CHAPTER 5: ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

This chapter analyzes the potential impacts of the proposed project and suggests mitigation measures for the impacts identified. Long-term effects -- those associated with operation of the project or that result from project right-of-way requirements -- short-term, construction phase impacts, and cumulative impacts are addressed. Discussions are organized by environmental topic area, except that construction phase impacts are discussed together, following the presentation of longer-term effects. In order to avoid repetition, a few environmental issues are addressed primarily in the construction phase impacts section, because their associated effects would derive primarily from construction activities.

NEPA and CEQA incorporate differing provisions affecting identification and mitigation of impacts. CEQA requires identification of impact level of significance in an EIR, whereas NEPA considers level of significance in determining whether or not to prepare an EIS and, once the decision to prepare an EIS is made, reports project impacts without defining level of significance. Similarly, CEQA requires mitigation only for significant adverse impacts, while NEPA allows for mitigation of all of the impacts of a project. This combined NEPA/CEQA document reports all of the impacts of the proposed project, and proposes mitigation wherever practicable to reduce the impacts identified. Chapter 7 provides specific discussion of impact significance and mitigation in accordance with CEQA.

5.1 LAND-USE, WIND, AND SHADOW

This section evaluates long-term land-use, wind and shadowing impacts of the proposed project. Construction-phase impacts are addressed in Section 5.21.

5.1.1 Land Use Impacts

The land use impacts resulting from each of the three project components are considered and compared to the No-Project Alternative. A discussion is also included of the overall effects of the project on neighborhood character and its consistency with existing plans and policies.

5.1.1.1 Transbay Terminal Land Use Impacts

The proposed Transbay Terminal would be located at the site of the existing terminal structure on Mission Street at First, Fremont and Beale Streets, *approximately 150 feet to the west of the present terminal footprint.* The existing Terminal would be demolished and a new multi-modal transit facility would be constructed in its place. There are two alternatives being considered for the new Transbay Terminal: the West Ramp and Loop Ramp Alternative. The main differences between the West Ramp Alternative and the Loop Ramp Alternative are the size of the terminal,

amount of ramp area, and the potential availability of land opened up for new development by removing sections of the existing ramp network.

West Ramp Alternative. Under the West Ramp Alternative, the Transbay Terminal would be one story taller than under the Loop Ramp Alternative, but would be constructed *approximately* on the footprint of the existing terminal, *but about 150 feet to the west. This would result in the terminal structure no longer spanning Beale Street.* The existing ramp segments on the east side of the Transbay Terminal (north of Howard Street, just east of Beale Street, then looping south and west to Essex Street) would be removed. However, the I-80 Fremont Street off-ramp would remain in place west of Fremont Street. Circulation between the Terminal and the Bay Bridge would occur on a ramp segment oriented on a north-south axis. In terms of land use, the West Ramp Alternative would open up new developable area on the blocks south and east of the Terminal at Beale and Howard Streets and Folsom at Beale and Main Streets, and would create opportunities for mid-block pedestrian throughways between towers fronting on Folsom Street or increase the amount of mid-block open space.

Loop Ramp Alternative. Under the Loop Ramp Alternative, the existing ramp segments on the east side of the terminal would be rebuilt in generally the same location and would continue to provide circulation between the Terminal and the Bay Bridge. Thus, in terms of land use, the Loop Ramp Alternative would provide less land area for future new transit-oriented development. When compared with the West Ramp Alternative, the Loop Ramp Alternative would lessen the amount of developable area on the blocks south and east of the Terminal at Beale and Howard Streets and Folsom at Beale and Main Streets, and would possibly limit planned mid-block pedestrian throughways between towers fronting on Folsom Street or decrease the amount of mid-block open spaces. In addition, the ramps would continue to be seen by some as a barrier in the district, walling off uses inside of the loops from uses located outside. Under any Terminal Alternative, however, the I-80 Fremont Street off-ramp will continue to impinge on the development along Fremont Street north of Folsom Street.

Impacts Common to Both Transbay Terminal Alternatives. Land use impacts would result under either Transbay Terminal Alternative. Development of the Terminal and the temporary terminal would require the acquisition of *11* parcels and demolition of five buildings (see Section 5.2, Displacements and Relocation).

Additional impacts would occur due to off-site staging and parking requirements for both AC Transit and Golden Gate Transit. Buses would be stored *under the West Approach to the Bay Bridge between Stillman, Perry,* Second and Fourth Streets, a site currently used for automobile parking. The project would include the construction of a parking deck *immediately west of Fourth Street between Perry* Street to the north and *Stillman* Street to the south, to make up for the loss of surface parking being used as a transit storage area.

The new terminal, regardless of the design alternative selected, would cause an increase in pedestrian traffic in the vicinity of the transit facility, creating a possible heightened demand for ground-floor retail uses, including, but not limited to restaurants, cafes and convenience retail, to

serve the increased numbers of transit patrons. The new Transbay Terminal could intensify land uses in its vicinity. Other land use effects resulting from the proposed Terminal would mainly be associated with the construction and operation of its ramps and the temporary bus storage facilities required during the construction of the terminal structure.

No-Project Alternative. Under the No-Project Alternative, a new Transbay Terminal would not be constructed. The existing terminal would be retrofitted and low-capital-cost transportation improvements would be implemented. Opportunities for revitalization in the Transbay area, such as establishing new open spaces, would be substantially less for the No-Project Alternative compared to *the* West Ramp Transbay Terminal Alternative, for example. Under the No-Project Alternative, the existing ramp network would continue to act as a barrier by dividing proposed new development and existing land uses in the area. Additionally, the ramps occupy considerable ground area that would not be available for future development and also may limit future development of adjacent lots.

5.1.1.2 Caltrain Downtown Extension Land Use Impacts

Two alignment alternatives are considered for the Caltrain Downtown Extension: the Second-to-Main Alternative and the Second-to-Mission Alternative. Both a cut-and-cover and tunneling option have been defined for each Caltrain Extension Alternative. The alternatives and options present distinct engineering opportunities and constraints. The cut-and-cover construction method for either alternative would involve the acquisition and demolition of up to 23 existing buildings. Land use impacts associated with the loss of these buildings are described in this section, while more detail regarding the parcels and buildings that would be acquired is provided in Section 5.2. Interim disruptions to land uses that remain in the project area could be anticipated for either alternative, as described in Section 5.21.

The affected properties for both Caltrain Alternatives are located in the vicinity of Second and Howard Streets, with additional properties on Mission Street affected under the Second-to-Mission Street Alternative. Eleven additional parcels with 10 building in the Second and Townsend Streets area would be acquired and demolished under the Cut-and-Cover Option but would remain under the Tunneling Option. See also Figure 4.1-1, in Chapter 4, which shows the land use context for these affected properties.

Affected properties would be purchased according to the procedures set forth in the Real Properties Acquisition Act. Structures would then be demolished to facilitate cut-and-cover construction of the tunnel.

At the Townsend and Second Streets intersection, cut-and-cover construction would require demolition of structures located mainly along the north side of Townsend Street (west of Second Street) and the west side of Second Street (north of Townsend). Land uses at this location consist mainly of industrial uses, with some office uses and two residential buildings. The

affected structures were constructed between 1906 and 1927 (although some have been dated earlier), and one contemporary residential building was constructed in 1996.

At the Second/Howard Street intersection, the project would require demolition of structures generally located on the east side of Second Street (between Minna and Howard Streets) and on the north side of Howard Street (east of Second Street). These structures contain industrial, office, residential and restaurant uses. The affected structures were constructed between 1906 and 1921, and one contemporary residential building was constructed in 1980. Three structures slated for demolition as part of the project (Class B and C office buildings) are located within the New Montgomery-Second Street Conservation District, *which overlaps the Second and Howard Streets Historic District*. Two structures south of the Second/Howard Street intersection would also require demolition to permit cut-and-cover construction. These structures are located along Second Street and include Class C office uses (built between 1906 and 1912). There is also a vacant lot used for surface parking.

The existing land uses described above would be displaced by project construction. Once project construction is completed, the cleared properties would be made available for development. Future land uses on these sites would be required to conform to the area's zoning, General/Area Plan requirements, and Redevelopment Agency's Guidelines (for properties located within the Redevelopment Area).

In addition, there is at least one major development proposal that has the potential to conflict with the Second-to-Mission Caltrain Extension Alternative – a 605-foot tall, 1,068,400 gross square foot mixed use development proposed at 301 Mission Street (Assessors Block 3719, lots 1 and 17). This proposal *has completed its* environmental review *and has received* various approvals from *City decision-makers.* The *current* proposed configuration of the foundation piling and underground parking for 301 Mission *takes into account the need for a small amount of property on the southern-most part of the parcel by the Transbay Terminal/Caltrain Downtown Extension Project for the Second-to-Main Caltrain Extension Alternative, the adopted LPA.*

In the long-term, however, the Transbay Terminal*/Caltrain Downtown Extension* project would not disrupt or divide the physical arrangement of the established community. Because many of the buildings that would be removed are older buildings, some of which are listed or eligible for listing in the National Register of Historic Places (as described in Section 5.14), there would be a change in the character of the area. This change would be lessened by the fact that there are already many new buildings in the general vicinity. The majority of the square footage that would be demolished is in office use, representing only a small portion of the office space throughout the City. Loss of this office space would not adversely affect the City's supply, particularly given that many of the recently constructed buildings in the area provide additional office space.

5.1.1.3 Redevelopment Land Use Impacts

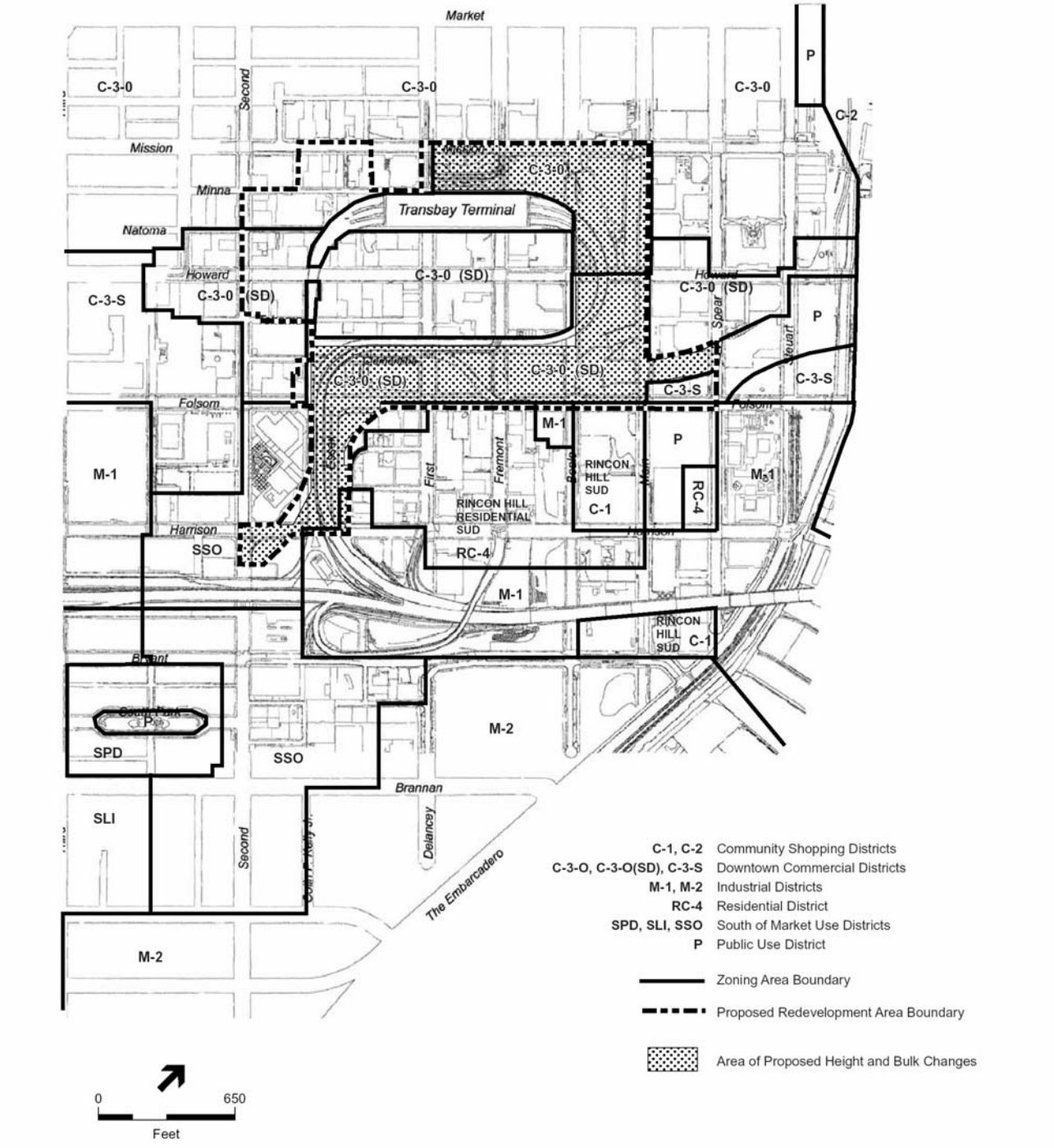
As described in Chapter 2, two redevelopment alternatives are proposed: the Full-Build Alternative and the Reduced Scope Alternative. Each alternative would include zoning changes and the establishment of a redevelopment area that generally would allow land uses that are currently allowed in the Transbay Study Area, with the exception of the P-zoned properties where the former freeway and ramps were located. Because the project would provide for new development, notable changes would be expected in the Transbay Redevelopment Area, especially with respect to urban form and the intensity of land use.

Full-Build Alternative. The Full Build Alternative would result in a mix of residential, office, hotel, and retail uses. This alternative would consist of land uses that are already permitted within the vicinity of the Transbay Study Area. As described in Chapter 2 and shown on Figure 2.2-22, the Full Build Alternative would result in development of 5.6 million square feet of residential uses (4,667 residential units, including affordable housing), close to 1.2 million square feet of office uses, 475,600 square feet of hotel uses, and more than 355,400-square feet of retail uses, or about 7.6 million square feet of development, overall.

Proposed changes to existing zoning would occur predominately along the blocks on Folsom Street, as well as those at the site occupied by the Transbay Terminal and along its ramps to the west of Essex Street to First Street. Existing parcels zoned P would be rezoned to either C-3-O or C-3-O (SD) to facilitate and further the goals of the redevelopment plan. Proposed changes to the height and bulk regulation would occur on the same blocks. These changes are identified in Table 5.1-1 and on Figures 5.1-1, 5.1-2, and 5.1-3.

As indicated in Table 5.1-1, existing height and bulk limits range from 30-X at the site of the current Transbay Terminal to 400-S at Mission and Beale Streets. Existing height limits are, on average, approximately 80 feet. Under the Full Build Alternative, height limits would range from 150 feet around Essex Street to 400 feet along Folsom Street. The maximum height limit established under the Full Build Alternative would be 550 feet, at a proposed hotel site at Mission and Fremont Streets, adjacent to the proposed Transbay Terminal.

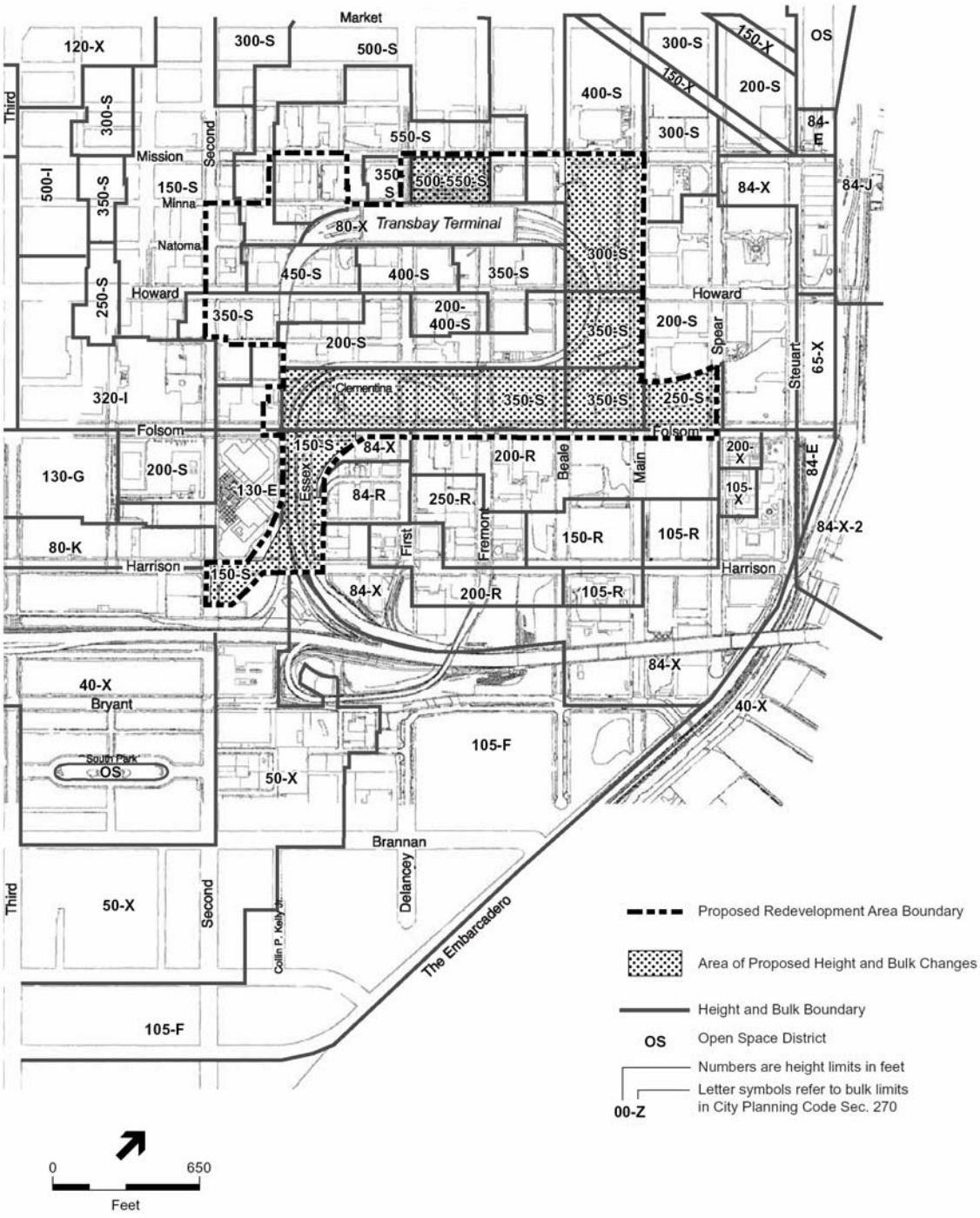
Reduced Scope Alternative. The Reduced Scope Alternative would result in less commercial and retail development and is weighted more toward housing. This alternative assumes approximately four million square feet of residential development (approximately 3,430 dwelling units), 350,000 square feet of hotel uses, and approximately 260,000 square feet of retail development, or 4.7 million square feet overall. The *base* zoning changes proposed under the Reduced Scope would be identical to those proposed under the Full Build, *although the height and bulk designations are different.* Existing parcels zoned P (Public) would be zoned to C-3-O or C-3-O (SD) to accommodate housing or retail uses.



SOURCE: Parson's Transportation Group, Inc., Environmental Science Associates

Transbay Terminal/Caltrain Downtown Extension / 201050 ■

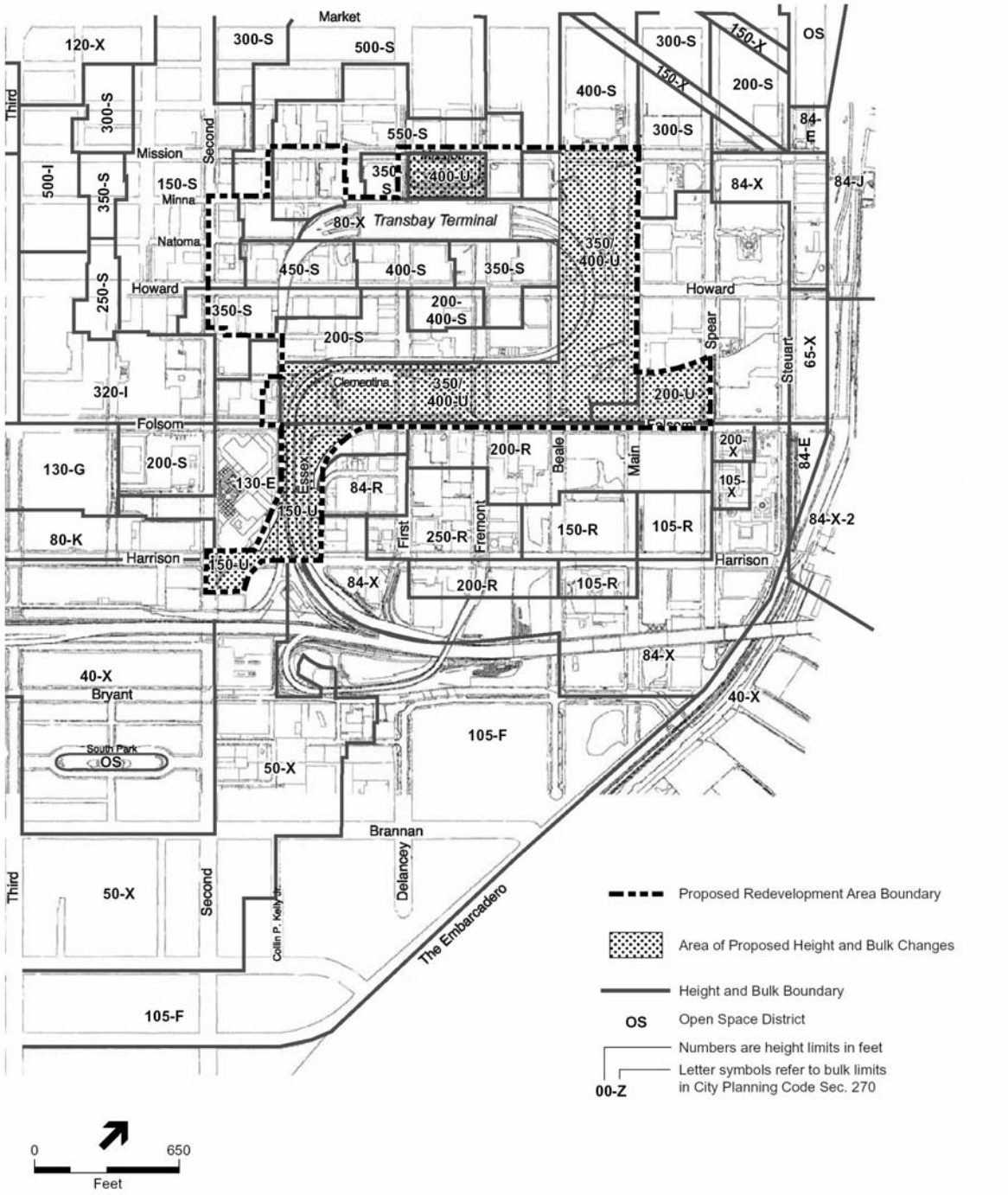
Figure 5.1-1
Proposed Zoning,
Full Build and Reduced Scope Alternatives



SOURCE: Parson's Transportation Group, Inc., Environmental Science Associates

Transbay Terminal/Caltrain Downtown Extension / 201050 ■

Figure 5.1-2
Proposed Height and Bulk Districts
Full Build Alternative



SOURCE: Parson's Transportation Group, Inc., Environmental Science Associates

Transbay Terminal/Caltrain Downtown Extension / 201050 ■

Figure 5.1-3
Proposed Height and Bulk Districts
Reduced Scope Alternative

Table 5.1-1: Existing and Proposed Zoning in the Proposed Transbay Terminal Redevelopment Area

Assessor's Block	Block Bounded by:	Zoning Districts		Height/Bulk Districts		
		Existing	Proposed*	Existing	Full Build	Reduced Scope
3718	Mission, Main, Howard, and Beale Streets	P, C-3-0, C-3-0 (SD)	C-3-0	80-X, 80X \ 400S	300-S	350-*U*
3720	Mission, Fremont, Howard, and First Streets	P	C-3-0	30-X / 80-X	550-S	400-*U*
3736	Howard, First, Folsom, and Second Streets	P	C-3-0 (SD)	80-X \ 200-S	350-S	400-*U*
3737	Howard, Fremont, Folsom, and First Streets	P, C-3-0 (SD)	C-3-0 (SD)	80-X	350-S	400-*U*
3738	Howard, Beale, Folsom, and Fremont Streets	P	C-3-0 (SD)	80-X	350-S	350-*U*
3739	Howard, Main, Folsom, and Beale Streets	P, C-3-0, C-3-0 (SD), C-3-S	C-3-0 (SD)	80-X, 90-X, 200-S	350-S	350-*U*
3740	Howard, Spear, Folsom, and Main Streets	P, C-3-S	C-3-0 (SD)	40-X, 200-S	250-S	200-*U*
3749	Folsom, First, Harrison, and Second Streets	M-1	C-3-0 (SD)	84-X	150-S	150-U
3764	Harrison, Rincon, Bryant, and Second Streets	P	C-3-0 (SD)	50-X	150-S	150-U

Zoning Districts: C-3-0: Downtown commercial office; C-3-0 (SD): Downtown commercial office (special development); C-3-S: Downtown support; M-1: Light industrial; P: Public use; S: See Planning Code Section 270(d) or refer to Height and Bulk maps 1H, 2H and 7H of the Zoning Map; U: Maximum plan dimensions for buildings over 80 feet but less than 300 feet in height: 100 feet (length), 125 feet (diagonal dimension); buildings greater than 300 feet: 115 feet (length). 145 feet (diagonal dimension). Building setbacks would be required pursuant to Planning Code Section 253.2.

* proposed *zoning district designation* for both the Full Build and Reduced Scope/Variant Alternatives are identical

Source: The San Francisco Planning Department, June 2001

The Reduced Scope Alternative differs from the Full Build scenario in the proposed the heights and bulks of the proposed new structures on certain blocks. Under the Reduced Scope Alternative, Assessor Block 3720 would accommodate a hotel at a height of approximately 400 feet, which would be up to 150 feet shorter than allowed under the Full Build Alternative. The Reduced Scope Alternative would permit building heights of up to 50 feet higher than under the Full Build Alternative on the blocks between Beale and Main and Mission and Folsom Streets, and on Folsom Street, along the southern boundary of the Transbay Redevelopment Area boundary.

As indicated in Table 5.1-1, existing height and bulk limits range from 30-X at the site of the current Transbay Terminal to 400-S at Mission and Beale Streets. Existing height limits are, on average, approximately 80 feet. Under the Full Build Alternative, height limits would range from 150 feet around Essex Street to 400 feet along Folsom Street. The maximum height limit established under the Full Build Alternative would be 550 feet, at a proposed hotel site at Mission and Fremont Streets, adjacent to the proposed Transbay Terminal.

Reduced Scope Alternative. The Reduced Scope Alternative would result in less commercial and retail development and is weighted more toward housing. This alternative assumes approximately four million square feet of residential development (approximately 3,430 dwelling units), 350,000 square feet of hotel uses, and approximately 260,000 square feet of retail development, or 4.7 million square feet overall. The zoning changes proposed under the Reduced Scope would be identical to those proposed under the Full Build. Existing parcels zoned P (Public) would be zoned to C-3-O or C-3-O (SD) to accommodate housing or retail uses.

The Reduced Scope Alternative differs from the Full Build scenario in the proposed the heights and bulks of the proposed new structures on certain blocks. Under the Reduced Scope Alternative, Assessor Block 3720 would accommodate a hotel at a height of approximately 400 feet, which would be up to 150 feet shorter than allowed under the Full Build Alternative. The Reduced Scope Alternative would permit building heights of up to 50 feet higher than under the Full Build Alternative on the blocks between Beale and Main and Mission and Folsom Streets, and on Folsom Street, along the southern boundary of the Transbay Redevelopment Area boundary. The main difference between the Reduced Scope and Full Build Alternative would be in building mass. Under the Reduced Scope, new towers would have, on average, smaller floor plates and would be more slender than those under the Full Build, due to the maximum diagonals of the building towers in the proposed U bulk district (see Table 5.1.3). The smaller, more slender floor plates also would result in increased spacing between towers, compared to bulkier building towers in the Full Build Alternative.

North of Folsom Street, there would be an expansion of office development, including high-rises, particularly near the site of the existing Transbay Terminal. As under the Full Build Alternative, the existing terminal at First and Mission Streets is proposed to be demolished, and a new terminal would be constructed at this site. Both alternatives would result in an expansion of educational and institutional uses, with open space surrounded by mid-rise structures. Farther west, existing historic buildings in the New Montgomery-Second Street Conservation District would remain, except for those buildings that would be demolished as part of the right-of-way acquisition for the Caltrain Downtown Extension alignment, providing a moderating buffer in building scale between Yerba Buena Gardens and the northwest corner of the Transbay Redevelopment Area. The Second Street corridor could become an increasingly attractive destination for street-level retail and restaurants and a pedestrian link between downtown and Pacific Bell Park at China Basin.

The main difference between the Reduced Scope and Full Build Alternatives would be in building mass. Under the Reduced Scope, new towers would have, on average, smaller floor plates and would be more slender than those under the Full Build, due to the maximum diagonals of the building towers in the proposed U bulk district (see Table 5.1.3). The smaller, more slender floor plates also would result in increased spacing between towers, compared to bulkier building towers in the Full Build Alternative.

North of Folsom Street, there would be an expansion of *residential* development, including high-rises, particularly near the site of the existing Transbay Terminal. As under the Full Build Alternative, the existing terminal at First and Mission Streets is proposed to be demolished, and a new terminal would be constructed at this site. Both alternatives would result in an expansion of educational and institutional uses, with open space surrounded by mid-rise structures. Farther west, existing historic buildings in the New Montgomery-Second Street Conservation District would remain, except for those buildings that would be demolished as part of the right-of-way acquisition for the Caltrain Downtown Extension alignment, providing a moderating buffer in building scale between Yerba Buena Gardens and the northwest corner of the Transbay Redevelopment Area. The Second Street corridor could become an increasingly attractive destination for street-level retail and restaurants and a pedestrian link between downtown and Pacific Bell Park at China Basin.

Draft Transbay Redevelopment Area Design for Development Vision (August 2003). *Implementation of the current Design for Development Vision would result in a mix of residential, retail, office and hotel uses that would be similar to those uses under both the Full Build and Reduced Scope Alternatives. The Design for Development Vision would consist of land uses already permitted within the vicinity of the Transbay Area, and would result in development of roughly 4.14 million square feet of residential uses (3,378 residential units, including affordable housing), approximately 965,000 square feet of office uses, 475,000 square feet of hotel uses, and approximately 30,670 square feet of retail commercial use, with a total of about 5.6 million square feet of development.*

This Design for Development Vision proposes land uses that would be consistent with the General Plan and the Planning Code, as they now exist and may be amended from time to time in the future. The Transbay Redevelopment Area Design for Development Vision would consist of three main land use zones: the Transbay Residential Zone (Zone 1), the Transbay C-3 Zone (Zone 2), and the Transbay Terminal and Ramp Environs (Zone 3). Because the Design for Development Vision would be consistent with the Full Build and Reduced Scope Alternatives, the changes to land uses in the Transbay Redevelopment area would be essentially the same as those illustrated on Figure 5.1-1.

The Redevelopment Area Design for Development Vision would result in land use effects identified for both the Full Build and Reduced Scope Alternatives. The Design for Development Vision would generally construct shorter buildings and fewer towers (specifically along Folsom Street) and fewer dwelling units than proposed under the Full Build Alternative. The Redevelopment Area Design for Development Vision would also include mid-block pedestrian passages, public open space in the form of parks, and private open spaces in the interiors of private residential developments.

Because the Redevelopment Area Design for Development Vision would be consistent with land uses analyzed for the Full Build and Reduced Scope Alternatives and because its proposed development program would be less dense (e.g., fewer dwelling units, less office and retail square footage) than the Full Build Alternative, the land use effects of the Design for

Development Vision would also not be adverse. As with both the Full Build and Reduced Scope Alternatives, rather than disrupting or dividing the community or adversely affecting its character, implementation of the Design for Development Vision could do the opposite by lending a positive neighborhood identity to an area that would provide a cohesive mix of jobs, housing and support services.

Impacts Common to Both Redevelopment Alternatives. Both alternatives are expected to result in substantial open space areas in several portions of the Transbay Redevelopment Area, to complement the more intensive development. Folsom Street itself could be transformed from a relatively quiet (except at rush hour) street bordered by numerous undeveloped parcels to a built-out boulevard with residential and commercial uses side-by-side and a large amount of pedestrian traffic. This street would play an important role in defining the identity of the Transbay Redevelopment Area as a cohesive neighborhood, providing a mix of jobs, housing and support services.

No-Project Alternative. Under the No-Project Alternative new development, driven by market forces, is anticipated in the Transbay area. Existing programmed land uses would continue to the year 2020. Growth of office and residential uses would continue, but more slowly than under the above-described alternatives, and perhaps with less design guidance. Without any coordinated planning effort in the Transbay area, development in the district would occur on a per-parcel basis depending on the demands placed on the market. Development would occur under existing zoning and height and bulk regulations. Any proposed development would also be subject to Proposition M requirements concerning the amount of office space to be built, the timing of such development, and the impacts of the office square foot limitations (Planning Code Sections 320 and 321) on development. Sponsors seeking to develop the parcels zoned P (Public) would be required to seek a rezoning as part of their projects.

Because the area is designated as part of the Downtown Plan's Financial District north of Folsom Street, it could be assumed that office uses would locate in the area. There is a considerable amount of under-used land in the Transbay area and, depending on market forces, the area would act as an expansion area for high-density office uses that would otherwise occur north of Market Street. Most of the increase in residential development likely would occur on or near Rincon Hill. Because development would continue to occur in a less directed manner, the area could continue to lack definition or strong neighborhood identification, particularly compared to the Full Build or Reduced Scope Alternatives.

5.1.1.4 Neighborhood Character and Compatibility

An important goal of the Transbay redevelopment planning effort is to promote the development of a new mixed-use neighborhood. Both alternatives of the project's redevelopment component anticipate the development of residential, office, retail, service, and entertainment uses in a neighborhood in which these uses co-exist side-by-side or even within the same building. The potential incompatibility among uses is minimized by the exclusion of heavy industrial uses.

While the project could indirectly result in notable changes in land uses in the Transbay area, future development would be expected to intensify the urban character of the area and, particularly if planning efforts are successful, to result in a more cohesive neighborhood with a true mixture of residential and commercial activities. Rather than disrupting or dividing the community or adversely affecting its character, realization of the project's goals could do the opposite.

5.1.1.5 Consistency with Existing Plans and Policies

A review was conducted to assess the project's conformity with the plans and policies that guide land use development in the study area. These plans include the San Francisco General Plan (with subsequent elements including: the Urban Design Element, the Commerce and Industry Element, the Transportation Element, the Residence Element, and the Recreation and Open Space Element); and local area plans contained within the General Plan, such as the Downtown Plan, the South of Market Plan, the Rincon Hill Plan, the Northeastern Waterfront Plan. Project compliance with San Francisco Redevelopment Agency Area Plans was also evaluated. These plans include the Rincon Point-South Beach Redevelopment Plan, the Yerba Buena Center Redevelopment Plan, and the Mission Bay North Redevelopment Plan. The proposed project would not conflict with any of the policies contained in the documents stated above.

The City's General Plan, which provides general policies and objectives to guide land use decisions, contains some policies that relate to physical environmental issues. The current project would not obviously or substantially conflict with any such policy that would apply to the project.

In general, any potential conflicts with the General Plan are considered by decision makers independently of the environmental review process, as a part of the decision whether to approve or disapprove a proposed project. Any potential conflict not identified here could be considered in that context, and would not alter the physical environmental effects of the proposed.

No mitigation measures are indicated. Relocation impacts and mitigation are addressed in Section 5.2.

5.1.2 Wind Impacts

A wind tunnel test was performed for two massing scenarios, as documented in the Wind Test Technical Memorandum and summarized in this section. The first massing scenario represents the Full Build Alternative and consists of generic building masses constructed to the height and bulk limits for each parcel or block. The second massing scenario represents the Reduced Scope Alternative. It contains nearly 35 percent less floor area but has towers that are taller and more slender than those of the Full Build Alternative.

The new Transbay Terminal design was used in both tests. For the wind tunnel testing, adverse impact was defined as wind conditions that exceed the City of San Francisco Planning Code Section 148 wind hazard criterion of 26 miles per hour for more than one full hour per year.

5.1.2.1 Wind Test Point Locations

Wind test locations are shown in Figure 5.1-4. The study evaluated conditions under the four prevailing wind directions (northwest, west-northwest, west and southwest) that are the most common in San Francisco.

In general, the testing focused on public streets and sidewalks located (generally near high-rise building sites) throughout the Transbay Terminal Redevelopment Area.[1] For purposes of this analysis, test locations were grouped into four subareas, as follows:[2]

- Adjacent to or near the Transbay Terminal building (15 test points).
- Within the redevelopment area bounded by Mission, Main, Folsom, and Beale Streets (17 test points).
- Within the redevelopment area adjacent to Folsom Street (31 test points).
- Within the redevelopment area adjacent to or near Essex Street (6 test points).

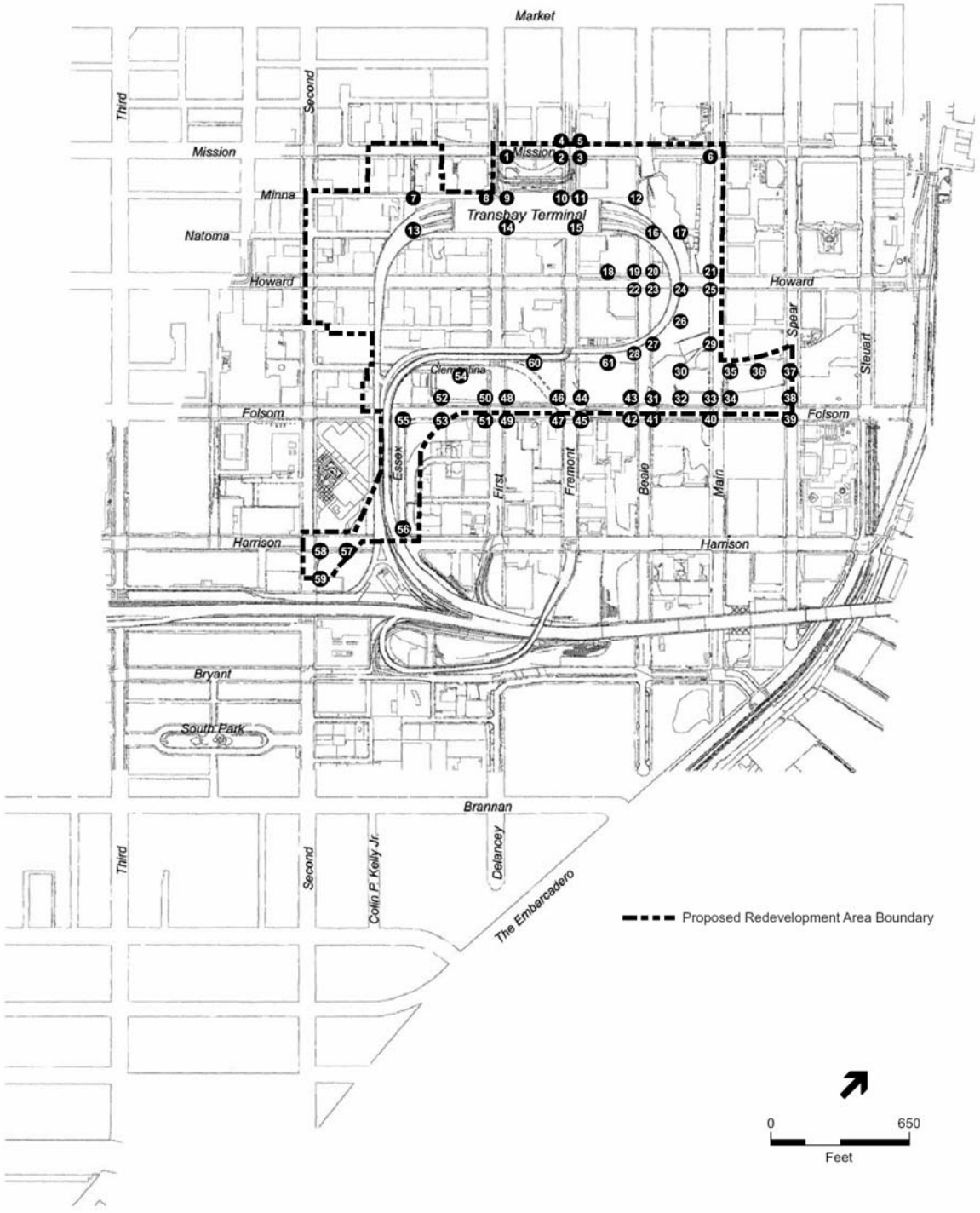
5.1.2.2 Full-Build Alternative, Wind Impacts

Development proposed as part of the Full-Build Redevelopment Plan would introduce new buildings at heights and massing greater than under current conditions. Wind conditions would be considered moderate to windy; the average for all 61 test points would be about seven mph, about 1.5 mph higher than the average for the existing conditions. Wind speeds in the pedestrian areas would range from one mph (No. 10) to 18 mph (No. 57). Wind speeds of 14 mph or higher would occur at three locations (Nos. 52, 57, 59). Fifty-two of the 61 locations would meet the Planning Code's pedestrian-comfort criterion value of 11 mph, while nine locations (Nos. 42, 48, 49, 52, 53, 56-59) would not. Under this Alternative, the Planning Code's wind hazard criterion would be exceeded at one of the 61 test locations: test site number 57 in the Essex Street wind study subarea.

Transbay Terminal Wind Study Subarea. Winds in this area would be moderate to windy, with speeds ranging from one mph (No. 10) to 10 mph (No. 2). Of the 15 points in this subarea, all would continue to meet the Planning Code's pedestrian-comfort criterion value of 11 mph.

[1] For purposes of this analysis, local north-south runs along Second Street and parallel streets, and east-west runs along Mission Street and parallel streets. Wind directions will refer to true compass directions.

[2] Note that in describing the wind test locations for the four subareas, some points were referred to in more than one group.



SOURCE: Environmental Science Associates

Transbay Terminal/Caltrain Downtown Extension / 201050 ■

Figure 5.1-4
Wind Test Point Location Map

Mission, Main, Folsom, and Beale Streets Wind Study Subarea. Winds would increase slightly compared to existing conditions, ranging from two mph (No. 30) to eight mph (Nos. 22, 24, 25, 29, 31). Of the 17 points in this subarea, all would continue to meet the Planning Code's pedestrian-comfort criterion value of 11 mph.

Folsom Street Wind Study Subarea. Winds would continue to be moderate to windy, and would range from two mph (No. 30) to 14 mph (No. 52). Of the 31 points in this subarea, 26 would continue to meet the Planning Code's pedestrian-comfort criterion value of 11 mph. Table 5.1-2 identifies the five test sites at which the comfort criterion would be exceeded.

Essex Street Wind Study Subarea. Winds would substantially increase in some portions of this area, with speeds ranging from nine mph (No. 55) to 18 mph (No. 57). Of the six points in this subarea, only one would continue to meet the Planning Code's pedestrian-comfort criterion of 11 mph. One site (No. 57) would exceed the hazard criterion, for a total duration of one hour per year. Site No. 57 is west of Essex Street just east of the intersection of Harrison and Second Streets. Table 5.1-2 identifies the test sites at which the comfort and/or hazard criteria are exceeded.

Table 5.1-2: Full Build Alternative Exceedences of Comfort and Hazard Criteria

Wind Study Subarea	Location	Locations with Exceedence of Comfort Criterion	Locations With Exceedence of Hazard Criterion
Folsom Street Subarea	South sidewalk of Folsom Street	Nos. 42, 49, 53	-
	North sidewalk of Folsom Street	Nos. 48 and 52	-
Essex Street Subarea	East of Essex Street	Nos. 53 and 56	-
	West of Essex, near Second Street	Nos. 57, 58, and 59	No. 57

Source: Environmental Science Associates, Wind Study Technical Memorandum, 2001

5.1.2.3 Reduced Scope Alternative, Wind Impacts

Under this Alternative, development would result in greater building heights and massing than under existing conditions. This variant assumes that new buildings would be slightly taller and more slender than those associated with the Full Build Alternative.

Wind conditions would be considered moderate to windy, with an average of 6.8 mph (for all 61 test points). This is approximately 0.2 mph lower than the average for the Full Build Alternative conditions. Wind speeds in the pedestrian areas would range from three mph (Nos. 8, 9, 12, 14, 15, 17, 26, 31-33, 50) to 18 mph (No. 57). Wind speeds of 14 mph or higher would occur at four locations (Nos. 52, 57-59). Under this Alternative, the highest wind speeds would continue to

occur at the same location as under the Full-Build Alternative (No. 57) just east of the intersection of Harrison and Second Streets, with a speed of 18 mph.

Wind conditions under this Alternative would be very similar to those under the Full-Build Alternative. Fifty-four of the 61 test sites would meet the Planning Code's pedestrian-comfort criterion value of 11 mph. This option would exceed the comfort criterion at a total of seven locations, two fewer than under the Full-Build Alternative. Six of these locations (Nos. 49, 52, 53, 57-59) would also experience exceedences under the Full-Build Alternative. The seventh exceedence is located at test site number 60, as shown in Table 5.1-3. With this Alternative, the wind hazard criterion would remain exceeded for one hour per year at the point just east of the intersection of Harrison and Second Streets (No. 57).

Table 5.1-3: Reduced Scope Alternative Exceedences of Comfort and Hazard Criteria

Wind Study Subarea	Location	Locations with Exceedence of Comfort Criterion	Locations With Exceedence of Hazard Criterion
Folsom Street Subarea	South sidewalk of Folsom Street	Nos. 49 and 53	-
	North sidewalk of Folsom Street	No. 52	-
	Between Folsom and Tehema St.	No. 60	-
Essex Street Subarea	East of Essex Street	No. 53	-
	West of Essex, near Second Street	Nos. 57, 58, and 59	No. 57

Source: Environmental Science Associates, Wind Study Technical Memorandum, 2001

5.1.2.4 Draft Transbay Redevelopment Area Design for Development Vision (August 2003)

Because the Design for Development Vision would construct an overall less intense (in terms of square footage) and less dense (in terms of the number of towers and more slender aspect of the towers) development program, wind effects would be less or essentially the same as those analyzed for both the Full Build and Reduced Scope Alternatives.

5.1.2.5 No-Project Alternative

The No-Project Alternative would result in less total development between the present and the horizon year 2020 than under the Full Build and Reduced Scope alternatives. The No-Project Alternative would be expected to have fewer tall buildings and thus fewer areas with increased ground level winds than the other alternatives considered. The wind conditions expected with this alternative would be expected to be similar or less substantial increases than those described under either build alternative.

5.1.2.6 Mitigation Measures

During the environmental review process that would precede the approval of any individual project proposed for the proposed Transbay Redevelopment Area, potential wind effects of that project shall be considered and, if necessary, wind tunnel testing shall be performed in accordance with City Planning Code Section 148. If exceedences of the wind hazard criterion should occur for any individual project, design modifications or other mitigation measures would be required to mitigate or eliminate these exceedences. Mitigation measures would need to be tailored to the individual needs of each project. Examples of mitigation measures that could be used include articulation of building sides and softening of sharp building edges.

5.1.3 Shadows

Shading impacts were evaluated for the Redevelopment Plan Alternatives using the two massing scenarios described in Section 5.1.2, above. The analysis included the shadow effect of the proposed Transbay Terminal, determined by using the 60-foot height of the West Ramp Alternative (worst-case shadow) for both Transbay Terminal Alternatives (West Ramp or Loop Ramp). Shadow effects attributable to the project were analyzed for representative times of day (9 a.m., 12 noon, and 3 p.m.) during the four seasons of the year: in December on the winter solstice, when the sun is at its lowest and shadows are at their longest; and in June on the summer solstice, when the sun is at its highest and shadows are at their shortest; at the spring equinox, when shadows are midway through a period of shortening; and at the fall equinox, when shadows are midway through a period of lengthening. Shadows on any other day of the year would be within the range of shadows presented during the seasons and times of day described above.

Given the height limits for high-rise towers in the Reduced Scope and Full-Build alternatives, it appears that the project would conform to Section 295. That means the project would appear not to cast new shadow on any open space under the jurisdiction of the San Francisco Recreation and Park Commission within or outside of the study area between one hour after sunrise and one hour before sunset. However, the City would still require a shadow analysis application for each individual development proposal. The discussion below identifies the shadow effects that would occur on open space areas.

5.1.3.1 Shading Impacts of the No-Project Alternative

The No-Project Alternative would result in a lesser total amount of development between now and 2020 than would the Full Build or Reduced Scope alternatives. Thus, the No-Project Alternative would be expected to have substantially less shadow effect than either of these two alternatives. Subsequent development projects greater than 40 feet in height would be subject to project-specific shadow analyses. No mitigation is indicated.

5.1.3.2 Shading Impacts of the Full-Build Alternative

The new shading caused by the project would not appear to affect open spaces protected by Section 295 of the Planning Code, such as South Park or South Beach Park. Future development would also be regulated by Sections 146 and 147 of the Planning Code, which protect sunlight access to streets and sidewalks and provide for reduction of shadows on public and publicly accessible open spaces within the C-3 districts. However, some publicly accessible, privately owned open spaces would be expected to see an increase in shading during certain periods of the day and the year, as described below.

Spring. In spring, new project shadow would generally fall in a northwesterly direction during the morning. Shadow from the proposed towers would extend from the southeast corner of Folsom Street to shade much of First, Fremont, Beale, and Main Streets to Howard Street. Surface parking on the south side of Howard Street could be shaded in the morning hours by proposed towers on Folsom Street.

At noon in spring, project shadows would be relatively short and would fall to the north. The Transbay Terminal shadow would cover Minna Street and the east side of Beale Street near the Terminal, as well as shading the proposed plaza area in front of the Terminal on Mission Street. New shadows cast from the proposed towers along Folsom Street would fall mid-block between Folsom and Howard Streets, shading less of First, Fremont, Beale, and Main Streets than they would have during the morning hours. To the east, new project shadow from the towers on Howard Street would shade Main Street from Folsom to Mission Streets.

During the afternoon hours, new shadows would lengthen and be cast more easterly. New shadows from the hotel and Transbay Terminal would fall mid-block on Assessor's Block 3718, which lies just east of the Transbay Terminal at Beale and Howard Streets. New shadows from the towers along Folsom Street would reach Folsom Street in the late afternoon. Under the Full Build Alternative, shadows would extend east just past the intersection of Steuart and Folsom Streets; under the Reduced Scope Alternative, shadows would also extend toward Steuart Street, but would fall short of the intersection.

Summer. During the summer solstice morning hours, shadows would fall to the west. Minna Street, directly north of the Transbay Terminal, would be in shadow. The Transbay Terminal would shade a portion of Mission Street between First and Fremont Streets, and the shadow would extend halfway to Market Street. New shade would be added to a portion of Howard Street between Main and Beale Streets. The southerly half of the block on Folsom Street between Essex and First Streets would also be newly shaded during morning hours.

During midday, relatively little new shading would occur, but would be in a northerly direction. Small portions of First, Fremont, Beale, Main and Spear Streets would be newly shaded by the proposed towers on Folsom Street.

During the late afternoon, shadows would fall to the east. New shading would occur along Folsom Street fronting the project towers. Shadows from the proposed towers would be longer and cross over the southern side of Folsom, specifically at Beale and Main Streets, but allow sunlight to reach the street. Guy Place would be shaded in the late afternoon hours from the proposed development on the corner of Folsom and Essex Streets.

Autumn. By the fall equinox, the position of the sun is lower in the sky, causing shadows to be longer. During the mid-morning through midday, new shadow caused by the project would extend generally northwest. The Transbay Terminal would create new shade on small sections of First and Fremont Streets, just south of Mission Street. New shadows from towers on Howard Street would cover Beale Street between Mission and Howard Streets. The northern half of First, Fremont, Beale, and Main Streets, between Folsom and Howard Streets, would be shaded by the proposed towers on Folsom Street. Because shadows would fall to the northwest, Folsom Street would generally not be shaded during the morning hours.

During midday, shadows would fall to the north. The proposed hotel in front of the Transbay Terminal would shade the intersection of Mission and Fremont Streets. The Transbay Terminal would shade the plaza in front of the Terminal. Along Howard Street, only the section between Beale and Main Streets would experience new shading. Along Folsom Street, shadow from the proposed towers on Folsom Street would be cast to the north, away from Folsom Street, but would fall on private mid-block open spaces just north of those project towers.

In the late afternoon hours, shadows would fall generally to the east. Folsom Street would be shaded both on the north and south sides of the street. Shadows cast by the proposed towers on Folsom Street would extend eastward to the intersection of Folsom and Spear Streets. The proposed high-rise on Folsom and Essex Streets would cast shadows in an easterly direction and partially shade Guy Place.

Winter. During the morning hours, the new shadows cast by the project would extend their farthest northwest during the winter season. Considerable shadowing occurs under existing winter conditions, so relatively little new shadow would be cast on the streets and sidewalks. To the north, the Transbay Terminal, the hotel and other project towers, would cast new shadows on Mission Street that would reach almost halfway up the block on First and Fremont Streets. New shadow would fall on both the north and south side of Howard Street, between Beale and Main Streets. In the morning, Folsom Street would not be shaded by the new development, except for new shadow that would occur between Essex and First Streets. New shadows cast by the proposed towers along Folsom Street would fall to the northwest and would shade mid-block throughways and planned open spaces, but would not shadow Folsom Street.

At midday, shadows would be cast to the north. New towers would shade interior block spaces along Folsom between First and Spear Streets. Shadows would reach east to the Gap Building. In the late afternoon hours, shadows would lengthen and reach their easternmost extent. With the exception of the shadow from the proposed towers along Folsom Street, new shadow would be minimal in the area due to the extensive existing shadow. Shadows from most new towers

would generally be cast on adjacent towers and not reach the street. However, in the late afternoon, shadows from the tower proposed at the corner of Folsom and Spear Streets could reach the planned Rincon Park and shade a small southern portion of the park.

5.1.3.3 Shading Impacts of the Reduced Scope Alternative

The effects of this alternative would be very similar to those of the Full-Build. The following discussion identifies specific locations in which the impacts differ.

Spring. In the late afternoon, new shadows from the towers along Folsom Street would reach Folsom Street and extend east toward Steuart Street, but would fall short of the intersection between Folsom and Steuart Streets. (This intersection would be in shadow under the Full-Build Alternative.)

Summer. During the late afternoon, shadows would fall to the east. Under the Reduced Scope Alternative, shadows from the Transbay Terminal and the proposed redevelopment would add new shadow on Howard Street between Beale and Main Streets. Shadows from the proposed towers along Folsom Street would generally not extend as far south (i.e., would not cross Folsom Street) as under the Full Build scheme, but greater lengths of Folsom Street would be shaded.

Autumn. The effects of the Reduced Scope Alternative would be identical to those of the Full-Build Alternative.

Winter. The effects of the Reduced Scope Alternative would be identical to those of the Full-Build Alternative.

5.1.3.4 Shading Impacts of the Draft Transbay Redevelopment Area Design for Development Vision (August 2003)

Because the Design for Development Vision would have fewer towers and because those towers would be taller and more slender than those of the Full Build Alternative, shadowing effects would be generally less than those of the Full Build Alternative and more similar to those of the Reduced Scope Alternative. No adverse effects to sites under the control of the Recreation and Parks Department would found. Therefore, these shading effects would not be adverse.

5.2 DISPLACEMENTS AND RELOCATION

5.2.1 No-Project Alternative

No residential or non-residential displacements would occur directly as a result of the No-Project Alternative. Therefore, this section focuses on the displacement effects of the proposed Transbay Terminal, Caltrain Downtown Extension, and Redevelopment Plan.

5.2.2 Transbay Terminal

Properties to be acquired for construction of the Transbay Terminal are shown in Table 5.2-1. These properties are shown as blue on Figures 5.2-1, 5.2-2 and 5.2-3. *Movement of the Transbay Terminal footprint to the west would require the acquisition of four additional properties for the terminal. These properties were formerly identified in the Draft EIS/EIR as necessary acquisitions under both Caltrain Extension Alternatives, so the properties were anticipated to be acquired for the Project in any event. The properties are now required for the terminal rather than the Caltrain Extension and are shown in the table in italics.*

Table 5.2-1: Property Acquisitions for the Transbay Terminal Alternatives

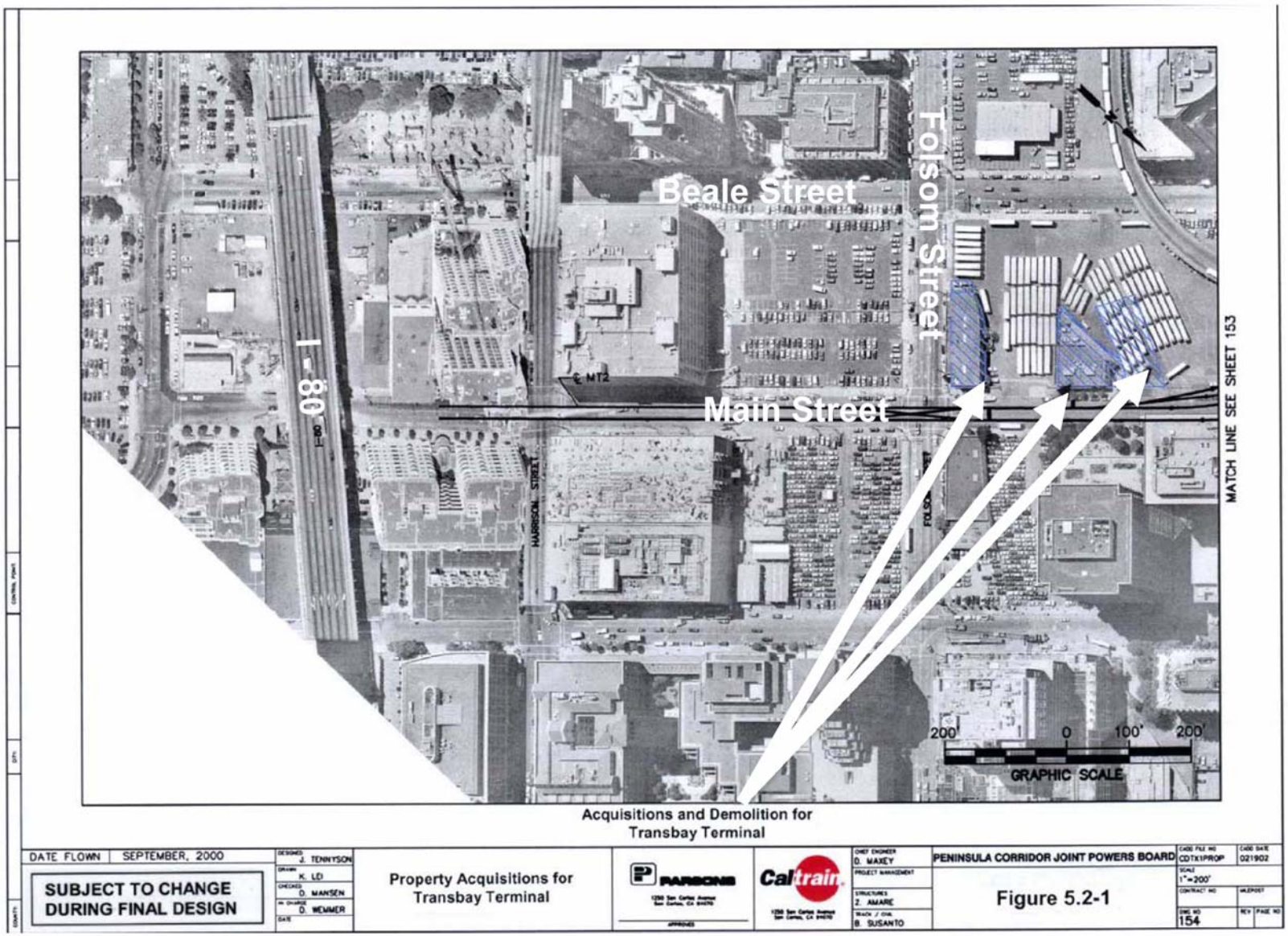
Block & Lot Number		Address
Full Acquisitions		
3721	*45A*	*70 Natoma Street [a]*
3721	*46*	*78-80 Natoma Street [a]*
3721	*53*	*81 Minna Street [a]*
3721	*54*	*65 Minna Street [a]*
3736	*74*	*57 Tehama [b]*
3739	2	Vacant lot on Main Street
3739	6	272 Main Street
3739	4 & 7	200 Folsom
3736	88	60 Tehama
Partial Acquisitions		
3721	16	546 Howard Few feet from northeast corner of building
3719	17	*101-129* Fremont Street (Southern portion of this parcel near the Transbay Terminal)

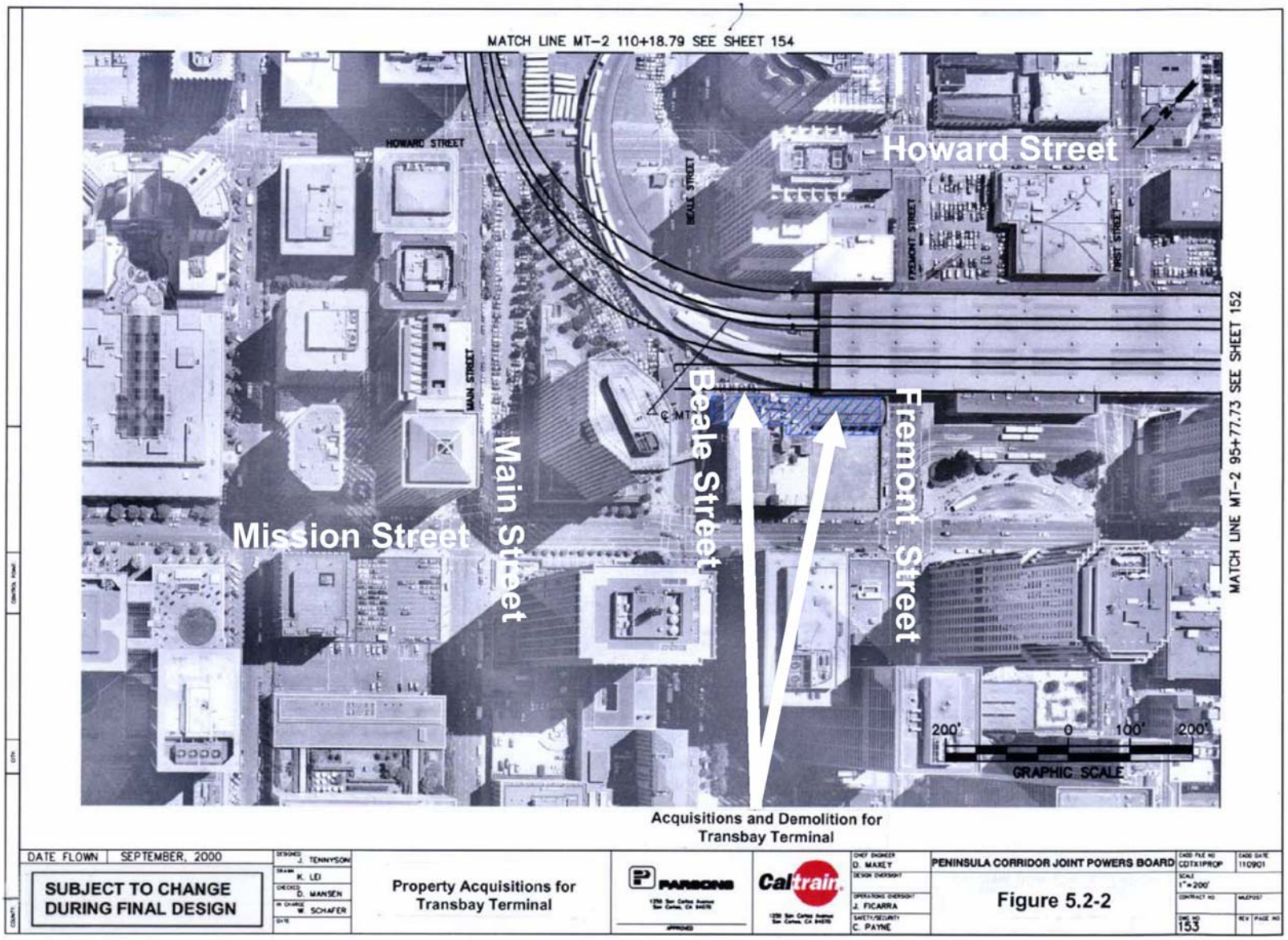
Notes:

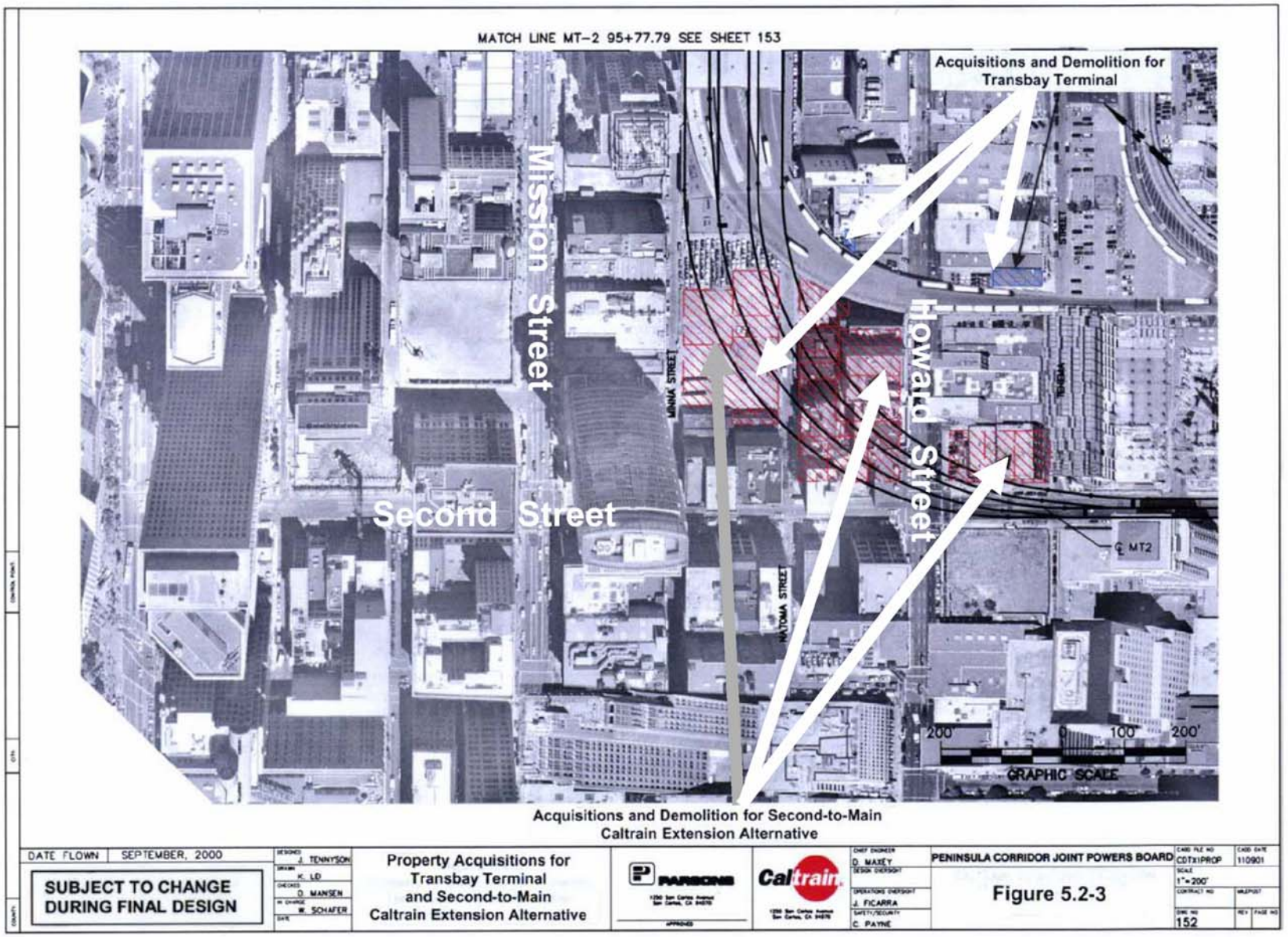
[a] Assumed for acquisition as part of the Caltrain Extension in the Draft EIS/EIR. Now assumed for acquisition as part of the Transbay Terminal in this Final EIS/EIR due to proposed movement of the terminal to the west.

[b] Additional property required for acquisition due to the necessary revisions between the Draft and Final EIS/EIR regarding the permanent bus ramp to the terminal.

Source: Sedway Group, Parsons, 200*4*.


Beale Street
Folsom Street
Main Street
I - 80
HARRISON STREET
MATCH LINE SEE SHEET 153
200'
0
100'
200'
GRAPHIC SCALE
Acquisitions and Demolition for
Transbay Terminal
DATE FLOWN SEPTEMBER, 2000
SUBJECT TO CHANGE
DURING FINAL DESIGN
J. TENNYSON
K. LOI
D. MANSEN
D. WEMMER
Property Acquisitions for
Transbay Terminal
PARSONS
Caltrain
D. MAXEY
Z. AMARE
B. SUSANTO
PENINSULA CORRIDOR JOINT POWERS BOARD
CDTX1PROP
021902
1" = 200'
Figure 5.2-1
154


MATCH LINE MT-2 110+18.79 SEE SHEET 154
Howard Street
Mission Street
Main Street
Beale Street
Fremont Street
MATCH LINE MT-2 95+77.73 SEE SHEET 152
200' 0 100' 200'
GRAPHIC SCALE
Acquisitions and Demolition for Transbay Terminal
DATE FLOWN SEPTEMBER, 2000
SUBJECT TO CHANGE DURING FINAL DESIGN
Property Acquisitions for Transbay Terminal
PARSONS
Caltrain
PENINSULA CORRIDOR JOINT POWERS BOARD
Figure 5.2-2


MATCH LINE MT-2 95+77.79 SEE SHEET 153
Acquisitions and Demolition for Transbay Terminal
Mission Street
Second Street
Howard Street
MINNA STREET
NATOMA STREET
TEHAMA STREET
℄ MT2
200' 0 100' 200'
GRAPHIC SCALE
Acquisitions and Demolition for Second-to-Main Caltrain Extension Alternative
DATE FLOWN SEPTEMBER, 2000
SUBJECT TO CHANGE DURING FINAL DESIGN
J. TENNYSON
K. LO
D. MANSEN
W. SCHAFER
Property Acquisitions for Transbay Terminal and Second-to-Main Caltrain Extension Alternative
PARSONS
Caltrain
D. MAXEY
J. FICARRA
C. PAYNE
PENINSULA CORRIDOR JOINT POWERS BOARD
CDTX1PROP
110901
1"=200'
152
Figure 5.2-3

An additional property would be required for the permanent bus ramp. This property – Block 3736, Lot 74 (57 Tehama Street) – was not identified in the Draft EIS/EIR. The additional property is required due to necessary revisions to the permanent bus ramp resulting from: (1) responses to comments from Caltrans on the Draft EIS/EIR regarding the ramp structure shown in the Draft EIS/EIR, and (2) movement of the terminal to the west. This additional property is also shown in the table in italics.

5.2.3 Caltrain Downtown Extension

Properties that would need to be acquired or for which an underground easement would be required for either Caltrain Downtown Extension Alternative are shown in Table 5.2-2 and on Figure 5.2-4. Acquisition and demolition of these properties would occur for the Cut-and-Cover Option. Underground easement would be required for these properties for the Caltrain Extension Tunneling Option. *A construction easement will also be required for a portion of the private property (southern portion of Block 3718 – Lot 025) associated with 201 Mission Street, namely the parking area and access road to the loading docks for this structure. Temporary access will be provided from Main Street to the loading area for this structure during the construction period for the Caltrain Extension tail tracks.*

Properties that would need to be acquired and demolished for each of the Caltrain Downtown Extension Alternatives are shown in Tables 5.2-3 and 5.2-4. Properties shown as red on Figure 5.2-3 would be acquired for the Second-to-Main Alternative. Properties shown in red on Figures 5.2-5 and 5.2-6 would be required for the Second-to-Mission Alternative.

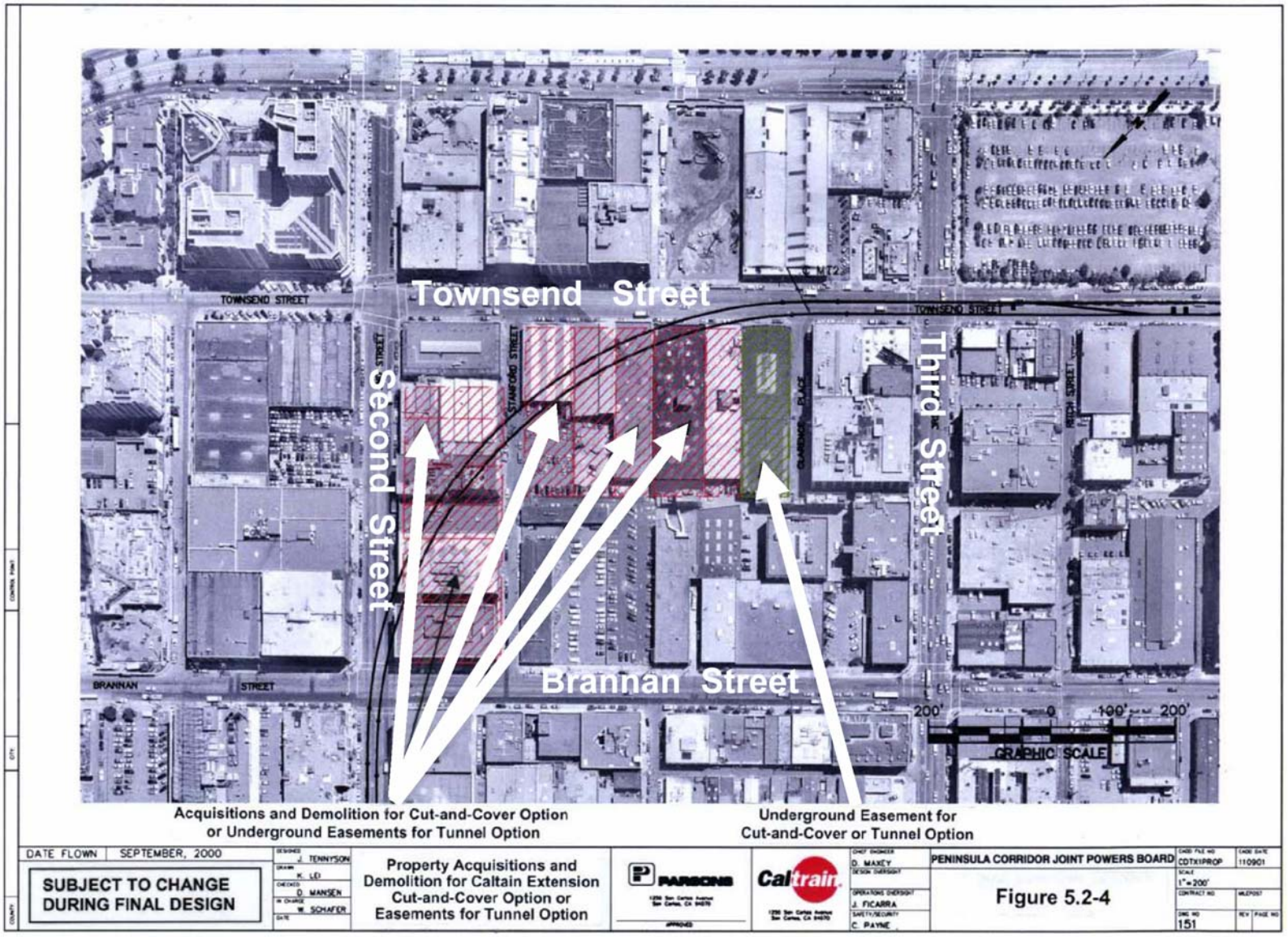

Townsend Street
Second Street
Third Street
Brannan Street
TOWNSEND STREET
BRANNAN STREET
STANFORD STREET
CLARKSON PLACE
FOURTH STREET
200' 0 100' 200'
GRAPHIC SCALE
Acquisitions and Demolition for Cut-and-Cover Option or Underground Easements for Tunnel Option
Underground Easement for Cut-and-Cover or Tunnel Option
DATE FLOWN SEPTEMBER, 2000
SUBJECT TO CHANGE DURING FINAL DESIGN
J. TENNYSON
K. LEI
D. MANSEN
W. SCHAFER
Property Acquisitions and Demolition for Caltain Extension Cut-and-Cover Option or Easements for Tunnel Option
PARSONS
Caltrain
D. MAXEY
J. FICARRA
C. PAYNE
PENINSULA CORRIDOR JOINT POWERS BOARD
CDTX1PROP
110901
1" = 200'
151
Figure 5.2-4

Table 5.2-2: Properties to be Acquired or Underground Easement Properties
(Either Second-to-Main or Second-to-Mission Caltrain Extension Alternative)

Block and Lot Number		Address
Acquisitions and Demolition or Underground Easement [1]		
3788	*74 through 85*	164 Townsend Street
3788	10	148-154 Townsend Street
3788	9A	144-146 Townsend Street
3788	9	136 Townsend Street
3788	8	130 Townsend Street
3788	43	670 Second Street
3788	44	678-80 Second Street
3788	49 to 73	650 Second Street
3788	2	640 Second Street
3788	38	35 Stanford Street
3788	37	301 Brannan Street
Underground Easement for Either Cut-and-Cover or Tunneling Option		
3788	12	166-178 Townsend Street
Temporary Construction Easement (Second-to-Main Alternative – Locally Preferred Alternative)		
3718	*025*	*201 Mission (southern portion of site)*

***Notes**:*
[1] Properties listed would be acquired and demolished under the Cut-and-Cover Option. For the Tunneling Option, underground easement would be required for the listed properties.

***Source:** Sedway Group, Parsons, 2004.*

Table 5.2-3:
Property Acquisitions & Demolitions
Second-to-Main
Caltrain Extension Alternative

Block & Lot Number		Address
3736	95	217 Second Street
3736	96	205-215 Second Street
3736	97	201 Second Street
3721	22	191Second Street
3721	23	181 Second Street
3721	25	171 Second Street
3721	47	90 Natoma Street
3721	95	580-586 Howard Street
3721	*108*	81-83 Natoma Street
3721	*109 through 118*	85 Natoma Street
3721	29	77-79 Natoma Street
3721	20	568-576 Howard Street
3721	31	* Natoma Street

Notes:
***** indicates no address listed

Source: Sedway Group, Parsons Transportation Group, 2001.

Table 5.2-4:
Property Acquisitions & Demolitions
Second-to-Mission
Caltrain Extension Alternative

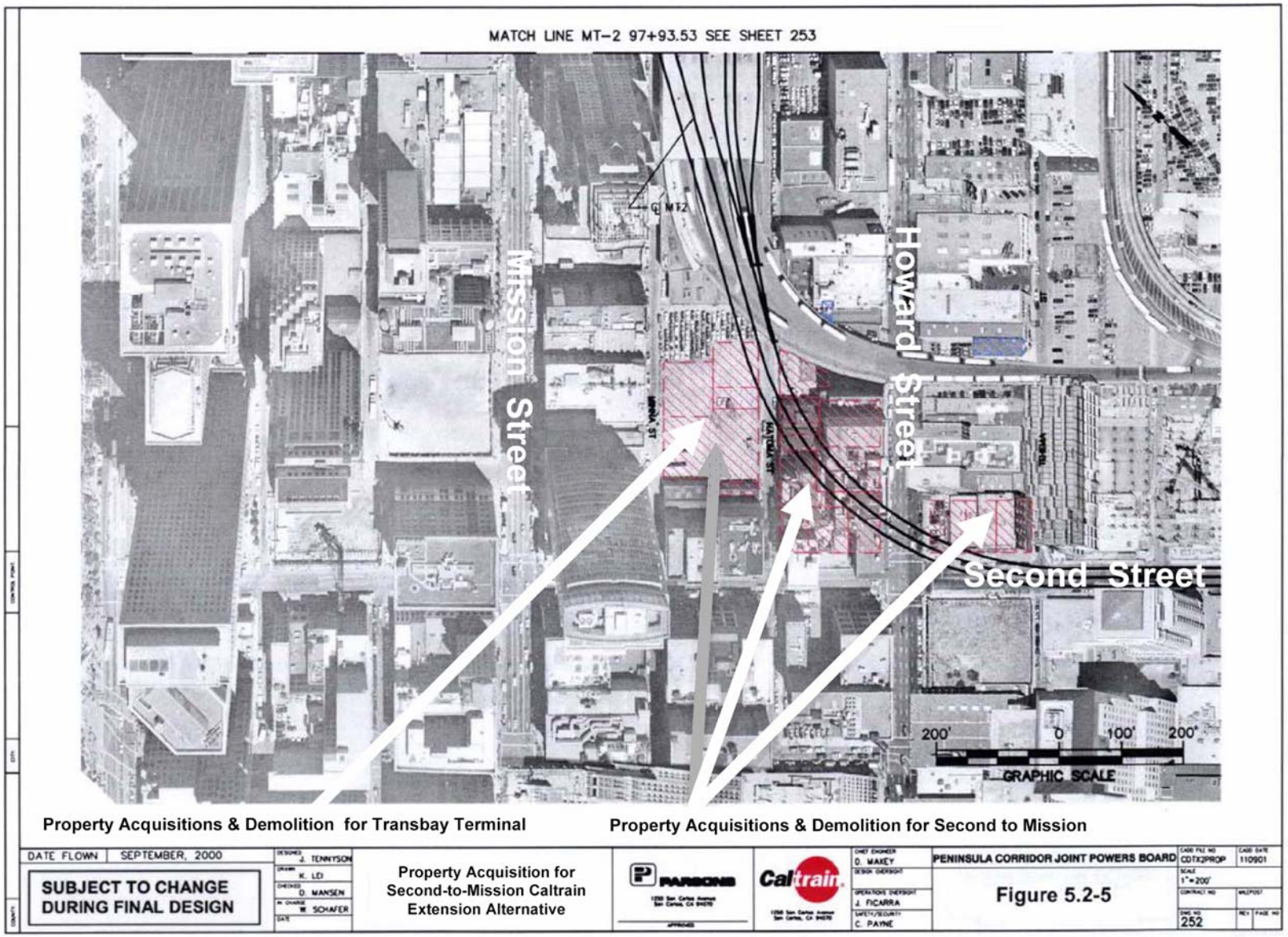
Block & Lot Number		Address
3736	95	217 Second Street
3736	96	205-215 Second Street
3736	97	201 Second Street
3719	1	301-315 Mission Street (northern portion)
3719	17	101-129 Fremont Street
3721	22	191 Second Street
3721	23	181 Second Street
3721	25	171 Second Street
3721	47	90 Natoma Street
3721	95	580-586 Howard Street
3721	*108*	81-83 Natoma Street
3721	*109 through 118*	85 Natoma Street
3721	29	77-79 Natoma Street
3721	20	568-576 Howard Street
3721	31	* Natoma Street

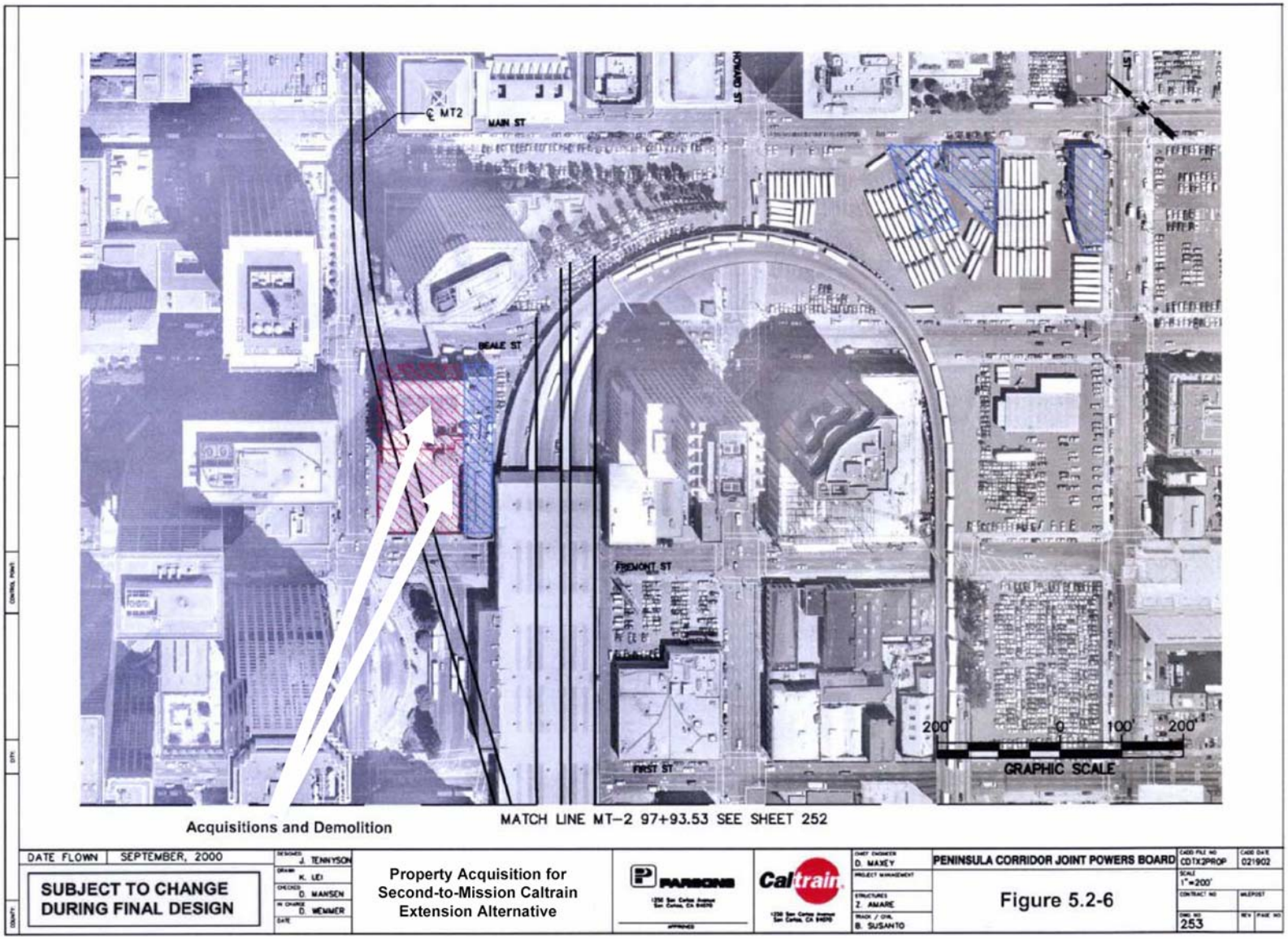
Notes:
***** indicates no address listed

Source: Sedway Group, Parsons Transportation Group, 200*4*

5.2.4 Transbay Redevelopment Plan

Properties identified for redevelopment as part of the Redevelopment Plan are principally occupied by surface parking. Impacts to parking are discussed in Section 5.19.5.


MATCH LINE MT–2 97+93.53 SEE SHEET 253
Mission Street
Howard Street
Second Street
200'
0
100'
200'
GRAPHIC SCALE
Property Acquisitions & Demolition for Transbay Terminal
Property Acquisitions & Demolition for Second to Mission
DATE FLOWN SEPTEMBER, 2000
SUBJECT TO CHANGE DURING FINAL DESIGN
Property Acquisition for Second-to-Mission Caltrain Extension Alternative
PARSONS
Caltrain
PENINSULA CORRIDOR JOINT POWERS BOARD
Figure 5.2-5


℄ MT2
MAIN ST
HOWARD ST
BEALE ST
FREMONT ST
FIRST ST
200'
0
100'
200'
GRAPHIC SCALE
Acquisitions and Demolition
MATCH LINE MT-2 97+93.53 SEE SHEET 252
DATE FLOWN SEPTEMBER, 2000
SUBJECT TO CHANGE DURING FINAL DESIGN
J. TENNYSON
K. LEI
D. MANSEN
D. WEMMER
Property Acquisition for Second-to-Mission Caltrain Extension Alternative
PARSONS
Caltrain
D. MAXEY
PENINSULA CORRIDOR JOINT POWERS BOARD
Z. AMARE
B. SUSANTO
Figure 5.2-6
CD1X2PROP
021902
1"=200'
253

5.2.5 Business and Residential Displacements

Field surveys and public records searches were performed to determine the potentially affected properties, the number and types of businesses occupying these properties, and the general character of the land uses. Businesses were consolidated into the following categories, as shown in Table 5.2-5: small or specialty retail, office/business services, restaurant/bar, industrial, warehouse, and parking. The estimated number of employees who may be displaced was determined from public business records or estimated by applying per-square-foot factors to the building areas of the affected properties. Estimates of affected employees are in full-time equivalents in all cases.

Because of the varied types of businesses in the SOMA, the high incidence of small specialty firms, and the relatively rapid changes in business activity, it is difficult to estimate accurately the number of businesses and employees that may be affected by acquisitions that would take place three to five years from now. The estimated acquisitions and displacements presented in this section are representative of conditions that may exist when the Transbay Terminal and Caltrain Downtown Extension would be implemented. Information would be updated during final design and during pre-construction surveys.

Residential Displacement. Construction of the Transbay Terminal and the Caltrain Downtown Extension could require acquisition of up to 60 residential units, including 14 live/work units. Twelve of these units have operating commercial businesses. Up to 120 persons per alternative would be relocated, assuming an average of two residents per unit.

Business Displacement. The Transbay Terminal and Caltrain Downtown Extension could displace up to 67 businesses, plus 12 businesses currently operating in the live/work units. Up to an estimated 1,600 respective employees could be displaced.

Federal and state laws require consistent and fair treatment of owners of properties to be taken, including just compensation for their properties. Uniform and equitable treatment of temporarily or permanently displaced businesses is also required by these laws. Acquisition costs are discussed in Section 5.6.

5.2.6 Relocation Resources

Acquisition of private properties required for the Caltrain Downtown Extension would represent a loss of up to 742,000 square feet of building space, of which up to 478,000 square feet is estimated to be office space; 127,000 square feet is estimated to be industrial space; 20,000 square feet is estimated to be retail/restaurant space; and 117,000 square feet is residential space.

Table 5.2-5: Estimated Residential and Non-Residential Acquisitions for Transbay Terminal, Caltrain Downtown Extension and Redevelopment Program

RESIDENCES

Project Component/ Alternatives	No. of Properties Acquired	Total Est. Land Area in Sq. Ft.	Total Est. Building Sq. Ft.	Estimated Number of Residential Units Displaced by Type					Estimated Persons Displaced
				Total Single Family Units	Mobile Homes	Multi-Family		Total	
						Buildings	Units		
Transbay Terminal & Redevelopment Area	No Residential Units Affected								
Caltrain Downtown Extension (Cut-and-Cover Option)									
Second-to-Main	4	41,000	117,000	0	0	4	60	60	120
Second-to-Mission	4	41,000	117,000	0	0	4	60	60	120
Caltrain Downtown Extension (Tunneling Option)									
Second-to-Main	2	14,000	50,000	0	0	2	23	23	46
Second-to- Mission	2	14,000	50,000	0	0	2	23	23	46

BUSINESSES

Project Component/ Alternatives	No. of Properties Acquired	Total Est. Land Area in Sq. Ft.	Total Est. Building Sq. Ft.	Estimated Number of Businesses Displaced by Type							Estimated Employees Displaced
				Retail	Office/Bus. Services	Rest. / Bar	Industrial	Warehouse	Parking	Total	
Transbay Terminal and Redevelopment Area											
	6	36,000	82,000	0	9	0	0	0	1	10	200
Caltrain Downtown Extension (Cut-and-Cover Option)											
Second-to-Main	25	224,000	433,000	6	32	4	2	1	3	48	1,084
Second-to-Mission	27	274,000	543,000	6	42	4	2	1	2	58	1,422
Caltrain Downtown Extension (Tunneling Option)											
Second-to-Main	16	81,000	146,000	5	29	4	0	0	2	40	425
Second-to-Mission	18	131,000	256,000	5	39	4	0	0	2	50	763

Source: Sedway Group, Parsons Transportation Group, 2001

Based on current market conditions for commercial and residential space, most businesses and residents should be able to be relocated within the study area. The study area is part of the broader South of Market Area (SOMA), which has witnessed a dramatic transformation over the past seven years with older buildings rehabilitated and new buildings constructed on previously vacant or underutilized parcels. This area was the epicenter of the "dot com" boom in 1999 and 2000, during which multimedia, technology, and Internet companies, fueled by venture capital, exhibited a healthy appetite for real estate. Correspondingly, vacancy rates plummeted, rents and sales prices spiked, and new development and redevelopment was widespread throughout SOMA.

However, by the end of 2000, stock market reductions hit the technology and Internet sector and space was increasingly placed on the market for sublease. In 2001, the overall economy has substantially slowed, affecting demand for space. As a result, vacancy rates have increased. The properties located at Second and Howard streets are within the South of Market Financial District office submarket, which posted a 12 percent vacancy on an inventory of 20.8 million square feet as of the end of September 2001. The properties located at Second and Townsend streets are in the SOMA South office submarket, which has been more severely affected by the downturn. As of September 2001, this market had a vacancy rate of 26 percent on a total inventory of 5.5 million square feet.

As demand for office space has deteriorated, so has demand for industrial and retail space. The residential market, while not as severely affected, has also experienced increasing vacancy rates, lowered rents, and, with respect to "for-sale" projects, lower sales prices and longer marketing periods. A recovery is expected, but may not commence until at least the end of 2002. An improvement in the market to the point of the extremely strong conditions experienced in 1999 and 2000 is not expected for a number of years. Therefore, displaced businesses and residents interested in relocating within SOMA would likely find an ample supply of comparable office, industrial, retail, or residential space.

The federal Uniform Relocation Act (Public Law 91-646) and the California Relocation Act (Chapter 16, Section 7260 et seq. of the Government Code) and related laws and regulations contain specific requirements that govern both land acquisition and relocation. All real property to be acquired *will* be appraised to determine its fair market value before an offer is made to each property owner. Minimum relocation payments are detailed in the laws, and include moving and search payments for businesses. For purposes of the relocation acts, parking lots are considered businesses.

The City and County of San Francisco and the *Transbay Joint Powers Authority will* provide information, assistance and payments to all displaced businesses in accordance with these laws and regulations.

5.3 SOCIOECONOMICS

5.3.1 No-Project Alternative

The No-Project Alternative would not directly affect residential or business access or the character of neighborhoods so as to adversely influence location choices or the local economy.

5.3.2 Transbay Terminal

Construction of the proposed Transbay Terminal would increase pedestrian activity and as a result would potentially contribute to the intensification of land uses and the redevelopment of underutilized parcels in the vicinity of the Terminal; thereby improving the economic vitality of the area.

Four nonresidential units would be displaced due to implementation of the Transbay Terminal. No residential units would be displaced by the Transbay Terminal component.

5.3.3 Caltrain Downtown Extension

The Caltrain Downtown Extension would provide improved access to the major employment center in the heart of downtown San Francisco, and therefore would enhance economic activity in this area.

Construction of the cut-and-cover tunnel configuration between Fifth Street and the Transbay Terminal would entail the acquisition and demolition of all existing buildings under which the Downtown Extension alternative alignments would pass. Following construction of the underground extension, however, it is anticipated that new buildings would be constructed as vacant sites become available for resale.

Construction of the Caltrain Downtown Extension Tunneling Option would involve fewer acquisitions and displacements. Specifically, underground easements would be required for the properties along Townsend and Brannan Streets and in the 600 block of Second Street, but these properties would not be demolished or vacated.

As described in Section 5.2.2, the Caltrain Downtown Extension Cut-and-Cover Option would displace up to 60 residential units, including 14 live/work units, with either the Second-to-Main or the Second-to-Mission alternatives. An estimate of up to 120 persons per alternative would be relocated, assuming an average of two residents per unit. All homeowners or renters displaced as a result of the project would be offered relocation assistance and replacement housing.

For the Cut-and-Cover Option, up to an estimated 58 businesses would be displaced for the Second-to-Mission Alternative. The lowest number of business displacements would occur for the Second-to-Main Tunneling Option, with an estimated 40 business displacements.

The City and County of San Francisco or the TJPA *will* acquire the properties, and each business owner *will* be offered relocation assistance. In the event the displaced businesses chose not to relocate within the area, a loss of jobs would result. The maximum number of jobs lost if no businesses relocated in the area is estimated to be between 425 for the Second-to-Main Tunneling Option to 1,422 jobs for the Second-to-Mission Cut-and-Cover Option.

In all likelihood, a number of the affected businesses would relocate nearby or elsewhere within the City and County of San Francisco. Also, other businesses might relocate or expand in the area, in part because of the general improvement in transportation facilities. As a result, net job loss attributable to the project would be minimal. Fiscal and economic impacts of residential and business displacements are discussed in Section 5.6.

5.3.4 Redevelopment Area Alternatives

The Redevelopment Area alternatives are expected to intensify the urban character of the area and to result in a more cohesive neighborhood with a balanced mixture of residential and commercial uses. Consequently, proposed development is anticipated to improve rather than to disrupt or adversely affect the character of the existing socioeconomic environment.

Displacement impacts *will* be mitigated in accordance with the relocation assistance programs summarized in Section 5.2, Displacements and Relocation. Since no other long-term impacts to residential populations, neighborhoods, community cohesion or land use patterns in the study area are anticipated, no further mitigation is suggested. Potential project impacts on community facilities and services, parklands, schools and churches are discussed in Sections 5.4, Community Facilities and Services, and 5.5, Parklands, Schools, and Religious Institutions.

5.3.5 Environmental Justice

Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations), dated February 11, 1994, calls on federal agencies to identify and address disproportionately high and adverse human health or environmental effects of federal programs, policies, and activities on minority populations and low- income populations. In 1997, the U.S. Department of Transportation (DOT) issued its DOT Order to establish procedures for use in complying with EO 12898 for its operating administrations, including FTA.

Impacts and benefits of transportation projects result from the physical placement of such facilities, and also from their ability to improve or impede access to neighborhoods or portions of the region. This analysis examines whether ethnic minority and/or low-income populations in the project area would experience these types of impacts, and if they are inconsistent with the benefits created.

As noted in Section 4.2, the study area as a whole consists of relatively smaller percentages of ethnic and minority populations as compared to overall percentages for the City of San Francisco. Census Tract 180 at the west end of the study area, however, reveals higher concentrations of Black/African American and Hispanic populations relative to percentages citywide. With the exception of Census Tract 180, the percentage of residents below the federal poverty level was comparable to the citywide average. Auto ownership within the study area is slightly less than for the city as a whole.

The construction of the proposed Transbay Terminal, Caltrain Downtown Extension and Redevelopment Plan would have no long-term adverse effects on minority, low-income and transit dependent communities. As described above, the study area, particularly Census Tracts 176.02 and 179.01 where the majority of the project impacts would occur, has relatively lower percentages of minority and low-income populations as compared to the greater San Francisco area. Census Tract 180, where higher concentrations of minority populations occur, would have fewer project impacts. Minority populations are not disproportionately represented among those who would be displaced by the project or who would live adjacent to the project. Therefore, the project would have neutral environmental justice implications. The proposed project components would improve mobility for transit-dependent populations and would enhance intermodal connectivity. All transit services would remain continuous during the construction period. The proposed community revitalization and redevelopment plan, including the provision of affordable housing, would be an added benefit to the community.

5.4 COMMUNITY FACILITIES AND SERVICES

5.4.1 No-Project

Implementation of the No-Project Alternative would have no effect on existing community facilities and services. The demand for police protection, fire prevention, emergency medical services and waste management facilities as a result of No-Project development would be adequately accommodated through the horizon year 2020. Therefore, no impacts are anticipated with the implementation of the No-Project Alternative, and no mitigation measures are proposed.

5.4.2 Transbay Terminal

5.4.2.1 Public and Community Facilities

None of the public and community facilities described in Section 4.3 would be displaced, relocated, or otherwise affected by construction of either of the Transbay Terminal Alternatives.

5.4.2.2 Safety and Emergency Services

Police. Implementation of either the West Ramp or the Loop Ramp Alternative would increase the amount of pedestrian activity within the Terminal and general vicinity, and thus the potential for crimes reported in the area. Currently, the Terminal falls under the jurisdiction of the California Highway Patrol, but this would change with the change in Terminal ownership and the TJPA would need to determine how it would obtain police services for the new Terminal. *According to Lieutenant Pardini of the San Francisco Police Department (SFPD), the SFPD's Southern Station does not have the sufficient personnel to realign its staff and provide offices exclusively for the Terminal.*[3] Southern Station currently has no patrol officers assigned to the Terminal. Sources at the Department anticipate that a minimum of two Southern Station patrol officers would *need to* be assigned (24 hours per day, seven days per week), and this increase in demand could *not* be met by reorganizing existing staff *and would require a funding arrangement between the terminal and SFPD.*

It is likely that some Terminal police and protection services would remain with the security forces associated with Terminal transit agencies, including AC Transit and Golden Gate Transit. It is anticipated that these agencies would extend their security responsibilities to accommodate the new Terminal under either the West Ramp or Loop Ramp Alternative.

Fire and Emergency Medical Services. The development of the Transbay Terminal at a height and massing greater than the existing Terminal, coupled with an increase in the intensity of land uses associated with the site would increase demand for fire prevention and suppression and emergency services under either of the new terminal alternatives (West Ramp or Loop Ramp). Demand for fire prevention and suppression and emergency services would be expected to be greater under the West Ramp Alternative due to the increased mix of land uses, including the pedestrian concourse level with retail, commercial, conference, and cultural uses.

To ensure that adequate life safety measures and emergency access *will* be incorporated into the design and construction of either of the design alternatives, the Fire Department *will* review project plans at the time of permitting. *The San Francisco Fire Department will require "a risk analysis to accurately determine the number of personnel necessary to maintain an acceptable level of service" (written communication, Aaron Stevenson, San Francisco Fire Department, May 29, 2001)."* To reduce the potential for impacts to occur under either the West Ramp or Loop Ramp Alternative, development and implementation of a life safety plan *will* be required. A life safety plan *will* include provision of on-site measures such as a fire command post at the Terminal, the Fire Department's 800-megahertz radio system and all necessary fire suppression equipment.

[3] Lieutenant Albert Pardina, Planning Division, SFPD, letter to Joan Kugler, January 10, 2003.

5.4.2.3 Solid Waste Management

The West Ramp Alternative would provide for a greater intensity and mix of land uses, and thus would be expected to generate more solid waste than the Loop Ramp Alternative, which would entail about 110,000 square feet less space. Under either of the two alternatives, however, the generation of solid waste would be small when compared to the waste stream generated citywide (1.39 million tons). Impacts associated with the demolition of the existing Terminal would include a short-term increase in the amount of solid waste and debris disposed of which, according to sources at the Solid Waste Management Program, could be adequately accommodated by existing landfills.

Although an increase in solid waste generation and disposal would occur due to implementation of either the West Ramp or Loop Ramp Alternative, new or expanded facilities would not be required to accommodate the demand for Solid Waste Management Services, and therefore no mitigation measures are required. The following measures are recommended to achieve the 50 percent reduction goal specified in the California Integrated Solid Waste Management Act of 1989 (AB 939). In addition, compliance with all City and County ordinances regarding the minimization of waste though recycling would be expected to occur.

Short-term measures include utilizing recycled construction materials where feasible, encouraging recycling of construction and demolition materials, and including built-in compartmentalized recyclable material collection bins into the proposed developments.

Long-term measures include creating and implementing a long-term waste management plan for comprehensive recycling of materials. Such a plan would be developed in coordination with existing recycling programs in the area, and should target materials generated by office, residential and retail land uses such as paper, glass, aluminum beverage containers, and plastic. In addition, proposed development should have a designated space for the collection and storage of recyclable materials.

5.4.3 Caltrain Downtown Extension

5.4.3.1 Public and Community Facilities

None of the public and community facilities described in Section 4.3 would be displaced, relocated, or otherwise affected by construction of the Caltrain Downtown Extension Alternatives.

5.4.3.2 Safety and Emergency Services

Police. Implementation of either of the Caltrain Downtown Extension alternatives would not result in impacts to police protection services. As both alternatives would be located

underground, construction and use of the alignments would not be expected to require additional police staff or new or expanded police facilities. Caltrain security officers would continue to patrol the Caltrain vehicles en route towards the Transbay Terminal. Therefore, no mitigation measures are proposed.

Fire and Emergency Medical Services. Implementation of either of the proposed alternatives would be expected to increase the demand for fire prevention and suppression and emergency medical services during the construction and occupancy of the underground tunnel. To ensure that adequate life safety measures and emergency access would be incorporated into the design and construction of the design alternatives, the Fire Department *will* review project plans at the time of permitting. To reduce the potential for impacts to occur under either of the design alternatives, development and implementation of a life safety plan *will* be required. A life safety plan *will* include provision of on-site measures such as a fire command post near the tunnel operations, the Fire Department 800-megahertz radio system and all necessary fire suppression equipment located on the premises, if applicable, as well as adequate access to the underground tunnel.

5.4.3.3 Solid Waste Management

Impacts associated with implementation of either of the proposed underground Caltrain Downtown Extension alternatives would be limited to short-term construction impacts associated with tunnel-bore operations. Construction impacts associated with the Caltrain Downtown Extension are addressed in greater detail in Section 5.21. The City's Solid Waste Management Program previously determined that the amount of construction debris generated and disposed of could be adequately accommodated by existing landfills.

5.4.4 Transbay Redevelopment Area

The proposed project's redevelopment component would occur over time (through the year 2020). Generally, increases in population result in incremental increases in the demand for public services, in this case specifically for police and fire services. In written communication provided by both the police and fire departments, these providers plan to maintain the necessary staffing levels and equipment to meet the level and scope of service needs of the citizens of San Francisco, and to address the future growth resulting from the project.

5.4.4.1 Public and Community Facilities

None of the public and community facilities described in Section 4.3 would be displaced, relocated, or otherwise affected by construction of the Redevelopment Alternatives.

5.4.4.2 Safety and Emergency Services

Police. On the basis of the current ratio of police staffing to the population, the Police Department would require an estimated additional 85 to 115 staff under the Reduced Scope Alternative and Full-Build Alternative, respectively[4]. It is anticipated that an increase in demand such as this could be met by reorganizing existing staff (i.e., adjusting schedules, re-deploying officers), instead of hiring new staff. There are currently no plans for additional police facilities to serve this area.

The San Francisco Police Department divides the City into different geographic areas, known as patrol sectors. In the South of Market area, there are currently five patrol sectors. The Transbay Terminal Area is within the southern patrol sector and serviced by the Southern Station. The southern patrol sector extends from Market Street on the north, Bryant Street on the south, The Embarcadero on the east, and Third Street on the west. If additional police presence in the southern patrol sector would be required, the police department could reorganize staff allocated to specific patrol sectors or could reconfigure the geographic area of a specific patrol sector by reducing the geographic area of the southern patrol sector and increasing another patrol sector where service demands are less (personal communication, Lt. Al Pardini, San Francisco Police Planning Division, July 2, 2003).

Implementation of either development alternative would not be expected to require new or expanded facilities, and therefore no mitigation measures are required. To ensure adequate security measures are incorporated into the design of all new development, creation and implementation of a security plan, which would include measures that provide for state-of-the-art security and communications capabilities in each of the new facilities, is recommended.

Fire and Emergency Medical Services. The Fire Department anticipates that implementation of either the Full-Build Alternative or Reduced Scope Alternative could impact the Department's level of service in the study area. Demand may be great enough to require additional fire suppression personnel to maintain an adequate level of service. It is anticipated, however, that an increase in demand could be met through the reorganization of existing staff instead of hiring new staff. Furthermore, a proposal to build a new fire station in the nearby Mission Bay area could potentially offset any adverse impact to the Department's level of service in the area.

According to the San Francisco Fire Department (SFFD), response times for Station 1 and Station 2 are approximately three to five minutes, and development of the proposed project is not expected to adversely affect existing response times (personal communication, Battalion Chief Paul Chin, June 27, 2003).

[4] Projections based on Port of San Francisco Waterfront Land Use Plan (San Francisco Planning Department, 1997). It is likely that these figures are over estimated due to the fact that they were calculated based on a standard ratio of officers per capita, and do not reflect the most realistic estimates of how the need for additional staff changes as population of a neighborhood changes. Police Department staff were not able to provide more accurate figures.

As part of the building permit process required for all new construction or building renovation, the building owner/developer must show evidence of the proposed work meeting current building and safety standards. In the case of renovations, additions such as new sprinkler systems, fire alarms or new exits are likely, thus improving a structure's overall fire protection. For new construction, some projects would require the demolition of older buildings, thus reducing the existing fire hazards they may pose. Therefore, any level of future development in the Redevelopment Area would result in improved fire protection due to an increase in the number of structures that adhere to the most recent fire and safety code requirements.

Future development is assumed to result in a decrease in the amount of industrial square footage in the area. As the amount of industrial space diminishes and new construction activity results in the cleaning up of contaminated sites, the potential for fires or other incidents related to hazardous materials would be reduced. In addition, existing hazardous materials programs would likely be able to expand and receive additional financial support as the number of fee-paying businesses increases.

Additional development under either of the redevelopment area alternatives could adversely affect emergency medical resources, especially during daytime hours. Demand may be great enough to require larger staffing, but in most cases new staffing could be supported by new user fees, provided fee allocations allow for it.

5.4.4.3 Solid Waste Management

The City's Solid Waste Program calculates citywide solid waste generation by adjusting yearly taxable sales, the California Consumer Price Index (CPI), population growth, and employment. The annual diversion rate is then calculated by using the known disposal tonnage and the adjusted waste generation figure. The current diversion rate is 42 percent, which could likely increase to more than 50 percent by the horizon year 2020. Accordingly, solid waste generation tonnage could vary from approximately 1.39 million tons towards more than 1.5 million tons by 2020.

Based on development projections for recent studies in the Transbay Area, it is estimated that the Redevelopment Area would generate at least 15,000 tons and dispose of at least 12,000 tons per year of combined residential and commercial waste under the Full Build Alternative.[5] Given that the total citywide waste stream is approximately 1.39 million tons per year, the occupancy waste from development under either of the alternatives would constitute less than 0.9 percent of the entire solid waste stream.

[5] This figure was estimated using a 42 percent diversion rate and the following waste generation assumptions used by the City's Solid Waste Program: 3 lbs. per residential square foot during construction, 1.02 tons per household during occupancy, 11.5 lbs. per commercial square foot during construction, 2.6 lbs. per square foot of office space per year during occupancy and 3.1 lbs. per square foot of commercial space per year during occupancy.

As implementation of either the Full-Build or Reduced Scope alternatives would not result in an impact to Solid Waste Management Services, no mitigation measures are required. The measures outlined previously for the Transbay Terminal alternatives could potentially reduce the short-term and long-term impacts to Solid Waste Management, including the City's ability to achieve the state mandated 50 percent reduction goal (AB 939). In addition, compliance with current City and County ordinances regarding the minimization of waste through recycling would be required.

5.5 PARKLANDS, SCHOOLS, AND RELIGIOUS INSTITUTIONS

The No-Project Alternative would have no effect on parks, schools, or religions institutions. The remainder of this section therefore focuses on the Terminal/Extension/Redevelopment project effects.

With the exception of the set-back and porte-cochere (semi-circular drive) immediately in front of the existing Transbay Terminal, none of the open spaces, parks, recreational facilities, universities, or churches described in Section 4.4 would be displaced or affected as part of any of the Transbay Terminal, Downtown Extension or Redevelopment alternatives, except to the extent that transit access and traffic patterns would change.

5.5.1 Parklands

Both the Transbay Terminal alternatives would displace the set-back and porte-cochere located in front of the existing Transbay Terminal. The existing area is almost entirely paved, and would not be considered a "park" in most senses of the word, although the 1994 Draft Downtown Streetscape Plan developed by the San Francisco Planning Department calls for "retaining the area in front of the Terminal or other suitable areas for much needed open space," and "retaining . . . a garden walk pedestrian connection and open space," on the former freeway parcels south of the Terminal. The current concept for the new Transbay Terminal includes an open plaza for public use and a grand staircase as the front entrance to the new terminal.

Both Redevelopment Alternatives would introduce new public open space into the Transbay Redevelopment Area, an area currently lacking public open space and parks. The current open space concept for the area includes four primary public open spaces, with two open spaces forming Fremont Square, a primarily hardscaped plaza that would be adjacent to the new Terminal and would replace the existing open space and two new "green" open spaces. Natoma Green would be located between Minna and Natoma Streets and would serve as a mixed-use educational and cultural center, and Essex Green would be located between Tehama and Clementina Streets. In addition, smaller open spaces such as pocket parks, sitting areas, and playgrounds are proposed for the area. The addition of new public open space to the Transbay Redevelopment Area would represent an improvement over current conditions.

5.5.2 Schools

No schools would be displaced, relocated, or disrupted by the project. Private schools and colleges located within the vicinity of the Terminal, such as Golden Gate University, would likely benefit from the improved transit operations and the creation of new transit-oriented development (retail, cultural, commercial uses). Moreover, the new, aesthetic design of the Terminal would create a distinct point of interest in the Transbay Area, which could in turn attract new patrons. Short-term construction effects such as noise, redistribution of traffic, and dust would be anticipated to occur; these are discussed in Section 5.21.7, Construction Impacts on Parks, Schools, and Religious Institutions.

Increased public school enrollment at the K-12 level generated by proposed residential development in the Transbay Redevelopment Area would increase demand for school facilities. Based on the student generation rate of 0.203 students per new housing units used by the San Francisco Unified School District (SFUSD) for planning purposes, the number of students that could potentially be added to the Transbay Redevelopment Area would range from about 685 students under the Reduced Scope Alternative (3,373 housing units) to about 737 students under the Full Build Alternative (3,630 housing units).

Funding for school construction is generated by fees on new development, at levels capped by the State legislature. The current State legislature establishes a maximum fee for residential development at $1.93 per square foot, and $0.31 per square foot of commercial development. The San Francisco Board of Education has not adjusted the fees in the San Francisco Unified School District (SFUSD) since 1994; current SFUSD fees are $1.72 per square foot of residential development, $0.24 per square foot of office, and $0.13 per square foot of retail. Fees of $0.08, $0.09, $0.15, and $0.22 per square foot of lodging, warehouse, heavy industrial, and light industrial development, respectively, are also charged by the SFUSD. At the current rate fees, development proposed for the Transbay Redevelopment Area under the Full Build Alternative would generate about $10 million in fees, and about $7 million in fees would be generated under the Reduced Scope Alternative.

School development fees are considered under Senate Bill 50 (SB50) to mitigate any potential effect associated with the implementation of proposed residential development under either development alternative.

5.5.3 Religious Institutions

Due to their distance from the proposed improvements, none of the religious institutions identified in Section 4.4 would experience long-term impacts of the project components, although there would be limited short-term construction effects such as noise, redistribution of traffic, and dust. These impacts are addressed in Section 5.21.7.

As there would be no long-term adverse effects to parklands, schools, and churches, no mitigation is proposed.

5.6 FISCAL AND ECONOMIC IMPACTS

5.6.1 No-Project Alternative

The No-Project Alternative is the reference point for estimating the fiscal and economic impacts of the proposed project alternatives and therefore, by definition, would have no impacts. The rest of this section therefore focuses on the impacts of the Terminal/Extension/Redevelopment project.

5.6.2 Transbay Terminal/Caltrain Extension/Redevelopment

Because the Transbay Terminal, Caltrain Downtown Extension, and Redevelopment components are very closely related from the point of view of fiscal and economic impacts, these effects are discussed together in this section.

To construct the Caltrain Downtown Extension from Fourth and Townsend Streets to the site of the Transbay Terminal, land and buildings will need to be acquired, and permanent underground easements will need to be secured. Due to Caltrain design standards, local geology, and the resultant depth of the Caltrain alignment, the construction of either alternative, as presently envisioned, may involve the acquisition and demolition of buildings under which the alignment would pass, depending on the construction technique selected (cut-and-cover versus tunneling). After the underground extension is constructed, these properties would be available for resale as vacant sites ready for new construction. The properties that would be affected by the extension are detailed in Section 5.2.

Properties identified in Section 5.2 are in private ownership; publicly-owned properties are excluded from this fiscal analysis. These publicly-owned properties would be transferred to the Transbay Joint Powers Authority (TJPA – see Section 1.3, Project Sponsors) and the Redevelopment Agency from the State of California (see Section 6).

5.6.2.1 Net Order-of-Magnitude Land Building and Easement Cost

This analysis estimates the order of magnitude cost to acquire the privately-owned land, buildings, and easements needed to construct the Caltrain Downtown Extension Alternative. This order of magnitude cost estimate also includes the following items:

- Estimated premium associated with eminent domain proceedings, such as legal fees, appraisal costs, and other consulting and administrative costs;
- Estimated cost to relocate commercial and residential tenants and owner-occupants; and
- Estimated building demolition costs.

The cost estimate does not include payments associated with business interruption, loss of goodwill, and "nuisance" costs associated with the construction of the extension, including loss of property access. Costs would be partially offset by the estimated proceeds from resale of the properties as vacant sites become available for new construction.

Acquisition Costs. Compensation to owners of the acquisition parcels would be based on accepted appraisal techniques, specifically comparison to sales of other buildings in the broader South of Market neighborhood. Because the individual properties exhibit a wide range of building sizes, conditions, tenancies, etc., a broad price range was used to prepare the order of magnitude cost estimate. Individual properties have not been appraised at this stage; however, if a property recently transferred ownership, the actual transaction was factored into the analysis.

Using such sources as First American Real Estate Solutions, Comps Inc., and Marshall Valuation Service, estimated cost ranges were determined for each land use type to be acquired under each alternative and option. Based on these estimates, Tables 5.6-1, 5.6-2 and 5.6-3 provide a summary of the estimated acquisition costs for the Transbay Terminal and the two Caltrain Downtown Extension Alternatives for both the Cut-and-Cover and Tunneling Options.

Estimates include an assumed premium associated with possible eminent domain proceedings and relocation costs, which is based on information provided by the San Francisco Redevelopment Agency and professional experience with other redevelopment and eminent domain projects.

Table 5.6-1: Summary of Acquisition Cost Estimates
Transbay Terminal & Redevelopment Properties

	Low	High
Estimated Acquisition Cost [1]	*$34,000,000*	*$46,400,000*
Relocation Cost	$300,000	$300,000
Demolition Cost	$300,000	$300,000
Total Net Acquisition Costs	***$34,600,000***	***$47,000,000***

Notes:
[1] Includes premium for possible condemnation proceedings.
Sources: Sedway Group; City of San Francisco; First American Real Estate Solutions; Comps Inc.; Marshall Valuation Service, August 2001.

Table 5.6-2: Summary of Acquisition Cost Estimates Second-to-Main Alternative

	Low	High
Cut-and-Cover Option		
Estimated Acquisition Cost [1]	*$124,400,000*	*$202,400,000*
Easements	*1.200,000*	*1,200,000*
Relocation Cost	$4,100,000	$4,100,000
Demolition Cost	$3,200,000	$3,200,000
Resale Proceeds	*($27,200,000)*	*($88,100,000)*
Total Net Acquisition Costs	***$105,700,000***	***$122,800,000***
Tunneling Option		
Estimated Acquisition Cost		
Fee [1]	*$46,000,000*	*$69,800,000*
Easements	*$2,200,000*	*$2,200,000*
Relocation Cost	$2,400,000	$2,400,000
Demolition Cost	$1,100,000	$1,100,000
Resale Proceeds	*($7,600,000)*	*($24,900,000)*
Total Net Acquisition Costs	***$44,100,000***	***$50,600,000***

Note: [1] Includes premium for condemnation.

Sources: City of San Francisco; Sedway Group; First American Real Estate Solutions; Comps Inc.; Marshall Valuation Service, August 2001.

Table 5.6-3: Summary of Acquisition Cost Estimates Second-to-Mission Alternative

	Low	High
Cut-and-Cover Option		
Estimated Acquisition Cost [1]	$188,100,000	$277,800,000
Relocation Cost	$4,500,000	$4,500,000
Demolition Cost	$3,800,000	$3,800,000
Resale Proceeds	($66,000,000)	($148,500,000)
Total Net Acquisition Costs	**$130,400,000**	**$137,600,000**
Tunneling Option		
Estimated Acquisition Cost		
Fee [1]	$109,800,000	$145,300,000
Easements	$1,000,000	$1,000,000
Relocation Cost	$2,800,000	$2,800,000
Demolition Cost	$1,800,000	$1,800,000
Resale Proceeds	($46,400,000)	($85,200,000)
Total Net Acquisition Costs	**$69,000,000**	**$65,700,000**

Notes: [1] Includes premium for condemnation.

Sources: City of San Francisco; Sedway Group; First American Real Estate Solutions; Comps Inc.; Marshall Valuation Service, 2001.

Relocation costs are estimated at $35,000 per unit for residential units, $40,000 per business for small- and medium-sized businesses, and $120,000 for large businesses. The relocation costs used here are estimates to be used for planning and budgeting purposes. Actual relocation payments will be determined at the time of project implementation using state and federal guidelines.

Demolition costs are based upon cost estimates provided by Marshall Valuation Service. Depending upon the construction type of the building and other individual factors, demolition costs range from $3.60 to $8.10 per square foot of building area. An average of $5.85 per square foot of building was used.

After construction of the Caltrain Extension, the properties would be available for resale as developable vacant sites. The estimated resale proceeds would partially offset the estimated acquisition costs, resulting in a net acquisition cost estimate. Resale proceeds estimates are based upon land prices per square foot of land area. A broad range is used to reflect the wide variety of locations of the individual properties and their respective unknown redevelopment potentials. For commercial sites, the estimated range is $100 to $300 per square foot of land area, while for residential properties, the range is from $200 to $760 per square foot of land area.[6] As shown in the tables, estimated resale proceeds range from $34 to $113 million for the Second-to-Main Alternative and from $69 to $153 for the Second-to-Mission Alternative.

5.6.2.2 Total Net Acquisition Cost Estimate

Based on each of the acquisition components described above, the net acquisition cost estimate for the Transbay Terminal and the Caltrain Downtown Extension (in 2001 constant dollars), including land, buildings, and easement, is as follows:

Estimated net acquisition costs for properties required for:

- Transbay Terminal - *$34.6 to $47.0 million*
- Second to Main Caltrain Downtown Extension
    - Cut-and-Cover Option – *$105.7 to $122,8 million*
    - Tunneling Option – *$44.1 to $50.6 million*
- Second to Mission Caltrain Downtown Extension Alternative
    - Cut-and-Cover Option – *$130.4 to $137.6 million*
    - Tunneling Option - *$65.7 to $69.0 million.*

These cost ranges include estimated premiums associated with eminent domain proceedings, relocation costs, and demolition costs. Business interruption, loss of goodwill, and "nuisance" costs are not included.

[6] The two properties on Mission Street for the Second-to-Mission Alternative are estimated at $700 to $790 per square foot of land area, due to a recent partial transfer of these properties.

5.6.2.3 Fiscal Implications of Land Acquisition for Caltrain Downtown Extension

The acquisition of real estate parcels for construction of the Caltrain Downtown Extension would result in fiscal impacts to the City and County of San Francisco. These effects are anticipated to be short-term, lasting only for the duration of the construction period and any subsequent period required for property resale. This analysis assumes that all of the acquired properties are ultimately resold to private parties. If the properties remain in public ownership, the implications would be longer-term.

The properties identified for acquisition currently generate revenues to the City and County of San Francisco through taxation, both directly and indirectly. These revenues include property taxes, payroll taxes, retail sales taxes, parking taxes, and other less significant taxes, such as utility taxes. Once the properties are purchased by a public entity for construction of the Transbay Terminal and Caltrain Downtown Extension, they would no longer generate property taxes to the City and County of San Francisco, because public entities' owners are exempt from such taxation. In addition, the ultimate demolition of existing development will result in the loss of occupancy-related taxes, such as payroll taxes paid by existing businesses, retail sales taxes generated by existing restaurants and retailers, retail sales taxes generated by subject property residents, and parking taxes paid by existing parking operators.

Property Tax. The properties to be acquired for the Caltrain Downtown Extension for the Cut-and-Cover Option have a year 2000 assessed valuation of $76.0 million for the Second-to-Main Alternative and $104.0 million for the Second-to-Mission Alternative.[7] Pursuant to the annual allowable property value increase of two percent under Proposition 13, and a recent area real estate transaction involving 301-315 Mission Street and 101-129 Fremont Street[8] (which properties lie within the alignment for the Second-to-Mission Alternative), these assessed valuations for the year 2001 are assumed to increase to approximately $77.6 million for the Second-to-Main Alternative and $127.6 million for the Second-to-Mission Alternative.[9] Given the City and County of San Francisco's current property tax rate of 1.136 percent, these properties generate annual property tax revenues to various City and County funds of $881,109 for the Second-to-Main Alternative and $1,449,109 for the Second-to-Mission Alternative. For the Tunneling Option, fewer parcels will need to be acquired. Therefore, the property tax revenues associated with these properties are lower, estimated at $517,379 for the Second-to-Main Alternative and $841,426 for the Second-to-Mission Alternative. Regardless of option, the property tax revenues associated with the properties requiring acquisition for the Transbay Terminal total an additional $97,536.

[7] Assessed valuation as reported by First American Real Estate Solutions, August 2001.

[8] Eighty percent interests in these properties were recently sold for $40 million, implying a $50 million total valuation. It is assumed the County Tax Assessor will include this total valuation in the 2001 property tax rolls.

[9] The full figures are $77,562,377 for Second-to-Main and $127,562,377 for Second-to-Mission.

These revenues would be lost to the City and County of San Francisco for the time period the properties are under public ownership. However, many of the properties could be resold following construction of the Caltrain Downtown Extension. If the properties were resold to private parties following construction of the Downtown Extension, property tax revenues would again accrue to the City and County of San Francisco (and the San Francisco Redevelopment Agency pending formulation of a redevelopment project area). To the extent subsequent development occurs, higher property tax revenues might ultimately accrue to the City and County of San Francisco due to higher assessed values associated with new, more intense development with higher values than the present uses. Thus in the long run, the short-term property tax losses may be recouped and even exceeded following new development reflecting the highest and best use of each property.

Payroll Tax. Payroll taxes, assessed at a rate of 1.5 percent of gross payroll, are a significant revenue source to the City and County of San Francisco. There are up to 67 operating businesses located in the properties identified for acquisition for the Downtown Extension and the Transbay Terminal, depending upon alternative and option. An estimate of the number of employees associated with these businesses and their average annual payroll provides a basis for formulating a general estimate of annual payroll and associated payroll taxes. If any of these businesses were to close or relocate out of San Francisco, their payroll taxes would be lost to San Francisco. Although area-related payroll taxes would resume following redevelopment of the properties, any taxes lost during the construction and property resale period would not be recouped by San Francisco, unless these businesses were successfully relocated within San Francisco prior to or during construction. If these businesses were successfully relocated within San Francisco prior to or during construction, their payroll taxes would be preserved, both during and after construction.

For each alternative and option, the total square feet by land use and a square-foot-per-employee estimate provides a basis for estimating total affected employment. This, coupled with an annual per capita payroll estimate, provides an estimate of the maximum payroll taxes that would be foregone as a result of business closures and relocations out of San Francisco with the Caltrain Downtown Extension. The calculated results per alternative are presented in Table 5.6-4, which estimates that for the Cut-and Cover Option, 1,089 jobs are associated with the Second-to-Main Alternative properties and 1,219 jobs are associated with the Second-to-Mission Alternative properties. For the Tunneling Option the figures are lower, totaling 424 employees for the Second-to-Main Alternative and 762 employees for the Second-to-Mission Alternative. Assuming an annual average payroll of $52,000 per employee,[10] estimated annual payroll taxes for the Cut-and-Cover Option are $849,420 for the Second-to-Main Alternative and $1,113,060 for the Second-to-Mission Alternative. For the Tunneling Option, these figures are $330,720 for the Second-to-Main Alternative and $594,360 for the Second-to-Mission Alternative. While not included in Table 5.6-4, the Transbay Terminal properties have an additional estimated 200 office employees, with an associated payroll tax estimate of $156,000.

[10] Derived from County Business Patterns data for all San Francisco employees.

These are revenues that would be retained in both the short-term and long-term by the City and County of San Francisco if the affected businesses were to be successfully relocated within San Francisco. They would be lost only if the businesses were to close or relocate out of San Francisco following demolition of their existing space.

Retail Sales Tax. Retail sales taxes accrue to the City and County of San Francisco at a rate of 1.25 percent of total taxable sales. Retail sales taxes would accrue from the retail businesses and restaurants within the affected properties as well as from citywide spending by residents who live in the affected properties. As presented in Table 5.6-4, there are 19,680 square feet of retail and restaurant space included in the properties that would need to be acquired for both the Cut-and Cover and Tunneling Options. There are no additional retail properties associated with the Transbay Terminal. At a conservative $200 taxable sales per square foot annually, these operations generate an estimated $49,200 in retail sales taxes to the City and County of San Francisco annually. These revenues would be lost only if the affected businesses were to close or relocate outside of San Francisco. As with the payroll taxes, these retail sales taxes would be preserved if these operations were to be successfully relocated within San Francisco prior to or during construction.

For both Alternatives under the Cut-and-Cover Option, construction of the Caltrain Downtown Extension will require the acquisition and demolition of 60 residential units, including 14 live/work units. This translates into the relocation of an estimated 120 persons, assuming an average of two residents per unit. Under the Tunneling Option, only 23 residential units will be acquired and demolished. If each resident spends $7,200[11] in taxable retail sales in San Francisco, the total annual sales tax contribution to the City and County of San Francisco would amount to a rather low $10,800 for the Cut-and-Cover Option and $4,140 for the Tunneling Option. Thus retail sales taxes at risk of loss would total only $60,000 per year for the Cut-and-Cover Option and $53,340 for the Tunneling Option. These taxes would be lost to the city only if all of the affected residents were to do all of their spending elsewhere. There are no residential units associated with the Transbay Terminal; hence no additional retail sales tax impacts.

Other Tax. Other taxes generated by real estate may also be interrupted or cease subsequent to acquisition of the properties for construction of the Caltrain Downtown Extension. These include utility user taxes, franchise fees, and, for the three existing parking facilities (with less than an estimated 100 spaces), parking taxes. These tax revenues are likely to be very insubstantial relative to the preceding taxes, especially property and payroll taxes, and were not quantified.

[11] Assumes $9,000 per capita in retail sales expenditures, with 80 percent captured by San Francisco retailers.

Table 5.6-4: Estimated 2001 Payroll Tax Revenue Generated by Business Displaced by Construction of the Caltrain Downtown Extension Alternatives

	Cut-and-Cover Option		Tunneling Option	
	Second-to-Main	Second-to-Mission	Second-to-Main	Second-to-Mission
Industrial Space				
Square Feet	126,880	126,880	2,600	2,600
Square Feet Per Employee	750	750	750	750
Total Employment	169	169	3	3
Office Space				
Square Feet	286,358	396,315	124,157	234,114
Square Feet Per Employee	325	325	325	325
Total Employment	881	1,219	382	720
Retail/Restaurant				
Square Feet	19,680	19,680	19,680	19,680
Square Feet Per Employee	500	500	500	500
Total Employment	39	39	39	39
Total Employment	1,089	1,427	424	762
Average Annual Payroll (1)	$52,000	$52,000	$52,000	$52,000
Payroll Tax Rate (2)	1.5%	1.5%	1.5%	1.5%
Annual Payroll Tax Revenue	$849,420	$1,113,060	$330,720	$594,360

Notes:

(1) Annual payroll reflects countywide average annual payroll for all San Francisco workers in 1999 inflated three percent annually to 2001 dollars.

(2) Current payroll tax rate in San Francisco County

Sources: First American Real Estate Solutions; County Business Patterns; U.S. Bureau of the Census, 1999, San Francisco, CA; Office of the Treasurer and Tax Collector, City of San Francisco; and Sedway Group.

Summary Tax Implications. Table 5.6-5 summarizes the major annual tax revenues attributable to the properties that would be involved in the acquisition process for the Transbay Terminal and the Caltrain Downtown Extension. For the Cut-and-Cover Option, these revenues total $1.8 million for the Second-to-Main Alternative and $2.6 million for the Second-to-Mission Alternative. For the Tunneling Option, these revenues are much lower at approximately $0.9 million for the Second-to-Main Alternative and $1.5 million for the Second-to-Mission Alternative. The net increment attributable to the Transbay Terminal is estimated at approximately $250,000.

Table 5.6-5: Annual 2001 San Francisco Taxes at Risk of Loss Due to Property Acquisitions

Type of Tax	Cut-and-Cover Option		Tunneling Option		Transbay Terminal
	Second-to-Main	Second-to-Mission	Second-to-Main	Second-to-Mission	
Property	$881,109	$1,449,109	$517,379	$841,426	$97,536
Payroll	$849,420	$1,113,060	$330,720	$594,360	$156,000
Retail Sales	$60,000	$60,000	$53,340	$53,340	$0
Total	**$1,790,529**	**$2,622,169**	**$901,439**	**$1,489,126**	**$253,536**

At worst, all of these revenues would be lost to the City and County of San Francisco following acquisition of the properties to construct the Downtown Extension. At least, property taxes – which comprise the greatest portion of the total revenues – would be lost during the construction period due to public ownership of the property until the extension was constructed. The other revenue sources, however, might or might not be interrupted, depending upon whether or not the affected businesses and residents were successfully relocated within San Francisco prior to or during construction. To the extent they were successfully relocated, there would be no disruption in these tax revenues. Alternatively, if all of the businesses were not successfully relocated, some portion of the tax revenues would be lost, until such time as the properties were resold and redeveloped.

Given the size and nature of existing development, it is likely that subsequent redevelopment would be more intense and would more accurately reflect the highest and best use of the properties. Thus, in the long run, the short-term property and other tax losses may be recouped and even exceeded.

5.7 AIR QUALITY

This section considers long-term impacts and benefits of the three project components with regard to regional air quality. It also considers the project's conformity with the applicable State Implementation Plan (SIP), as required by the Clean Air Act amendments of 1993. Impacts are assessed by comparing conditions under the No-Project and project alternatives, and by comparing projected concentrations of pollutants to the ambient air quality standards (AAQS).

5.7.1 Regional Air Quality

Provision of a multi-modal transit facility and extension of Caltrain to Downtown San Francisco is projected to reduce the number of miles traveled by autos in the region, which in turn would result in an overall reduction of air emissions. This section estimates the direct auto travel and

air emissions reduction anticipated as part of the Caltrain Extension as calculated by the transportation modeling and ridership projections. As the Transbay Terminal is a replacement of an existing facility, anticipated auto travel reductions were not included in the modeling projections. To the extent that a new Terminal would attract new bus riders, auto travel and air emissions may be further reduced beyond the estimates provided.

The proposed redevelopment would generate additional trips, and the air emissions implications of these trips at local intersections are evaluated in Section 5.7.2. However, by locating large-scale, high density residential, commercial and institutional development near the site of a transit hub, the project can be expected to divert to public transit many trips that would otherwise be made by the private automobile. This transit-oriented development is expected to improve transit's ability to attract a larger mode share of persons commuting to jobs in the region, in that the Terminal and Caltrain Extension would provide an attractive transportation option to the automobile for new residents and workers in the area.

Auto travel and air emission reductions from the Caltrain Downtown Extension. Future emissions from automobile traffic were projected to evaluate the effect of the Caltrain Downtown Extension, based on projected ridership, which is expected to be identical for both the Second-to-Mission and the Second-to-Main alternatives. The effect of the Caltrain Downtown Extension on regional emissions of pollutants was calculated based on the number of vehicle miles diverted from private automobiles and public buses to the electric-powered trains operating on the Downtown Extension. The proposed project is expected to produce a decrease in vehicle miles of travel (VMT), and would therefore result in a reduction of emissions associated with automobiles. Specifically, the total daily VMT in the region (under either the Second-to-Main or Second-to-Mission alternatives) would be about 260,000 less than under the No-Project Alternative, including a 3,668 reduction in bus VMT. This decrease would result in incremental regional reductions in the projected daily local emissions burden (measured in pounds per day or tons per year) of some pollutants, as shown in Table 5.7-1.

Table 5.7-1: Reductions in Air Pollution Emissions Resulting from the Caltrain Downtown Extension [1]

Pollutant	Reduction in Emissions (pounds per day)	Reduction in Emissions (tons per year)
Reactive organic gases (ROG)	329	*52*
Carbon monoxide (CO)	5,211	*820*
Oxides of nitrogen (Nox)	899	*142*
Particulate matter (PM_{10})	30	*5*
Oxides of sulphur (Sox)	18	*3*

[1] The results are identical for either Caltrain Downtown Extension alternative (Second-to-Main or Second-to-Mission).

Source: Terry A. Hayes Associates, September 2001; Parsons, September 2001

5.7.2 Microscale Air Quality

Existing local carbon monoxide (CO) conditions were assessed using the carbon monoxide dispersion computer model CAL3QHC. The model uses state and federally approved emissions factors,[12] meteorological data, traffic volume, speed, and vehicle mix inputs. The results of the model are then added to the background or "ambient" conditions to provide an estimate of local conditions.

Within the urban setting, vehicle exhaust is the main source of CO. Therefore, the highest concentrations of CO are found near busy intersections. CO is a localized gas, and its concentrations decrease substantially as distance from the source (intersection) increases. To provide a worst-case simulation of CO concentrations within the area that may be affected by the proposed project, CO concentrations at sidewalks adjacent to eight area intersections were modeled. The study intersections (listed in Table 5.7-2 along with existing CO concentrations) were selected based on their potential to experience the greatest impacts with regard to volume, capacity, and level of service, and are intended to represent the "worst case" for impacts among the 27 intersections that were evaluated in the project traffic report.[13]

Table 5.7-2: Existing (2001) Weekday P.M. Peak Hour Carbon Monoxide Concentrations at Study Intersections (ppm)

Study Intersection	Highest Concentration at Intersection (ppm)			
	1-Hour Concentration	Standard Exceeded? (State-20.0 ppm Federal-35 ppm)	8-Hour Concentration	Standard Exceeded? (State & Federal-9.0 ppm)
First/Market	11.7	No	8.2	No
First/Mission	12.4	No	8.7	No
First/Howard	14.3	No	10.0	Yes
Beale/Howard	12.0	No	8.4	No
Second/Folsom	12.7	No	8.9	No
Second/Harrison	12.1	No	8.5	No
Fremont/Harrison	10.9	No	7.6	No
Main/Harrison	10.2	No	7.1	No

Source: California Air Resources Board and Terry A. Hayes Associates, LLC. September 2001.

[12] California Air Resources Board, MVEI7G Emissions Factors, Run, Date: 6/18/01.

[13] Wilbur Smith Associates, Transbay Terminal Area/Caltrain Extension Traffic Analysis, September 7, 2001.

5.7.2.1 Existing Carbon Monoxide at Local Intersections

For each of the eight intersections modeled, traffic-related CO contributions were added to the background conditions discussed above. Traffic CO contributions were estimated using the CAL3QHC dispersion model. As demonstrated in Table 5.7-2, none of the eight study intersections currently exceeds the state or federal one-hour CO concentration standard of 20.0 ppm. The intersection of First and Howard Streets, however, currently exceeds the state and federal eight-hour standard of 9.0 ppm.

5.7.2.2 Future Carbon Monoxide Concentrations at Study Intersections

The CAL3QHC micro-scale dispersion model was used to calculate CO concentrations for year 2020 No-Project Alternative and "project" conditions. The evaluation of project conditions assumed the Downtown Extension, with a "worst case"[14] development scenario (i.e., maximum development) that included the Full-Build Alternative and the Transbay Terminal West Loop Alternative.

Overall, CO concentrations are expected to be lower than existing conditions in the year 2020 due to stringent state and federal mandates for lowering vehicle emissions. Although traffic volumes would be higher in the future both with and without implementation of the proposed project, increases in traffic volumes are expected to be offset by increases in cleaner-running cars as a percentage of the entire vehicle fleet on the road.

Projected CO concentrations at the eight "worst case" intersections are shown in Table 5.7-3. As indicated, one-hour CO concentrations under project conditions would range from approximately 4.0 ppm to 5.7 ppm at these intersections. Project eight-hour CO concentrations are anticipated to range from approximately 2.8 ppm to 4.0 ppm. The state and federal one-hour standards would not be exceeded at any of the eight study intersections. Similarly, none of the eight intersections is anticipated to exceed the state or federal eight-hour standard. Incremental increases in CO concentrations at all intersections under both the one-hour and eight-hour scenario would be less than one part per million.

[14] Maximum development was considered "worst case" for this analysis, because it would generate incrementally more automobile trips than the Reduced Scope and Loop Ramp alternatives. Nevertheless, the number of automobile trips generated by any of the project alternatives is considered low. As stated in Section 5.19, the traffic analysis assumed a greater transit mode share than could be achieved in a location that does not have the transit access of the proposed Transbay Terminal Redevelopment Area.

Table 5.7-3: Future (2020) Weekday P.M. Peak Hour Carbon Monoxide Concentrations at "Worst Case" Intersections

Intersection	1-Hour Concentration (ppm)				8-HourConcentration (ppm)			
	No Project	With Project [1]	Change	Impact?	No Project	With Project [1]	Change	Impact?
First/Market	4.6	4.7	0.1	No	3.2	3.3	0.1	No
First/Mission	4.8	5.0	0.2	No	3.4	3.5	0.1	No
First/Howard	5.4	5.7	0.3	No	3.8	4.0	0.2	No
Beale/Howard	4.6	5.0	0.4	No	3.2	3.5	0.3	No
Second/Folsom	4.8	5.1	0.3	No	3.4	3.6	0.2	No
Second/Harrison	4.5	4.6	0.1	No	3.2	3.2	0.0	No
Fremont/Harrison	4.1	4.1	0.0	No	2.9	2.9	0.0	No
Main/Harrison	3.9	4.0	0.1	No	2.7	2.8	0.1	No

[1] "Project" includes the Caltrain Downtown Extension, as well as the Redevelopment and Transbay Terminal alternatives with the greatest development impact (the Full-Build and West Loop Alternatives)

Source**:** Terry A. Hayes Associates, LLC. September 2001.

5.7.3 Supplemental Air Quality Impact Analysis of the Permanent Bus Storage Area

In response to public comments on the Draft EIS/EIR, a supplemental air quality assessment was completed for the proposed permanent mid-day bus storage facility under the West Approach to the Bay Bridge between Second and Fourth Streets. The supplemental assessment evaluated the effect of the proposed relocation of the Transbay Terminal bus layover and storage area from the immediate terminal area to a new location between Second and Fourth Street and north of Stillman Street underneath the aerial structure of I-80. The assessment identified the change in year 2020 concentrations of three criteria pollutants that would typically have a direct localized effect on adjacent sensitive land uses, i.e. carbon monoxide, nitrogen dioxide and PM_{10}. Sensitive locations within approximately 500 feet of the relocated bus storage/layover area were evaluated.

The assessment was based on year 2020 diesel bus emission factors as set forth by the California Air Resources Board (CARB). These emission factors reflect the projected diesel bus fleet mix for the year 2020 and were adjusted to include bus models from the year 2008 until 2020 only, which reflects the anticipated fleet mix for the proposed project. CARB considers clean diesel technology when calculating its emission factors but does not assume that all buses running in the year 2020 will be clean diesel.

The air quality analysis incorporated meteorological data taken from the Arkansas Street air monitoring station, which is approximately one mile south of the proposed bus storage facility. Local wind patterns, as measured from the station, were taken into account in order to estimate pollution concentrations, including those associated with diesel buses. The analysis took into account the cumulative effect of various pollutant sources on the area. Included in the analysis

is the ambient background concentration as measured by the nearest air monitoring station as well as pollutant concentrations generated by street traffic and freeway traffic.

The proposed storage area is currently used for vehicular parking, and an additional vehicular parking structure is proposed to replace the existing parking (or a fraction thereof) lost as a result of the proposed project. The amount of vehicular parking would remain the same or decrease under the proposed Project scenario, and emissions from street traffic, which reflect traffic generated by the current parking lots, were included in the overall pollution concentration levels projected for future conditions. Thus, impacts from the proposed replacement parking structure were considered in the air analysis, and concentration levels due to the proposed parking lot would remain equal to or below the amount generated from existing parking.

The assessment assumed that buses would be running at the storage site for a few minutes each day. Specifically, when estimating pollutant concentration, it was assumed that the buses would be idling for three minutes and that they would be moving at 15 miles per hour on the dedicated ramps – a conservative estimate. It would take between six and 11 minutes for the buses to travel to the terminal from the proposed storage facility at this speed.

The analysis evaluated sensitive receptors within 500 feet of the proposed bus storage facility. These sensitive receptors include residences, parks, and schools. The analysis addressed air pollution concentrations (including PM_{10}) associated with buses, including pollutant emissions associated with diesel exhaust fumes, at the proposed bus storage facility.

For the sensitive receptor locations identified near the proposed off-site bus storage facility, air quality is heavily influenced by three primary sources: (1) vehicular traffic using the grid of surface arterials in the area (e.g., Harrison Street, Bryant Street, Brannan Street, etc.); (2) traffic volumes on the elevated segment of Interstate 80 that crosses the project area carrying between 218,000 to 232,000 vehicles daily; and (3) the volume of urban bus traffic servicing the Transbay Terminal.

The influence and added contribution of these mobile sources on localized pollutant concentration levels was calculated using the Industrial Source Complex Short Term Phase 3 (ISCST3) dispersion model. This model is used throughout California as well as other states to compute short term pollutant concentrations from multiple sources on specific locations. The United States Environmental Protection Agency (USEPA) recognizes ISCST3 as an accepted regulatory air model.

Table 5.7-4 illustrates year 2020 concentrations, along with their corresponding California Ambient Air Quality Standard (CAAQS), of criteria pollutants that would have a direct effect on adjacent land uses because of their localized dispersion characteristics. Estimates are given both for the bus storage and layover area remaining near its current location as well as for the relocated storage area. These estimated Year 2020 concentrations include the ambient background plus localized sources modeled in ISCST3 such as surface street traffic, freeway traffic and bus operations surrounding the Transbay Terminal area. Ambient background

concentrations were added to ensure that a worst-case scenario would be calculated. The ISCST3 model calculated year 2020 pollutant concentrations through the inclusion of several line and area sources of pollutant emissions. Line sources included emissions from local street traffic within 500 feet of the storage facilities, emissions from bus traffic along access ramps leading in and out of existing and future facilities, bus circulation within the new storage areas, and freeway traffic from the elevated freeway. Area sources included emissions from idling buses in the current and future bus storage areas.

Pollution rates were derived using San Francisco County EMFAC2002 emission factors for the year 2020. For vehicle emissions on local streets and on the freeway, peak hour traffic volumes were multiplied by emission factors for model years 1975 (the earliest year in the model) to 2020. Bus emissions were calculated based on information provided for both AC Transit and Golden Gate Transit that included bus model years, fuel type, and the number of buses in use during peak hours. Bus emission factors were calculated based on the assumption that all buses in use in the year 2020 would be model year 2008 or higher and would be diesel buses.

Urban diesel bus idling emission factors are not provided by EMFAC2002. School diesel bus idling emission factors, however, are calculated in EMFAC2002. The characteristics of school diesel buses most closely match those of urban diesel buses, and for purposes of this analysis, idling emission factors for diesel school buses were substituted for the missing urban diesel bus emission factors. By using these emission factors, a worst-case scenario is anticipated in that urban buses are expected to be technologically superior to school buses in limiting the amount of pollutant emissions, and school buses would most likely generate higher pollutant concentrations.

As shown on the table, the supplemental air quality analysis concluded that pollutant concentrations would not exceed the CAAQS, which are designated to protect public health with an adequate margin of safety, and thus, would not have an adverse impact at any sensitive receptor locations. Additional information can be found in the Supplemental Air Quality Analysis Report, which is available for review by appointment at the Planning Department.

An important design feature of the bus storage facilities is the addition of a sound wall along the south perimeter of the area to mitigate noise impacts on surrounding residents (see Section 5.8.6). The sound wall would also serve the dual purpose of changing the dispersion pattern and effectively elevating the release height of pollutant emissions from buses circulating and idling in the bus storage area. Thus, the emission release height would be equal to the height of the wall. The higher the release height, the lower the pollutant concentration would be at adjacent sensitive receptors.

Pollutant concentrations at all receptors are expected to remain below the applicable CAAQS even without the inclusion of the sound wall. Therefore, the sound wall will provide even further assurance that pollution levels would not adversely affect residents adjacent to the bus storage facilities.

Table 5.7-4: Estimated Year 2020 Concentrations With and Without Bus Layover Storage Relocation [b]

Sensitive Receptors		*CO (1 hr) ppm (CAAQS = 20)*		*CO (8-hr) ppm (CAAQS = 9)*		*NO_X (1-hr) ppm (CAAQS = 0.25)*		*PM_{10} (24-hr) ug/m3 (CAAQS = 50)*	
ID	*Type*	*w/o*	*with*	*w/o*	*with*	*w/o*	*with*	*w/o*	*with*
1	*Residential-2nd and Bryant Streets*	*2*	*2*	*2*	*2*	*0.14*	*0.20*	*31*	*30*
2	*Residential-Stillman St. Between 2nd & 3rd Sts.*	*2*	*2*	*2*	*2*	*0.14*	*0.15*	*31*	*31*
3	*Residential-Stillman St. Between 2nd & 3rd Sts.*	*2*	*2*	*2*	*2*	*0.14*	*0.14*	*31*	*30*
4	*Residential-3rd and Stillman Streets*	*2*	*2*	*2*	*2*	*0.13*	*0.15*	*30*	*30*
5	*Residential-3rd and Bryant Streets*	*2*	*2*	*2*	*2*	*0.11*	*0.12*	*29*	*29*
6	*Residential-Bryant St. Between 2nd and 3rd*	*2*	*2*	*2*	*2*	*0.11*	*0.11*	*29*	*29*
7	*Residential-Bryant St. Between 2nd & 3rd Sts.*	*2*	*2*	*2*	*2*	*0.11*	*0.11*	*28*	*28*
8	*Residential-Bryant St. Between 2nd & 3rd Sts.*	*2*	*2*	*2*	*2*	*0.11*	*0.12*	*29*	*29*
9	*Residential-Park Ave. Between 2nd & 3rd Sts.*	*2*	*2*	*2*	*2*	*0.11*	*0.11*	*28*	*28*
10	*Residential-Park Ave. Between 2nd & 3rd Sts.*	*2*	*2*	*2*	*2*	*0.10*	*0.11*	*28*	*28*
11	*Residential-Park Ave. Between 2nd & 3rd Sts.*	*2*	*2*	*2*	*2*	*0.10*	*0.11*	*28*	*28*
12	*Park*	*2*	*2*	*1*	*1*	*0.09*	*0.10*	*27*	*27*
13	*Residential-3rd St. Between Bryant and Brannan Streets*	*2*	*2*	*1*	*1*	*0.09*	*0.10*	*27*	*27*
14	*Residential-3rd and Harrison Streets*	*2*	*2*	*2*	*2*	*0.13*	*0.16*	*30*	*31*
15	*Residential 3rd and Harrison Streets*	*2*	*2*	*2*	*2*	*0.11*	*0.11*	*29*	*29*
16	*School*	*2*	*2*	*2*	*2*	*0.11*	*0.11*	*28*	*28*

/a/ Concentrations include ambient background concentrations added to the concentrations calculated by the ISCST3 model for each pollutant.

***Source**: Terry A Hayes Associates LLC*

The potential impact of pollutant trapping inside the storage area due to the sound wall and overhead freeway is regulated by the U.S. Occupational Safety and Health Administration's (OSHA) standards for air toxic exposure in the work place. OSHA has determined the interior threshold levels of CO, NOx, and PM10 air concentrations to be 50 ppm, 5 ppm, and 5000 µg/m3 respectively. These standards are well above the projected concentration levels of the pollutants inside the storage facility, as determined by the supplemental air quality impact analysis. Thus, no adverse air quality impact based on these standards would be anticipated. Should pollutant concentration levels exceed these limits, OSHA has established appropriate procedures for ventilating such pollutants to acceptable levels.

The criteria used to evaluate air quality impacts from the proposed project are the CAAQS. These outdoor air quality standards are adopted by the State's enforcement agency, the CARB, as provided for in the California Health and Safety Code section 39606. These standards set legal limits on outdoor air pollution and are designed to protect public health and welfare. Ambient air quality standards define clean air, and are established to protect even the most sensitive individuals. Typically, the outdoor CAAQS are more stringent and provide a wider margin of safety than indoor air quality standards promulgated by such agencies as OSHA.

An air quality standard defines the maximum amount of a pollutant that can be present in outdoor air without harm to the public's health. The standards are based on the CARB's on-going review of scientific studies on the health effects of individual air pollutants. As new scientific information on public health consequences becomes available the CAAQS are periodically revised. In light of new information and studies, CARB is responsible for determining whether CAAQS need to be revised to adequately protect human health, particularly sensitive population groups. For example, The Children's Environmental Health Protection Act (CEHPA, California Senate Bill 25, Escutia 1999) required the CARB and other state agencies to evaluate all ambient air quality standards by December 2000 to determine whether these standards adequately protect human health, particularly that of infants and children. The CEHPA also required staff to prioritize those standards found to be inadequate for full review and possible revision. The evaluation found that health effects may occur in infants, children, and other potentially susceptible groups exposed to pollutants at levels near several of the current standards, with PM10, ground-level ozone (O3) and nitrogen dioxide (NO2) receiving the highest priority for review and revision.

5.7.*4* Conformity Assessment

FTA cannot approve funding for project activities beyond preliminary engineering until it has reviewed the project in accordance with the Environmental Protection Agency (EPA) transportation air quality conformity regulations (40 CFR Part 93) and has found that the project conforms. This regulation, which became effective in December 1993, establishes criteria for project conformity that cover all possible situations.

The RTIP has been demonstrated by MTC to conform to the state air quality implementation plan (SIP) for the Bay Area Air Basin. The carbon monoxide modeling results presented in Table 5.7-3 demonstrate that the Terminal/Extension Project will neither cause nor contribute to any carbon monoxide violations in the year 2020. The conformity criteria that the Terminal/Extension Project must satisfy and the status of the project in meeting these criteria are as follows.

•§93.110 The conformity determination must be based on the latest planning assumptions.

Assumptions used in the transportation and traffic analyses for this project, upon which the microscale carbon monoxide and regional criteria pollutant analyses are based, are derived from the MTC's most recently adopted population, employment, travel, and congestion estimates. Travel forecasts are based on MTC's growth assumptions for the Year 2020.

•§93.111 The conformity determination must be based on the latest emission estimation model available.

All emissions estimates are based on the latest available version of the California Air Resources Board's model. Carbon monoxide modeling was conducted using the CAL3QHC model.

•§93.112 The Metropolitan Planning Organization must make the conformity determination according to the consultation procedures of this rule and the implementation plan revision required by §51.390.

The most current SIP is called the Revised 2001 Bay Area Ozone Attainment Plan, which was adopted by the MTC, ABAG, and BAAQMD in October 2001 and by ARB in November 2001. The EPA's approval of the Bay Area mobile source emissions budget was published in the Federal Register in February 2002 allowing MTC to make a conformity finding on the 2001 RTP. MTC's, FHWA's and FTA's conformity approval in March 2002 lifted the conformity lapse that had existed in the region since January 2002.[15] MTC's followed the consultation procedures in 40 CFR Part 93, as amended.

•§93.114 There must be a currently conforming transportation plan and currently conforming TIP at the time of project approval.

The current transportation plan and TIP are, respectively, the 2001 Regional Transportation Plan (RTP) and the *2003* Regional Transportation Improvement Program (RTIP). *The air quality conformity analysis for the 2001 RTP was approved by MTC in March 2002. The 2003 TIP was federally approved in February 2003. The proposed project is included in the 2003 TIP.*

[15] Under new FHWA/FTA guidance, circulation of this draft EIS/EIR would have been allowed, with or without a conformity lapse. However, FTA can make a finding of conformity in the Final EIS/EIR for this project only following the lifting of the conformity lapse.

•§93.115 The project must come from a conforming transportation plan and program.

The Transbay Terminal / Caltrain Downtown Extension / Redevelopment Project is included as one of the top funding priorities in the financially constrained portion (called "Track 1") of the Regional Transit Expansion Policy (RTEP).[16] The RTEP is the transit element of the 2001 Regional Transportation Plan (RTP). The 2001 RTP, including the RTEP, was adopted by the *MTC* in December 2001.

•§93.116 The FHWA/FTA project must not cause or contribute to any new localized carbon monoxide or PM_{10} violations or increase the frequency or severity of any existing carbon monoxide and PM_{10} violations in carbon monoxide and PM_{10} nonattainment and maintenance areas.

By its nature, the Terminal/Extension Project would result in changes in travel patterns and concentrations of motor vehicle traffic in the vicinity of the Transbay Terminal area, which would cause small increases in pollutant concentrations for these road segments, but no standards would be violated. At the same time, the proposed project would result in a decrease in regional vehicle trips and vehicle miles of travel, which would reduce the emission of criteria pollutants, when compared to the No-Project Alternative.

The microscale carbon monoxide analysis indicates that the project would neither cause nor contribute to new carbon monoxide violations during operation. The source of PM_{10} emissions typically associated with transportation is the effect of tires stirring up dust on roadways. PM_{10} is not associated with electric commuter rail transit operations. The project can be considered beneficial in terms of PM_{10}, in that it would remove vehicle trips from area roadways.

•§93.117 The FHWA/FTA project must comply with PM_{10} control measures in the applicable implementation plan.

The project would comply with all PM_{10} control measures in the most recent SIP document for the region.

•§93.118 The transportation plan and TIP must be consistent with the motor vehicle emissions budget(s) in the applicable implementation plan (or implementation submission).

The RTP and RTIP are consistent with the motor vehicle emissions budget in the applicable implementation plan, as indicated by the MTC's approval of the conformity analysis in December 2001.

[16] The Project is identified as the "Caltrain Downtown Extension/Rebuilt Transbay Terminal" in the RTEP and RTP.

No exceedences of state or federal AAQS are projected under either alternative in the future analysis year of 2020, and no mitigation is proposed for long-term air quality effects resulting from project operation.

5.8 NOISE AND VIBRATION

This section analyzes anticipated increases in noise and vibration resulting from the proposed project. Sources of noise and vibration considered include airborne noise from trains operating along Seventh and Townsend Streets south and west of the subway portal near Fifth Street, traffic noise from any increases in traffic volumes or changes in traffic patterns, storage yard noise, and ground-borne vibration from trains operating both above and below ground.

5.8.1 Sensitive Receptors

A visual survey of the project area was conducted to determine the location of residential land uses (including live/work units) that might be affected by changes in noise or vibration. Noise monitoring sites identified in Section 4.7 and shown in Figure 4.7-1 were selected to satisfy the conditions of being noise-sensitive receptors and being representative of other neighborhoods in the study area with similar noise characteristics. Residential land uses are generally considered most sensitive to changes in noise and vibration, except where research or manufacturing activities require vibration sensitive instrumentation or where background noise can pose a problem, such as in recording studios. Although multi-media companies are located within the study area, their operations are not uniquely sensitive to outside noise and vibration except where studio recordings are being prepared. Based on a visual survey of the study area, the closest recording studio is approximately 700 feet from the proposed Caltrain Downtown Extension alignments, and impact from rail noise or vibration is therefore extremely unlikely.

5.8.2 FTA Criteria for Noise and Vibration

The FTA noise impact criteria[17] are founded on well-documented research on community reaction to noise and are based on change in noise exposure using a sliding scale. The amount that the transit project is allowed to change the overall noise environment is reduced with increasing levels of existing noise. FTA's noise criteria consider the combination of existing noise exposure and project-specific increases in relation to three sensitive land use categories:

- Category 1: buildings or parks where quiet is an essential element of their purpose;
- Category 2: residences and buildings where people normally sleep; and
- Category 3: institutional land uses with primarily daytime and evening use (e.g., schools, libraries, churches).

[17] Transit Noise and Vibration Impact Assessment, Federal Transit Administration, 1995.

There are two levels of impact included in the FTA criteria: "severe" and "impact":

- **Severe**: Severe noise impacts are considered "significant" as this term is used in the National Environmental Policy Act (NEPA) and implementing regulations. Noise mitigation will normally be specified for severe impact areas unless there is no practical method of mitigating the noise.
- **Impact**: This range is sometimes referred to as moderate impact. In this range, other project-specific factors are considered to determine the magnitude of the impact and the need for mitigation. Other factors can include predicted increases over existing noise levels, types and numbers of noise-sensitive land uses affected, existing outdoor-indoor sound insulation, and the cost effectiveness of mitigating noise to more acceptable levels.

Noise impact criteria are summarized in Table 5.8-1. The first column shows the existing noise exposure, and the remaining columns show the additional noise exposure caused by the transit project. Future noise exposure would be the combination of the existing noise exposure and the additional noise exposure caused by the project.

Table 5.8-2 gives the information from Table 5.8-1 in terms of the allowable increase in cumulative noise exposure (noise from existing sources plus project noise) as a function of existing noise exposure. As the existing noise exposure increases, the amount that the transit project can increase the overall noise exposure before there is impact decreases.

Vibration criteria for three categories of sensitive receptors are summarized in Table 5.8-3. Ground-borne vibration from transit trains is characterized in terms of the root mean square (RMS) vibration velocity amplitude. A one second RMS time constant is assumed. This is in contrast to vibration from blasting and other construction procedures that have the potential of causing building damage. It is very rare that ground-borne vibration from any type of train operations will be high enough to cause any sort of building damage, even minor cosmetic damage. The only real concern is that the vibration will be intrusive to building occupants or interfere with vibration sensitive equipment.

The threshold of vibration perception for most humans is around 65 VdB, levels in the 70 to 75 VdB range are often noticeable but acceptable, and levels in excess of 80 VdB are often considered unacceptable. For urban transit systems with 10 to 20 trains per hour throughout the day, limits for acceptable levels of residential ground-borne vibration are usually between 70 and 75 VdB.

For human annoyance, there is some relationship between the number of events and the degree of annoyance caused by the vibration. More frequent vibration events, or events that last longer, will be more annoying to building occupants. To account for this effect, FTA's Guidance Manual includes an eight VdB higher impact threshold if there are fewer than 70 trains per day.

Because it is projected that as many as 132 trains per day would eventually use the proposed tunnel, the adjustment for infrequent events is not applicable.

Table 5.8-1: FTA Noise Impact Criteria

Existing Noise Exposure* L_{eq} or L_{dn}	Project Noise Exposure Impact Thresholds (dBA)			
	Category 1 or 2 Sites		Category 3 Sites	
	Impact	Severe Impact	Impact	Severe Impact
<43	Amb.+10	Amb.+15	Amb.+15	Amb.+20
43-44	52	58	57	63
45	52	58	57	63
46-47	53	59	58	64
48	53	59	58	64
49-50	54	59	59	64
51	54	60	59	65
52-53	55	60	60	65
54	55	61	60	66
55	56	61	61	66
56	56	62	61	67
57-58	57	62	62	67
59-60	58	63	63	68
61-62	59	64	64	69
63	60	65	65	70
64	61	65	66	70
65	61	66	66	71
66	62	67	67	72
67	63	67	68	72
68	63	68	68	73
69	64	69	69	74
70	65	69	70	74
71	66	70	71	75
72-73	66	71	71	76
74	66	72	71	77
75	66	73	71	78
76-77	66	74	71	79
>77	66	75	71	80

Notes: * L_{dn} is used for land uses where nighttime sensitivity is a factor; 1-hour L_{eq} is used for land use involving only daytime activities.

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, 1995.

Table 5.8-2: Increase in Cumulative Noise Levels Allowed by FTA Criteria

Existing Noise Exposure* L_{eq} or L_{dn}	Impact Threshold for Increase in Cumulative Noise Exposure(dBA)			
	Category 1 and 2 Sites		Category 3 Sites	
	Impact	Severe Impact	Impact	Severe Impact
45	8	14	12	19
46	7	13	12	18
47	7	12	11	17
48	6	12	10	16
49	6	11	10	16
50	5	10	9	15
51	5	10	8	14
52	4	9	8	14
53	4	8	7	13
54	3	8	7	12
55	3	7	6	12
56	3	7	6	11
57	3	6	6	10
58	2	6	5	10
59	2	5	5	9
60	2	5	5	9
61	1.9	5	4	9
62	1.7	4	4	8
63	1.6	4	4	8
64	1.5	4	4	8
65	1.4	4	3	7
66	1.3	4	3	7
67	1.2	3	3	7
68	1.1	3	3	6
69	1.1	3	3	6
70	1.0	3	3	6
71	1.0	3	3	6
72	0.8	3	2	6
73	0.6	2	1.8	5
74	0.5	2	1.5	5
75	0.4	2	1.2	5

Notes:
* L_{dn} is used for land uses where nighttime sensitivity is a factor; 1-hour L_{eq} is used for land use involving only daytime activities.

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, 1995.FTA Noise/Vibration Criteria, 2001.

Table 5.8-3: Ground-Borne Vibration and Noise Impact Criteria

Land Use Category	Ground-Borne Vib. Impact (VdB re 1 micro-inch/sec)		Ground-Borne Noise Impact (dB re 20 micro-Pascals)	
	Frequent [1] **Events**	**Infrequent** [2] **Events**	**Frequent** [1] **Events**	**Infrequent** [2] **Events**
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB [3]	65 VdB[3]	- [4]	- [4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB	40 dBA	48 dBA

Notes:
[1] Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
[2] "Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
[3] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
[4] Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, 1995.

There are some buildings, such as concert halls, TV and recording studios, and theaters that can be very sensitive to vibration and noise but do not fit into any of the three categories shown in Table 5.8-3. Because of the sensitivity of these buildings, they usually warrant special attention during the environmental assessment of a transit project. Table 5.8-4 gives criteria for acceptable levels of ground-borne vibration and noise for various types of special buildings.

Table 5.8-4: Ground-Borne Vibration and Noise Impact Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec)		Ground-Borne Noise Impact Levels (dB re 20 micro-Pascals)	
	Frequent [1] **Events**	**Infrequent** [2] **Events**	**Frequent** [1] **Events**	**Infrequent** [2] **Events**
Concert Halls	65 VdB	65 VdB	25 dBA	25 dBA
TV Studios	65 VdB	65 VdB	25 dBA	25 dBA
Recording Studios	65 VdB	65 VdB	25 dBA	25 dBA
Auditoriums	72 VdB	80 VdB	30 dBA	38 dBA
Theaters	72 VdB	80 VdB	35 dBA	43 dBA

Notes: [1] "Frequent Events" is defined as more than 70 vibration events/day. Most transit projects fall into this category.
[2] "Infrequent Events" is defined as fewer than 70 vibration events/day. This category includes most commuter rail systems.
[3] If the building will rarely be occupied when the trains are operating, there is no need to consider impact. As an example, consider a commuter rail line next to a concert hall. If no commuter trains will operate after 7 pm, it should be rare that the trains interfere with the use of the hall.
Source: Harris Miller Miller and Hanson, 2001

5.8.3 Train Noise

The Caltrain Downtown Extension is the only component of the proposed project that would result in train noise. For both the Second-to-Main and Second-to-Mission Alternative, the proposed rail line would be in a tunnel, except for a short section south of the intersection of Seventh Street and Townsend Street. This is the only track section where train operations have potential to create noise impact. The land use along this segment of the alignments is almost exclusively commercial and industrial. In a walking survey, the closest noise sensitive receptors were found to be live/work lofts on Townsend Street, more than 1,500 feet from the subway portal. There is no impact predicted at this building from the train noise.

5.8.4 Traffic Noise

5.8.4.1 Methodology

The traffic noise impact assessment was based on a comparison of the Transbay Terminal/ Caltrain Downtown Extension/Redevelopment Alternatives to the No-Project Alternative. A screening procedure was used to locate areas of potential noise impact where a more detailed assessment of traffic noise may be required. Areas were identified in which the projected increase in traffic volume (under the "worst case conditions" – i.e., Full Build Alternative) could cause a noticeable increase in noise exposure at residential land uses and other noise-sensitive receptors in the study area. It is generally assumed that a two to three dBA increase in noise exposure is required before residents consider the increase to be of any consequence. This translates to an increase in traffic volume of at least 60 percent before there is potential for noise impact. The screening procedure used was based on the logarithmic ratio of the project alternatives to the No-Project Alternative. The formula used was:

Approximate Change in Noise Exposure = 10 x log (No. of vehicles/No. of base vehicles).

All areas where the approximate increase in noise exposure exceeded one dBA were identified. The Full Build Alternative and No-Project traffic volumes were derived from the one-hour turning movements results for all the streets in the study area using the traffic studies performed by the San Francisco County Transportation Authority. This included numbers for afternoon and morning peak hours.

5.8.4.2 Results of Traffic Noise Analysis

The noise predicted at each of the street sections for the project alternatives was compared to the future No-Project Alternative. Results of the traffic noise analysis are summarized in Table 5.8-5. The table lists street sections and corresponding cross streets where there is at least a one dBA increase in either direction. The numbers for both directions are included to provide a complete picture along the segment being analyzed. The modeled number of vehicles for the

Full Build and No-Project Alternatives are also shown. The last column shows the decibel increase (or decrease, as the case may be) for the build Alternatives as compared to the No-Project Alternative. A traffic volume increase of 25 percent or greater is necessary for a one-decibel increase in noise exposure.

Table 5.8-5: Summary of Traffic Noise Analysis

Street	Dir.	From Street	To Street	TOTAL Vehicles		Approximate Change in Noise Level (dBA)
				No Project	Build	
Weekday PM Peak Hour						
1. Mission St.	NE	First St.	Fremont St.	639	817	1
	SW	Fremont St.	First St.	637	700	0
2. Howard St.	SW	Beale St.	Fremont St.	1461	1843	1
	NE	Fremont St.	Beale St.	350	390	0
3. Howard St.	SW	Main St.	Beale St.	830	1324	2
	NE	Beale St.	Main St.	410	455	0
4. Folsom St.	NE	First St.	Fremont St.	1063	1345	1
5. Folsom St.	NE	Fremont St.	Beale St.	1015	1272	1
6. Folsom St.	SW	Spear St.	Main St.	136	290	3
	NE	Main St.	Spear St.	780	878	1
7. Folsom St.	NE	Spear St.	The Embarcadero	967	1086	1
	SW	The Embarcadero	Spear St.	183	264	2
8. Harrison St.	NE	First St.	Fremont St.	84	130	2
	SW	Fremont St.	First St.	1431	1547	0
9. Beale St.	SE	Howard St.	Folsom St.	975	1314	1
10. Spear St.	SE	Howard St.	Folsom St.	563	813	2
11. Main St.	SE	Folsom St.	Harrison St.	195	252	1
	NW	Harrison St.	Folsom St.	334	456	1

Source: San Francisco County Transportation Authority, Harris Miller Miller & Hanson, Wilbur Smith Associates, 2001.

There are a total of eleven road segments where a noise exposure increase of one decibel or greater is projected for the build alternatives during the weekday PM peak hour. The areas with the greatest traffic increases and the potential for noise impacts are:

- Mission Street between First Street and Fremont Street. The land use in this area is almost exclusively commercial and office space. No noise impact from the increased traffic noise is projected.
- Howard Street between Fremont Street and Main Street. There are no noise-sensitive receptors in this area.
- Folsom Street between First Street and Beale Street. The land use in this area is primarily office space, industrial space, and parking, with some residential space near Folsom and Beale Streets. No noise impact from the increased traffic noise is projected.

- Folsom Street between Main Street and The Embarcadero. The land use in this area is mostly office space and parking. Between Main and Spear Streets, the hourly traffic volume in the southwest direction is projected to increase from 136 vehicles per hour to 290 vehicles per hour. Since traffic volume in the opposite direction is approximately 800 to 900 vehicles per hour, the volume increase in the southwest direction will not contribute significantly to noise exposure when compared to the volume in the northeast direction. Therefore, no noise impact from the increased traffic noise is projected.
- Harrison Street between First Street and Fremont Street. The hourly traffic volume in the northeast direction is projected to increase from 84 vehicles per hour to 130 vehicles per hour. Since traffic volume in the opposite direction is approximately 1,500 vehicles per hour for the No-Project Alternative, the volume increase in the northeast direction will not affect overall noise exposure and no impact is projected.
- Beale Street between Howard Street and Folsom Street. There are no noise-sensitive receptors in this area.
- Spear Street between Howard Street and Folsom Street. The land use in this area is mostly office space. No noise impact from the increased traffic noise is projected.
- Main Street between Folsom Street and Harrison Street. The land use in this area is mostly office space and parking. No noise impact from the increased traffic noise is projected.

In no case does the projected noise exposure increase exceed one decibel in both directions. In residential areas, the projected change in noise exposure does not exceed one decibel. In other office, industrial, commercial, and parking areas, the projected change in noise exposure does not exceed three decibels. The potential noise exposure increase for all other road segments is clearly below FTA impact thresholds.

5.8.5 Caltrain Storage Yard Noise

Normally storage yards and layover facilities can be a significant source of noise because much of the activity takes place during nighttime or early morning hours. Diesel locomotives are required to idle for a short amount of time before starting revenue service operations and are usually a source of annoyance near storage yards.

A live/work loft at 388 Townsend Street is currently the only residential area near the planned storage yard. A lot located to the southwest is expected to undergo residential development in the near future and was included in the noise assessment. Under existing conditions, noise at both the live/work loft on Townsend and the proposed new residential development is often dominated by Caltrain noise, trains entering or departing the station, or idling locomotives.

Projections are that the proposed project will result in lower noise levels at both noise sensitive receptors near the storage yard because most locomotives would be electric instead of the current diesel. This would virtually eliminate the noise from idling locomotives.

5.8.6 Bus Storage Facility Noise

Noise would also be generated by operations at the bus storage facilities proposed beneath the Bay Bridge approach (between Fourth and Third Streets, between Third and Second Streets, and immediately east of Second Street). Noise would occur as vehicles enter and exit these storage lots, and while engines warm up before starting revenue operations.

In response to public comment on the Draft EIS/EIR, a supplemental noise assessment was made of the proposed permanent off-site bus storage facility under the Western Approach to the Bay Bridge between Second and Fourth Streets. The assessment was conducted using bus source noise levels and noise projection formulas contained in the FTA Guidance Manual. Noise projections were made for noise sensitive receptors near the bus storage facility and compared with the appropriate impact criteria. Where noise impact is projected, mitigation measures are recommended.

Existing noise conditions were based on the nearest long-term noise measurement conducted as a part of the noise and vibration study for the EIS/EIR. Long-term (24-hour) noise measurements were made in July 1995 at a parking lot near the intersection of Brannan and Second Street. This measurement was used to characterize the ambient noise at sensitive receptors near the proposed bus storage facility.

Since the bus facility would be in use only during the morning and evening peak-hour periods, the noise assessment was based on the existing ambient hourly Leq for the hours of operation of the bus storage facility. Table 5.8-6 summarizes the measurement results for the time periods that the bus storage facility would be in use. The hourly Leqs shown in the table were used in the assessment of noise impact at sensitive receptors near the bus storage facility.

Table 5.8-6: Existing Noise Levels

Site #	*Location*	*Date*	*Time*	*Hourly Leq (dBA)*
1	*Parking Lot (Brannan & Second)*	*7/95*	*7:00am*	*64*
		7/95	*8:00am*	*68*
		7/95	*4:00pm*	*61*
		7/95	*5:00pm*	*61*
		7/95	*6:00pm*	*62*

The methodology used for the impact assessment follows that described in the detailed noise assessment section of the FTA Guidance Manual. Projections of Project noise levels from the bus storage facility were based on source noise levels contained in the FTA Guidance Manual and formulas for projecting noise from both bus idling and bus operations. The operations data, including information on the number of buses using the facility, bus speeds in the facility and on the ramp, and durations of bus idling in the facility during the afternoon is based on the terminal facility operations assumed as part of the Project. For purposes of analysis, it was assumed that approximately 104 buses (71 Golden Gate Transit buses and 33 AC Transit buses) would enter the proposed storage facility in the peak morning hour of 8:00 AM. In addition, a total of 119 buses (67 Golden Gate Transit buses and 52 AC Transit buses) would leave the proposed storage facility, and a total of 57 AC Transit buses would arrive at the proposed storage facility during the peak afternoon hour of 4:00 PM. Buses were assumed to be traveling at a speed of 15 mph on average and idling for approximately three minutes in the storage facility before leaving in the afternoon. In the morning, Golden Gate Transit buses would gain access the storage facility via Fourth Street at Perry and AC Transit buses would gain access to the facility via the ramp structure east of Second Street. In the afternoon, both the Golden Gate Transit and AC Transit buses would use the dedicated ramp when leaving the proposed storage facility.

The projected noise levels for the peak hour of activity (4:00 PM) at the closest noise-sensitive receptors adjacent to the storage facility are shown in Table 5.8-7. The results indicate that noise impacts are projected at residences to the north and south of the AC Transit storage facility.

Table 5.8-7: Bus Storage Facility Projected Noise Levels

Location	***Sound Level (Leq, dBA)***		***FTA Noise Impact Criteria (Leq, dBA)***		***Impact?***
	Existing	***Project***	***Impact***	***Severe***	
Residences North of AC Transit Facility at Perry and Third Street	*61*	*66*	*59*	*64*	***Severe***
Residences South of AC Transit Facility along Stillman Street	*61*	*62*	*59*	*64*	***Impact***
Residences South of the Golden Gate Transit Facility along Stillman Street	*61*	*59*	*59*	*64*	***Impact***
Residences South of AC Transit Facility along Stillman Street	*61*	*55*	*59*	*64*	*No*

Source: Harris Miller Miller, Hanson, 2003.

5.8.7 Noise Mitigation

Based on this analysis, there appears to be no need to mitigate train noise, traffic noise, or Caltrain storage yard noise.

Based on the results of the noise assessment, mitigation is recommended at three locations adjacent to the bus storage facility. The proposed noise mitigation locations are:

- *Residences North of the AC Transit Facility. Severe noise impact is projected for the residences to the north of the AC Transit facility at the corner of Perry and Third Street. Because of the configuration of the site, noise barriers are not an option for noise mitigation. Therefore, sound insulation will be installed to mitigate the noise impacts at this location. At a minimum, sound insulation will be applied to the façade facing the bus storage facility (the south façade).*

- *Residences South of the AC Transit Facility. Noise impact is projected for the residences to the south of the AC Transit facility along Stillman Street. For these residences, a combination of two barriers would mitigate the noise impacts. The first noise barrier will be approximately 10-12 feet high and run along the southern edge of the AC Transit storage facility. The second noise barrier will be approximately 5-6 feet high and will be located on the portion of the ramp at the southwestern corner of the AC Transit facility. To minimize the potential for reflections off the underside of the freeway, noise barriers will be treated with an absorptive material on the side facing the facility.*

- *Residences South of the Golden Gate Transit Facility. Noise impact is projected for the residences to the south of the Golden Gate Transit facility along Stillman Street. A noise barrier would mitigate the impacts. The barrier will be approximately 10-12 feet high and run along the southern and a portion of the eastern edge of the Golden Gate Transit storage facility. To minimize the potential for reflections off the underside of the freeway, the noise barriers will be treated with an absorptive material on the side facing the facility.*

Noise walls will be landscaped, although the actual design will be developed in cooperation with area residents. *The walls will be constructed prior to the development of the permanent bus facilities.*

5.8.8 Ground-Borne Vibration

5.8.8.1 Methodology

The ground-borne vibration and ground-borne noise projections are based on the force density curve developed from train noise tests described in Section 4.7, and based on transfer mobility data derived from vibration propagation tests described in Section 4.7. One factor that the vibration analysis has not been able to account for is that only electric locomotives would be used in the new tunnel, and these electric-powered locomotives will generate different vibration levels than the existing diesel locomotives.

Another factor that could not be accounted for is that, in many cases, the subway structure will be founded in bedrock and the building foundations will be in soil, sometimes supported by piles that have been driven down to the bedrock. The vibration path from the subway foundation though the bedrock, into the soil overburden and finally into the building foundation will tend to be a less efficient vibration path than what was measured at the vibration test sites. Vibration propagation tests were all performed at the surface, meaning that the testing force was in the soil layer rather than the rock layer.

The vibration projections are based on the most representative vibration propagation test. All of the ground-borne vibration projections include a five decibel "safety factor" to account for vibration amplification that will occasionally be caused when floor resonances are excited by the ground vibration, and to account for the normal fluctuation in ground-borne vibration caused by variations in ground conditions.

In most cases, the measurements were at closer distances than the subway would be. The additional distance was accounted for using the attenuation curves from the propagation tests at sites VP2 and VP3. These were the only sites in the corridor where there was sufficient open space to obtain information on vibration attenuation with distance.

5.8.8.2 Results of Ground-Borne Vibration Analysis

Vibration projections were developed for all buildings along Townsend and Second streets that appear to have residential occupants. Projections of ground-borne vibration and ground-borne noise were developed for all buildings along the proposed corridor that were identified as having residential uses. These include live/work lofts, apartment buildings, row houses, and a new hotel under construction that was under construction during the testing. The vibration projections are summarized in Table 5.8-6.

Buildings at which vibration impacts are projected without mitigation are listed below.

- **388 Townsend Street:** The projections indicate vibration levels will exceed the FTA 72 VdB impact threshold by three VdB, and the ground-borne noise will exceed the 35 dBA impact threshold by 10 dBA.

- **Clocktower Building:** Projected vibration levels exceed the FTA impact threshold by two VdB at the hallway site.

- **Second Street Apartment Building and new Marriott Courtyard:** The projections at these two buildings are based on the measurements at the Marine Firefighter's Union building. It was not possible to obtain permission to test at the apartment building and the Marriott Courtyard was still under construction. The projections at the test location closest to the front of the building exceed the vibration and noise impact thresholds by less than one VdB. No mitigation is indicated.

After mitigation, groundborne noise impact at 388 Townsend Street and vibration impact at the Clocktower Building would still exceed the impact threshold by one decibel. This level of impact would not constitute a substantial adverse change requiring further mitigation, in terms of FTA guidance. The next level of mitigation that would be effective would be to install floating slab under the Caltrain alignment trackage for 600 to 800 feet on either side of each building (at a construction cost of $1,000 per linear foot), which would add installed costs approaching one million dollars or even more per building. Such high mitigation costs would not be a prudent and reasonable expenditure to eliminate the last one decibel of impact at these two sites.[18]

There are *four* buildings at which projected vibration exceeds FTA impact thresholds. Only one location – 388 Townsend Street – is projected to exceed the FTA thresholds by more than a marginal amount.

[18] Per FTA guidelines, "to be feasible, the measure, or combination of measures, must be capable of providing a significant reduction of the vibration levels, at least 5 dB, while being reasonable from the standpoint of the added cost."

Table 5.8-8: Summary of Vibration Projections

Location	Horiz. Distance (feet)	Depth to Top of Rail (ft)	Train Speed (mph)	Without Mitigation (stiff DF fasteners)		With Mitigation (resilient track system)	
				Vib. (VdB)	Noise (dBA)	Vib. (VdB)	Noise (dBA)
Live/Work Condos, 388 Townsend Street (VP0, Hubbell and Seventh)							
Front rooms	70	32	35	**75**	**45**	72	**36**
San Francisco Residences on Bryant (VP2, Harrison Parking Lot Site)							
Building 1	120	74	35	61	28	--	--
Building 2	150	74	35	60	26	--	--
Building 3	170	74	35	59	25	--	--
Clock Tower Building (VP4)							
Hallway	30	82	35	**74**	**38**	**73**	33
Elevator	30	82	35	72	29	72	25
Room 132	30	82	35	70	25	70	21
Room 131	30	82	35	69	18	69	16
2nd Floor Stair	30	82	35	66	28	65	22
Second Street High Rise and new Marriott Courtyard (VP1, Marine Firefighter's Union)							
Inside, 16 ft	30	69	35	**73**	**35**	72	31
Inside, 37 ft	30	69	35	69	30	68	26
Inside, 58 ft	30	69	35	65	23	64	20

Notes:
All projections include a five-decibel safety factor to account for potential that there will be amplification from floor resonances and to allow for normal fluctuations caused by variations in ground conditions.

Numbers in bold indicate where projections exceed the FTA impact threshold for residential land uses. The applicable thresholds are 72 VdB for ground-borne vibration and 35 dBA for ground-borne noise.

Source: Harris Miller Miller and Hanson, 2001.

5.8.8.3 Vibration Mitigation

As shown in Table 5.8-6, the projected ground-borne vibration and ground-borne noise levels can be mitigated with the use of high-resilience track fasteners or a resiliently supported tie system. With this mitigation measure, the projected vibration levels would be reduced by zero to three VdB, and the projected noise levels would be reduced by four to nine dBA.[19]

[19] The variation is caused by the differences in the frequency spectrum of the vibration.

5.9 GEOLOGY AND SEISMICITY

This section focuses on the potential for geologic or seismicity features of the project area to affect the proposed project, or for the project to increase the potential exposure of people to hazard from geologic or seismic risks. In this context, the No-Project Alternative does not have potential impacts, but serves as a basis of comparison with the Project Extension Alternatives.

5.9.1 Geology

The primary geologic elements that could affect the proposed project include Bay Mud and artificial fill. Impacts associated with these elements can be mitigated through appropriate design and are discussed below.

For the Transbay Terminal and Redevelopment sites, fill soils possess adverse characteristics such as rubble, heterogeneity of composition and depth, and locally high permeability. Similar to Bay Mud, these characteristics could affect the stability of excavations and resultant ground deformations.

Bay Mud overlain by artificial fill would be encountered beneath the southwestern portions of the Caltrain Downtown Extension alternatives, and would be the primary factor potentially affecting non-seismic settlement of the storage yard, surface tracks, rail stations, and cut-and-cover subways.

Differential settlement of Bay Mud is expected to occur within the storage yard and along the surface tracks; however, the degree of settlement is expected to be relatively minor. Without appropriate foundation support, settlement of the rail facilities would occur due to the presence of the mud. With respect to cut-and-cover and station construction, the low strength and moderate deformation characteristics of Bay Mud could affect the stability of the face of the tunnel, the stability of excavations, the degree of ground deformation caused by the excavations, and the resulting response of adjacent structures.

Core drillings were taken in the corridor in 1996, and the rock was identified as "fractured rock." A panel of experts[20] recommended that a "specialized tunneling" technique known as "spiling" be used in this rock. Because the proposed Caltrain Extension Alternatives Tunneling Option includes a larger tunnel (three tracks instead of two) than was proposed in 1996 and would pass under historic structures, a tunneling technique known as "stacked drift" is now proposed. This technique, which is designed to assure no tunnel collapse, is described in the Construction Section 5.20. Additional core drillings are proposed along the tunneling portion of the Caltrain Extension Alternatives to assure that this is the best tunneling approach.

[20] The panel included professor Thomas D. O'Rourke of Cornell University, Professor Tor L. Brekke of the University of California, Berkeley, and Mr. Norman A. Nadel, of Nadel Associates, Brewster, New York. The Panel was chaired by Demetrious Koutsoftas, URS, San Francisco, who has extensive experience with development and tunnel projects in the Project Area and a substantial knowledgeable regarding the Project area's geology.

5.9.2 Seismicity

Seismically-induced ground shaking could damage a new Transbay Terminal, Caltrain Downtown Extension, or new development. The primary hazards related to seismically-induced ground motion are liquefaction and associated ground deformation (e.g., subsidence and lateral spreading). Portions of the Transbay Terminal/Caltrain Extension, and redevelopment sites are underlain by soft sediments that are susceptible to amplified ground motion.

Seismic shaking may cause subsidence and lateral spreading of the ground surface as a result of liquefaction of saturated fill soils. This type of ground deformation could damage or obstruct the surface train lines or limit the use of the new Transbay Terminal or Caltrain storage yard and surface tracks until track repairs are completed. Up to 50 feet of soil sediments consisting of fill, Bay Mud, and loose to medium dense marine sands would be encountered along the northernmost cut-and-cover Caltrain segment between Folsom Street and the new terminal. The invert elevation of the subway would be below the base of the fill layer, thereby mitigating liquefaction hazards associated with the fill. However, the subway may be subjected to amplified ground motion.

The potential liquefaction hazard associated with the marine sands is considered to be minor. Moreover, since the terminal would be supported on deep foundations, the effects of liquefaction and earthquake ground motion would be minimal.

Portions of the tunnel sections of the Caltrain Downtown Extension would intersect Bay Mud along Seventh and Townsend to Fifth Street. Bay Mud extends to depths of almost 100 feet below the ground surface along this portion of the alignment. Because Bay Mud is a primary contributing factor to ground motion amplification during earthquakes, this section of the alignment is considered to be the most susceptible to amplified ground motion of any portion of the proposed project alignment. As noted above, liquefaction of fill soils should not affect the cut-and-cover subway because its invert depth lies below the base of the fill layer.

The cut-and-cover subway would encounter Bay Mud only immediately east of the Fifth Street portal. Although fill soils along the tunnel alignment are susceptible to liquefaction, the proposed subway depth should place the subway invert below the bottom of fill deposits, except at the portal.

Due to the rock formations, the alignment between Fifth and Folsom Streets would be the least affected by ground motion and should not have major ground deformation related to earthquakes, regardless of the alignment alternative.

The geologic impacts and seismic concerns discussed above are similar to those associated with numerous high-rise buildings in downtown San Francisco, and with the BART and Muni tunnels. Mitigation of these impacts *will* be accomplished through the application of geotechnical and

structural engineering principles and conventional construction techniques, similar to the design and construction of high-rise buildings and tunnels throughout the downtown area.

Consistent with current practice along other portions of the Caltrain corridor that overlie soft soils, potential settlement of the storage yard and surface tracks is best mitigated by regular maintenance of the tracks. Track repairs *will* be performed as part of Caltrain's ongoing track maintenance program.

Potential settlement of the surface and underground stations *will* be mitigated through proper design and construction of pile supported foundations for both structures. Stability of the excavations for both stations and the resultant impacts on adjacent structures can be controlled within tolerable limits by proper design and implementation of the excavation shoring systems.

Mitigation of seismic impacts on surface tracks may be handled in two ways: reinforcement or stabilization of soils beneath the tracks, or implementation of contingency plans for rapid repair of damaged rails resulting from ground shaking. Reinforcing or stabilizing soils beneath the rails is very expensive and may not guarantee that the tracks would remain operable after a strong earthquake. Consistent with current practice along other portions of the Caltrain corridor that overlie soft soils, potential impacts due to seismically induced ground motion are best mitigated by provisions for rapid rail repair. At present, these provisions include emergency communications links and work stations to expedite mobilization of personnel and equipment to damaged areas.

Structural components of the project *will* be designed and constructed to resist strong ground motions approximating the maximum anticipated earthquake (0.5g). The cut-and-cover portions would require pile supports to minimize non-seismic settlement in soft compressible sediments (Bay Mud). These supports would also serve to minimize settlement and lateral displacement resulting from seismic shaking. The underground Caltrain station at Fourth and Townsend would require pile-supported foundations due to the presence of underlying soft sediments. These foundation designs combined with seismically resistant building structures should adequately mitigate seismic impacts to the stations.

5.10 WATER RESOURCES

No impacts to surface or groundwater resources would result from the No-Project Alternative.

Piles underlain by Bay Mud would be used to support the Transbay Terminal and portions of the Caltrain Extension Alternatives. Although the piles could create a conduit for contaminants in shallow groundwater to migrate to deeper groundwater zones (as discussed in Section 5.21.14), the geotechnical properties of Bay Mud suggest that a tight seal will develop around the piles, minimizing downward migration of contaminated groundwater.

Stormwater along the Caltrain Extension Alternatives will discharge to the City's combined storm/sanitary sewer system. During construction, sediment transported by stormwater would not affect surface water bodies in China Basin or San Francisco Bay. For further discussion on the effects to water resources during construction, see Section 5.21.11. No mitigation measures are required for impacts to water resources.

5.11 FLOODPLAIN

No portions of the Transbay Terminal/Caltrain Downtown Extension/Redevelopment Project area would encounter surface water bodies, including creeks or reservoirs. Also, according to the City and County of San Francisco Planning Department, no portions of the project area lie within recognized flood hazard zones with the exception of potential tsunami inundation. No flood hazard zones have been mapped by the Federal Emergency Management Agency (FEMA) in San Francisco. Mitigation measures are not required.

5.12 UTILITIES

As noted in Chapter 4, the Transbay Terminal/Caltrain Downtown Extension/Redevelopment area is served by the City and County of San Francisco combined storm drain, sanitary sewer system, water supply and fire suppression system. Numerous communications systems exist in the area. The Transbay Terminal and the redevelopment would connect to these utility systems consistent with utility provider requirements.

The Project includes the proposal to increase development in the proposed Redevelopment Area. Thus, the Project would increase the demand for and use of water and energy consumption, but not in excess of the amounts expected and provided for in the area. There would be no need for major expansion of power or water facilities due to the Project.

San Francisco consumers have recently experienced rising energy costs and uncertainties regarding the supply of electricity. The root causes of these conditions are under investigation and are the subject of much debate. Part of the problem is thought to be that the State does not generate sufficient energy to meet its demands and must import energy from outside sources. Another part of the problem may be the lack of cost controls as a result of deregulation. The California Energy Commission (CEC) is currently considering applications for the development of new power-generating facilities in San Francisco, the Bay Area, and elsewhere in the State. These facilities could supply additional energy to the power supply "grid" within the near future. These efforts, together with conservation, will be part of the statewide effort to achieve energy sufficiency. The Project would not be built and occupied until after 2008; therefore, additional generating facilities may have been completed by the time the Project components are utilizing electricity. The Project-generated demand for electricity would be negligible in the context of the overall demand within San Francisco and the State and would not in and of itself

require a major expansion of power facilities. Therefore the energy demand associated with the proposed Project would not result in a major, adverse environmental effect.

The cut-and-cover portion of the Caltrain Extension Alternatives would require the relocation of utilities or the utilities would be supported in place along the cut-and-cover segments on Townsend, Second, Mission, and Main streets. Utilities intercepted or blocked by cut-and-cover excavation would experience the greatest potential effects. Pressure lines crossing tunnels would either be relocated out of the excavation or supported in place during construction. Gravity sewer lines would have to be rerouted around tunnels or routed over/under by siphon and/or pumping. Large consolidation sewers are especially problematic. Rerouting of these sewers would require extensive planning and coordination with the San Francisco Department of Public Works during all phases of design and construction.

Utilities crossing the alignments *will* typically be supported in place from the excavation cross-bracing. Large utility crossings (36-inch and larger) may require specially designed supporting structures. Longitudinally running utilities *will* be permanently relocated outside the excavation area or temporarily supported along the side of the excavation, then permanently relocated over the subway during street restoration.

Substantially fewer utilities would be affected by the Tunneling Option, which would be constructed below the level of utilities. A summary of anticipated utility impacts for cut-and-cover segments along the Second-to-Main and Second-to-Mission Caltrain Alternatives is provided below for the Caltrain Extension Alternatives and options.

Utility modifications will need to be evaluated in more detail during final design. Careful and continuous coordination with utility providers *will* be initiated during preliminary engineering and *will* continue through final design and construction. Utilities *will* be avoided, relocated, and/or supported as necessary during construction activities to prevent damage to utility systems and to minimize disruption and degradation of utility service to local customers. Coordination efforts *will* focus on identifying potential conflicts, planning utility reroutes, and formulating strategies for overcoming problems that may arise.

5.12.1 Sewer and Storm Drains

Townsend Street from about 100 feet east of Fifth Street to Clarence Place (for both Caltrain Extension Alternatives) – a three foot by five foot brick sewer would be affected. Cross street sewers affected include a 6.5-foot circular sewer at Fourth Street and three by five-foot brick sewer at Luck, Ritch, and Third Streets.

Second Street from Brannan to Howard Streets (for the Cut-and-Cover Option) or from Folsom to Howard Streets (for the Tunneling Option) -- both Caltrain Extension Alternatives) – a three by five-foot brick sewer would be affected. Cross street sewers affected include three by five-foot brick sewer at Brannan, and a three by five-foot brick sewer at Bryant,

Folsom, and Howard streets (east side of Second), and Natoma street (east side of Second Street).

Main Street from Howard Street towards the Transbay Terminal (Second-to-Main Alternative only) – a four by six-foot concrete sewer would be affected. Cross street sewers affected include seven-foot circular concrete sewer at Howard Street (east side of Main), a three by five-foot brick sewer at Howard Street (west side of Main), and a three by five-foot brick sewer at Folsom Street (east and west of Main Street).

Mission Street from Beale to Main Streets (Second-to-Mission Alternative only) – a 3.5 by 5.25-foot concrete sewer would be affected. Cross street sewers affected include a four by six-foot concrete sewer at Main Street (south of Mission) and a three-foot force main at The Embarcadero (north and south Mission Street).

5.12.2 Communications

Relocation of Pacific Bell's existing conduit and manhole structures, particularly underneath Second Street, would, according to Pacific Bell, require construction of duplicate structures on different paths, placing new copper and fiber optic cable, and splicing the existing cable to the replacement cable and removal of the existing cables on the existing path. Pacific Bell notes that structure construction and the cable replacements would take many years to complete, provided that new paths could be found. Pacific Bell would require specific details and an in-depth study before commenting on the feasibility of the Terminal/Extension Project as it relates to their facilities.

5.13 ELECTROMAGNETIC FIELDS

Although short-term human health effects from exposure to electromagnetic fields (EMFs) are well established, such as effects on the central nervous system and heating of the body, the long-term effects from EMF exposures are not clear. Several reports have proposed a link between EMF exposures and such health problems as cancer, including childhood leukemia. However, the preponderance of authoritative scientific studies has found no firm evidence of long-term health risks from low-intensity EMF exposures. Despite the lack of scientific evidence of harm, the public continues to express concern, and health and regulatory agencies continue to study the matter.

5.13.1 Regulatory Setting

Neither the federal government nor the State of California has set standards for EMF exposures. The Federal Drug Administration, Federal Communications Commission, Department of Defense, and Environmental Projection Agency at various times have considered guidelines. The

California Department of Education has established a policy of "prudent avoidance" for the location of schools in the vicinity of high voltage power lines. Several states and other countries have standards for electrical field exposures. The International Radiation Protection Association has proposed limiting electric field exposure to five kV/m and magnetic field exposure to 2000 mG.

5.13.2 Impacts

EMF effects of the Transbay Terminal / Caltrain Downtown Extension / Redevelopment Area Project pertain mainly to the implementation of electrified passenger rail service and its attendant systems in the area between the current Caltrain terminal and the proposed new terminus at the site of the present Transbay Terminal. The extension of rail service would result in new sources of EMF generation and exposure to passengers and to individuals working on commuter rail systems or passing in the vicinity of such systems. The main sources of EMF generation include overhead train power distribution systems; power substations with connecting lines to the major utility lines; passenger facilities, with their various electrical systems for lighting, communications, utilities, fare machines, among other systems, and their proximity to power distribution networks; and electrically powered locomotives or commuter rail passenger vehicles.

EMF intensities associated with trains vary considerably. The greatest potential fields, and therefore potential for exposures, are for passengers within the electric rail vehicle. Stations would also be a location of EMF exposure to passengers and any station personnel. Train operator and attendants' exposure would also be greatest in the motorized vehicle. Other worker exposure would likely be greatest when working close to an activated overhead contact system and substations.

Strong fields that carry a greater possibility of health risks are not associated with these environments, however. The field strengths of electrified rail systems are low and below recommended exposure levels. Measurements of direct current (DC) magnetic fields at substations on the San Francisco Bay Area BART system, which receives alternating current (AC) power at 34.5 kV, 60 Hertz from two parallel transmission lines, found field strengths to be small where public exposure might occur and diminishing rapidly. At the substation fence perimeter, field strengths above background ranged from 0.3 to 13.0 mG and averaged four mG, a typical exposure level of household appliances. At approximately 14 feet from the fence line, magnetic field strength was at natural background levels, or around 400-500 mG (Summary of Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement, BART-San Francisco Airport Extension), BART/U.S. Department of Transportation; SamTrans, January 1995). On-board BART trains, which contain major propulsion equipment below floor level, field strengths are higher, with measurements ranging from 1,600 to 2,000 mG total, which is four to five times the natural background level.