8. Sustainability

The Sustainability evaluation assesses the ability of each Alternative to positively address the Sustainability Goals defined in this section, which have been derived from the Estuary Policy Plan and other City of Oakland plans and policies and California state law. The Sustainability evaluation covers the following categories: Social, Land Use, Transport, Economic, Energy, Water, and Materials & Waste and Carbon. Table 8.1 presents a list of these categories, the associated indicators that are used to assess the Alternatives' performance in each category and the chapters of this document that further address each category.

Table 8.1: Sustainability Categories and Indicators

Category	Indicators	Related Chapters
Social	Open space (availability and accessibility), connectivity to neighborhood services (e.g. retail, schools), housing diversity, public health performance, historic preservation potential	Public Health
Land Use	Density, jobs housing balance and industrial separation from other uses	Urban Design, Public Health
Transport	Trip generation, VMT, transit suitability, connectivity (roads, bike/walk)	Transport, Public Health
Economic	Jobs, Infrastructure Cost, Light Industrial Retainage, Green R&D availability	Employment and Demographics
Energy	Consumption, demand, renewables and district energy feasibility	Infrastructure
Water	Consumption, recycled water utilization, stormwater runoff reduction	Infrastructure
Materials & Waste	Waste generation (total and organic), existing building adaptation potential,	Infrastructure
Carbon	Absolute and per capita, including energy, transport, water and waste	All

Preceding Plans, Commitments & Regulations that Address Sustainability

The key plans that have been used to determine the Project's Sustainability Goals are summarized below.

Estuary Policy Plan (EPP)

The Estuary Policy Plan (EPP) calls for the Plan Area and surrounding areas to gradually transform its land uses from heavy industrial to a mixture of commercial, light industrial, and residential uses. The EPP also calls for transformation of the Plan Area into a regional amenity that contains a "system of open spaces and shoreline access that provides recreational use opportunities, environmental enhancement, interpretive experiences, visual amenities and significant gathering places… a series of individual parks,

open spaces and shoreline access points, connected by a continuous parkway and promenades, bikeways and shoreline trails."

The EPP states that new parks should be added to the area to serve neighborhood needs. In addressing historic preservation, the Plan states that an emphasis should be put on the reuse of existing structures of historic value and architectural significance.

In terms of transportation, the Plan promotes connectivity between the waterfront and surrounding development, or the "continuous system of movement within East Oakland and the waterfront." The Plan also recommends the maximization of shoreline accessibility.

California Renewable Portfolio Standard (RPS)

The California RPS requires that the State transform its energy supply from fossil fuels to renewable energy. This mandate, established by an Executive Order by Arnold Schwartzenegger in 2008, requires retail power generators to produce 20 percent of its energy from renewable sources by 2017.

AB 32 (AB 32)

This bill is designed to reduce California's GHG emissions. It requires the State of California to reduce GHG emissions to 1990 levels by 2020.

Oakland Energy and Climate Action Plan (ECAP) - draft

The Oakland CAP will set the City's GHG reduction targets for 2020. These targets are likely to be 36 percent below 2005 levels and 83 percent below 2005 levels by 2050. These targets are aligned with the City with AB 32 goals.

Urban Environmental Accords (UEA)

Oakland is one of the cities that has signed the Urban Environmental Accords. As a result, the City has committed to obtaining 10 percent of peak electric load from renewable sources and reducing peak energy load by 10 percent.

Storm Water Quality Management Plan (SWQMP)

The Storm Water Quality Management Plan requires all new developments in Oakland to treat 85 percent of the volume of runoff on-site utilizing BMPs, such as pervious pavement, bioswales and other methods of natural filtration.

Zero Waste Strategic Plan (ZWSP)

This Plan calls for the City of Oakland to achieve "zero waste" by 2020. Zero waste means that no waste will be sent to landfill.

Central Estuary Plan Existing Conditions Report

The Existing Conditions Report developed by the Central Estuary Plan team identifies numerous sustainability issues and opportunities. The Transportation section states the need for the Oakland Estuary Project to limit congestion, allow greater access to the freeway, promote North-South connectivity and address a confusing street network. This section also identifies the need to improve pedestrian access to transit, make the project area for conducive to pedestrians and bicyclists and close gaps in the Bay Trail.

The Infrastructure section states that the site is appropriate for stormwater BMPs such as wetlands, ponds, biofiltration planters, raingardens, swales, etc. Groundwater and stormwater currently infiltrates the sanitary sewer system, which leads to Combined Sewer Overflows (CSOs), which the Oakland Estuary Plan needs to address.

To adequately address climate change, the report emphasizes the need for the Oakland Estuary Plan to minimize tailpipe emissions, limit energy use and upgrade heating and cooling equipment. In order to restore the Estuary's natural environment, the report identifies the need for additional vegetated landscaped areas. With the exception of Union Point Park and the Martin Luther King Jr. Regional Shoreline Park, the site is almost entirely paved.

In terms of the green economy, the report recognizes that the City of Oakland has the opportunity to revitalize industrial parks and attract green businesses. Further, the Central Estuary Plan has the opportunity to promote green job training and placement.

Sustainability Goals

The reports, policies and plans identified in the previous section are used to derive the Sustainability Goals for the Central Estuary Plan. Sustainability is also a key part of the Central Estuary Plan Vision Statement, which states that one of the Plan's overarching goals is to balance the pressure for waterfront development with the City's Industrial Land Preservation Policy and "Green Jobs" strategy. The Vision Statement also expresses that the Plan will evaluate alternative concepts related to land use, transportation, economic development, socio-demographic, public health, neighborhood livability and the environment.

The Sustainability Goals associated with each category (Social, Land Use, Transport, Economic, etc.) and indicator (Open Space Availability, Housing Diversity, etc.) are listed in Appendix D.

Sustainability Evaluation

This section evaluates the three Alternatives based on the following:

- The ability of each Alternative to balance the strengths and weaknesses associated with possible land use conversions and achieve an optimal land use mix from a sustainability perspective. This optimal mix takes advantage of all location advantages, including proximity to existing and new resources, and maximizes synergies with both existing infrastructure and adjacent land uses.
- The performance of the Alternatives in each Sustainability Category. Each Alternative is assigned a score (-2 to +2) for each Sustainability Indicator. Scores are based on both qualitative and quantitative analysis. Appendix E lists the metrics used to evaluate the Alternatives' performance and the respective scores for each indicator.

Note: This analysis was conducted with the assumption that in Alternative 3, the PG&E site would be redeveloped into light industrial and incubator space. At the outset of the planning process and after initial discussions with PG&E representatives, it appeared that this large site could become available for partial redevelopment within the Plan's 25-year planning horizon. However, in a letter to staff and testimony at the December 2009 Planning Commission hearing on the preferred alternative, a PG&E representative indicated that redevelopment or more intensive use of the site was not compatible with PG&E's goals. With the elimination of this change and the movement of the incubator to elsewhere in the Plan Area, there is a net loss of 300,000 sq. ft. of industrial land and associated job implications in Alternative 3. To maintain the integrity of these analyses, which preceded the change described above, the calculations and conclusions here have not been modified.

Land Use Conversion Implications Analysis

The implications of converting one land use to another are also important to consider when determining the optimal land use mix. The strengths and weaknesses of each conversion proposed in the three Plan alternatives are listed in Table 8.2 below. Appendix E lists measures that can be implemented in order to mitigate the weaknesses associated with each land use conversion and improve the sustainability performance of each conversion type.

Table 8.2: Land Use Conversion Strengths and Weaknesses

Conversion	Strengths	Weaknesses
Industrial to Residential	• Increases density and number of residents in the area. • Conducive to better social fabric, improved safety, pedestrian-friendly streetscapes and transport connectivity. • Reduces the energy and water demand and use of development on an absolute basis • Decreased waste generation (especially toxic / non-recyclable) • Increased availability of open space • Increased opportunity for internal trip capture; enhances mixed-use • If the industrial land is not previously dedicated to food industries, this conversion will result in higher amounts of organic waste produced, which is more conducive for composting and waste-to-energy systems.	• Will reduce jobs in project area; reduce blue-collar or green-collar jobs • Lack of access to transit may increase traffic congestion • May reduce the feasibility of district energy systems, which typically require a "heat sink" to make them feasible; industrial use best candidate for cogeneration and on-site wastewater and solid-waste treatment • Will take away existing character and "branding" of the area • Market demand indicates stronger prospects for industrial; residential may hurt success of overall program
Industrial to Retail	• Opportunity for neighborhood-serving retail; maximizing internal trip capture • Conductive to better social fabric, pedestrian-friendly streetscapes and transport connectivity • Potential reduction in energy and water demand/use and waste generation in absolute terms	• May reduce the feasibility of district energy and water systems • May result in less jobs per square foot and reduction in availability of blue collar jobs. If R&D Industrial is replaced, the job quality and wages would reduce as well • Lack of access may hurt market for destination retail • May not be sufficient residential program to support retail • May hurt area's "brand" as an industrial area; same reputation may prevent success of retail • May increase local traffic and congestion
Industrial/Retail to Park	• Reduced stormwater runoff • Increased amenity value • Increased carbon sequestration via urban trees • Reduced energy consumption in buildings for cooling due to reduced urban heat island effect • Potential reduction in energy and water demand/use and waste generation in absolute terms	• Eliminates the opportunity for adaptive reuse and thus low embodied carbon emissions from materials • Reduces number of available jobs in the region • May reduce the feasibility of district energy and water systems

Conversion	Strengths	Weaknesses
Industrial (heavy or light) to R&D Office or Incubator	• Increased employee density and addition of high quality, higher paying jobs • Increased jobs to residents ratio increasing the likelihood of internal trip capture and reduced congestion • Potential for increasing number of companies locating in the project by housing those that "graduate" from the incubator • Reduced air quality risks related to trucks for industrial logistics • Lower floor area ratios (i.e. larger open space available) • Opportunity for employees to also live in the project area • Potential reduction in energy and water demand/use and waste generation in absolute terms	• Reduced blue-collar jobs • May reduced opportunity for district energy and water systems • Significant competition for green R&D throughout the Bay Area could make finding tenants difficult • Industrial tenants may not want to co-locate with office tenants and vice-versa
Warehouse to Industrial	• Potential for Increased jobs and density • Increased potential for on-site district and renewable energy, on-site wastewater treatment and recycled water systems and on-site waste management systems	• Increased total energy and water consumption and waste generation • Increased trip generation (especially trucks and other high-carbon modes) which may lead to congestion and reduced air quality • Potential embodied carbon implications due to need for additional infrastructure and suitable building types
Warehouse to Retail or Office	• Potential for increase in jobs • Increased potential for attractive streetscapes and increased revenues via higher rents • Increased potential for workers to live and work in the project area • Increased potential for on-site district and renewable energy, on-site wastewater treatment and recycled water systems and on-site waste management systems	• Increased resource consumption (energy, water) • Increased waste generation • Increased trip generation which may lead to congestion

Plan Alternative Comparative Analysis

A complete Plan Alternative Analysis that scores each plan according to each Sustainability Indicator is provided in Appendix E. . Please note that at this conceptual plan level, the numbers are not intended to be used as precise quantities, but rather to demonstrate orders-of-magnitude differences that are useful for comparison purposes. All scores are based on qualitative analysis and are supported with specific metrics associated with each Indicator. A summary of these metrics, or Key Performance Indicators, is provided in Appendix F.

The key strengths and weaknesses that are taken from the Plan Alternative Analysis are listed below. Please note that, in some key evaluations such as VMT and carbon footprint, the performance comparison is made both on an absolute and per-capita basis. For the latter case, a "per person" figure is used, which refers to the projected number of residents and employees within the Plan Area. "Per resident" is also used for a few indicators such as open space accessibility and refers to the number of projected residents only.

Alternative 1 – Key Strengths & Weaknesses

Key Strengths	Key Weaknesses
• Open space accessibility – performs relatively well due to the waterfront development on eastern and western subareas of the site that provide good access to MLK & Union Point parks as well as the Bay Trail. • Connectivity to retail services – has more retail/residents than other alternatives • District energy systems - more conducive to district systems (like Alternative 3) because of their diverse land use, higher density and high peak demand. • Waste generation – low generation figures due to limited industrial and residential land uses.	• Connectivity to schools - has significant development in subareas with low school accessibility • Public Health - pose risks due to the development of residential on previous industrial sites (similar to Alternative 3), which have contamination risk • Housing density – (similar to Alternative 2) has relatively low density with 30-35 dwelling units per acre • Jobs Housing Balance – 58 percent jobs/resident ratio vs. 82 percent for Alternative 3 • Trip Generation (absolute) -–generates ~54K vehicle trips per day, implying that it has highest probability for congestion problems • Vehicle Miles Traveled – has the highest total and per capita VMT. The total VMT is 20 percent higher than Alternative 3, whereas the per capita VMT is almost 70 percent higher. • Separation of industrial uses from other uses – has waterfront development in close proximity to industrial uses • Green R&D Availability – does not have an explicit green R&D park • Recycled water utilization – lack of industrial program, which has higher demand for non-potable water • Carbon Footprint (per capita) – performs the worst of the Alternatives with almost 11 metric tons per person

Alternative 2 - Key Strengths & Weaknesses

Key Strengths	Key Weaknesses
• Open Space Availability – has 11 acres per 1,000 residents vs. five acres for Alternative 3 • Connectivity to Schools – residential areas are in closest proximity to schools • Public Health - poses less risk due to limited redevelopment of brownfields with residential uses • Housing Diversity – has greatest distribution of dwelling units • Historic Preservation – demonstrates the most extensive overlap with existing conditions and retains more than 60 percent of the buildings currently on site • Separation of industrial uses from other uses – aggregates majority of industrial program in the eastern subarea • Jobs – highest number of jobs (~5,500) compared to other alternatives • Retaining Light Industrial Uses – only Alternative that expands light industrial use (from 550,000 sq. ft. to ~785,000 sq. ft.) • Energy Demand & Consumption (total) –has 60 percent of the demand and consumption of Alternative 3 • Renewable Energy – more potential for renewable energy use due to larger industrial program • Water consumption (absolute) – has lowest amount of total consumption assuming that the development does not include especially water intensive industries • Recycled Water Utilization – due to extensive industrial and parks program • Existing Buildings Adaptation Potential - likely to have the least embodied carbon for materials due to its low need for building demolishment • Trip Generation (absolute) - generates 25 percent fewer trips than Alternative 1 and 10 percent fewer than Alternative 2, implying less congestion	• Open Space Accessibility – the green industry cluster has the potential to block off access to MLK Park • Housing Density - has relatively low density with 30-35 dwelling units per acre • Transit Suitability and Connectivity - has worst connections and the least amount of flexibility with regards to redevelopment/realignment of parcels • Waste Generation (per capita) – generates 25 percent more waste than Alternative 3 due to high waste generation rates associated with industrial and commercial uses

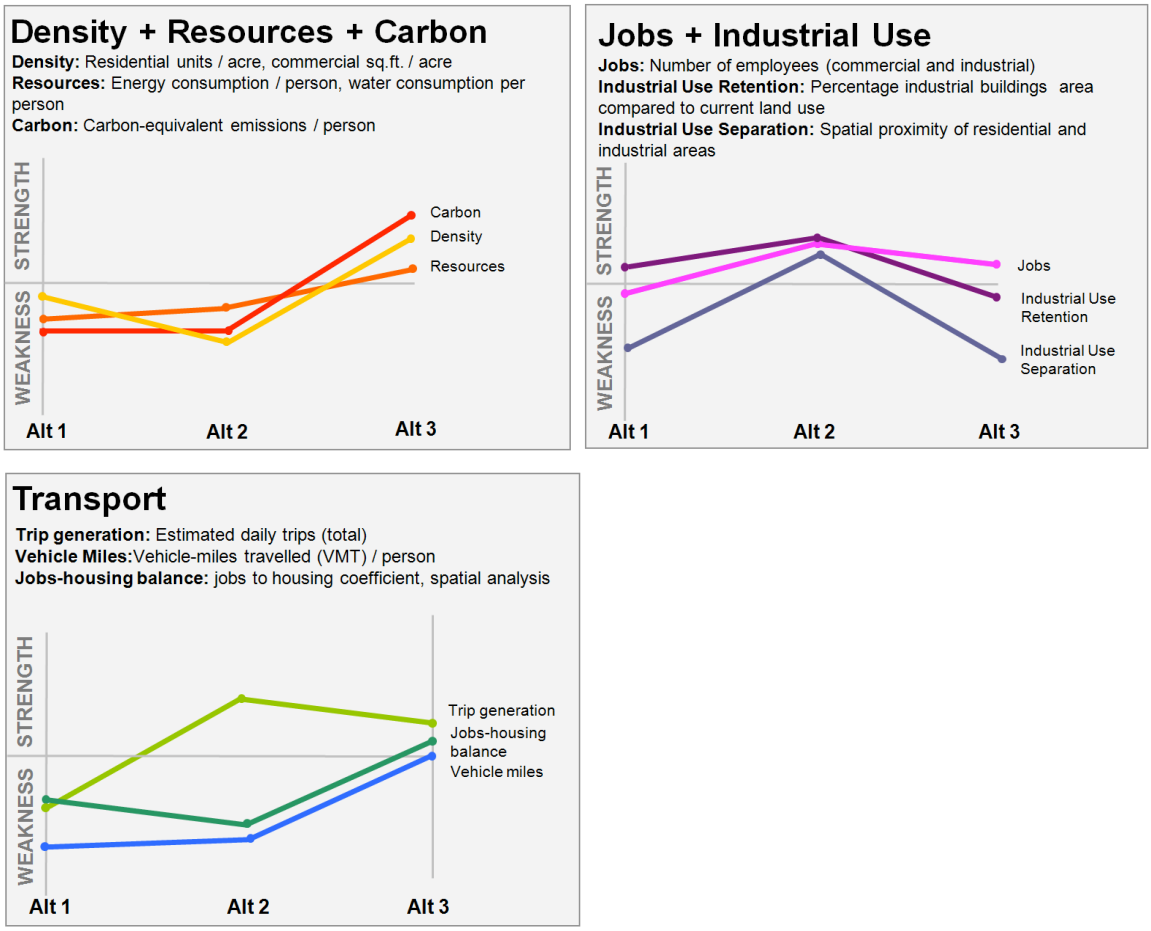
Alternative 3- Key Strengths & Weaknesses

Key Strengths	Key Weaknesses
• Housing Density – has highest density with 44 dwelling units/acre • Commercial/Industrial Density – has the highest FAR (0.45) • District energy systems - more conducive to district systems (similar to Alternative 1) because of their diverse land use, higher density and high peak demand. • Vehicle Miles Travelled (absolute and per capita) - has the lowest VMT with ~384K miles and has the lowest VMT / capita with ~27 miles • Transit Suitability and Connectivity - has much better connections (the most flexibility with regards to redevelopment/realignment of parcels) • Energy Consumption (per capita) – due to the high projected population • Water Consumption (per resident) – due to high residential program and high density • Stormwater Runoff Reduction – has opportunity to convert most non-permeable surfaces to permeable surfaces • Jobs Housing Balance– has approximately 80 percent jobs housing balance vs. 44 to 58 percent for other alternatives • Waste Generation (per capita) - generates 30 percent less waste per resident compared to Alternative 2 and 57 percent less than Alternative 1 • Organic Waste Generation - has the highest percentage of residential land use and food-related industrial use • Carbon Footprint (per capita) - performs the best for this combined resource consumption indicator mainly due to its high residential population	• Open Space Availability – only has five acres/resident vs. eleven for Alternative 2; benchmark for healthy neighborhoods is approximately 10 acres per 1,000 residents • Open Space Accessibility – Union Park on the West side is impeded by food-related industrial use • Historic Preservation – has the most extensive program for new development and retains less than 55 percent of current land uses • Connectivity to Retail Services – has the least amount of retail per capita • Connectivity to Schools – has some residential development in the eastern subareas with low school accessibility • Public Health- pose risks due to the development of residential on previous industrial sites, which have contamination risk • Separation of industrial uses from other uses – waterfront development in close proximity to industrial uses • Retaining Light Industrial Uses – reduces industrial use by 16 percent while Alternative 2 expands industrial use • Electricity Consumption (total)/Demand, Water Consumption and Waste Generation - due to its larger residential and commercial and industrial programs

Plan Alternative Performance Summary

Figure 8.1 compares the three Plan Alternatives according to a few key categories and indicators. While Alternative 3 performs particularly well in terms of some Transport metrics (vehicle-miles traveled per person and resident-work proximity) and Density, Resource Use and Carbon metrics, Alternative 2 performs particularly well in key Economic metrics (jobs and industrial use) and total vehicle trip generation. Alternative 1 demonstrates weak performance for most of the metrics except industrial use retention.

Figure 8.1: Sustainability Evaluation Summary Graphics

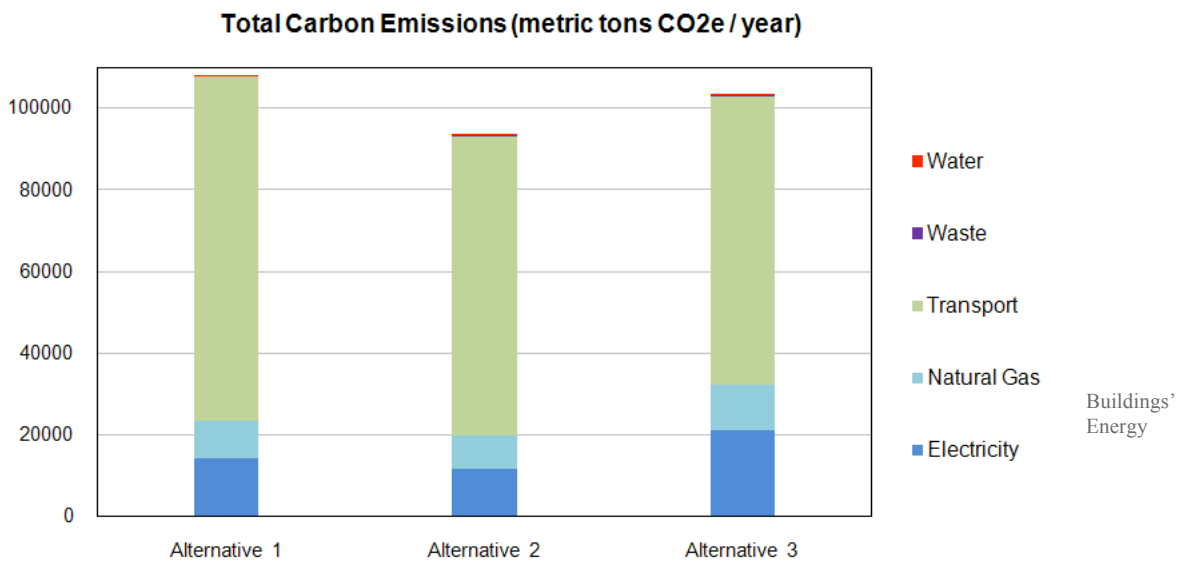


Carbon Footprint Analysis

As stated above, the carbon footprint of the Plan Alternatives is a key evaluation criterion. This footprint has been calculated based on the projected carbon dioxide equivalent emissions from transportation (vehicle-miles traveled), energy (amount of electricity and natural gas used), water (treatment, wastewater treatment and conveyance) and waste (solid waste sent to landfill).

A detailed comparison of the carbon dioxide equivalent generated by each of the three Plan Alternatives on a tons/year basis and total tons/person/year is illustrated in Figures 8.2 and 8.3 below.

Figure 8.2: Total Carbon Emissions

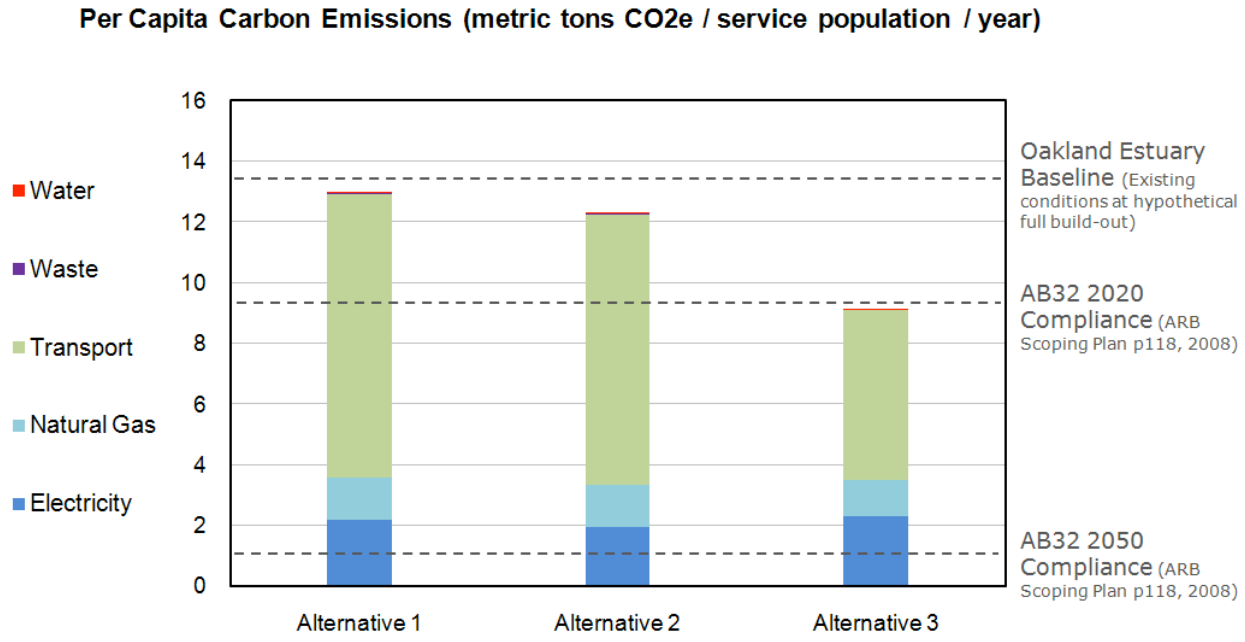


All three alternatives generate a similar amount of carbon dioxide equivalent on an absolute basis, although the breakdown of this total number is different. In particular, transport is responsible for a larger portion of the emissions in Alternatives 1 and 2. On the other hand, Alternative 3 has more emissions from buildings' energy consumption than the other two Alternatives do. This is related to various factors such as the higher vehicle trip generation rate in Alternative 1 and extensive residential use with higher relative electricity and natural gas consumption in Alternative 3.

One consistent trend across the three alternatives is the *de minimis* portion of carbon emissions related to water consumption and waste generation. The reason for this trend is the relatively low embodied energy in water for the water supply as well as the well-managed landfills with low methane emissions in the region.

Please note that all of these quantities are preliminary estimates, since both the transport and energy numbers can fluctuate significantly based on type of industrial uses, regional transit improvements and future residential energy efficiency codes, among other factors.

Figure 8.3: Central Estuary Carbon Emission per Service Population (Employees and Residents)



On a per service population basis, Alternative 3 generates the least amount of carbon dioxide equivalent (7.4 tons/service population/yr). Alternative 1 generates the most carbon dioxide equivalent per service population (10.9 tons/service population/yr). This difference is largely due to the higher service population in Alternative 3 compared to Alternative 1 and 2, as a result of higher residential density in that alternative.

Finally, it is noteworthy that Alternative 3 is the only one that meets the AB32 2020 greenhouse gas emissions benchmark. However, to fully confirm this finding, more detailed analysis is needed.