

Pathways to Community Health:  
Evaluating the Healthfulness of Affordable Housing  
Opportunity Sites  
Along the San Pablo Avenue Corridor  
Using Health Impact Assessment

August 2009

Human Impact Partners  
[www.humanimpact.org](http://www.humanimpact.org)



## **I. Introduction**

Health Impact Assessment (HIA) is a systematic and inter-disciplinary policy evaluation process to make transparent the health impacts of social decisions. This HIA provides a comparative evaluation of area-level social and environmental health assets and constraints for three potential affordable housing opportunity sites along the San Pablo Avenue corridor.

Urban Habitat (UH) is an Oakland based non-profit organization that is supporting community engagement in land use planning in the San Pablo Avenue corridor. In order to inform community engagement, UH contracted with Human Impact Partners (HIP) to conduct an HIA of alternative sites in the corridor for affordable housing. Urban Habitat requested the HIA to lead to optimum housing locations from the standpoints of community priorities and health needs. UH selected the potential housing locations for the HIA and HIP performed all research and wrote this HIA report. At the time of the analysis, land use planning had not determined specific sites for affordable housing nor the percentage and type of affordable housing at any site.

This HIA considers the variation in several area-level health determinants at the three potential affordable housing sites using available community-level indicators of health, GIS mapping techniques, air quality and noise exposure assessment, and human health risk assessment. This report includes a review of research findings on the documented health effects of each factor, a qualitative or quantitative evaluation of the potential health impacts, both positive and negative, associated with the three sites, and recommendations to mitigate any negative health effects.

The analysis was based on the following rationale:

- Community members and organizations are engaged with the San Pablo Corridor Development program to promote the inclusion of affordable housing
- Affordable housing meets a critical health need for shelter and economic security but is not the only need required for health
- Extensive research demonstrates that residential location impacts health opportunities both through exposure to environmental hazards, availability of public infrastructure, and access to public and private services
- Data and indicators are available to provide a health assessment of alternative opportunity sites for affordable residential development
- A health impact assessment of alternative sites could support and compliment community goals for affordable housing

## **II. Screening and the Scope of the Analysis**

In June 2008, members of Human Impact Partners and Urban Habitat held a screening and scoping meeting to determine the scope and direction of the HIA. At this meeting it was agreed that the ultimate goal of the HIA is to encourage the healthfulness of the San Pablo Area Specific Plan and eventual site development.

Urban Habitat informed HIP that the achievement of sufficient affordable housing within the Plan

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was the primary issue for communities bordering the San Pablo Avenue Study Area. However, the qualities of housing and environmental conditions at the project sites were also important considerations. Thus, it was decided that the HIA would compare alternative affordable housing sites based on a series of health indicators.

Following the screening and scoping meeting, Urban Habitat identified three potential housing sites (also called “Opportunity Sites”) along the San Pablo Avenue corridor as the subject of the comparative site analysis (Figure 1):

- 1) the former Albertsons grocery store site located at 12010 San Pablo Avenue in Richmond;
- 2) the former Mayfair site at 11600 San Pablo Avenue in El Cerrito; and
- 3) the former Target store site at 11450 San Pablo Avenue, also in El Cerrito.

These three sites are relatively close to one another. The Mayfair and Target sites are very close to each other, sandwiching the Del Norte BART station on San Pablo Avenue, with the former just north of the station and the latter south. The Albertsons Site is a few blocks north of the Mayfair Site. Figure 1 shows the three Opportunity Sites and the study area.

Figure 1. Affordable Housing Opportunity Sites



As mentioned above, ensuring sufficient affordable housing is the primary interest of many organized community residents in the corridor. Ensuring that housing is affordable itself meets critical health needs for shelter and economic security. Unaffordable housing can result in overcrowded living conditions and displacement of residents, exacerbate the extent of poverty poor families already suffer from, and even lead to homelessness. For the purpose of this HIA, we assume that the amount and price of affordable housing at each site would be equivalent.

Based on a review of health determinants related to residential neighborhood conditions and a review of health determinants important to populations in below-market rate housing, we selected several area-level and health-relevant social and environmental factors to focus of the comparative analysis. The analysis also considered and utilized community-level health objectives, indicators, and

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other evidence from the Healthy Development Measurement Tool in choosing the analytic questions (See [www.thehdmt.org](http://www.thehdmt.org)). The HDMT is a comprehensive evaluation metric developed by the San Francisco Department of Public Health through a two year community stakeholder process to consider health needs in urban development plans and projects. Factors that we selected include: exposure to environmental hazards (such as air quality and noise); proximity to public transportation; access to parks and trails; access to public and private services such as schools, community centers, and retail outlets; safety and quality of the pedestrian environment; and levels of concentrated poverty in the area. Described in more detail below and in the subsequent analysis is the scientific basis for our selection.

*Emissions from vehicular traffic* are responsible for much of the variation in air pollution exposure in urban areas. Vehicle emissions include particulate matter, nitrogen oxide, diesel exhaust and benzene, which are detrimental to respiratory and cardiovascular health, cause cancer, and are associated with increased mortality.<sup>1 2</sup> *Proximity to public transportation* tends to facilitate the use of public transit, reduce car ownership, and decrease vehicle miles traveled,<sup>3</sup> which translates into less pollution and traffic collisions, more physical activity, reduced likelihood of obesity.<sup>4</sup> Children living *within a half-mile of a school* are more likely to walk or bike to school<sup>5</sup> to get higher daily levels of physical activity and better cardiovascular fitness than do children who do not actively commute to school.<sup>6</sup> Active commuting has also been associated with increased levels of independence in children<sup>7</sup> and with increased social interaction and communication.<sup>8</sup> Ensuring that everyday *retail destinations are accessible by walking* also reduces health impacts associated with driving and increases physical activity.<sup>9</sup> Retail food access is particularly important because low-income households without easy access to fresh produce and healthy food tend to purchase food less expensive but with higher calories and lower nutritional values.<sup>10</sup> *Residential proximity to parks* is a significant predictor of physical activity levels.<sup>11</sup> Parks and other open spaces also help reduce stress and depression and recovery from illness.<sup>12</sup> Finally, *the level of concentrated poverty* in an area is closely associated with the quality of parks, schools and other public infrastructure, as well as the rate of violence and crimes.<sup>13</sup>

### **III. Assessment: Existing Conditions, Potential Health Impacts, Significance Thresholds, and Potential Mitigations**

As discussed above, the assessment evaluates area-level variation in known health determinants at the three potential affordable housing sites. Analysis and indicator selection focused on end points with potentially significant differences among sites (e.g., we assessed traffic-related air pollutants and not average regional air pollution levels). The assessment is organized into the following sections: retail outlets; public transportation services; parks and trails; schools; community/senior centers and other public services; pedestrian safety and quality; environmental noise; air quality; and concentrated poverty. Each section includes a review of empirical research evidence on the documented health effects of each factor, a description of analytic methodology, a qualitative or quantitative evaluation of the potential health impacts—both positive and negative—associated with the three sites, relevant standards or significance thresholds, and recommendations to mitigate any negative health effects.

### *Retail Outlets*

Research demonstrates that close proximity to retail can help improve health for two main reasons. First, close proximity to stores improves access to and consumption of healthy food. Of critical importance to low-income residents is proximity to a full-service supermarket. Smaller retail food stores typically charge about 10% more for products than supermarkets<sup>14</sup> and usually have less or no fresh produce available, and offer more processed foods. When low-income households lack access to full-service supermarket in their neighborhoods, they have little choice but to buy less expensive but more accessible food at fast food restaurants or highly processed food at corner stores, which is often higher in calories but usually lower in nutritional value.<sup>15</sup> One result of consuming these types of foods can be higher prevalence of obesity in low-income populations.<sup>16</sup> Indeed, diet-related disease is one of the top sources of preventable deaths among Americans,<sup>17</sup> with the burden of overweight and obesity falling disproportionately on populations with the highest poverty rates.<sup>18</sup> Access to at least one large neighborhood supermarket, therefore, may help improve nutritional health of lower-income residents.

Second, proximate retail destinations increase physical activity by helping to reduce reliance on cars for everyday needs.<sup>19</sup> Proximity and mix of retail, as well as having many quality destinations and modes of transport choices, are some of the most influential factors in people's decisions to walk.<sup>20</sup> Physical activity has been associated with various health benefits including reductions in premature mortality, the prevention of chronic diseases such as diabetes<sup>21</sup> and hypertension, and even improvements in psychological well-being.<sup>22</sup>

Some types of retail also have greater potential to contribute to disease, injury, and behavioral health risk factors. The density of liquor stores in an area, in particular, has been found to be associated with higher prevalence of violence and crimes,<sup>23</sup> alcohol use,<sup>24</sup> and other risk-taking behaviors. Another form of retail that can lead to higher health risks is fast food. Fast food restaurants tend to lead to low quality nutrition and are associated statistically to diet-related disease rates, while full-service restaurants are associated with better health outcomes.<sup>25 26</sup>

### *Existing Conditions*

By virtue of being located along San Pablo Avenue—the main commercial thoroughfare of the City of El Cerrito—all three sites generally have relatively easy access to retail outlets. However, analysis of the pedestrian quality of the three sites graded pedestrian quality *immediately juxtaposed* to all three sites as “unsuitable” to “poor” land use, meaning that retail and restaurants that provide destinations were not present or intermittent (See *Pedestrian Safety and Quality* section).

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**Table 1. Retail Outlets within 0.5 Mile of Each Site: Fifteen Common Retail Services for Neighborhood Completeness**

Type of Retail Outlet	Albertsons Site	Mayfair Site	Target Site
Restaurant	16	15	15
Coffee shop/cafe	1	3	3
Gym/fitness center	1	2	2
Drug store/Pharmacy	1	1	1
Hardware store	1	1	1
Bank/credit union	5	1	1
Laundromat/Dry cleaner	4	2	2
Hair salon/Barber shop	9	4	4
Auto repair/Gas station	6	2	2
Bike shop/Repair	0	0	0
Grocery store/Supermarket	1	0	0
Produce store	0	0	0
Childcare	1	0	0
Entertainment	0	0	0
Nursing Home	0	0	0

Potential Health Impacts

Due to the proximity to a wide range of retail outlets and meeting the requirement for retail neighborhood completeness, all locations would support access to common material needs and encourage residents to engage in more physical activity.

The location of the Albertsons Site would situate it where a wide variety of retail outlets are within a half-mile radius, most of which are located along San Pablo Avenue or Macdonald Avenue, which crosses the former right next to the Albertsons Site. The presence of Safeway, a large, full-service grocery store just across Macdonald Avenue, is a distinct advantage, as it provides access to a greater variety of cheaper and healthier food items such as fresh fruits and vegetables, and thus helps facilitate healthier dietary choices. There is also a natural foods store nearby. A Target store where various household goods are sold at affordable prices is only two blocks away. In addition, laundromats, dry cleaners, auto repair shops, several banks and credit unions, nail/hair salons and barber shops, bike shops, dry cleaners, hardware stores, a thrift store, dental offices, an herb clinic, a chiropractic center, a veterinarian hospital, tax services, and a daycare are all within a half-mile radius.

The Albertsons Site is also notable for the absence of liquor stores nearby. With the exception of a supermarket and two convenient stores where alcoholic beverages are sold, there is no liquor store within 0.5 mile. Furthermore, full-service restaurants—mostly Asian or Mexican restaurants where relatively healthy food is served at affordable prices – far outnumber the area’s several fast food restaurants. Therefore, the retail services environment of the Albertsons site appears to provide relative advantages with regard to nutritional opportunities.

**Table 2. Number of Retail Food Outlets and Restaurants within 0.5 Mile of Each Site**

Type	Albertsons Site	Mayfair Site	Target Site
<b><i>Healthy Retail Food</i></b>			
Supermarkets	1	0	0
Farmers Markets	0	0	0
Fruit and Produce Markets	0	0	0
Full-service Restaurants/Take-out Places	11	8	8
<b><i>Unhealthy Retail Food</i></b>			
Fast Food Establishments	5	7	7
Convenience Stores (including one at a gas station)	2	2	2
Liquor Stores (excluding supermarkets and convenience stores)	0	2	2

The Mayfair and Target sites are also close to a wide variety of retail outlets within a half-mile radius, including those located south of the Albertsons Site. The difference is that retail outlets close to the Mayfair and Target sites include somewhat more fast food restaurants, motels, and commercial business establishments serving industries, such as those for construction supplies and medical equipment, than are those close to Albertsons Site. Both the Mayfair and Target sites are farther from Safeway—the full-service supermarket—than is the Albertsons Site. The Target Site is 0.8 mile away from Safeway, which does not meet the first of the two development targets described below. The Mayfair Site, 0.54 mile from Safeway, narrowly fails to meet it. The only farmers market in El Cerrito is on San Pablo Avenue and Fairmont Avenue—1.7 and 2 miles away from the Mayfair and Target sites, respectively—and thus not within walking distance from them. Two liquor stores are nearby.

According to development targets adopted in the HDMT, a neighborhood is complete when it has a combination of the following retail outlets in close proximity: restaurant, coffee shop/café, gym/fitness center, drug store/pharmacy, hardware store, bank or credit union, laundromat/dry cleaner, hair salon, auto repair/gas station, bike shop/repair, grocery store/supermarket, fruit/produce store, childcare, entertainment (i.e., video store, movie theater, performance theater, music venue), and nursing home. Complete neighborhoods with integrated public and retail services as well as quality pedestrian environments can increase physical activity by making everyday retail destinations accessible by walking.<sup>27</sup>

As far as retail services are concerned, a development at any of the three sites would meet these targets, although all of them have limitations that cause them to fall short of having a complete neighborhood. A development project at the Albertsons Site would meet the targets for key retail services, but, as discussed in the next section, it does not have proximity to important public services such as community centers and post offices. A development at either the Mayfair or Target site would have nine out of 15 common retail services, and thus barely meet the requirements for neighborhood completeness for key retail services, but it would not have easy access to retail outlets vital to community health such as a full-scale supermarket.

The Retail Food Environment Index (RFEI), developed by the California Center for Public Health



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Advocacy (CCPHA), is used to evaluate existing retail food environments in California. The RFEI is defined as the ratio of the number of outlets of unhealthy food (i.e., fast-food establishments and convenience stores) to the number of healthy food options such as fruits and vegetables (available at grocery and produce stores). Thus, the higher the RFEI index, the more likely consumers will find unhealthy food options.<sup>28</sup> The RFEI for the Albertsons Site is  $7/12=0.58$ , which means that there is 0.58 unhealthy food retail outlet per every healthy counterpart around this site.

The REFI for the Mayfair and Target sites is  $11/8=1.38$  each, indicating that there are 1.38 times more unhealthy food outlets, such as fast food establishments and convenience stores, than there are healthy food retailers such as supermarkets, produce stores, and farmers' markets. The low RFEI (0.58) for Albertsons Site, compared to that (1.38) for the Mayfair and Target sites is another indication that the retail food environment for the former is more conducive to healthy lifestyles than that for the latter.

Overall, the location of the Albertsons Site is particularly favorable, because of its proximity to a full-scale grocery store where residents would be able to make healthy dietary choices at more affordable prices. It would help improve the nutritional health of the residents and reduce their risks of obesity and chronic illness associated with consumption of unhealthy food items. Without easy access to a large neighborhood supermarket and with a great number of fast food chains and liquor stores, the health benefits that easy access to retail services can provide for the residents of the Mayfair and Target Sites are likely to be smaller.

*Standards and Thresholds for Significance*

No regulatory standards applicable to the plan area exist for retail completeness. The HDMT's voluntary guidance development targets applicable to retail development are: that the development project is within 1/2 mile of a grocery store with fresh produce; and that the development is within 1/2 mile of an area with nine out of 12 common retail services that contribute to neighborhood completeness—auto repair, banks/credit unions, beauty salon/barber, bike repair, dry cleaner, eating establishments (restaurants and cafes), gym/fitness center, hardware store, laundromat, pharmacy, retail food market (including supermarket, produce store, and other retail food stores), and entertainment (i.e. video store or movie theater).

*Recommendations for Protecting and Promoting Health*

To address the absence of easy access to full-scale supermarket from the Mayfair and Target sites, the project design could include sufficient ground floor retail space for a retail food use such as a produce market. The city could provide incentives for opening and operating such a store, provided that a certain percentage of the shelf space is used for healthy food items.

Additionally, a farmers market might be instituted at the parking lot of the Del Norte BART station. Alternatively, the venue of the El Cerrito farmers market currently located at the El Cerrito Plaza, about two miles south on San Pablo Avenue and open twice a week, could be located at the Del Norte site once a week.

Similarly, given the lack of a childcare center in the vicinity, a space for other needed services—a childcare center, in particular—could be created at Sites 2 or 3.

### *Public Transportation Services*

A healthy and accessible public transportation system can decrease vehicle miles traveled and encourage more physically active forms of transportation. Workers with access to public transit are more likely to walk, bike, and take public transit to work than those without;<sup>29</sup> and the availability of public transportation can decrease the distance a family drives.<sup>30</sup> In the San Francisco Bay Area, the counties with more access to public transportation have the lowest vehicle miles traveled (VMT) per day.<sup>31</sup>

Americans who use public transit have been found to be more physically active, spending a median of 19 minutes per day walking to and from transit.<sup>32</sup> A U.S. study found that each additional hour spent in a car per day was associated with a 6% increase in the likelihood of obesity and that each additional hour walked per day is associated with a 4.8% reduction in the likelihood of obesity.<sup>33</sup> It has also been found that close (i.e., <.5 mile) proximity of dense and mixed-use development to public transit decreases the distance between people's residential, employment, and other (e.g., shopping, errands, social) activities and increases walking as a means of transportation.<sup>34</sup>

For low-income residents who do not own automobiles, accessible, affordable, and convenient mass transit is necessary for most daily activities: to get to work, to take children to school and childcare, to buy groceries and other daily necessities, to use public services, and to obtain timely medical care. A study of fifteen low-income neighborhoods in the San Francisco Bay Area found that 66% of residents had no transit access to hospitals and 48% no walking access to a supermarket.<sup>35</sup> Residents do not utilize available medical services if they are difficult to reach and thus limited or no access to transit may affect low-income residents' health and quality of life in a critical manner.

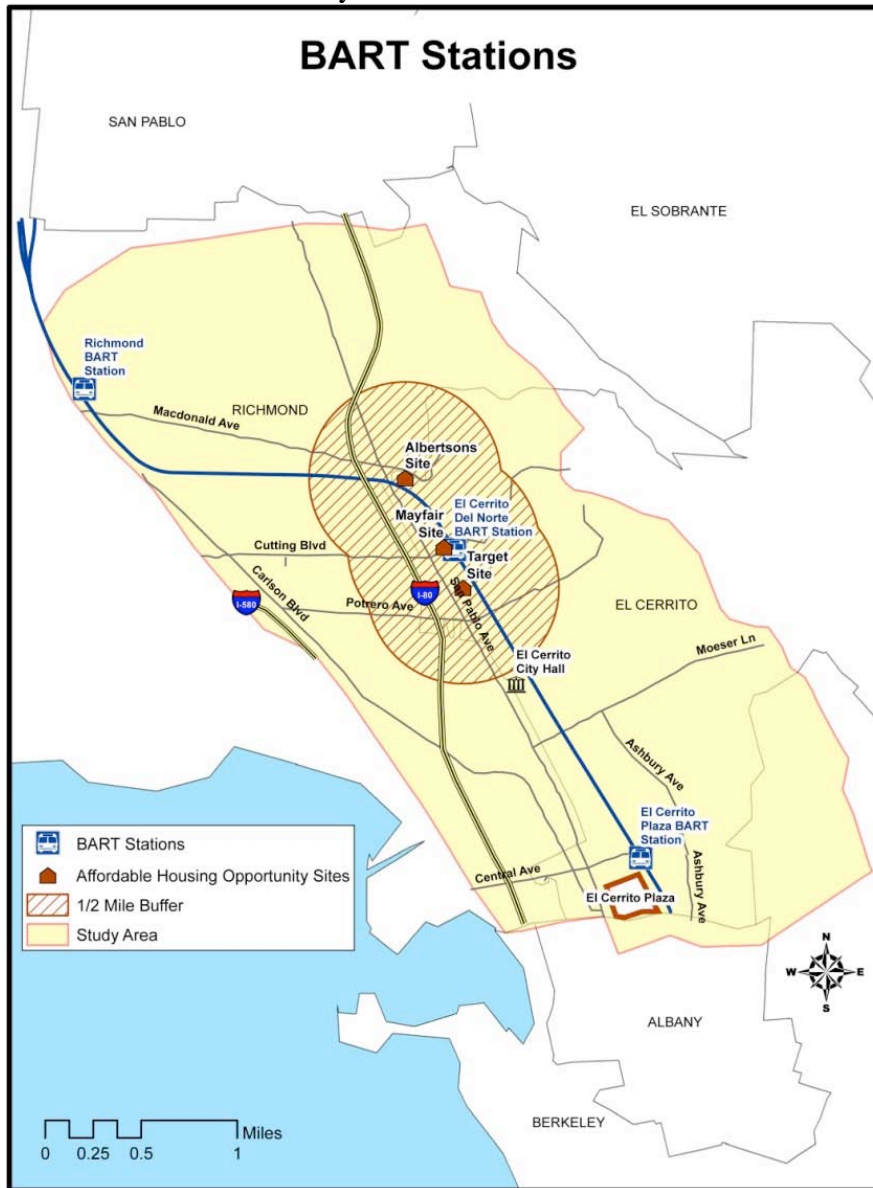
### *Existing Conditions*

Public transit is highly accessible from all three affordable housing opportunity sites. All of them are relatively or very close to the Del Norte BART Station, and AC transit bus service is robust around the three sites, especially along San Pablo Avenue, serving both local destinations and other bay-area cities such as San Francisco, Oakland, Berkeley, and San Pablo. According to the 2000 U.S. Census, about 20.5% of workers aged 16 or older living in El Cerrito and 15.2% in Richmond took public transportation to work. These proportions are substantially higher than the 8.7% in Contra Costa County and the 5.0% in California, which may be explained at least in part by the easy accessibility to transit, especially in El Cerrito.

Figure 2. AC Transit Stops Within Study Area



Figure 3. BART Stations Within Study Area



Public transit is highly accessible from the Albertsons Site, although the Del Norte BART Station, about a half-mile away (but still within walking distance), is somewhat farther away than from the other two sites. However, more AC transit bus routes are accessible from the Albertsons Site than from the other two sites. A bus stop for routes 72, 72R, 800, and L is located within a few hundred yards on the next block; a bus stop for routes 667 and 72M is a few blocks away on Macdonald Avenue. Bus services are available almost around the clock, with routes 72 and 72M operating daily with 15- to 20-minute intervals from the Oakland Amtrak station to the Hilltop Mall/Contra Costa College in San Pablo, and Route 800 every hour daily during early morning hours to connect downtown San Francisco and the Richmond BART Station. Route 667 runs during limited hours in early morning and mid-afternoon. Route L operates every 15 minutes during peak hours and every hour between 3:10 p.m. and 9:00 p.m. on weekdays.

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The Mayfair and Target sites are also close to public transit. Both of them are located right next to the Del Norte BART station, and a bus stop for routes 72, 72M, 72R, 667, 800, and L are nearby on San Pablo Avenue. Routes 7, 668, and 675 are also accessible a few blocks away.

**Table 3: AC Transit Services Near the Three Affordable Housing Opportunity Sites**

Route	Areas served	Weekday services	Weekend services
72	From Oakland Amtrak station to Hilltop Mall & Contra Costa College, San Pablo	Every 15 minutes peak hours; Every 15-20 minutes off-peak	Every 15 minutes peak hours Every 20 minutes off-peak
72M	From Oakland Amtrak station Castro St. & Tewksbury Ave. (Richmond BART)	Every 15 minutes peak hours; Every 15-20 minutes off-peak	Every 15 minutes peak hours Every 20 minutes off-peak
72R	From Jack London Square to Contra Costa College	Every 12 minutes	No service
667	From Market Ave. & 6 <sup>th</sup> St. in Richmond to El Cerrito High School	Limited services during weekday commute hours	No service
800	From Market St. & Van Ness Ave. in S.F. to Richmond BART station	Every hour during early morning hours (1 a.m. – 5:30 a.m.)	Every 30-60 minutes during early morning hours
7	From Rockridge BART station to El Cerrito Del Norte BART station	Every 20-22 minutes peak hours; every 30 minutes off-peak (6:15 a.m.)	Every hour
L	From San Francisco Transbay Terminal to Princeton Plaza Shopping Center	Every 15 minutes peak hours; Every 20 minutes off peak (from 3:10 p.m. to 9:00 p.m.)	No service
668 & 675	From 16 <sup>th</sup> St. & Macdonald Avenue in Richmond to Portola Middle School in El Cerrito	Services in limited morning and afternoon hours	No service
H	From San Francisco Transbay Terminal to Barrett Avenue and San Pablo, Richmond	Every 20 minutes from 5:50 a.m. to 9 a.m. & 4 p.m. to 9 p.m.	No Service

Potential Health Impacts

Obviously, the extent to which public transit is a convenient and reliable means of transportation for the area’s residents depends on the bus lines they use, if they have to make further transit connections, and how efficiently the connections are made. Still, given the easy accessibility to both BART and AC Transit, public transportation may be a viable and relatively convenient means of transportation for the residents at any of the three sites. Not only would such easy access to transit allow residents at any of the three sites to stay physically active by walking to and from transit, it would also enable them to access public services and health care facilities and thus to better maintain their health.

Standards and Thresholds of Significance

With the Resolution No. 95-51, the El Cerrito City Council adopted a “Transit First Policy” requiring that city planning and development approval processes include consideration of means of

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promoting public transit within El Cerrito. It is thus the official policy of the City of El Cerrito to encourage public transit among El Cerrito residents and visitors, and expedite the movement of transit vehicles.<sup>36</sup> Still, the City of El Cerrito does not have standards for public transit services for the city; neither do other local jurisdictions such as Richmond and Contra Costa County.

The 2003 Governors Environmental Goals and Policy Report<sup>37</sup> recommends that the public should be provided with a transportation network that increases mobility choices—including public transportation, walking, and biking. A goal of Caltrans Strategic Plan 2007-2012<sup>38</sup> is to maximize transportation system performance and accessibility. These goals would likely be achieved with housing at any of these three opportunity sites.

*Recommendations for Protecting and Promoting Health*

To encourage the use of public transportation by residents of the potential new affordable housing developments, free or reduced-cost AC Transit passes should be provided to residents. Another incentive suggested by community members was to provide some car share memberships to residents of affordable housing, in addition to sites for car share parking. While there is an informal casual carpool site near the freeway, setting up a more formal system could encourage carpooling.

*Parks and Trails*

Access to local parks and trails facilitates opportunities for physical activity. The Centers for Disease Control states that enhanced access to spaces for physical activity resulted in 25% more people exercising three or more days a week.<sup>39</sup> Another study concluded that each additional park within a half mile increased physical activity in teenage girls by 2.8%.<sup>40</sup>

Parks and trails provide needed reprieve from everyday stressors, acting as “escape facilities.” Being able to escape fast-paced urban environments improves health by reducing stress and depression and improving the ability to focus, pay attention, and be productive.<sup>41</sup> Children with neurobehavioral disorders function better following activities in green settings.<sup>42</sup> In contrast, people dissatisfied with their available green spaces have 2.4 times higher risk for mental health issues.<sup>43</sup>

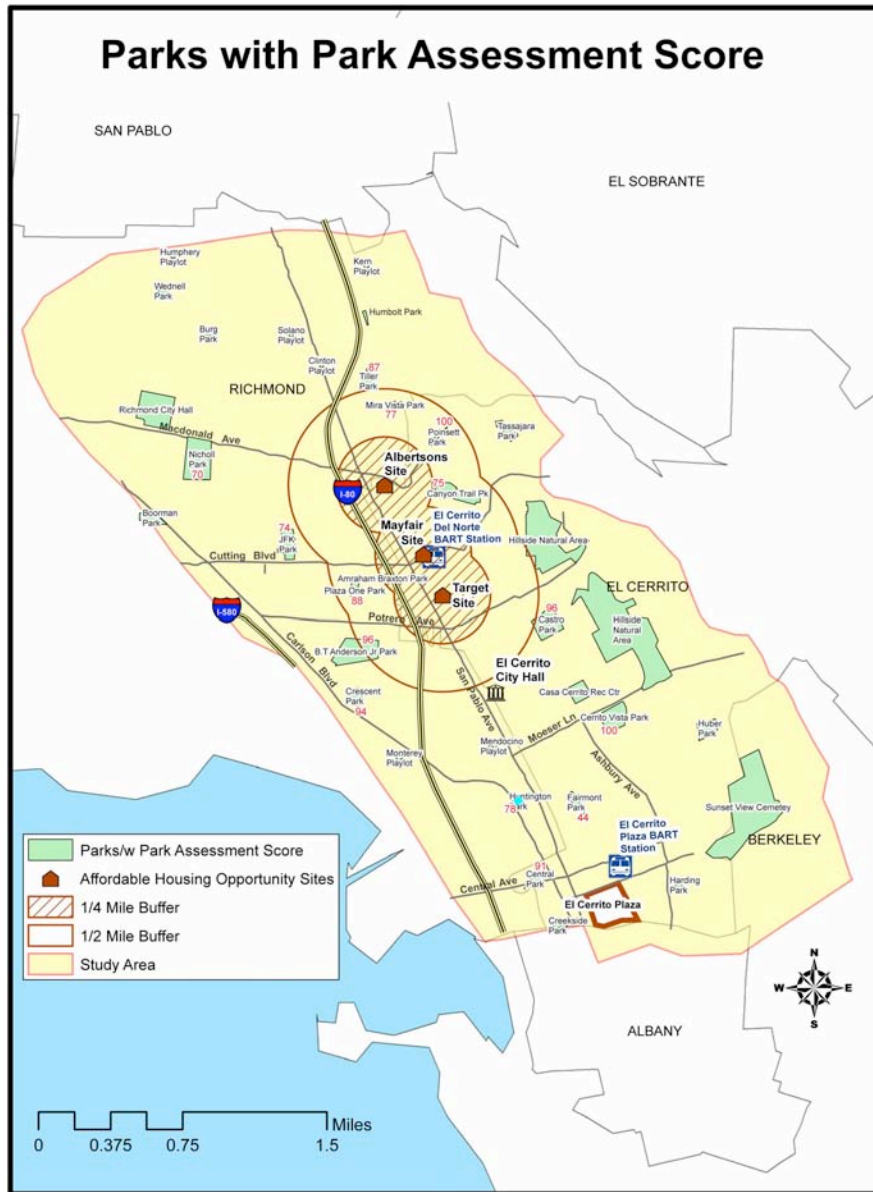
Green space is an attractive place for socializing, which is important for health and wellbeing. Observations by researchers of vegetated areas with trees and grass showed that green areas contain 90% more people than do barren areas. In this study, 83% more people were observed being involved in social activities in green spaces vs. barren spaces.<sup>44</sup>

By reducing smog, decreasing the heat island effect in cities, and removing harmful air pollution, tree cover and vegetation can also have positive environmental health benefits.<sup>45 46</sup>

*Existing Conditions*

*Parks.* As shown on Figure 4 below, there are several parks and playgrounds in the vicinity of all three Opportunity Sites. The parks pictured on the map are located in both cities of El Cerrito and Richmond.

Figure 4. Parks with Scores



Park accessibility is a multi-dimensional construct that reflects factors including proximity, safety from vehicular collisions as well as crime and violence, functionality, maintenance, and aesthetics. The failure to ensure quality in all dimensions may inhibit park accessibility. For example, a park may be large and have diverse functionality but dangers to pedestrian and bicycle access may limit use. Community members noted, for example, that Central Park in El Cerrito did not deserve a “91” score because of the presence of homeless people and traffic congestion on the way there. Park grades, as noted below, did not reflect traffic on nearby streets, so community input is vital in any parks assessment the cities might undertake.

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For this HIA, HIP conducted a limited parks assessment of 14 parks near the Opportunity Sites. An observational instrument adapted from the San Francisco Park Maintenance Standards Manual and Evaluation Form<sup>47</sup> was used to assess parks based on the following characteristics:

**Table 4. Parks Assessment Indicators**

<b>Lawns</b>	Cleanliness Color Density and spots Height/mowed Holes	<b>Children's Play Areas (if applicable)</b>	Cleanliness Functionality of equipment Integrity of equipment
<b>Trees</b>	Plant health	<b>Restrooms</b>	Presence Cleanliness Functionality of structures Waste receptacles
<b>Hardscapes and Trails</b>	Cleanliness Surface quality	<b>Waste/Recycling Receptacles</b>	Presence
<b>Turf Athletic Fields (if applicable)</b>	Cleanliness Functionality of structures Height/mowed Holes	<b>Benches, Tables and Grills (if applicable)</b>	Cleanliness Structural integrity and functionality
<b>Outdoor Athletic Courts (if applicable)</b>	Cleanliness Functionality of structures Surface quality	<b>Water Fountain</b>	Presence

Figure 4 above depicts scores for the 14 assessed parks. Park scores range from 44 (worst) to 100 (best), with an average score of 84. It should be noted that some of the parks located in the eastern portion of the study area are separated from the housing opportunity sites by a fairly steep hill. These parks (i.e., Canyon Trail Park, Poinsett Park, and Mira Vista Park) may be inaccessible to some San Pablo Avenue residents, particularly young children and elderly people.

**Table 5. Parks per Population and Park Assessment Scores within ¼ Mile and ½ Mile Radii from Each Site**

	Distance	Albertsons Site	Mayfair Site	Target Site
<b>Parks acres/Population</b>	1/4 Mile	0.0	0.001	0.0
	1/2 Mile	0.001	0.002	0.013
<b>Average Park Scores (#)</b>	1/4 Mile	0	0	0
	1/2 Mile	63	54	59

Living within a quarter-mile radius from a park is considered optimal for health.<sup>48</sup> Of the three sites, the Target Site has the most parks (6) and acreage of parks (74 acres) within a half-mile radius. It also has the most acres per population within a half-mile radius (0.013 acres per person). The Mayfair Site has the lowest number and acreage of parks (3 parks and 10.4 acres of parkland), while the Albertsons Site has the least parks per person (0.001).



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*Regional Parks.* Large parks of the East Bay region provide wilderness and active recreational activities such as hiking, running, mountain biking, and enjoyment of nature. Many regional parks are within a short driving distance of all three Opportunity Sites. The following map<sup>49</sup> portrays many regional parks in the East Bay hills and along the San Francisco Bay.

**Figure 5. East Bay Regional Parks in the Northwestern Portion of the East Bay**



In addition to the regional parks displayed above, large neighborhood parks offering a variety of recreational activities were included in this assessment even if they are located outside of a quarter- or half-mile radius. Of the three such parks in the area that were assessed—Booker T. Anderson, John F. Kennedy, and Nicholl Parks—Booker T. Anderson Park in Richmond received the highest score. This park is large (16 acres), very well maintained, and offers athletic fields and courts, a playground, and a community center with a variety of programs. Of the three Opportunity Sites, this park is nearest to the Target Site, and it is within a half-mile from the Mayfair Site and less than a mile from the Albertsons Site.

Nicholl Park and John F. Kennedy Park, while large (18 and 7 acres, respectively) and offering playgrounds and athletic courts and fields, appear less maintained. At the time of the site visit, Nicholl Park contained a burnt-down concession stand and some athletic fields were not open to the public.

*Trails.* The only trail within a half-mile radius from the Opportunity Sites is the Ohlone Greenway,

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which runs northwest-southeast and is accessible within a few blocks of each Opportunity Site. This trail is pictured in Figure 6 below. Extending almost four miles, the trail begins in Berkeley, runs through Albany and El Cerrito, and terminates at Baxter Creek Gateway Park near the Albertsons Site. In the vicinity of the three Opportunity Sites, the greenway is divided into two paths – one for pedestrians and the other for bicyclists. Work is underway to extend the Greenway west from the terminus at Baxter Creek to unite with the new Richmond Greenway, which will extend all the way to Point Richmond and the Bay Trail.<sup>50</sup>

The Greenway serves as an important bicycle and pedestrian transportation corridor, and is accessible from the North Berkeley, El Cerrito, and Del Norte BART Stations as well as several bus lines and civic, recreational and shopping destinations. According to a recently released Ohlone Greenway Master Plan, the Greenway is also used as a place to sit, stroll, recreate, and play.<sup>51</sup> The Ohlone Greenway is an important and very accessible resource to all potential housing sites.

Figure 6. Parks and Regional Trails Within Study Area



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*Potential Health Impacts*

Areas of Richmond and El Cerrito that surround the Housing Opportunity Sites are rich in parks and accessible to open space and natural areas. Eight parks and a regional greenway are located within a half-mile radius of the three sites, and several more parks are within a one-mile radius. Access to parks and trails gives residents opportunities for physical activity, which reduces the risks of diabetes, obesity, and hypertension, and improves mental and psychological well-being.

Of the three sites, the Target Site has the most nearby parks (6) and acreage of parks (74 acres) within a half-mile radius. It also has the most acres per population within a half-mile radius (0.013 acres per person). Booker T. Anderson Park, which is within a half-mile radius of this site only, is a large (16 acres) recreational park with many uses that have the potential to enhance health and wellbeing, including basketball and tennis courts, baseball fields, and an on-site community center.

All three sites are located within a few blocks of the Ohlone Greenway, which is an excellent resource for physical activity, recreation, and transportation.

Besides acreage and quality of parks and trails, which were the focuses of this assessment, park programming (e.g., recreational programs for youth offered at a given park) and transit options (e.g., bus transportation and pedestrian facilities) to parks and trails will greatly influence accessibility to future residents. These resources should be considered and improved as part of the San Pablo Avenue Specific Plan.

*Standards and Thresholds of Significance*

The El Cerrito General Plan's Public Facilities and Services Chapter<sup>52</sup> has a level of service standard of five acres of publicly owned parkland per 1,000 residents. The Richmond General Plan Update's Administrative Draft Parks and Recreation Element<sup>53</sup> gives a standard of three acres of active parkland per 1,000 residents in each neighborhood planning area. Richmond's Draft Parks and Recreation Element also specifies an equitable distribution of parks within a "comfortable walking distance of homes, schools, and businesses."

*Recommendations for promoting and protecting health*

While the cities of El Cerrito and Richmond include many parks and an excellent regional trail is located very near to the SPASPPA, certain planning actions would increase accessibility to local parks and trails for future residents of the selected Housing Opportunity Site.

First, a needs assessment for existing and future residents within the SPASPPA should be conducted to ensure that local park programming reflects the identity and needs of residents.

Joint use of recreational spaces within schools and other public and private facilities in the SPASPPA would help fill gaps in park access. Some nearby parks (i.e., Nicholl Park and JFK Park) need maintenance and improved security. Interpretive programs, nature walks, and coordination with school districts could be implemented to build awareness about local parks and trails.

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Finally, a requirement for the selected Opportunity Site to provide on-site open space and recreational facilities for residents, or to provide a combination of park in-lieu fees and on-site facilities, is advised to increase access to parks.

### *Schools*

Opportunities for quality education are unequally distributed in American society for both early childhood and K-12 education.<sup>54</sup> Research has found that it is partially through (the allocation of children to) schools that general and race-specific family disadvantages are played out. Particularly important are class and racial inequalities in public/private school enrollment, school social class composition, instructional expenditure, and crime at the school level.<sup>55</sup>

Higher educational attainment is associated with higher income.<sup>56</sup> Income is one of the strongest and most consistent predictors of health.<sup>57</sup> Educational attainment may also affect health independently of income, as completing more years of education is associated with better nutrition, lower rates of risk-taking behaviors, chronic illnesses, and lower mortality.<sup>58 59</sup>

Research also suggests that the physical location of school—the distance to school, in particular—may significantly impact health outcomes in several different ways. With long distances to schools being a primary barrier to walking to school,<sup>60</sup> the distance to school has the strongest influence on the students' decisions to walk or bike.<sup>61</sup> Living within a half-mile of school greatly increases the likelihood of walking or biking to school across all racial groups.<sup>62</sup> Active commuting to school can provide a substantial portion of children's physical activity,<sup>63</sup> because children who walk or bicycle to school have higher daily levels of physical activity and better cardiovascular fitness than children who do not actively commute to school.<sup>64</sup> Active commuting has also been associated with increased levels of independence in children<sup>65</sup> and with increased social interaction and communication.<sup>66</sup>

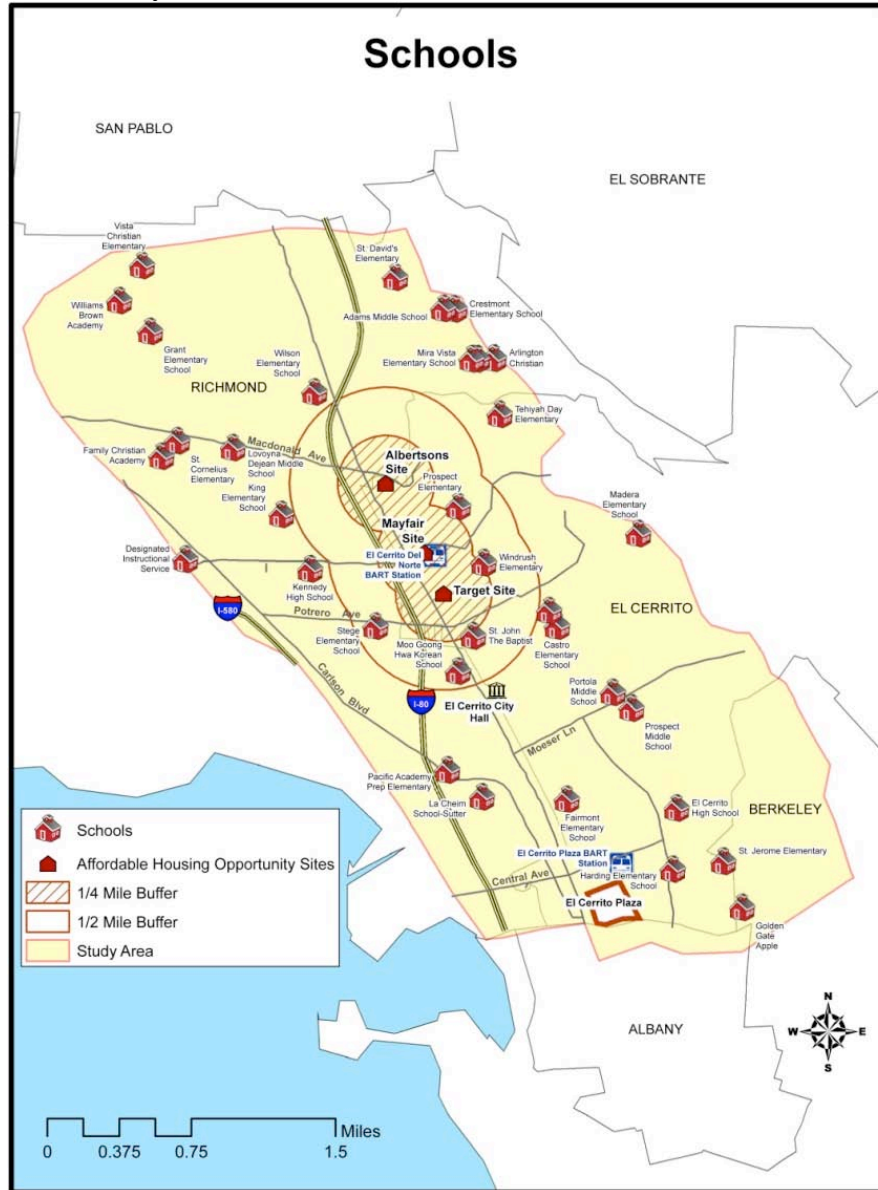
Distance to school also affects children's safety as pedestrians. Child pedestrian injury is an important cause of mortality and morbidity and remains one of the leading causes of death in developed countries.<sup>67</sup> A child's risk for pedestrian injury is likely related to his/her overall exposure to traffic, as a longer distance to school is likely to increase such exposure and thus place children at higher risk for pedestrian-traffic collision. At least one study found that many of the collisions with motor vehicles that children experience occur when they play outdoors or while walking to places other than school.<sup>68</sup> Other research findings, however, generally suggest that children who walk to or from school are at a higher risk of traffic injuries, and that the higher average number of streets children cross is significantly and positively associated with traffic injury rate.<sup>69</sup> It has also been well-established that children from disadvantaged areas are much more likely to experience pedestrian fatalities than their peers in higher-income communities.<sup>70</sup>

### *Existing Conditions*

School-aged children who would live at one of the sites would go to schools in two different cities: those at the Albertsons Site to schools in Richmond, and those at Mayfair or Target Site to those in El Cerrito. There are no West Contra Costa Unified School District (WCCUSD) schools within 0.5 mile of the any of three affordable housing opportunity sites. Schools in close proximity to the sites are mostly private schools, which would likely be inaccessible to children of low-income residents.

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Figure 7. Schools in Study Area



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**Table 6: WCCUSD Schools in Richmond in Relative Proximity to Albertsons Site**

School	Grade levels	Distance from Albertsons Site	Enrollment	Students per teacher	English language proficiency (%)	Math proficiency (%)	Economically disadvantaged (%)	Average Attendance	API
Wilson Elementary	K-5	0.8 mile	478	20.8	35.9	43.3	73.4	94.3	734
Mira Vista Elementary*	K-6	1.1 miles	404	21.7	44.2	41.2	53.2	93.3	N.A.
King Elementary	K-5	1.2 miles	336	17.2	29.8	42.2	94.4	92.2	697
Adams Middle*	6-8	2.4 miles	815	20.7	23.7	17.1	77.7	92.2	624
Lovoyna Dejean Middle	6-8	0.9 mile	848	23.2	18.3	10.5	76.2	94.2	578
Kennedy High*	9-12	1.9 miles	861	17.2	56.0	58.0	72.4	91.4	549

N.A.=Not available

\* Schools children living at the Albertsons site would be assigned to.

The only school located within a half mile from the Albertsons Site is Prospect Sierra Elementary School, a private school. It is nestled in a quite residential neighborhood a few blocks East (thus away from the heavy traffic on San Pablo Avenue) of the Albertsons Site and would allow children to walk or bike to school relatively safely from the Albertsons Site. However, with annual tuition of over \$18,000 and other costs, this is a school most low-income residents could not afford to send their children to. The information on student attendance and performance is unavailable for this school.

The closest public elementary and middle schools to the Albertsons Site are Wilson Elementary School, 0.8 mile away, and Lovoyna Dejean Middle School, which is 0.9 mile away. According to the information<sup>71</sup> provided by the WCCUSD, children who would live at the Albertsons site would be assigned to schools somewhat farther away than these two: Mira Vista Elementary School, 1.1 miles away and Adams Middle School, 2.4 miles away. The high school children living at the Albertsons site would be assigned to Kennedy High School, which is almost 2 miles away.

Not only are no public schools within a half-mile radius, the conditions and academic performance of the public schools near to the Albertson's Site are poor. The proportions of economically-disadvantaged (as defined by WCCUSD) students are troublingly high—over seventy percent of students at Adams Middle and Kennedy High are from such a background. This proportion is somewhat lower at Mira Vista Elementary School; still, over half (53.2%) of the students at this school are economically disadvantaged. Student-teacher ratios at these three schools are around 20 to one—the upper limit (20) of class size associated with quality education as documented in the literature.<sup>72</sup> Students at these schools tend to exhibit poor academic performance, especially at Adams Middle School where only 23.7% and 17.1% of students demonstrated an adequate level of English language and math proficiency, respectively. Both Adams Middle and Kennedy High reported Academic Performance Indices (APIs) lower than the state averages of 733 for middle

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schools and 694 for high schools. A numeric index or scale ranging from a low of 200 to a high of 1000, API measures the performance and progress of a school in California, with the target of 800 for all schools in California. Therefore, the Albertsons Site may not be an appealing choice for most parents with school-aged children.

**Table 7: West Contra Costa Unified School District (WCCUSD) Schools in El Cerrito**

School	Grade levels	Distance from		Enrollment	Students per teacher	English language proficiency (%)	Math proficiency (%)	Economically disadvantaged (%)	Average Attendance	API
		Mayfair Site	Target Site							
Castro Elementary	K-6	1.1 miles	0.9 mile	316	18.5	38.2	50.6	39.2	95.4%	755
Fairmont Elementary	K-6	1.6 miles	1.4 miles	276	18.7	35.5	42.5	57.3	94.3%	741
Harding Elementary	K-6	2.5 miles	2.2 miles	289	15.2	35.6	32.2	46.4	94.2%	680
Madera Elementary*	K-5	1.7 miles	1.5 miles	351	18.3	75.4	77.8	17.1	96.0%	906
Portola Junior High*	6-8	1.7 miles	1.5 miles	640	25.2	35.8	27.4	60.5	93.8%	654
El Cerrito Senior High*	9-12	2.3 miles	2.0 miles	1,363	23.4	73.0	75.0	23.0	93.8%	666

\* Schools children living at the Mayfair and Target sites would be assigned to.

As is the case for the Albertsons Site, there is no public school in El Cerrito within a half-mile of the Mayfair Site. Three elementary schools are within a half-mile radius from this site: Prospect Sierra, Windrush, and Stege Elementary School. Both Prospect Sierra and Windrush are private, which low-income residents living at Mayfair Site may not be able to afford. Although Stege Elementary, a public school, is within a half-mile radius of Mayfair Site, it is in Richmond and children living in El Cerrito generally are not assigned to this school.

The schools children who would live at the Mayfair and Target sites would be assigned to are: Madera Elementary School, Portola Junior High School, and El Cerrito Senior High School. All of them are at least 1.5 miles away from either of the two sites. Therefore, there is no WCCUSD school within a half-mile of the Mayfair or Target Site.

Overall, these three schools in El Cerrito perform better than do the Richmond schools described above. The API of 906 of Madera Elementary is substantially higher than the state average of 772; over three-quarters of Madera’s students reportedly demonstrated an adequate level of English language and math proficiency. Judging by the APIs of 654 and 666, respectively—lower than the state averages of 733 and 694—students’ academic performance at Portola Junior High and El Cerrito Senior High School are somewhat poorer, especially at Portola where only 25.2% and 35.8% of the students demonstrated an adequate level of English language and math proficiency. Still, their APIs are higher than APIs of the Richmond schools (624 and 549) discussed above. The proportions of economically disadvantaged students are also lower at the El Cerrito schools, especially at Madera Elementary (17.1%) and El Cerrito Senior High (23.0%). Although at 60.5%, the proportion of economically disadvantaged students is much higher at Portola Junior High School than are those at Madera Elementary and El Cerrito Senior High, it is lower than those at

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Adams Middle and Kennedy High School in Richmond. The student-teacher ratio at Madera is below 20, but the ratio is higher at Portola Junior High and El Cerrito High School at 25.2% and 23.4%, respectively. Overall, children living at the Mayfair or Target site would be assigned to better-performing schools than would those living at the Albertsons site.

*Potential Health Impacts*

Compared to one at the Mayfair or Target Site, an affordable housing development at the Albertsons Site would place school-aged children at a higher risk of receiving poor quality instruction and having less motivation, ill-preparing them for future opportunities for higher education and better earnings in their adulthood, which are likely to be instrumental in their achieving better health and well-being through more informed and healthier lifestyle choices. Schools that children living at the Albertsons Site would attend are also environments where the disadvantages of concentrated poverty are likely to be more pronounced (see our discussion in the Concentrated Poverty section below), leading to more frequent experience of violence and crime as well as negative physical and mental health outcomes associated with them.

Having no public schools of any level within a half-mile radius, none of the three sites is likely to be conducive to non-motorized transportation to schools. Thus some of children living at any of the three sites may not gain the health and developmental benefits (i.e. increased independence) of active commuting to school and the associated increase in physical activity. Alternatively, as car ownership is associated with income, children living in affordable housing may be more dependent on walking and bicycling to work. Children who do walk or bike to school may be at risk to traffic collision hazards given both the school-commute distances and the area arterials.

*Standards and Thresholds of Significance*

*California Code of Regulations, Title 5, §14010 for Standards for School Site Selection*<sup>73</sup> requires that the school site “shall be located within the proposed attendance area to encourage student walking and avoid extensive bussing unless bussing is used to promote ethnic diversity.” Excluding private schools low-income families are unlikely to be able to afford, none of the three affordable housing opportunity sites would meet this requirement.

*Recommendations for promoting and protecting health*

Poor instruction and a host of social ills manifested in schools in impoverished areas stem from inequality in schooling in the United States—a structural problem that cannot be tackled without fundamentally changing the way in which schools are funded and in which incomes and life chances are distributed. Thus, the problem with schools in Richmond (where the Albertsons Site is located) is not one that can be effectively mitigated away by measures incorporated in a single housing development, however thoughtful they are.

Schools in El Cerrito perform better than do Richmond schools. Given the absence of public schools within half-mile of any of the two opportunity sites in El Cerrito and the population growth associated with the plan, we recommend that planning for a new public elementary school be initiated in the context of the area plan.

Active commuting to schools can be promoted by instituting bike lanes and ensuring pedestrian/bicyclist safety on streets of Richmond and El Cerrito. (See the discussion in the



Pedestrian Safety section.)

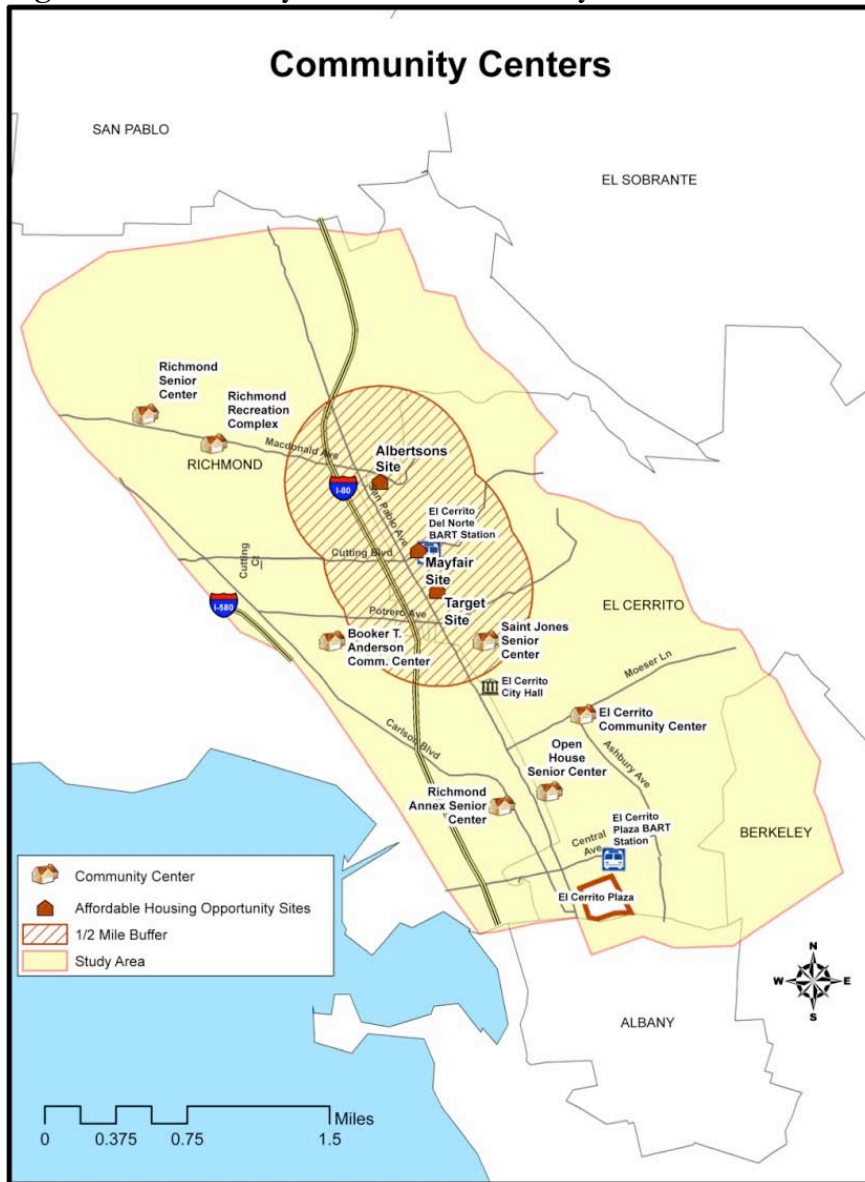
*Community/Senior Centers & Other Public Services*

Community centers where one can enjoy various artistic, cultural and fitness programs at no- or low-cost can help enrich one's life. Community centers can also be places where residents can make social connections to other community members to build a foundation for social support. Research has consistently demonstrated that social support, perceived or provided, can buffer stressful situations, prevent feelings of isolation, and contribute to self-esteem.<sup>74</sup> Cultivating a supportive network in one's community may be particularly critical for seniors who may be more prone to feelings of isolation and illnesses than those who are younger. As is the case for retail outlets, community centers and other public services located in close proximity may help residents to increase physical activity.

*Existing Conditions*

Few community or senior centers are located in proximity to the three sites. Only one center is located less than a half-mile from one of the three potential sites, but it is open just one day a week and only to senior citizens. Some centers, however, are easily accessible by public transit.

Figure 8. Community Centers Within Study Area



As Figure 8 shows, there are no community or senior centers within walking distance from the Albertsons Site. However, *Richmond Recreation Complex* (1.1 miles away) and *Richmond Senior Center* (1.3 miles away), both located on Macdonald Avenue, are easily accessible by bus routes 72M, 800 and 667. *Richmond Recreation Complex* offers a variety of sports and fitness programs, such as basketball, indoor soccer, and weight/fitness programs, for both adults and youth for low fees. *Richmond Senior Center* offers a wide range of programs and services for seniors, including fitness/exercise/dance classes, a lunch program, a mini health clinic (offering free blood pressure readings, dental/denture assessment, eye glass cleaning/adjustments, hearing aid cleaning/adjustment, and monthly massage therapy), bi-monthly HICAP counseling, and monthly birthday celebrations. *Open House Senior Center*, located 1.9 miles south and accessible by bus routes 72, 72M, 72R, and 667, offers a variety of arts/craft, exercise/fitness, creative writing, music, games, and support-group programs.

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Public services are not available within a half-mile radius of the Albertsons Site. The closest post office is 0.9 mile away. Richmond City Hall is 4.1 miles away, although it is accessible by AC transit buses. The closest fire department is 1.3 mile away in El Cerrito. Richmond Fire Department is 4.1 miles away.

As is the case for the Albertsons Site, there is no community or senior center within walking distance from the Mayfair Site. *St. Johns Senior Center*, 0.6 mile away and the closest, opens only one day a week to offer various fitness/exercise/dance classes, Spanish language classes, a lunch program, and a limited range of health screening/information services for seniors. *Booker T. Anderson Community Center*, located 1.1 miles away in Richmond, offers: various fitness/exercise programs for adults; performing arts and a sports/academics/arts program for pre-school youth; and afterschool programs for children aged 3-14, including homework assistance/academic assignment, team/leadership building, computer classes, and sport programs such as basketball, boxing, and aikido. Housed in a spacious building adjacent to Booker T. Anderson Park—the large recreational park of highest-quality in the area (See Parks and Trail section)—the Center is also rich in its programming and serve a diverse clientele, but it is not easily accessible by public transit. *Open House Senior Center* is 1.6 miles away and accessible by public transit (via bus routes 72, 72M, 72R, and 667). *El Cerrito Community Center*, 1.5 miles away, offers a variety of programs for youth and adults, but it is difficult to access by transit because AC transit services on the routes that serve that location—668 and 675—are less frequent and provided in limited hours.

Public services are easily accessible from the Mayfair Site. El Cerrito City Hall, a post office, and the El Cerrito Fire Department are all within a half-mile radius.

Given the proximity to the Mayfair Site, much of the information provided above for the Mayfair Site applies to the Target Site, although the latter appears to be located even in closer proximity to public services. *St. Johns Senior Center* is located within a half mile, although given that this center is open only one day a week for a limited range of activities for senior citizens, the proximity to this center may not be a clear advantage to most residents who would live at the Target Site. In addition to the City Hall and the Fire Department, two post offices and at least one church are within a half-mile from the Target Site.

*Potential Health Impacts*

With the exception of a senior center close to the Target Site, there are no community or senior centers within 0.5 mile of each potential housing site. Still, all three sites have easy access to community or senior centers offering a wide variety of programs/services via mass transit. Provided that the residents would use transit to visit them, these centers may provide physical and mental health benefits associated with using them. However, seniors with physical and health conditions that discourage them to use public transit may not be able to use community or senior centers on a regular basis, which can worsen their social isolation, feelings of loneliness, and inactiveness.

Due to close proximity to post office(s), the city hall, and at least one church, housing at the Mayfair and Target Sites would be more conducive than the Albertsons Site to physical activity by residents, and allow them to organize their personal lives more efficiently (and thus helping to reduce stress) by providing easy access to public services.

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Standards and Thresholds for Significance

Applicable regulatory standards do not exist for the location and density of community centers. The voluntary HDMT development targets advise that a development project be within a half-mile of the community centers, including culturally specific organization centers, arts and cultural centers, recreation centers, training and employment centers, senior centers and teen centers. Another development target it sets is that a development is within a half-mile of an area that has 8 out of the following 11 common public services that contribute to neighborhood completeness: elementary school; public art or performance space; public library; childcare/daycare; community garden; hospital and public health clinic; open spaces; neighborhood/regional parks of 1/2 acre or more; post office; recreational facility.<sup>75</sup>

Recommendations for Protecting and Promoting Health

To increase access to community or senior centers by seniors living at the Mayfair or Target Sites, arrangements can be made so that the *St. Johns Senior Center* can be open more than one day a week. The City of El Cerrito could provide funding for this and/or solicit participation by volunteers to increase the administrative or programmatic capacity of the Center.

To increase access to public services from the Albertsons Site, a post office could be created in a location close to that site.

*Pedestrian Safety and Quality*

Transportation and land use patterns can have beneficial effects on health by encouraging physical activity and walking for leisure.<sup>76</sup> A “walkable” or “complete” neighborhood, characterized by mixed residential and commercial uses with easy access to a variety of food and retail options, parks and open space, and modes of transport, can lead to more exercise and less obesity by significantly reducing the need to drive.<sup>77</sup> Lower traffic volumes and speeds tend to correlate with a perception of safety for pedestrians, and this perception often leads to more outdoor activities in the neighborhood.<sup>78</sup> Other traffic variables that encourage walking on streets include: traffic calming measures; street connectivity; access to public spaces; well-maintained and well-lit sidewalks; traffic conditions that encourage maximum pedestrian visibility to drivers; safety from crime; and the presence of well-marked bike lanes.<sup>79 80 81</sup> In turn, it is well established that physical activity can prevent obesity, diabetes, and heart disease, reduce stress, improve mental health, and promote longevity.<sup>82</sup>

In spite of the many health benefits gained by active transportation, the risk of collisions with vehicles is an undeniable health hazard for pedestrians. In the United States in 2007, 4,654 pedestrians were killed in traffic crashes and 70,000 were injured.<sup>83</sup> Nearly one out of every five children ages 5 to 9 years who died in traffic were pedestrians. Child pedestrians are at a higher risk for injuries than adults due to their smaller size, inability to judge distances and speeds, and lack of experience with traffic rules.<sup>84</sup> Seniors are also at a greater risk: due to weaker physical resilience, pedestrians ages 65 and older are two to eight times more likely to die than younger people when struck by motor vehicles.<sup>85</sup>

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Existing Conditions

As a main thoroughfare traversing the cities of San Pablo, Richmond, El Cerrito, Berkeley, Albany, and Oakland, and with close proximity to Interstate 80, San Pablo Avenue is characterized by high volumes of vehicle traffic. Near the three Opportunity Sites, many pedestrians and cyclists also use San Pablo Avenue to access the Del Norte BART station, bus routes, retail outlets, and the Ohlone Greenway. Vehicles, pedestrians, and cyclists are in constant contact.

The following table presents pedestrian and bicycle collisions in the vicinity of the three opportunity sites in the ten-year period between 1997 and 2006. These and other collisions that occurred nearby in the same 10-year period are portrayed on Figures 9 and 10 below.

**Table 8. Pedestrian and Bicycle Collisions within a ½ Mile from Opportunity Sites**

<b>Collision Type</b>	<b>Distance</b>	<b>Albertsons Site</b>	<b>Mayfair Site</b>	<b>Target Site</b>
Pedestrian	¼ mile	1	5	4
	½ mile	4	7	10
Bicycle	¼ mile	1	1	1
	½ mile	4	2	4

Figure 9. Pedestrian Collisions Within Study Area

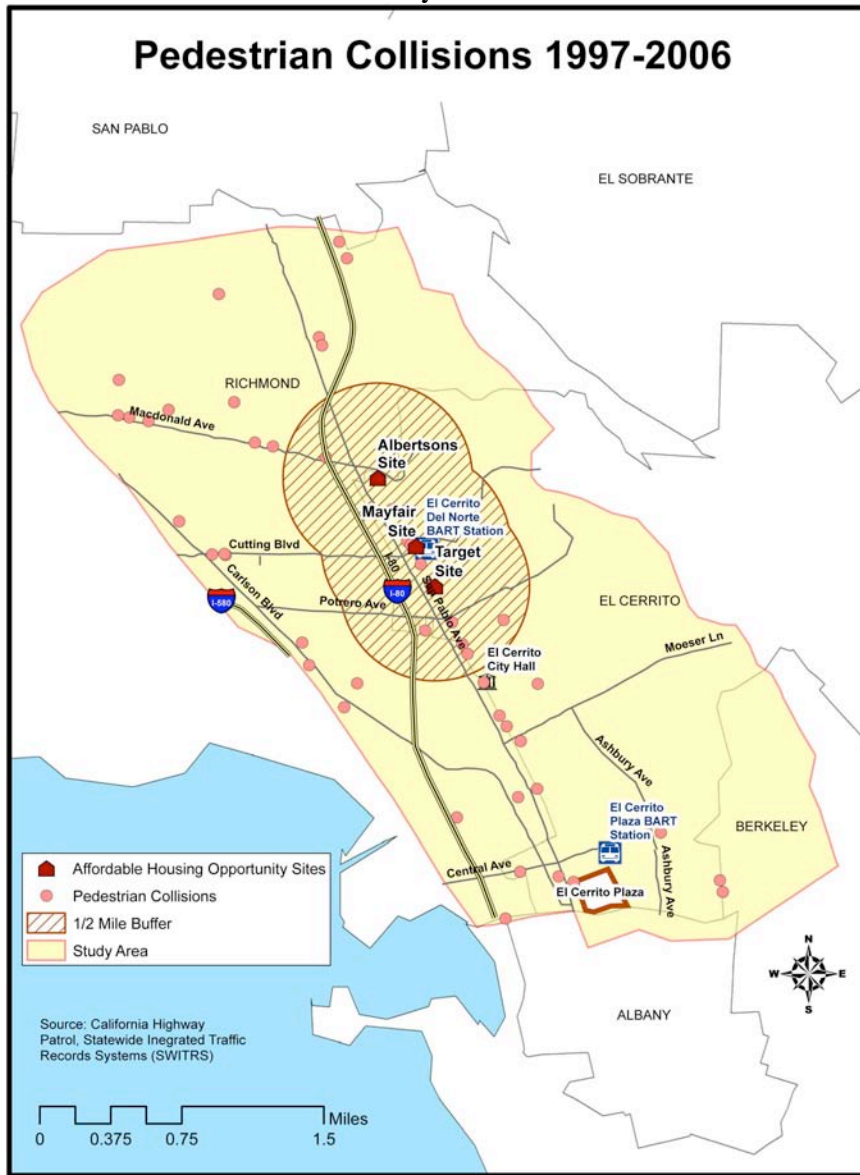
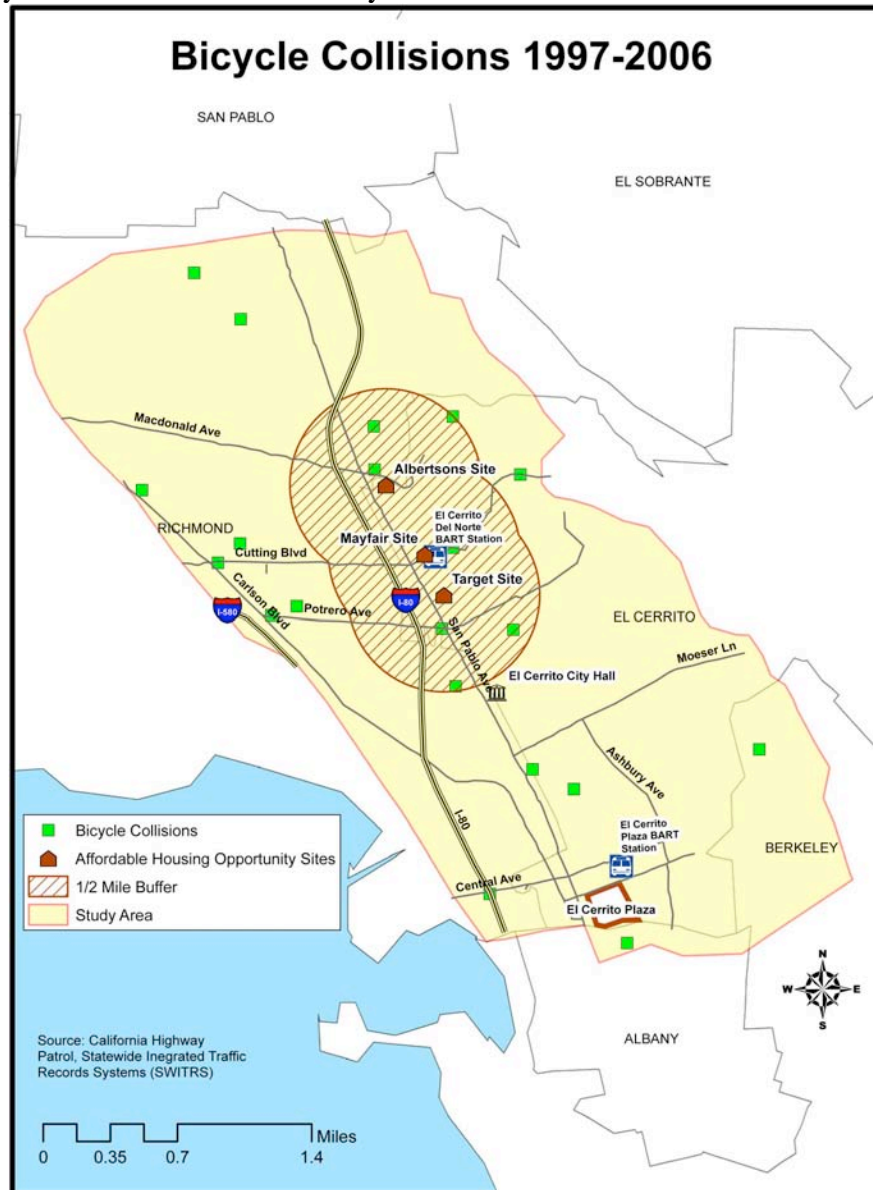


Figure 10. Bicycle Collisions Within Study Area



Most pedestrian collisions occurred on San Pablo Avenue, while bicycle collisions were more spread out throughout the study area.

The Pedestrian Environmental Quality Index (PEQI) is used to quantitatively summarize street and intersection environmental factors known to affect people's travel behaviors.<sup>86</sup> With a formula developed by San Francisco Department of Public Health (SFDPH), the following indicators are used to judge pedestrian quality.

**Table 8. Indicators used to Judge Pedestrian Quality**

<b>PEQI Indicators</b>				
<u>Intersection Safety</u>	<u>Perceived Safety</u>	<u>Traffic</u>	<u>Street Design</u>	<u>Land-Use</u>
Crosswalks	Illegal graffiti	Number of vehicle lanes	Width of sidewalk	Public art/historical sites
Ladder crosswalks	Litter	Two-way traffic	Sidewalk impediments	Restaurant and retail use
Countdown signal	Lighting	Vehicle speed	Large sidewalk obstructions	
Signal at intersection	Construction sites	Traffic volume	Presence of curb	
Crossing speed	Abandoned buildings	Traffic calming features	Driveway cuts	
Crosswalk scramble			Trees	
No turn on red			Planters/gardens	
Traffic calming features			Public seating	
Additional signs for pedestrians			Presence of a buffer	

To assess existing pedestrian environmental quality in the vicinity of the three potential housing sites, PEQI field observations were made on November 13, 2008, and data were subsequently analyzed by SFDPH staff. Figures 11 through 20 depict separate PEQI characteristics. Scores are identified with colors and classified within the following range:

- Ideal pedestrian conditions exist
- Reasonable pedestrian conditions exist
- Basic pedestrian conditions exist
- Poor pedestrian conditions exist
- Environment not suitable for pedestrians



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Figure 11. Total PEQI Scores – North and West Sides of Streets

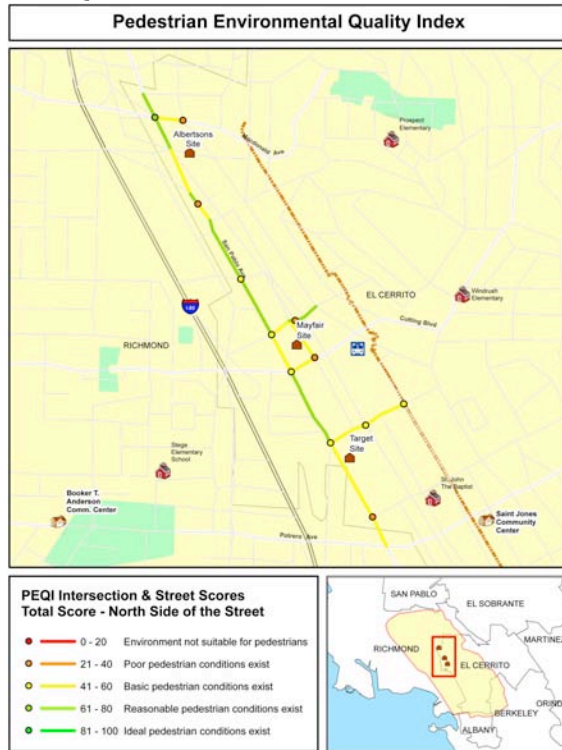
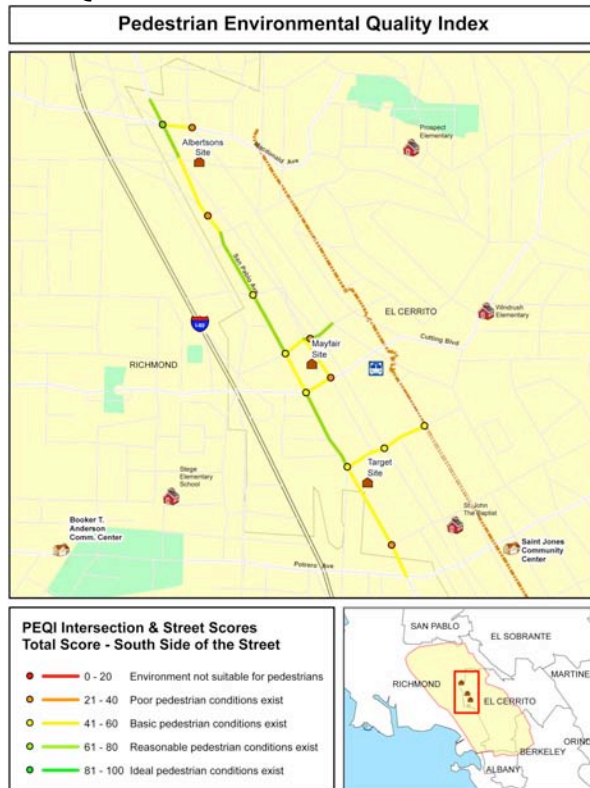


Figure 12. Total PEQI Scores – South and East Sides of Streets



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Figure 13. Street Design PEQI Scores – North and West Sides of Streets

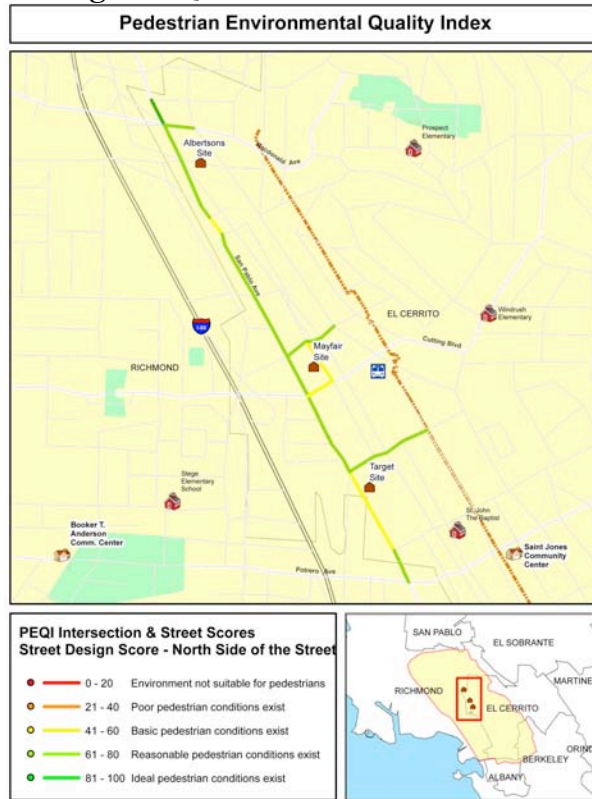


Figure 14. Street Design PEQI Scores – South and East Sides of Streets



Figure 15. Traffic PEQI Scores – North and West Sides of Streets



Figure 16. Traffic PEQI Scores – South and West Sides of Streets

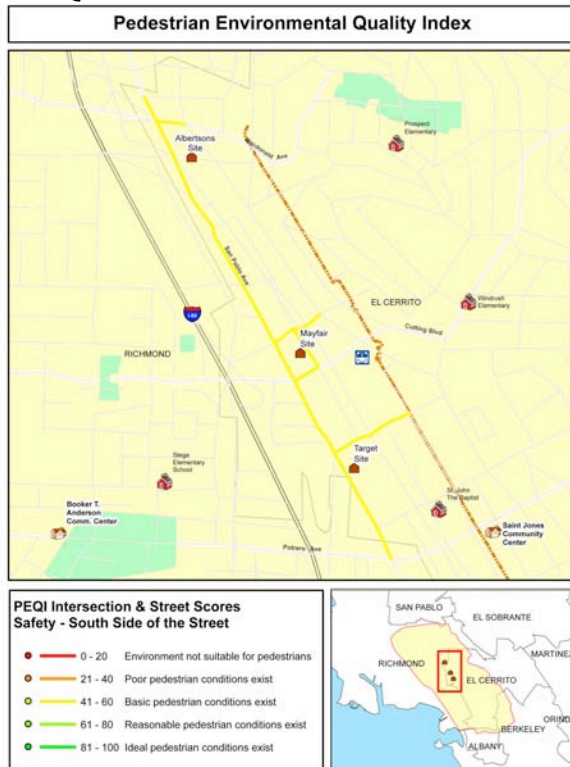


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Figure 17. Safety PEQI Scores – North and West Sides of Streets



Figure 18. Safety PEQI Scores – South and East Sides of Streets



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Figure 19. Land-Use PEQI Scores – North and West Sides of Streets



Figure 20. Land-Use PEQI Scores – South and East Sides of Streets



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Total PEQI scores for north/west and south/east sides of the streets are shown on Figures 11 and 12. They indicate that basic pedestrian facilities exist near all three sites, with the exception of five intersections throughout the study area that received worse scores (poor or unsuitable pedestrian conditions).

Scores for *street design* features shown on Figures 13 and 14 indicate that streets around all three sites have mostly basic and reasonable design features for pedestrians. The block of San Pablo Avenue north of Macdonald Avenue is even classified as ideal. Figures 15 through 18 show that *traffic* characteristics and *safety* conditions are generally classified as basic around all three sites.

Figures 19 and 20, which show scores based on *land-use* features, depict that streets in the vicinity of the Mayfair and Target sites do not have adequate access to retail stores, restaurants, or artistic/historical resources. The analyzed streets directly adjacent to these two sites received the worst possible scores. The Albertsons Site received slightly higher scores in this category, although improvements in access to resources are needed around this site too.

Another indicator of pedestrian safety that is not incorporated into the PEQI is the presence versus absence of unsignalized marked crosswalks. Marked crosswalks unaccompanied by traffic signals on high volume roadways have been found to be associated with higher pedestrian crash rates than intersections without marked crosswalks.<sup>87</sup> Community members consulted about the HIA results confirmed this danger. Within this analysis, unsignalized marked crosswalks were observed on San Pablo Avenue in the vicinity of the Opportunity Sites. In the absence of additional improvements such as installing traffic and pedestrian signals, providing raised medians, or implementing other speed-reducing measures, these intersections could represent pedestrian hazards.

### *Standards and Thresholds for Significance*

The U.S. Department of Health and Human Services (USDHHS) establishes national health objectives known as Healthy People 2010.<sup>88</sup> Objectives for vehicle injuries to pedestrians are that there are no greater than 19 non-fatal vehicle injuries per year per 100,000 people, and no greater than 1 fatal vehicle injury per year per 100,000 people.

Healthy People 2010 objectives for physical activity are to increase proportions of trips made by walking and bicycling. A Healthy People 2010 objective related to reducing obesity and overweight is to increase the number of adults who engage in regular, preferably daily, moderate physical activity for 30 minutes per day.

The five goals of the Contra Costa Countywide Bicycle and Pedestrian Plan<sup>89</sup> are: to expand, improve and maintain facilities for bicycling and walking; to improve safety for bicyclists and pedestrians; to encourage more people to bicycle and walk; to support local efforts to encourage walking and bicycling; and to plan for the needs of bicyclists and pedestrians.

### *Potential Health Impacts*

With regards to pedestrian-vehicle collisions, within the ten-year period studied, the Albertsons Site had the lowest number of collisions within a ¼-mile and ½-mile radius. This data suggests that for pedestrians, there may be a lower risk of collisions with vehicles around this site compared to the other two Opportunity Sites. In addition, of the three potential housing sites, land-use PEQI scores

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were highest near the Albertsons Site, which indicates better access to retail and other resources that encourage physical activity and are important for well-being.

There were not significant differences between the sites in terms of bicycle-pedestrian collisions. There was one bicycle-vehicle collision within each of the ¼-mile radius of all three sites. The Mayfair Site had two bicycle-vehicle collisions within a ½-mile radius, while the Albertsons and Target Site each had four.

Many characteristics measured in the PEQI assessment were identified as inadequate in the vicinity of all three sites. The assessment indicated that all sites would benefit from improvements in pedestrian quality such as traffic calming features, lower vehicle speeds, pedestrian-scale lighting, bike lanes, and access to retail stores and other resources. If streets and intersections around all three Opportunity Sites were perceived as safer, were more aesthetically pleasing, and included more retail, community, and educational resources for pedestrians, they may be more conducive to physical activity and its many associated health benefits.

In a meeting with community members presenting preliminary results of the HIA, residents underscored several pedestrian concerns, such as: a ‘mismatch’ between posted speed on San Pablo and the speed the road was built for (the presence of wide lanes and absence of parallel parking in certain places encourages high speeds); a need for more crosswalks in general, specifically at highly congested intersections; and a need for pedestrian level lighting, specifically behind El Cerrito City Hall.

To supplement the San Pablo Ave Area Plan, as of August 2009 a request for proposals has been released for streetscape improvement, with the intention of implementing traffic calming, pedestrian improvements, and beautification that will improve pedestrian quality in the region.

New housing, retail, and other developments on San Pablo Avenue will increase the numbers of both pedestrians and vehicles. While pedestrians and bicyclists of all income levels are expected to increase due to the presence of a nearby transit station, lower-income people are more likely than higher-income people to walk rather than drive. Therefore, without mitigations, development of any of the three Opportunity Sites will place a high proportion of lower income people into an area with known traffic hazards such as crosswalks at unsignalized intersections.

*Recommendations: Mitigating Negative Health Effects*

To improve pedestrian and bicycle quality and safety, traffic calming features (i.e., curb extensions, speed tables, speed bumps, roundabouts, and speed limit enforcements) should be implemented at all sites as part of the streetscape improvement plan that both cities have funded. Marked crosswalks at non-signalized intersections should either be removed or signals should be added to ensure safe pedestrian crossings. To improve safety, pedestrian-level lighting should be included as part of streetscape improvements. The cities should use results from the PEQI and pedestrian/bicycle collision analysis in this HIA to guide the streetscape improvements. A bike lane should be constructed all along San Pablo Avenue within the SPASPA. To encourage biking at the affordable housing sites, outdoor secured bike parking should be provided to residents. The recommendations provided above for retail completeness may also support pedestrian safety.

### *Environmental Noise*

Noise is unwanted sound. Noise is characterized by pitch or frequency and loudness. Pitch refers to the quality of the tone (high versus low) and is measured by the frequency or length of sound waves. Loudness refers to the intensity of a sound measured by the amplitude of the sound wave. Noise loses energy as it moves away from the source, causing a reduction in measured and perceived sound intensity. Each doubling of distance from a single point source of noise results in a 6 decibel reduction in the noise level.

Measurement of sound intensity corrects for the way the human ear de-emphasizes low and very high frequencies (called the A-weighted scale). A decibel (dB) is a unit of measurement based upon a logarithmic scale indicating the relative intensity of a sound. Audible changes in noise levels generally refer to changes of 3 dB or more. An increase of 10 dB represents a 10-fold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense. Noise levels are typically averaged over time. For example, the day-night average level (Ldn) is the A-weighted time varying equivalent sound level (Leq) over a 24-hour period, with a 10 dBA penalty applied to noise occurring in night-time hours from 10:00 pm to 7:00 am.

Factors contributing to urban noise are vehicle volume, type, and speed, as well as road conditions and mechanical equipment. The health impacts of environmental noise depend on the intensity of noise, the duration of exposure, and the context of exposure. Long-term exposure to moderate levels of environmental noise can adversely affect sleep, school and work performance, blood pressure and cardiovascular disease.<sup>90</sup> Increasing community noise, including traffic noise, also increases the risk of myocardial infarction.<sup>91</sup> Chronic road noise can affect cognitive performance of children including attention span, concentration and remembering, poorer reading ability, and poorer discrimination between sounds.<sup>92</sup> The combination of noise and poor quality housing has been associated with higher stress and stress hormone levels.<sup>93</sup>

#### Existing Conditions

According to the El Cerrito General Plan Noise Element,<sup>94</sup> the major noise sources in the city are vehicular and rail traffic. One resident noted that a helicopter landing pad for taking patients to a trauma unit is a new source of environmental noise in Richmond. This source was not analyzed in this HIA. Vehicular traffic noise is greatest along I-80 and San Pablo Avenue. BART trains are another significant contributor to environmental noise in the city. BART noise is episodic. After entering or leaving the Del Norte BART Station, BART trains produce maximum noise levels typically in the range of 72 to 76 dBA. Further away from the station, where BART trains travel faster, maximum noise levels typically range from 75 to 80 dBA. Residents also complain about BART noise where the tracks curve in the northern end of the City.<sup>95</sup>

Table 9 shows existing (1998) and projected (2020) noise levels for BART, I-80 and San Pablo Avenue as provided in the General Plan. Although this previous analysis suggests noise levels will decrease (hence larger contour distances for given noise levels) in 2020, it projects that development along San Pablo Avenue may result in increased exposures of future residents to high levels of local arterial, freeway traffic, and BART noise.



**Table 9. Existing and Buildout Noise Contour Distances**

Interstate 80 with Soundwalls	
Ldn (dB)	Distance from Centerline (feet)
70	140
65	320
60	1100

Source: Illingworth & Rodkin, Inc., 1999

Interstate 80 without Soundwalls	
Ldn (dB)	Distance from Centerline (feet)
80	150
75	400
70	1200
65	3000
60	6500

Source: Illingworth & Rodkin, Inc., 1999

BART (Existing and Projected)	
Ldn (dB)	Distance from Centerline (feet)
70	30
65	150
60	320

Source: Illingworth & Rodkin, Inc., 1999

San Pablo Avenue (Existing and Projected)		
Ldn (dB)	Distance from Centerline (feet)	
	Existing	General Plan Buildout
70	45	55
65	140	175
60	300	380

Source: Illingworth & Rodkin, Inc., 1999

Health Impact Analysis

To evaluate potential noise exposures and corresponding health impacts at three potential affordable housing sites in the project area, we used a combination of traffic noise modeling and mapping of existing BART noise contours to assess noise levels at these sites. Traffic conditions along San Pablo Avenue were recently assessed in the San Pablo Avenue Specific Plan,<sup>96</sup> which we used to model traffic noise impacts. These data consist of relatively recent peak hour traffic measurements taken in 2007. We assumed that the major traffic-related noise sources would be I-80, San Pablo Ave., and arterials crossing San Pablo Ave. (MacDonald Ave., Cutting Blvd., Potrero Ave., and Eastshore Blvd./Hill St.). For arterials that were unmeasured in the San Pablo Ave Specific Plan (Potrero Ave. and MacDonald Ave.) we assumed that the average from the measured arterials crossing San Pablo Ave. near our sites may be used as an estimate for the unmeasured streets. Health impacts associated

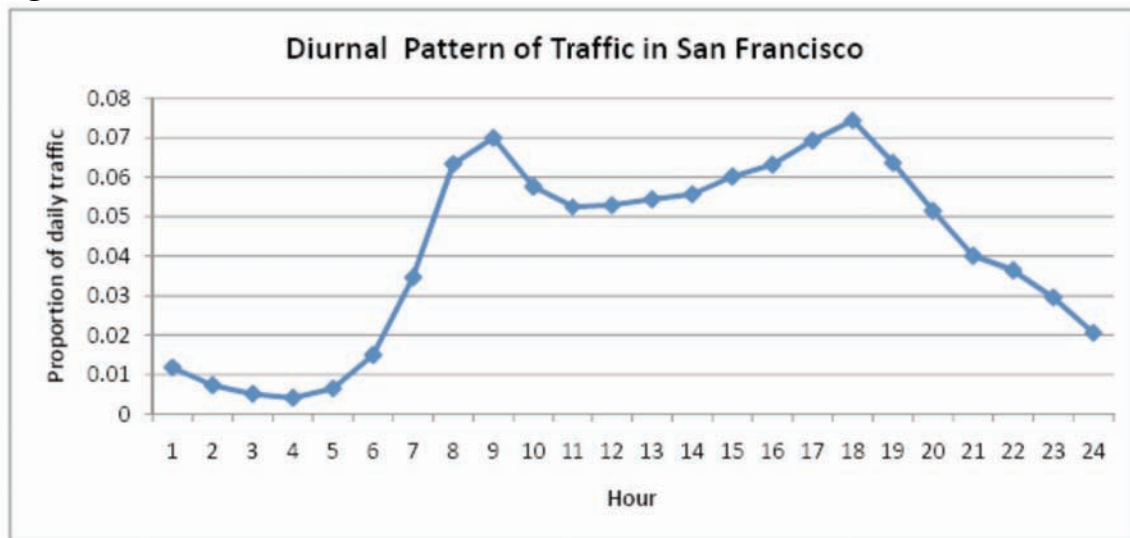
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with sound levels were assessed using well-established relationships between environmental noise and high annoyance.

The San Pablo Avenue Specific Plan provided data on "Heavy Vehicle" percentages. We assumed that Heavy Vehicles listed in the San Pablo Ave Specific Plan consisted of equal numbers of buses, medium trucks, and heavy trucks. Nearly all of the reported Heavy Vehicle percentages were less than 10%, with most lanes reported as 2%. We assumed 3% as a fairly conservative estimate to use for noise modeling. However, we note that a few of the counts in the Specific Plan identified as many as 25% Heavy Vehicles, which suggests that the siting of potential housing projects need to carefully consider common Heavy Vehicle routes.

To assess 24-hour Ldn noise levels we assumed the relationship between AM/PM peaks and the other hours in the day may be approximated by 24-hour traffic patterns for the average neighborhood in San Francisco for which there exists data as shown in Figure 21.

**Figure 21. Diurnal Pattern of Traffic in San Francisco**



Figures 22 and 23 show the proposed housing sites in relationship to freeway I-80 and BART noise contours, respectively. We find little difference between sites with respect to I-80 noise, with all sites falling within the 70 dB freeway noise contour (assuming no sound walls). With respect to BART noise, while portions of the Target and Mayfair sites fall within the 65 dB contour, the Albertsons site only overlaps with the 60 dB contour.

Figure 22. Proposed Housing Sites in relationship to I-80 Noise Contours

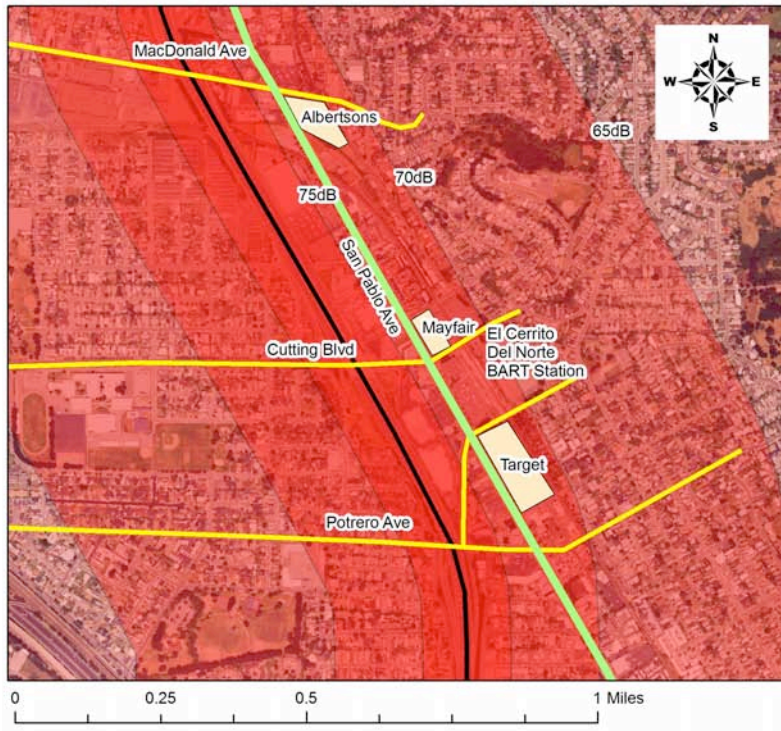
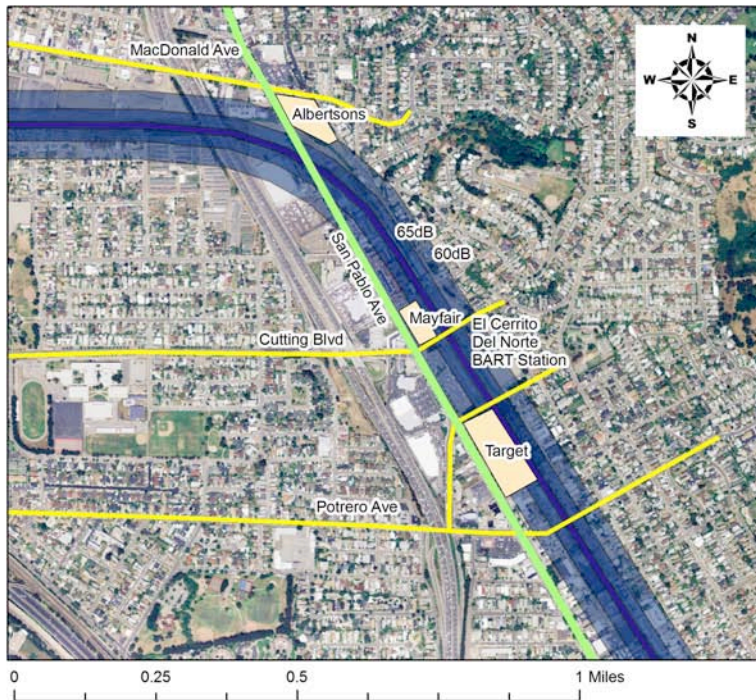


Figure 23. Proposed Housing Sites in relationship to BART Noise Contours



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Table 11 lists the results of applying the Federal Highway Administrations Traffic Noise Model version 2.5 (TNM) to the traffic data. The table also shows the estimated percentage of the population that would be highly annoyed by the traffic noise according to the Miedema and Oudshoorn, 2001 relationship:<sup>97</sup>

$$\%HA = 9.994 \times 10^{-4} (L_{dn} - 42)^3 - 1.523 \times 10^{-2} (L_{dn} - 42)^2 + 0.538(L_{dn} - 42)$$

As there is little difference between sites with respect to exposure from San Pablo Avenue and one cross street arterial, we would expect that without mitigations the risk of high annoyance from noise to be quite high (roughly 14-20% depending on location within the site).

**Table 11. Results of Traffic Noise Model and Annoyance Relationship**

	Peak Hour Traffic		Estimated Peak Hour Noise Levels (dB)*		Estimated 24-hour Noise Levels (Ldn dB)*	Estimated % Heavily Annoyed
	AM	PM	AM	PM		
<b>San Pablo Avenue</b>	1,814	2,287	66.2	67.2	67.4	20.2%
<b>Arterials crossing San Pablo Ave</b>	734	911	62.2	63.2	63.4	14.4%

\* Assuming 25 mph speeds, 10m distances between roadway and receivers, no barriers, and hard surfaces.

Overall, with respect to environmental noise, the Albertsons site may be marginally preferable for development due to the roughly 5 dB difference in BART noise. However, there is little difference between sites with respect to freeway and local arterial noise. Moreover, the difference of 5 dB is smaller than the reductions by 6-14 dBA, which as WHO suggests, is enough to result in subjective and objective improvements in sleep.<sup>98</sup>

*Standards and Thresholds for Significance*

Title 24 of the California Code of Regulations<sup>99</sup> provides for noise insulation standards for residential buildings. The code requires an acoustical study whenever a residential building is proposed near an existing or planned freeway, major roadway, rail line, or industrial noise source and where those noise sources cumulatively produce an outdoor Ldn of 60 dB or higher. Residences must be designed to limit interior noise to no more than a Ldn of 45 dB.

The noise portion of the El Cerrito General Plan lists several implementation policies with regard to noise, including those that require the standard of Ldn of 60 dB for maximum exterior noise level in new residential developments (Policy H3.1) and 45 dB for interior (Policy H3.3).

Richmond's 1994 General Plan Noise Element<sup>100</sup> also includes noise-related policies for residential development, such as: Policy NE-A that discourages development where such development will significantly increase existing noise levels, unless mitigation measures are designed as part of the

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project to limit noise emissions to an acceptable level compared to the existing sound level; and Policy NE-B.2 to support traffic and highway improvements that will lessen noise or alleviate the need for through traffic, especially truck traffic, passing through residential neighborhoods.

Table 10 describes the World Health Organization (WHO) noise exposure thresholds. Sound level standards are much lower for levels inside (30 dB) and outside (45 dB) homes than for commercial (70 dB) and other public areas.<sup>101</sup> At all three opportunity sites, the estimated noise levels are higher than the WHO thresholds for dwellings.

**Table 10. WHO community noise standards and main health effects of concern**

<b>Environment</b>	<b>Health effect</b>	<b>Sound level dB (A)*</b>	<b>Time hours</b>
Outdoor dwellings	Annoyance	50-55	16
Indoor dwellings	Speech intelligibility	35	16
Bedrooms	Sleep disturbance	30	8
School classrooms	Disturbance of communication	35	During class
Industrial, commercial and traffic areas	Hearing impairment	70	24
Music through earphones	Hearing impairment	85	1
Ceremonies and entertainment	Hearing impairment	100	4

Recommendations for promoting and protecting health

A number of noise mitigation strategies can be incorporated into the design of new residential housing projects. These include locating residential uses and other sensitive land uses at a given site in a manner to minimize exposures to environmental noise. Another siting option is building non-vulnerable uses that block noise close to freeways, such as parking garages where people do not spend extended time exposed to noise. Designs that have interior courtyards for public outdoor spaces and patios may reduce noise exposures. Landscaping (such as trees) at the housing sites and incorporation of double paned windows are design features that help mitigate environmental noise. Vehicle traffic calming measures may be taken on cross streets, and BART tracks should be well maintained to reduce noise emissions. Due to the relatively high noise emissions of heavy vehicles, careful consideration of routing such traffic away from (new and existing) residential areas should be considered with new development projects. Adequate noise insulation to achieve indoor noise standards may also reduce noise exposures.

Because all sites are near local arterials with noise levels above 60 dB, and have fairly high estimated risk of high annoyance from traffic noise, a thorough acoustical review and design to prevent exterior and interior sound transmission should accompany proposed residential development at any of these sites. Acoustical reviews should consider the proximity of the sites to BART not only in terms of noise annoyance, but annoyance to vibration which are associated with passing trains. The proximity of the Target and Mayfair sites to the existing BART station may also require consideration of BART horn noise, as well as overly loud broadcasted public announcements at the station.

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Because the noise at any of these project sites may be greatest for the units facing the arterials or BART tracks, there is the potential for environmental injustice if the projects are built as mixed-income development. Members of low income households may be more sensitive to the health impacts and developmental impacts of high environmental noise given that they are likely to face additional environmental stressors (e.g., at work) and may have less ability to control their environments.<sup>102</sup> Therefore, the location of affordable units within these sites should be considered carefully so as to ensure against potential environmental injustices.

*Air Quality*

Air pollutant exposures and their associated health burdens vary significantly within a place or city in relation to sources of air pollution. In most urban areas, roadways are the most important source of intra-urban variation in air pollutant exposure. Engine exhaust, from diesel, gasoline, and other combustion engines, is a complex mixture of particles and gases, with collective and individual toxicological characteristics. Vehicle tailpipe emissions include criteria air pollutants, such as particulate matter and carbon monoxide, ozone precursor compounds, such as nitrogen oxides (NO), and other hazardous air pollutants (e.g., air toxics) not regulated by the US Environmental Protection Agency (EPA) as criteria pollutants.

Particulate matter represents a heterogeneous group of physical entities.<sup>103</sup> Based on toxicological and epidemiological research, smaller particles and those associated with traffic appear more closely related to health effects.<sup>104</sup> Collectively, exposure to fine particles is strongly associated with mortality, respiratory diseases and lung development in children, and other endpoints such as hospitalization for cardiopulmonary disease.

Motor vehicles also emit air toxics. EPA has identified six priority mobile source air toxics, including benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, naphthalene, and diesel exhaust. Similarly, the California Air Resources Board (CARB) has identified 10 air toxics of concern, five of which are emitted by on-road mobile sources: benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and diesel PM.<sup>105</sup> Mobile source air toxics are known or suspected to cause cancer or other serious health or environmental effects. Benzene is of particular concern because it is a known carcinogen and most of the nation's benzene emissions come from mobile sources. Diesel exhaust particulate matter (DPM) is a toxic air contaminant and known lung carcinogen resulting from combustion of diesel fuel in heavy-duty trucks and heavy equipment.

Air quality research consistently demonstrates that air pollutant levels are significantly higher near freeways and busy roadway. A recent meta-analysis, based on 33 exposure studies and four pollutants; carbon dioxide, nitrogen oxides, particulates and ultra fine particulates found significant spatial difference exist in multiple traffic related pollutants relative to proximity to busy roadways.<sup>106</sup>

Epidemiologic studies have confirmed that vehicle traffic proximity results in human impacts. Studies have consistently demonstrated that children living in proximity to freeways or busy roadways have poorer respiratory health outcomes.<sup>107</sup> In Oakland California, children at schools and residences in proximity to high volume roadways experienced more asthma and bronchitis symptoms.<sup>108</sup> In a study conducted in 12 southern California communities, children who lived with 500 meters of a freeway had reduced growth in lung capacity relative to those living greater than 1,500 meters from the freeway.<sup>109</sup>

**Table 12. Air Pollutants and Pollutant Mixtures with Important Motor Vehicle Sources<sup>110</sup>**

	<b>Air Pollutant</b>	<b>Source</b>	<b>Health Effects</b>
<b>Criteria Pollutants</b>	<b>Ozone</b>	Tropospheric ozone is formed in the atmosphere from chemical transformation of certain air pollutants in the presence of sunlight. Ozone precursors include vehicles, other combustion processes and the evaporation of solvents, paints, and fuels	Ozone causes eye irritation, airway constriction, and shortness of breath and can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema.
	<b>Carbon Monoxide (CO)</b>	Produced due to the incomplete combustion of fuels, particularly by motor vehicles	Exposure to high concentrations of CO reduces the oxygen-carrying capacity of the blood resulting in fatigue, impaired central nervous system function, and induced angina.
	<b>Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>)</b>	Diverse sources including motor vehicles (tailpipe emissions as well as brake pad and tire wear, wood-burning fireplaces and stoves, industrial facilities, and ground-disturbing activities	Impaired lung function, exacerbation of acute and chronic respiratory ailments, including bronchitis and asthma, excess emergency room visits and hospital admissions, pre-mature arteriosclerosis, and premature death.
	<b>Nitrogen Dioxide (NO<sub>2</sub>)</b>	Combustion processes in vehicles and industrial operations	Increase the risk of acute and chronic respiratory disease and reduce visibility.
	<b>Sulfur Dioxide (SO<sub>2</sub>)</b>	Combustion of sulfur-containing fuels such as oil, coal, and diesel	Increased risk of acute and chronic respiratory.
<b>Non-criteria Pollutants</b>	<b>Diesel exhaust</b>	Diesel engines	Probable human carcinogen (IARC Group 2A) Diesel engines also emit particulate matter criteria pollutants produced through combustion.
	<b>Benzene</b>	Gasoline engines	Known human carcinogen (IARC Group 1A)
	<b>1,3 butadiene</b>	Motor vehicle engines	Probable human carcinogen (IARC Group 2A)
	<b>Benzo(a) pyrene</b>	Motor vehicle engines	Probable human carcinogen (IARC Group 2A)

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*Existing Conditions & Potential Health Impacts*

***Methodology***

The comparative air quality analysis of the three housing opportunity sites focused on differences in annual average concentrations of particulate matter less than 2.5 microns in aerodynamic diameter (PM 2.5) attributable to roadway emissions. As discussed above, we focused on PM 2.5 because of the strong epidemiological relationships between PM 2.5 and adverse health outcomes and because PM 2.5 was likely to best reflect the variation in air quality among the three sites. Review of the planning area did not suggest important point sources of PM 2.5.

There are a variety of methods to measure PM concentrations, such as pollutant monitoring, land use regression, interpolation, and dispersion analysis.<sup>111</sup> For this air quality analysis, we used the EPA-approved dispersion model CAL3QHCR to assess the spatial extent of vehicle emissions at the three housing opportunity sites.<sup>112</sup>

Inputs for the CAL3QHCR model include meteorological conditions, traffic volumes (average vehicles per hour based on estimated average annual daily traffic), and PM 2.5 emissions factors. We considered emissions from vehicles on high volume roadways (e.g. San Pablo and I-80) within the vicinity of all three housing sites. We ignored emissions from other local streets, as they were unlikely to contribute to important variation among sites. One year of meteorological data was used provided by the Bay Area Air Quality Management District from the U.C. Berkeley Richmond Field Station in Richmond, CA. This site was selected because it represents the general pattern of wind we would expect at all three housing sites. Vehicle emission concentrations were determined using EMFAC 2007, the California Air Resource Board emission model, for the County of Contra Costa. Average Annual Daily Traffic (AADT) counts were downloaded from the California Department of Transportation website for Interstate 80 and State Road 123 (San Pablo Avenue). These specific traffic counts were used because the air quality model requires average annual hourly traffic counts compared to AM/PM peak provided in the San Pablo Ave Specific Plan. The model does not take into account traffic volumes on cross street running through San Pablo Ave, therefore PM 2.5 concentration could be slightly higher around each housing site.

From the San Pablo Ave Specific Plan Appendix, at San Pablo Avenue intersections, most heavy vehicle (bus, medium truck, and heavy truck) percentages are <10%, with most lanes reported as 2%. We assume 3% is a fairly conservative estimate to use for air quality estimates on San Pablo Avenue and Interstate 80. We assume heavy vehicles listed in the San Pablo Ave Specific Plan consist of equal numbers of buses, medium trucks, and heavy trucks. In some cases we noticed high heavy vehicle percentages up to 25% on San Pablo Avenue. Because heavy vehicles have relatively higher PM 2.5 emission concentrations than automobiles, we decided to consider a separate analysis (25% heavy vehicles) for cases in which some streets might have significantly higher heavy vehicle traffic.

Based on regulatory health impact assessment methods used by the California Air Resources Board,<sup>113</sup> we calculated the excess mortality associated with roadway-attributable PM 2.5 concentrations as follows:



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- multiplying the estimate of roadway-attributable PM2.5 in ug/m<sup>3</sup> as derived from the CAL3QHCR dispersion model times
- the crude incidence of mortality from non-injury causes times
- the excess relative risk for mortality associated with a unit change in PM2.5

$$\text{Change in Annual Mortality}_{\text{Traffic Attributable PM 2.5}} = (\text{Change in Concentration}_{\text{Traffic Attributable PM 2.5}}) \times (\text{Incidence}_{\text{Non Injury Mortality}}) \times (\text{Relative Risk Per Unit Change in PM 2.5} - 1)$$

The crude death rate for Contra Costa County excluding deaths due to unintentional injuries, motor vehicle crashes, suicides, homicides, and drugs was estimated at 591 per 100,000 population based on the State Department of Public Health profile for the county. We estimated the relative risk (effect measure) of a unit change in PM 2.5 as 1.014, based on the study by Jerrett et al.<sup>114</sup>

*24-Hour Average Hourly Traffic Volume with 3% Heavy Vehicles*

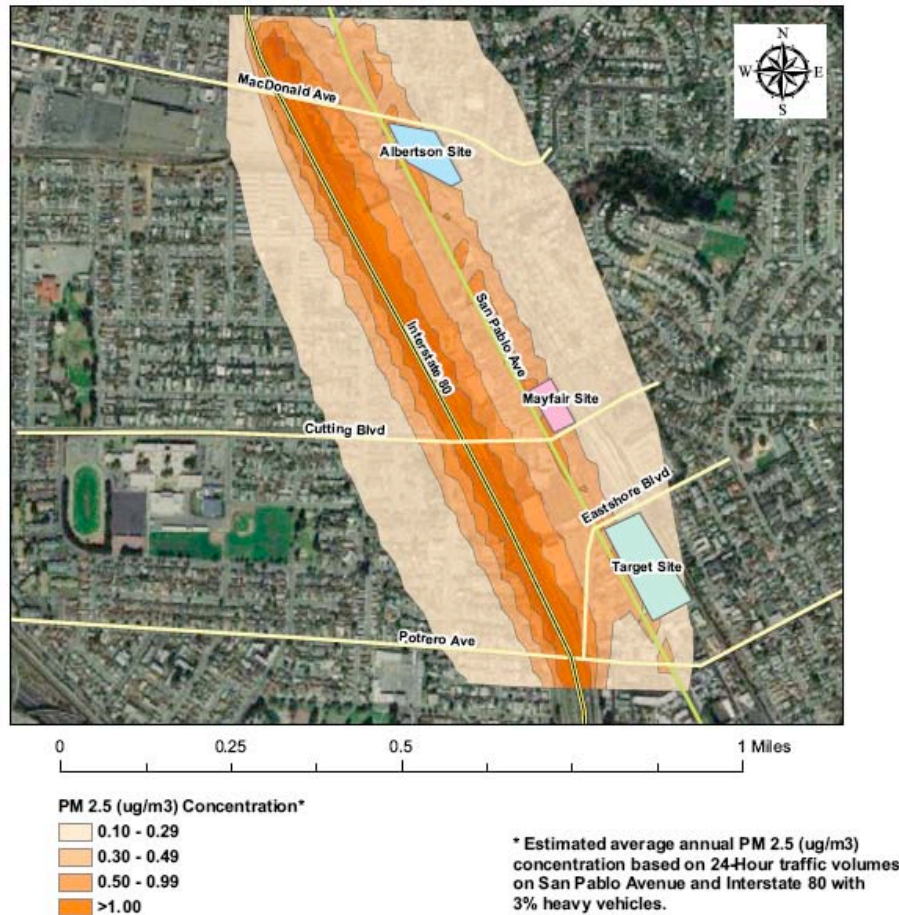
Results indicate high concentrations of PM 2.5 from traffic on San Pablo Avenue and Interstate 80, producing a negative health outcome at each housing site (Table 13). Results of the air quality modeling are also provided in contours and displayed in Figure 24. On average, the PM 2.5 exposure levels were slightly higher at the Albertson site, but all three sites have very similar exposure levels. The health analysis estimates pre-mature mortality per million population at 33 – 41 due to the high traffic volumes in the area. These results do not include additive air quality impacts resulting from vehicle traffic on both San Pablo Avenue and I-80.

The results suggest that the Mayfair and Target sites would have a lower impact on pre-mature mortality compared to the Albertson site, although the difference is comparatively low.

**Table 13. PM2.5 Concentrations and Health Effects Based on 24-Hour Traffic Volumes on San Pablo Avenue and Interstate 80 with 3% Heavy Vehicles**

Potential Housing Sites	San Pablo Ave	Interstate 80	Estimated Annual Daily Average PM 2.5 (ug/m3)	Pre-Mature Mortality Per Million Population
	Traffic Volume/Hour	Traffic Volume/Hour		
Albertson	1,142	8,240	0.45 – 0.50	37 - 41
Mayfair	1,142	8,240	0.40 – 0.45	33 - 37
Target	1,142	8,240	0.40 – 0.45	33 - 37

Figure 24. PM 2.5 Concentration Based on 3% Heavy Vehicles



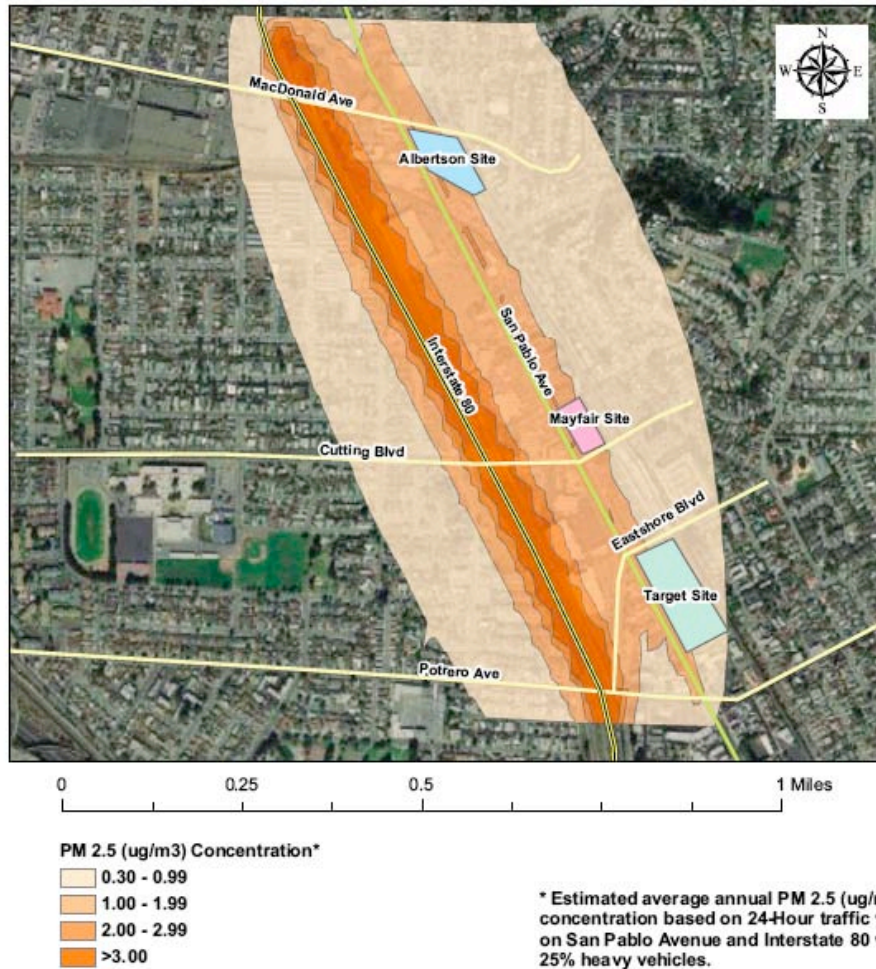
*24-Hour Average Hourly Traffic Volume with 25% Heavy Vehicles*

Results indicate extremely high concentrations of PM 2.5 from traffic on San Pablo Avenue and Interstate 80, producing a negative health outcome at each housing site (Table 14). Results of the air quality modeling are also provided in contours and displayed in Figure 25. Again, on average, the PM 2.5 exposure levels were higher at the Albertson site. Although, the difference in average PM 2.5 concentration from the Albertson site and the other two housing sites is much higher, ranging from 0.35 – 0.50 ug/m3. The health analysis estimates pre-mature mortality per million population at 112 – 157 due to the high traffic volumes in the area.

Table 14. PM2.5 Concentrations and Health Effects Based on 24-Hour Traffic Volumes on San Pablo Avenue and Interstate 80 with 25% Heavy Vehicles

Potential Housing Sites	San Pablo Ave Traffic Volume/Hour	Interstate 80 Traffic Volume/Hour	Estimated Annual Daily Average PM 2.5 (ug/m3)	Pre-Mature Mortality Per Million Population
Albertsons	1,142	8,240	1.85 – 1.90	153 - 157
Mayfair	1,142	8,240	1.35 – 1.40	112 – 116
Target	1,142	8,240	1.50 – 1.55	125 – 128

Figure 25. PM 2.5 Concentrations Based on 25% Heavy Vehicles



Traffic with 25% heavy vehicles is a worst case scenario for annual average daily air quality conditions but implies that exposure to high volumes of heavy traffic is occurring around these sites and should be addressed if any of the housing sites are developed. These results do not include additive air quality impacts resulting from vehicle traffic on both San Pablo Avenue and I-80.

The results suggest that the Mayfair site would have the lowest impact on pre-mature mortality compared to the other two potential housing sites. While the high percent of heavy vehicles inputted into the model may be a high estimate, it confirms that the percent of heavy vehicles is a significant factor, showing how the PM 2.5 concentrations change as the percent of heavy vehicles is increased.

Standards and Thresholds of Significance

No federal or state regulations currently protect sensitive land uses from health effects associated with roadway proximity. However, in 2005, the California Air Resources Board issued guidance on preventing roadway related air quality conflicts, suggesting localities avoid placing new sensitive uses within 500 ft of many freeways.<sup>115</sup> Furthermore, the California Environmental Quality Act (CEQA) requires the examination of potentially significant human health effects associated with environmental change even where the change involves bring people into *proximity* with a known environmental hazard (CCR 15095; CCR 15226.2).

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In the absence of established regulation, good planning and public health practice requires examining environmental hazards and potential health effects on a project-level basis and appropriate avoidance or mitigation. The San Francisco Board of Supervisors recently adopted Article 38 of the Health Code imposing regulations to prevent health impacts from air pollution hotspots created by busy roadways. The rules require developers to screen all residential projects for proximity to traffic and calculate the concentration of particulate matter (PM 2.5) from nearby traffic sources. If levels of traffic-attributable particulate matter at a project site exceed a health based action level, developers are required to incorporate ventilation systems to remove pollutants from outdoor air.

*Recommendations for Protecting and Promoting Health*

Because all housing site locations have roadway-attributable PM 2.5 concentrations sufficient to cause or exacerbate adverse health outcomes, we recommended that each site would have to mitigate impacts on indoor air quality through building design and ventilation. For example, mechanical ventilation and filtration systems could remove 80% of ambient PM 2.5 from indoor air.<sup>116</sup> Action levels, modeling, and mitigations are discussed in the *Department of Public Health's, Assessment and Mitigation of Air Pollutant Health Effects from Intra-urban Roadways: Guidance for Land Use Planning and Environmental Review* and could be considered for these projects.<sup>117</sup>

To decrease air pollution impacts from municipal vehicles, the cities and counties could consider phasing in electric vehicles for municipal use.

***Concentrated Poverty***

Income is one of the strongest and most consistent predictors of health. People with lower incomes are more likely to have chronic mental and physical health conditions, to suffer injuries or violence, and to die prematurely;<sup>118</sup> conversely, earning self-sufficiency income predicts better health, improved nutrition, and lower mortality.<sup>119</sup> Relative poverty, associated with the inability to earn the level of income needed to maintain the customary standard of living,<sup>120</sup> thus is a health risk, especially in areas where living costs are high.

Of particular significance with respect to the health and well-being of lower-income residents, however, is concentrated poverty. This is because the confluence of disadvantages in a highly impoverished area, such as persistent poverty, lack of labor market opportunities, and racial isolation, leads to social disorganization, fundamentally undermining the institutions vital to residents' health and well-being (such as schools, community organizations, and families) and rendering them to suffer from perpetual poverty and social isolation<sup>121 122</sup> and associated negative health outcomes.<sup>123</sup>

One pervasive outcome of concentrated poverty and disadvantages in a highly impoverished area is high prevalence of violence and crimes,<sup>124</sup> as children without beneficial social experiences and preparations for participation in the labor market and other mainstream institutions are more likely to turn to criminal behavior.<sup>125</sup> Violent crime can cause disability and injuries, depression, alcohol abuse, anxiety, post-traumatic stress disorder, and suicidal behavior.<sup>126</sup> Homicide is a leading cause of death for people of color in the United States,<sup>127</sup> and witnessing and experiencing community violence causes longer-term behavioral and emotional problems in youth, such as post-traumatic-

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stress disorder, depressive symptoms, and perpetration of violence.<sup>128</sup> Crime in a neighborhood causes fear, stress, feeling unsafe, and poor mental health for the young and old,<sup>129</sup> and fear of crime limits mobility or physical activity in a neighborhood and inhibits social interactions.<sup>130</sup>

Research has found that much of the effects of concentrated poverty are intertwined with those of racial segregation and that African-American segregated communities typically suffer from much greater concentrations of community disadvantages.<sup>131</sup> However, concentrated poverty is not a unique property of impoverished black communities. It has also been noted that it has differential implications for communities of different racial and ethnic compositions,<sup>132</sup> influencing health independently of racial segregation. Therefore, examining the level of concentrated poverty in the area where each opportunity sites may be located and considering its potential health impacts should be an integral part of an HIA of an affordable housing development project.

*Existing Conditions*

As Figure 26 (below) shows, the Albertsons Site is located in a more impoverished area than the Mayfair or Target sites. According to 2000 Census, 12-18% of the households had incomes below the federal poverty line in much of the half-mile radius surrounding this site. At 9-13%, the unemployment rate was also high in much of this area. In 2000 the median household income of the area within a quarter-mile radius of the Albertsons Site was \$39,565 and that within a half-mile was \$52,825.

Figure 26. Proportion of Population in Poverty Within Study Area

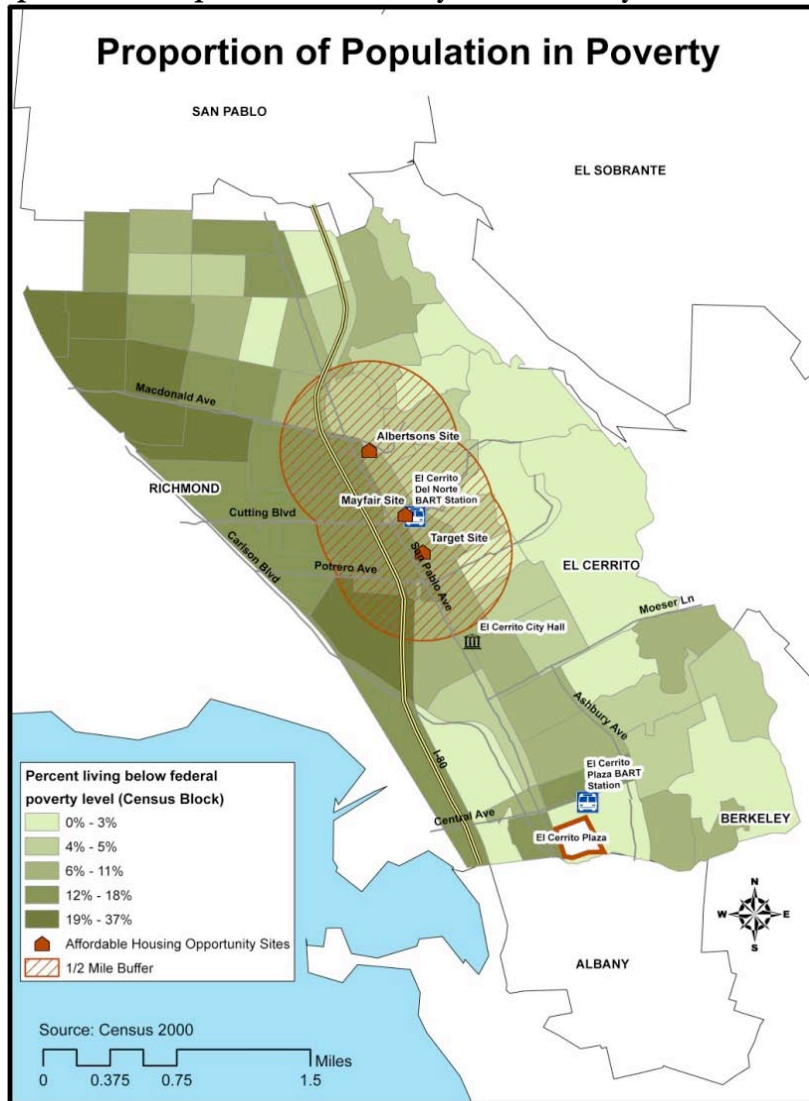
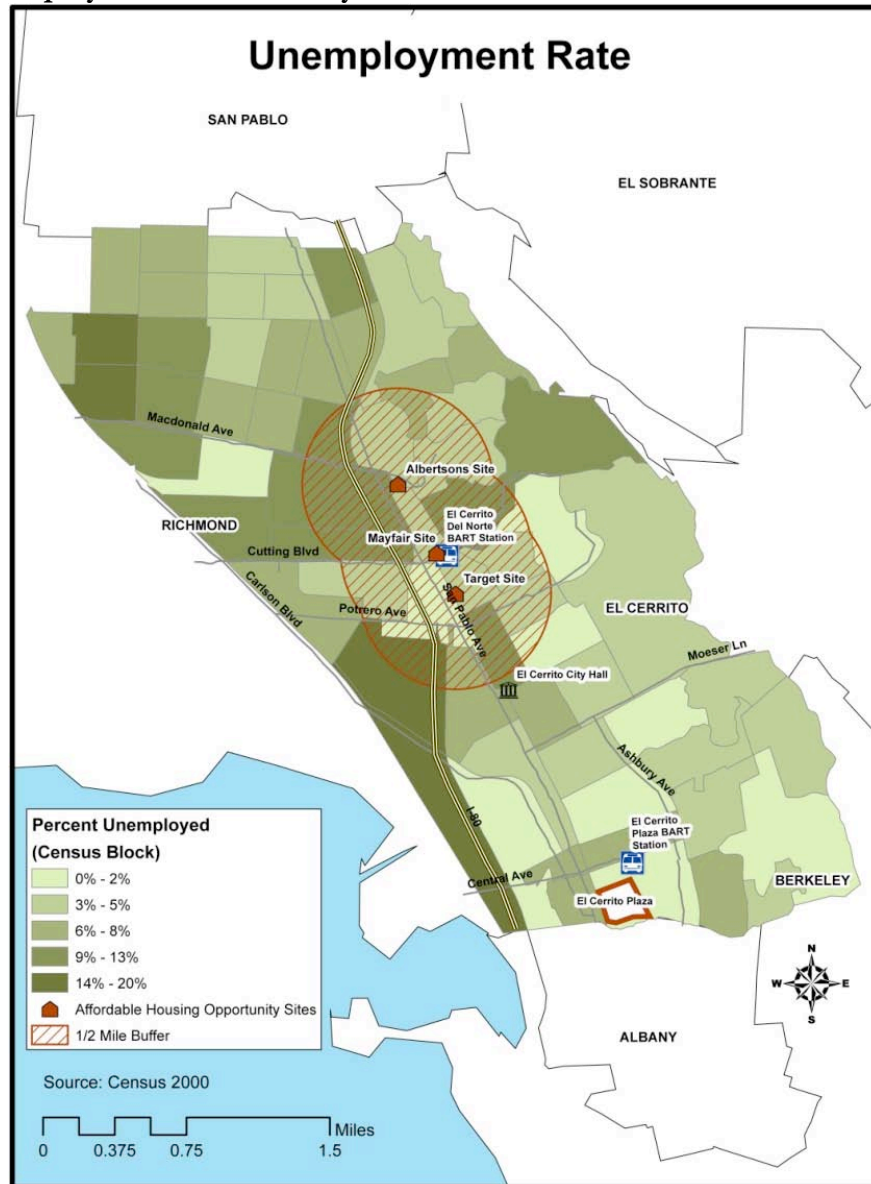


Figure 27. Unemployment Within Study Area



The Mayfair Site is in an area where 6-11% of the households had incomes below the federal poverty line (and thus the level of concentrated poverty was lower), adjacent to two areas where the proportions of households with incomes below the federal poverty line are higher (12-18%) and lower (4-5%). In 2000 the median household income in the area within a quarter-mile of the Mayfair Site was \$54,464 and that within a half-mile was \$56,326—higher than those of the area where the Albertsons Site is located. Unemployment rates in much of this area were also lower than those in the area surrounding the Albertsons Site.

Like Mayfair, the Target Site is located in an area where 6-11% of the households had incomes below the poverty line in 2000 but adjacent to a poorer area where 12-18% of the households lived below the poverty level. At \$60,312 (within a quarter-mile radius) and \$56,558 (with a half-mile

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radius), the 2000 median household incomes were higher in this area than in those surrounding the other two sites. It is located in an area with low unemployment rate (0-2%), though surrounded by areas with somewhat higher rates.

Apparently, the Albertsons Site is located in a more impoverished area than are the Mayfair and Target sites, with potentially greater negative health impacts. Available data also point to higher crime and violence rates in Richmond (where the Albertsons Site is located) than in El Cerrito (where the Mayfair and Target sites are). In 2006, 637 (610 per 1,000) aggravated assaults were reported in Richmond, compared to 50 (211.2 per 100,000) in El Cerrito; 1224 (1181.1 per 100,000) violent crimes were reported in Richmond, compared to 193 (810 per 100,000) in El Cerrito; only 2 (8.4 per 100,000) willful homicides were reported in El Cerrito, compared to 42 (40.5 per 100,000) in Richmond.<sup>133</sup> Although data on morbidity and mortality are by and large unavailable for El Cerrito, these rates are higher in Richmond than in Contra Costa County. For example, 265 deaths per every 100,000 persons due to heart disease were reported in Richmond, compared to 180 in the County; similarly, 37 (per 100,000) diabetes-related deaths were reported in Richmond—a rate almost twice as high as that (19.7) in Contra Costa.

*Potential Health Impacts*

Due to its location in a more impoverished area, an affordable housing development at the Albertsons Site would potentially subject its residents to more violence and crimes and other negative health outcomes associated with them, than would one located at the Mayfair or Target Site. It could also lead the residents to be more sedentary because they would choose to stay indoors in fear of falling victim to crimes. The evidence provided in the existing literature suggests that housing at this site may thus be associated with more adverse health outcomes, both for adults and youth, compared to the alternative sites.

However, the fact that the three sites are located in relative proximity to one another on the same commercial thoroughfare—San Pablo Avenue—may somewhat temper substantial differences in actual health and social effects due to differences in levels of concentrated poverty.

As the discussion in the *Schools* section might make it clear, the more insurmountable effects of concentrated poverty associated with housing at the Albertsons Site may rather be mediated through the schooling available to low-income children living at this site.

*Standards and Thresholds of Significance*

While housing policy in California supports both meeting affordable housing needs and encouraging mixed-income residential development, to our knowledge there are no enforceable or applicable federal- or state-level standards for the goal of addressing concentrated poverty. California Department of Housing and Community Development requires that each jurisdiction plan for meeting a share of the regional housing needs through the Regional Housing Needs Determination process, including those for affordable housing; however, the location and density of affordable housing is not proscribed. Similarly, to help reduce the level of concentrated poverty, Goal 10 of Oregon State's Land Conservation and Development Act requires that plans "encourage the availability of adequate numbers of needed housing units at price ranges and rent levels which are commensurate with the financial capabilities of Oregon households and allow for flexibility of housing location, type and density."<sup>134</sup> Voluntary development targets in the Healthy Development



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Measurement Tool (HDMT)<sup>135</sup>—similarly encourage the reduction in concentrated poverty and mixed income housing.

Recommendations for Protecting and Promoting Health

To help reduce the level of concentrated poverty, especially in the area surrounding the Albertsons site, we recommend that affordable housing occur in the context of a mixed-income development plan for the area.

Furthermore, a mixed-use development creating jobs in such industries that provide a living would help address poverty and unemployment in this area. Occupations in Contra Costa and Alameda Counties that can provide a living wage (i.e., an hourly mean wage that can support a family size of one adult and one child; \$20.82 per hour) are mostly managerial and professional positions, but there are industries that sometimes provide jobs with living wage, such as education; healthcare; social services; and construction.<sup>136</sup>

**IV. Summary: Comparing Affordable Housing Opportunity Sites**

Overall, given the proximity of the three sites located on a 1.2-mile stretch of San Pablo Avenue in El Cerrito, differences in health-relevant area conditions among the sites are not substantial. As Table 15 shows, there are advantages all three sites share. All of them have high access to public transportation and a variety of retail outlets that would allow residents to live relatively comfortably without owning automobiles. All of them are close enough to parks of relatively high quality and to at least one trail. These conditions would encourage the residents to engage in physical activity by actively commuting to work, walking to shops and stores, and enjoying outdoor activities right in their neighborhoods.

**Table 15: A comparison of Affordable Housing Opportunity Sites**

Area		Albertsons Site	Mayfair Site	Target Site
Air quality		Poor	Poor	Poor
Noise level		High	High	High
Transit	Accessibility to transit	High	High	High
Pedestrian Safety and Quality	Pedestrian Safety	Better	Worse	Worse
	Pedestrian Quality	Basic – slightly better	Basic	Basic
Parks & Trails	Number of park(s) within 0.5 mile	4	3	6
	Average rating of parks within 0.5 mile	63	54	59
	Number of trail within 0.5 mile	1	1	1
Concentrated poverty/Violence	Concentrated poverty level	Very high	High/medium	High/medium
	Violence/crime rates	High	Medium/Low	Medium/Low
Schools	Public schools within 0.5 mile	No	No	No
	Student academic performance at Junior & Senior High Schools	Very low	Medium	Medium
Retail	Neighborhood completeness level	Very high	High	High
	Access to full-service supermarket	Yes	No	No
	Access to retail outlets detrimental to health	Low	Medium	Medium
Community or Senior centers/ Public services	Number of community or senior center(s) within 0.5 mile	0	0	1

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At the same time, there are common disadvantages associated with all three sites. None of them has public schools within the distance that may encourage their children to commute actively, bicycling or walking to school. With the exception of the Albertsons Site located within a half mile of a senior center open one day a week, none of them has community or senior centers within a half-mile radius, although this may not be a distinct disadvantage because some of them are easily accessible via public transit—just a few bus stops away on bus routes that operate with 12-20 minute intervals daily. Due to their locations on San Pablo Avenue—the commercial thoroughfare crisscrossing between El Cerrito and Richmond—and in close proximity to freeways with high volumes of automobile traffic on a daily basis, especially I-80, air quality is poor and noise levels are high. The pedestrian and bicycle environment around all three sites is lacking bike lanes, pedestrian-scale lighting, and sufficient pedestrian access to retail stores and other resources; litter and abandoned buildings make the pedestrian environment aesthetically unpleasing. High vehicle speeds and volumes on San Pablo Avenue increase perceived and actual risks of collisions.

Beyond these commonalities, there are differences among the three sites. Below are the unique advantages and disadvantages associated with each site as compared to the others:

*Albertsons Site*

- Somewhat better in air quality and noise, which should still be mitigated to reduce potential health risks
- Close to a wider range of retail outlets, particularly a full-service supermarket
- Relative absence (or a smaller number) of retail outlets detrimental to health, such as liquor stores and fast food restaurants
- Not as accessible to public services such as a post office, city hall, or community/senior center
- Lack of access to high-quality public school education
- Higher prevalence of poverty, crimes, and violence
- Somewhat lower risk of pedestrian-vehicle collisions than other sites

*Mayfair Site*

- Poor air quality and high level of noise
- Absence of a full-service supermarket in close proximity
- Presence of retail outlets detrimental to health
- Easy access to a post office, city hall, and a fire department
- Access to relatively high-quality public school education
- Lower prevalence of poverty, crimes and violence
- Potentially more pedestrian-vehicle collisions in this area given current conditions

*Target Site*

- Poor air quality and high noise level
- Absence of a full-service supermarket in close proximity
- Presence of retail outlets detrimental to health
- Easy access to public services such as a post office, city hall, a fire department, and a senior center

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- Access to relatively high-quality public school education
- Lower prevalence of poverty, crimes and violence
- Potentially more pedestrian-vehicle collisions in this area given current conditions

Some of these potential problems can be more effectively mitigated than others. As discussed above, air quality problems can be mitigated through installing mechanical ventilation with air filtering systems inside residential units. Environmental noise can be mitigated through architectural design, interior noise insulation, vehicle traffic calming, maintenance of BART tracks, and routing large trucks and other heavy vehicles away from residential areas. A safer and higher quality environment for pedestrians and bicyclists could be created by implementing traffic calming features, providing healthy retail stores and restaurants with pedestrian access, and constructing a bike lane along San Pablo Avenue. The absence of a full-service supermarket can be addressed by bringing a farmers market and/or a produce store to a location close to the site. Limited access to public services can be somewhat mitigated by available public transit.

Other health-relevant conditions may be more challenging to address. Public schools of poor instruction and student performance, especially those in an impoverished area infested with violence, crimes, and other social ills, constitute such challenges.

Ultimately, the selection of an affordable housing site will depend in large part on how the community prioritizes different needs and problems. This Health Impact Assessment is intended to help community residents and city planners make a more informed decision about affordable housing locations and land use plans, and optimize health conditions for future residents of the San Pablo Avenue Corridor.

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