompassing much of Solano and Contra Costa counties, has strong interests in preserving industrial land. Its assets include a large inventory of industrial land and buildings, as well as access to rail and port facilities (in addition to the airport in Byron) and connections to the interstate system. There has been slow but steady rezoning in waterfront communities like Hercules, and there continues to be some pressure to rezone to other uses, particularly in areas with existing encroachment (such as schools). But due to the outflow of jobs over the past 50 years, there is an increasing jobs/housing imbalance that creates pressure to prioritize jobs over housing.

Over time, many of the area's manufacturing industries are transforming, and there is new demand for warehousing space. Not only are the refineries changing, but also traditional manufacturing: for instance, C&H Sugar remains but has replaced much of its labor force with new technology. Growing clusters with potential include advanced transportation fuels, biomedical manufacturing, food processing, and clean technology. Warehousing is another area of growth: there is a significant inventory of warehouse space, but also steady demand for newer building types with higher ceilings and technology.

This area is likely to support preserving its industrially zoned land because of its economic development strategy. Given the potential of its clusters, it would like to use protected areas to attract some of the critical suppliers to existing firms, as well as nurture new start-up companies. Another need is for infrastructure investment, to improve Highway 4 and short-line rail connectors, help industries access recycled water, and adopt clean energy technology. Having designated industrial areas might help the county access funding for such improvements.

Thus, the arguments in Contra Costa's Northern Waterfront are primarily for preserving industrial land, due to:

- Assets for industrial development
- Fiscal issues related to current jobs/housing imbalance
- Demand for industrial space

Altas Courtesy of Contra Costa County: Department of Conservation and Development

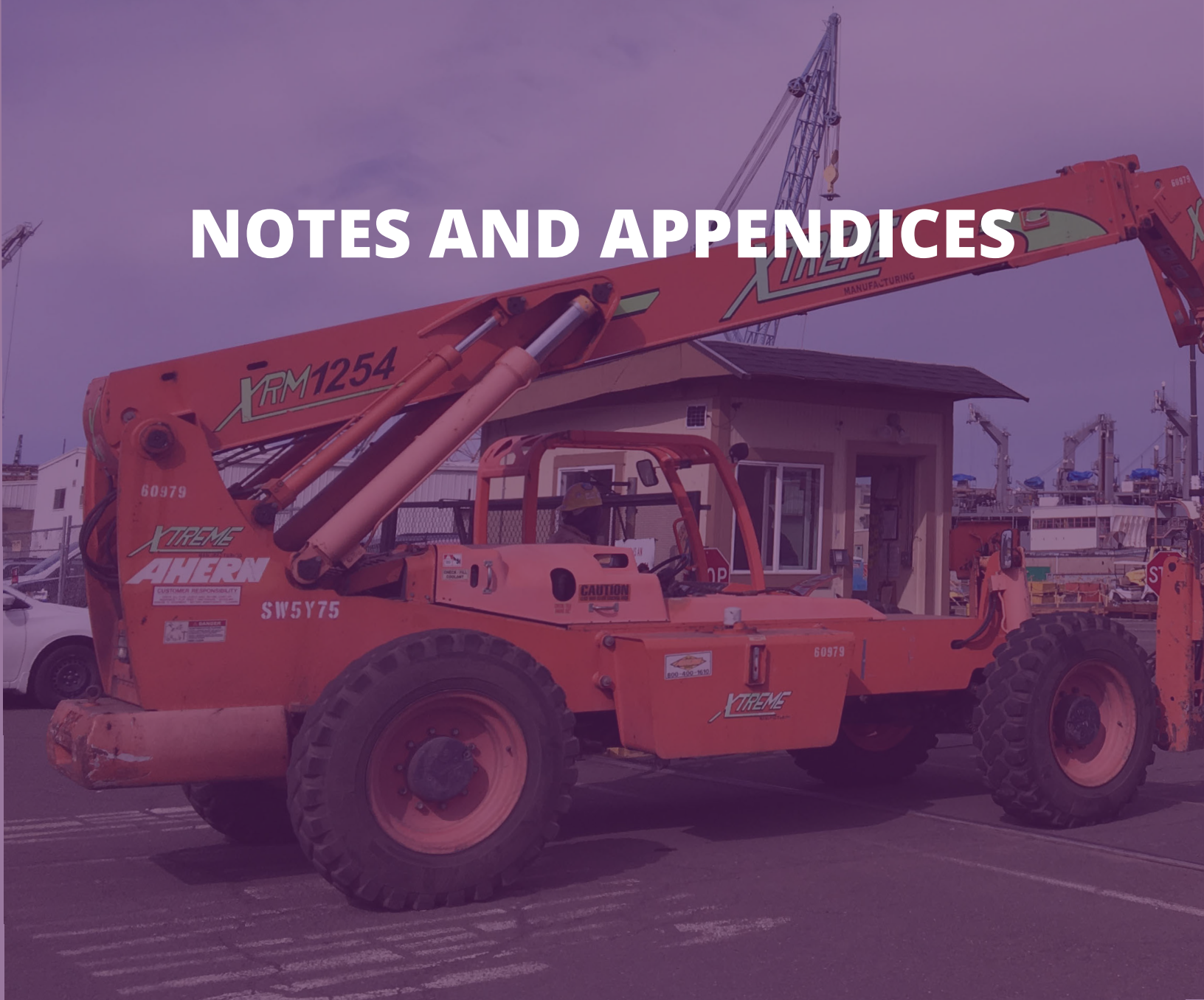
PART VII: POTENTIAL CRITERIA FOR INDUSTRIAL LAND PRESERVATION AND CONVERSION

This analysis suggests that the conversion of industrial land is proceeding at a slow pace, but is likely to accelerate in coming years due to the visions put forward in general plan and PDA designations. To guide city decision-making about where to preserve industrial land and where to convert it, MTC/ABAG should develop criteria. Figure 11 presents potential criteria in terms of transportation, economy, equity, site characteristics, and environment. These may serve as the basis for designating Priority Industrial Areas in the future.

	Retain as Industrial	*Convert to Residential or Mixed-use*
Transportation	• Proximity to freight and/or port facilities • Low VMT for workers on industrial land	• Proximity to transit • High VMT for workers on industrial land
Economy	• Production or related employment • Proximity to business clusters/suppliers/markets • Critical supplier to local businesses • Industry stable or growing	• High-density non-production employment • Proximity to markets/customers • Limited linkages to local economy • Industry in decline
Equity	• Offers middle-wage jobs for less-skilled workers	• Potential for affordable housing
Land use/zoning compatibility	• Surrounded by medium/heavy industrial zoning	• Adjacent to residential
Environment	• Brownfield site, remediation infeasible	• Environmental health hazard for surrounding communities (especially if historically disadvantaged)
Adequacy of supply	• In areas with projected deficit of industrial land • Low vacancy rates for industrial buildings	• In areas with projected surplus of industrial land • High vacancy rates for industrial buildings

Figure 11. Criteria for Industrial Land Preservation and Conversion

NOTES AND APPENDICES



NOTES

1. Hausrath Economics Group and Cambridge Systematics, Inc., *MTC goods movement study Phase 2, task 11 working paper: A land use strategy to support regional goods movement in the Bay Area* (Oakland, CA: Hausrath Economics Group, 2004). http://files.mtc.ca.gov/pdf/Task_2_Report.pdf
2. This represents 20 housing units of a total of 555 constructed from 2005-2015. Due to challenges with data quality and geocoding, this represents a sample of Oakland housing units, not the entire population.
3. Of 4,968 permits for residential new construction from 2001 to 2014, only 47 overlapped with industrial zones
4. Maps of the location of vacant land are provided at www.planningforjobs.org.
5. Evelyne St. Louis, *Priority Development or Priority Industrial?* (Berkeley, CA: University of California, Berkeley, 2016), www.planningforjobs.org.

Appendix 1. Calculating industrial land at risk

Both the maps and the calculations of industrial land at risk were generated through a series of ArcGIS operations. Shapefiles for each jurisdiction's general plan land use designations were obtained from MTC or directly from local planning departments. While not all jurisdictions provided a general plan shapefile, outreach focused on obtaining shapefiles from the top 50 cities with the highest stock of industrial land. These city-level general plan shapefiles were first layered on top of the county-level industrial zoning shapefiles that were generated using assessor parcel data. The Intersect tool was then used to produce a new layer that contained fields for both general plan designation and industrial zoning. Parcels with general plan designations that conflicted with industrial zones were then exported and coded according to the residential, commercial, and other categories described above. Once this step was completed for each individual jurisdiction, the Merge tool was used to compile all city-level shapefiles into a larger county-level shapefile of industrial land at risk. The Calculate Geometry tool was then used in the county-level shapefile to determine the acreage of each industrially zoned parcel with conflicting general plan designations. The attribute table was then exported to Excel to produce all tables and calculate all risk percentages for each county and the bay area at large.

In San Francisco, there are a number of mixed-use zones that allow for industrial uses but promote the increase of alternative land uses that have the potential to increasingly replace industrial activities over time. These mixed-use zones were coded into the same categories created for the general plan designations for the purpose of comparison across counties. In the case of San Francisco, these categories indicate the following:

Residential	The residential category refers to all single-family and multi-family residential land use designations, as well as mixed-use designations intended to introduce or increase residential uses in particular areas of a jurisdiction. Converting industrial land to residential has become an attractive option for some cities in the face of housing shortages, making this category of special interest to the study.
Commercial	This category includes all commercial designations that support activities such as restaurants, hotels, and retail businesses, as well as mixed-use designations that promote the intensification of these commercial activities in select districts or corridors.
Other	The other category encompasses all land use designations other than residential and commercial ones that also move away from industrial activities. This includes general mixed-use districts, parks and open space, and public and institutional centers. It should be noted that areas designated for use by public and quasi-public agencies for their industrial activities, such as airports and water management facilities, are excluded from the other category.

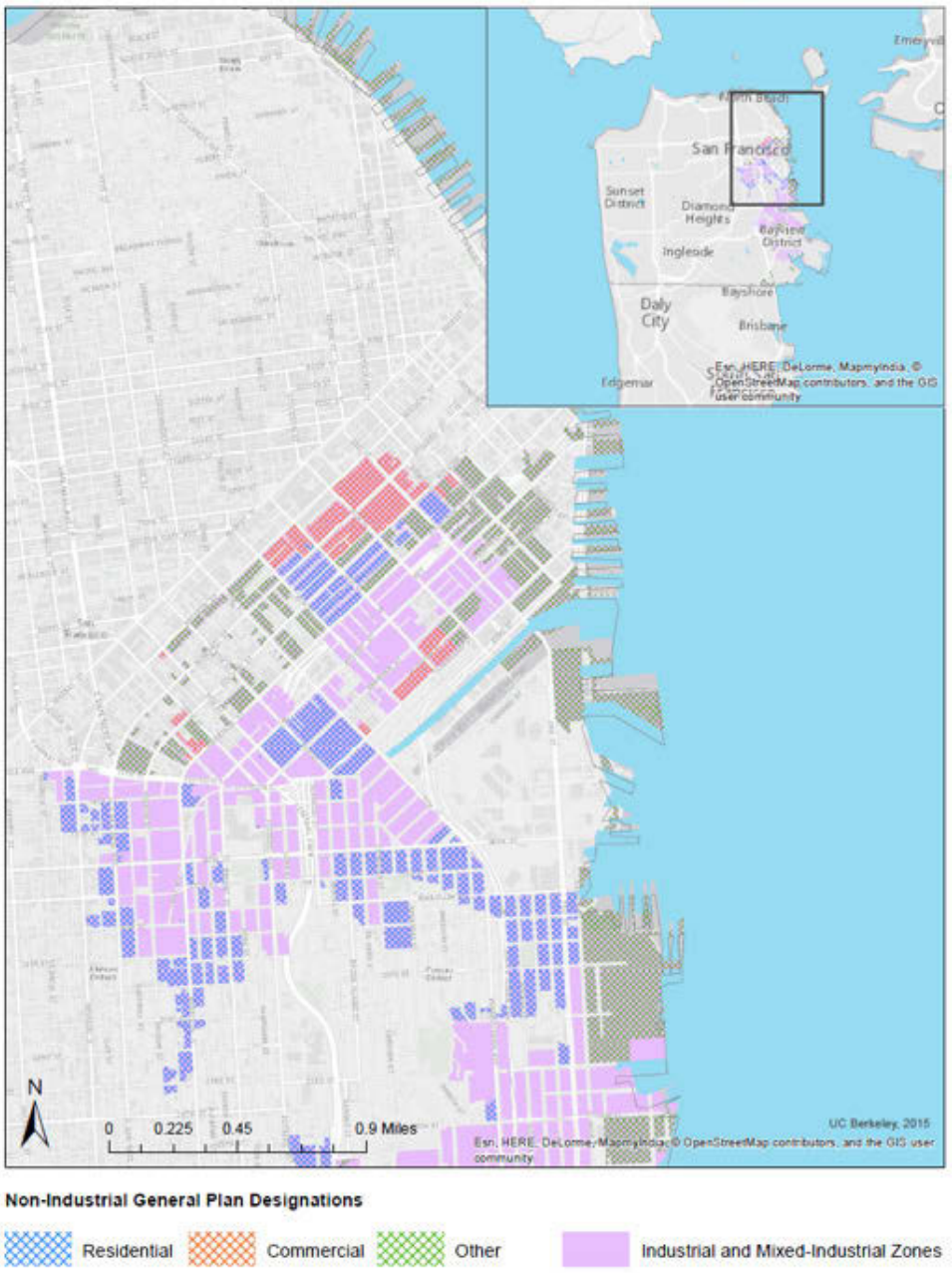
To obtain a percentage of industrial land at risk of conversion in San Francisco, the acreage for these mixed use industrial zones was divided by the acreage for all main industrial and mixed-use industrial zoning categories outlined in Section 3.

% of Industrial Land Susceptible to Conversion =

(Acres of industrially zoned land with nonindustrial general plan category (Residential,Commercial,or Other))

(Acres of land with industrial zone category (Heavy,Medium,or Light Industrial or Industrial Office))

**Note: The denominator excludes two industrial zone categories identified in Section 3 – Mixed Use Industrial-Residential and Mixed Use Industrial-Commercial – because these zones are already moving away from traditional industrial activities with the introduction of residential and commercial uses. For industrial-office land, we only consider conversion risk to residential, since most commercial uses are permitted as-of-right.*



Map 1. Map of Industrial Land at Risk of Conversion in San Francisco

County-Level Analysis

The following section presents the results of the conversion risk analysis conducted for each of the nine counties in the Bay Area region. Each county's percentage of industrial land at risk is broken down by the general plan designation categories introduced in the previous sections. Each county also includes a table that illustrates which specific industrial zoning categories are conflicting with which general plan designation categories (or mixed-use zones in the case of San Francisco). It should be noted that to ensure conservative estimates, parcels with commercial or other general plan designations overlapping with industrial-office zoning were not considered at risk of conversion, and thus they were not factored into the risk calculation. Finally, each county is accompanied by a set of maps that geographically illustrate where industrial land is at risk of conversion. No maps are presented for Napa County, whose conversion risk percentage is marginal at 1%.

Following maps available at www.planningforjobs.org

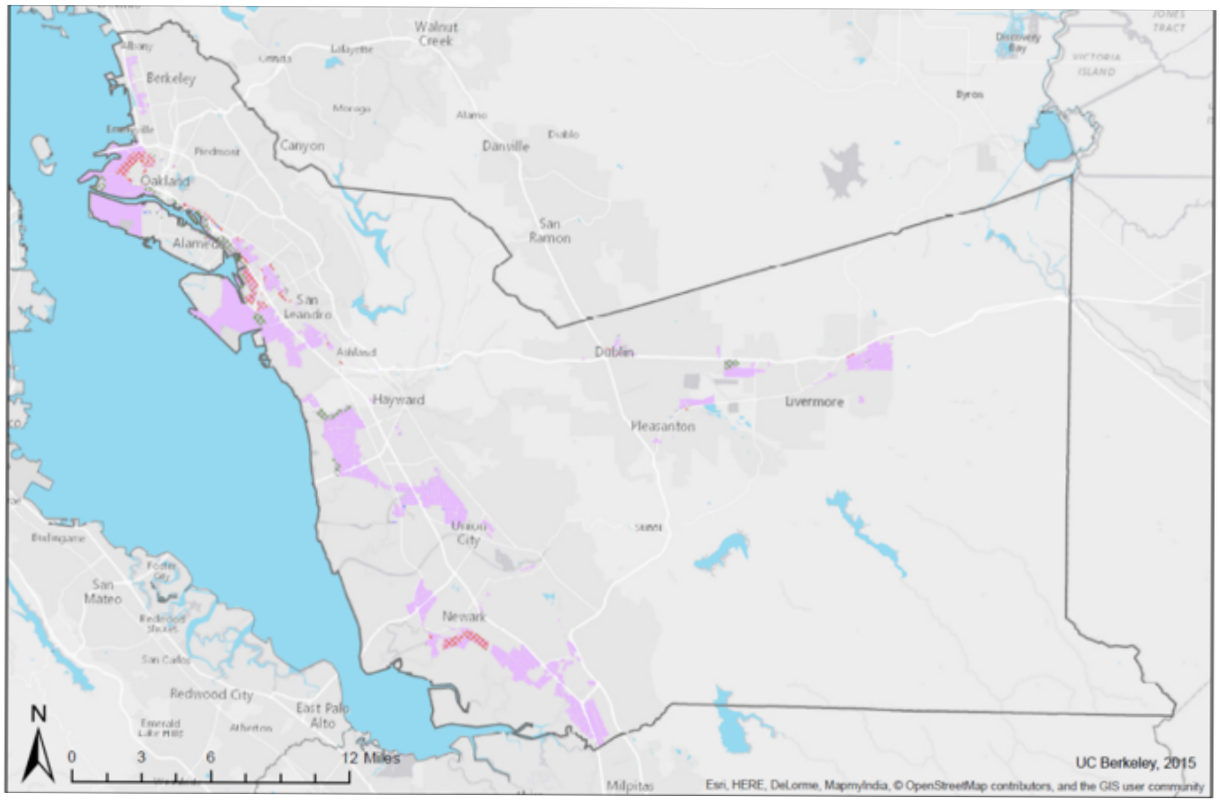
Alameda County

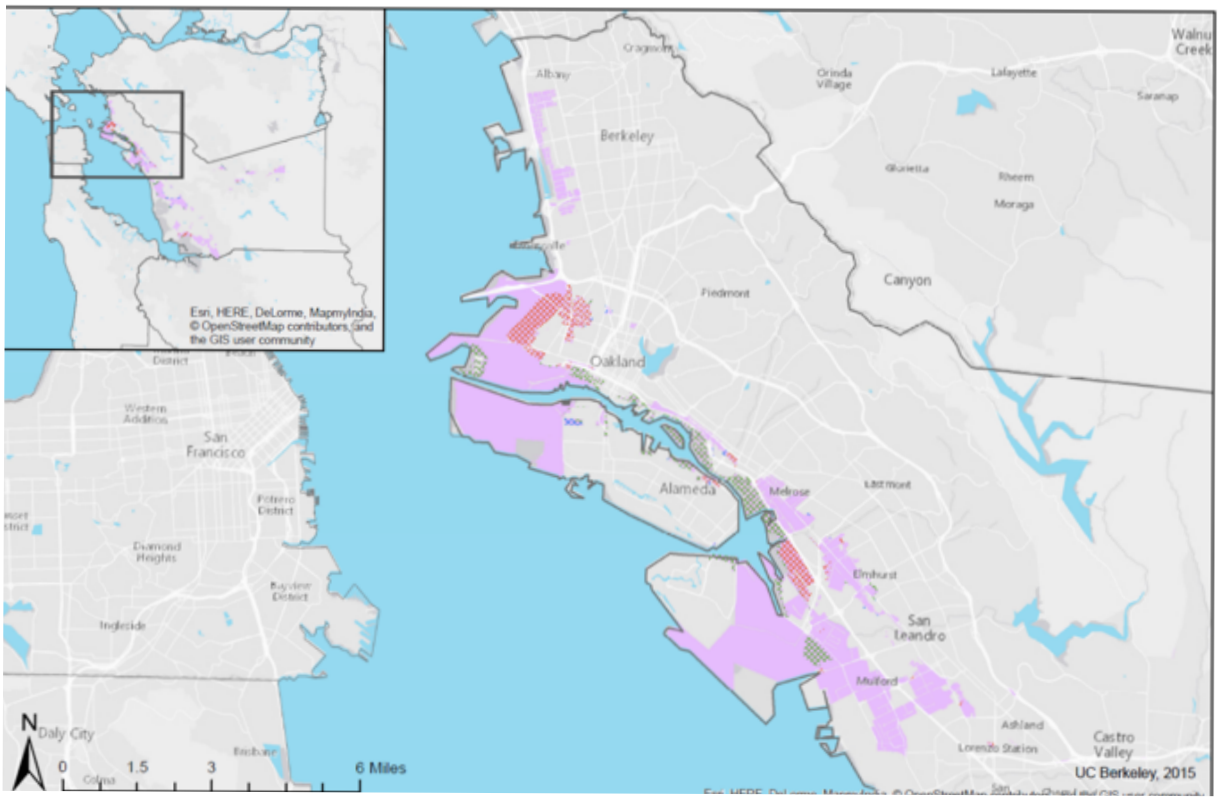
	Total (Acres)	*Percentage*
Residential	90	2.9%
Commercial	1,378	44.0%
Other	1,667	53.2%
Total IL at Risk	**3,135**	**100%**
Total IL	**22,127**	
% at Risk	**14%**	

Table 3. Alameda County Industrial Land (IL) at Risk of Conversion by General Plan Designation

	heavy	heavy-office	light	light-office	medium	transp	Total
commercial	1		669		707	-	**1,378**
other	638		75		701	253	**1,667**
residential	0.39	5	26	11	47	-	**90**
Total	**640**	**5**	**771**	**11**	**1,455**	**253**	**3,135**

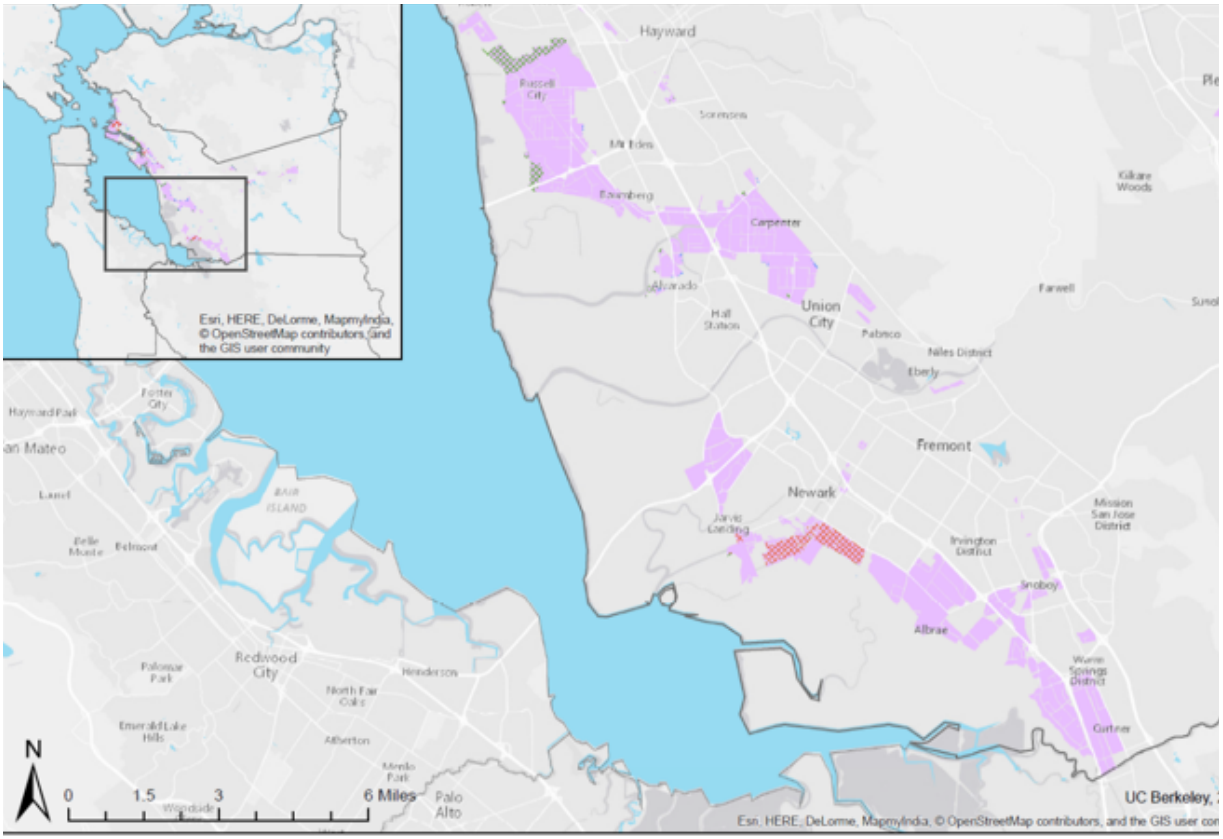
Table 4. Alameda County General Plan Designation vs. Industrial Zoning Conflicts

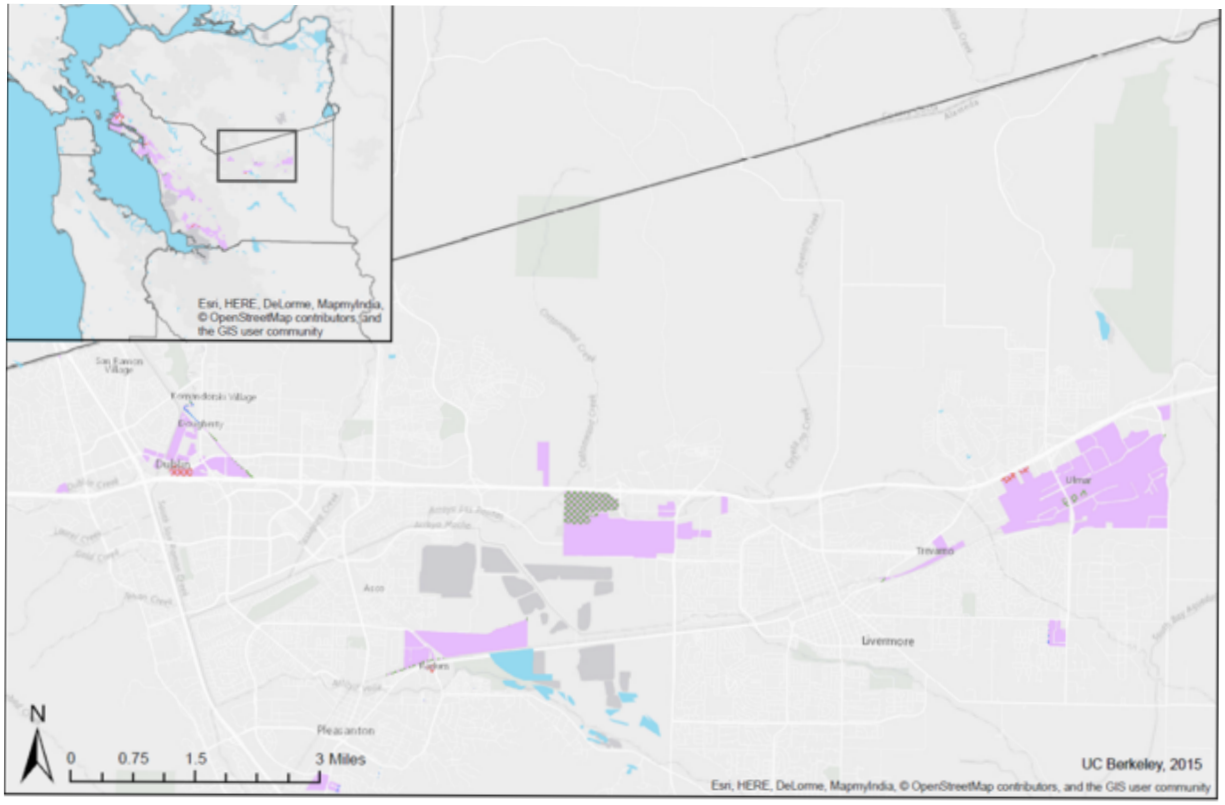




Non-Industrial General Plan Designations

Residential | Commercial | Other | Industrial and Mixed-Industrial Zones





Non-Industrial General Plan Designations

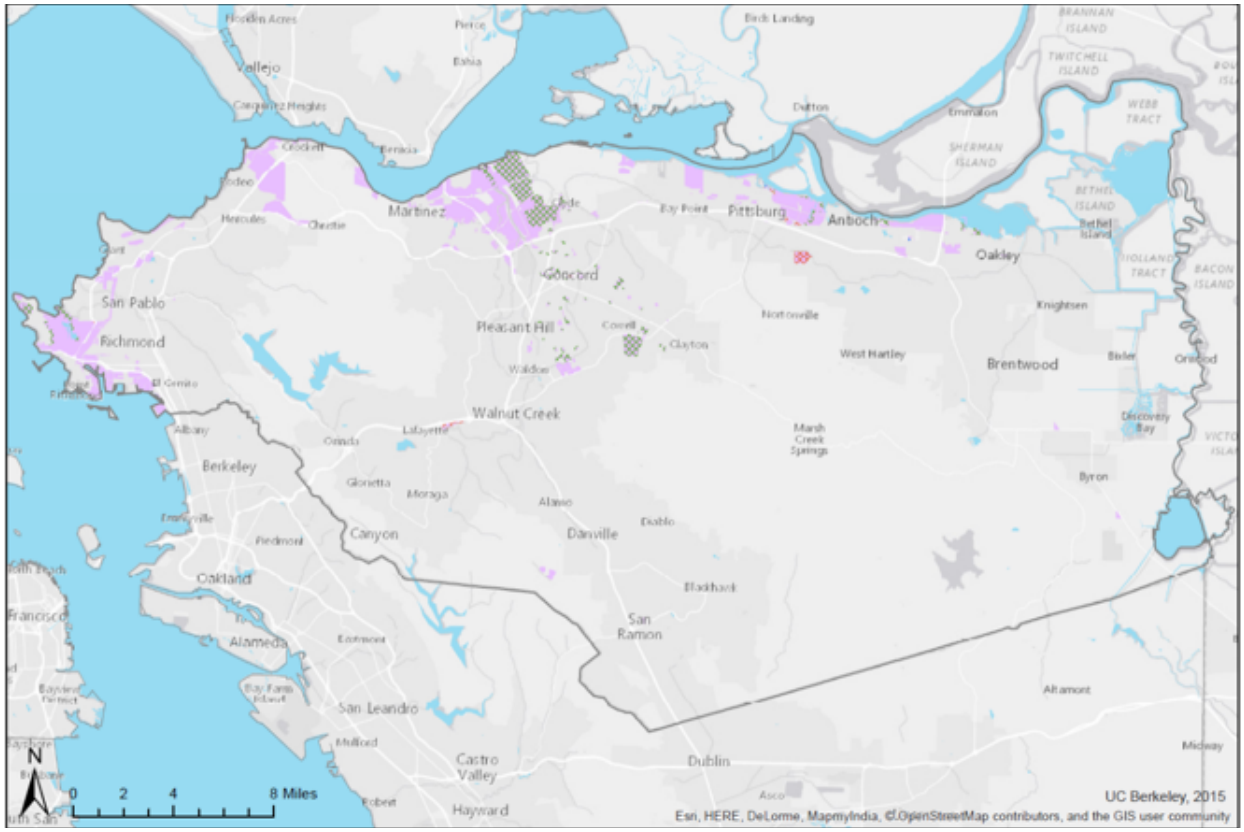
Residential | Commercial | Other | Industrial and Mixed-Industrial Zones

	Total (Acres)	*Percentage*
Residential	26	0.6%
Commercial	395	9.4%
Other	3,786	90.0%
Total IL at Risk	**4,207**	**100%**
Total IL	**18,357**	
% at Risk	**23%**	

Table 5. Contra Costa County Industrial Land (IL) at Risk of Conversion by General Plan Designation

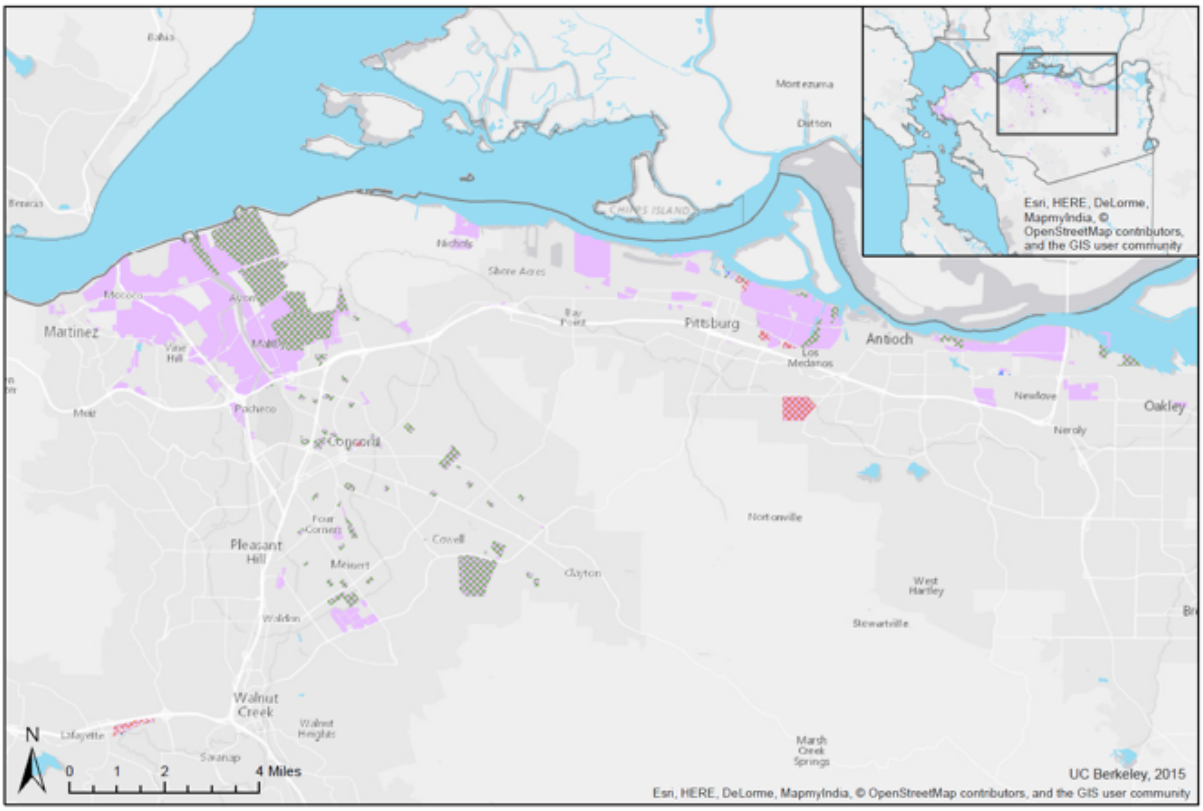
	heavy	light	light-office	medium	transp	Total
commercial	258	77		20	40	**395**
other	1,961	607		101	1,118	**3,786**
residential	0.01	4	10	0.48	11	**26**
Total	**2,219**	**688**	**10**	**121**	**1,169**	**4,207**

Table 6. Contra Costa County General Plan Designation vs. Industrial Zoning Conflicts



Non-Industrial General Plan Designations

Residential | Commercial | Other | Industrial and Mixed-Industrial Zones



Non-Industrial General Plan Designations

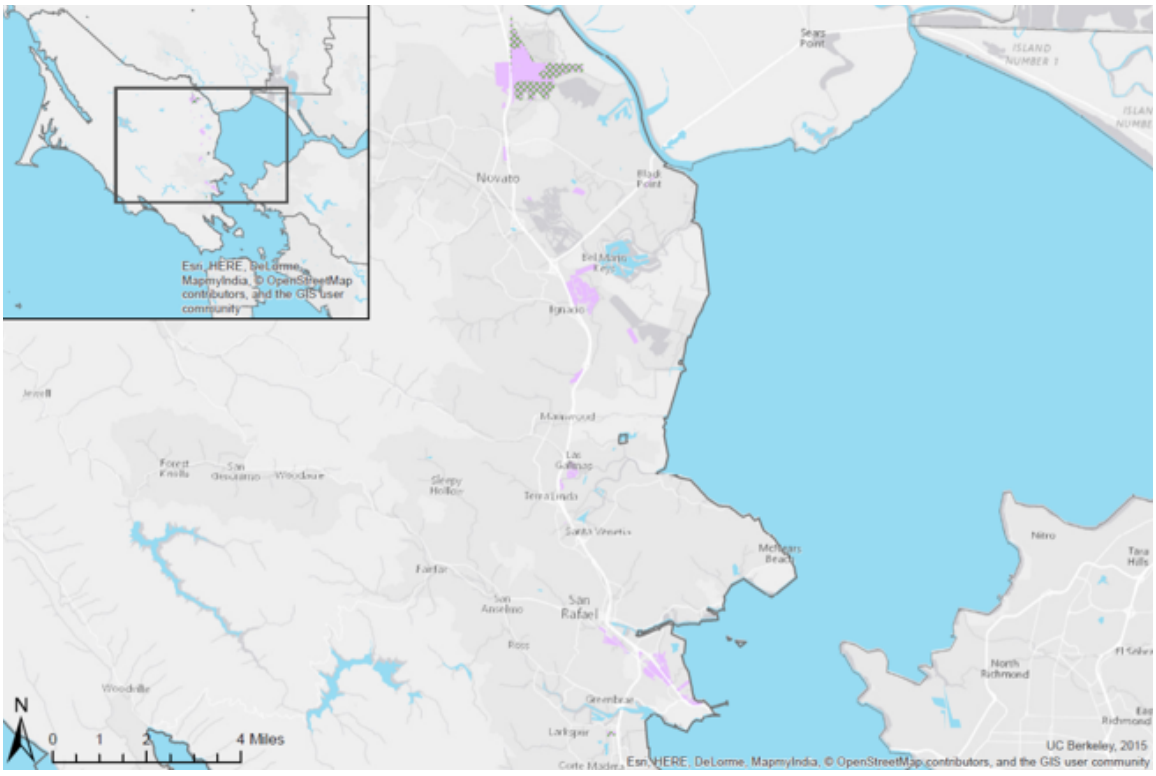
Residential | Commercial | Other | Industrial and Mixed-Industrial Zones

	Total (Acres)	*Percentage*
Residential	1	0.2%
Commercial	9	2.3%
Other	400	97.5%
Total IL at Risk	**410**	**100%**
Total IL	**1,426**	
% at Risk	**29%**	

Table 7. Marin County Industrial Land (IL) at Risk of Conversion by General Plan Designation

	heavy	light	light-office	medium	transp	Total
commercial	-	-		-	9	**9**
other	376	21		-	3	**400**
residential	0.13	0.07	0.41	0.14	0.002	**1**
Total	**376**	**21**	**0.41**	**0.14**	**13**	**410**

Table 8. Marin County General Plan Designation vs. Industrial Zoning Conflicts



Non-Industrial General Plan Designations

Residential | Commercial | Other | Industrial and Mixed-Industrial Zones

Napa County

	Total (Acres)	*Percentage*
Residential	1	4.1%
Commercial	7	21.8%
Other	24	74.1%
Total IL at Risk	**33**	**100%**
Total IL	**3,809**	
% at Risk	**1%**	

Table 9. Napa County Industrial Land (IL) at Risk of Conversion by General Plan Designation

	heavy	light	light-office	medium	transp	Total
commercial	-	7		-	-	**7**
other	17	5		0.15	2	**24**
residential	-	1	-	0.00002	-	**1**
Total	**17**	**14**	**-**	**0.15**	**2**	**33**

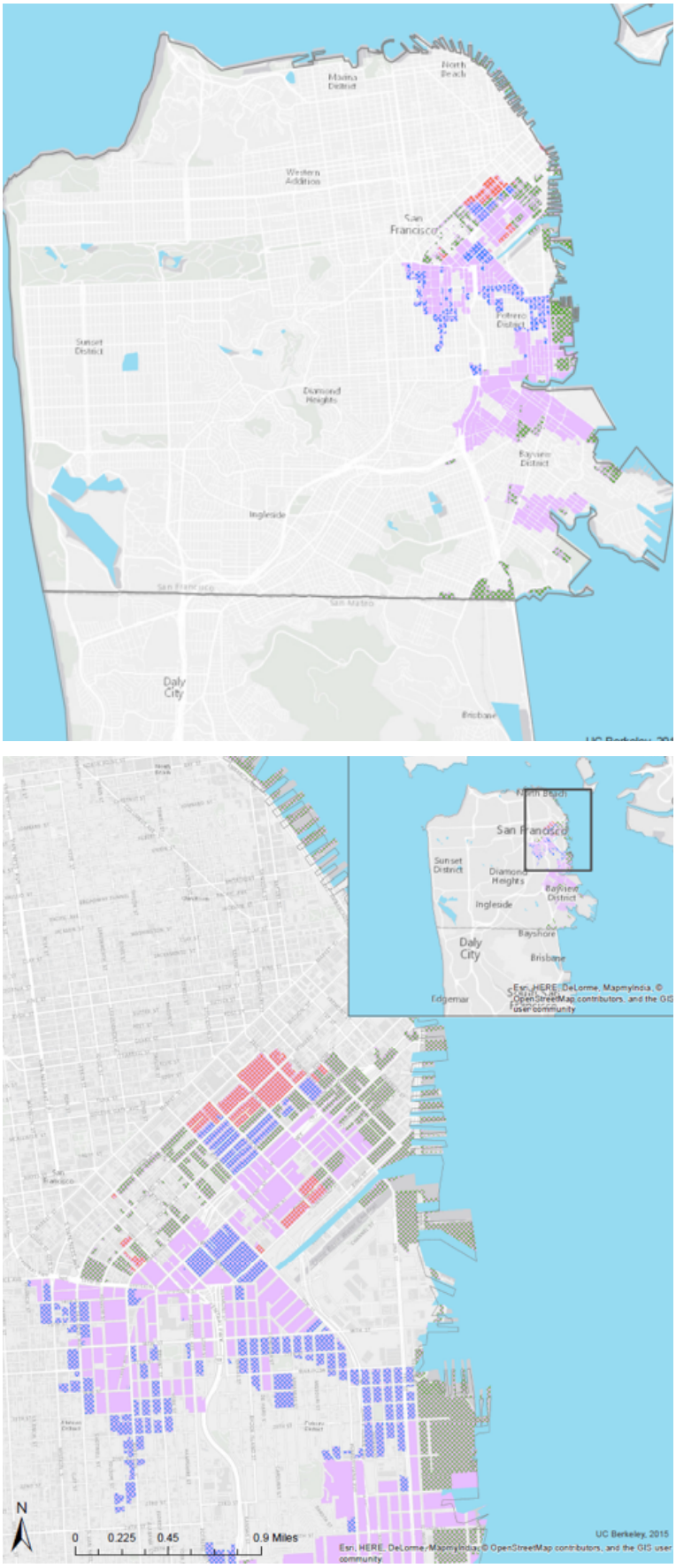
Table 10. Napa County General Plan Designation vs. Industrial Zoning Conflicts

San Francisco County

	Total (Acres)	*Percentage*
Residential	232	24.3%
Commercial	66	6.9%
Other	659	68.8%
Total IL at Risk	**957**	**100%**
Total IL	**1,970**	
% at Risk	**49%**	

Table 11. San Francisco County Industrial Land (IL) at Risk of Conversion by Mixed-Use Zoning Designation*

*Because the San Francisco General Plan does not include a Land Use Element, risk was calculated using the area of parcels whose zoning has already been converted to residential mixed-use, commercial mixed-use, or general mixed-use designations



Non-Industrial General Plan Designations

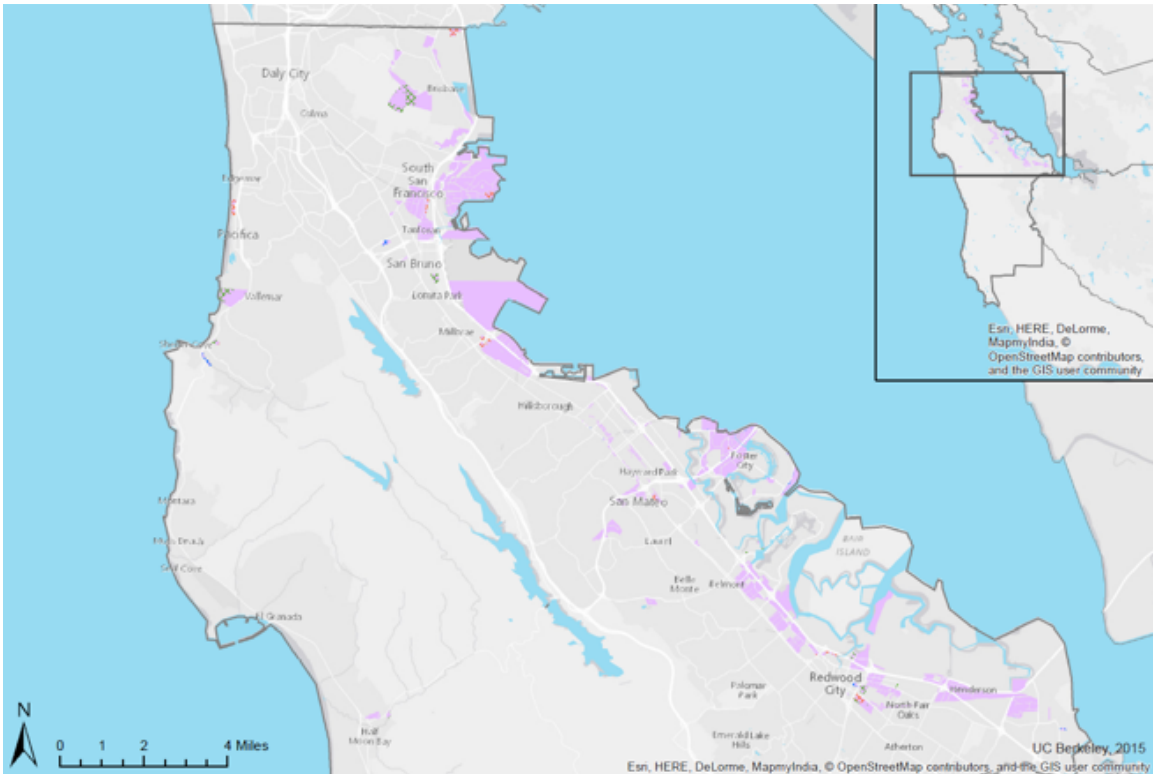
Residential | Commercial | Other | Industrial and Mixed-Industrial Zones

	Total (Acres)	*Percentage*
Residential	50	12.9%
Commercial	133	34.2%
Other	206	52.9%
Total IL at Risk	**389**	**100%**
Total	**8,883**	
% at Risk	**4%**	

Table 12. San Mateo County Industrial Land (IL) at Risk of Conversion by General Plan Designation

	heavy	light	light-office	medium	medium-office	Total
commercial	0.0004	107		26		**133**
other	91	62		52		**206**
residential	0.14	17	27	7	-	**50**
Total	**92**	**185**	**27**	**85**	**-**	**389**

Table 13. San Mateo County General Plan Designation vs. Industrial Zoning Conflicts



Non-Industrial General Plan Designations

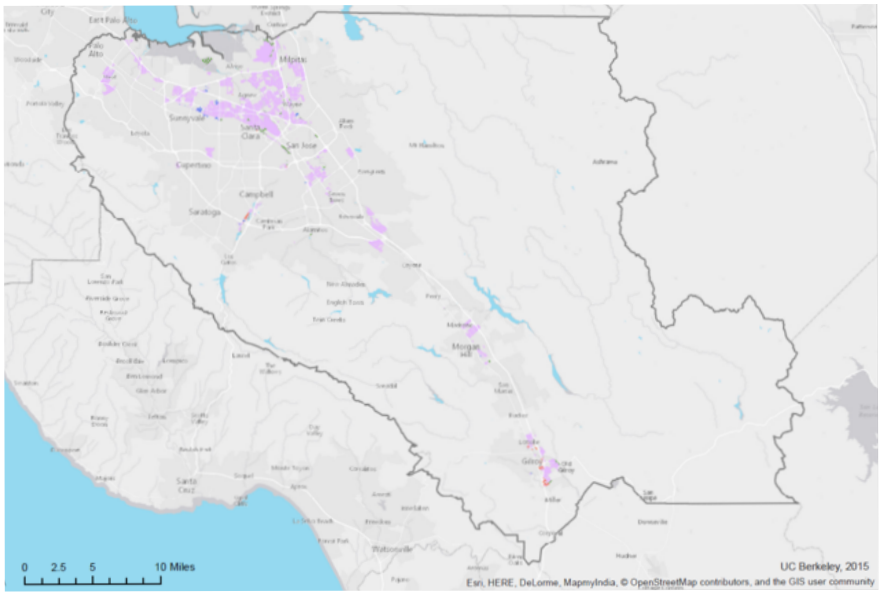
Residential | Commercial | Other | Industrial and Mixed-Industrial Zones

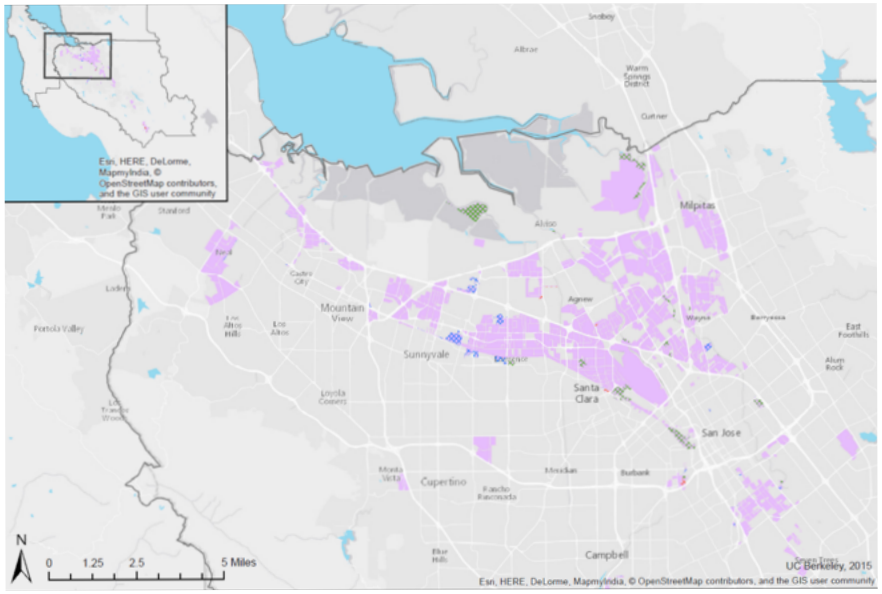
	Total (Acres)	*Percentage*
Residential	290	20.4%
Commercial	320	22.5%
Other	814	57.1%
Total IL at Risk	**1,424**	**100%**
Total IL	**18,501**	
% at Risk	**8%**	

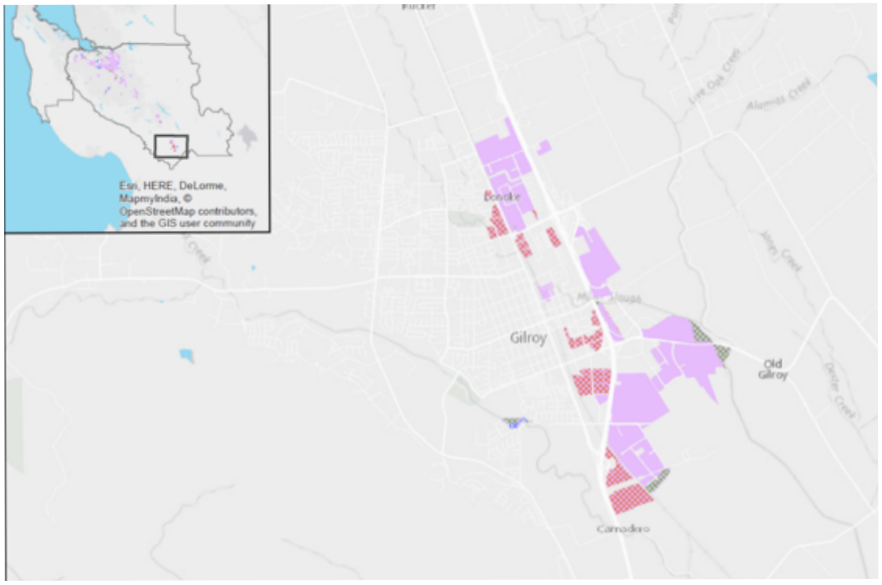
Table 14. Santa Clara County Industrial Land (IL) at Risk of Conversion by General Plan Designation

	heavy	light	light-office	medium	medium-office	transp	Total
commercial	13	306		2		-	**320**
other	684	68		43		19	**814**
residential	32	32	104	4	118	-	**290**
Total	**729**	**406**	**104**	**49**	**118**	**19**	**1424**

Table 15. Santa Clara County General Plan Designation vs. Industrial Zoning Conflicts







Non-Industrial General Plan Designations

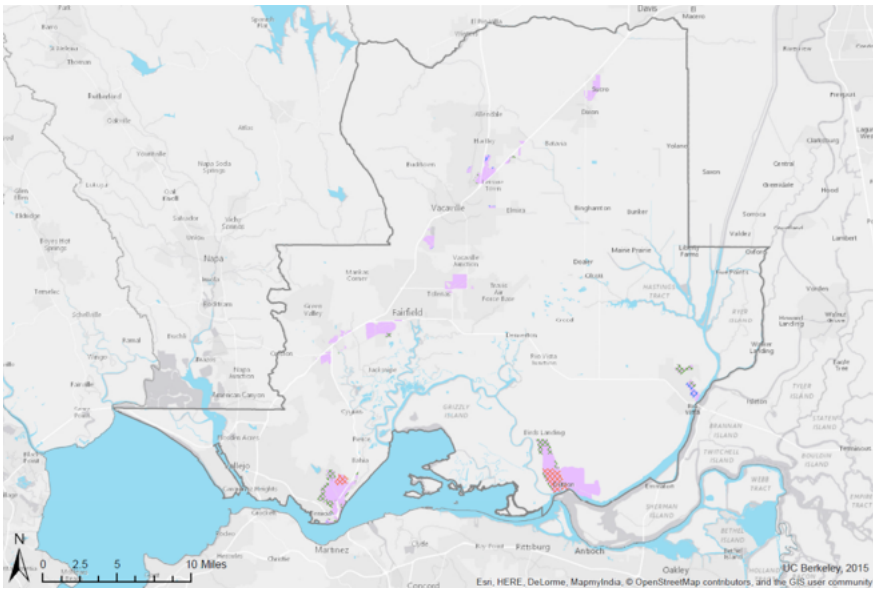
Residential | Commercial | Other | Industrial and Mixed-Industrial Zones

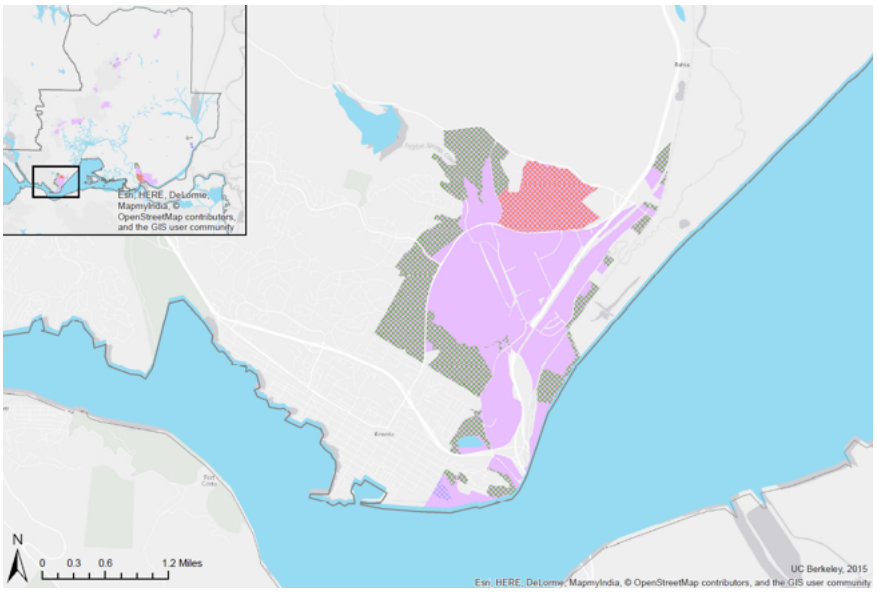
	Total (Acres)	*Percentage*
Residential	261	6.3%
Commercial	1,555	37.5%
Other	2,325	56.1%
Total IL at Risk	**4,142**	**100%**
Total IL	**11,911**	
% at Risk	**35%**	

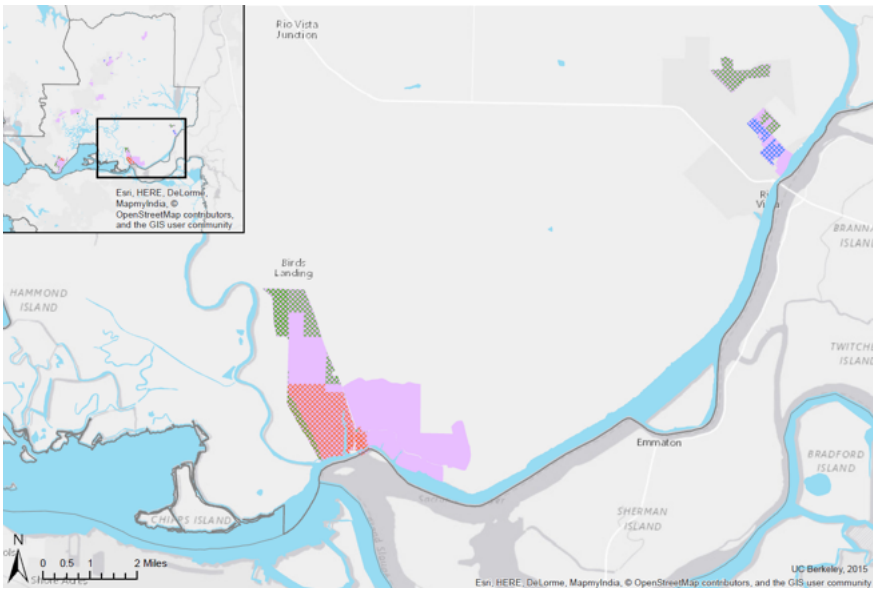
Table 16. Solano County Industrial Land (IL) at Risk of Conversion by General Plan Designation

	heavy	light	light-office	medium	transp	Total
commercial	-	-		314	1,241	**1,555**
other	234	444		434	1,214	**2,325**
residential	0.27	35	213	0.41	12	**261**
Total	**234**	**479**	**213**	**748**	**2,467**	**4,142**

Table 17. Solano County General Plan Designation vs. Industrial Zoning Conflicts







Non-Industrial General Plan Designations

Residential | Commercial | Other | Industrial and Mixed-Industrial Zones

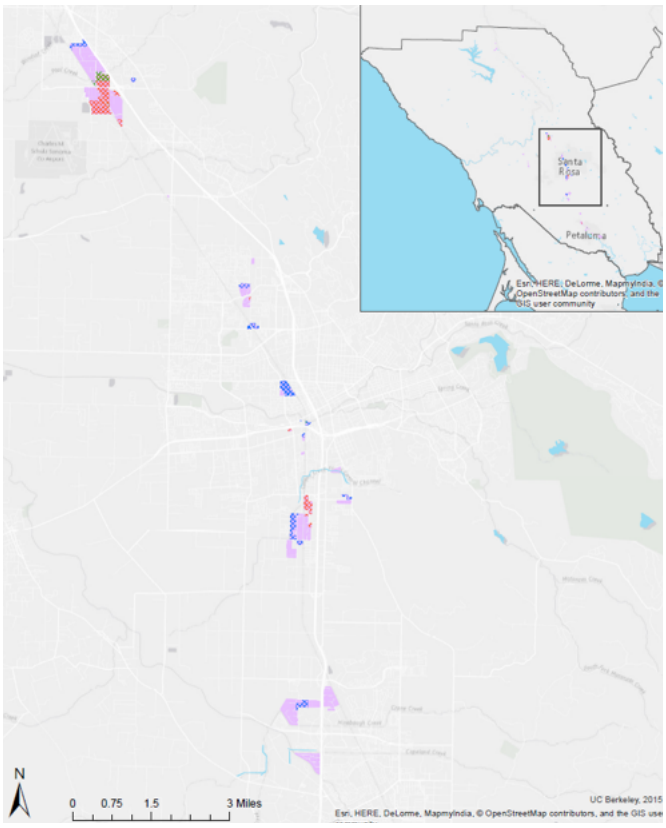
Sonoma County

	Total (Acres)	*Percentage*
Residential	172	44.3%
Commercial	168	43.3%
Other	48	12.4%
Total IL at Risk	**387**	**100%**
Total IL	**1,437**	
% at Risk	**27%**	

Table 18. Sonoma County Industrial Land (IL) at Risk of Conversion by General Plan Designation

	heavy	light	light-office	medium	Total
commercial	71	93		4	**168**
other	3	27		18	**48**
residential		147	18	7	**172**
Total	**74**	**267**	**18**	**29**	**387**

Table 19. Sonoma County General Plan Designation vs. Industrial Zoning Conflicts



Mission Bay

In its original form, Mission Bay—a growing neighborhood just south of San Francisco's Financial District and SoMa areas—was a wide shallow bay with surrounding swamp land and a creek leading up to it. Roughly running along the present-day Third Street, a long bridge crossed the middle of the bay. The bay was filled between 1850 and 1900, as decommissioned or shipwrecked ships, dirt from the leveling of nearby hills, and debris from the 1906 earthquake were used to fill it. Once stabilized, the Santa Fe and Southern Pacific Railroads took over the property and began using it as a railroad yard that included industrial use buildings related to shipping (Laura Adler et al. 2011).

However, by the 1990s, the area was no longer in use by the railroad: it was a "tangle of abandoned railyards and warehouses" (Massey and Bodovitz 1990). This was due to several factors:
After World War II, the flight of jobs and housing to the suburbs, the movement of industry to cheaper locations, the replacement of train traffic by truck and air, left San Francisco, and virtually every other North American city, with underutilized railyards (Prowler 2005).

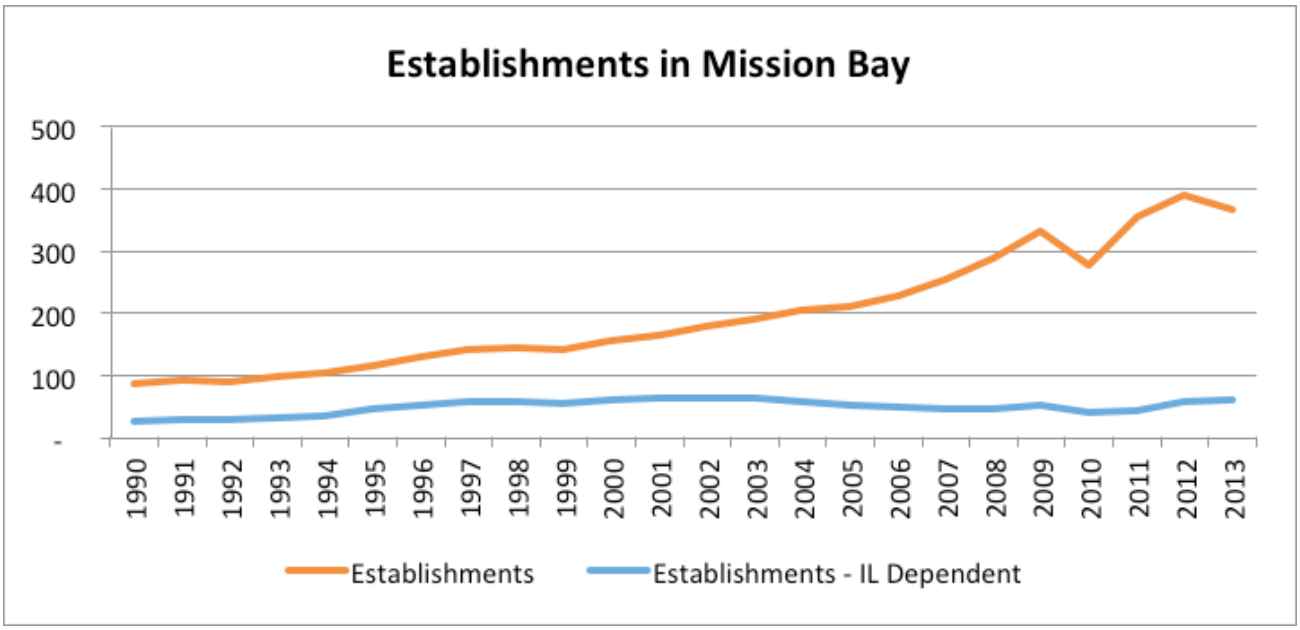
This case study considers the reasons for Mission Bay's redevelopment into the growing residential, office, and educational neighborhood it is now. The story of Mission Bay provides an example of a place with significant industrial land that was successfully redeveloped into new uses. Here, we offer an analysis of why the redevelopment was successful, which leads to an understanding of some basic criteria for when redeveloping industrial land makes the most sense.

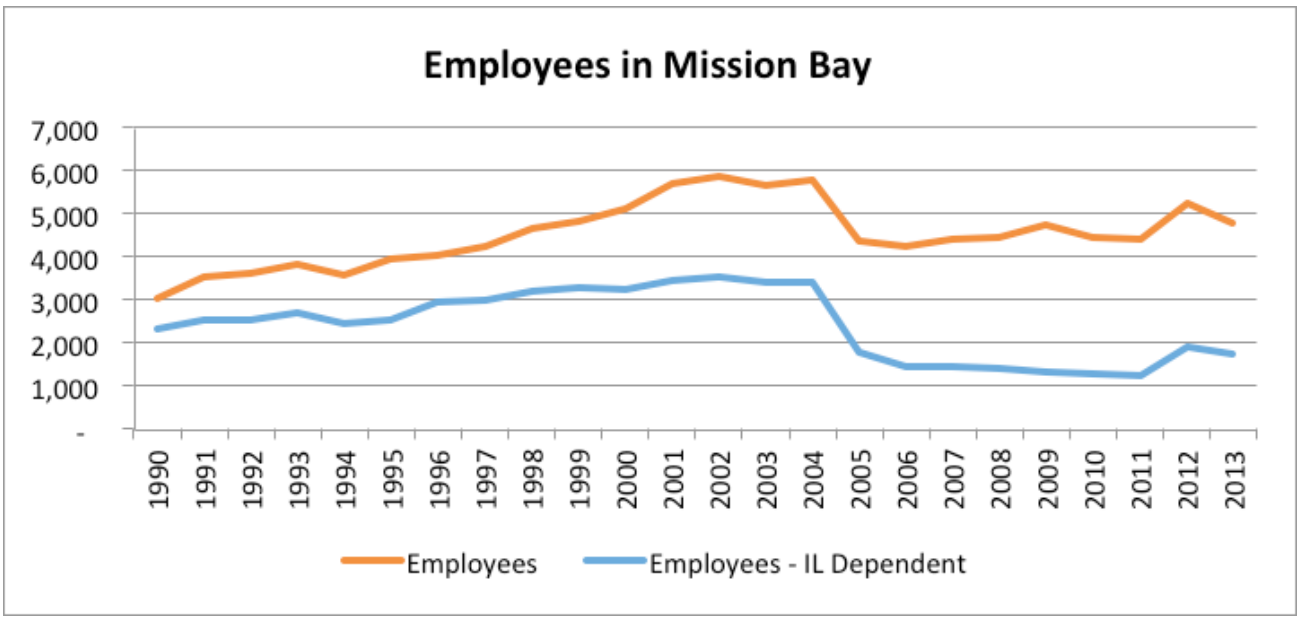
Mission Bay before its redevelopment. Source: (City and County of San Francisco Planning Department and San Francisco Redevelopment Agency 1999)

Mission Bay Before Redevelopment

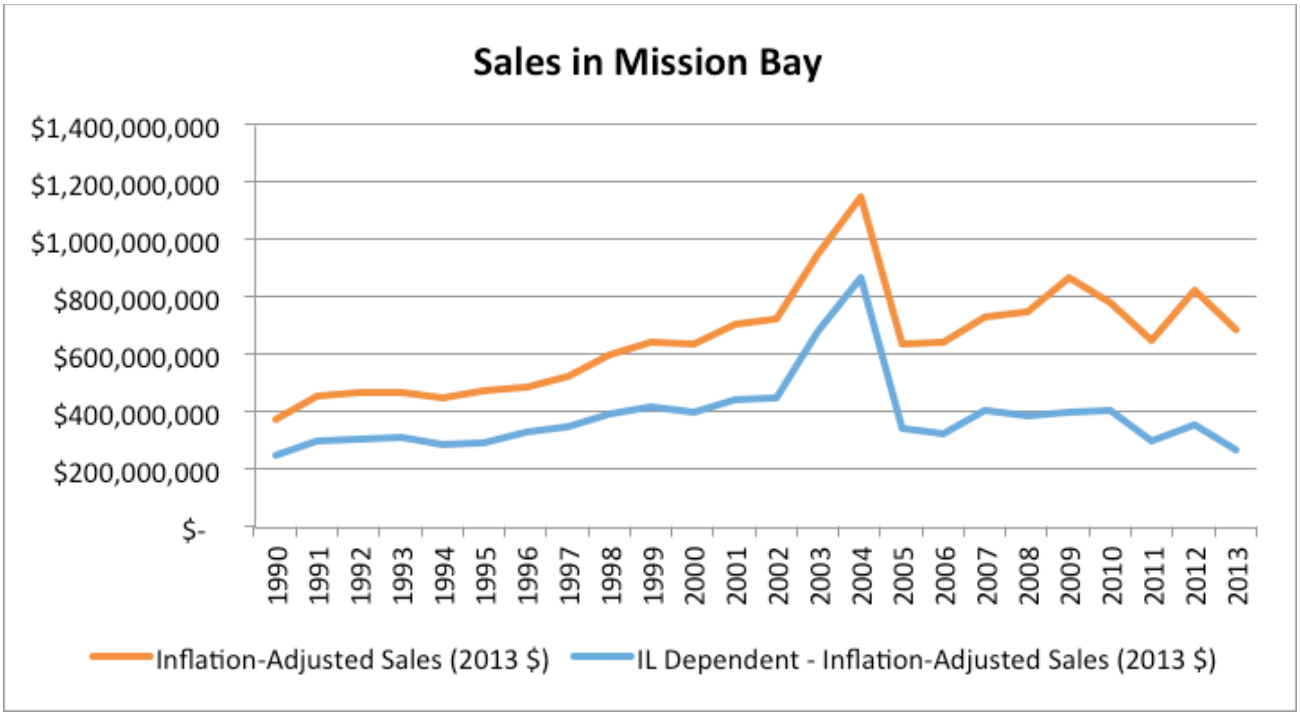
Mission Bay was not engaged in very productive uses in the years leading up to redevelopment. The area hosted "block-long warehouses, concrete and gravel processing facilities, truck terminals, and surface parking;" buildings in the area were used for "distribution and storage facilities for food products, clothing, rental furniture, and personal effects; light manufacturing; and some office use" while "undeveloped areas include[d] maintenance yards, parking areas for container trucks and commercial buses, and storage areas for construction materials" (City and County of San Francisco Planning Department and San Francisco Redevelopment Agency 1999 Page V.B.1). The area was "flat, built on fill of unknown quality, toxic, and surrounded by disused piers and other neighborhoods with industries dead or dying" (Prowler 2005).

As the following charts show, the number of establishments rose dramatically in the 2000s, but industrial land-dependent establishments stayed flat. Employment in the area rose steadily through the late 1990s and at the turn of the century, before taking a dip around 2004. Sales have slowly increased, with a spike in 2004.





Data Source: NETS, for the Mission Bay redevelopment area. "IL Dependent" includes only businesses whose NAICS code is for an industry that is dependent on Industrial Land, as defined by our analysis of industrial land and businesses throughout San Francisco.

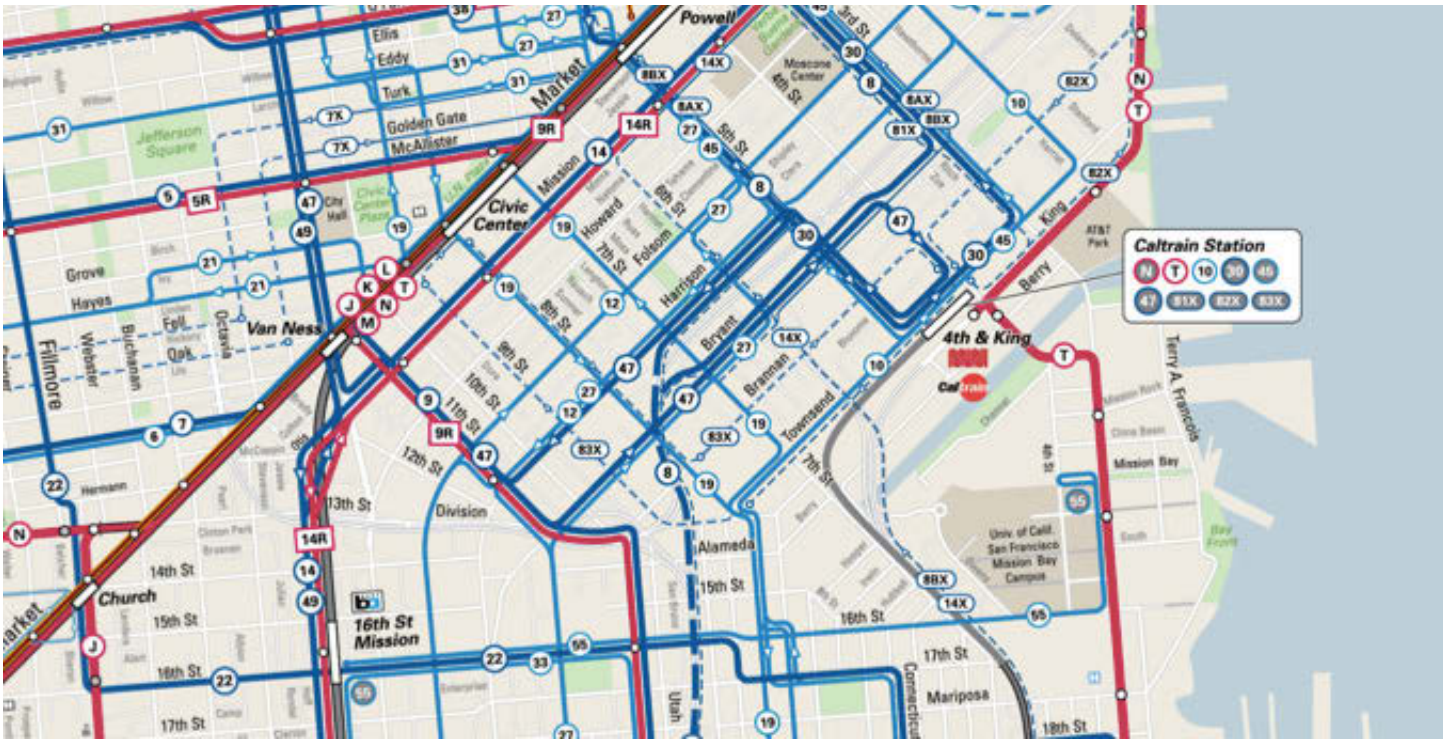


Data Source: NETS, for the Mission Bay redevelopment area. "IL Dependent" includes only businesses whose NAICS code is for an industry that is dependent on Industrial Land, as defined by our analysis of industrial land and businesses throughout San Francisco.

An examination of businesses that moved in and out of Mission Bay from 1990 to 2013 shows that professional/scientific/technical services and health care/social assistance establishments moved in, while wholesale trade and information-related establishments moved out.

Data Source: NETS, for the Mission Bay redevelopment area

Context: Mission Bay is well-located, well-connected, and in the region's core
Mission Bay is located very close (1-2 miles) to the Financial District. To the north, the South Beach and South of Market neighborhoods had grown tremendously leading up to Mission Bay's redevelopment (Prowler 2005). These neighborhoods were already part of the City's "downtown" and constituted a thriving business community and increasingly residential sector. In particular, high tech companies were steadily establishing a niche in SOMA and are pushing farther south into the vicinity of Mission Bay. From these neighborhoods, the city "grew to Mission Bay's border, creating the critical mass necessary to jumpstart development," particularly north of Mission Creek (Prowler 2005). Mission Bay has easy access to the 101 and 280 freeways. Caltrain, which provides rail access to the peninsula and Silicon Valley, is located in Mission Bay. In 2007, Muni opened the T-line, which runs down Third Street through the neighborhood and provides connections to the Embarcadero, downtown, and south of Mission Bay to Bayshore. These features—especially the transit access—made the neighborhood well-suited to residential and commercial uses that require access for many people.



Excerpt of Muni system map showing "T" rail line, Caltrain, and numerous bus routes running through Mission Bay. Source: https://www.sfmta.com/sites/default/files/maps/SFMTA-Metro-Sept2015-RTP-Outln.png

The Redevelopment Process and Community Perspectives
Catellus, the real estate division of the Santa Fe/Southern Pacific Railroad, initiated Mission Bay's redevelopment process in the 1980s. Plans were submitted in 1981, revised plans were approved in 1984, and the city signed a development agreement in 1991 (Chung 1991). But progress did not begin in earnest until 1998, when the city adopted the Mission Bay Plan, which "projected 30-year build-out, with the rate of development to be determined by market demand"(Prowler 2005).

In Mission Bay, most of the land was owned by one entity. This allowed the site to be entitled by a single master-developer and then subdivided for individual project build-out. The large size of the site and consolidated ownership facilitated an easier master planning process. A lot could be done on the site—a whole 40 acres could be donated for a new UCSF campus (discussed below), and there was s still considerable land leftover for other uses, including parks and open space. The consolidated ownership meant the city could negotiate (mostly) with just one entity.

Another key feature of the redevelopment was the role of a master plan and the Redevelopment Agency. That sort of comprehensive effort, once completed, mitigated the risk to the master developer and individual developers, because they know the city was committed to bringing the surrounding infrastructure up to speed, and the land uses were all designated in advance. Because the Redevelopment Agency was involved, tax increment financing could be used, whereby the extra taxes generated by the new development were put back to use developing infrastructure and subsidized affordable housing (Laura Adler et al. 2011).

The project had its share of community opposition. Conservationists had expressed concern about the plan including too little open space, and not restoring a wetlands area at the mouth of the China Basin (San Francisco Chronicle 1990). Advocates had pushed for more affordable housing at the site through the 1980s, with one ambitious proposal being 70% affordable housing, proposed by Mayor Agnos (San Francisco Chronicle 1988). Others were concerned that the high number of offices planned for the area would end up "adding to the city's housing and traffic woes" (Massey and Bodovitz 1990).

The overall land use plan for Mission bay includes primarily office, residential, and institutional uses. Source: http://sfocii.org/sites/default/files/FileCenter/Documents/783-MB%20Land%20Use%20Plan.pdf

The project's Environmental Impact Report listed several "areas of controversy," including: increased traffic

- "density of development"
- "visual effects from allowable building heights, especially as would be seen from Potrero Hill"
- water quality, fish, wildlife issues from "increased sewer overflows" and "contaminated soils and groundwater"
- "sufficiency of proposed open space, particularly in Mission bay North"
- "availability of long-term rental units versus conversion of rental units to for-sale condominiums"
- (City and County of San Francisco Planning Department and San Francisco Redevelopment Agency 1999 Page II.42)

However, the opposition seemed to be primarily related not to the development as a whole, but to the specific choices of what to put at Mission Bay. That is, there did not seem to be loud voices demanding that the area be kept industrial and not redeveloped at all. Instead, the concerns were with the specifics of the development plans.

A concert at the new public park along Mission Creek, with housing under development across the inlet. Source: http://urbanland.uli.org/wp-content/uploads/sites/5/2014/05/peterson1_800.jpg

The role of UCSF

The project area was not always envisioned as the bio-medical campus it is becoming. Proposals over the years were for a variety of ideas including only housing, a sports-entertainment complex, a Home Depot and Expo Design center and other similar regional-serving retail; the bio-medical vision got underway in the mid-1990s (Laura Adler et al. 2011).

In 1996, Willie Brown was elected mayor of San Francisco. It was reported that the first thing he said he would do as mayor was call Catellus to see about moving the Mission Bay project forward (Laura Adler et al. 2011). Willie Brown had a long history with Catellus, having provided it legal counsel for over a decade during the 1980s.

Concurrently, UCSF had outgrown its Parnassus Campus and was actively shopping around for a site for a second campus, with one in Alameda close to finalized. With these elements in play, Willie Brown and Catellus cemented a land deal whereby the City would provide a streamlined process for Catellus to get the Mission Bay project going and, in exchange, Catellus would agree to donate 40 acres to UCSF for a future second campus (Laura Adler et al. 2011).

UCSF's facilities attracted other biomedical companies. Lab tenants have an incentive to locate near UCSF because of the opportunity to build relationships with scientists from similar and larger companies, as well as the University. These two uses, in turn, attracted venture capitalists from the peninsula, whose interest comes from a desire to be close to the labs and to be able to compete with other VCs who might find the good investment before they do (Laura Adler et al. 2011).

A concert at the new public park along Mission Creek, with housing under development across the inlet. Source: http://urbanland.uli.org/wp-content/uploads/sites/5/2014/05/peterson1_800.jpg

Financial Viability of New Uses

Key to the redevelopment's success was the financial viability of the plan. A large, mostly undeveloped parcel of land one mile from downtown is an extremely valuable opportunity for development. The city's growth in the last 30 years created a need for—and, more importantly, financially viable market for—new office and residential uses. Therefore, transforming the area into a new mixed-use neighborhood was far from a pipe dream—it was financially feasible given the surrounding market conditions.

In fact, not only was significant private investment attracted to the site, the potential earnings were so high that the developer was willing to agree to include a relatively high proportion of affordable housing units—28%—and to provide a very generous public benefits package that included infrastructure, parks, shuttle services, and more (Prowler 2005).

Instrumental to this viability was having a diversified market in San Francisco. While planners and the developer thought for a time they would create a biotechnology campus, what made the development "go" in the end was attracting technology entrepreneurs and venture capitalists, with interests including, but not exclusively, biology and health care.

Conclusion: Criteria for Redevelopment of Industrial Land

The success of Mission Bay's redevelopment suggests several criteria for when redeveloping industrial land makes sense:

- The land is not substantially in active use for industrial purposes, and is unlikely to be in the future.
- The site is well-located for non-industrial uses, has adequate connectivity for non-industrial uses, and is in the region's core.
- The site is large and has few land-owners. These features make it easier to create a master plan and utilize the tools of (the former) redevelopment agencies, which facilitate redevelopment.
- The community generally agrees that redevelopment is the right step, even if there is disagreement about the specific details of planned uses.
- Having a large institutional user can help spur investment.
- Finally, and most importantly, the market conditions are such that not only is private capital interested in development, their money-making potential is so strong that they take on the development of public benefits, including affordable housing, parks, and other improvements.

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West Oakland

The West Oakland case study is informed by document review and interviews conducted in late 2015 and early 2016. The document review focused on recent plans and publications, and related evaluations and media coverage. A series of four interviews included:

- A retired city planner who worked for the former redevelopment agency in West Oakland
- A current City of Oakland staff member working on economic development in West Oakland
- A group of land and business owners in West Oakland, working together through the West Oakland Commerce Association (WOCA)
- A real estate developer with several projects in West Oakland

Background: Industrial Development in West Oakland

West Oakland has a long history of controversial public intervention and investment – including the closing of the army base; planning by the Redevelopment Agency; the construction and collapse of the Cyprus freeway; and the building of BART tracks through the neighborhood. This complex history has been well documented, but many questions remain about how the past should inform the future of West Oakland. Over the last twenty years the City has sponsored 36 different planning proposals in the area. Despite these various plans, West Oakland has struggled to attract investment and adequately address the needs of some of the city's most vulnerable residents.

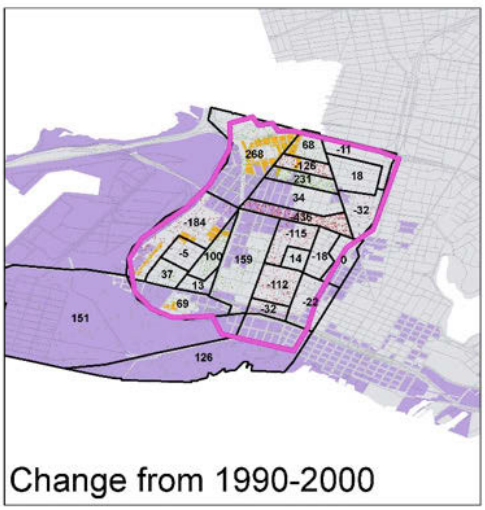
Following national trends in offshoring, over the last twenty years many large companies have left West Oakland. In their place, small, entrepreneurial business and the arts sector have taken over some of the industrial building stock. According to an analysis by Strategic Economics: "in 1992, large businesses accounted for 28 percent of employment in West Oakland, with small businesses (those with under five employees) accounting for just 13 percent. By 2012, small businesses accounted for a much higher share of employment (22 percent) in West Oakland, while large businesses' share of total employment had dropped to 17 percent."

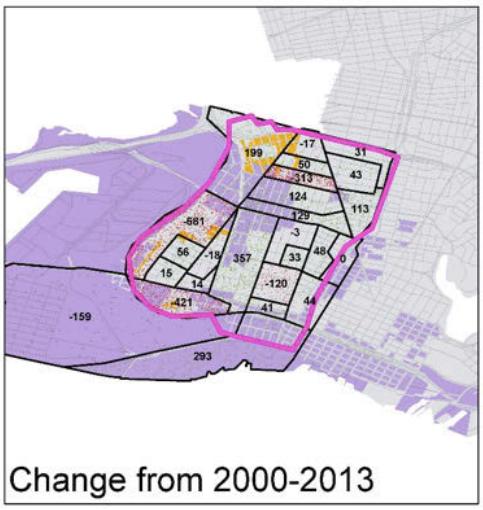
These business trends call for a new approach to economic development in West Oakland. Future development efforts must adapt to a new economy composed of many smaller entrepreneurs instead of a few large employers. An industrial artist/property owner and member of the West Oakland Commerce Association (WOCA) described how previous economic development approaches focused on attracting one large employer like Kaiser Hospital. As a result, the "support for mom and pop entrepreneurs in West Oakland has been overlooked in exchange for trying to attract one game changer."

While the large 'game changing' investments have not materialized there has always been a modest flow of business activity in West Oakland given its central location and relatively affordable real estate. Today the area has a variety of commercial and industrial uses occupying approximately 23 percent of land. These industrial businesses include "custom manufacturing, construction, transportation, environmental services and recycling, arts and creative businesses, and professional service and related businesses typically in older industrial buildings."

Our analysis of business dynamics at the block group level over the decades (see figures below) suggests that although many block groups saw job growth in both 1990-2000 and 2000-2013, significant job loss occurred adjacent to the port in recent years (over 1,100 jobs). Looking specifically at industrial land-dependent jobs, job loss in 2000-2013 is even higher, particularly in the northeastern part of the neighborhood. Although there has been job growth in West Oakland, the majority of the new businesses are service-oriented, able to locate in mixed-use areas.

ALL JOBS



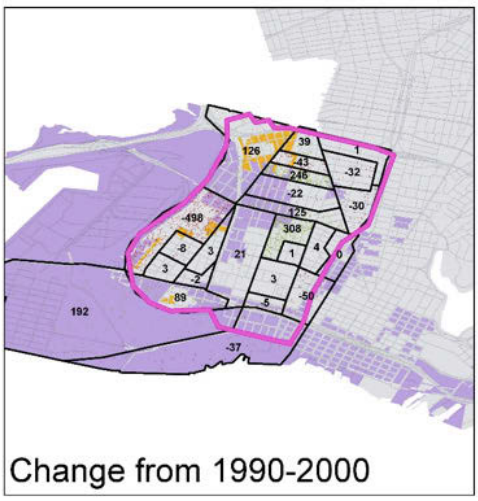


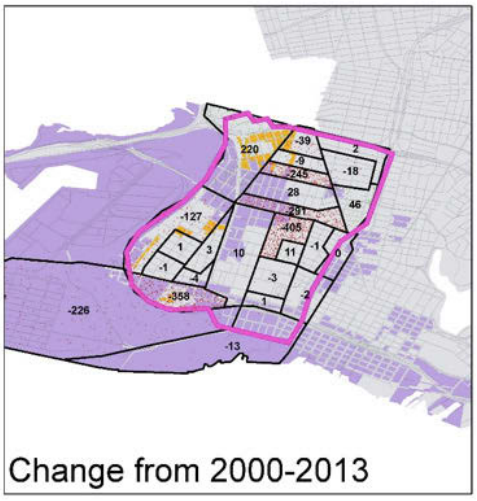
Legend

- Specific_Plan
- Block Groups In Specific Plan
- HBX Zoning
- Oakland Industrial Land

1 Green Dot = 1 Job Gained
1 Red Dot = 1 Job Lost

INDUSTRIAL LAND DEPENDENT JOBS





Legend

- Specific_Plan
- Block Groups In Specific Plan
- HBX Zoning
- Oakland Industrial Land

1 Green Dot = 1 Job Gained
1 Red Dot = 1 Job Lost

Another 60 percent of the area is composed of residential neighborhoods that house much of the city's low-income population. West Oakland's household median income is 60% the citywide median and 78% of West Oakland residents are renters, compared to 58% citywide. This mix of different land uses presents a challenging dilemma: how can the city plan for healthy, safe, and affordable residential neighborhoods while also supporting the creation of jobs and a strong economic base?

The West Oakland Specific Plan (WOSP)

The most recent planning effort in West Oakland was completed in August of 2014. With the elimination of redevelopment, the City created the new West Oakland Specific Plan (WOSP) to bring together scattered resources and bolster new revitalization efforts. The WOSP's primary focus was not on residential development, but on the industrial areas of West Oakland. As the document explains:

> Some of the fundamental objectives of the West Oakland Specific Plan are to retain businesses that are compatible with surrounding neighborhoods; rehabilitate underutilized, vacant, and neglected properties; create new employment opportunities at living wages; and attract new businesses that contribute to economic and environmental health. These economic development objectives underscore the importance and prominence of retaining and preserving West Oakland's industrial lands and the job base, which it supports. In the interest of growth and change, this Specific Plan acknowledges that new development needs to be compatible with the industrial properties that are so vital to Oakland's economy, yet so scarce and vulnerable to opposing short-term interests.

WOSP Zoning Changes

To support this growth the WOSP includes two main components. First, an Environmental Impact Report (EIR) was completed for the area to incentivize and expedite the development process. Second, the Plan amended zoning in order to: "establish more identifiable borders between the established residential neighborhoods and the industrial and intensive commercial business areas; prevent new land use incompatibilities that might adversely affect existing neighborhoods; restore neighborhoods at the residential/ industrial interface; and continue to provide for an ample supply of industrial land within West Oakland to meet existing and projected market demand." Part of this re-zoning involved adding in new areas designated for Housing Business Mix (HBX) and segmenting the Commercial Industrial Mix (CIX) into four, more specific overlay categories (see Figure 1).

Table 4.8-1: Current and Proposed Zoning, West Oakland Opportunity Areas

Current Zoning (net acres)	
CIX-1	227
IG	5
M-30	38
Total	**270**
Proposed Re-Zoning to CIX and HBX Zones	
CIX-1A, Business Enhancement	133
CIX-1B, Low Intensity	48
CIX-1C, High Intensity	66
CIX-1D, Retail Commercial Mix	7
	253
HBX, Housing Business Mix	17
Total	**270**

These zoning changes are part of a history of attempts by the City to integrate residential and industrial uses across Oakland. Previously, conditional use permits controlled many mixed-use developments. To decrease uncertainty caused by the conditional use permits, Oakland introduced the Housing Business Mix (HBX) zoning classification. Historically West Oakland included some parcels with the HBX-2 classification that "intends to provide development standards for areas that have a mix of industrial, certain commercial and medium to high density residential development. This zone recognizes the equal importance of housing and business."

The WOSP introduced a new HBX-4 classification that intends to "provide development standards for live/work, work/live, and housing in areas with a strong presence of industrial and heavy commercial activities." This new HBX-4 refines the City's density and permitted use requirements for live/work and work/live developments, but several stakeholders interviewed felt that the new requirements were not adequate. During the development

of HBX-4, the West Oakland Commerce Association advocated for the zoning to require a 50/50 mix of residential and commercial/industrial uses. Ultimately, however, this 50/50 mix was not included in the new classification by the City planning staff.

New CIX classifications were created, in part, to better control for the preservation of unique architecture in certain areas and the demolition of less attractive buildings in others. The four classifications were also intended to concentrate heavier industries within certain areas. New CIX zoning was proposed along with a "T" Combining Zone Overlay for areas with heavy truck uses near the Port. This overlay was applied primarily to one area under the I-880 freeway, and was advocated for by those working on the attraction and retention of industrial businesses in West Oakland.

Projected Zoning Impacts

The WOSP anticipates that the EIR and new zoning guidelines would catalyze the development of enough commercial and industrial space to accommodate as many as 22,000 new jobs. By providing opportunity for residential infill in certain areas the plan also projected the construction of up to 4,980 new housing units.

Yet some groups are concerned about negative impacts of these zoning changes. For example, the WOSP changes potentially exacerbate the tensions between residential and industrial development. The Housing Business Mix (HBX-2 and HBX-4) zoning was introduced in several areas that were previously zoned for only commercial uses under CIX. While the new HBX-4 regulations applied to many of these areas attempt to better define mixed-use requirements, it does not require a 50/50 mix of residential and commercial uses for which WOCA was advocating. Given the higher financial returns for residential development, it is probable that the majority of these newly zoned parcels will be put to residential uses, further restricting the available industrial land in West Oakland.

In addition to the HBX zoning issues, others have expressed concern about the highly prescriptive zoning under CIX. For example, the new CIX-A classification requires a full design review and demolition permit criteria to preserve historic character except if the building is considered condemnable. This creates a perverse incentive for property owners to let their buildings fall into disrepair as a way to avoid the design review process. An industrial business owner and board member of WOCA explained: "In the Specific Plan zoning the City tried to control the economics, which just can't be done at that micro scale."

WOSP Implementation Challenges

The WOSP describes ambitious goals of growing industrial business and improving the conditions for West Oakland residents. While its long-term impacts are still unknown, recent developments demonstrate the complex challenges and conflicts that arise when trying to plan for a viable mix of residential and industrial uses.

Economic Conflicts: Residential v. Industrial Development

The WOSP proclaimed itself to be focused on industrial and commercial activity, but heated debate during the planning process focused on residential displacement. One local website summarized some of the community concerns about WOSP stating "rather than focusing on the needs of long-term and working class residents, WOSP is re-writing the rules for developers and financial capital to ease their access to the city by re-writing the zoning regulations and providing them with a pre-packaged Environmental Impact Report." For many, the WOSP is simply continuing decades of government policies – from urban renewal to federal disinvestment – that have failed to address the actual issues facing minority and low-income residents of West Oakland.

Both developers and business owners interviewed agree that there is clear need for more services and affordable housing in West Oakland, and that the community must be organized to ensure these priorities are incorporated. In an interview, a West Oakland real estate developer reiterated this sen-

timent stating: “given the influx of capital that’s coming to the area, neighbors will get steamrolled if there isn’t a strategy.” Members of the West Oakland Commerce Association (WOCA) also underscored the need for affordable housing, but added “there is no affordable housing if you don’t have a job.” They expressed frustration that the planning process for the WOSP was entirely dominated by the debate about gentrification and residential displacement, leaving no room to develop real strategies to grow jobs and business in the area.

Given the increasing demand for real estate across the region, members of the West Oakland Commerce Association noted that many industrial property owners in the area are waiting for an opportunity to sell for higher, residential prices. This, in combination with some of the stricter design review requirements under CIX zoning, has incentivized some property owners to avoid upkeep of their existing industrial buildings. To address this issue of abandoned buildings, WOCA created the Business Alert group that works with the City to identify problematic properties. Many of these problematic owners are holding on to their property in hopes of selling for a higher future return. The Business Alert group has had some initial success: four owners have moved towards selling their properties after threats from the City to enforce codes and levy fines. Yet at the same time WOCA members expressed a fear that identifying these blighted properties may give the city another reason that the area should be ‘scrubbed’ and used for residential purposes.

Lastly, for the new CIX and HBX zoning there is still tension over how to define and monitor ‘work/live’ and ‘live/work’ developments. The requirements for these developments are very loose and not strongly enforced. For example, one developer recently proposed a ‘work/live’ development in an area zoned for CIX, requiring a variance because residential is not permitted in the original zoning. The development proposed 42 units on a one-acre site, creating a density and unit size that would preclude many businesses from being able to use the space. In this case WOCA worked with the City and the developer to increase the unit sizes (consequently lowering the financial returns of the project).

While the WOSP set out to create clear development guidelines, in practice the City has not adequately defined and enforced zoning and code requirements. Further, because the 50/50 requirement for industrial/residential use proposed by WOCA was not included in the new HBX zoning, the City has limited power to ensure there is a mix of uses in those areas. This creates development loopholes that allow more lucrative residential development to take over land previously designated for industrial uses.

Land Use Conflicts: Residential v. Industrial Logistics

Beyond the economic conflicts between residential and industrial zoning, the WOSP implementation also highlights land use conflicts encountered when attempting to blend residential and industrial activity. The plan attempts to address the issue of residential/industrial buffers through the introduction of Housing Business Mix (HBX) zoning. The WOSP explains that the HBX zone “recognizes the equal importance of housing and business, allows residential and business activities to compatibly co-exist, provides a transition between industrial areas and residential neighborhoods, encourages development that respects environmental quality and historic patterns of development, and fosters a variety of small, entrepreneurial, and flexible home- based businesses”

Given the economic preference for residential development in the HBX areas discussed above, many industrial business owners fear that this new zoning will not create buffers, but simply eat away at more industrial land. A West Oakland business owner and member of WOCA noted that this encroachment has been happening for a while, stating: “when I started working in West Oakland, the industrial-residential buffer line was San Pablo, now it has grown to Adeline.”

A related encroachment on industrial land has taken the form of road diets proposed through the

WOSP. The stated goal was to improve the pedestrian experience by reducing the number of lanes and incorporating new protected bike lane on Adeline Street. Currently the segment of Adeline that runs through West Oakland includes primarily residential uses on the east side and industrial uses on the west; a segment of the road was rezoned HBX to reflect that mix. One City staffer observed that the road diet plan is partially motivated by urban designers who believe both sides of the street should “match.” While these urban design interventions would be a valuable new amenity for residents, the proposed design conflicts with the truck parking and loading areas used by many industrial businesses located along Adeline. One industrial business owner on Adeline Street explained this tension, stating: “I’m in favor in having bike lines — but to throw the term back to them – it has to be mixed-use." The business owner also identified other, better-suited bicycle corridors in West Oakland, noting that the Adeline road diet is representative of an attitude held by some City staffers who believe bicycles and pedestrians should be prioritized everywhere. Despite requests from industrial businesses to reconsider the road diet, the City has indicated that it will move forward with the plan. However, construction has not yet begun on the bike lanes, so the ultimate impact on Adeline businesses is still to be determined.

The proposed road diet, in combination with the new HBX zoning along Adeline, may also lead to further encroachment of residential uses into industrial areas. For example, a purely residential development was recently proposed on Adeline Street, in between several industrial businesses. One business owner anticipated that this development would further limit the surrounding industrial uses when new residents complain about the businesses’ noise and logistics. Another WOCA member noted that the businesses along Adeline represent the kind of light industrial uses (e.g. makers, specialty food and custom manufacturing) that could be integrated with other uses if approached with appropriate planning and design. Many of these businesses also provide good paying jobs for low-skilled workers. Instead, with the current plans, the business owner worries that “the City is going to choke off exactly the kind businesses they want to have."

While the WOSP’s proposed pedestrian/bicycle improvements and HBX zoning threatens industrial land in many parts of West Oakland, the Plan may provided one bright spot for the preservation of industrial uses. The “T” Combining Zone Overlay included on a section of CIX-zoned parcels near the Port of Oakland prioritizes businesses requiring heavy truck use. This Overlay has already helped to encourage one new industrial development in that area.
If serious about creating separation between industrial and residential activities, the City will have to refine and strengthen the requirements of development along shared corridors and in buffer areas – in CIX and HBX areas. For example, the current requirements place the entire burden of creating buffers on industrial buildings. As a West Oakland residential real estate developer explained: “I’m the person that’s going to challenge the cushion.” Only requiring industrial development to accommodate buffers creates another mechanism where industrial land is encroached on by residential uses.
Across West Oakland these ‘soft buffer areas’ created through weak HBX zoning requirements and residential-oriented infrastructure improvements have also led to rising land prices. No matter the current zoning, many landowners are waiting to sell their land at higher rates. Observing the encroachment in these buffer areas, landowners anticipate that residential uses will eventually be viable on their industrially zoned land. This further constricts the amount of available industrial land, as many businesses cannot pay the higher rates that the landowners are anticipating.

Funding Conflicts: Public v Private Investment
The challenges faced by industrial land are exacerbated by the lack of funding available to support business attraction and retention. The implementation section of the WOSP describes how growth in West Oakland will initially need to be catalyzed by public investment. Yet the document also acknowledges, “in the nearer term, there are uncertainties as to the availability of public funding to implement this strategy.”

Without public funding it is difficult to support the development of a robust cluster of industrial businesses in West Oakland. Yet there are still other ways that the City could drive the WOSP's vision by partnering with businesses and landowners. Members of WOCA expressed frustration in the City's limited support and resistance to partnership.

Further, the WOSP identifies key challenges to growing the number of businesses in West Oakland, including inadequate infrastructure, environmental contamination, and crime. According to WOCA business owners the City has provided little support in addressing theses issues. Instead the City has often "thrown the book" at new businesses moving to the area, requiring them to upgrade facilities to incredibly high and unnecessary standards.

A final public funding challenge is the low prioritization given to grant applications for industrial attraction and retention activities under the current 'Priority Development Areas' (PDA) system. Given the tendency of PDAs to favor residential, mixed-use development, a supplemental 'Priority Industrial Area' could provide an important new stream of resources for industrial businesses.

Future of Industrial Land in West Oakland

As described above, the WOSP provides important examples of the conflicts involved in determining where and how to prioritize industrial land. This case study concludes by outlining the arguments for and against continued industrial development in West Oakland. These arguments may also be useful in developing regional criteria for future 'Priority Industrial Areas.'

Against Prioritizing Industrial Land in West Oakland

Challenges of Residential-Industrial Buffers

Issues of environmental justice are clear in West Oakland. For many years low income and minority communities have been exposed to pollution and health-hazards from the adjacent industrial activities. While the WOSP attempts to create new industrial-residential buffers, they are difficult to create through zoning alone. For example, the freeway provides an effective buffer between West Oakland and the industrial activity at the Port, however similar physical infrastructure does not exist within the neighborhoods. A retired city planner who worked in West Oakland, underscored this challenge by saying "buffers are kind of like diet butter, it's really difficult to have it all." As seen with the Adeline road diet, residential and industrial tenants also have very different transportation and public realm needs that are not easily mixed along shared thoroughfares. Understanding these land use conflicts, what industries/sectors identified could the City prioritize that would also promote the wellbeing of West Oakland residents? The information sector is likely more compatible with residential uses than construction or urban manufacturing, yet the current demand is for the latter not the former given the low quality of infrastructure in West Oakland.

Significant Investment Required in Public Safety and Industrial Infrastructure

The WOSP includes a section that identifies obstacles to community and economic development. The section found: "the leading indicators of blight in West Oakland include underutilized and vacant land, deteriorated and dilapidated buildings, high rates of vandalism and crime [...], inadequate public improvements and lack of private investment." Each of these obstacles make the attraction of new businesses very difficult. WOCA members note that many business owners are hesitant to locate in West Oakland because of these safety and infrastructure issues. Business owners are worried about the safety of their employees coming to work, and are deterred by the significant upfront cost required to improve the infrastructure in and around their building. The Implementation section of the WOSP details the needed infrastructure investment and identifies potential budget sources. However, this documentation has not translated into actual investment. Business owners in West Oakland observe very little investment or construction activity 'on-the-ground'. While there may be a patchwork of public investment slowly addressing the needs identified in the WOSP (e.g. measure BB

funds for street repaving), these plans and their connection with the larger redevelopment strategy are not well articulated. In the absence of significant public investment to address these obstacles, developing a thriving and sustainable cluster of industrial businesses in West Oakland will be extremely difficult. Alternative cities (e.g. Stockton) many have less challenges, requiring less public investment to preserve industrial land in the region.

Actual Demand and Job-Creation Potential
A second reason against prioritizing industrial land in West Oakland comes from skepticism that the actual demand for industrial space in West Oakland is as high as projected. The WOSP projected that "industrial space and the availability of industrially designated land is a declining resource within the central Bay Area, while business demand for such land and space continues to grow. This disparity between business demand and available space supply will increase business interest in West Oakland over time." Yet at the same time many industrial businesses are moving further out to areas like Stockton where real estate prices are lower, and some see this as a natural progression. A West Oakland real estate developer noted that he is not seeing a shortage of industrial spaces in West Oakland. Instead he believes the problem may be that there are not enough companies with the right business models to afford the comparatively higher rents. He described his experience working in San Francisco's SOMA neighborhood in the 1990s when similar industrial-residential conflicts were occurring. Many thought that preserving industrial buildings would bring jobs, but that was not the reality. Based on these experiences, he posed the question: "if we are going to protect the industrial buildings in West Oakland who will move in?" Yet, very low vacancy rates and the steady employment growth in the neighborhood suggest that the demand exists.

For Prioritizing Industrial Land in West Oakland
Existing Building Stock
Previous analysis of industrial businesses in West Oakland found that the many businesses are attracted to the area "due to the availability of affordable large-scale industrial work spaces." In the WOSP the City also identified the Opportunity Sites as "among the few large commercial/industrial properties remaining in the central Bay Area." Given this existing building footprint in West Oakland an opportunity exists to attract and retain businesses that are moving further out to areas like Stockton. This will require creatively adapting and retrofitting the building stock to meet the evolving needs of industrial businesses – for example: finding ways to incubate small businesses while also providing larger spaces for growing businesses.

Unique Industrial Artist Sector
An asset for businesses in West Oakland is the industrial artist community. The WOSP notes that many of the businesses moving to the area "benefit and draw inspiration from their close proximity to what some regard as the foremost industrial arts community in the nation." This combination of more traditional industrial activities like manufacturing and construction with the creativity of the arts sector presents an exciting opportunity for new ideas and products. Many are particularly worried, however, about the vulnerability to displacement faced by industrial artists. Recognizing this problem, the Mayor is convening a task force to determine how to keep artists in Oakland. Initial recommendations from the task force focused on real estate acquisition strategies, financial assistance, and technical assistance strategies to help preserve artist housing and workspaces. The task force has not yet addressed industrial land policies, but intends to discuss them in a future white paper. Aligning this work of the Artist taskforce with a larger push to prioritize and protect other industrial activity, could lay the groundwork for exciting new innovations.

Regional Location
The most cited reason to maintain industrial land in West Oakland is its location within the region. The area is directly in the center of the Bay Area, providing ideal access to employees and markets. Many of the business owners and employees live close by, reducing commuting distances and con-

gestion. In a recent profile, the owner of a small food manufacturing business in West Oakland described how: “we have people who ride their bikes or walk to work,” adding “there is a halfway house nearby for ex-convicts going through transition. They’re some of our best workers.” In terms of market access, an industrial property owner and member of WOCA, described a subset of industrial businesses whose logistics require close access to markets in core areas like Oakland, Berkeley, and San Francisco. Often, the business owners live nearby, in the Oakland hills or the suburbs beyond, and it is well established that the CEO’s residential location will drive firm location. Thus, these businesses typically prefer to locate in between Albany and San Leandro and George believed that West Oakland should better position itself to absorb more of that activity.

The final, and perhaps most critical characteristic of West Oakland’s location is its connection with the Port. While the WOSP does reference opportunities to develop industrial activity alongside the Port, many observed that there is little actual alignment between the two areas. The Port provides unmatched transportation access that cannot be replicated in other areas in the region. Coordinated infrastructure investments in West Oakland and at the Port could support, for example, the development of a regional cluster of food processing and custom manufacturing businesses. If done strategically these infrastructure investments could also help to create better buffers between industrial and residential uses and reduce vehicle miles traveled by providing businesses with direct connections to rail and shipping transport.

Interviews
- 12/2/15 – Wendy Simon: former planner for the City of Oakland Redevelopment Agency
- 12/4/15 – West Oakland Commerce Association members and City of Oakland Economic Development Office
- George Burtt: Secretary and one of the founders of WOCA; industrial property owner.
- Jon Sariugarte: Member of WOCA; industrial artist and business owner; industrial property owner
- Lauren Westrich: WOCA board member; industrial land and business owner
- Margot Prado: City of Oakland, Senior Economic Development Specialist
- 12/10/15 – Rick Holliday: West Oakland developer
- 2/22/16 -- Margot Prado: City of Oakland, Senior Economic Development Specialist

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Potential Criteria for Industrial Land Preservation and Conversion

This analysis suggests that the conversion of industrial land is proceeding at a slow pace, but is likely to accelerate in coming years due to the visions put forward in general plan and PDA designations. To guide city decision-making about where to preserve industrial land and where to convert it, MTC/ABAG should develop criteria. Figure 10 presents potential criteria in terms of transportation, economy, equity, site characteristics, and environment. These may serve as the basis for designating Priority Industrial Areas in the future.

Transportation	• Proximity to freight and/or port facilities • Low VMT for workers on industrial land	• Proximity to transit • High VMT for workers on industrial land
Economy	• Production or related employment • Proximity to business clusters/suppliers/markets • Critical supplier to local businesses • Industry stable or growing	• High-density non-production employment • Proximity to markets/customers • Limited linkages to local economy • Industry in decline
Equity	• Offers middle-wage jobs for less-skilled workers	• Potential for affordable housing
Land use/zoning compatibility	• Surrounded by medium/heavy industrial zoning	• Adjacent to residential
Environment	• Brownfield site, remediation infeasible	• Environmental health hazard for surrounding communities (especially if historically disadvantaged)
Adequacy of supply	• In areas with projected deficit of industrial land • Low vacancy rates for industrial buildings	• In areas with projected surplus of industrial land • High vacancy rates for industrial buildings

Figure 10. Criteria for Industrial Land Preservation and Conversion

Technical Memo #3

Center for Community Innovation
INDUSTRIAL LAND AND JOBS STUDY FOR THE SAN FRANCISCO BAY AREA

ASSESSING THE IMPACTS OF CHANGES IN INDUSTRIAL EMPLOYMENT ON JOB QUALITY AND COMMUTER PATTERNS

Professor Karen Chapple
with Evelyne St.-Louis and Ángel Ross

Berkeley

Authors
Karen Chapple
with Evelyne St.-Louis **and** Ángel Ross

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The Center for Community Innovation (CCI) at UC-Berkeley nurtures effective solutions that expand economic opportunity, diversify housing options, and strengthen connection to place.

Report prepared for the Association of Bay Area Governments/Metropolitan Transportation Commission

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Contents

INTRODUCTION

The Regional Industrial Land and Jobs Study complements the 2015 MTC Goods Movement Needs Assessment with an analysis of the demand for and supply of industrially zoned land in the nine-county region, both now and in the future. This Technical Memo analyzes the economic and transportation impacts from future projected changes in industrial land and jobs across the nine-county Bay Area region.

OVERVIEW OF INDUSTRIAL JOB CHANGE FROM 2011-2040

There were 600,824 jobs in the Bay Area in 2011 in the industries that tend to concentrate on industrial land. Just 205,561 of these jobs were actually located on exclusive or mixed-use industrial land; the remaining jobs might be considered the latent demand for industrial land. Projecting out to 2040 —assuming existing patterns of distribution remain constant—a 24% growth is expected, resulting in about 747,301 jobs overall in the Bay Area, and 254,966 jobs actually located on industrial parcels.

Zooming in from the county-level to the block group level (see map, right), we find that areas of growth are found throughout the Bay Area. Although there are a few pockets throughout the region that show a net job loss, overall, there are no distinct areas of very concentrated decline.

CURRENT AND FUTURE TRENDS IN JOB QUALITY

In 2011, middle-wage jobs counted for a near-majority (44%) of jobs on pure industrial land, while low-wage jobs counted for 28%, and high-wage jobs for 28% of jobs. This is a favorable distribution considering that only about a quarter (27%) of total jobs in the Bay Area offer middle wages, while a third (36%) offer low wages, and 38% offer high wages, according to the Regional Economic Prosperity Strategy (2014).[1] In other words, middle-wage jobs are twice as concentrated on industrial land as in the region generally.

When we apply occupational distributions to employment growth patterns for 2040, the distribution of low-, medium-, and high-wage employment remains surprisingly similar.[2] The share of middle-wage jobs is projected to increase only slightly to 45%, at the expense of a one-percentage point decrease in the share of high-wage jobs. Furthermore, in 2040, the share of jobs that pay more than $18/hour and that require less than a bachelor's degree or five years' experience increases slightly from 57% to 60% of total industrial jobs.

IMPACTS ON COMMUTE PATTERNS AND VMT

Counties located further away from the urban core cities of Oakland and San Francisco – such as Sonoma, Marin and Solano— currently have the highest average vehicle miles traveled (VMT) estimates, between 18.4 and 24.6 miles per worker (one-way only). Santa Clara is not far behind, with both Santa Clara Core (San Jose and surroundings) and Non-core attracting similarly long trips of around 17-18

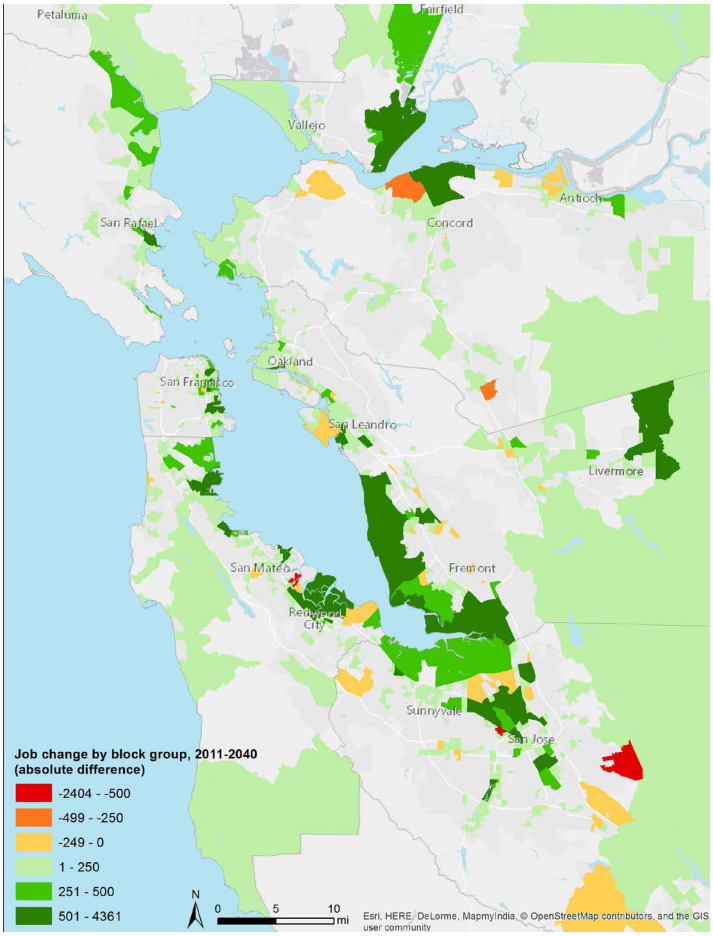

Figure a. Projected employment growth by block group (2011-2040) on exclusive and mixed-use industrial land

miles per worker (one-way). Because these are workplace based VMT calculations, we interpret this as: workers need to drive more, and/or longer distances to reach employment in these areas.

Conversely, San Francisco and Alameda Core (including Oakland and cities along the shoreline like San Leandro, Hayward, and Fremont) display the smallest average VMT estimates—with values of 7.7 and 8.6 miles per worker (one-way), respectively. Interestingly then, even though a city like San Francisco attracts workers from across the region, its per-worker average VMT (7.7 miles per worker, one-way commute) still remains much lower than Santa Clara Core's VMT estimate (18.1 miles per worker, one-way commute). To meet the goal of reducing greenhouse gas emissions, it may be beneficial to maintain industrial jobs in areas with lower VMT.

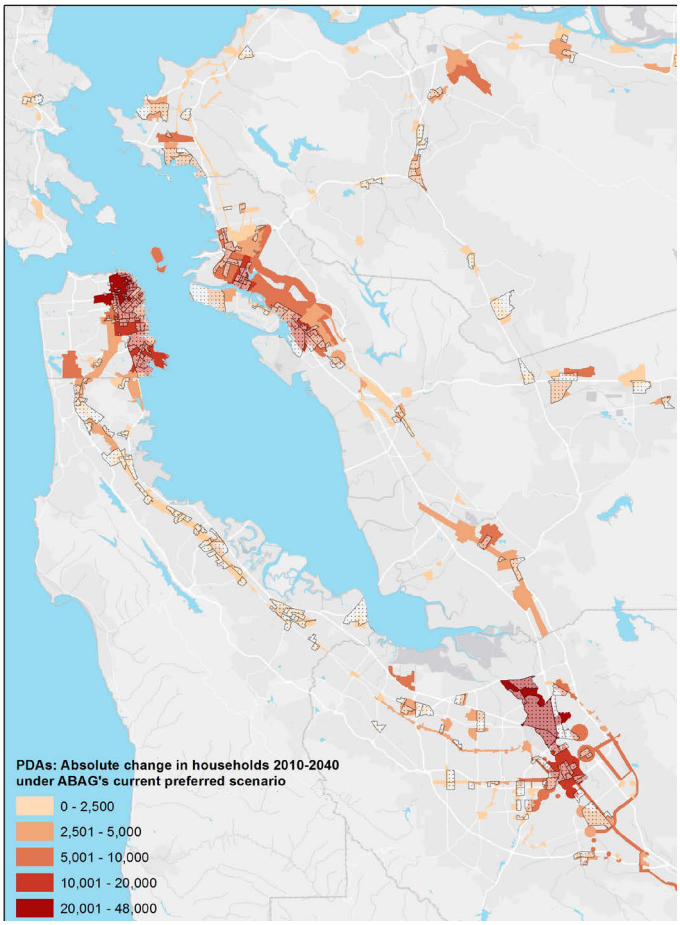

Figure b. Net new households in PDAs under ABAG middle scenario for growth to 2040, shown in relation to industrial block groups

OVERLAP OF REGIONAL HOUSEHOLD GROWTH SCENARIOS AND INDUSTRIAL LAND

This section integrates ABAG's middle scenario regional 2010-2040 projections for households and jobs with industrial block groups' location and projected growth.[3] What does the spatial overlap between these two geographic entities say about the pressure of priority development area (PDA) housing/job growth on industrial jobs?

At present, about 29,000 industrial land-dependent jobs are located on industrial land within the region's PDAs, and up to 320,000 are located in adjacent block groups. We find that about 96,700 industrial jobs are located in block groups within or adjacent to the eight highest-growth Priority Development Areas. These high-growth PDAs—each projected to accommodate over 10,000 new households by 2040—are located in Eastern and Downtown San Francisco, in Northern and Downtown San Jose, and in Downtown and East Oakland.

These numbers do not paint a complete picture of future growth, and certainly cannot confirm if industrial jobs overlapping with PDAs are definitely at risk of loss or displacement, however, this analysis is a useful first step to determine areas of potential conflict between housing growth and industrial sector growth. This analysis highlights the need to reconcile the regional housing and job strategy with broader regional economic development needs, such as planning for industrial land use at a regional scale.

REPORT

Photo courtesy of PuzzleMonkey! on Flickr

PART I: INTRODUCTION

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This Technical Memo is the third product from the Regional Industrial Land and Job Study, prepared for ABAG and MTC as a complement to the 2016 MTC Goods Movement Needs Assessment. In this study, we analyze the economic and transportation impacts from projected changes in industrial land and jobs across the nine-county Bay Area region:

- Part 2 of this report provides an overview of job change in the Bay Area from 2011 to 2040, looking at overall shifts in employment sectors that are dependent on industrial land. Projected job change is also mapped for the region by block group.
- Part 3 looks more specifically at the impacts of the projected economic growth on job quality. By combining employment data with occupational data, we specifically focus on middle wage 'accessible jobs' – that is, that require relatively lower levels of education.
- Part 4 examines current commute patterns to industrial land in the Bay Area and estimates potential future impacts on Vehicle Miles Travelled (VMT) based on projected job growth across the region. We also analyze home location of industrial land workers.
- Part 5 compares 'business as usual' economic projections from Part 1 with ABAG's middle growth scenarios for the region.[4] We use the scenario for housing and job growth in Priority Development Areas for 2040, and we assess the extent of overlap between these housing/job high-growth areas and high-growth industrial areas.

PART II:
OVERVIEW OF INDUSTRIAL JOB CHANGE FROM 2011 TO 2040

To understand the overall impacts of future change in industrial land, we first need to understand the regional outlook for industrial job growth in the Bay Area looking forward. For this reason, this section explores projected growth in industrial employment, by geography and by industry type.

METHODS

We estimated employment growth from 2011 to 2040 based on REMI projections.[5] We projected the sum of employment in 6-digit industries dependent on industrial land[6] using the closest corresponding 3-digit REMI projection. While a straightforward match between NAICS and REMI industry categories was possible in most cases, projections using closely related industries or corresponding 2-digit industries had to be performed for a small number of industries.[7] We calculated employment growth for jobs located both on exclusively-zoned industrial land, and on exclusive and mixed-use industrial land.

Following this, we used 2011 NETS data to break down employment projections by block group. Although employment numbers are much smaller at this geographic level – making projections riskier to do with certainty – this analysis still provides crucial insight into where growth and decline are expected to occur. Given that industrial jobs tend to be geographically concentrated in specific zones throughout the Bay Area, a spatial approach to job projection is key: a certain district could be highly impacted depending on its relative specialization.

In sum, we conducted employment projections at the following levels:

- By NAICS category (3-digit, summarizing 6-digit employment numbers for industries dependent on industrial land)
- Regional level (total)
- Sub-regional or county level
- Block group level

We did not conduct projections specific to the parcel level, i.e., for actual industrially zoned land, because of uncertainty in predicting economic trends at the micro scale. In order to project job growth in industrial land-dependent industries actually located in exclusive or mixed-use industrial zones (Figure 1), we apply the growth rate from summing the block group projections at the county level.

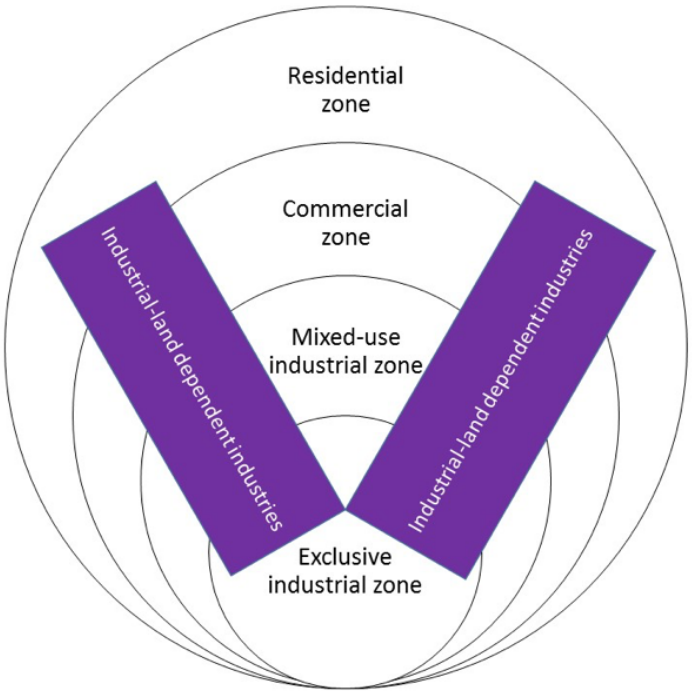


Figure 1. Location of industrially zoned land and industrial land-dependent jobs.

FINDINGS: REGION-WIDE PROJECTIONS

Based on our definition of industrial land-dependent employment,[8] the estimate for industrial jobs located on exclusive and mixed-use industrial land in 2011 for the Bay Area is 600,824 jobs. Projecting out to 2040, a 24% growth is expected, resulting in about 747,301 jobs, with 254,966 jobs actually located on industrial parcels and the remainder in adjacent block groups.

A few sectors emerge as having a large number of projected net new jobs (for full list, see Appendix 1). For example, in ranked order, Merchant Wholesalers of Durable Goods (NAICS code 423) and Nondurable Goods (424), Repair and Maintenance (811), Transit and Ground Passenger Transportation (485), Waste Management and Remediation (562), Machinery Manufacturing (333), Truck Transportation (484), Support Activities for Transportation (488), and Warehousing and Storage (493) are each contributing an additional 1,000 new jobs or more by 2040.[9]

Photo courtesy of PuzzleMonkey! on Flickr

Interestingly, a few select manufacturing industries also are projected to see net positive growth to 2040, such as Nonmetallic Mineral Product Manufacturing (327), Fabricated Metal Manufacturing (332), Transportation Equipment Manufacturing (335), Wood Product Manufacturing (321), and Beverage and Tobacco Product Manufacturing (312), which are each providing over 200 net new jobs or more by 2040.

In contrast, a smaller number of NAICS industries are projected to experience a net decline in jobs to 2040. Some of the more noticeable declining industries include, in ranked order, Computer and Electronic Product Manufacturing (334), Couriers and Messengers (492), Apparel Manufacturing (315), Plastics and Rubber Products Manufacturing (326), Petroleum and Coal Manufacturing (324), Paper Manufacturing (322) and Primary Metal Manufacturing (331).

FINDINGS: INTER-REGIONAL DIFFERENCES IN INDUSTRIAL GROWTH

Notable differences occur between counties, as shown in Figure 2 and Table 1. In general, the South Bay counties (Santa Clara and San Mateo) display high growth rates and a large number of net new jobs (over 19,000 new jobs by 2040). The East Bay counties (Alameda and Contra Costa) have relatively smaller growth rate percentages, and while Alameda will be contributing many jobs (~18,000 jobs), Contra Costa does not display many net new jobs (~5,000). Interestingly, the East Bay accounts for a distinctively larger proportion of industrial jobs located on exclusive industrial land (40%) compared to the share it contributes to industrial jobs on exclusive and mixed use land (30%). Finally, San Francisco contributes a relatively high share of growth as well (~17,500 jobs), while the North Bay counties (Solano, Sonoma and Marin) – albeit only growing by around ~5,000 jobs each – are growing at a considerable pace given their size.

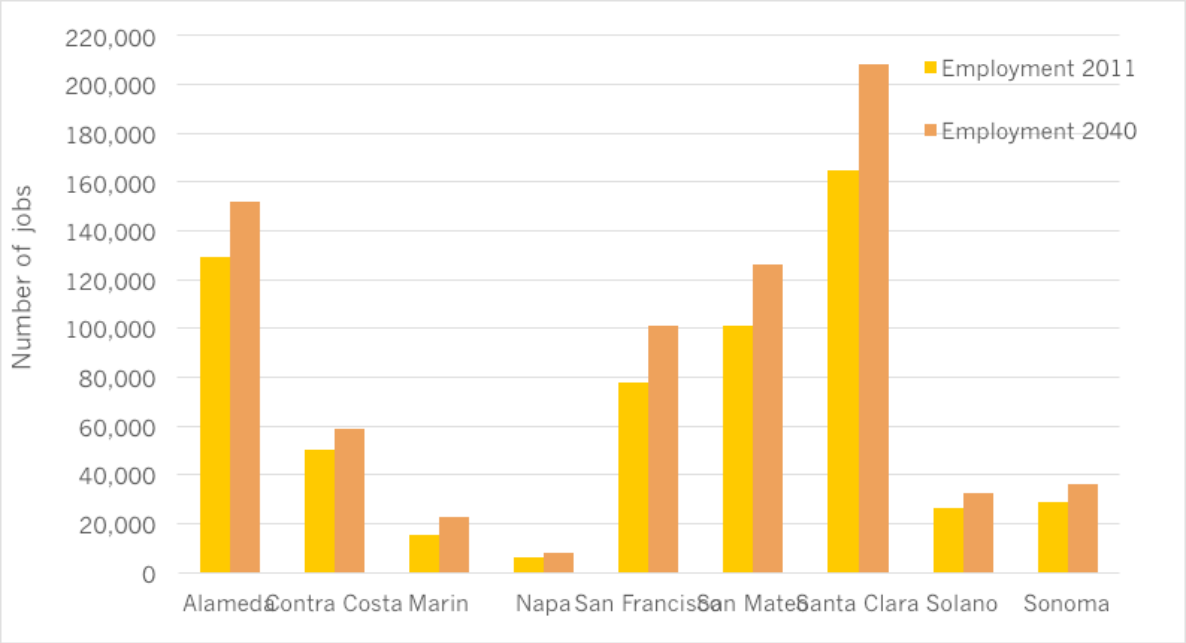


Figure 2. Projected job growth by county (2011-2040) on exclusive and mixed-use industrial land

Zooming in from the county-level to the block group level (Figure 3), we find that areas of growth occur throughout the Bay Area, with no distinct areas of very concentrated decline.

Areas of high growth are projected to be spread through parts of the East Bay, merging into parts of Northern and Central San Jose. Pockets of high growth are also present in the Northern Contra Costa Waterfront area and southern Solano County. San Francisco also displays a few block groups of high growth. Moderate growth areas are also found throughout the nine-county – mainly in the outskirts of Solano, San Mateo, Alameda and Contra Costa, and in parts of Richmond, Oakland, Berkeley, and San Francisco. This is perhaps a sign that, in most cases, employment industries are sufficiently diversified that no single area suffers from the decline of a single industry.

In turn, projected areas of strong decline are few: pockets of decline are located in Northern Contra Costa (near Antioch, Martinez/Concord, and Hercules) and around San Ramon, which is related in large part to the projected decline of Petroleum and Coal Products Manufacturing (324). There is a small concentration of declining block groups in Santa Clara County, near Northern San Jose, in the

outskirts of the city, in Cupertino, and on the San Mateo shoreline. Most of these areas of decline in the South Bay are related to decline in Computer and Electronic Product Manufacturing (334) as well as Postal Service (491) and Couriers and Messengers (492). Another pocket of decline is located in the Oakland Airport area, which is due to the projected decline in Air Transportation jobs, and around Union City, which is explained by the decline in Plastics and Rubber Products Manufacturing (326). In San Francisco, the decline of Apparel Manufacturing (315) and Computer Electronic Product Manufacturing (324) explains the small decline seen in SoMa.

Sub region	Employment 2011	Employment 2040	Absolute difference	Percent difference
East Bay	179,511	210,966	31,455	0.175
North Bay	77,279	100,213	22,934	0.297
South Bay	265,883	334,991	69,108	0.260
West Bay	78,151	101,130	22,979	0.294
Total	600,824	747,301	146,477	0.244

Table 1. Projected job growth by sub-region (2011-2040) in industrial land-dependent industries.

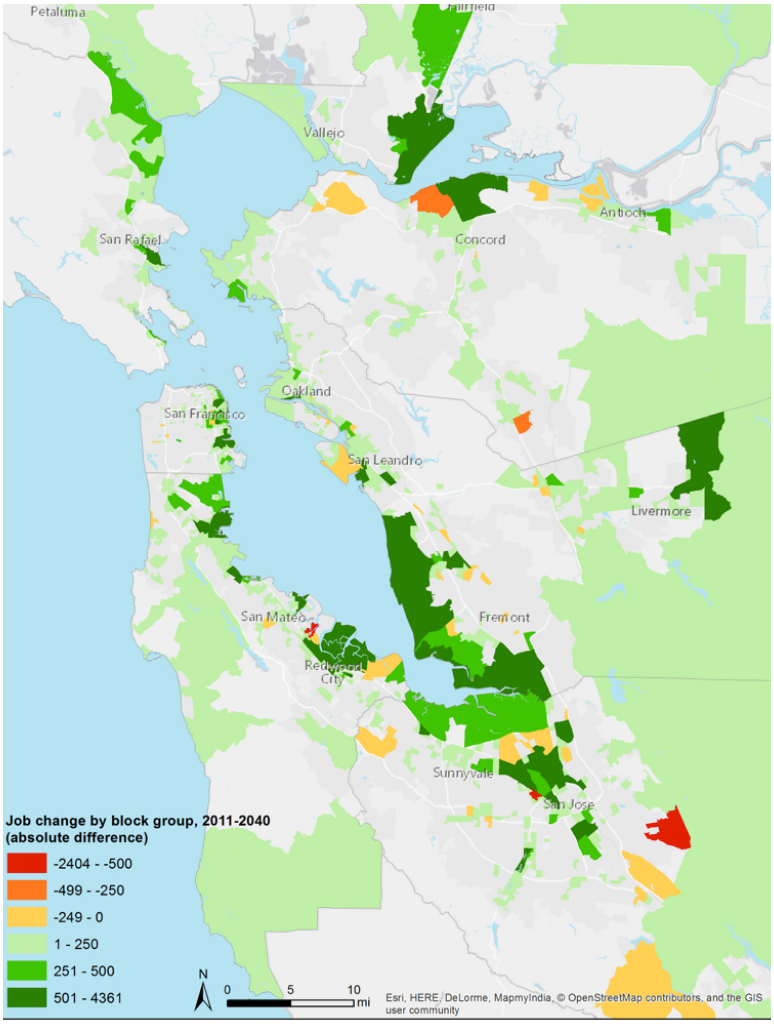


Figure 3. Projected employment growth by block group (2011-2040) on exclusive and mixed-use industrial land

PART III: CURRENT AND FUTURE TRENDS IN JOB QUALITY

The second part of the report explores whether industrial sectors that are expected to grow on industrial land offer the type of jobs that are beneficial to the Bay Area's economy and residents. According to the Bay Area Regional Prosperity Plan, the region should be growing the economy with an explicit focus on middle-wage work. As said in the report, "In the Bay Area, more than 1.1 million workers, over one third of the total workforce, earn less than $18 per hour (or less than $36,000 per year for full-time work). The majority of these workers earn less than $12 per hour. Further, the number of jobs that pay wages less than $18 per hour has risen during the economic recovery, and these low-wage jobs are expected to increase even more over the coming years."[10] In other words, there is a critical need to improve economic conditions for low- and moderate-income Bay Area residents and workers. Opportunities for improvement include examining more closely the contribution of the industrial sector to job quality in the Bay Area.

In this section, we combine NAICS employment numbers, as described in Part 1, with their associated occupational salary and educational levels, and estimate changes in this distribution to 2040. For this analysis, we focus only on jobs in industries that are dependent on exclusive industrial land, because the industries located on mixed-used industrial land are not only extremely diverse, but also do not experience the locational constraints that of the industrial land-dependent industries (as described in Technical Memo #1).

METHODS

We aggregated industries dependent on exclusive industrial land in each of the nine counties, accounting for 171,740 jobs in 2011. Using a similar process to match REMI 2- to 4-digit categories as described in Part 1, we projected employment out to 2040. Note that job totals in this section are smaller than those described in Part 1, as we did not include jobs in sectors for which we did not have a direct REMI match.[11]

Then, we identified occupations associated with each three-digit industry that had at least 100 jobs using the California Employment Development Department's (EDD) Staffing Patterns Matrix. Ultimately, we used 54 industries accounting for 171,419 jobs. The Staffing Patterns matrix provides employment estimates for every 6-digit occupation within a respective industry. We also pulled 6-digit occupations from the Bureau of Labor Statistics matrix, which we integrated with the 6-digit occupational data provided by the California EDD. The BLS matrix includes an estimated percentage of employment for each occupation within the respective industry. We pulled all 6-digit occupations with more than 1% employment in the industry. We reweighted these job-to-occupation proportions, and then estimated an occupational distribution for all 54 industries. We obtained 370 unique 6-digit occupations accounting for all 171,419 jobs.

We then linked each occupation to its associated wage, training, and educational data. We used the EDD 2014 Occupational Employment Statistics updated to the first quarter of 2015 for the Oakland-Fremont-Hayward Metropolitan Division, as this geography was the closest approximation to the nine-county Bay Area region available.[12]

Throughout the report, we use the definition of 'quality jobs' as defined in the Regional Economic Prosperity Strategy: the report describes low-wage jobs as having salaries under $18/hour (less than $36,000/year), middle-wage jobs with salaries between $18 and $30/hour (between $36,000-$62,0000/year), and high-wage jobs with salaries over $30/hour (over $62,000/year). We also define 'accessible' good jobs as these mid or high-paying jobs that require less than a bachelor's degree.

FINDINGS: MIDDLE-WAGE JOBS ON INDUSTRIAL LAND, PROJECTED TO 2040

In 2011, middle-wage jobs counted for a near-majority (44%) of jobs on exclusive industrial land, while low-wage jobs counted for 28%, and high-wage jobs for 28% of jobs. This is a favorable distribution considering that only about a quarter (27%) of total jobs in the Bay Area offer middle wages, while a third (36%) offer low wages, and 38% offer high wages, according to the Regional Economic Prosperity Strategy (2014)[13] (Figure 4).

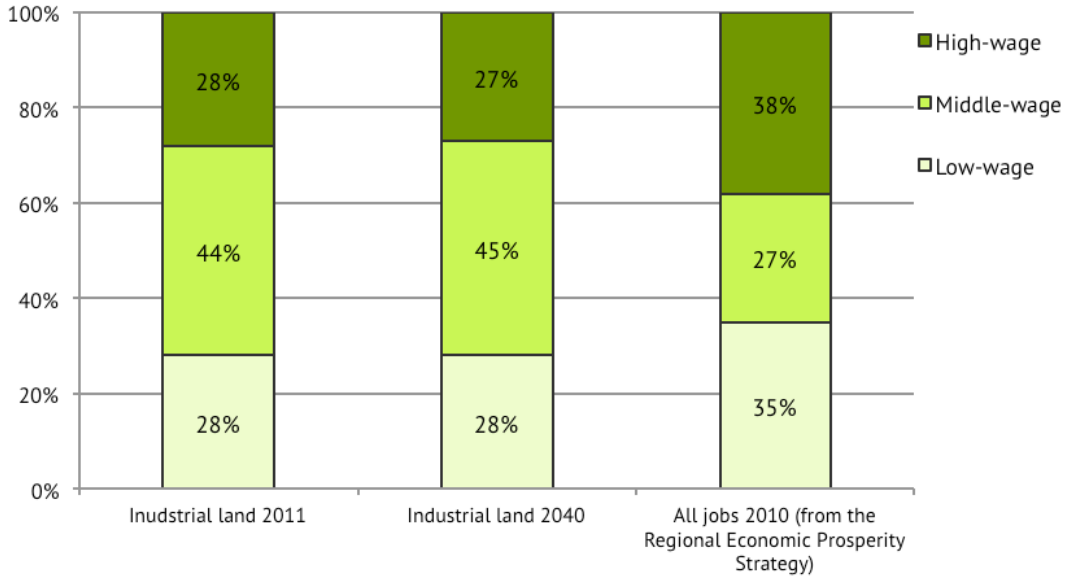


Figure 4. Wage distribution of jobs on industrial land in 2011 and 2040, compared to the wage distribution all jobs in the Bay area

Beyond wages, educational levels are also important to take into consideration. Middle- and high-wage paying jobs (>$18/hour) that also require less than a bachelor's degree and five years or less of work experience account for more than half of all jobs on industrial land (57%, or 99,000 jobs). Middle- and high-wage paying jobs (>$18/hour) that require less than a high school diploma count for about 7% of all jobs on industrial land (11,500 jobs).

When we apply occupational distributions to employment growth patterns for 2040, the distribution of low-, medium-, and high-wage employment remains surprisingly similar. The share of middle-wage jobs is projected to increase only slightly to 45%, at the expense of a one-percentage point decrease in the share of high-wage jobs. Furthermore, in 2040, the share of jobs that pay more than $18/hour and that require less than a bachelor's degree or five years' experience increases slightly from 57% to 60% of total industrial jobs.

Among the jobs that are expected to grow between 2011 and 2040, a majority requires less than a bachelor's degree (for full list, see Appendix 2). The top two growing 'accessible' occupations – Construction Laborers and Heavy and Tractor-trailer Truck Drivers, which will account for over 4,000 new jobs combined– require a high school diploma and post-secondary non-degree award, respectively. Heavy and Tractor-trailer Truck Drivers in particular, will employ a total of 9,000 jobs by 2040 and offer a median wage of $22/hour. Other 'accessible' occupations that are expected to grow by 2040 include Carpenters, Electricians, First-line Supervisors of Construction Trades, Plumbers, and several administrative positions such as Sales representatives, Office clerks and Secretaries and Administrative Assistants.

PART IV: IMPACT ON COMMUTE PATTERNS AND VMT

This analysis estimates the aggregate VMT generated by workers commuting to jobs in industrial land-dependent industries, and then projects their future VMT based on ABAG's middle scenario projections of job growth.

METHODS

Industrial workers VMT estimates

The analysis of current and projected commute patterns in the Bay Area is based on commute work-place flows, using a set of 735 work block groups (WBGs) that display a high density of industrial jobs (>100 jobs dependent on industrial land). This set of block groups contains 493,120 jobs in industries considered dependent on industrial land. (Because it is only including high-density block groups, the total is less than the 600,824 jobs region-wide.) Detailed methods and maps for this process are included in Memo 1.

To understand where commuters working in these 735 industrial work block groups are coming from, we used the 2013 LEHD LODES dataset (Longitudinal Employer-Household Dynamics Origin-Destination Employment Statistics), provided by the U.S. Census Bureau. This dataset provides all origin-destination commute flows between home and work block groups in California. We narrowed our sample to only include commute flows to our set of 735 WBGs of interest. We then obtained the centroid of every associated home block group, and calculated home-to-work block group Euclidian distances for every unique home-to-work block group combination. We then calculated a **total commute distance travelled per work block group** by multiplying the Euclidian distance[14] between each unique home-work block group combination by the number of jobs that possessed that unique commute pattern.

We paired this with data from the Census Transportation Planning Package (CTPP) from 2006-2010 ACS, which is the most recent data available on work-place based commute mode shares.[15] We assume that overall, commute mode shares have not drastically changed since those dates. We thus used CTPP to discount the total distance associated to a given work block group by the proportion of workers who drive and carpool to work. However, because the CTPP is only available at the census tract level, we aggregated our work block group distances to the census tract level. We thus obtained the **total commute distance travelled per work census tract, in private or carpooling vehicles.**

The final step was to create a per-worker weighted aggregated averages. We calculated countywide averages for Napa, Marin, Solano, Sonoma and San Francisco; for Alameda, Contra Costa, Santa Clara, and San Mateo, we differentiated Core versus Non-Core tracts and calculated two separate averages for each of these aggregated areas. The census tracts selected for this analysis are shown in Appendix 3. What this means is that we averaged out the total commute distance by tract, for all census tracts in a county, core, or non-core area, and weighted the average by the number of workers in the census tract. Results are summarized in Table 2, and Figures 5 and 6.

Using this per-worker VMT average, we multiplied the net new number of jobs in industrial sectors by 2040, by county, (as described in Part 1), by county-specific VMT, in order to estimate the net VMT impact of job growth in different areas of the region. This gave us an estimate of the contribution of each county to new total VMT created. Although this is a rough assessment that does not take into consideration various possible changes in growth patterns across the region, it does give an overall sense of what areas of the region are contributing most to VMT.

Industrial workers home location

We also mapped the density of workers' home location by block group – only representing workers who commute to the 735 industrial work block groups described previously. Results are shown in Table 3 and Figure 7. The LODES dataset also allows to break down workers by wage level, so we mapped the home location of low-wage workers (wage below $18/hour) who commute to industrial block groups.[16]

As a final note on our methodology, the employment numbers used from the LEHD dataset account for total employment in the work block groups of interest (as seen in Table 3 and Figure 7 for instance). This differs from the employment numbers used in the majority of this report, which were obtained from NETS, by block group, only accounting for jobs in specific 6-digit industries dependent on industrial. Thus, in the 735 work block groups of interest, LEHD yields a total of 1,800,000 jobs, whereas the NETS numbers yields about 493,000 industrial jobs.[17] Although this is a significant discrepancy, what matters in this analysis is that the same industrial work block groups are being used throughout the report.

FINDINGS

Industrial workers VMT estimates

County-specific VMT values are summarized in Table 2. Counties located further away from the urban core cities of Oakland and San Francisco – such as Sonoma, Marin and Solano – have the highest average VMT estimates, between 18.4 and 24.6 miles per worker (one-way only). Santa Clara is not far behind, with both Santa Clara Core and Non-core attracting similarly long trips of around 17-18 miles per worker (one-way). In other words, because these are work-place based VMT calculations, we interpret this as: workers need to drive more, and/or longer distances to reach employment in these areas. Conversely, San Francisco and Alameda Core (Oakland, and cities along the shoreline like San Leandro, Hayward, Fremont) display the smallest average VMT estimates – with values of 7.7 and 8.6 miles per worker (one-way), respectively. Interestingly then, even though a city like San Francisco, for instance, attracts workers from across the region, its per-worker VMT (7.7 miles per worker, one-way commute) still remains much lower than Santa Clara Core's VMT estimate (18.1 miles per worker, one-way commute). Finally, Contra Costa and San Mateo hover between these two extremes, with values ranging from 11 to 16 miles per worker (one-way).

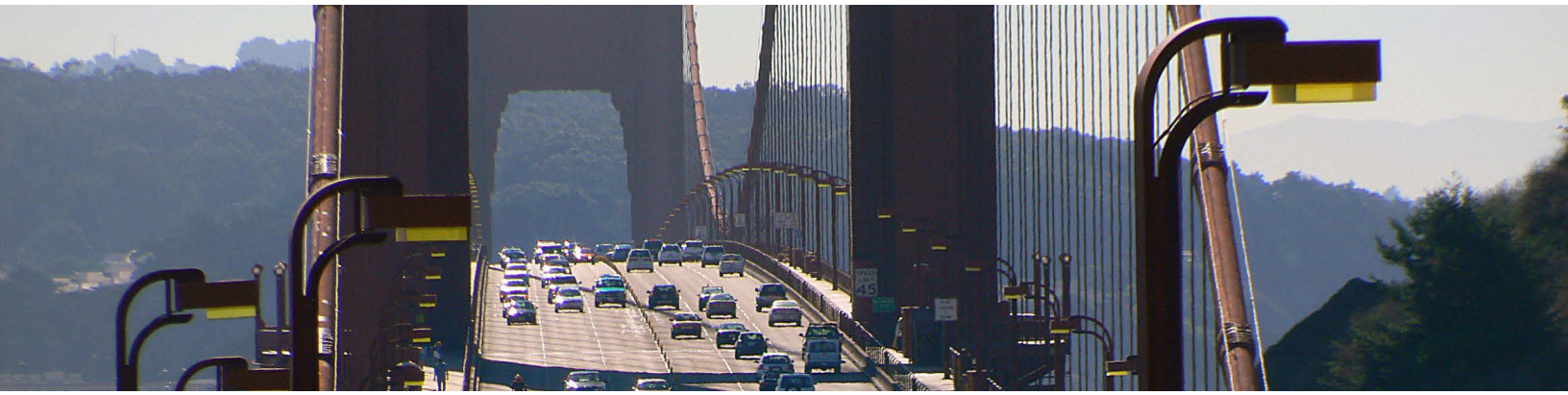
The difference between core and non-core areas is most stark for Alameda County: while Alameda Core work block groups attract workers with an average commute of 8.6 miles, Alameda Non-core industrial work block groups attract on average of 15.6 miles – almost double. When thinking about the location of industrial jobs in the future, this type of finding suggests that to reduce VMT, there is potentially some benefit to keeping jobs in the areas closer to the Core, particularly in San Francisco and Alameda counties. However, as discussed later in this section, further research is needed to claim this with more certainty.

When combining job growth projections (from Part 1) with VMT estimates from Table 2, we find that Santa Clara's Core areas seem to be the biggest contributor to increased VMT under a "business-as-usual" scenario. Its high job growth and high per-worker VMT averages mean that this would be a key area on which to improve transit, and/or otherwise, increase the amount of housing available to workers to live closer to their work destination. Other counties also contribute significant VMT – mainly San Mateo Core and Alameda Core – but this is related more to their high job growth rates. Conversely, although Marin, Sonoma, and Solano had high VMT estimates, their net new number of jobs to 2040 is not very high – making the total impact appear more reasonable.

	Average per worker VMT (one-way) to industrial block groups (miles)*	Employment 2011**	Projected employment 2040**	Projected net new jobs (2011-2040)	Estimated net new daily one-way VMT (2011-2040) (miles)
Alameda total	9.0	-	-	-	-
Alameda core	8.6	94,670	108,890	14,220	121,817
Alameda non-core	15.6	17,577	21,456	3,879	60,645
Contra Costa - total	15.4	-	-	-	-
Contra Costa - Core	16.1	9,735	10,979	1,244	19,994
Contra Costa - Non-core	15.3	28,349	32,060	3,711	56,809
Santa Clara - total	17.9	-	-	-	-
Santa Clara - Core	18.1	113,280	140,270	26,990	489,868
Santa Clara - Non-core	17.0	26,763	32,164	5,401	91,590
San Mateo - total	13.6	-	-	-	-
San Mateo - Core	14.0	81,134	99,076	17,942	251,671
San Mateo - Non-core	11.0	6,771	8,737	1,966	21,711
San Francisco	7.7	62,935	80,374	17,439	134,849
Marin	18.4	10,548	15,597	5,049	92,994
Sonoma	24.6	20,220	25,374	5,154	126,963
Solano	20.3	21,138	25,763	4,625	94,077
Napa***	n/a	n/a	n/a	n/a	n/a
Total		493,120	600,741	107,621	

Table 2. Current VMT per worker to industrial jobs, and projected VMT impact from industrial projected job growth to 2040

* Per worker, one-way commute, weighted average for the aggregated geography by census tract employment, accounting for census tract mode share
** Employment numbers used only from block groups with >100 jobs
***Napa does not have any block groups with employment in industries dependent on industrial land > 100



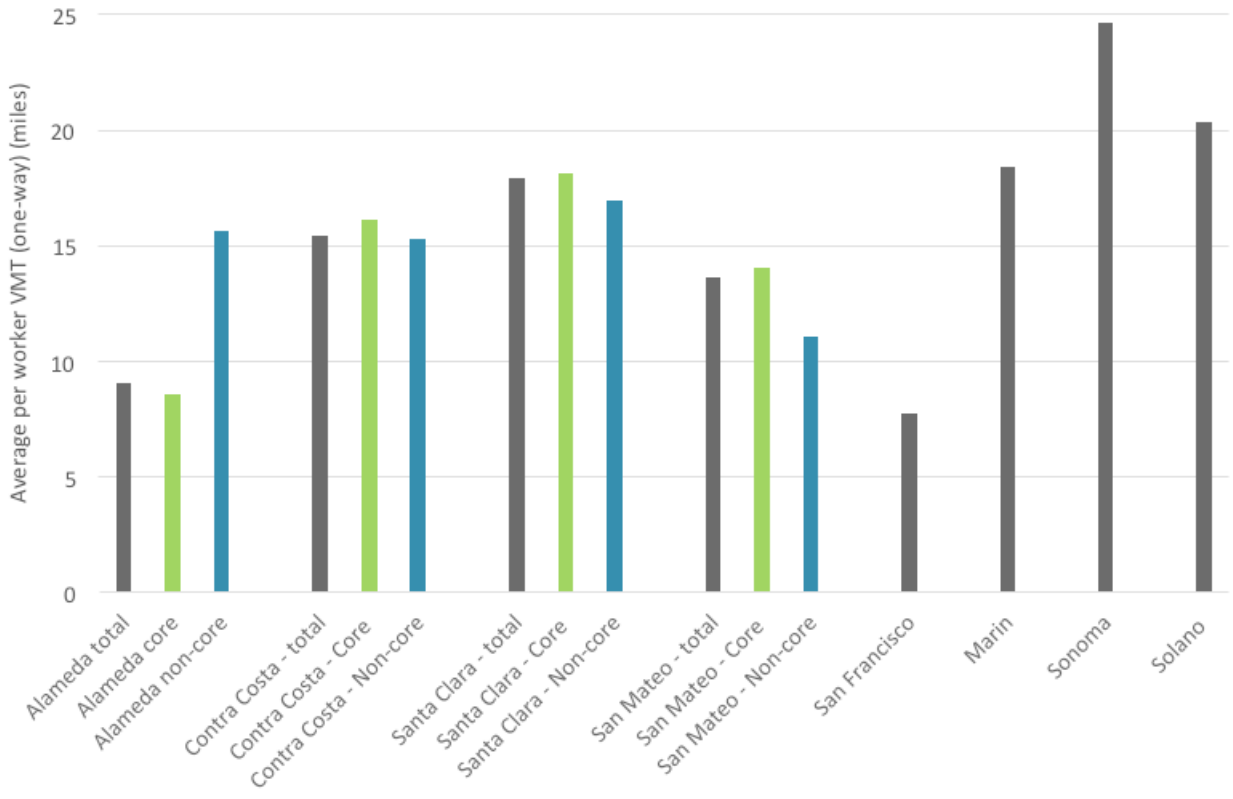


Figure 5. Average per-worker VMT generated by county, based on 2011 Longitudinal Household Employer Dynamics

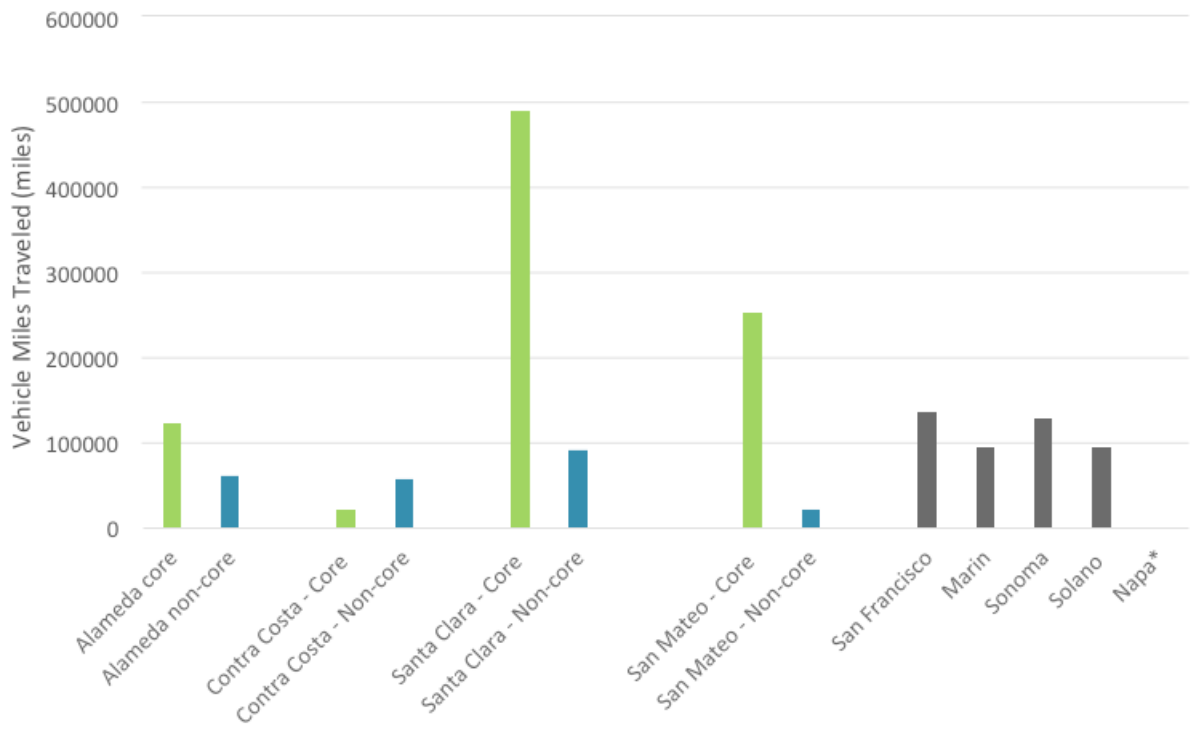


Figure 6. Net new VMT generated by county, based on employment projections from 2011 to 2040 and on countywide per worker VMT averages

Industrial workers home location

As shown in Table 3, industrial workers tend to live in the largest four cities of the Bay Area – with approximately 14% of industrial workers living in San Jose, 14% in San Francisco, 5% in Oakland, and 4% in Fremont. Other cities that also have a substantial portion of this subpopulation include Hayward, Sunnyvale and Santa Clara. However, overall, people working in industries dependent on industrial land are found all across the Bay Area. As shown in Figure 6, there are no distinct areas from which these workers are commuting from – although a few pockets of concentration can be seen in Alameda, Contra Costa and Santa Clara.

Figure 8 displays home location of low-wage workers only – again, it seems that low-wage workers are present in most areas of the region. There are, however, a few more concentrated areas. Part of SoMa, the Visitation Valley, Daly City, South San Francisco/Millbrae in the West Bay, parts of eastern Contra Costa in the Antioch-Oakley-Brentwood area, parts of the Alameda shoreline, various block groups around San Jose, and parts of Solano in Fairfield and Vacaville, seem to have pockets of low-wage workers commuting to industrial block groups.

Limitations and future research

It should be noted that this analysis estimates VMT impacts from all block groups with concentrations of industrial land-dependent jobs, rather than all industrial land-dependent jobs in the region. Thus, it underestimates the magnitude of VMT impacts from industrial jobs now and in the future.

Important in the discussion of VMT impacts from future industrial job growth and job location, is the counterfactual question of, what happens in place of industrial jobs/land if those jobs/land move? For example, if Core industrial jobs move to the outskirts of the region, or if industrial land is converted to residential land, then several questions need to be asked:

- Do workers' home location also change, and if so, will they commute longer or shorter distance from this unknown new home location?
- Do workers necessarily keep their job if their job changes location, or do workers change jobs when their job experiences a location change?
- Do workers' mode of transportation change as their job location changes?
- Do new residents now living in the hypothetical converted (industrial-to-residential) land now commute short or long distances to their respective jobs?

In other words, there is uncertainty in predicting the impact of changes in job location – especially because predicting worker home location in tandem with job location itself is technically complex. Nevertheless, examining one side of the equation (what we have begun doing in Part 3) is a first necessary step to illustrate the complexity of the tradeoffs. This methodology could be further developed in future work, with a larger emphasis on housing and job location predictions.

City	Number of workers	Percent
San Jose	259,001	14.3%
San Francisco	248,500	13.8%
Oakland	89,262	4.9%
Fremont	65,079	3.6%
Hayward	44,474	2.5%
Sunnyvale	43,664	2.4%
Santa Clara	36,122	2.0%
Daly City	32,550	1.8%
San Mateo	32,422	1.8%
Concord	25,715	1.4%
Livermore / Sunol	25,511	1.4%
Mountain View	24,536	1.4%
San Leandro	23,018	1.3%
Richmond	21,919	1.2%
San Ramon	21,718	1.2%
Vallejo	21,262	1.2%
Alameda	21,039	1.2%
South San Francisco	20,960	1.2%
Pleasanton	20,843	1.2%
Union City	19,233	1.1%
Other	812,136	45.0%
Total	**1,805,627**	100.0%

Table 3. Top 20 cities with largest population of workers (absolute numbers) working in industrial block group

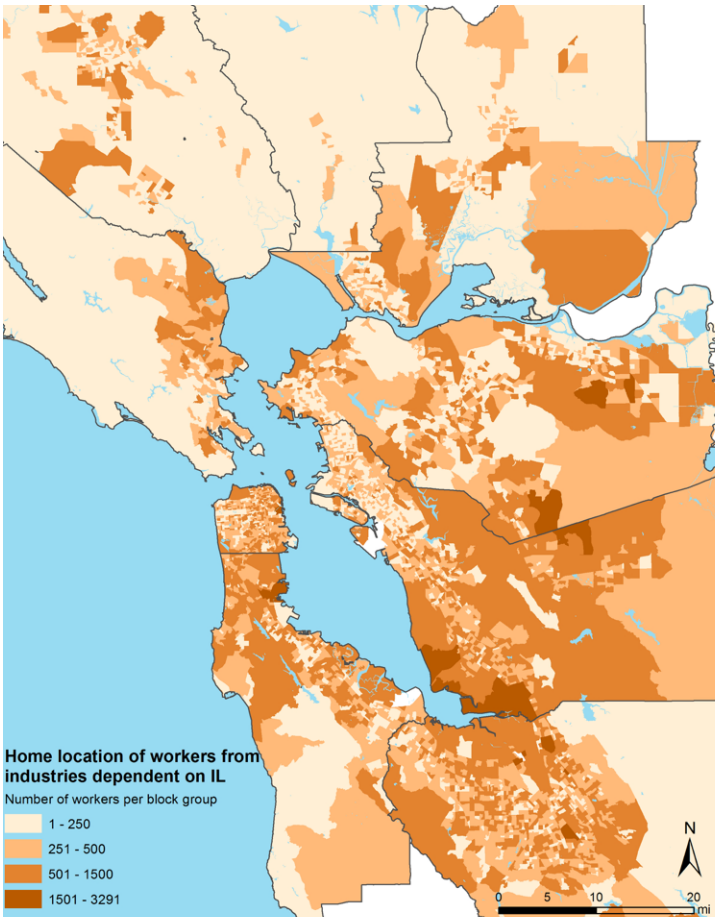


Figure 7. Home location of workers of industrial block groups, based on LEHD Origin-Destination 2011 data

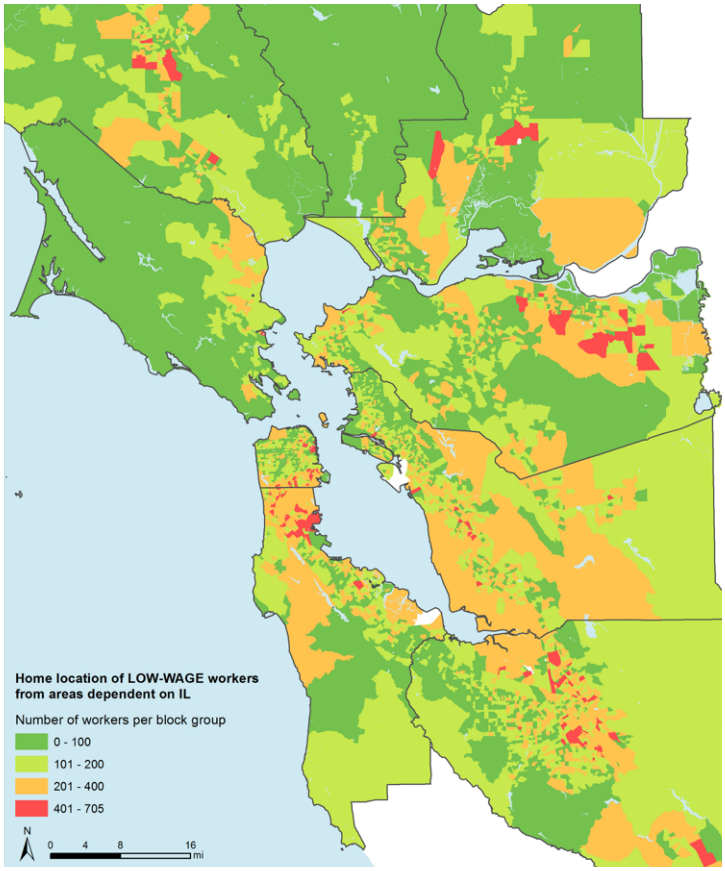


Figure 8. Home location of low-wage workers of industrial block groups, based on LEHD Origin-Destination 2011 data

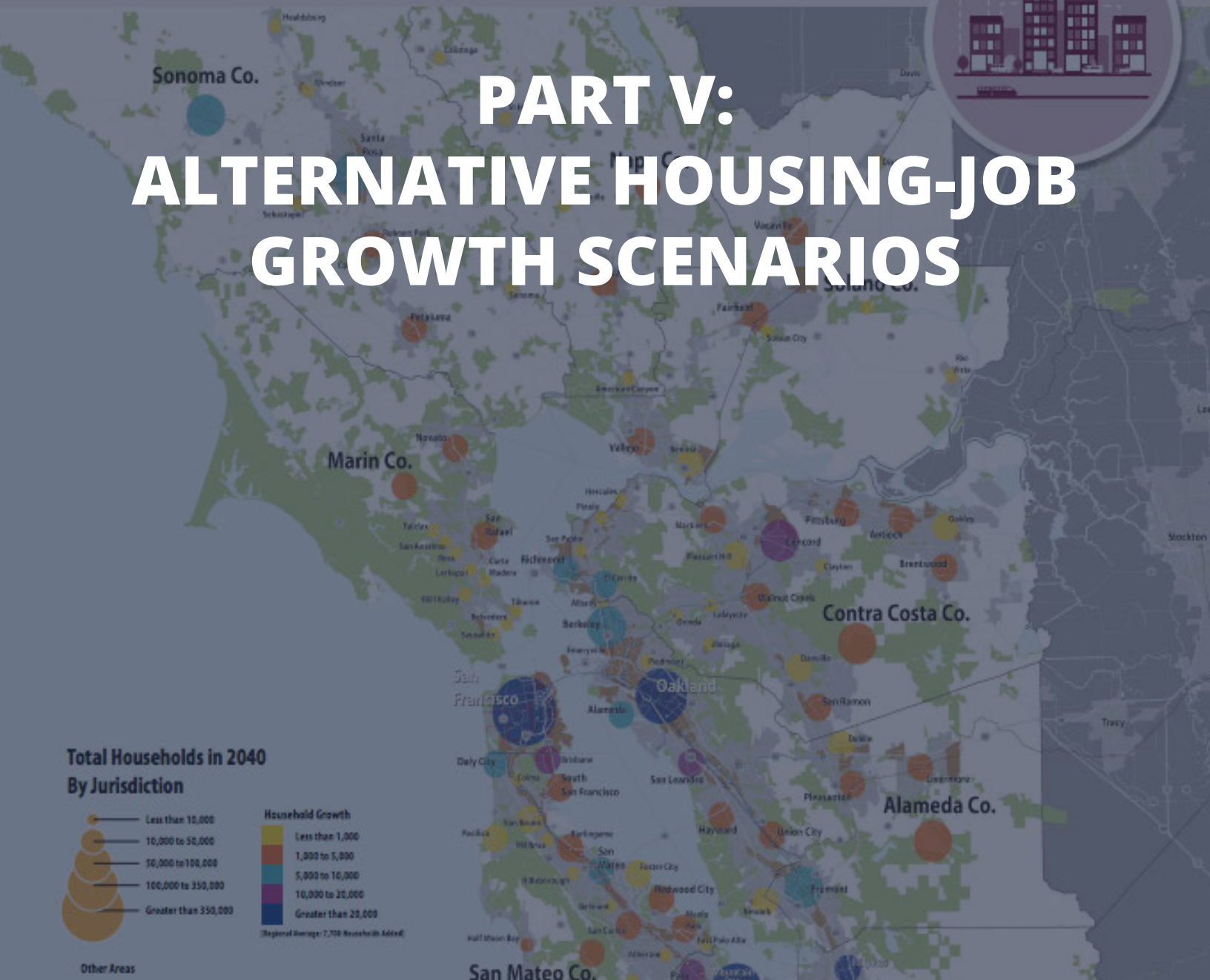
Scenarios

Big Cities Scenario

Plan BayArea 2040

The **Big Cities Scenario** targets future population and employment growth in locally adopted Priority Development Areas (PDAs) within San Jose, San Francisco and Oakland.

Neighboring cities already well-connected to the region's three largest cities would also see growth, particularly in their locally adopted PDAs. Growth outside of these three cities would be small, with limited infill development in PDAs and no development on currently undeveloped land.



PART V: ALTERNATIVE HOUSING-JOB GROWTH SCENARIOS

In this section, we integrate MTC/ABAG regional 2010-2040 projections for households and jobs, with industrial block groups' location and projected growth. As established in regional plans such as Plan Bay Area, MTC/ABAG projections in Priority Development Areas (PDAs) are meant to help plan for future sustainable and equitable growth – in this section, we use ABAG's current middle growth scenario, which focuses growth along key corridors in the region.[18]

However, as described in the three previous sections of this report, job growth is also predicted across many industrial block groups. What does the spatial overlap between these two geographic entities say about the pressure of PDA housing/job growth on industrial jobs?

METHODS

Using ABAG's current middle growth scenario for jobs and households, we mapped the absolute change in number of jobs and number of households by Priority Development Area (PDAs), for the 188 PDAs in the Bay Area. Then, we selected industrial block groups that display significant spatial overlap with PDAs, and mapped them in relation to the regions' PDAs.

FINDINGS

Figure 9 shows the highest-growing PDAs in terms of households in dark red, overlaid with industrial block groups. In areas of high housing growth, there is a possibility of land use conflict – i.e., can significant housing growth occur alongside industrial land? For example, if we consider the 188 PDAs across the Bay Area, eight of them (in Downtown/Eastern San Francisco, Downtown/East Oakland, and Downtown/North San Jose) are predicted to have over 10,000 new households, each, by 2040. Combined, these eight top-growing PDAs are expected to contribute 160,000 new households to the Bay Area's population. At the same time, we also know from previous analyses (Part 1) that within these top-growing PDAs are found block groups with 96,700 industrial jobs. Rather than manufacturing or transportation jobs, these are likely to be in smaller scale industrial uses, such as auto repair or contracting, or information technology-related businesses.

Furthermore, combining Figure 3 (industrial job growth by block group) with Figure 9 (Figure 10) allows us to compare the overlap of high-growing industrial areas with high-growing housing areas. Coming back to our top eight high-growing PDAs, a majority of the industrial block groups overlapping with them are also predicted to have mid- to high growth, with the exception of a few declining block groups in San Jose, due mainly to the Electronic and Computer Manufacturing sectors, and of a small number of block groups in Oakland.

These numbers do not paint a complete picture of future growth, and certainly cannot confirm if industrial jobs overlapping with PDAs are definitely at risk of loss or displacement – but, this analysis is a useful first step to determine areas of potential conflict between housing growth and industrial sector growth. This analysis also highlights the pressing need to reconcile the regional housing and job strategy with broader regional economic development needs – such as planning for industrial land use at a regional scale.

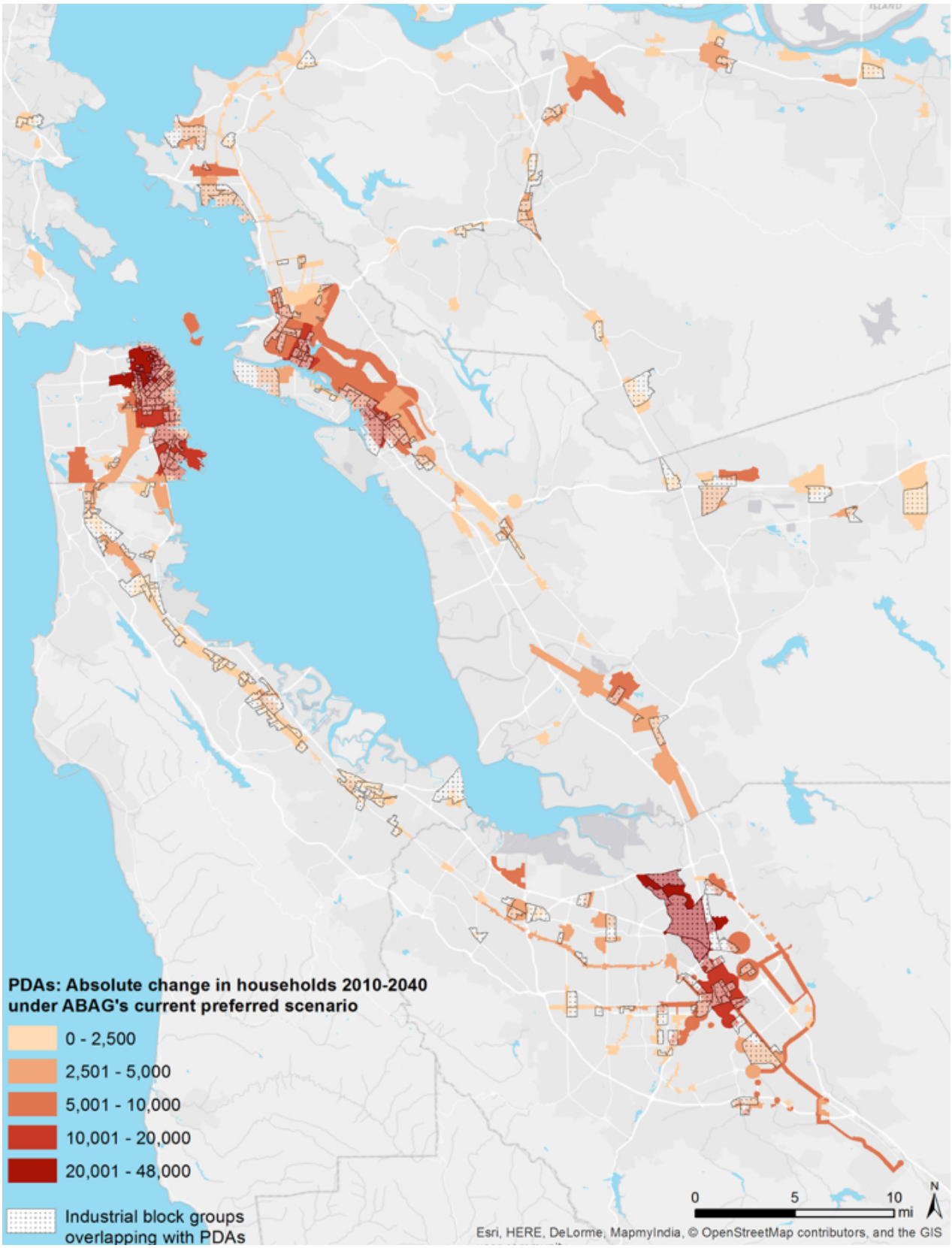


Figure 9. Net new households in PDAs under ABAG middle scenario for growth to 2040, shown in relation to industrial block groups

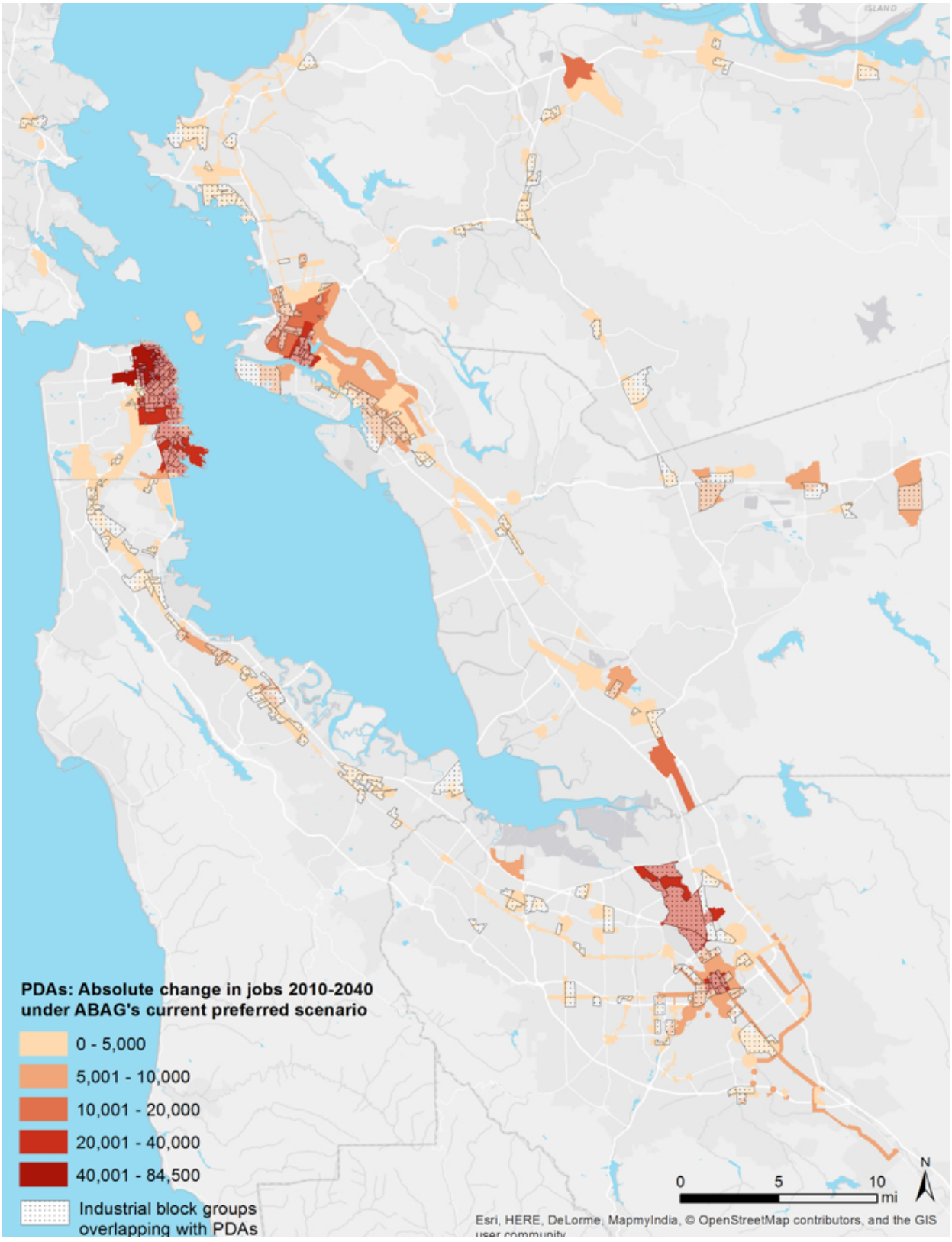


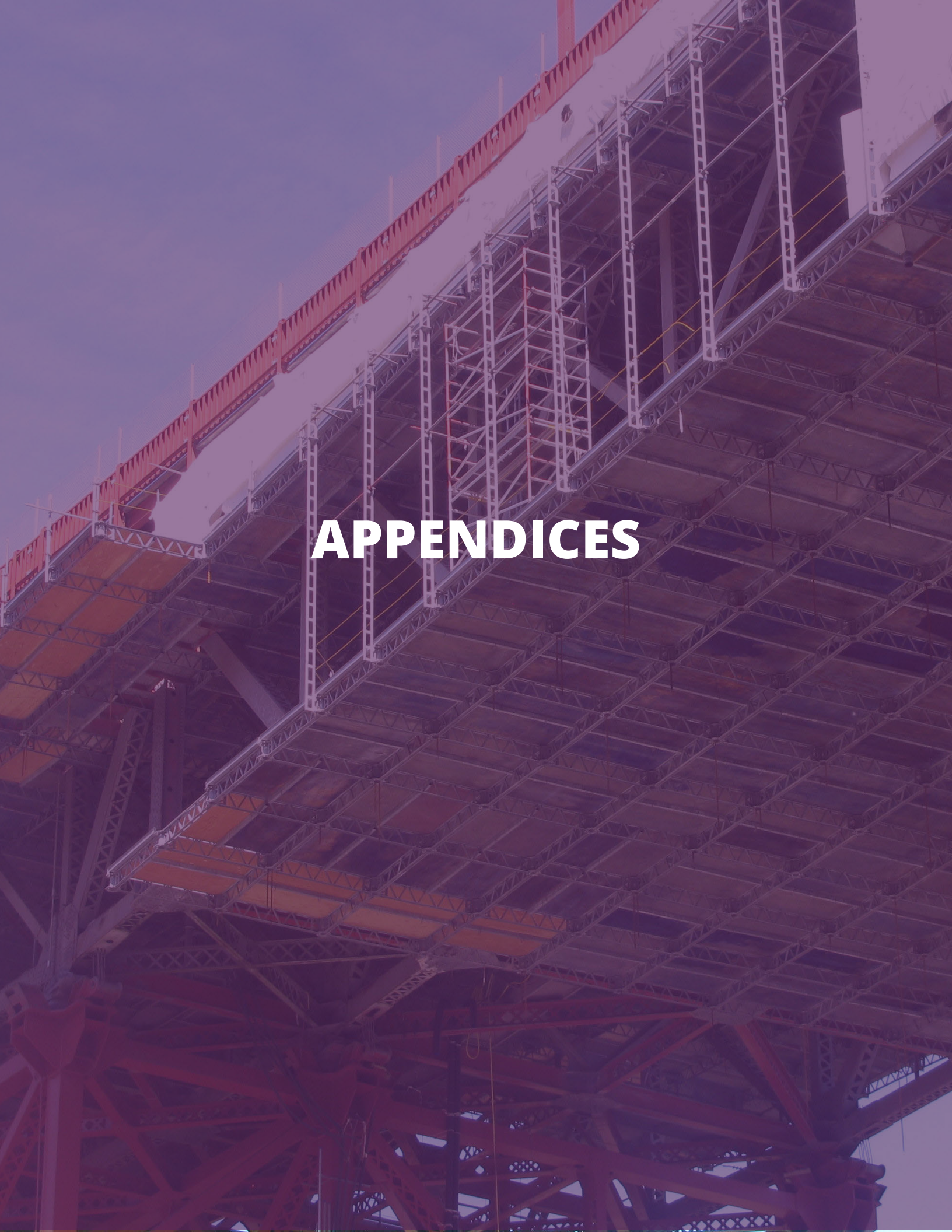
Figure 10. Net new jobs in PDAs under ABAG middle scenario for growth to 2040, shown in relation to industrial block groups

NOTES

1. *San Francisco Planning and Urban Research, Center for the Continuing Study of the California Economy, San Mateo County Union Community Alliance, and Working Partnerships USA, Economic Prosperity Strategy* (San Francisco, CA: San Francisco Planning and Urban Research, 2015), 8.
2. For this analysis, we assume that wage levels will remain constant from 2011 to 2040. In reality, some middle-wage jobs may become low-wage (and vice-versa).
3. At the time of analysis, this was the only scenario available for study. The final version of the scenario differs slightly from the one studied here.
4. At the time of analysis, this was the only scenario available for study. The final version of the scenario differs slightly from the one studied here.
5. For Plan Bay Area, ABAG produced two REMI projections, one based on the industry distribution used by the Bureau of Economic Analysis, and the second using the Bureau of Labor Statistics industry distribution. For this analysis, we used the first projection; thus, our outputs may differ from those used in Plan Bay Area.
6. Refer to Technical Memo #1 for technical details on jobs dependent on industrial land. Employment in these 6-digit industries was only included in the sum of those jobs in a given block group was higher than 100.
7. The job sum by block group only counts the jobs in the 6-digit industries dependent on IL – the 3-digit descriptor is used for ease of projecting using the REMI numbers.
8. Refer to Technical Memo #1 for methods and findings.
9. As a caveat, these growth categories also include NAICS industries such as Specialty Trade Contractors (238), Administrative and Support Services (561), and Construction of Buildings (236), which are not typically what cities explicitly encourage to locate on industrial land.
10. *San Francisco Planning and Urban Research, Center for the Continuing Study of the California Economy, San Mateo County Union Community Alliance, and Working Partnerships USA, Economic Prosperity Strategy* (San Francisco, CA: San Francisco Planning and Urban Research, 2015), 8.
11. NAICS 111, 112, 114, 314, 316, 451, 452, 453, 488, 491, 522, 535 and 533 did not have a direct match in the REMI projections. Because there are two steps of projection here, we took a more conservative route and did not also project occupational change for jobs that did not have an appropriate REMI match.
12. Its median wage is near the various median wages of the Metropolitan Statistical Areas of the Bay Area.
13. *San Francisco Planning and Urban Research, Center for the Continuing Study of the California Economy, San Mateo County Union Community Alliance, and Working Partnerships USA, Economic Prosperity Strategy* (San Francisco, CA: San Francisco Planning and Urban Research, 2015), 8.
14. Euclidian distances, as opposed to network (Manhattan) distances, are used. Although Manhattan distances are more accurate for calculating absolute VMT, we only use these numbers to calculate a marginal difference in VMT, and the proportional difference in distance is estimated to be about the same. Also, we automatically assigned a distance of 0 miles to workers who work and live in the same block group.
15. We could have used home-location commute mode shares from US Census ACS data. However, it is more accurate to use work-based commute mode shares in our case. The reason for this is that the work block groups we have in our sample might be biased towards driving in their mode share break down, since, due to their industrial nature, they might be more isolated geographically or further away from transit. Previous research has also found that work-place characteristics, such as transit availability or job density, affect VMT levels (for example, see a 2013 report by the Washington State Department of Transportation entitled "Tools for Estimating VMT Reduc-

tions from the Built Environment").

16. Again, it is important to note that the employment numbers used in Figure 6, taken from the LEHD total employment by work block groups of interest, differs from the employment numbers used in previous figures and calculations (from NETS, by block group, for specific industries of interest). The large discrepancy relates to the fact that LEHD includes all industry categories. Thus, in the 735 work block groups of interest, LEHD yields a total of 1,800,000 jobs, whereas the NETS numbers for industrial jobs yields about 493,000.
17. We ran our analysis above excluding the "Other Services" jobs in the LODES – thus only accounting for "Goods producing" and "Transportation and Utilities" jobs. However, this led to discording numbers and excluded too many industries considered dependent on industrial land.
18. At the time of analysis, this was the only scenario available for study. The final version of the scenario differs slightly from the one studied here.



APPENDICES

Appendix 1. Projected growth from 2011 to 2040 by 3-digit NAICS industries on exclusive and mixed-use industrial land in the Bay Area. NOTE: this table focuses on block groups with more than 100 employees. Thus, the totals are significantly lower than in the rest of Memo #3.

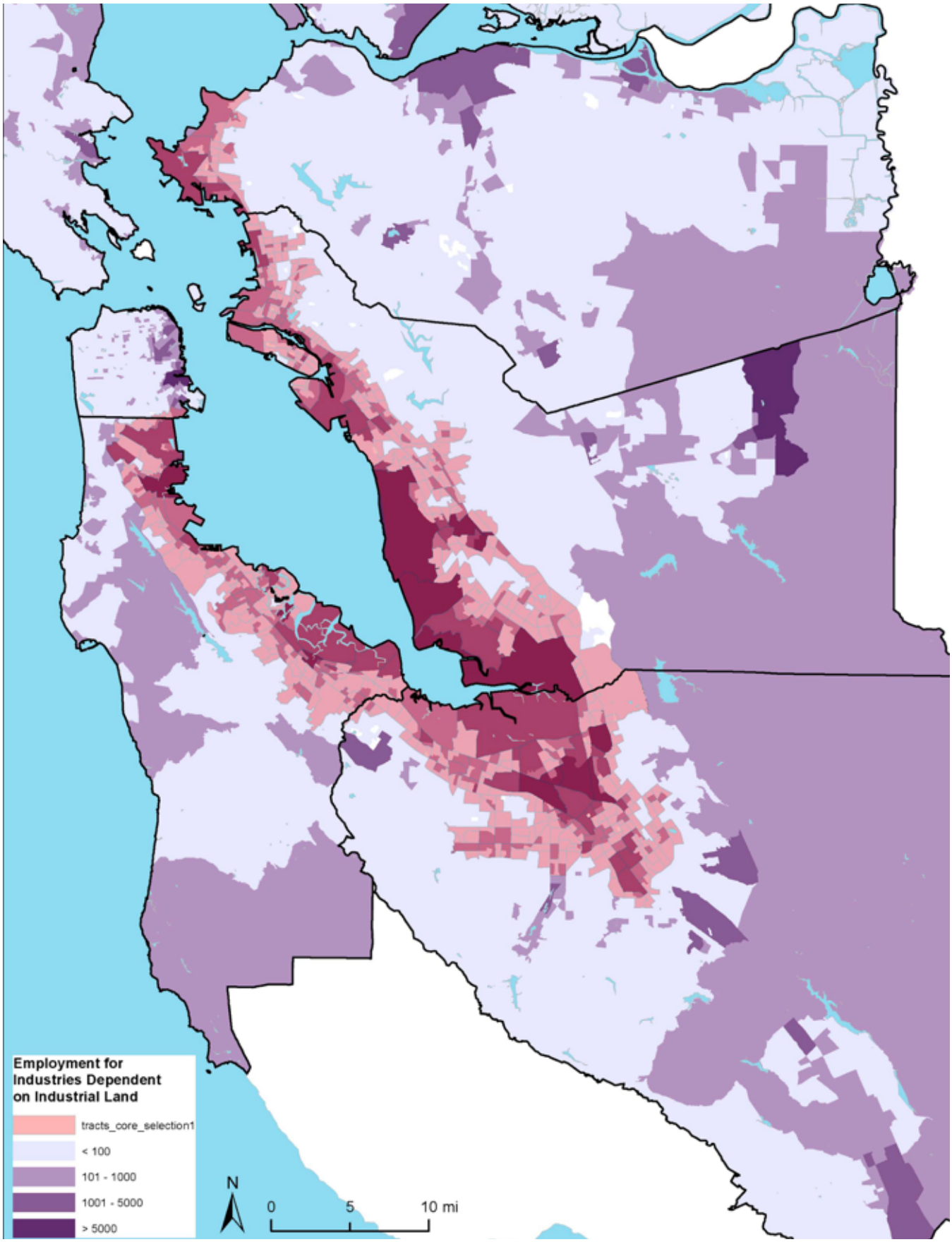
NAICS 3-digit	NAICS 3-digit Category Description	Employment 2011	Employment 2040	Absolute difference	Percent difference
238	Specialty Trade Contractors	62,245	93,430	31,185	0.50
561	Administrative and Support Services	18,378	32,126	13,748	0.75
423	Merchant Wholesalers, Durable Goods	59,756	73,172	13,416	0.22
236	Construction of Buildings	17,933	26,517	8,584	0.48
811	Repair and Maintenance	14,430	22,307	7,877	0.55
541	Professional, Scientific, and Technical Services	13,910	21,769	7,859	0.56
424	Merchant Wholesalers, Nondurable Goods	27,926	34,118	6,192	0.22
485	Transit and Ground Passenger Transportation	5,604	9,710	4,106	0.73
237	Heavy and Civil Engineering Construction	8,250	12,259	4,009	0.49
562	Waste Management and Remediation Services	6,237	10,238	4,001	0.64
624	Social Assistance	2,010	5,852	3,842	1.91
333	Machinery Manufacturing	7,540	10,932	3,392	0.45
532	Rental and Leasing Services	7,693	10,922	3,229	0.42
621	Ambulatory Health Care Services	3,605	6,021	2,416	0.67
484	Truck Transportation	11,582	13,727	2,145	0.19
488	Support Activities for Transportation	7,075	8,888	1,813	0.26
721	Accommodation	3,267	4,664	1,397	0.43
812	Personal and Laundry Services	4,175	5,261	1,086	0.26
493	Warehousing and Storage	3,738	4,795	1,057	0.28
441	Motor Vehicle and Parts Dealers	6,263	7,218	955	0.15
921	Executive, Legislative, and Other General Government Support	5,801	6,745	944	0.16
922	Justice, Public Order, and Safety Activities	7,045	7,981	936	0.13
327	Nonmetallic Mineral Product Manufacturing	3,188	3,992	804	0.25
332	Fabricated Metal Product Manufacturing	18,993	19,792	799	0.04
336	Transportation Equipment Manufacturing	4,692	5,460	768	0.16
515	Broadcasting (except Internet)	2,346	3,024	678	0.29
722	Food Services and Drinking Places	1,619	2,232	613	0.38
444	Building Material, Garden Equipment & Supplies Dealers	3,987	4,594	607	0.15
321	Wood Product Manufacturing	1,609	2,181	572	0.36
924	Administration of Environmental Quality Programs	3,429	3,987	558	0.16
926	Administration of Economic Programs	6,731	7,269	538	0.08
442	Furniture and Home Furnishings Stores	2,971	3,497	526	0.18
452	General Merchandise Stores	2,652	3,157	505	0.19
213	Support Activities for Mining	210	710	500	2.38
523	Securities, Commodity Contracts, and Other Financial Investments	887	1,379	492	0.55
531	Real Estate	1,663	2,016	353	0.21
111	Crop Production	1,806	2,123	317	0.18
453	Miscellaneous Store Retailers	1,679	1,909	230	0.14
524	Insurance Carriers and Related Activities	1,330	1,553	223	0.17
337	Furniture and Related Product Manufacturing	4,368	4,584	216	0.05
487	Scenic and Sightseeing Transportation	365	571	206	0.57
312	Beverage and Tobacco Product Manufacturing	1,415	1,613	198	0.14
813	Religious, Grant-making, Civic, Professional, and Similar Orgs.	1,364	1,558	194	0.14
443	Electronics and Appliance Stores	1,367	1,561	194	0.14
711	Performing Arts, Spectator Sports, and Related Industries	713	887	174	0.24
221	Utilities	1,315	1,486	171	0.13
611	Educational Services	488	654	166	0.34
533	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)	647	804	157	0.24
212	Mining (except Oil and Gas)	70	198	128	1.83
518	Data Processing, Hosting, and Related Services	409	532	123	0.30
445	Food and Beverage Stores	762	875	113	0.15

Appendix 1 Continued.

NAICS 3-digit	NAICS 3-digit Category Description	Employment 2011	Employment 2040	Absolute difference	Percent difference
451	Sporting Goods, Hobby, Musical Instrument, and Book Stores	483	581	98	0.20
486	Pipeline Transportation	153	246	93	0.61
622	Hospitals	384	467	83	0.22
511	Publishing Industries (except Internet)	847	928	81	0.10
923	Administration of Human Resource Programs	1,529	1,604	75	0.05
454	Non-store Retailers	422	478	56	0.13
446	Health and Personal Care Stores	384	429	45	0.12
623	Nursing and Residential Care Facilities	98	133	35	0.36
339	Miscellaneous Manufacturing	3,863	3,897	34	0.01
713	Amusement, Gambling, and Recreation Industries	100	132	32	0.32
483	Water Transportation	6	33	27	4.44
447	Gasoline Stations	168	188	20	0.12
551	Management of Companies and Enterprises	100	115	15	0.15
522	Credit Intermediation and Related Activities	50	58	8	0.16
112	Animal Production and Aquaculture	57	64	7	0.13
525	Funds, Trusts, and Other Financial Vehicles	31	36	5	0.17
448	Clothing and Clothing Accessories Stores	36	41	5	0.14
113	Forestry and Logging	6	11	5	0.81
114	Fishing, Hunting and Trapping	9	9	0	-0.02
325	Chemical Manufacturing	5,961	5,960	-1	0.00
115	Support Activities for Agriculture and Forestry	31	29	-2	-0.07
482	Rail Transportation	27	25	-2	-0.08
314	Textile Product Mills	541	461	-80	-0.15
512	Motion Picture and Sound Recording Industries	873	747	-126	-0.14
481	Air Transportation	651	484	-167	-0.26
316	Leather and Allied Product Manufacturing	1,250	1,077	-173	-0.14
313	Textile Mills	534	168	-366	-0.69
311	Food Manufacturing	12,372	11,734	-638	-0.05
335	Electrical Equipment, Appliance, and Component Manufacturing	2,268	1,477	-791	-0.35
331	Primary Metal Manufacturing	2,797	1,982	-815	-0.29
323	Printing and Related Support Activities	5,801	4,954	-847	-0.15
491	Postal Service	7,153	6,076	-1,077	-0.15
322	Paper Manufacturing	4,674	3,349	-1,325	-0.28
324	Petroleum and Coal Products Manufacturing	4,408	2,675	-1,733	-0.39
326	Plastics and Rubber Products Manufacturing	8,002	5,539	-2,463	-0.31
315	Apparel Manufacturing	2,656	67	-2,589	-0.97
492	Couriers and Messengers	10,104	6,975	-3,129	-0.31
334	Computer and Electronic Product Manufacturing	36,753	24,663	-12,090	-0.33
Total		493,120	600,741	107,621	0.218

Occupation Title	Employment 2011	Employment 2040	Absolute di	Median Wa	Typical Education Needed	Typical Work Experience
Construction laborers	4,847	7,181	2,335	$21.12	Less than high school	None
Heavy and tractor-trailer truck drivers	7,437	9,143	1,705	$22.47	Postsecondary non-degree award	None
Sales representatives, wholesale and manufacturing, except technical and scie	9,375	11,038	1,663	$29.16	High school diploma or equiv	None
Carpenters	3,513	5,144	1,631	$30.05	High school diploma or equiv	None
Office clerks, general	5,362	6,984	1,621	$18.26	High school diploma or equiv	None
Electricians	2,989	4,282	1,294	$37.75	High school diploma or equiv	None
Secretaries and administrative assistants, except legal, medical, and executive	3,353	4,542	1,189	$20.55	High school diploma or equiv	None
First-line supervisors of construction trades and extraction workers	2,474	3,660	1,186	$38.49	High school diploma or equiv	5 years or more
Bookkeeping, accounting, and auditing clerks	3,262	4,249	987	$21.90	High school diploma or equiv	None
Plumbers, pipefitters, and steamfitters	1,976	2,912	936	$34.53	High school diploma or equiv	None
Customer service representatives	3,701	4,494	793	$19.82	High school diploma or equiv	None
Operating engineers and other construction equipment operators	1,564	2,311	747	$34.27	High school diploma or equiv	None
Bus drivers, school or special client	1,290	2,031	741	$19.37	High school diploma or equiv	None
Automotive service technicians and mechanics	1,921	2,639	718	$23.96	High school diploma or equiv	None
Heating, air conditioning, and refrigeration mechanics and installers	1,214	1,793	579	$29.53	Postsecondary non-degree award	None
Painters, construction and maintenance	1,042	1,538	497	$23.23	Less than high school	None
Refuse and recyclable material collectors	771	1,204	433	$25.67	Less than high school	None
Cement masons and concrete finishers	902	1,332	430	$24.57	Less than high school	None
First-line supervisors of office and administrative support workers	1,209	1,529	321	$29.04	High school diploma or equiv	Less than 5 years
Roofers	664	981	317	$23.84	Less than high school	None
Bus drivers, transit and intercity	547	857	311	$26.76	High school diploma or equivalent	None
Sheet metal workers	766	1,057	290	$25.01	High school diploma or equiv	None
Automotive body and related repairers	598	864	266	$24.40	High school diploma or equiv	None
Sales representatives, services, all other	487	751	264	$29.04	High school diploma or equiv	None
Drywall and ceiling tile installers	537	793	256	$38.39	Less than high school	None
Bus and truck mechanics and diesel engine specialists	669	911	243	$29.66	High school diploma or equiv	None
Brickmasons and blockmasons	386	570	184	$30.81	High school diploma or equiv	None
Hazardous materials removal workers	326	509	183	$19.42	High school diploma or equiv	None
First-line supervisors of non-retail sales workers	731	894	164	$34.46	High school diploma or equiv	Less than 5 years
Parts salespersons	800	958	158	$18.62	Less than high school	None
Industrial truck and tractor operators	1,817	1,969	152	$21.65	Less than high school	None
Welders, cutters, solderers, and brazers	1,285	1,427	142	$22.21	High school diploma or equiv	None
First-line supervisors of mechanics, installers, and repairers	637	773	136	$37.15	High school diploma or equiv	Less than 5 years
Registered nurses	422	557	135	$62.15	Associate's degree	None
Order clerks	555	679	124	$18.44	High school diploma or equiv	None
First-line supervisors of retail sales workers	382	501	119	$20.70	High school diploma or equiv	Less than 5 years
Bill and account collectors	167	277	110	$20.77	High school diploma or equiv	None

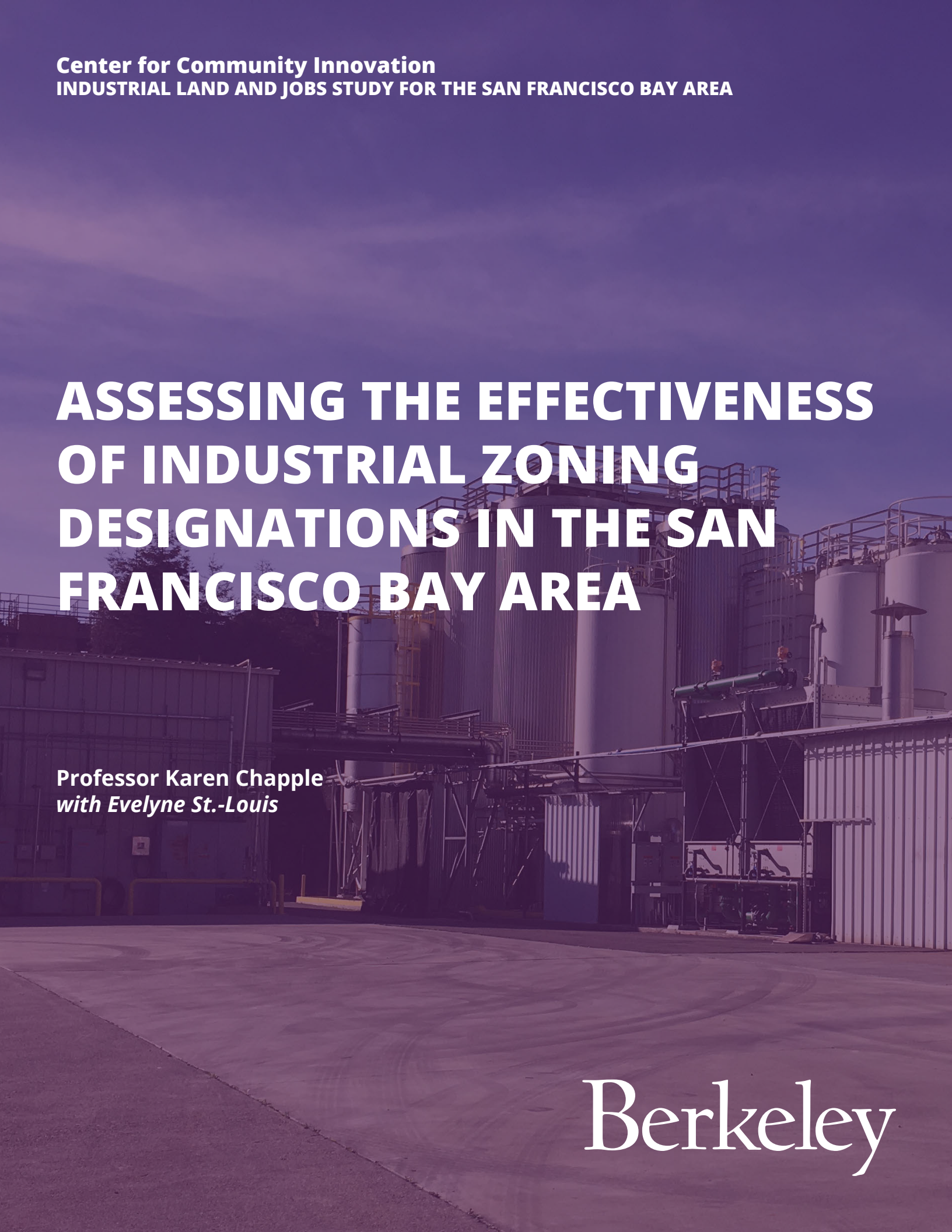
Appendix 3. Employment levels of industrial block groups, highlighting in darker pink the block groups considered "Core areas" for the purposes of calculating VMT levels.



Technical Memo #4

Center for Community Innovation
INDUSTRIAL LAND AND JOBS STUDY FOR THE SAN FRANCISCO BAY AREA

ASSESSING THE EFFECTIVENESS OF INDUSTRIAL ZONING DESIGNATIONS IN THE SAN FRANCISCO BAY AREA



Professor Karen Chapple
with Evelyne St.-Louis

Berkeley

Authors
Karen Chapple
with Evelyne St.-Louis

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The Center for Community Innovation (CCI) at UC-Berkeley nurtures effective solutions that expand economic opportunity, diversify housing options, and strengthen connection to place.

Report prepared for the Association of Bay Area Governments/Metropolitan Transportation Commission

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Contents

EXECUTIVE SUMMARY

The Regional Industrial Land and Jobs Study complements the 2015 MTC Goods Movement Needs Assessment with an analysis of the demand for and supply of industrially zoned land in the nine-county region, both now and in the future. This Technical Memo analyzes the effectiveness of different industrial land (IL) zoning classifications at fostering employment growth.

Interviews conducted with cities across the region revealed that planning and economic development professionals considered certain zoning designations superior in their capacity to retain and prevent crowding out of industrial uses due to increasing rents or encroachment of non-industrial uses. According to locals, exclusively zoned IL (land zoned for only transportation or light, medium, or heavy industrial uses) is one of the most effective ways of controlling market forces, ensuring job growth, and influencing the type of businesses that locate in industrial areas. Although mixed-use IL offers more flexible use, new commercial and residential uses may be incompatible with industrial use and also raise local rents to unsustainable levels for small industrial firms. However, there is little systematic evidence or analysis to support this.[1]

Therefore, this memo seeks to determine whether zoning makes a difference for employment growth on industrial land. Looking at Alameda, San Francisco, and Santa Clara counties, we compare how jobs are growing on IL (both exclusive and mixed-use), looking both at overall growth and growth just in production, distribution, and repair (PDR) industries.[2] As shown in Figure A, the overall patterns are the same across counties, but the specifics differ. Job growth rates are higher on industrial land than overall in all three areas, and San Francisco experiences particularly high job creation on its industrial land. The picture for PDR job growth is quite different, however, since these jobs are in significant decline in both San Francisco and Santa Clara counties. In the case of PDR, then, locating on industrial land seems to simply slow the decline. Only in Alameda County is the industrial land associated with PDR job growth. Not only are PDR jobs on industrial land growing as fast as the economy overall, but also locating on industrial land seems to reverse their overall decline.

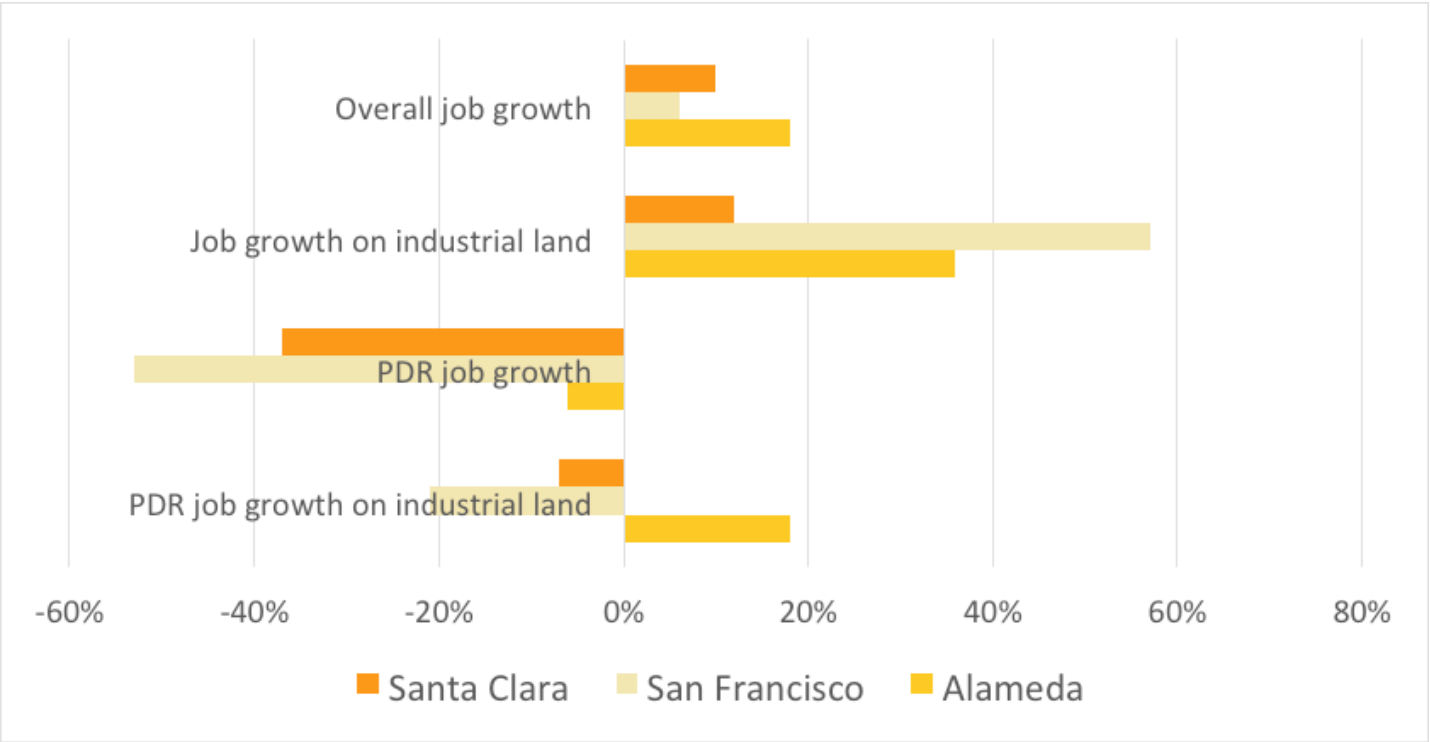

Figure A.Job and PDR job growth on industrial land and overall, selected counties.

Specifically, the analysis finds:

- Industrial land is the most productive land for job creation. Industries locating on IL grow at a faster rate than anywhere else.

- Job growth rates are particularly high in mixed-use zones. One reason for this is that MU IL allows for a relatively wider mix of activities (compared to exclusive IL), so these areas undergo the effect of being able to host very fast-growing industries, such as information, finance, real estate, professional, scientific, and technical service sectors.

- Industrial land supports job growth (and mitigates job decline) in PDR sectors. In San Francisco, land zoned for exclusively PDR use is most effective at mitigating the decline in its PDR sectors. Alameda, medium and light IL seem to be fairly effective also at fostering growth of PDR sectors. In Santa Clara, mixed-use zoning is most effective.

- Specific types of zones work in different areas, depending on the local economy. In San Francisco and Alameda, medium and light industrial exclusive IL do well to foster positive job growth in PDR sectors (especially manufacturing sectors) that are otherwise declining in each of these counties. In other words, they allow for a space for these industries to grow where they otherwise cannot occur. However, In Santa Clara, MU IL zoning categories appear much more successful at enabling job growth for manufacturing and wholesale trade sectors than exclusive IL. Exclusively zoned land may work better to protect transportation and warehousing.

REPORT

PART I: INTRODUCTION

This technical memo is the fourth product from the *Regional Industrial Land and Job Study*, prepared for ABAG and MTC as a complement to the 2016 MTC Goods Movement Needs Assessment. In this fourth memo, we ask what types of zoning designations, if any, have been effective in encouraging employment growth in industrial sectors.

Interviews conducted with cities across the region revealed that planning and economic development professionals considered certain zoning designations superior in their capacity to retain and prevent crowding out of industrial uses due to increasing rents or encroachment of non-industrial uses. According to locals, exclusively zoned IL (land zoned for only transportation or light, medium, or heavy industrial uses) is one of the most effective ways of controlling market forces, ensuring job growth, and influencing the type of businesses that locate in industrial areas. Although mixed-use IL offers more flexible use, new commercial and residential uses may be incompatible with industrial use and also raise local rents to unsustainable levels for small industrial firms. However, there is little systematic evidence or analysis to support this.[3]

Therefore, this memo seeks to determine whether zoning makes a difference for employment growth on industrial land. Looking at Alameda, San Francisco, and Santa Clara counties, we compare how jobs are growing on exclusive and mixed-use IL, looking both at overall growth and growth just in production, distribution, and repair (PDR) industries.[4]

PART II: METHODS

Photo Courtesy of Dave R on Flickr

ZONING AND EMPLOYMENT DATA

For the Regional Industrial Land and Jobs Study, we created a parcel-level inventory of industrially zoned land in the Bay Area. This inventory was prepared by gathering the most recent zoning maps from all 101 jurisdictions in the region, and by recoding city-specific zoning designations into seven industrial categories that we standardized for the region. These categories are: (1) heavy industrial, (2) medium industrial, (3) light industrial, (4) transportation and utilities – these are 'exclusive' industrial land (IL) categories—and (5) mixed-use commercial, (6) mixed-use residential, and (7) industrial office—these are 'mixed-use' industrial land (MU IL) categories. These categories were then applied to county assessor data to build a parcel-level dataset of industrially zoned land. Field checks and feedback from local jurisdictions were used to verify the accuracy of the re-classified zoning maps.[5] One caveat is that we assume for this analysis of effectiveness over time that the zoning designation we apply to 2012 (i.e. most recent zoning codes we could gather from the 101 municipalities) was the same in 1990.[6]

We used the data from the National Establishment Time Series (NETS) database (data compiled from Dun & Bradstreet by Walls and Associates) linked to our parcel-level industrial land inventory to aggregate the number of jobs located on industrially zoned land (IL) in 1990 and in 2012. We included all jobs located on IL, regardless of NAICS sectors. For simplicity, we summarized these numbers at the 1- or 2-digit NAICS level. In tandem, we gathered the list of NAICS codes present on IL and calculated countywide job growth for these same sectors, and similarly summarized these at the 1- or 2-digit NAICS level.

We thus compared job growth on different types of IL zoning classifications from 1990 to 2012, to the overall job growth for the county from 1990 to 2012. The purpose is to determine which zoning classification, if any, performed better than others, or better than the county. We are particularly interested in determining which zones are successful in protecting production (and related) employment for which they were designed, rather than service employment. For the purposes of understanding industries likely to be located on industrially zoned land, we analyze more closely NAICS 31-33 (Manufacturing), 42 (Wholesale Trade) and 48-49 (Transportation and Warehousing), which are generally considered to be production, distribution, and repair (PDR) industries.[7] We also consider 23 (Construction) as a PDR industry for the sake of this memo.

Another caveat is that sectoral growth rates are influenced by factors much broader than just local zoning designations—indeed, national and international economic trends play a role in the growth and decline of industries over a 22-year time period. It is possible that even the best zoning designation could fail to "protect" a "doomed" industry. Nevertheless, in this analysis, we attempt to compare relative growth rates across different categories; if, within the same county, the industry is growing at different rates on certain types of land, there may well be local factors, such as zoning, at work.

COUNTIES ANALYZED

We perform the zoning effectiveness analysis at the county level for Alameda, San Francisco, and Santa Clara counties. We focus on these counties only for different reasons. First, interviewees from Oakland, Berkeley, San Jose, and San Francisco were some of the main advocates for zoning codes that include exclusively zoned IL, as a key enabler of industrial job retention and growth.

Furthermore, these three counties demonstrate differences in land use (Table 1), which provides a useful comparison to answer our main research question. On one end, San Francisco has a carefully crafted zoning classification that protects industrial land with its well-known PDR designations, and 50% of its 1,971 acres of IL is zoned exclusive IL. Santa Clara has a similar mix (53% of its 18,500 acres of IL are MU IL), but has actually opened up much of its IL to light- and heavy-office IL uses quite recently.[8] In contrast, Alameda's land is primarily exclusively zoned, with only about 15% of its 24,192 acres of IL zoned MU IL.

		Total IL	Exclusive IL	Mixed-use IL
ALAMEDA	Acres	24,192	20,656	3,535
	Percent	100%	85%	15%
SAN FRANCISCO	Acres	1,971	986	985
	Percent	100%	50%	50%
SANTA CLARA	Acres	18,500	8,661	9,839
	Percent	100%	47%	53%
BAY AREA TOTAL	Acres	96,696	65,793	30,903
	Percent	100%	68%	32%

Table 1. Industrial land (IL) zoning categories, by county

Lastly, while industrial land is much in demand across all three counties, they differ in terms of their markets. Over the last ten years, the most active and volatile markets for industrial land have been Alameda, Santa Clara and San Francisco Counties; yet, while the number of transactions is about equal in Santa Clara and San Francisco, Santa Clara outpaces all counties in terms of the total acreage of industrial land transacted over the last five years (4,000 acres). Alameda also displayed a large amount (3,150 acres). Gross rents for all industrial spaces in San Francisco and the Peninsula are higher than regional averages – whereas Alameda has more affordable rates, particularly for manufacturing and warehouse spaces. As discussed in Memo #1, economic restructuring, particularly the decline in traditional and even high-tech manufacturing, has transformed the San Francisco and Santa Clara economies particularly dramatically, while also impacting Alameda County. Finally, vacancy rates for industrial space are at all-time lows across all counties, are particularly low for San Francisco and Santa Clara.[9]

PART III: FINDINGS

CROSS-COUNTY

The purpose of this analysis is to determine which zoning classification (exclusive vs. mixed-use), if any, performed better than others, and/or better than the county overall. We are interested particularly in which zones are successful in protecting production and related employment, for which they were designed, rather than the service employment. As seen in Table 2:

- The rate of job growth on IL for all sectors present on IL, is higher than the rate of job growth for those same sectors across the county –this holds true for all three counties. This is evidence that IL is the most productive zone for businesses: job growth is occurring, and at a faster rate than for the county as a whole.

- The employment growth rate on MU IL is higher than that on exclusive IL in Alameda and Santa Clara, and nearly similar in San Francisco. This is due at least in part to the concentration of high-growth, non-PDR industries on this land. This is an important point: a range of IL zoning classifications allow for growth of many different sectors, including non-PDR sectors.

- Exclusive IL makes some difference for sectors that are otherwise declining across the county. For example, PDR sectors – as shown in Table 2 – are in decline across the county in Alameda, San Francisco, and Santa Clara. Nevertheless, these sectors are slightly more successful in certain zoning designations. In Alameda, for instance, exclusive IL does a good job at retaining job growth, as does medium IL in San Francisco. However, in other cases like Santa Clara, these zoning codes do not seem to make a difference in countering the overall sector decline.

In the following sections, we examine each county to uncover patterns at the 2-digit NAICS sectors, and discuss county-specific trends that might be influencing the relationship between land use zoning classification and employment growth.

		ALAMEDA	SAN FRANCISCO	SANTA CLARA
ALL SECTORS	County growth % (1990 to 2012 jobs)	**18%** *(420,827 to 495,830)*	**6%** *(399,767 to 422,358)*	**10%** *(684,716 to 756,391)*
	Growth on all IL % (1990 to 2012 jobs)	**36%** *(113,578 to 154,309)*	**57%** *(41,160 to 64,573)*	**12%** *(201,709 to 223,052)*
	Growth on exclusive IL % (1990 to 2012 jobs)	**27%** *(89,169 to 113,134)*	**54%** *(17,929 to 27,595)*	**0.2%** *(78,852 to 79,044)*
	Growth on mixed-use IL % (1990 to 2012 jobs)	**69%** *(24,409 to 41,175)*	**59%** *(23,231 to 26,978)*	**19%** *(122,857 to 146,008)*
PDR SECTORS	County growth % (1990 to 2012 jobs)	**-6%** *(166,750 to 156,413)*	**-53%** *(78,857 to 36,738)*	**-37%** *(332,636 to 208,199)*
	Growth on all IL % (1990 to 2012 jobs)	**18%** *(76,478 to 89,876)*	**-21%** *(20,268 to 15,971)*	**-7%** *(137,566 to 127,630)*
	Growth on exclusive IL % (1990 to 2012 jobs)	**15%** *(65,921 to 75,675)*	**-11%** *(12,180 to 10,855)*	**-16%** *(56,308 to 47,063)*
	Growth on mixed-use IL % (1990 to 2012 jobs)	**35%** *(10,557 to 14,201)*	**-37%** *(8,088 to 5,116)*	**-1%** *(81,258 to 80,567)*
	Growth on exclusive HEAVY IL % (1990 to 2012 jobs)	**13%** *(5,443 to 6,159)*	n/a	**-18%** *(18,726 to 15,350)*
	Growth on exclusive MEDIUM IL % (1990 to 2012 jobs)	**13%** *(41,619 to 46,838)*	**11%** *(5,422 to 6,019)*	**-9%** *(2,976 to 2,708)*
	Growth on exclusive LIGHT IL % (1990 to 2012 jobs)	**19%** *(18,165 to 21,679)*	**-28%** *(6,758 to 4,836)*	**-16%** *(34,599 to 29,005)*
	Growth on MU OFFICE IL % (1990 to 2012 jobs)	**2%** *(6,327 to 6,424)*	**41%** *(515 to 727)*	**-1%** *(75,414 to 74,811)*
	Growth on MU RES-COMM IL % (1990 to 2012 jobs)	**84%** *(4,230 to 7,777)*	**-42%** *(7,573 to 4,389)*	**-2%** *(5,844 to 5,756)*

Table 2. Employment growth in sectors present on Industrial Land (IL) categories

COUNTY OF SAN FRANCISCO

In San Francisco in 1990, the total sum of jobs located on industrially zoned land in 1990 was 41,160 jobs. In 2012, this number increased 57% to 64,573 jobs. In comparison, the county overall increased about 6% from its starting base in 1990 to 2012.

Table 3 provides an overview of job growth on industrially zoned land by zoning category. In San Francisco, we grouped zoning categories into four types: exclusively light, exclusively medium, mixed-use office and mixed-use residential or commercial. Each IL type experienced high growth from 1990 to 2012, ranging from 1,700 new jobs on mixed-use office, to 5,400 jobs on exclusive light, and up to 12,000 new jobs on mixed-use residential/commercial. Table 4 breaks down job growth by zoning category and by NAICS. For simplicity, we only show percentages.

San Francisco: Protecting industrial land through zoning

Beginning in the early 2000s on an interim (and then permanent) basis, San Francisco has protected its production, distribution, and repair (PDR) uses through zoning. PDR uses are zoned either as 'protected' (exclusive, in zones that do not permit residential development), or simply 'allowed' (mixed-use). According to a planning official, very few conversions have occurred in the PDR protected zones, which have successfully kept housing out. Because of high rents, "We would have no PDR if we had no PDR designation."

In San Francisco, the market is strong enough that the city can impose specific requirements for industrial replacement. In certain strategic locations, for instance, the city is requiring industrial in tandem with office use, i.e., mid- to high-density office space above industrial uses. This way, office rents might even cross-subsidize the lower industrial rents for the developer. The city is thus leveraging the strong demand for residential/office uses in prime, high-rent locations to preserve, maintain or create industrial space. This would be suitable for artists and makers who have central location needs and compatible uses (i.e. non-noxious). For example, the Hundred Hooper Development in Mission Bay is planned as a large new PDR space (which was required to replace industrial land lost), which also incorporates office and commercial uses.

A few key patterns for San Francisco can be extrapolated from this data. To begin, although manufacturing sectors (31-33) declined markedly across the county, these sectors tended to do relatively well on light and medium industrial land. While Sector 32 declined drastically across the county, it only declined slightly on light industrial and actually grew rapidly on medium IL – while it declined in the mixed-use zones. While Sector 33 also declined across the county, it declined only slightly on light industrial and increased slightly on medium industrial. Interestingly, it also experienced very strong growth on both mixed use zoning categories

Growth patterns at the 3-digit level are also insightful. For example, for sector 321 (paper manufacturing), a county decline of 70% was outweighed by a 1444% (+520 net new jobs) growth on medium IL with an absence or limited growth on other IL; for sector 327 (nonmetallic mineral product manufacturing), a county decline of 57% was dwarfed by a 74% growth on light IL, despite a decline across other types of IL. For sector 315 (apparel manufacturing), although there was a small loss on light IL (-22%, or -49 jobs) and some growth on medium IL (24%, or +24 jobs), this contrasted with the marked job loss on both types of MU-IL (100% decline, or -74 jobs on MU-office, and 71% decline, or -697 jobs on MU-com-res). With wholesale trade (42), exclusive IL did well in providing space for this industry to grow. While the sector experienced a 46% decline

across the county, it grew 13% and 10%, respectively, on light and medium land – compared to a 5% and 15% decline on MU-office and MU-res-com, due perhaps to new warehouse uses. With the transportation sector (48), we see that in spite of a decline across the county, there was growth on MU IL, but decline on exclusive IL. This seems to be caused mainly by the marked decline of sectors 484 (truck transportation) and 485 (transit and ground passenger transportation), which combined, lost over 1,000 jobs on Medium IL, but gained modestly on MU-office (+180 jobs) and MU-res-com (+200 jobs), perhaps due to changes in these sectors, such as the use of lighter trucks. Finally, the postal, courier, and warehousing sectors (49) were in decline in all types of land and across the county, except on medium IL (1,099 new jobs).

Zoning classification	Employment 1990	Employment 2012	Absolute growth	Percent growth
Exclusive LIGHT IL	10,820	16,245	5,425	**50%**
Exclusive MEDIUM IL	7,109	11,351	4,242	**60%**
MU OFFICE IL	933	2,648	1,715	**183%**
MU RES-COMM IL	22,298	34,362	12,064	**54%**
ALL IL TOTAL	**41,160**	**64,606**	**23,446**	**57%**

Table 3. San Francisco job growth on Industrial Land by zoning classification

NAICS*	COUNTY	TOTAL ALL IL	LIGHT	MEDIUM	MU-OFFICE	MU-RES-COM
1	-46%	218%	-38%	-100%	0%	100%
21-22	-43%	1343%	200%	150%	0%	100%
23	-51%	51%	24%	42%	157%	96%
31	**-81%**	-56%	-20%	-61%	-83%	-68%
32	**-68%**	-62%	-30%	198%	-70%	-80%
33	**-80%**	12%	-7%	3%	35%	86%
42	**-46%**	3%	13%	10%	-5%	-15%
44-45	-4%	93%	174%	87%	164%	50%
48	**-71%**	-27%	-41%	-50%	197%	451%
49	**-50%**	-40%	-87%	658%	-77%	-58%
51 to 55	30%	142%	97%	112%	394%	153%
56	-8%	18%	184%	217%	107%	-21%
6	41%	129%	428%	127%	117%	98%
7	38%	75%	45%	97%	68%	83%
81	7%	58%	56%	125%	240%	34%
Total	**6%**	**57%**	**50%**	**60%**	**183%**	**54%**

Table 4. San Francisco job growth on Industrial Land by zoning classification and by NAICS sector
*See county shift share files by county - list of unique 6-digit NAICS was extracted from NETS and those were used for projections.

Anchor Steam Brewery, San Franciscom, Photo Courtesy of Jennifer Pickens on Flickr

Beyond the industries we typically expect on IL, other industries have significant employment on industrial land and grew significantly from 1990 to 2012. For example, the retail trade sectors (44-45), although in decline across the county, grew across all types of IL. Furthermore, the utilities (21-22) and construction (23) showed the same pattern, with a decline across the county, but growth on most types of IL. The information, finance, real estate, management, and professional, scientific, and technical services sectors (51-55), exhibited strong growth across the county, and even higher growth across all industrial zoning categories - especially on MU-office IL, which makes sense given the nature of this sector.

Overall, it seems like exclusively zoned IL in San Francisco has been relatively successful at ensuring continued growth of key PDR industries – in spite of countywide declines. Medium IL seems to have done particularly well in this regard for PDR sectors. More generally, exclusive IL seems effective at promoting all types of businesses – regardless of PDR sectors. It is possible that certain other types of zoning (such as mixed-use zoning) are not as conducive to business growth because of competition or conflicts with other uses.

ALAMEDA COUNTY

In Alameda, the manufacturing sectors (31-33) are in decline across the county, despite overall county job growth of about 18% from 1990 to 2012. Interestingly though, sectors 32 and 33 grew across all industrially zoned land. Furthermore, sectors 32 and 33 grew within each zoning type, except for sector 32 which declined on heavy IL. Certain zoning types did even better than others: for example, 33 experienced growth of 133% (1,422 jobs) on heavy IL, and sector 32 growth of 136% (2,309 jobs) on light IL and 360% (1,329 jobs) on mixed-use residential/commercial land. Sector 31, however, declined overall: The only zoning classifications with growth were medium IL (20%, or 310 jobs) and transportation/utilities IL (433% or 199 jobs).[10]

The case of wholesale trade (42), transportation and warehousing (48-49) was also different in Alameda as compared to San Francisco, because the county overall saw an increase in jobs in these sectors. Therefore, what we compare here is whether specific industries allowed the industry to grow marginally more than in the county. In the case of wholesale trade, all zoning types were growing, with heavy, medium and light IL doing the best in terms of net new number of jobs (337, 615, and 558 jobs, respectively). For transportation and warehousing (48-49), growth occurred not so much on the transportation IL, but in the MU-res-com and light IL zoning types.

For non-PDR industries, IL still seems to provide land for business growth. In sectors 51 to 81, all sectors grew countywide, and also grew on the vast majority IL zoning classifications – at even higher rates than the county at times. For example, for sectors 51 to 55 (which encompass information, finance, insurance, real estate, professional services, and management), both the absolute and percent job growth were very high across all IL categories (+3,700 jobs on medium IL, +339 jobs on heavy IL, +1,400 on MU-office and +1,700 on MU-res-com).

Overall, in Alameda, PDR sectors did better on all IL (MU and exclusive IL combined), than the county does overall. In terms of differentiating MU from exclusive IL, however, the patterns are not as marked as in San Francisco: although medium IL does seem to have fostered positive job growth across all PDR 2-digit industries, and light IL has been relatively successful, we also see that both MU-res-commercial and MU-office experienced, for most cases, positive growth. This, again, may reflect the ongoing restructuring of the economy in Alameda County.

Oakland: Letting the market decide

As noted in Memo #2, West Oakland has undergone significant transformation, with steady job growth occurring but in industries that are not necessarily dependent on industrial land. Oakland has a long history of efforts to preserve industrial land, and since at least the early 2000s, has tried to develop an industrial land conversion policy. However, increasing housing pressure, urban design issues, and new zoning designations – for instance, the Housing Business Mix (HBX) designation in West Oakland – keep creating new challenges to preserving key industrial areas.

The West Oakland Specific Plan introduced a new HBX-4 classification that refines the City's density and permitted use requirements for live/work and work/live developments, and applies to several formerly commercial areas. In effect, though, it is just "pretend mixed use," as one city official said. Industrial and commercial development is not financially feasible, and the only new construction is residential. Although the West Oakland Commerce Association (WOCA) had argued that a zoning requirement of a 50/50 mix of residential and commercial/industrial uses would stabilize the area, the cap was not adopted. Given the higher financial returns for residential development, it is probable that the majority of these newly zoned parcels will be put to residential uses, further restricting the available industrial land in West Oakland.

Zoning classification	Employment 1990	Employment 2012	Absolute growth	Percent growth
Exclusive LIGHT IL	7,450	9,781	2,331	**31%**
Exclusive MEDIUM IL	54,223	68,422	14,199	**26%**
Exclusive HEAVY IL	26,505	33,458	6,953	**26%**
Exclusive TRANSPORTATION	991	1,473	482	**49%**
MU OFFICE IL	11,760	15,456	3,696	**31%**
MU RES-COMM IL	12,649	25,719	13,070	**103%**
ALL IL TOTAL	**113,578**	**154,309**	**40,731**	**36%**

Table 5. Alameda job growth on Industrial Land by zoning classification

NAICS	COUNTY*	TOTAL IL	HEAVY	MEDIUM	LIGHT	TRANSP	MU-OFFICE	MU-RES-COM
1	-33%	-58%	0%	-56%	-87%	0%	-84%	181%
21-22	-75%	39%	48%	18%	54%	0%	-100%	100%
23	-17%	20%	-6%	63%	7%	127%	-29%	35%
31	**-17%**	-3%	-38%	20%	-16%	433%	14%	-8%
32	**-2%**	46%	-65%	19%	136%	26%	36%	360%
33	**-21%**	16%	133%	8%	4%	24%	0%	67%
42	**5%**	11%	27%	7%	11%	77%	5%	40%
44-45	-1%	23%	-21%	16%	11%	46%	87%	18%
48	**14%**	17%	79%	1%	71%	-14%	-40%	126%
49	**36%**	37%	24%	3%	28%	-94%	274%	100%
51-55	48%	84%	102%	121%	23%	212%	130%	71%
56	4%	55%	53%	47%	132%	2750%	5%	43%
6	70%	130%	351%	204%	34%	-56%	-7%	319%
7	69%	114%	15%	164%	204%	100%	182%	45%
81	15%	33%	52%	11%	31%	-50%	47%	78%
92	n/a	126%	100%	57%	85%	0%	7671%	170%
TOTAL	**18%**	**36%**	**31%**	**26%**	**26%**	**49%**	**31%**	**103%**

Table 6. Alameda job growth on Industrial Land by zoning classification and by NAICS sector
*See county shift share files by county - list of unique 6-digit NAICS was extracted from NETS and those were used for projections.

SANTA CLARA COUNTY

In Santa Clara County, manufacturing sectors (31-33) were in decline across the county and all IL in particular, despite county job growth of 10% from 1990 to 2012. In fact, the only IL classification on which employment grew during this time period is on light IL - with a small 4% increase, or +41 jobs for sector 32; on medium IL where jobs in sector 31 stayed stable; and on MU-office IL, with an impressive 127% increase (+642 jobs) for sector 31. In fact, heavy, medium and light IL all had dramatic decreases in jobs for sectors 33 (a loss of 5,037, 441, and 6,751 jobs in each IL type, respectively) – comparatively to less dramatic decreases on mixed-use land (-697 jobs on MU-office and -497 jobs on MU residential/commercial).

Fremont: Zoning industrial land for mixed use, but with little risk of conversion

Readily accessible via BART, the City of Fremont is a key industrial area of the East Bay and Silicon Valley. The city supports its industrial firms and is focusing on the growth of advanced manufacturing. Furthermore, Fremont is now in a unique position because it will benefit from a new BART station in the foreseeable future. The Warm Springs BART station will be located in the southern end of the city, near the large existing Tesla plant. Intended as an employment-focused transit station, Warm Springs is located in a mixed-use industrial zone.

Despite other commercial, office, and residential uses that are planned to be co-located nearby, city officials argue that this industrial land is not at risk of conversion. The key to this lies in the type of industry and the type of zoning allowed in the station area plan:

- Industries with mid- to high-density employment on-site are the types of firms that will occupy land closest to the station. Similarly, firms that locate near the station (such as advanced manufacturers) will require limited use of truck freight and have very limited environmental impact (toxicity, noise etc.).
- Planning tools and zoning are being leveraged to control the risk that residential uses will outbid industrial uses. A cap on both the number of housing units and on residential land area will be applied, and performance-based zoning (zoning based on standards for activity levels) is planned for implementation for the area surrounding BART.
- The physical integration of industrial buildings within the rest of the fabric also matters to the success of an employment-transit area: industrial uses are kept mainly separate from other uses (commercial and residential) and although they are not located directly adjacent to BART, they are still within ¾-miles or less from the station. Different land uses are scaled up by density as distance to the station decreases, but all within a tight perimeter around the station. Furthermore, larger boulevards and BART tracks act as buffer areas between the industrial areas and the residential/services areas.

This shift is perhaps not surprising. Since 1990, much of Santa Clara's high-tech manufacturing has shifted to offshore locations, reducing the need for exclusively zoned IL. It is plausible that MU office IL is most effective for job growth in the South Bay given the presence of Silicon Valley and the existing active cluster of tech industries – which perhaps need flexible space (office plus R&D) to thrive.

For wholesale trade (42), again, the picture is not clear. This sector grew across the county; and while heavy and medium IL seem somewhat effective with their low growth rates, light IL does not with a 12% decline (-366 jobs). But most of all, the highest growth in absolute numbers actually occurs on MU office and MU residential/commercial. For transportation and warehousing (48-49), MU IL types

overall do not perform as well as the exclusive IL types – both 48 and 49 are positive across heavy, medium, and light IL, but negative on all MU IL, except for 49 on MU-res-comm.

In terms of growth of non-PDR sectors, both MU IL zoning seem to be doing well – and perhaps better than exclusive IL. For instance, from sectors 51 to 82, there was practically no decline in jobs on both MU-office and MU-res-com, whereas a few instances do show decline on heavy, medium and light IL for these sectors.

Zoning classification	Employment 1990	Employment 2012	Absolute growth	Percent growth
Exclusive LIGHT IL	24,481	25,899	1,418	**6%**
Exclusive MEDIUM IL	8,091	6,852	-1,239	**-15%**
Exclusive HEAVY IL	46,270	46,221	-49	**0%**
Exclusive TRANSPORTATION	10	72	62	**620%**
MU OFFICE IL	111,888	132,306	20,418	**18%**
MU RES-COMM IL	10,969	13,702	2,733	**25%**
ALL IL TOTAL	**201,709**	**225,052**	**23,343**	**12%**

Table 7. Santa Clara job growth on Industrial Land by zoning classification

NAICS	COUNTY*	TOTAL IL	HEAVY	MEDIUM	LIGHT	TRANSP	MU-OFFICE	MU-RES-COM
1	-72%	-52%	-6%	-96%	471%	0%	76%	-67%
21-22	2%	-30%	-20%	-82%	100%	0%	-33%	167%
23	-25%	50%	57%	35%	55%	0%	45%	48%
31	**-57%**	-20%	-65%	0%	-59%	0%	127%	-49%
32	**-64%**	-8%	-16%	-46%	4%	0%	-3%	-10%
33	**-65%**	-14%	-57%	-41%	-24%	0%	-1%	-34%
42	**66%**	4%	11%	6%	-12%	-100%	7%	3%
44-45	-3%	70%	45%	212%	57%	0%	79%	36%
48	**16%**	-24%	14%	191%	396%	0%	-64%	-23%
49	**34%**	136%	185%	100%	825%	0%	-8%	411%
51-55	119%	42%	148%	32%	48%	0%	41%	-5%
56	16%	70%	81%	210%	19%	0%	119%	90%
6	60%	71%	184%	-81%	89%	0%	277%	93%
7	86%	76%	-26%	96%	122%	100%	112%	11%
81	7%	42%	31%	-8%	56%	-33%	57%	38%
92	N/A	55%	125%	0%	151%	100%	6%	100%
TOTAL	**10%**	**12%**	**6%**	**-15%**	**0%**	**620%**	**18%**	**25%**

Table 8. Santa Clara job growth on Industrial Land by zoning classification and by NAICS sector
*See county shift share files by county - list of unique 6-digit NAICS was extracted from NETS and those were used for projections.

PART IV: DISCUSSION

Photo Courtesy of Wilson Hui on Flickr

This analysis suggests some support for the idea that exclusive IL might be one of the most effective ways of controlling market forces, ensuring industrial job growth, and influencing the type of businesses that locate in industrial areas. However, the effectiveness of industrial zoning depends on local context. There is not a generalized clear distinction between what zoning types (exclusive vs. mixed-use IL) distinctively encourage job growth. Exclusively zoning for industrial use, which is considered the most protective, succeeds in preserving businesses – fostering job creation or stanching job loss – in San Francisco and Alameda counties, but in Santa Clara county, jobs thrive best in mixed-use zones. Further analysis, such as multivariate regression, would be needed to determine whether type of zoning matters regardless of larger trends such as economic restructuring.

Nevertheless, several trends can be discerned:

- Industrial land is the most productive land for job creation. Industries locating on IL grow at a faster rate than anywhere else.

- Job growth rates are particularly high in mixed-use zones. One reason for this is that MU IL allows for a relatively wider mix of activities (compared to exclusive IL), so these areas undergo the effect of being able to host very fast-growing industries, such as information, finance, real estate, professional, scientific, and technical service sectors.

- Industrial land supports job growth (and mitigates job decline) in PDR sectors. In San Francisco, medium industrial land zoned for exclusively PDR use is most effective at mitigating the decline in its PDR sectors. Alameda, medium and light IL seem to be fairly effective also at fostering growth of PDR sectors. In Santa Clara, mixed-use zoning is most effective.

- Specific types of zones work in different areas, depending on the local economy. In San Francisco and Alameda, medium and light industrial exclusive IL do well to foster positive job growth in PDR sectors (especially manufacturing sectors) that are otherwise declining in each of these counties. In other words, they allow for a space for these industries to grow where they otherwise cannot occur. However, In Santa Clara, MU IL zoning categories appear much more successful at enabling job growth for manufacturing and wholesale trade sectors than exclusive IL. Exclusively zoned land may work better to protect transportation and warehousing.

NOTES AND APPENDICES

NOTES

1. One exception is a study of industrially zoned land in the East Bay, which found that it is associated with higher levels of job creation. See Karen Chapple, "The highest and best use? Urban industrial land and job creation." Economic Development Quarterly 28.4 (2014): 300-313.
2. We based the list of industries in the PDR sector on the designations by the San Francisco Planning Department. See http://sf-planning.org/16727-appendix-d.
3. One exception is a study of industrially zoned land in the East Bay, which found that it is associated with higher levels of job creation. See Karen Chapple, "The highest and best use? Urban industrial land and job creation." Economic Development Quarterly 28.4 (2014): 300-313.
4. Because we are constrained to working at the 2- and 3-digit NAICS level, we define the PDR sector as NAICS 23 (Construction), 31- 33 (Manufacturing), 42 (Wholesale Trade) and 48-49 (Transportation and Warehousing).
5. More details on these methods and findings are included in Memo 1.
6. This analysis assumes that the zoning is constant. However, it is possible that industrial land in 2012 was zoned for other uses in 1990, or that mixed-use industrial land has been converted to exclusive industrial, or that exclusive industrial land has been converted to mixed-use. Based on our interviews, the only place that mixed-use industrial land has been converted to exclusive industrial is probably San Francisco; in the other counties, there has instead been a shift in the opposite direction, from exclusive to mixed-use. In general, the most likely zoning change is from industrial to residential or commercial – in which case, the businesses would not be included in our data. Thus, this analysis likely yields relatively conservative results – i.e., by not including jobs on land converted to non-industrial zoning it is underestimating the amount of job growth.
7. We break these to the 3-digit level, but due to small employment numbers in some categories, we do not use the 3-digit level systematically, and mainly stay with the 2-digit level.
8. Based on interview with City of San Jose Economic Development staff, March 2016.
9. See Memo 1 for more details on methods and numbers.
10. Mixed-use office is positive at 14% increase, but this only represents about 65 jobs.
11. Numbers and excluded too many industries considered dependent on industrial land.
12. At the time of analysis, this was the only scenario available for study. The final version of the scenario differs slightly from the one studied here.

Technical Memo #5

Center for Community Innovation
INDUSTRIAL LAND AND JOBS STUDY FOR THE SAN FRANCISCO BAY AREA

WHAT DO BUSINESSES WANT?

Findings from surveys and interviews of businesses located on industrial land

Professor Karen Chapple
with Evelyne St-Louis, Abigail Cochran, Rebecca Coleman, and Elizabeth Mattiuzzi

Berkeley

Authors
Karen Chapple
with Evelyne St-Louis, Abigail Cochran, Rebecca Coleman, and Elizabeth Mattiuzzi

Cover Photo
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The Center for Community Innovation (CCI) at UC-Berkeley nurtures effective solutions that expand economic opportunity, diversify housing options, and strengthen connection to place.

Report prepared for the Association of Bay Area Governments/Metropolitan Transportation Commission.

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Contents

INTRODUCTION

As part of the Industrial Land and Jobs Study of the San Francisco Bay Area, we conducted a survey and interviews of local businesses in order to better understand why businesses want to locate on industrial land, what role their business plays within the regional economy, and the challenges they experience.

RESPONDENT PROFILE

Our sample consists of 94 respondents; for most questions, 35 to 60 responses were usable. As shown in Figure A, over half of survey respondents are located in the East Bay (Oakland, San Leandro and West Berkeley); 12% in the North Bay; and 7-10% in each of the remaining subregions (Northern Contra Costa, San Francisco, and the Peninsula.

ECONOMIC LINKAGES FROM BUSINESSES LOCATED ON INDUSTRIAL LAND

Markets

While exporting globally, firms located on industrial land act as a key support to other private firms in the local and regional economy by supplying them with necessary goods or services (Figure B).

Suppliers

Firms located on industrial land possess multiple regional suppliers from across the Bay Area (shown on Figure C with dots color coded to the location of the firm to which they provide supplies), as well as very local suppliers – often even within the same city.

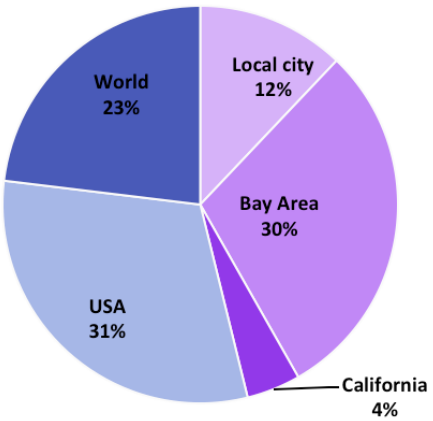


Figure A. Market linkages of business respondents: Location of primary and secondary markets

We would love to find a facility that [...] could allow us to grow over the next 10-15 years. Unfortunately space is so limited and at such a premium that is not possible for us at this time.
- San Francisco business

It is highly advantageous to have close at hand machine shops for fabrication of our custom parts. It is also highly advantageous to be so close to UC Berkeley, with whom we have several on-going collaborations. In the past we have also collaborated with LBL. The work we do could not be done in an office building. Because of our laboratory we require some sort of industrial zoning.
- West Berkeley business

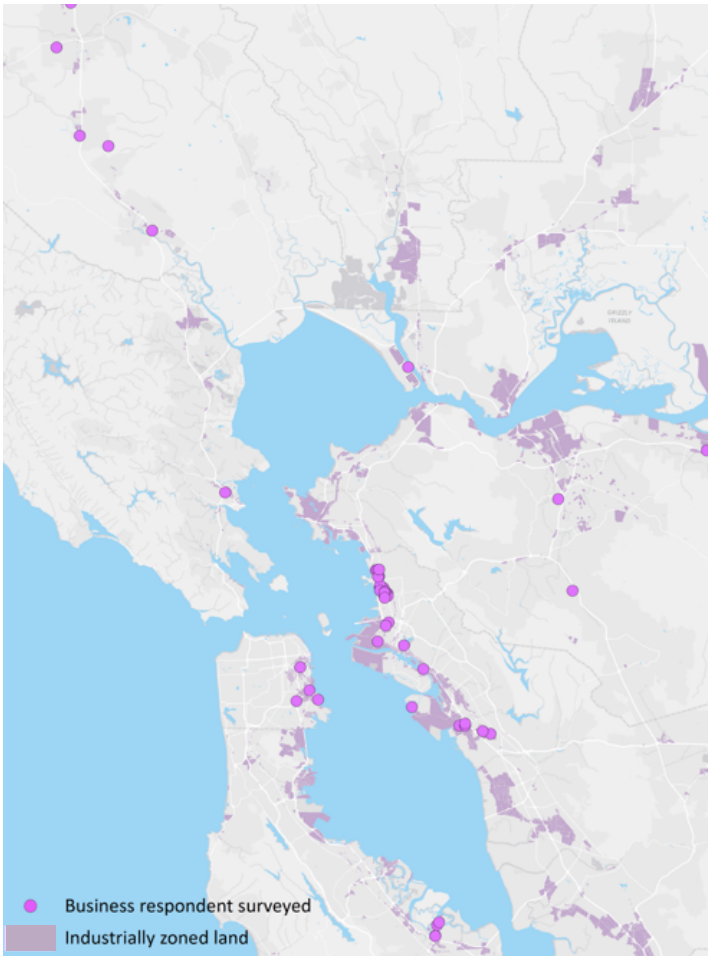


Figure B. Location of survey respondents across the region

INFRASTRUCTURE NEEDS

Businesses' most pressing infrastructure needs are summarized in Figure D: Out of 71 needs cited by 56 unique respondents (survey takers were asked to select up to two options), road maintenance was the most named. Transit access/improvements and higher-speed internet access came in second and third place, and improved port/rail access came in fourth place.

CHALLENGES, OPPORTUNITIES, AND SUGGESTIONS FOR LOCATION ON INDUSTRIAL LAND

Most businesses on industrially zoned land expect stable or positive growth in the next five years, and few wish to move from their current location. At the same time, several concerns emerged from interviews and surveys with businesses. One is the lack of industrial space, the inability to find suitable expansion space, or the inappropriateness of available space for business needs. In some industrial zones, businesses also report concerns with the ineffectiveness of zoning to protect against encroachment by other uses; in particular market pressure from residential demand was a particular concern. Some champion zoning that permits concentrations of production-related businesses, while others prefer the special advantages of mixed-locations. Yet, above all, businesses voice concern about dealing with land use conflicts and suggest the need for buffer zones, exclusive zoning, or more effective mixed-use zones.

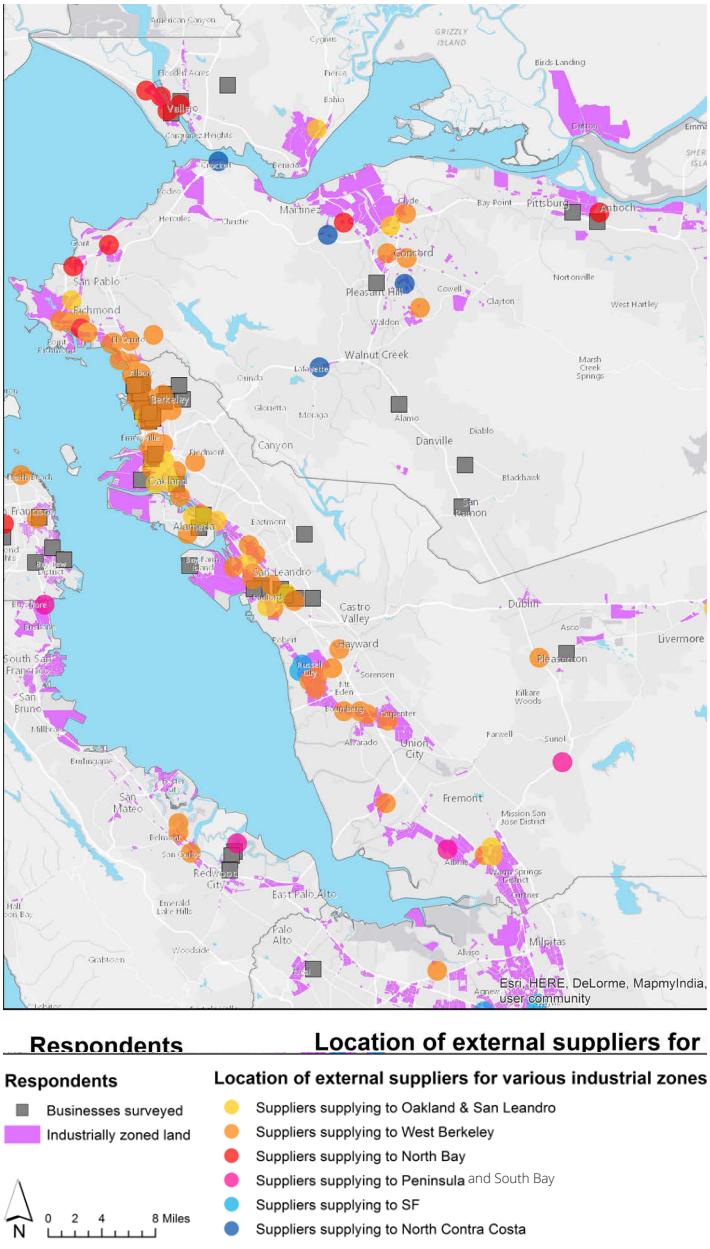


Figure C. Location of respondents' suppliers with a focus on the East Bay.

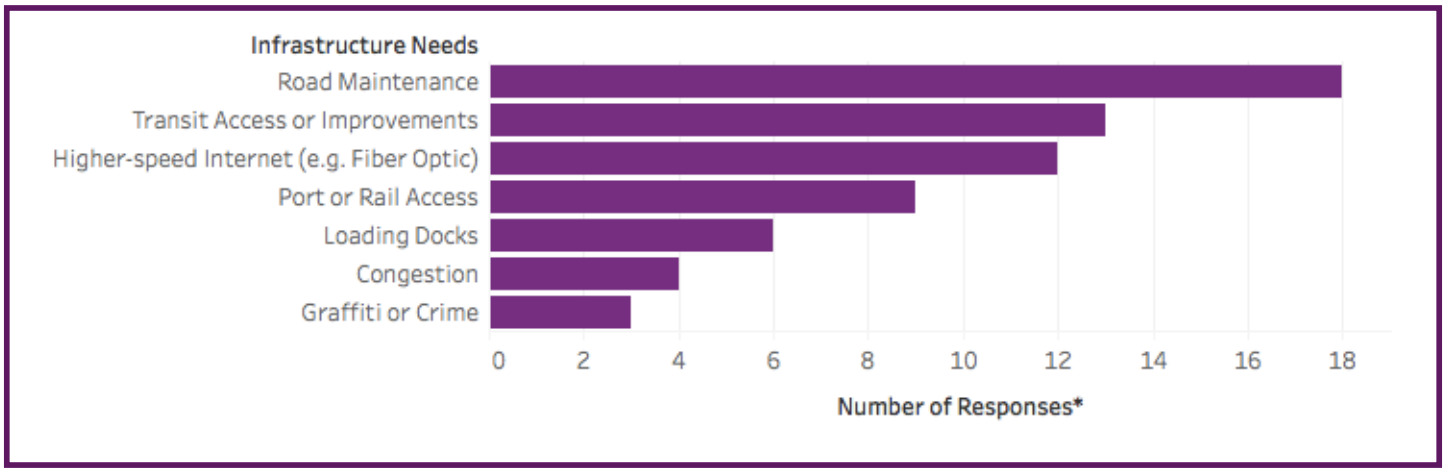
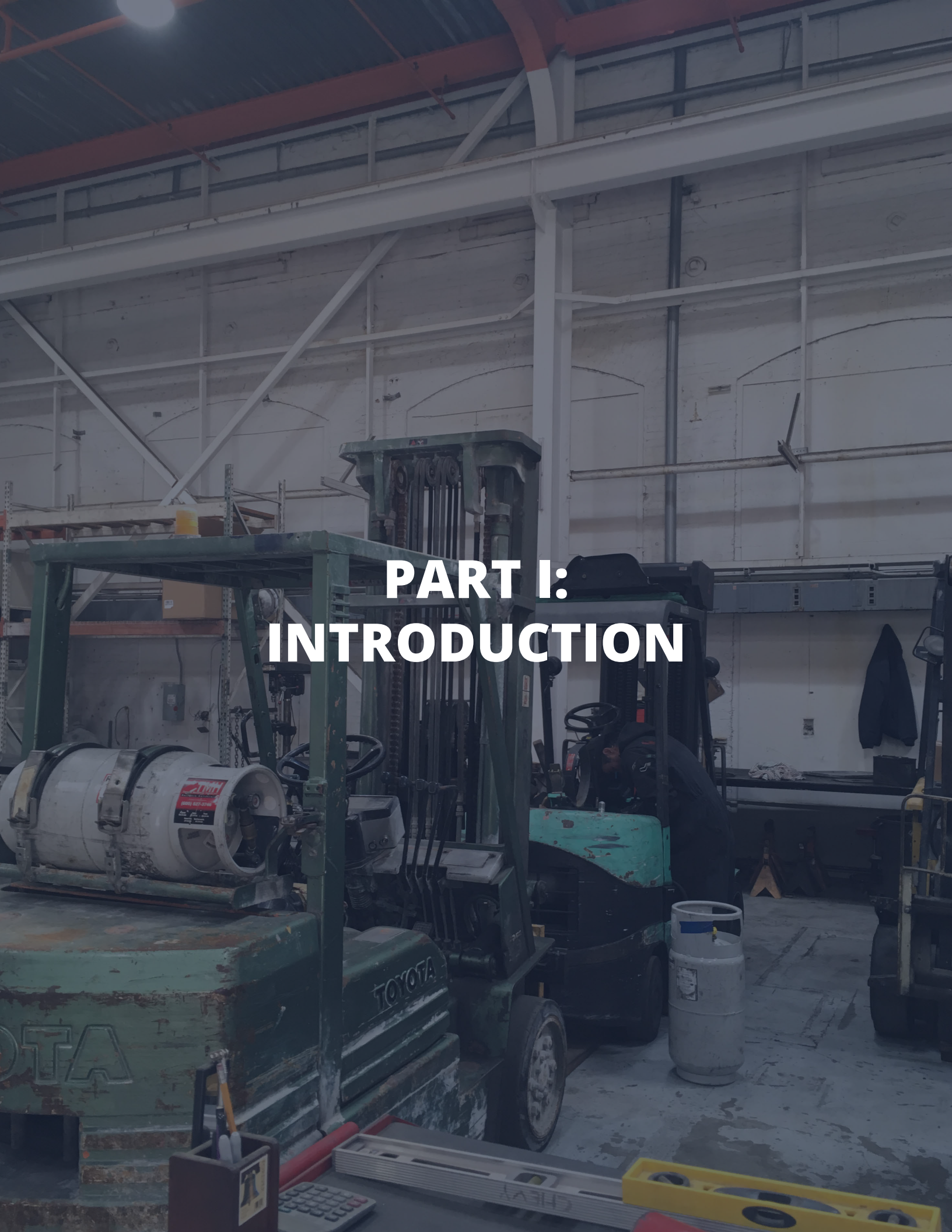


Figure D. Frequency of infrastructure needs, according to businesses located on industrial land
*There were 56 unique respondents on this question, but 71 total needs cited, as respondents could pick up to two of their most pressing infrastructure needs.

REPORT



PART I: INTRODUCTION

The Industrial Land and Jobs Study complements the 2015 MTC Goods Movement Needs Assessment with an analysis of the demand for and supply of industrially zoned land in the nine-county region, both now and in the future. This study involved intensive data analysis of current and future land use patterns, real estate dynamics, employment growth, and transportation impacts.

To accompany the technical analysis components of this study, we undertook outreach to businesses across the Bay Area located on, or near, industrial land. The aim was to incorporate the voice of the business community into our findings. We conducted a survey and interviews of local businesses in order to better understand why businesses want to locate on industrial land, what role their business plays within the regional economy, and the challenges they experience.

We review our methods (Section II) and provide a profile of survey respondents (Section III) below, then review in turn businesses' linkages to the region (Section IV), their infrastructure needs (Section V), and their location, land and real estate needs (Section VI).

PART II: METHODS

SURVEY OVERVIEW

Organized in five sections, the survey prompted business respondents on the following themes: (1) linkages to markets, suppliers, and partners, with a focus on understanding local linkages; (2) infrastructure needs; (3) expected growth and challenges/opportunities around industrial space and land; (4) background information about the firm; and (5) open-ended comments. The complete survey instrument is included in the Appendix. The survey was available online from July to November 2016. It targeted business proprietors or high-level staff familiar with the firm. Responses were kept anonymous.

SURVEY DISTRIBUTION AND SAMPLE

This survey was intended as an exploratory tool to surface new ideas and reveal patterns about opportunities and challenges of businesses located on industrial land. The aim of the survey was not to obtain a statistically representative picture or statistically significant results, and we did not seek an exact representation of businesses from across the region.

To get in touch with proprietors or high-level staff of firms located on industrial land, we leveraged "gatekeeper" informants from business/trade associations and from city economic development staff. We equipped them with promotional materials, which they used to distribute the survey to their personal business networks. In addition, we used local economic development events, such as those described in the "Interviews" section, to both publicize the survey and recruit more gatekeepers, such as elected officials, business consultants, and workforce development professionals. This "snowball sample" method not only helped us to identify respondents who are actively engaged in the business community, but also reassured respondents that the survey was trustworthy. At the same time, it should be noted that the survey likely did not capture the voices of local businesses that do not engage in networking activities, or are not vested in the local community.

INTERVIEWS

To supplement the survey, we conducted informal intercept interviews with business owners while attending two different economic development events. These events were: (1) A workshop entitled "Real Estate Opportunities with Makers and Small-Scale Manufacturers," organized by the City of Fremont Economic Development on August 17th, 2016, and (2) A conference entitled "Make it & Move it East Bay Manufacturing & Logistics Summit," organized by the East Bay Advanced Manufacturing Partnership on September 16th, 2016. The questions we asked business owners at these events were very similar to those included in the survey.

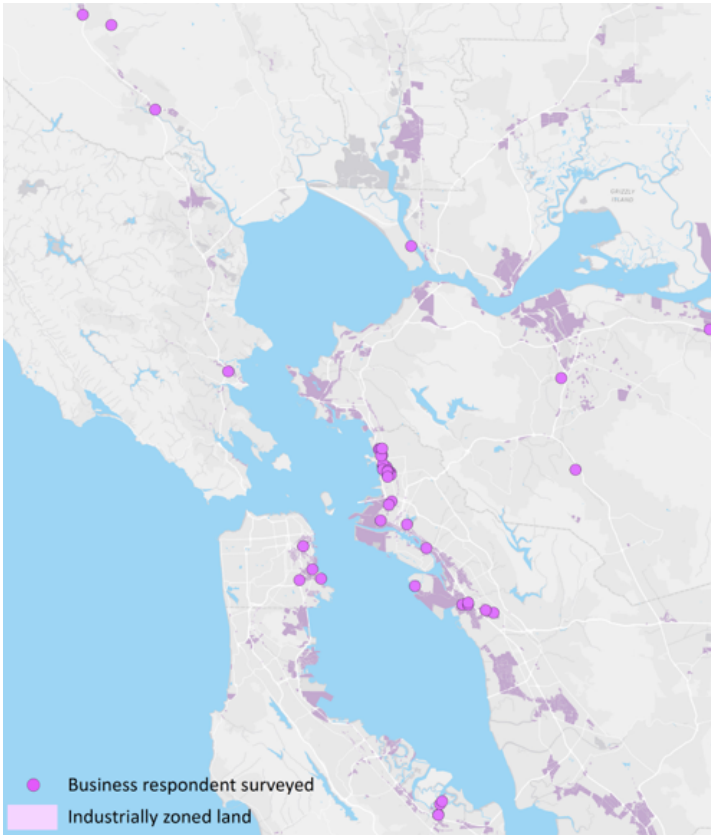


Figure 1. Location of survey respondents across the region

PART III: PROFILE OF BUSINESS RESPONDENTS

Our final sample consisted of 94 respondents; for most questions, 35 to 60 were usable responses. As shown in Figures 1 and 2, businesses we surveyed are located throughout the region and can be categorized into subregional industrial districts (Figure 2).[1] We obtained many responses from the inner East Bay (Oakland/San Leandro and West Berkeley), and a similar number of responses from other subregions (North Bay, Northern Contra Costa, San Francisco, and Peninsula)—with a notable lack of responses from the South Bay.[2] Given the disproportionate response from the East Bay, we focus mostly on these two counties, and we consider the report findings most reliable for that geography.

Of 52 respondents that specified their industry, more than half of respondents (n=30) were part of the Manufacturing sector, including manufacturing of diverse products such as food (311), wood products (321), chemicals (325), plastics and rubber (326), fabricated metal (332), machinery (333), computers and electronics (334), and transportation equipment (336). Beyond this, about 12% of respondents (n=6) were in retail and wholesale trade, mainly of nondurable goods (424), motor vehicle parts (441), and building materials (444).

Other relevant industries in the sample were Fishing (n=1), Construction (n=2), and Mining industries (n=2), as well as Rail transportation (n=1), Waste management (n=1), and Repair and Maintenance (n=1). Other industries that typically are not considered industrial—such as Real Estate, Professional/ Scientific/ Technical Services, Management and Administration (n=3)—are represented as well, since they are working in related areas, such as Research & Development.

Firms' self-reported activities were in line with the results above: out of 53 respondents, a majority indicated their primary activity as Production and Repair (n=29) and Distribution (n=6), and many of these listed Research & Development as their secondary activity. In turn, a significant number of firms listed Office and Research & Development as their primary activity (n=13), and Production, Repair, or Distribution as their secondary activity.

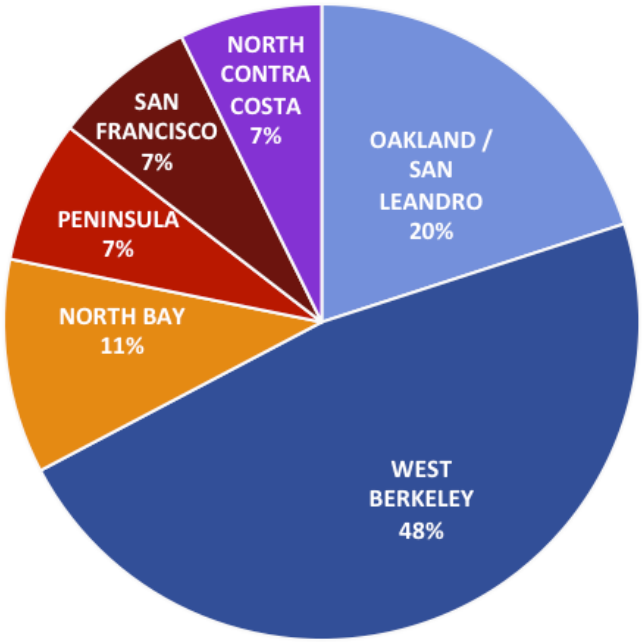


Figure 2. Business survey respondents classified by subregion.

On average, respondents were mid-sized firms, with a mean and median number of employees around 50 and 16 respectively; only a handful of firms had over 200 employees. Furthermore, firms varied greatly in tenure, anywhere from less than a year in their current location to up to over 100 years. The median tenure of the business surveyed was 24 years of existence in their current location.

PART IV: ECONOMIC LINKAGES FROM BUSINESSES LOCATED ON INDUSTRIAL LAND

MARKETS AND CUSTOMERS

More than the majority of respondents stated that their primary market type was private firms (n=31 out of 55), followed by private households (n=15) and public or non-profit agencies (n=9). Geographically, almost half of these primary markets were found locally, regionally or within state (n=24), and slightly more than half were national or international (n=31). For secondary markets, a large majority of businesses listed were public or non-profit agencies (n=15 out of 35) and private firms (n=14), and geographically, half sell within the state and half nationally or internationally. Figure 3 summarizes the location of both primary and secondary markets.

These numbers seem to suggest that while exporting globally, firms located on industrial land act as a key support to other private firms in the local and regional economy by supplying them with necessary goods or services. This is supported in the literature as a common benefit of industrial land[3].

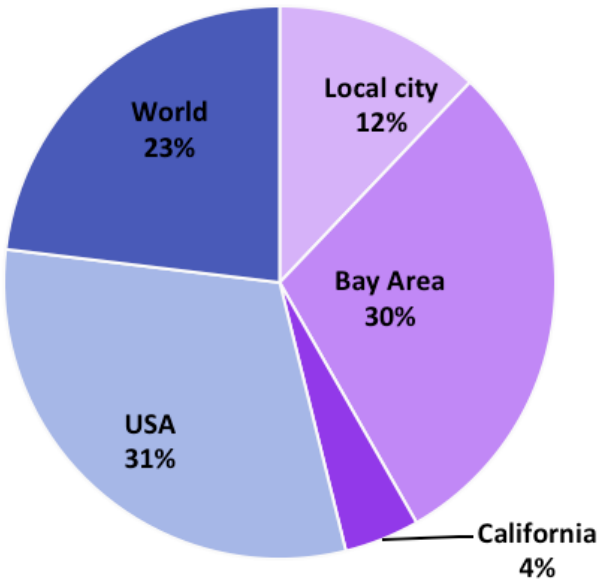


Figure 3. Market linkages of business respondents: Location of primary and secondary markets

SUPPLIER NETWORKS

We asked survey respondents to list their top seven suppliers (their location and their sector), including any local suppliers.

Similarly to the Back-Street Businesses Study conducted in San Francisco in 2007,[4] our analysis found that firms located on industrial land possess local networks of customers and suppliers. Firms have multiple regional suppliers from across the Bay Area, as well as very local suppliers, sometimes even within the same city.

Firms located on industrial land act as a key support to other private firms in the local and regional economy

Figure 4 depicts the location of suppliers enumerated by respondents (shown with dots color coded to the location of the firm to which they provide supplies). Firms located on industrial land possess multiple regional suppliers from across the Bay Area, as well as very local suppliers—often even within the same city. Indeed, clusters of suppliers appear clearly around the subregions that they serve, for example, Berkeley, Oakland, and the East Bay. Figure 5, provided by Adams & Chittenden Scientific Glass in West Berkeley, illustrates the web of relationships between firms and customers in one industrial neighborhood.

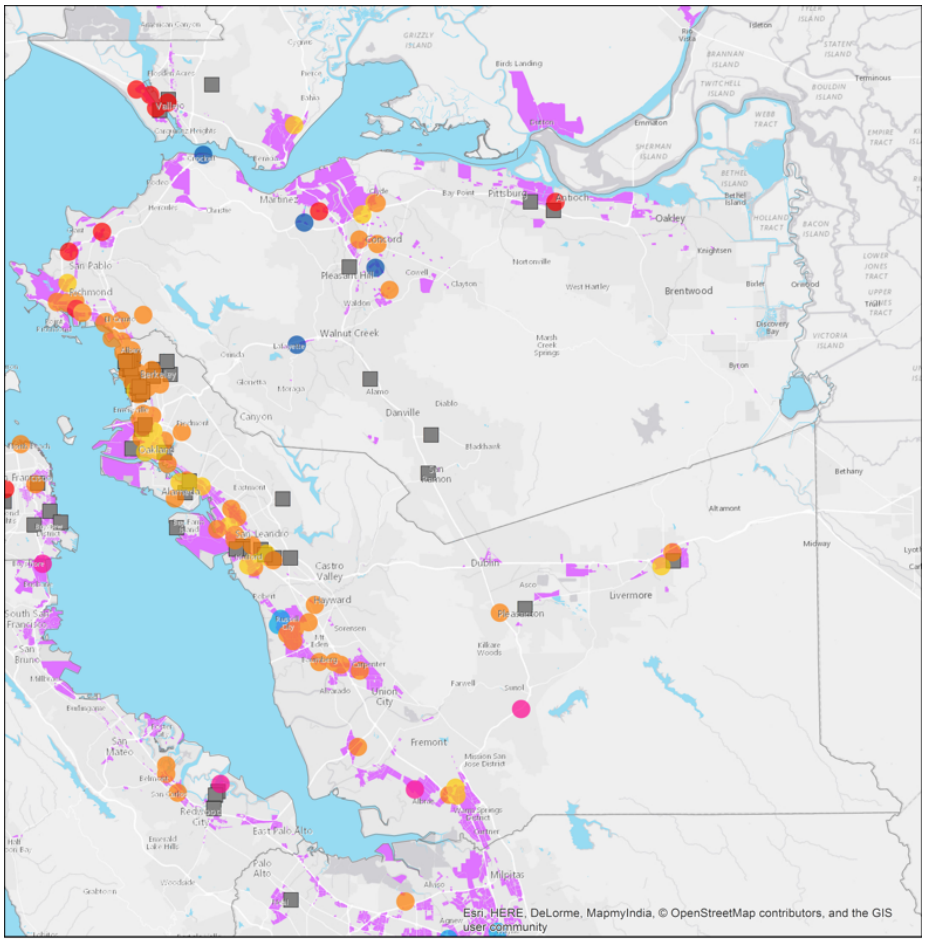


Figure 4. Location of respondents' suppliers with a focus on the East Bay.

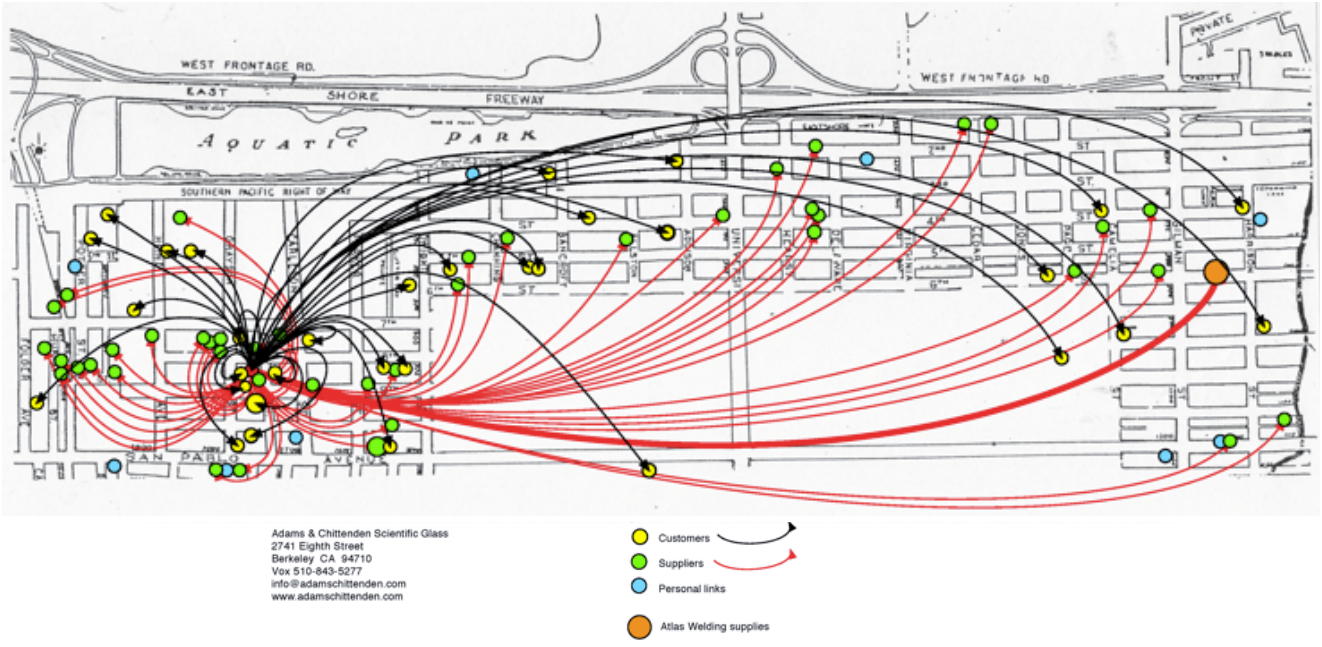


Figure 5. Customers and suppliers of Adams & Chittenden Scientific Glass, Berkeley.
Source: Adams & Chittenden Scientific Glass, Inc.

PART V: INFRASTRUCTURE NEEDS

The most pressing infrastructure needs, as perceived by business located on industrial land, are summarized in Figure 6. Out of 71 needs cited by 56 unique respondents (survey takers were asked to select up to two options), road maintenance was the most named. Transit access/improvements and higher-speed internet access came in second and third place, and improved port/rail access came in fourth place. Loading docks for trucks, traffic congestion, and graffiti/crime were also mentioned a few times. Finally, other needs that were ascertained from speaking more informally with businesses included reliable electrical supply in Berkeley, storm water management in Fremont, and utilities (gas line) expansion in Fremont.

Although our sample size is too small to conclude with certainty whether any needs emerged more specifically to a given subregion, certain patterns might be present. Road maintenance was cited across all subregions. Transit access and improvements was also mentioned across all subregions, except for businesses in the North Bay, as they are probably too isolated from transit to begin with. Similarly, higher-speed Internet (e.g. fiber optic) was mentioned in all subregions, except in the Peninsula—perhaps because of the subregion's specialization in the tech industry. Port/rail access was cited in all subregions, except San Francisco—perhaps because it is already well connected in terms of infrastructure, and is closer to its central city customers. Finally, it is worth noting that congestion was brought up several times during conversations and in the survey—especially in the North Bay, in San Leandro, and in West Berkeley.

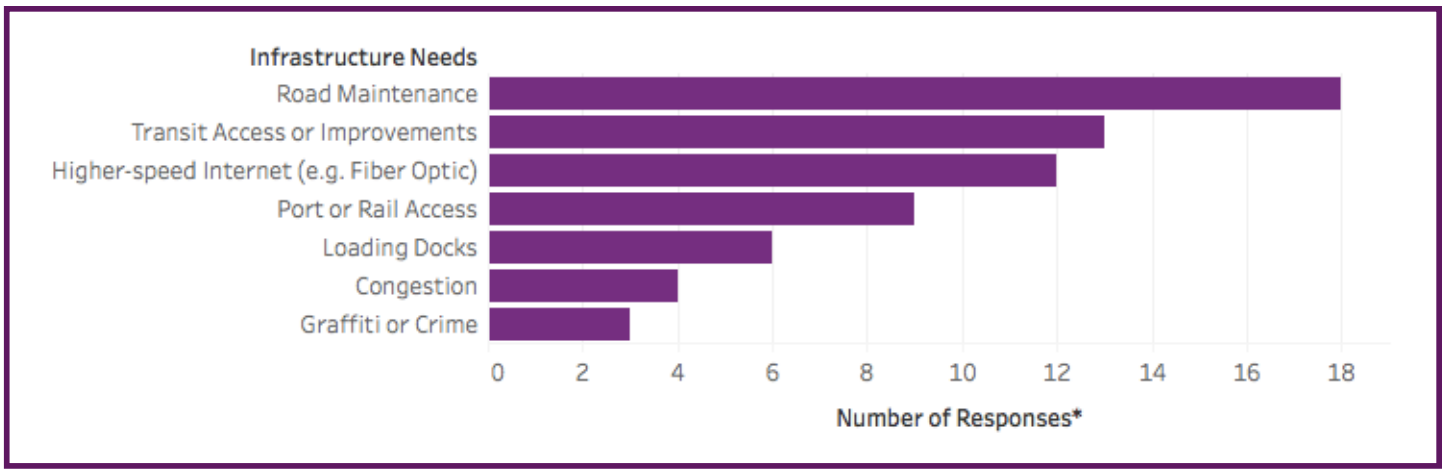


Figure 6. Frequency of infrastructure needs, according to businesses located on industrial land
*There were 56 unique responses on this question, but 71 total needs cited, as respondents could pick up to two of their most pressing infrastructure needs.

PART VI: LOCATION, LAND & REAL ESTATE

To understand challenges and opportunities faced by the Bay Area industrial business community, we asked survey respondents to comment on their expected location and growth in the next five years, and on the problems and advantages of their current location. Respondents were also given the chance to provide open-ended comments at the end of the survey. Interview respondents were prompted with similar questions to those included in the survey.

Most businesses expressed that they expected stable or positive growth in the next five years. And, out of 42 responses, 36 businesses stated that they predicted being in the same location five years from today. This is not surprising: other studies have found that businesses rarely move.[3] Six businesses stated that they expected to move; however, most of them expected to move to a nearby city within the Bay Area. For a couple of businesses in San Leandro and Berkeley, the cause of the move was a desire for growth (due to lack of space in their current location), and for one business located in the Peninsula, "encroaching office development" was stated as the cause of the move. A couple of businesses expected to leave the region entirely due to the rising cost of living.

Below we reclassify what we heard from the interviewees and surveys into key themes, organized into opportunities, concerns, and suggestions:

Opportunity #1: A first recurring theme was the importance of retaining industrial land to facilitate goods movement and to maintain locational advantages, such as proximity to key markets and suppliers. Several businesses also celebrated their location due to other advantages, like proximity to Silicon Valley or to academic and institutional partners.

- "Ports-related waterborne commerce and rail-borne commerce, and related industrial companies, need to be kept in place in order to keep product prices low and minimize truck trips on the freeways." – Redwood City business
- "The opportunity to [...] reach suppliers and materials [...] where we work is unmatched." – Vallejo business
- "The overall cost remains higher but carries the advantage of proximity to so much talent and technical expertise associated with Silicon Valley." – San Leandro business
- "The big opportunity is that our location puts us centrally located to our prime market area." – Oakland business
- "We value the multi-use, manufacturing and small business industry character of West Berkeley. It is highly advantageous to have close at hand machine shops for fabrication of our custom parts. It is also highly advantageous to be so close to UC Berkeley, with whom we have several on-going collaborations. In the past we have also collaborated with LBL. The work we do could not be done in an office building. Because of our laboratory we require some sort of industrial zoning" – West Berkeley business

Concern #1: However, a major concern that was frequently cited was the lack of industrial space, the inability to find suitable expansion space, or the inappropriateness of available space for business needs. This seemed to be a problem especially for businesses located in urban core areas.

- "We need to be by major highway entrances. We need enough warehouse space to store pallets of refrigerated fruits and vegetables. We need dock space to back 48' trailers into. This is a challenge in an urban center, especially where PDR spaces are limited. [...] We would love to find a facility that [...] could allow us to grow over the next 10-15 years. Unfortunately space is so limited and at such a premium that is not possible for us at this time. San Francisco must preserve its limited PDR space and incentivize food businesses to remain in San Francisco." – San Francisco business
- "But development is proceeding and the already-high price pressure is increasing. It could well force many nearby enterprises out of business or out of the area. If we wanted to expand here, our options would be slim to none." – Berkeley business
- "We need space to grow but can't here, so we are thinking about moving perhaps in the next five to ten years. Of course, buildings would be cheaper in Livermore or Modesto, but not as practical given their location..." – Fremont business
- "If you do a simple remodel on your parking lot, you trigger a process of storm water management from the state water board that can make it impossible..." – Fremont business

Concern #2: Businesses also reported concerns with the ineffectiveness of zoning to protect against encroachment by other uses. Some businesses cited encroachment as a problem because of the market pressure from residential demand.

- "Once an industrial property goes to residential, it will never produce even one good job. It is like building homes on fertile cropland—you will never get another harvest" – Oakland business
- "We need to preserve our city's PDR space. More and more residential and mixed-use facilities are encroaching on these areas." – San Francisco business
- "Due to the lower concentration of industrial businesses there is less synergy between companies in our area, higher transportation costs, and shortage of workers." – West Berkeley business
- "I agree that industrial uses can have a wide scope, but office not ancillary to manufacturing, retail and residential are not what should be here. Luckily, we own our building so the pricing impact is not significant. However, it would be nice not to have to worry about becoming an island." – Berkeley business

Concern #3: Above all, businesses spoke of the need to deal with land use conflicts, through buffer zones, exclusive zoning, or more effective mixed-use zones. Many brought up concerns over the encroachment of non-industrial uses such as residential, commercial and offices uses. These uses may drive them out not only because of increasing land costs as described above, but also because of the potential incompatibility of these uses.

- "We are in an industrial zone, but all around this zone are residences that built up after we were here, and this poses problems for noise and light in the area" – East Oakland business
- "We have industrial uses adjacent to our complex, and we have parkland. There have been lots of fights between the parkland users and the industrial users. The commercial users didn't feel impacted and supported the industrial uses continuing where they are." – Petaluma business
- "Industries [...] they need the locations and infrastructure close to transportation corridors that industrially zoned areas have. But even clean industries may be incompatible with the intruding condominiums and retail hot spots." – Berkeley business
- "Encroachment of retail spaces makes it harder to conduct business due to increased vehicle traffic, less tolerance by new retail businesses to industrial companies like ours." – Berkeley business

Opportunity #2/Concern #4: The case of mixed-use industrial land generated a variety of comments about both the special advantages and complications of businesses being located in mixed-use districts:

- "We need a *mix* of truck access, large production space, *and* office/R&D in *one* location. Zoning rules and development trends mean it is becoming very hard to operate a small high tech manufacturing and R&D company like ours in the Bay Area which also depends on proximity to retail, transit, restaurants, food markets and other amenities in order to attract and retain highly educated and talented staff." – Berkeley business
- "Incursion of residential to our mixed-use area discourages trucking, which we rely on for our business." – Oakland business
- "It's good that we have the downtown and the BART coming up, but how is the cost, developers going to play out. My neighbor is moving out this month because the landlord raised the rent fifty percent; the next move may be to Nevada because the market pressure is coming up, and he is a solar innovator." – Fremont business

Suggestion #1: On the topic of land use controls, some respondents championed zoning that permits concentrations of production-related businesses and districts:

- "We know that even with suburban office parks, these spaces can create community and energy." – Fremont business
- "It is very important to protect industrial land, where existing light manufacturing and other industrial uses can continue to thrive as they have for many decades. Protecting the existing industrial zones needs to be a priority to maintain a successful local and regional economy." – Berkeley business

Suggestion #2: Finally, businesses pushed for a balanced consideration of the various needs currently faced by the Bay Area—and thus suggested strategically retaining industrial uses in the most optimal locations:

- "Encourage new development that better utilizes its land inventory while also reserving the most valuable commercial and industrial corridors for businesses and industries likely to locate here given [the] opportunity." – Vallejo business
- "It's a challenge, in this area that there is a need for housing… demand for building housing wherever you can, versus industrial. How can that demand for housing pay for some of this [industrial space]?" – Fremont business
- "The lack of affordable housing is now putting even more pressure on East Bay industrial acreage. Unfortunately, everyone seems to forget that […] facilitating business growth […] creates higher paying jobs." – Oakland business

PART VII: CONCLUSION

The industrially zoned land in the San Francisco Bay Area houses a variety of businesses, primarily in production, distribution, and repair. Local firms export nationally and internationally, but also act as a key support to other companies in the local and regional economy by supplying them with necessary goods or services. Our analysis found local networks of customers and suppliers clustered in subregions; though we focus on the East Bay, such clusters exist throughout the region.

At present, businesses seek improvements to transportation—roads and transit—as well as higher-speed internet access. Most expect stable or positive growth in the next five years, and few wish to move from their current location.

At the same time, several concerns emerged from interviews and surveys with businesses. One is the lack of industrial space, the inability to find suitable expansion space, or the inappropriateness of available space for business needs. In some industrial zones, businesses also report concerns with the ineffectiveness of zoning to protect against encroachment by other uses; market pressure from residential demand was a particular concern. Some champion zoning that permits concentrations of production-related businesses, while others benefit from mixed-use locations. Yet, above all, businesses voice concern about dealing with land use conflicts and point to the need for buffer zones, exclusive zoning, or more effective mixed-use zones.

Berkeley

NOTES

1. Four respondents reported locations in residential or commercial districts; these were excluded from the analysis.
2. The lack of responses from the South Bay was due to the difficulty of getting “gatekeepers” to help with survey distribution.
3. Karen Chapple, *Planning Sustainable Cities and Regions: Towards More Equitable Development* (London, United Kingdom: Routledge, 2014).
4. Back Streets Businesses Advisory Board, *Made in San Francisco*, (San Francisco, CA: 2007), http://sfgov.org/sfc/bsbab/Modules/BStrRepor07__fbb0.pdf.
5. Karen Chapple and Carrie Makarewicz, "Restricting New Infrastructure: Bad for Business in California?" *ACCESS Magazine* no. 36 (2010), http://www.accessmagazine.org/wp-content/uploads/sites/7/2016/01/access-36restrictingnewinfras.pdf and Jed Kolko and David Neumark, *Business Location Decisions and Employment Dynamics in California*, (San Francisco, CA: Public Policy Institute of California, 2007).