

## 4. Infrastructure

Each Plan Alternative has various land use and site characteristics that present different infrastructure challenges and opportunities. Each alternative should provide sufficient capacity to support the activity within the Plan Area and improve existing infrastructure systems in a way that would provide additional benefits to surrounding neighborhoods.

The potential for required changes or upgrades to critical infrastructure systems under each Plan Alternative is discussed. Several quantitative infrastructure metrics included in this section are also reflected in the Sustainability evaluation at the end of this report.

Table 4.1 presents the water, natural gas, and electricity demand calculations. Table 4.3 provides the detailed infrastructure evaluation matrix.

*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.*

**Table 4.1 Utility Demand Comparison**

Utility Demand Estimates	Alternative 1	Alternative 2	Alternative 3
Indoor Water Demand (mgd) <sup>1</sup>	0.50	0.45	0.72
Irrigation Water Demand (mgd)	0.16	0.15	0.16
Waste-water (mgd) [peak wet weather flow]	0.95	0.86	1.37
Natural Gas Demand (Therm/yr) <sup>2</sup>	1,578,000	1,432,000	1,907,000
Electricity Demand (MW) <sup>3</sup>	8.8	6.3	11.0
Electricity Consumption (MWh/yr) <sup>4</sup>	45,000	36,350	66,900
Solid Waste Demand (Tons/yr)	7,933	7,519	9,093
<b>Notes:</b> (1) mgd = millions gallons per day (2) Assumed wet weather flow peaking factor (PF) = 2. Peak Wet Weather Flow = PF * Average Daily Dry Weather Flow. (2) Therm/yr = thermal units per year (3) MW = megawatts (4) MWh/yr = megawatt-hours per year <b>Source:</b> Arup (2009)			

The utility demands among the alternatives vary by up to 45 percent. The utility demands for Alternative 3 are greatest on an absolute basis, which is reflective of this alternative's greater development program. The likelihood of each Alternative requiring significant infrastructure components such as water storage reservoirs, substations, etc, will be determined as soon as possible through discussions with the utility providers.

The extent of the infrastructure improvements is anticipated to be proportional to the size of the redevelopment area. Assuming infrastructure costs are passed onto future developers, the infrastructure issues reported in this section are not anticipated to be major drivers in determining the preferred alternative.

The Sustainability evaluation reviews the potential opportunities for sustainable infrastructure by analyzing synergies between systems and the proposed land uses changes.

**Table 4.2: Infrastructure Evaluation Matrix**

Issue	Topic Area	Alternative 1	Alternative 2	Alternative 3
Site Grading	Grading and Earthwork	Grading activities are likely to be limited to fine grading. Significant grading activities such as basement construction are not anticipated.  Fine grading may be required in the 144-acres to be redeveloped.	Grading activities are likely to be limited to fine grading. Significant grading activities such as basement construction are not anticipated.  Fine grading may be required in the 110-acres to be redeveloped, which is the smallest impacted area of the alternatives.	Grading activities are likely to be limited to fine grading. Significant grading activities such as basement construction are not anticipated.  Fine grading may be required in the 152-acres to be redeveloped, which is the largest impacted area of the alternatives.
	Contaminated Soil	The extent and severity of soil and/or groundwater contamination on-site is unknown.  There is a risk that fine grading activities may disturb contaminated soil that would require costly remediation or removal.	The extent and severity of soil and/or groundwater contamination on-site is unknown.  As this Alternative has the smallest re-development footprint, it has the least risk of requiring soil remediation or removal.	The extent and severity of soil and/or groundwater contamination on-site is unknown.  As this Alternative has the largest re-development footprint, it has the greatest risk of requiring soil remediation or removal.
Storm Drainage	Run-off Water Quality	Redevelopment sites with a footprint greater than 10,000sf will be required to comply with National Pollution Discharge Elimination System (NPDES) water quality regulations, by incorporating Best Management Practices (BMPs) such as biofiltration planters and swales into the streetscape and development parcels. The existing sites are assumed to discharge untreated stormwater to the Bay, therefore the larger the redevelopment footprint, the greater the potential to treat run-off.  It may be feasible to incorporate a detention pond into the proposed 3 acre area at the Park Street Triangle to treat a significant volume of run-off from the site and/or upstream.	As this Alternative has the smallest redevelopment footprint, it has the least opportunity to improve the quality of site run-off entering the Bay.  It may be feasible to incorporate a detention pond into the proposed 3 acres park area at the ConAgra area. The park area in Alternative 2 does not intersect with a major storm drain line, therefore a new storm drain diversion would be required to utilize the pond.	As this Alternative has the largest re-development footprint, it has the greatest opportunity to improve the quality of site run-off entering the Bay.  It may be feasible to incorporate a detention pond into the proposed 3 acres park area at the Park Street Triangle Area to treat a significant volume of run-off from the site and/or upstream.

Issue	Topic Area	Alternative 1	Alternative 2	Alternative 3
Storm Drainage (continued)	Run-off Volume	<p>The existing site consists of approximately 80% impermeable area. This Alternative is anticipated to reduce the area of impermeable surfaces by 3% - 5%, and reduce the volume of run-off entering the Bay.</p> <p>Significant detention of run-off is not anticipated to be required to comply with NPDES regulations.</p>	<p>Alternative 2 is anticipated to have a similar reduction in run-off volume as Alternative 1.</p>	<p>Alternative 3 is anticipated to have a similar reduction in run-off volume as Alternative 1.</p>
	Storm Drain Conveyance	<p>Due to the anticipated reduction in stormwater run-off, the existing storm drainage system is expected to have sufficient capacity to serve the redevelopment.</p> <p>Removal of existing streets and construction of new streets will change the flow pattern, and will require relocation and installation of storm drain lines. Therefore, the more new streets, the more new storm drain lines. Installation of new storm drain lines and relocation of existing storm drain lines may be required for the 13,600 feet of new street and the 3,800 feet of street to be removed.</p>	<p>Due to the anticipated reduction in stormwater run-off, the existing storm drainage system is expected to have sufficient capacity to serve the redevelopment.</p> <p>Installation of new storm drain lines and relocation of existing storm drain lines may be required for the 10,200 feet of new street and the 600 feet of street to be removed.</p>	<p>Due to the anticipated reduction in stormwater run-off, the existing storm drainage system is expected to have sufficient capacity to serve the redevelopment.</p> <p>Installation of new storm drain lines and relocation of existing storm drain lines may be required for the 17,400 feet of new street, the 6,400 feet of new boulevard and the 1,800 feet of street to be removed.</p>
	Impaired Water Bodies	<p>Two segments of the Oakland Inner Harbor, (aka. Estuary), are listed on the 2006 State Water Resource Control Board’s Section 303(d) List of Impaired Waterbodies. Sausal Creek and Damon Slough have been recently added to the 2009 list as impaired waterbodies due to trash. Potential sources of these contaminants include industrial and municipal point sources, resource extraction, atmospheric deposition, natural sources, ballast water, and agriculture (USEPA, 2006).</p>	<p>As Alternative 2 has the largest proposed area of industrial land-uses of 152 acres, it has the greatest risk of pollutants entering the Bay. Stormwater BMPs will be required, which will mitigate this risk.</p>	<p>As Alternative 3 has the lowest proposed area of industrial land-uses of 92 acres, it has the lowest risk of pollutants entering the Bay. Stormwater BMPs will be required, which will mitigate this risk.</p>

Issue	Topic Area	Alternative 1	Alternative 2	Alternative 3
Storm Drainage (continued)	Impaired Water Bodies (continued)	Alternative 1 has 105 acres of proposed area of industrial land-uses, and it has similar risk of pollutants entering the Bay as Alternative 3.		
	Constructed Wetland	The 13 acres of parkland in the South of Tidewater Area provides an opportunity for integrating a constructed wetland to treat on-site and/or off-site run-off.	Alternative 2 provides the same opportunity for installing a constructed wetland as Alternative 1.	Alternative 3 provides the same opportunity for installing a constructed wetland as Alternative 1.
	Creek Day-lighting	Opportunities for day-lighting the culverted Sausal Creek are limited as there is no proposed park or open space along or near the end of Fruitvale Avenue.	Opportunities for day-lighting the culverted Sausal Creek are limited as there is no proposed park or open space along or near the end of Fruitvale Avenue.	Opportunities for day-lighting the culverted Sausal Creek are limited as there is no proposed park or open space along or near the end of Fruitvale Avenue.
Sanitary Sewer	Demand, 95% of Indoor Water Demand  [Note: 1. Waste-water demand is assumed to be 95% of indoor water demand. 2. Waste-water demand is reported for comparison purpose.]	The existing peak wet weather flow is estimated to be 0.54 MGD. This alternative is expected to increase the peak wet weather flow by 0.41 MGD to 0.95 MGD.  The greater the increase in sanitary sewer flows, the greater the likelihood that significant improvements to existing sanitary sewer infrastructure will be required.	This alternative is expected to increase the peak wet weather flow by 0.32 MGD to 0.86 MGD.  Alternative 2 is least likely to require significant upgrades to existing sanitary sewer infrastructure.	This alternative is expected to increase the peak wet weather flow by 0.83 MGD to 1.37 MGD.  Alternative 3 is most likely to require significant upgrades to existing sanitary sewer infrastructure.

Issue	Topic Area	Alternative 1	Alternative 2	Alternative 3
Sanitary Sewer (continued)	Demand, City of Oakland [Note: Waste-water demand is independent from indoor water demand, and is estimated according to the City of Oakland Sanitary Sewer Design Guidelines.]	The existing peak wet weather flow is estimated to be 1.84 MGD. This alternative is expected to increase the peak wet weather flow by 0.19 MGD to 2.03 MGD.  Alternative 1 is least likely to require significant upgrades to existing sanitary sewer infrastructure.	This alternative is expected to increase the peak wet weather flow by 0.28 MGD to 2.12 MGD.	This alternative is expected to increase the peak wet weather flow by 0.97 MGD to 2.81 MGD.  Alternative 3 is most likely to require significant upgrades to existing sanitary sewer infrastructure.
		The greater the increase in sanitary sewer flows, the greater the likelihood that significant improvements to existing sanitary sewer infrastructure will be required.		
	Wet Weather Flows	The <i>Industrial District Strategy Support</i> report <sup>11</sup> notes that approximately 80% of the total peak wet weather flow is the result of groundwater infiltration and rainfall-dependent inflow (I/I), with the remaining 20 percent consisting of sewage.  EBMUD recommends that new developments be responsible for the rehabilitation of existing sanitary sewer pipes or installation of new pipes to reduce groundwater infiltration and rainfall-dependent inflow (I/I), in order to meet the requirements of the new NDPES Wet Weather Discharge Permit.  The greater the length of existing sewers that are replaced / upgraded by new pipes, the greater the potential for reducing I/I.	Alternative 2 is least likely to provide opportunities for reducing I/I since it has the smallest development footprint and sewer flow rates.	Alternative 3 is most likely to provide opportunities for reducing I/I since it has the greatest development footprint and sewer flow rates.

<sup>11</sup> City of Oakland, Community and Economic Development Agency, *Industrial District Strategy Support - Public Infrastructure Assessment and Recommendations – Woodland -81<sup>st</sup> Avenue/Melrose-Coliseum/Tidewater Industrial Zones*, 2008 October 8<sup>th</sup>, by BKF.

Issue	Topic Area	Alternative 1	Alternative 2	Alternative 3
Sanitary Sewer (continued)	Conveyance	<p>Removal of existing streets and construction of new streets may require relocation and installation of new sanitary sewers.</p> <p>Installation of new sewers and relocation of existing sewers may be required in the 13,600 feet of proposed streets and the 3,800 feet of street to be removed.</p>	<p>Installation of new sewers and relocation of existing sewers may be required in the 10,200 feet of new streets and the 600 feet of street to be removed.</p>	<p>Installation of new sewers and relocation of existing sewers may be required in the 17,400 feet of new streets and the 1,800 feet of street to be removed.</p>
	Existing pump stations	<p>City of Oakland’s Tidewater sewer pump station and EBMUD’s Pumping Station H are located within the East Subarea.</p> <p>The two existing pump stations serving the site should be considered in the detailed planning of the area.</p>	<p>The two existing pump stations serving the site should be considered in the detailed planning of the area.</p>	<p>The two existing pump stations serving the site should be considered in the detailed planning of the area.</p>
Water	Demand	<p>The existing indoor and outdoor water demand is estimated to be 0.41 MGD. This alternative is expected to increase the demand by 0.25 MGD to 0.66 MGD.</p> <p>The greater the increase in water demand, the greater the likelihood that significant improvements to existing water infrastructure will be required.</p>	<p>This alternative is expected to increase the total water demand by 0.19 MGD to 0.60 MGD.</p> <p>Alternative 2 is least likely to require significant upgrades to existing water infrastructure.</p>	<p>This alternative is expected to increase the total water demand by 0.39 MGD to 0.88 MGD.</p> <p>Alternative 3 is most likely to require significant upgrades to existing water infrastructure.</p>
	Fire Water Requirements	<p>The redevelopment of the CEP plan area will trigger the new fire hydrant spacing requirement at 300 feet spacing maximum as required by the City of Oakland Fire Department and will require the installation of additional fire hydrants.</p> <p>The City of Oakland Fire Department has fire flow requirement of 1,500 gallons per minutes and the required residual water pressure is 20 psi. The increase in potable indoor and outdoor water demand may trigger the upsizing of water lines to meet fire flow requirements.</p> <p>The Fire Department requires all new development to provide adequate emergency access; and the installation of new streets will associate with installation of new fire hydrants and water lines.</p>		
		<p>Installation of new water lines and fire hydrants may be required for the 13,600 feet of new street.</p>	<p>Installation of new water lines and fire hydrants may be required for the 10,200 feet of new street.</p>	<p>Installation of new water lines and fire hydrants may be required for the 17,400 feet of new street.</p>

Issue	Topic Area	Alternative 1	Alternative 2	Alternative 3
Water (continued)	<p>Recycled Water Demand</p> <p>[Note: The on-site recycled water infrastructure cost will be proportional to the size of the redevelopment area.]</p>	<p>Recycled water may be a viable alternative water supply to meet non-potable water demands such as irrigation and toilet flushing.</p> <p>The potential non-potable water demand will be 0.30 MGD, or 46% of the total potable and non-potable water demand, for Alternative 1.</p> <p>There is no existing recycled water service at the CEP plan area. The closest connection point to the existing EBMUD recycled water distribution system is approximately 6,000 feet northwest of the plan area. The offsite improvement costs to bring recycled water to the plan area are not likely to be significantly different between alternatives.</p>	<p>Recycled water may be a viable alternative water supply to meet non-potable water demands such as irrigation and toilet flushing.</p> <p>The potential non-potable water demand will be 0.28 MGD, or 46% of the total potable and non-potable water demand, for Alternative 2.</p> <p>The offsite improvement costs to bring recycled water to the plan area are not likely to be significantly different between alternatives.</p> <p>This alternative will likely have the lowest cost associated with new on-site recycled water infrastructure as it has the smallest redevelopment area.</p>	<p>Recycled water may be a viable alternative water supply to meet non-potable water demands such as irrigation and toilet flushing.</p> <p>The potential non-potable water demand will be 0.36 MGD, or 41% of the total potable and non-potable water demand, for Alternative 3.</p> <p>The offsite improvement costs to bring recycled water to the plan area are not likely to be significantly different between alternatives.</p> <p>This alternative will likely have the highest cost associated with new on-site recycled water infrastructure as it has the largest redevelopment area.</p>
Natural Gas	Demand	The greater the increase in natural gas demand, the greater the likelihood that significant improvements to existing water infrastructure will be required.		
		This alternative will increase the natural gas demand from the existing conditions by 24%.	<p>This alternative will increase the natural gas demand from the existing conditions by 12%.</p> <p>Alternative 2 is least likely to require significant upgrades to existing gas infrastructure.</p>	<p>This alternative will increase the natural gas demand from the existing conditions by 49%.</p> <p>Alternative 3 is most likely to require significant upgrades to existing gas infrastructure.</p>
	Relocation of PG&E Oakland Service Center	No relocation required.	No relocation required.	No relocation required. Previously, Alternative 3 proposed to redevelop the North of Tidewater East Area into R&D Incubator which would require the relocation of the existing PG&E Oakland Service Center. If this were to take place relocation might be required.

Issue	Topic Area	Alternative 1	Alternative 2	Alternative 3
Electricity	Demand	<p>The greater the increase in electrical demand, the greater the likelihood that significant improvements to existing electrical infrastructure will be required.</p> <p>This alternative will increase the electrical demand from the existing conditions by 157%.</p>	<p>This alternative will increase the electrical demand from the existing conditions by 84%.</p> <p>Alternative 2 is least likely to require significant upgrades to existing electrical infrastructure.</p>	<p>This alternative will increase the electrical demand from the existing conditions by 221%.</p> <p>Alternative 3 is most likely to require significant upgrades to existing electrical infrastructure.</p>
	Relocation of PG&E Oakland Service Center	No relocation required.	No relocation required.	No relocation required. Previously, Alternative 3 proposed to redevelop the North of Tidewater East Area into R&D Incubator which would require the relocation of the existing PG&E Oakland Service Center. If this were to take place relocation might be required.
Telecommunications		<p>The redevelopment of the CEP plan area will involve installation of new streets and removal of existing streets that will require relocation of existing overhead or underground telecommunications facilities. The redevelopment will have additional demand for telecommunications services that will require upgrading of existing facilities.</p> <p>The larger the redevelopment area, the greater the likelihood that significant improvements to existing telecommunications infrastructure will be required.</p>		
Telecommunications (continued)		This alternative will require telecommunications facilities relocation and upgrading for its 144 acres of redevelopment area.	This alternative will likely have the lowest cost associated with new on-site recycled water infrastructure as it has the smallest redevelopment area.	This alternative will likely have the greatest cost associated with new on-site recycled water infrastructure as it has the largest redevelopment area.
Oil Transmission Pipelines		There are two Shell oil pipelines, most likely abandoned, running across the Central West Subarea. Special precautions will be needed during adjacent construction operations.	Alternative 2 is likely to require similar precautions during construction as Alternative 1.	Alternative 3 is likely to require similar precautions during construction as Alternative 1.

Table 4.3 presents a summary of the Infrastructure evaluation criteria. The majority of the criteria remain “unchanged” because it is expected that redevelopment of the Plan Area will not degrade the existing systems within the Plan Area. The redevelopment should incorporate adequate infrastructure improvements to maintain and upgrade the existing facilities. Storm drainage is one infrastructure system that the redevelopment of the Plan Area can have the most positive impact on.

**Table 4.3: Infrastructure Rating Summary**

<b>Infrastructure Topic Area</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>
<b>Infrastructure Systems and Site Evaluation:</b>			
Site Grading	<b>0</b>	<b>0</b>	<b>0</b>
Storm Drainage	<b>+</b>	<b>+</b>	<b>+</b>
Sanitary Sewer	<b>0</b>	<b>0</b>	<b>0</b>
Water	<b>0</b>	<b>0</b>	<b>0</b>
Natural Gas	<b>0</b>	<b>0</b>	<b>0</b>
Electricity	<b>0</b>	<b>0</b>	<b>0</b>
Telecommunications	<b>0</b>	<b>0</b>	<b>0</b>
Oil Transmission Pipelines	<b>0</b>	<b>0</b>	<b>0</b>
<b>Source: Arup (2009)</b>			

- ++ = Significantly Improved
- + = Improved
- 0** = Unchanged
- = Decreased

The Sustainability section provides additional information related to the impact of each Alternatives on utility demand.