

2. PROJECT DESCRIPTION

2.1 REGIONAL LOCATION

The proposed BART Warm Springs Extension would be located entirely within the City of Fremont in the East Bay region of the San Francisco Bay Area. The City's 1990 population was about 180,000 people. It is the southernmost city in the southwestern portion of Alameda County. Fremont is bounded by the San Francisco Bay to the west, the foothills and mountains of the Diablo Range to the east, and the cities of Union City and Hayward to the north. To the south, Fremont is bounded by the City of Milpitas in Santa Clara County.

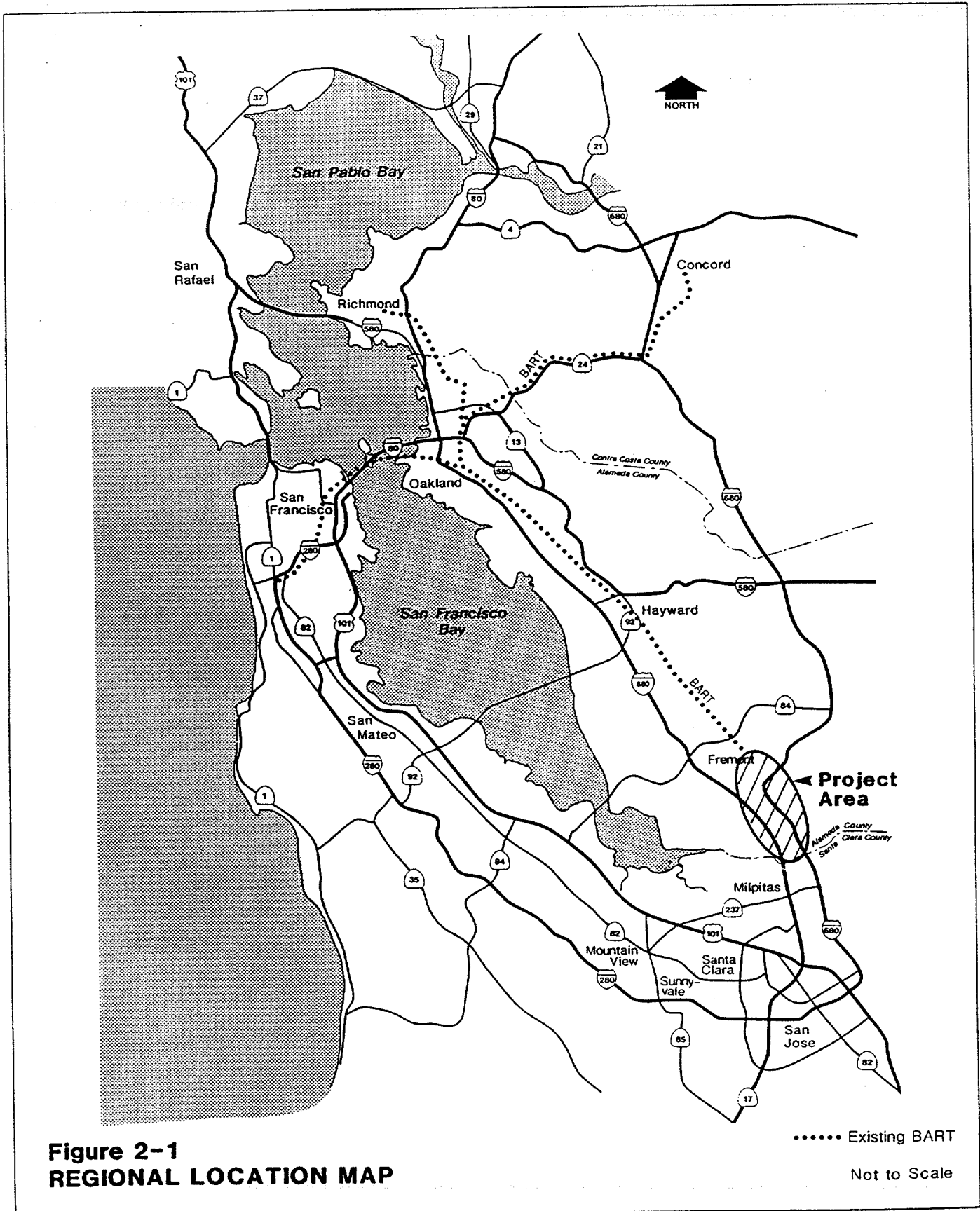
The Fremont line of the existing BART system terminates at the Fremont Station, about 2.5 miles south of the northern boundary of the City. The station is near the Civic Center area, and access to the station is via Civic Center Drive and Walnut Avenue.

Other important regional transportation facilities serving the City include Interstate 880 (I-880) and Interstate 680 (I-680). I-880 is the principal north-south freeway connecting Fremont with Santa Clara County and San Jose to the south and the communities of the East Bay to the north. I-680 generally runs parallel and approximately one mile east of I-880. I-680 also connects Fremont with Santa Clara County and San Jose to the south and the communities in eastern Alameda and central Contra Costa counties to the north. State Route 84 (SR-84) runs east-west and connects Fremont to the Peninsula via the Dumbarton Bridge and the Sunol Valley area to the east. The regional location of the project is shown in Figure 2-1.

The study area for the Warm Springs Extension extends from the existing Fremont BART Station to the north and the Alameda County Line to the south, and from the East Bay Hills to the east and the San Francisco Bay to the west.

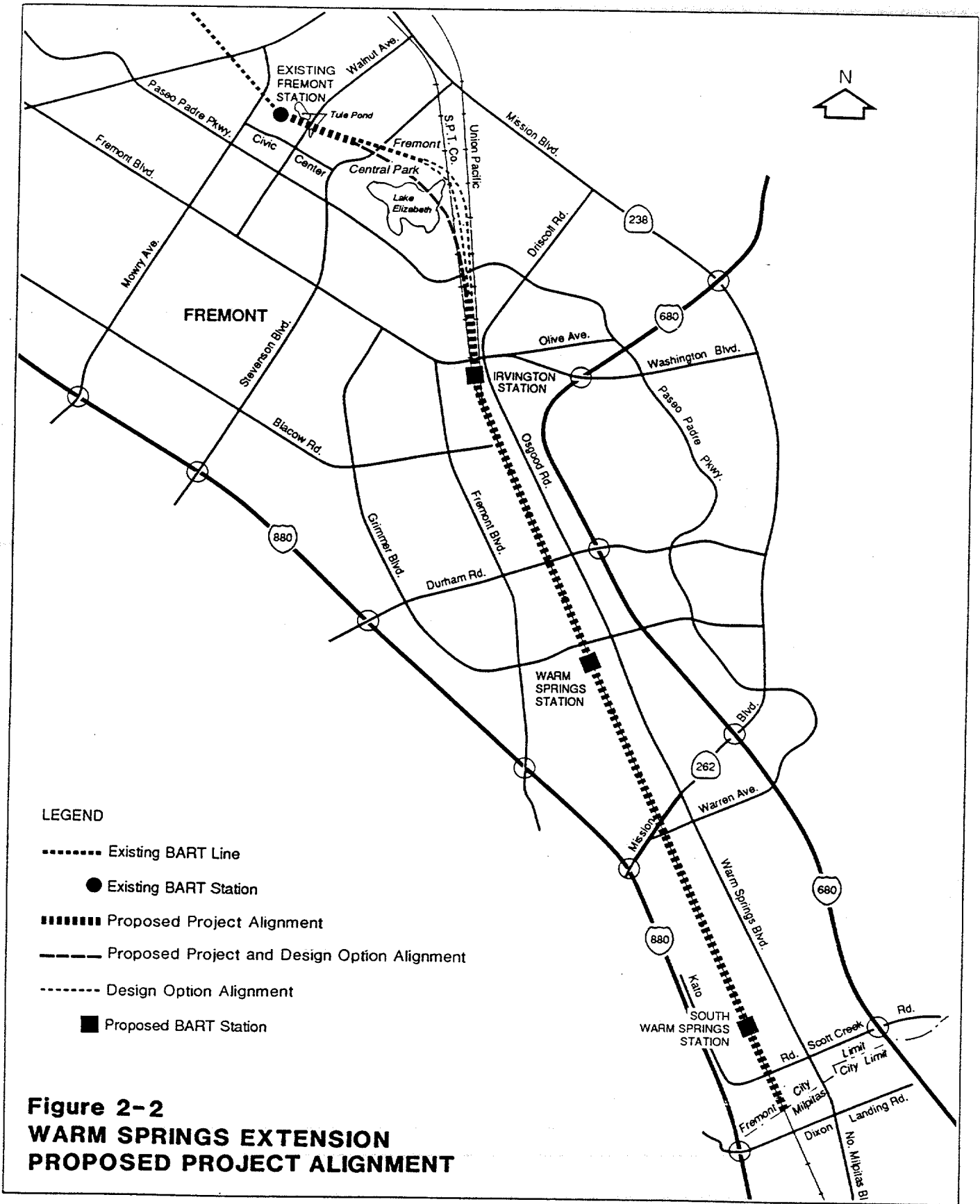
2.2 MAJOR FEATURES OF THE PROPOSED BART PROJECT

The Proposed Project is a 7.8-mile extension of BART from the current end-of-line in the City of Fremont (see Figure 2-2). The proposed extension includes three new stations in Fremont: one in the Irvington District, another in the Warm Springs District, and a terminal station in the southern Warm Springs area. The potential for parking garages, joint development



**Figure 2-1
REGIONAL LOCATION MAP**

SOURCE: DKS Associates, 1991



SOURCE: DKS Associates, 1991

2. Project Description

and value capture would be evaluated at each proposed station location. The Proposed Project alignment is shown in Figure 2-3.

2.2.1 ALIGNMENT CHARACTERISTICS

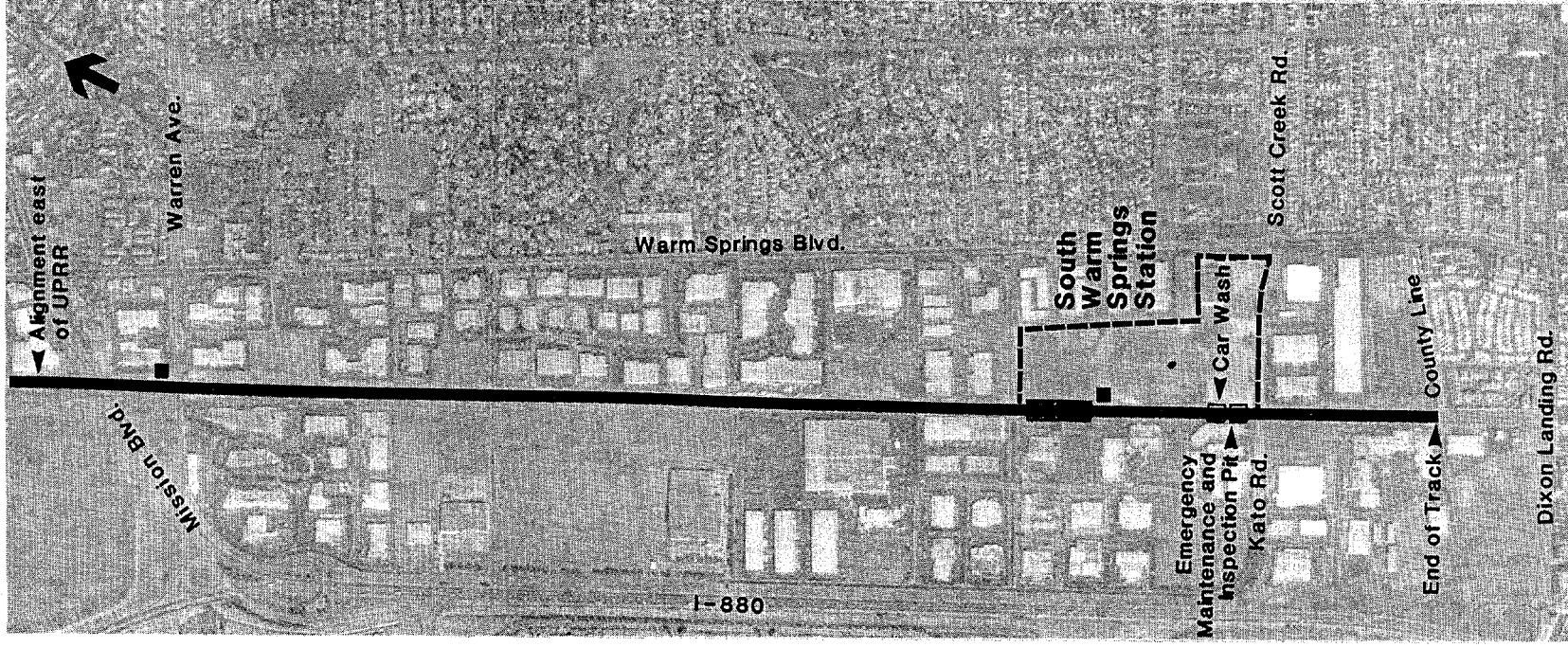
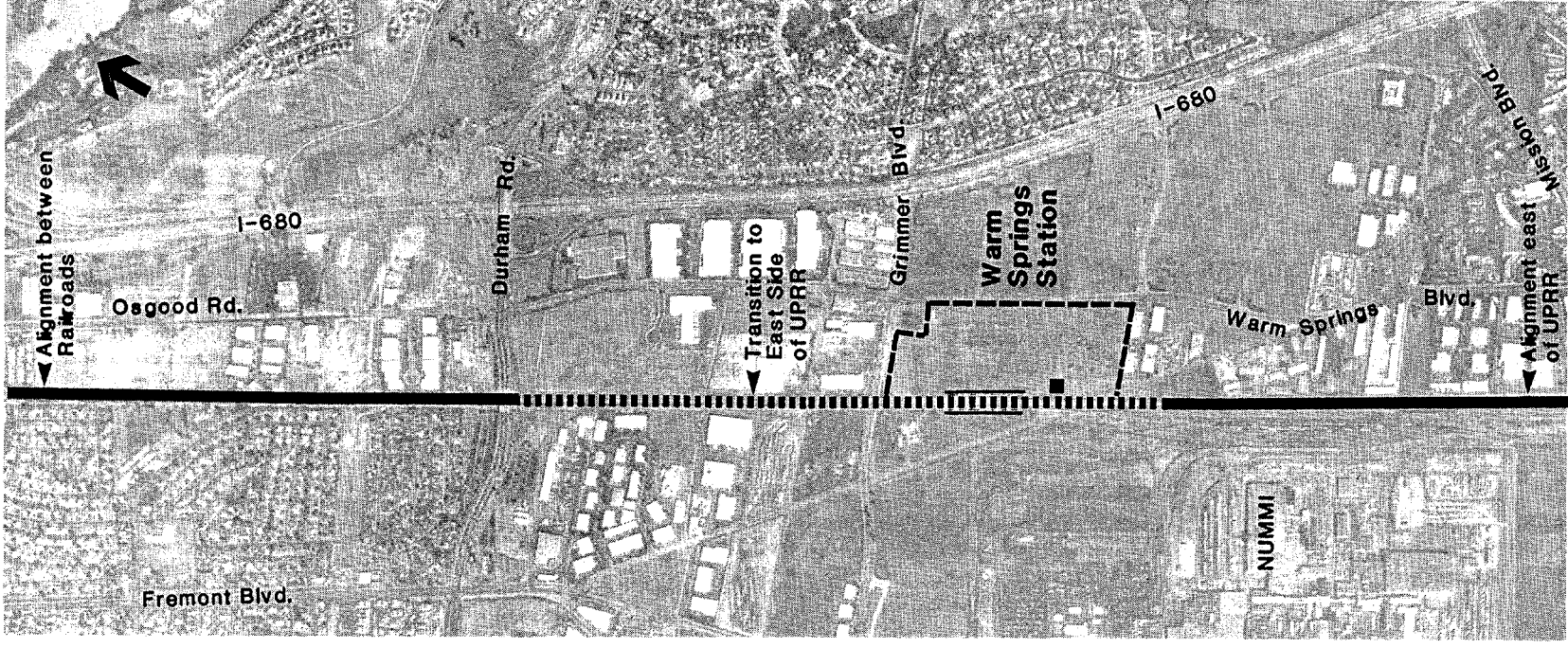
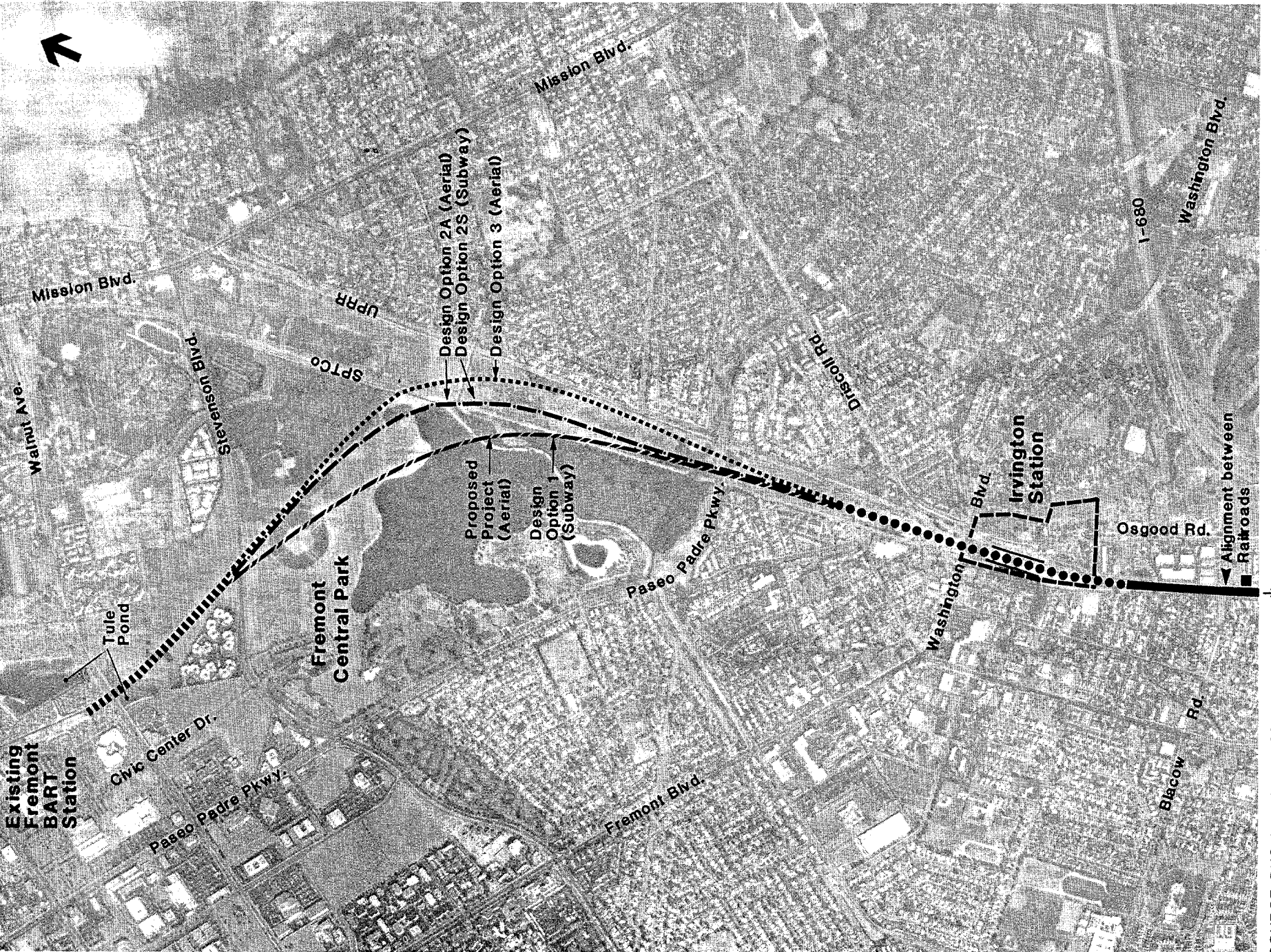
The Proposed Project would begin at the existing Fremont BART Station and proceed southeasterly on a raised embankment over Walnut Avenue. South of Walnut Avenue, existing poor load bearing soils in the Tule Pond will be excavated and replaced with soils suitable for construction of the embankment. Replacement for a portion of southern Tule Pond will be excavated west of the alignment (see Section 3.5 Ecosystems). About midway between Walnut Avenue and Stevenson Boulevard, BART would move onto an aerial structure. The BART alignment would continue on an aerial structure over Stevenson Boulevard, through Fremont Central Park, and over the east arm of Lake Elizabeth.¹

A BART alignment has two planes: one is vertical, and the other is horizontal. BART's vertical alignment can be at grade, above grade, or below grade. The horizontal alignment refers to BART's route of travel, including placement of the tracks in relation to existing facilities. In this document, the phrase "alignment" refers to both vertical and horizontal alignments.

From Lake Elizabeth, the BART aerial alignment would continue over the Southern Pacific Transportation Company (SPTCo) tracks, proceed southerly between the SPTCo and Union Pacific Railroad (UPRR) tracks, and cross over Paseo Padre Parkway. The BART alignment would then descend to pass under Washington Boulevard and continue to a proposed below-grade Irvington Station. The SPTCo and UPRR tracks would also be lowered to pass under Washington Boulevard.

From the proposed below-grade Irvington Station, the alignment would ascend to grade, cross over the future Blacow Road underpass (proposed by the City of Fremont) and under Durham Road. From Durham Road, the alignment would ascend to an aerial structure, cross over to the east of the UPRR tracks, over Grimmer Boulevard, and continue to the proposed elevated Warm Springs Station.

¹ For the Central Park/Lake Elizabeth segment of the Proposed Project, there are four design options which involve changes to both vertical and horizontal alignments. These design options (described in Section 2.3) are also applicable to all the BART alternatives.



**Figure 2-3
PROPOSED PROJECT ALIGNMENT**

2. Project Description

Leaving the Warm Springs Station, the alignment would proceed southward at grade on tracks placed east of the UPRR tracks. A crossover and siding (third track) would be located south of the station. The alignment would cross over Mission Boulevard, which is depressed, and over the future depressed Warren Avenue.¹ The alignment would continue at grade to the South Warm Springs Station. From the South Warm Springs Station, BART tailtracks would be extended at grade for approximately 3,000 feet, crossing over a Kato Road underpass. The tailtrack area will contain a rail car wash facility, and a small emergency maintenance and inspection pit.

2.2.2 STATION CHARACTERISTICS

Proposed stations would be similar to existing BART stations. The typical features that would be included in the BART Warm Springs Extension stations design include:

- **Parking.** Both short-term and long-term parking would be provided at stations. Short-term parking includes auto drop-off and pick-up (kiss-and-ride) parking, and bus drop-off and pick-up stops. Long-term parking, comprising the bulk of station parking, consists of park-and-ride parking spaces. Stations also include handicapped and bicycle parking and storage areas. The amount of parking required at each station varies with the projected patronage.
- **Fare collection systems.** Fare collection would be identical to the rest of the BART system. Tickets would be purchased through vendor machines located at various points in each station. Entrance to station platforms would be activated by inserting the fare ticket into the passenger gate which automatically records the necessary information to tally the remaining fare upon exiting.
- **Station concourses and platforms.** The concourse is a lobby that leads patrons to the platform. Station agents, schedules, local street maps, BART maps, and fare and collection machines would be located in the concourse. Platforms would be 700 feet long to accommodate ten-car trains. A minimum 25 foot-4 inch wide center platform flanked by the tracks is planned for the BART Warm Springs Extension stations.

¹ Warren Avenue is currently at-grade, but Caltrans is studying a plan for a new interchange at Mission Boulevard, which would include construction of an underpass for Warren Avenue.

2. Project Description

The following is a general description of each of the proposed station sites and concepts. Specific architectural treatments for each of the stations would be determined during final design of the project adopted by the BART Board of Directors and after consultation with the City of Fremont.

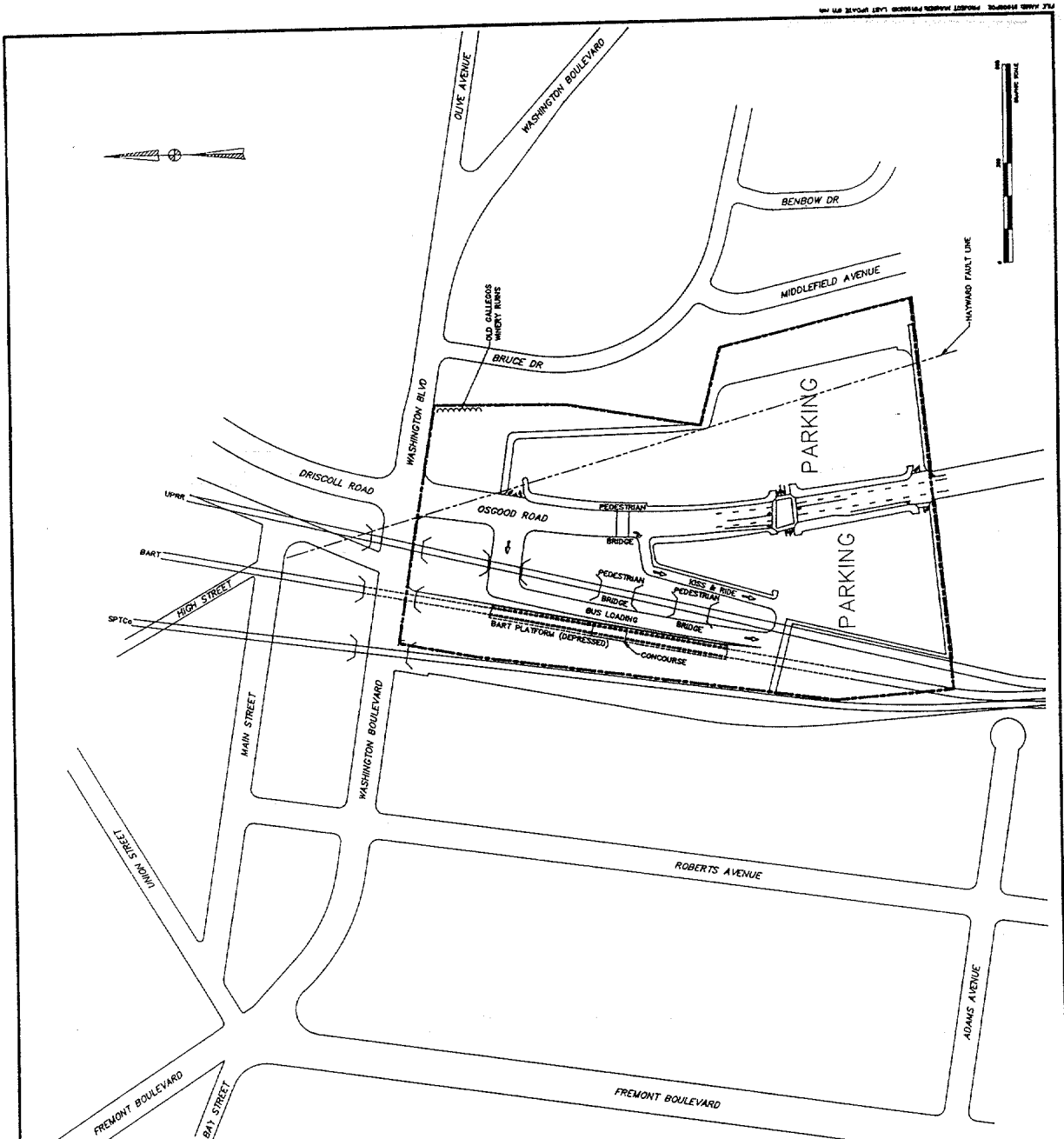
Irvington Station

The proposed Irvington Station would be a below-grade, center-platform station with an at-grade concourse and parking. The proposed station site occupies a total of approximately 26 acres south of Washington Boulevard on both the east and west sides of Osgood Road. The site slopes gently from Washington Boulevard toward the south. On the east, the station site is bounded by steep slopes, which contain the ruins of the Gallegos Winery. The proposed Irvington Station concept is shown in Figure 2-4.

The station concept is centered around the below-grade BART tracks which would be placed between the proposed below-grade SPTCo and UPRR tracks. This proposed grade separation is a fundamental design principle which was incorporated to minimize vehicular and pedestrian conflicts in the station area.

Vehicular access to the site from the east or west would be via Washington and Fremont Boulevards, and Olive Avenue. Driscoll and Osgood Roads provide the principal north-south access to the station. Vehicular access to the station and parking lots is via Osgood Road. The City of Fremont recently realigned Driscoll and Osgood Roads and widened Washington Boulevard at their intersections. The station concept calls for the main parking lot to be located east of Osgood Road with additional parking and the station area to the west. The two areas would be linked by a pedestrian bridge over Osgood Road. Bus and auto kiss-and-ride access would be to the east of the BART platform and on the west side of Osgood Road. The pedestrian bridge across Osgood Road would facilitate pedestrian access between the east parking lot and the station, and allows maximum utilization of the available site area west of Osgood Road over the below-grade BART alignment and SPTCo and UPRR tracks. The earth fill used to raise the parking area on the west side of Osgood Road would come from the excavation required for the depressed BART alignment, station structure, and the railroad rights-of-way in the station area and north of Washington Boulevard.

As noted above, parking at the station would be divided into two areas with a total of approximately 1,240 spaces. The second parking area would be located south of the station, and west of Osgood Road. A pedestrian bridge would also be located over the UPRR for access to the concourse from the kiss-and-ride areas.



LEGEND:
 - - - - - STATION SITE BOUNDARY
 ——— SUBWAY

Figure 2-4
IRVINGTON STATION CONCEPT
Proposed Project

SOURCE: DKS Associates, 1991

2. Project Description

The Gallegos Winery site at the southeast corner of the intersection of Washington Boulevard and Osgood Road would be incorporated into the station concept without disruption to the remains of the winery site. The brick and sandstone ruins of the winery are embedded in the hillside of the station site east of Osgood Road. Section 3.9, Cultural and Historic Resources, discusses the characteristics of the winery site in greater detail.

Warm Springs Station

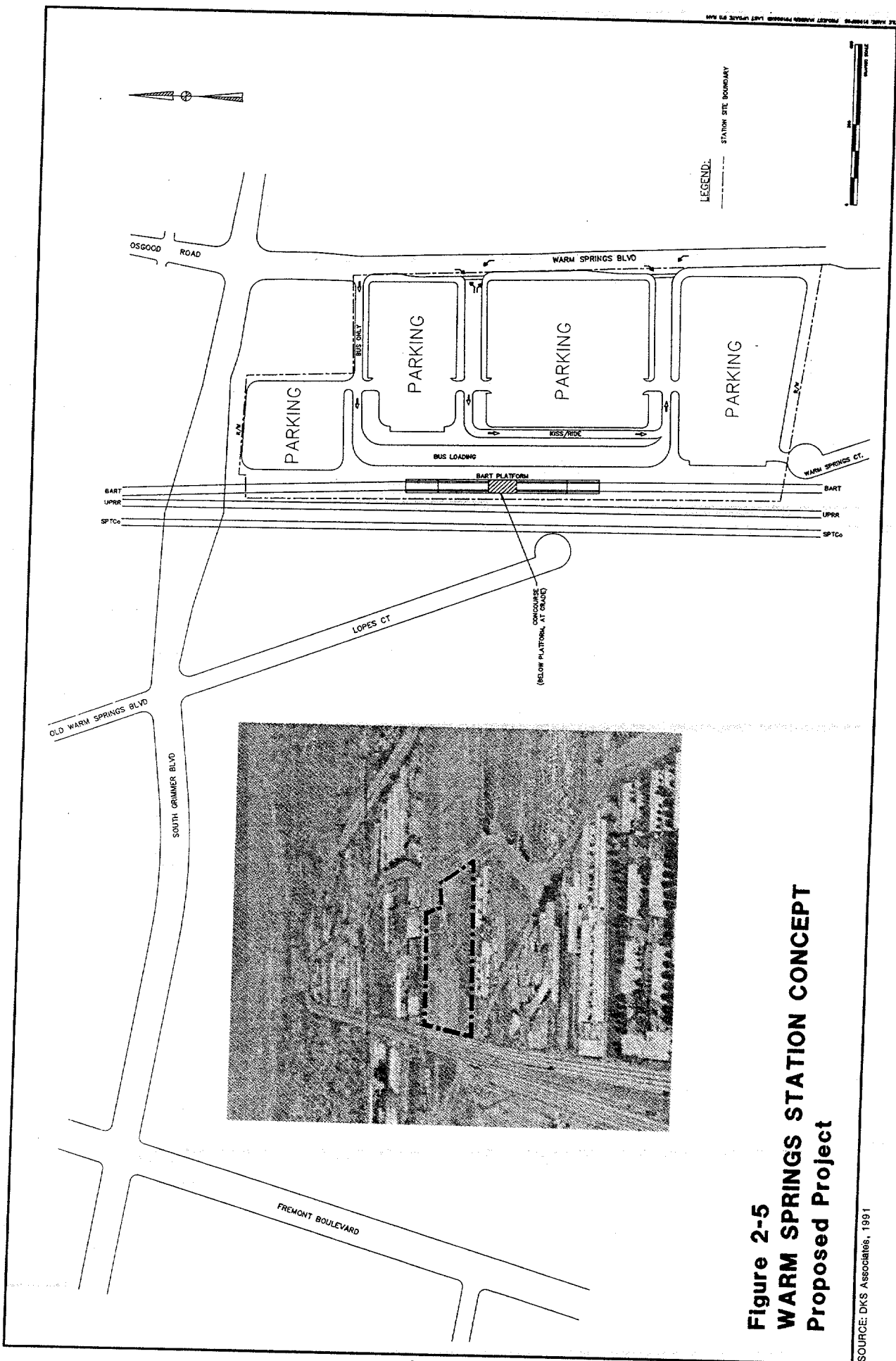
The proposed Warm Springs Station located at Grimmer Boulevard would have an aerial center platform with an at-grade concourse, and parking. The station site consists of approximately 34 acres extending approximately 2,000 feet south of Grimmer Boulevard between Warm Springs Boulevard and the SPTCo and UPRR tracks. The site is essentially flat.

Grimmer Boulevard would provide east-west vehicular access, while Osgood Road and Warm Springs Boulevard would provide north-south access to the station. The primary access into the station site and parking lot would be via Warm Springs Boulevard.

A concept plan for the Warm Springs Station is presented in Figure 2-5. The station concept includes bus loading and unloading in front of the platform area. A total of about 2,100 parking spaces to meet the Year 2010 future demand estimates would be provided. The kiss-and-ride loading and unloading would occur just east of the bus loading area. The primary pedestrian access to the station would be provided near the station entrance. Secondary pedestrian access would be provided throughout the parking lots via the areas bordering the lots. These areas are intended to include sidewalks as needed, with landscaping in the remaining space.

South Warm Springs Station

The design concept for the South Warm Springs Station involves an aerial platform with a slightly depressed concourse and parking. The station site consists of approximately 42 acres and extends approximately 2,000 feet north of Kato Road between Warm Springs Boulevard and the SPTCo and UPRR tracks. The site is essentially flat.



**Figure 2-5
WARM SPRINGS STATION CONCEPT
Proposed Project**

SOURCE: DKS Associates, 1991

2. Project Description

Scott Creek Road and Kato Road would provide east-west vehicular access, while Warm Springs Boulevard would provide north-south access to the station. The accesses into the station site and parking lot would be from Warm Springs Boulevard and Kato Road.

A concept plan for the South Warm Springs Station is presented in Figure 2-6. The station concept includes a kiss-and-ride area in front of the platform area. Bus loading would occur just south of the kiss-and-ride area. Approximately 2,400 parking spaces would be provided. Pedestrian access to the station would be provided throughout the parking lots via the areas bordering the lots. These areas are intended to include sidewalks as needed, with landscaping in the remaining space.

2.3 DESIGN OPTIONS

2.3.1 CENTRAL PARK DESIGN OPTIONS

The Proposed Project, as well as the build extension alternatives, would have the following design options relating to the alignment at Fremont's Central Park (see Figure 2-7):

Design Option 1

The vertical alignment for BART would be subway rather than aerial through Central Park and Lake Elizabeth. BART would still be on an embankment over Walnut Avenue, but would transition to subway under Stevenson Boulevard, Lake Elizabeth and Paseo Padre Parkway. With this design option, BART would be in a subway structure for an additional 1.5 miles of its length.

Design Option 2A

The BART alignment would be moved east around Lake Elizabeth. The vertical alignment north of Central Park would be on an embankment over Walnut Avenue, and an aerial structure over Stevenson Boulevard. After Stevenson Boulevard the vertical alignment would be aerial, but the placement of the aerial structure would be further east than the Proposed Project route. This design option would go over a more eastern section of Central Park, and would skirt Lake Elizabeth and continue south, crossing over Paseo Padre Parkway. With this design option, the alignment would be approximately 530 feet longer (0.10 miles) than the Proposed Project and require a 50 mph speed restriction on the BART trains.

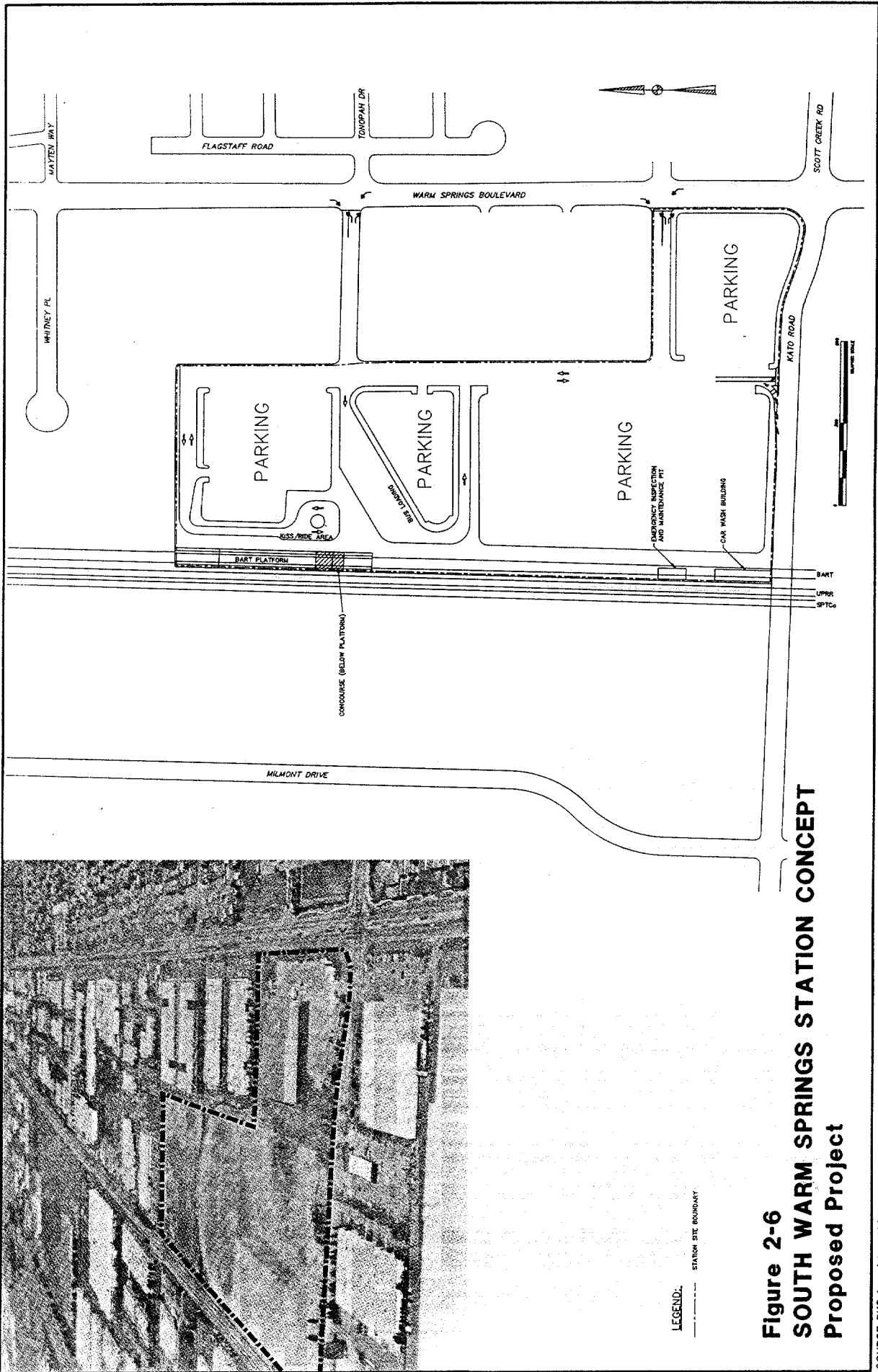


Figure 2-6
SOUTH WARM SPRINGS STATION CONCEPT
Proposed Project

SOURCE: DKS Associates, 1991

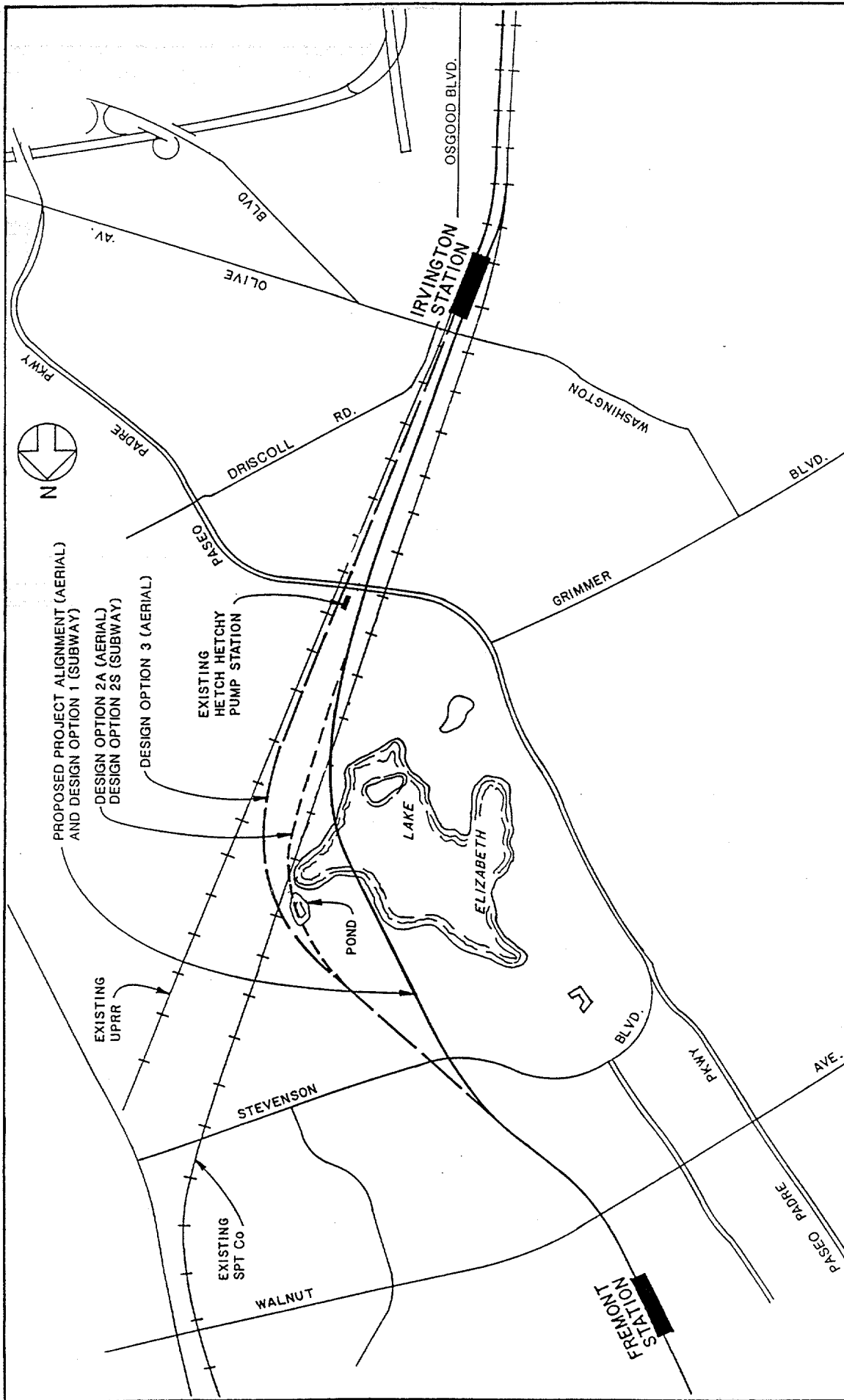


Figure 2-7
CENTRAL PARK DESIGN OPTIONS

NOT TO SCALE

SOURCE: DKS Associates, 1991

Design Option 2S

Similar to Design Option 2A, the BART alignment would be moved east around Lake Elizabeth. The vertical alignment north of Central Park would be on an embankment over Walnut Avenue and transition to subway under Stevenson Boulevard. After Stevenson Boulevard the vertical alignment would continue in subway, following the same route as the aerial Design Option 2A. The design option would go under a more eastern section of Central Park, and would skirt Lake Elizabeth and continue south, crossing under Paseo Padre Parkway. With this design option, the alignment would again be approximately 530 feet longer (0.10 miles) than the Proposed Project and would also require a 50 mph speed restriction on the BART trains.

Design Option 3

BART would go further east around Lake Elizabeth than Design Options 2A and 2S. The vertical alignment would still be on an embankment over Walnut Avenue, and an aerial structure over Stevenson Boulevard. After Stevenson Boulevard, the vertical alignment still would be aerial, but the structure would be further east than both the Proposed Project alignment or Design Options 2A and 2S. The alignment would go over a more eastern section of Central Park, and would skirt Lake Elizabeth. The alignment would continue south on the west side of the UPRR and cross over Paseo Padre Parkway. This alignment would add about 850 feet (0.16 miles) to the length of the aerial structure of the Proposed Project and requires a 70 mph speed restriction on the BART trains.

2.3.2 OTHER DESIGN OPTIONS

Other design options include:

- At Paseo Padre Parkway, in lieu of the aerial alignment over Paseo Padre Parkway, the alignment design option would be at grade, with the Parkway going over the BART alignment and the SPTCo and UPRR tracks. This alignment design option also applies to any of the Central Park design options.
- At Warren Avenue, in lieu of the at-grade alignment and depressed Warren Avenue, the alignment design option would be on an aerial structure over the roadway, with Warren Avenue staying at grade. This aerial structure would be approximately 0.4 miles long.

2. Project Description

A horizontal alignment design option (UPRR relocation option or "End" option) is introduced from approximately a half-mile south of Warren Avenue to just north of Dixon Landing Road. This "End" option would relocate the UPRR tracks to the west and the BART alignment would largely utilize existing UPRR right-of-way. The "End" option would reduce right-of-way required from the property owners adjacent to the railroad as compared to the Proposed Project alignment.

2.3.3 APPLICABILITY OF DESIGN OPTIONS

The Central Park design options are applicable to the Proposed Project and all alternatives, as is the at-grade design option at Paseo Padre Parkway. The other design options are applicable in appropriate situations shown in Table 2-1.

2.4 PROJECT ALTERNATIVES

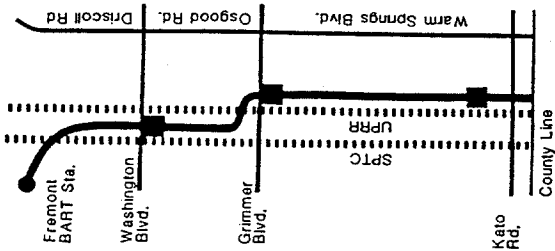
The EIR also evaluates eleven alternatives to the Proposed Project. Alternatives 1 through 3 are not "build" alternatives and do not include a BART Warm Springs Extension. Alternatives 4 through 11 include various configurations of a BART Warm Springs Extension, and are considered "build" alternatives. Figure 2-8 schematically presents the Proposed Project and the eight build alternatives. Briefly, Alternative 4 has a different route than the Proposed Project, and is shorter. Alternatives 5, 6, 9, 10 and 11 have the same routing as the Proposed Project, but involve changes in number of stations and/or extension length. Alternatives 7 and 8 have different stations and alignments than the Proposed Project.

2.4.1 ALTERNATIVE 1: No Project and No Transportation Improvements (status quo)

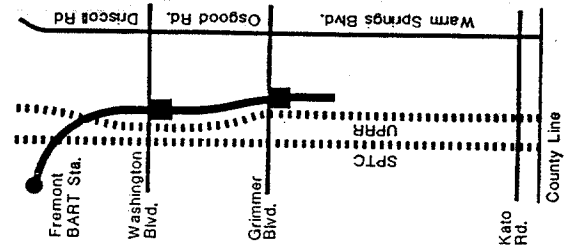
This alternative does not include BART extensions, and assumes that transit services offered by BART and AC Transit within the corridor will continue at current levels, except for limited improvements in service frequency.

Alternative 1 does not include improvements to the study area's highway system, except for the widening of I-880, which is currently under construction and expected to be completed in late 1991.

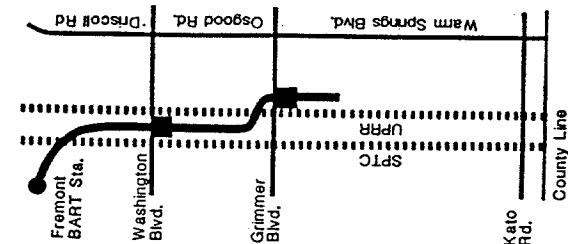
Proposed Project
7.8 Miles - 3 Stations



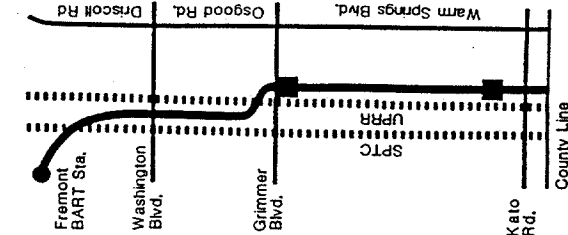
Alternative 4
5.4 Miles - 2 Stations



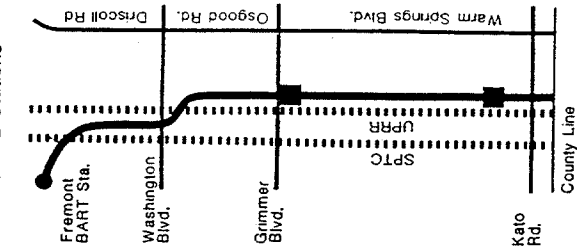
Alternative 5
5.4 Miles - 2 Stations



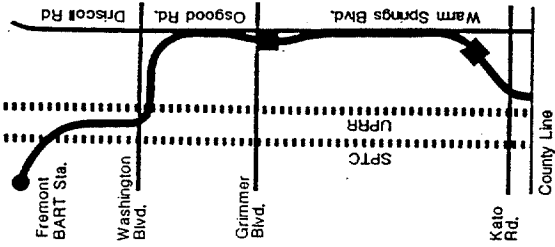
Alternative 6
7.8 Miles - 2 Stations



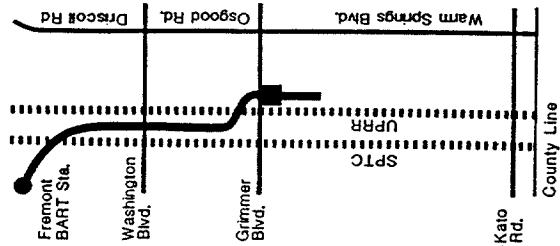
Alternative 7
7.8 Miles - 2 Stations



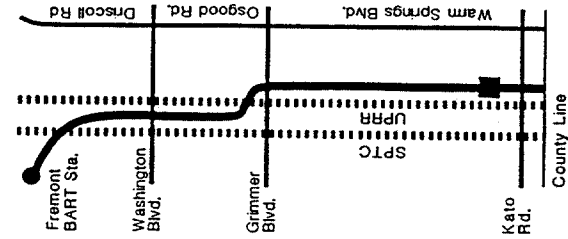
Alternative 8
7.8 Miles along Osgood Road - 2 Stations



Alternative 9
5.4 Miles - 1 Station



Alternative 10
7.8 Miles - 1 Station



Alternative 11
7.8 Miles - 2 Stations

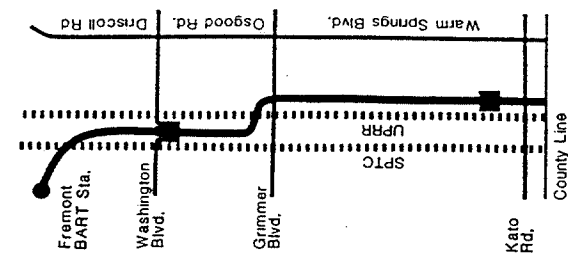


Figure 2-8
PROPOSED PROJECT and
RAIL ALTERNATIVE
SCHEMATICS (Not to Scale)

**Table 2-1
Applicability of Design Options**

Design Option	Proposed Project	Alt4	Alt5	Alt6	Alt7	Alt8	Alt9	Alt10	Alt11
Central Park									
Design Option 1		Applicable to all alternatives.							
Design Option 2A		Applicable to all alternatives.							
Design Option 2S		Applicable to all alternatives.							
Design Option 3		Applicable to all alternatives.							
Other Design Options									
At grade at Paseo Padre Pkwy		Applicable to all alternatives.							
Aerial at Washington Blvd	NA	NA	NA	X	*	*	X	X	NA
Aerial at Warren Avenue	X	NA	NA	X	X	NA	NA	X	X
UPRR Relocation	X	NA	NA	X	X	NA	NA	X	X

X = Applicable
NA = Not Applicable
* = Already Aerial

2.4.2 ALTERNATIVE 2: No Project, Programmed Transportation Improvements

Alternative 2 does not include a BART Warm Springs Extension, but takes into account existing and programmed highway and transit improvements. The specific highway improvements in Alameda County are those included in the 1990 State Transportation Improvement Program (STIP), and those funded by Alameda County's Measure B sales tax revenues. Transit improvements include those in the BART Ten-Year Plan (service and capital improvements). These transit improvements, which could affect BART patronage, include the Dublin, West Pittsburg and Colma BART extensions. Transit improvements also include the implementation of the AC Transit's Comprehensive Service Plan.

2. Project Description

2.4.3 ALTERNATIVE 3: Transportation Systems Management (TSM)

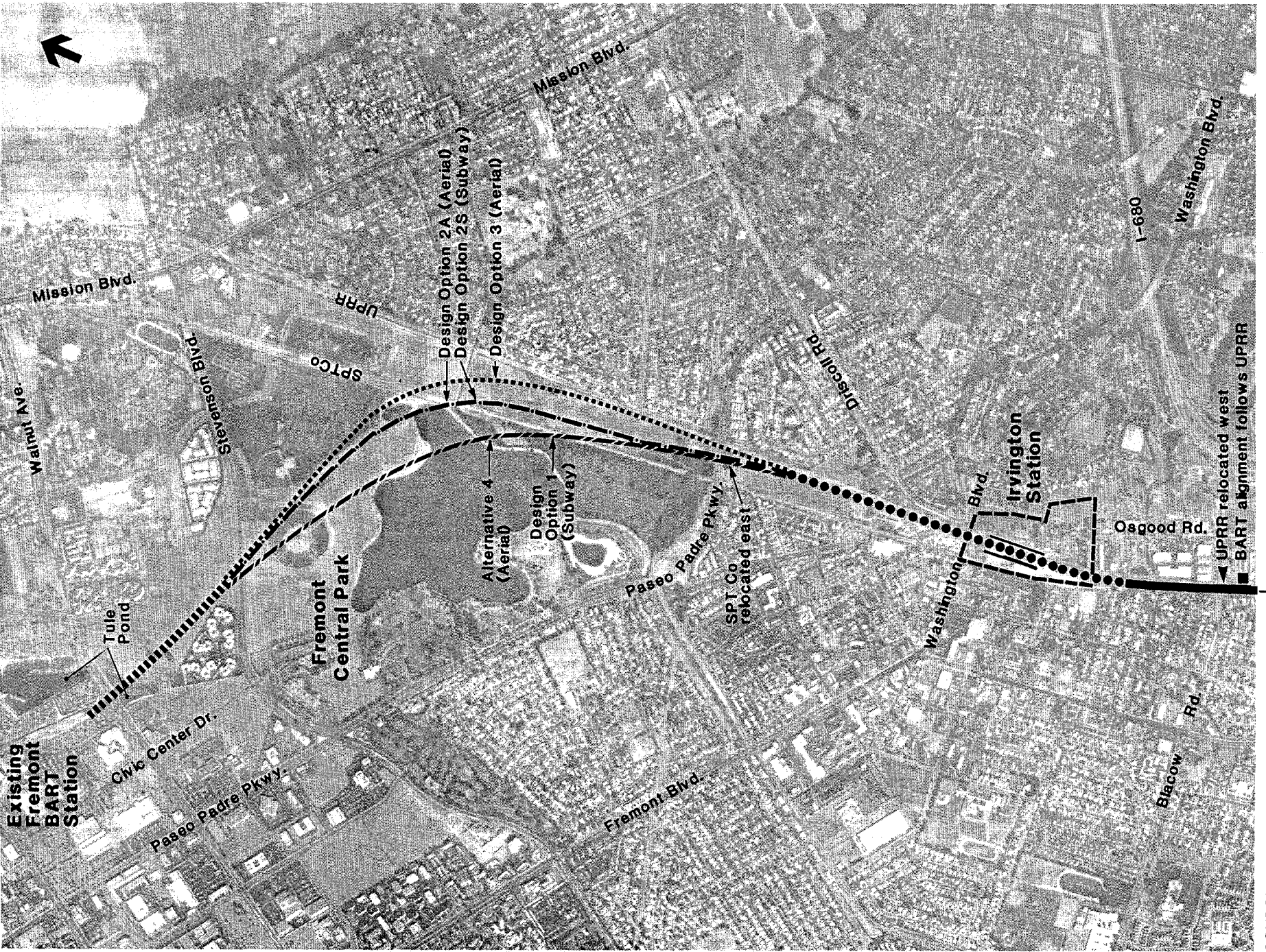
The TSM alternative includes the benefits of various existing or programmed transit and highway improvements noted in Alternative 2, and also includes the BART extension to the San Francisco International Airport and the Tasman Corridor LRT system from east San Jose to Sunnyvale or Mountain View. The additional highway improvements in the study area included in this alternative are HOV lanes on I-880 from SR 238 south to the Montague Expressway.

The highway and transit system for this alternative are included in the Proposed Project and alternatives 4 through 11. The AC Transit and Santa Clara County Transit District bus routes would be modified to complement the BART extension configurations.

2.4.4 ALTERNATIVE 4: A 5.4-Mile BART Extension with Two Stations, and Relocated Railroad

Alternative 4 consists of a 5.4-mile, two-station extension with stations in the Irvington and Warm Springs Districts of Fremont (Figure 2-9). The alignment would be similar to the Proposed Project through Central Park and past Lake Elizabeth, but would cross over both the SPTCo and UPRR tracks instead of running between them. (This would require that the UPRR tracks be relocated slightly westward.) Aside from running to the east of the UPRR tracks, the Alternative 4 alignment is similar to the Proposed Project, travelling under Washington Boulevard and remaining below grade to the proposed Irvington Station. In leaving the Irvington Station, the BART alignment continues at grade until it rises on an embankment or aerial structure to cross over the Grimmer Boulevard underpass to arrive at the proposed elevated Warm Springs Station. From the Warm Springs Station, tailtracks would be extended at grade for approximately 3,000 feet. The tailtrack area would contain a rail car wash facility and a small emergency maintenance and inspection pit. (The Central Park design options and the vertical alignment option at Paseo Padre Parkway apply to this alternative.)

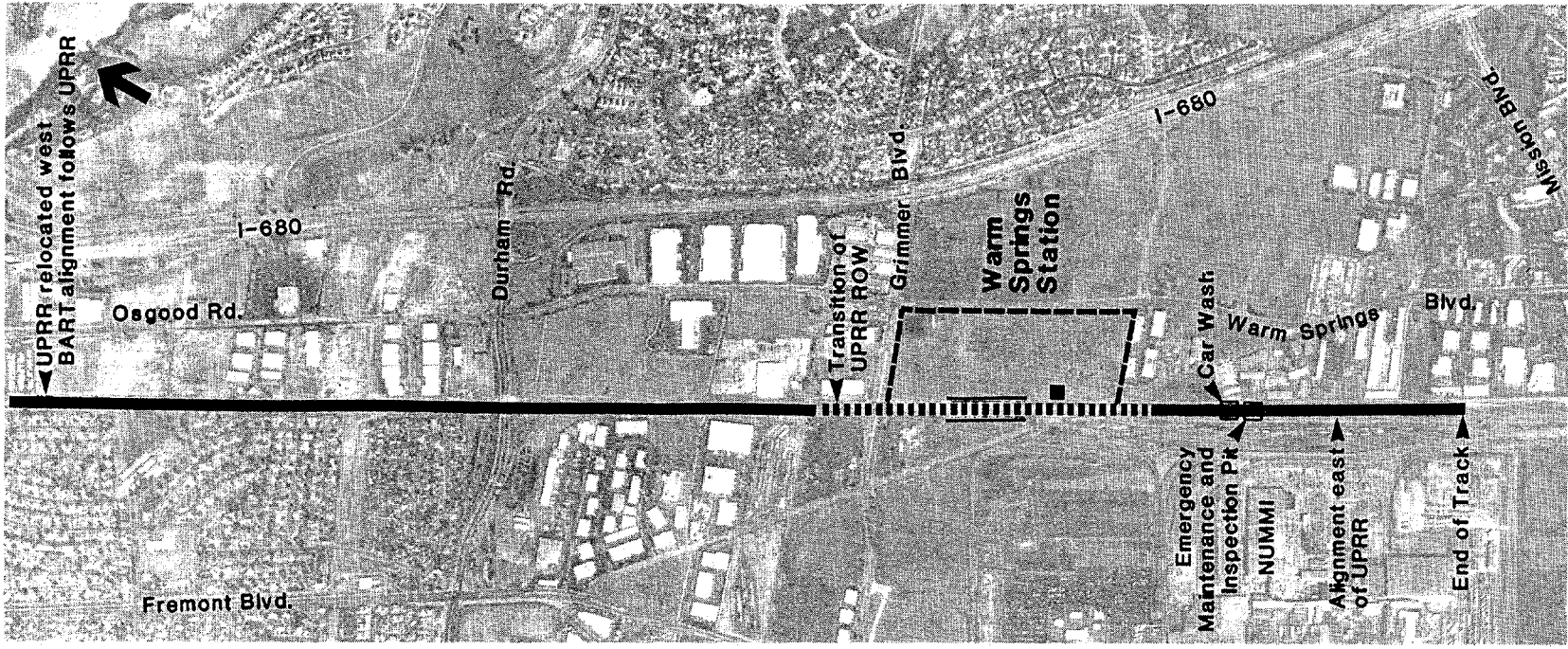
This alternative requires a different Irvington Station design than the design in the Proposed Project since the station would be to the east of the UPRR and SPTCo. The Irvington Station in this alternative would be a below-grade, center platform station with an at-grade concourse, similar to the Proposed Project, with the same station site boundary and 26-acre size (Figure 2-10). The parking area and access on the east side of Osgood Road is the same as that in the Proposed Project. The differences between the Proposed Project, Irvington Station design and this station design occur on the west side of Osgood Road.



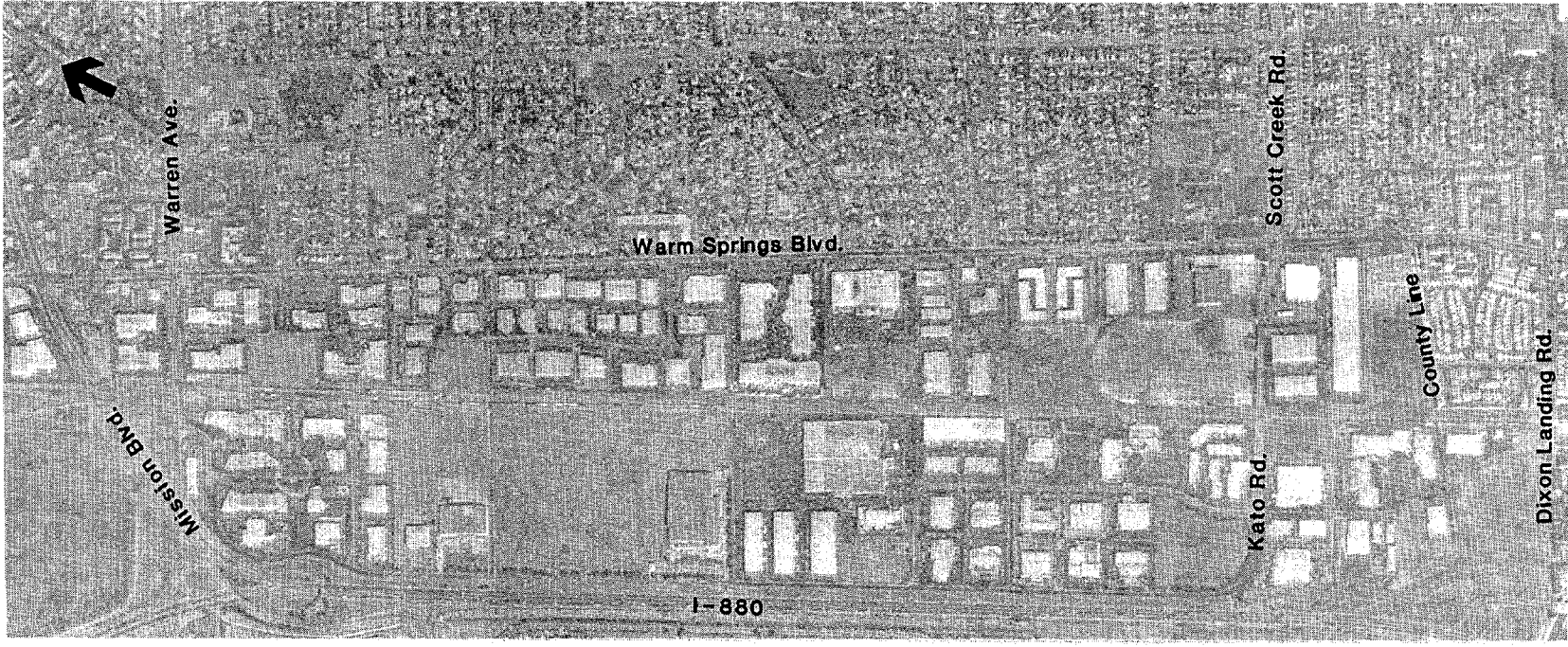
PANEL 1

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SOURCE: DKS Associates, 1991
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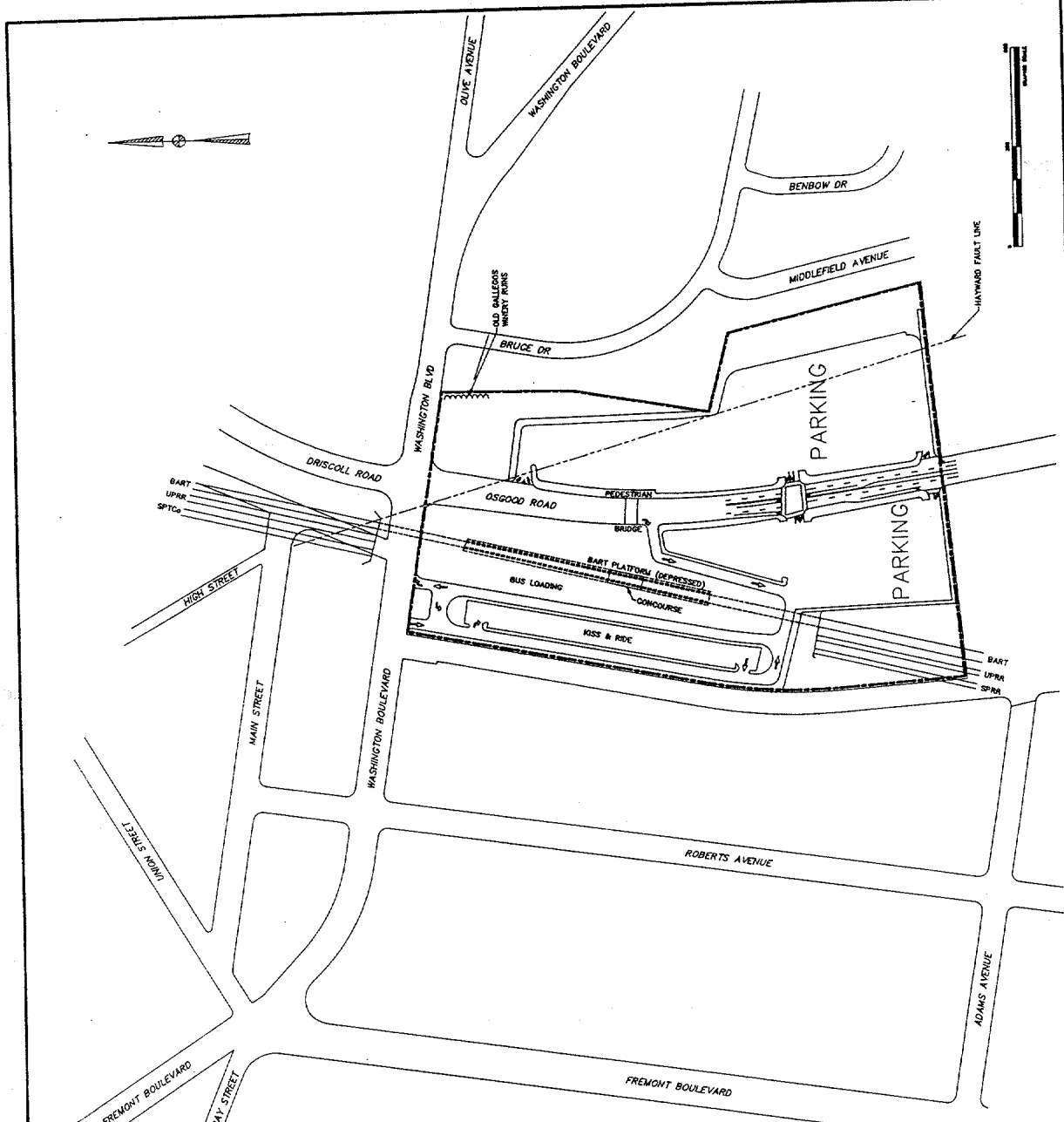


PANEL 2



PANEL 3

Figure 2-9
ALTERNATIVE 4 ALIGNMENT



LEGEND:
 STATION SITE BOUNDARY
 SUBWAY

Figure 2-10
IRVINGTON STATION CONCEPT
Alternative 4

SOURCE: DKS Associates, 1991

2. Project Description

The station design for this alternative provides limited access from Washington Boulevard on the west side of the platform with ingress from the west and egress to the east using right turn-in and right turn-out traffic control. Bus and auto kiss-and-ride access would use this limited access. Since the UPRR tracks are on the west side of the platform and are depressed and covered in the station area, no pedestrian bridge to cross the UPRR is necessary.

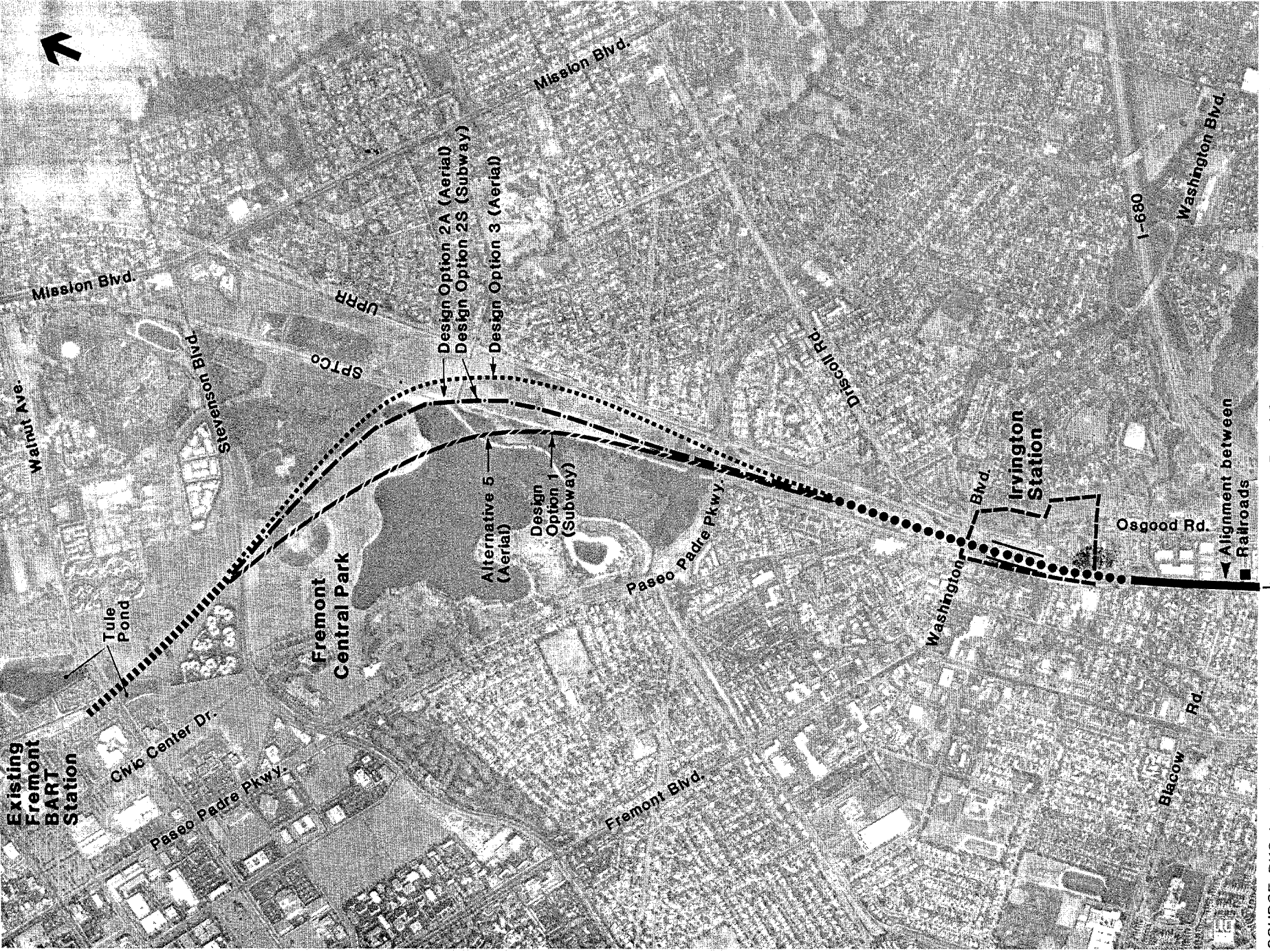
Since the Warm Springs Station is the terminal station for this alternative, a larger Warm Spring Station site area is needed for this site (approximately 37 acres) than in the Proposed Project. The three-acre parcel at the southwest corner of Grimmer and Warm Springs Boulevards will be included in the alternative's station site. Parking supply at Warm Springs would be approximately 2,300.

2.4.5 ALTERNATIVE 5: A 5.4-Mile BART Extension with Two Stations

Alternative 5 consists of a 5.4-mile, two-station extension along the same route as the Proposed Project (Figure 2-11). The two proposed stations are in the Irvington and Warm Springs Districts. From the Warm Springs Station, tailtracks would be extended at grade for about 3,000 feet. The tailtrack area will contain a rail car wash facility and a small emergency maintenance and inspection pit. (The Central Park design options and the vertical alignment design option at Paseo Padre Parkway also apply to this alternative). Since the Warm Springs Station is the terminal station for this alternative a larger Warm Spring Station site area is also needed for this site (approximately 37 acres) than in the Proposed Project three-acre parcel. The area at the southwest corner of Grimmer and Warm Springs Boulevards will be included in the alternative's station site. Parking supply at Warm Springs would be approximately 2,300.

2.4.6 ALTERNATIVE 6: A 7.8-Mile BART Extension with Two Stations (no Irvington Station)

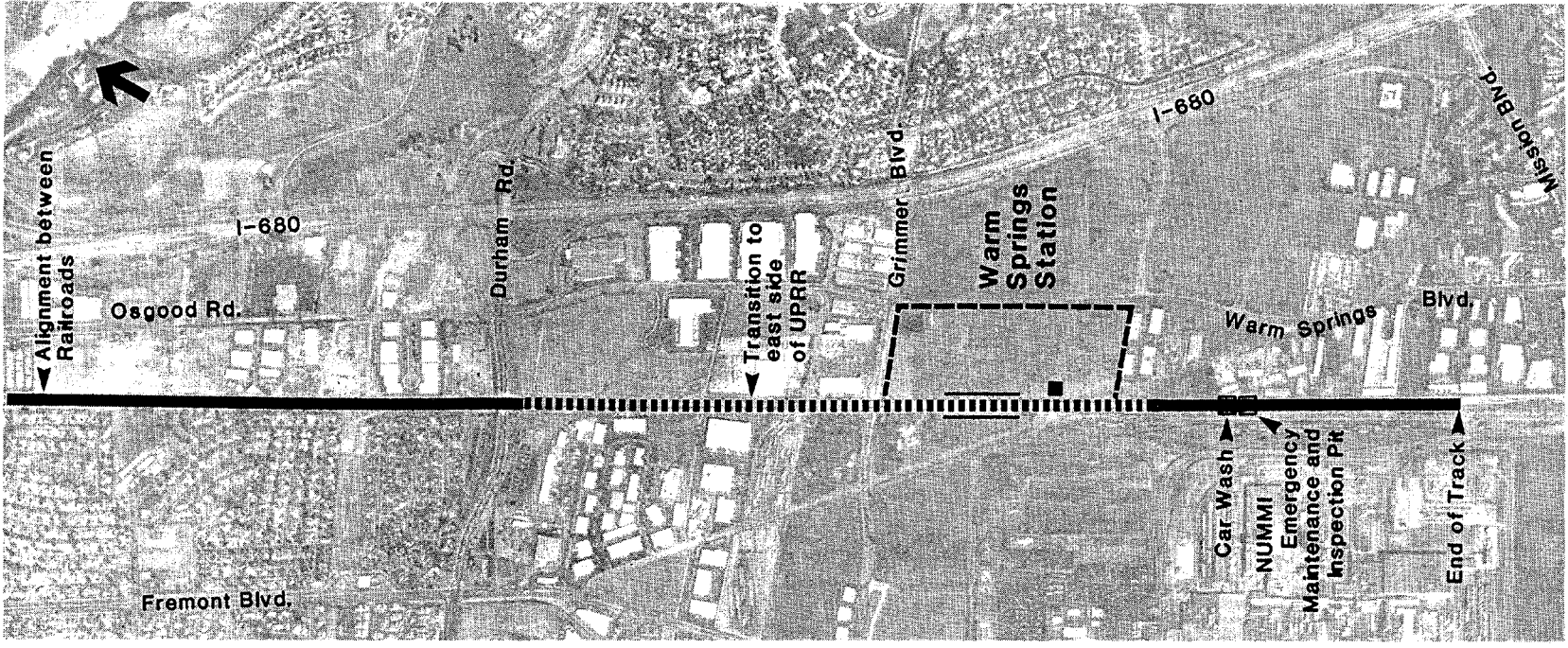
Alternative 6 consists of a 7.8-mile, two-station extension with no station in the Irvington District (Figure 2-12). From the existing Fremont BART Station south to Washington Boulevard, the Alternative 6 alignment would be the same as the Proposed Project, including a depressed below-grade crossing under Washington Boulevard. A vertical design option is introduced at Washington Boulevard. Since there would be no Irvington Station, the design option provides for an aerial crossing over Washington Boulevard as an alternative to the below-grade crossing. In either case, it is assumed that the railroads would remain at grade at Washington Boulevard.



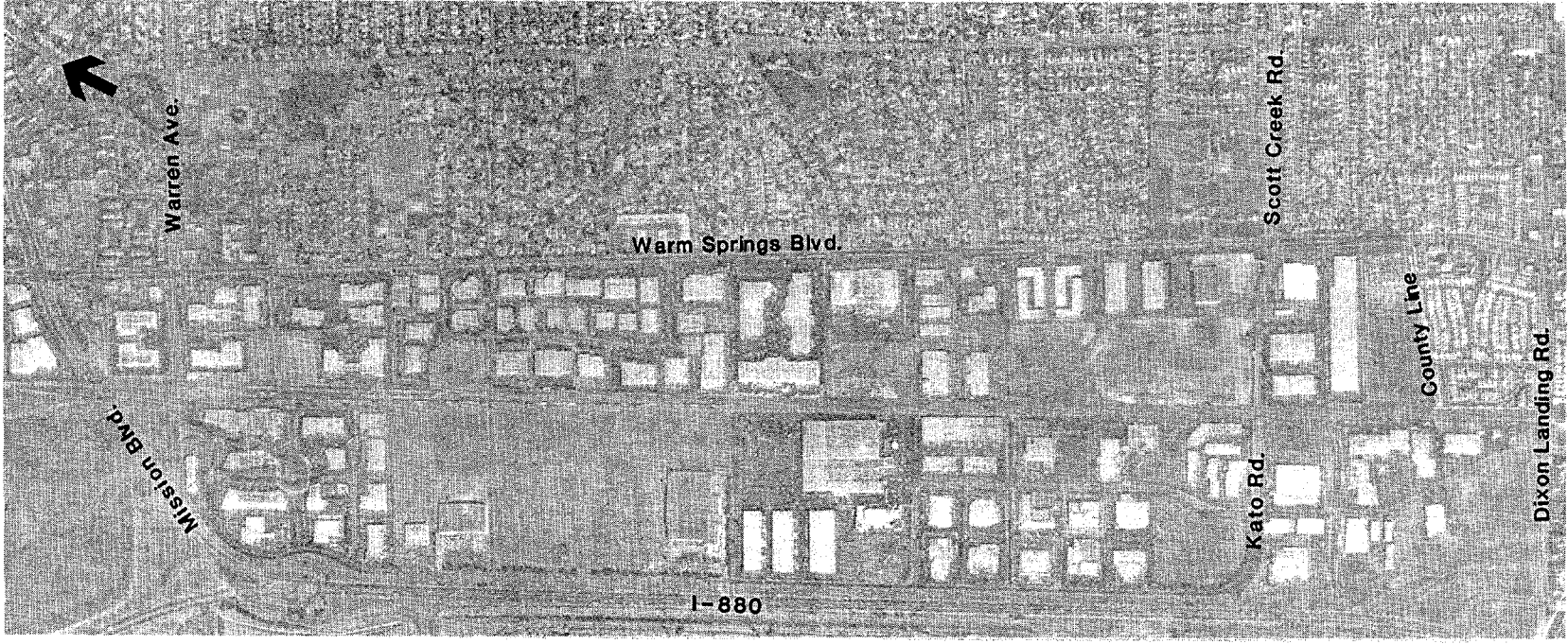
PANEL 1

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SOURCE: DKS Associates, 1991
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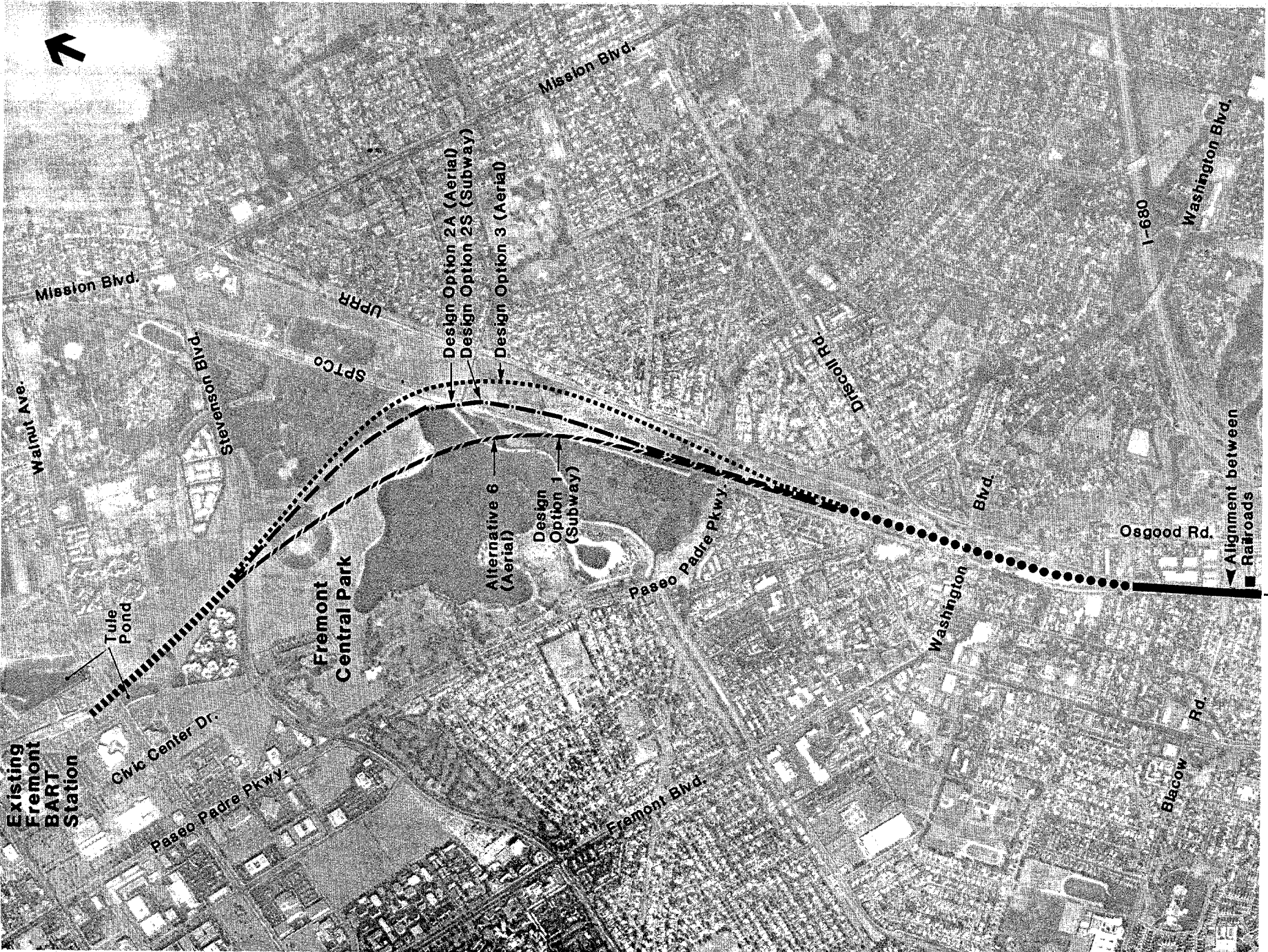


PANEL 2

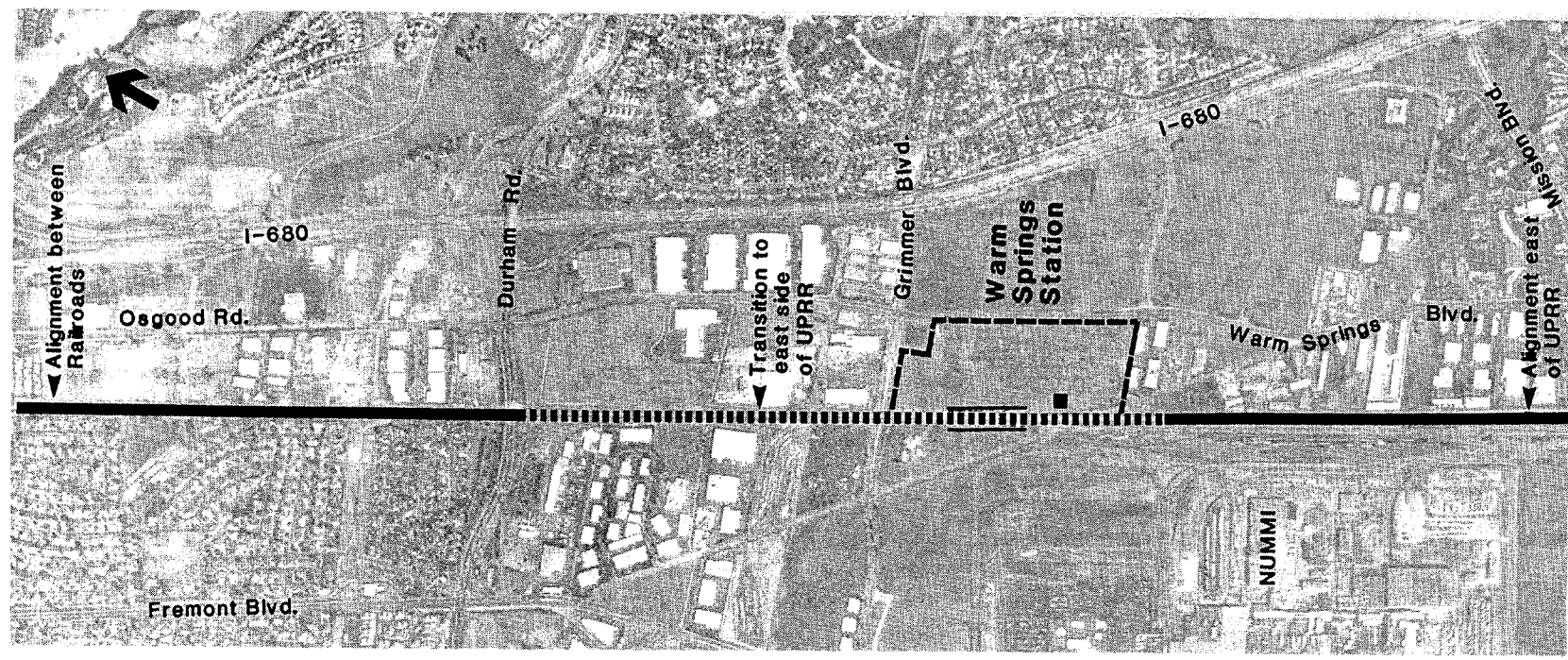


PANEL 3

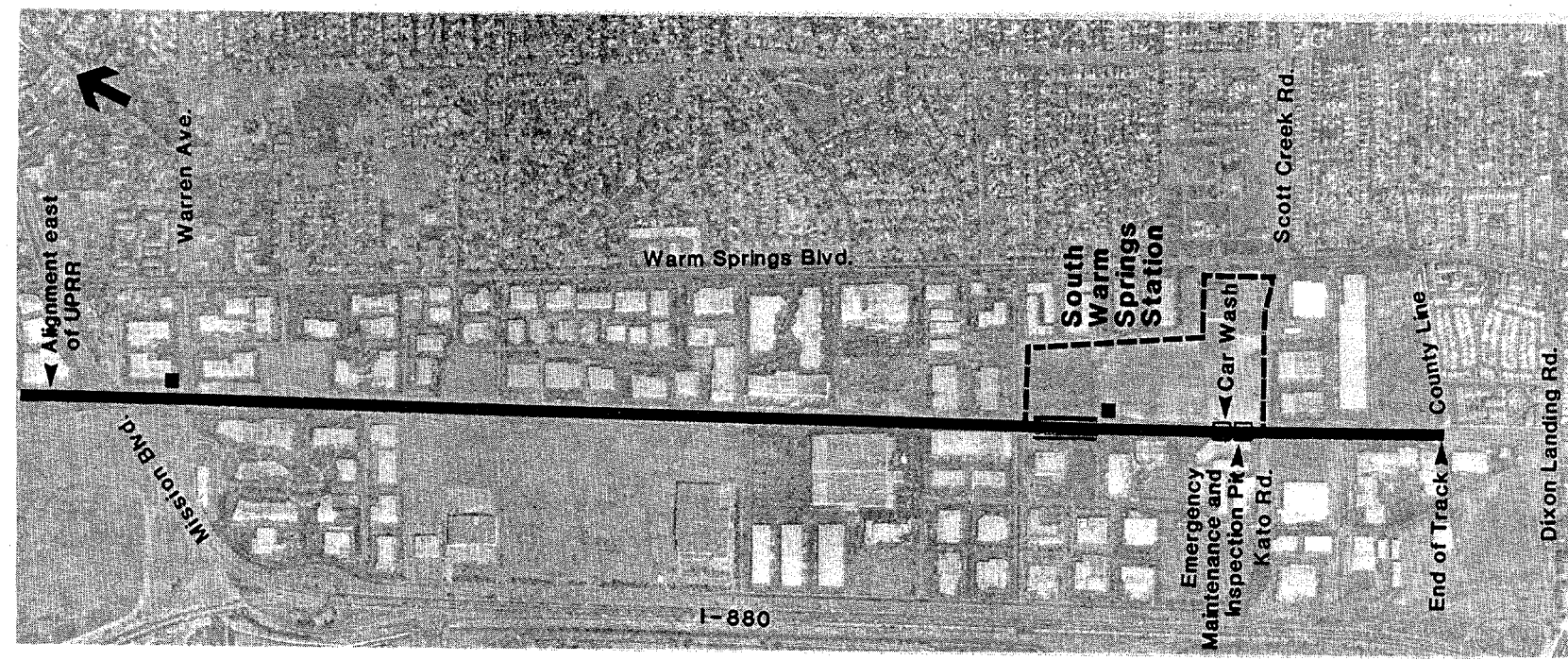
Figure 2-11
ALTERNATIVE 5 ALIGNMENT



PANEL 1
 SOURCE: DKS Associates, 1991
 NOT TO SCALE



PANEL 2
 Continued on Panel 3



PANEL 3

Figure 2-12
ALTERNATIVE 6 ALIGNMENT

2. Project Description

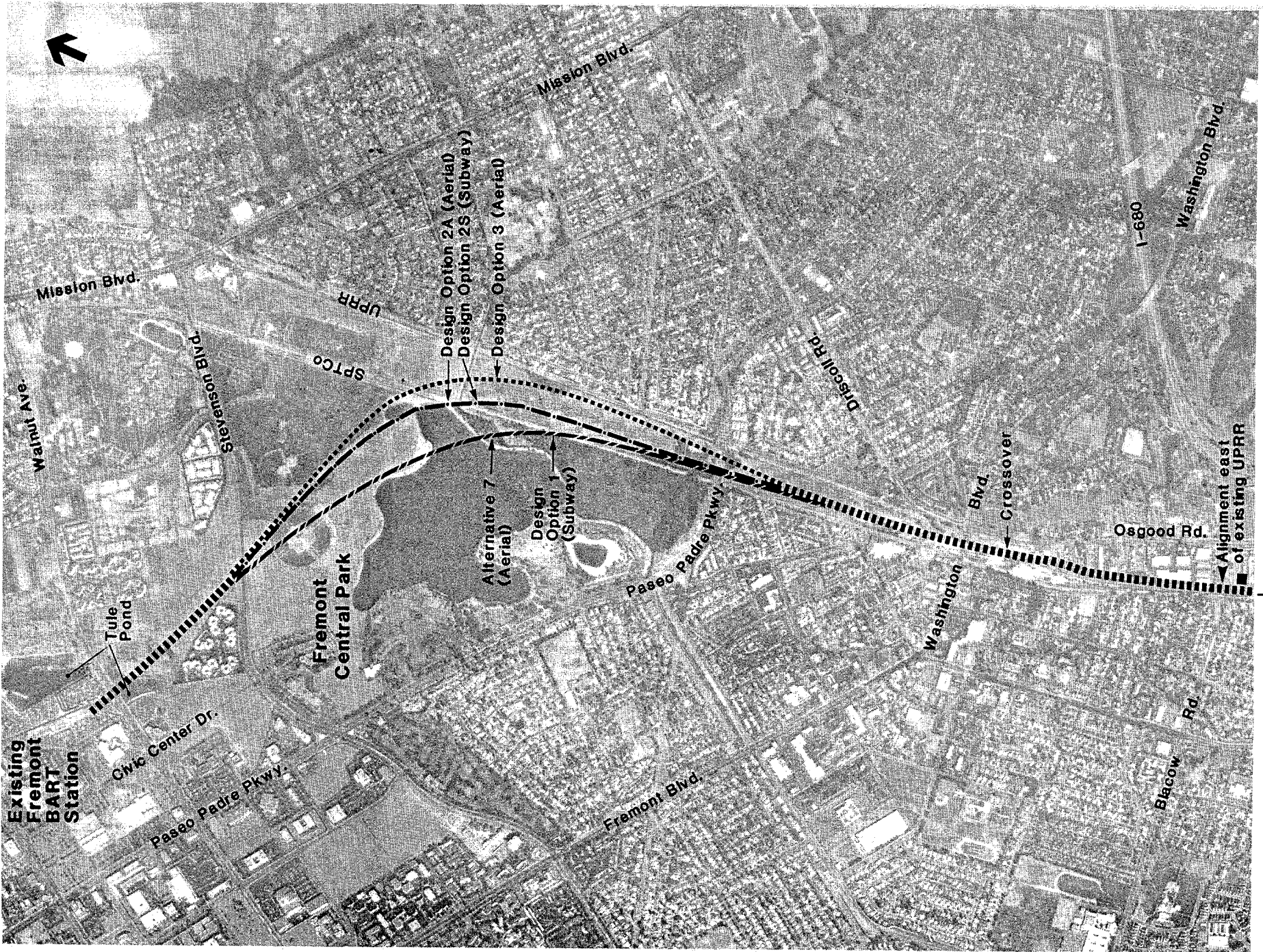
The subsequent aerial crossing of the UPRR railroad tracks and Grimmer Boulevard is the same as in the Proposed Project. Other station locations (Warm Springs and South Warm Springs) and alignment characteristics also remain the same as the Proposed Project including the tailtrack and ancillary facilities. (The Central Park design options also apply to this alternative, as do the vertical alignment design options at Paseo Padre Parkway, and Warren Avenue, and the UPRR relocation option occurring south of Warren Avenue.)

2.4.7 ALTERNATIVE 7: A 7.8-Mile BART Extension with Two Stations (no Irvington Station)

Alternative 7 consists of a 7.8-mile, two-station extension, mostly on an aerial structure, with no Irvington Station (Figure 2-13) and running east of the UPRR, outside of railroad rights-of-way, from south of Washington Boulevard to the end of the line. The Alternative 7 alignment is similar to the Proposed Project alignment from the existing Fremont BART Station until it passes over Paseo Padre Parkway. From there, the BART alignment continues on an aerial structure over Washington Boulevard (rather than below grade as in the Proposed Project). Immediately after crossing Washington Boulevard, the alignment crosses over to the east of the UPRR tracks and outside of the railroad rights-of-way. The alignment then lowers to at grade, passing under the existing overpass at Durham Road. From Durham Road, the alignment rises to an aerial structure, crossing over Grimmer Boulevard, and continuing to an elevated Warm Springs Station. From the Warm Springs Station to the South Warm Springs Station, the Alternative 7 alignment would be the same as the Proposed Project alignment including the tailtrack and ancillary facilities. (The Central Park design options and the vertical alignment design options at Paseo Padre Parkway and Warren Avenue, and the UPRR relocation option occurring south of Warren Avenue also apply to this alternative.)

2.4.8 ALTERNATIVE 8: A 7.8-Mile BART Extension along Osgood Road and Warm Springs Boulevard, with Two Stations (No Irvington Station)

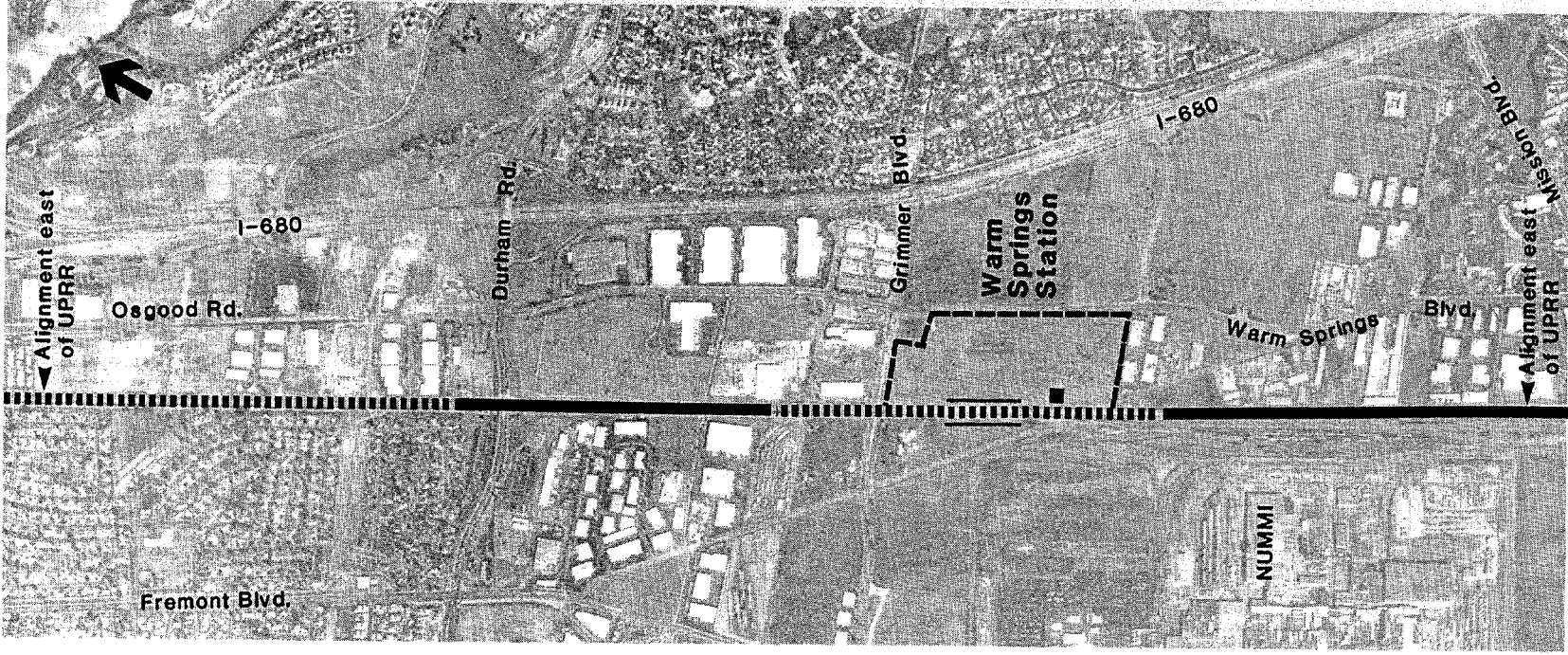
Alternative 8 consists of a 7.8-mile, two-station extension of BART south from the current Fremont Station (Figure 2-14). The Alternative 8 alignment is similar to the Proposed Project through Central Park and Lake Elizabeth, and past Paseo Padre Parkway. From Paseo Padre Parkway, the alignment stays on an aerial structure, and crosses over Washington Boulevard and the UPRR tracks and continues on an aerial structure to the center of Osgood Road. On the aerial structure, the alignment would cross over Durham Road and Grimmer Boulevard to a Warm Springs Station which would be located west of Warm Springs Boulevard.



PANEL 1

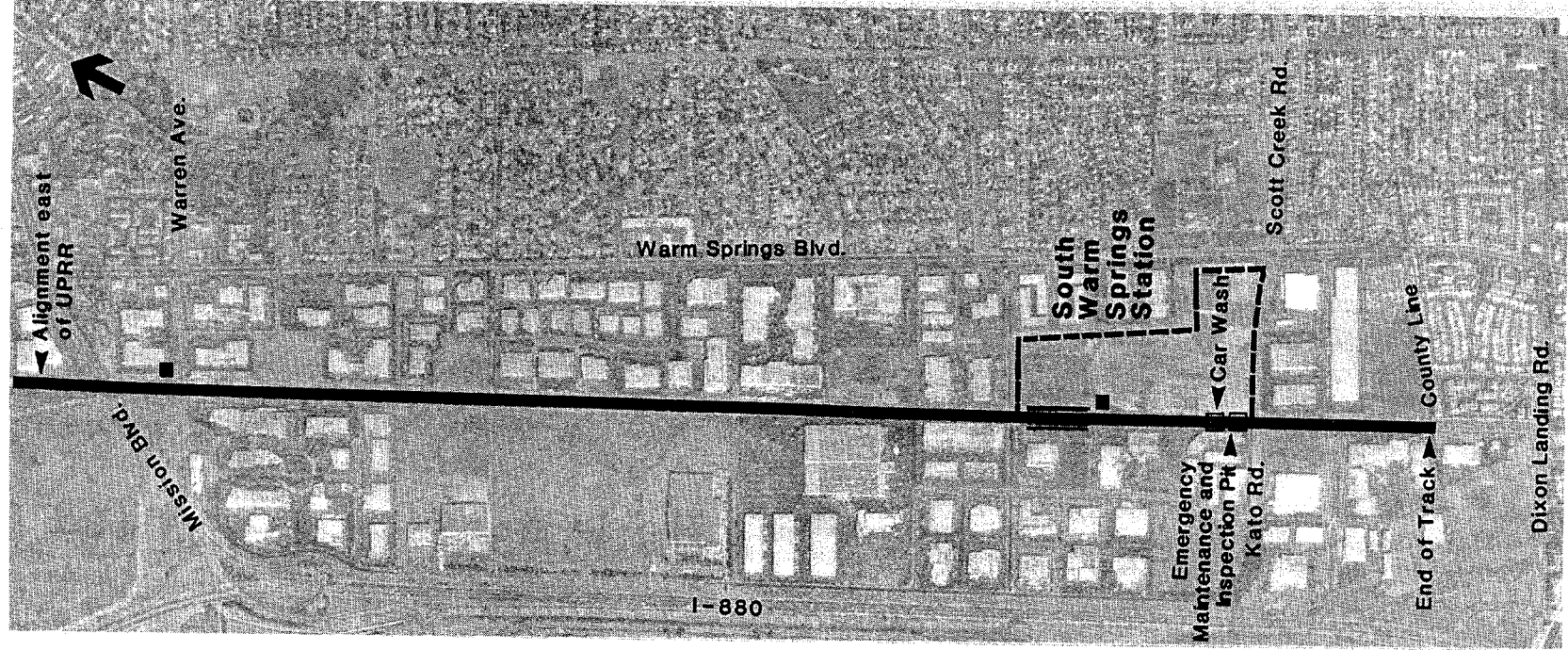
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SOURCE: DKS Associates, 1991
NOT TO SCALE



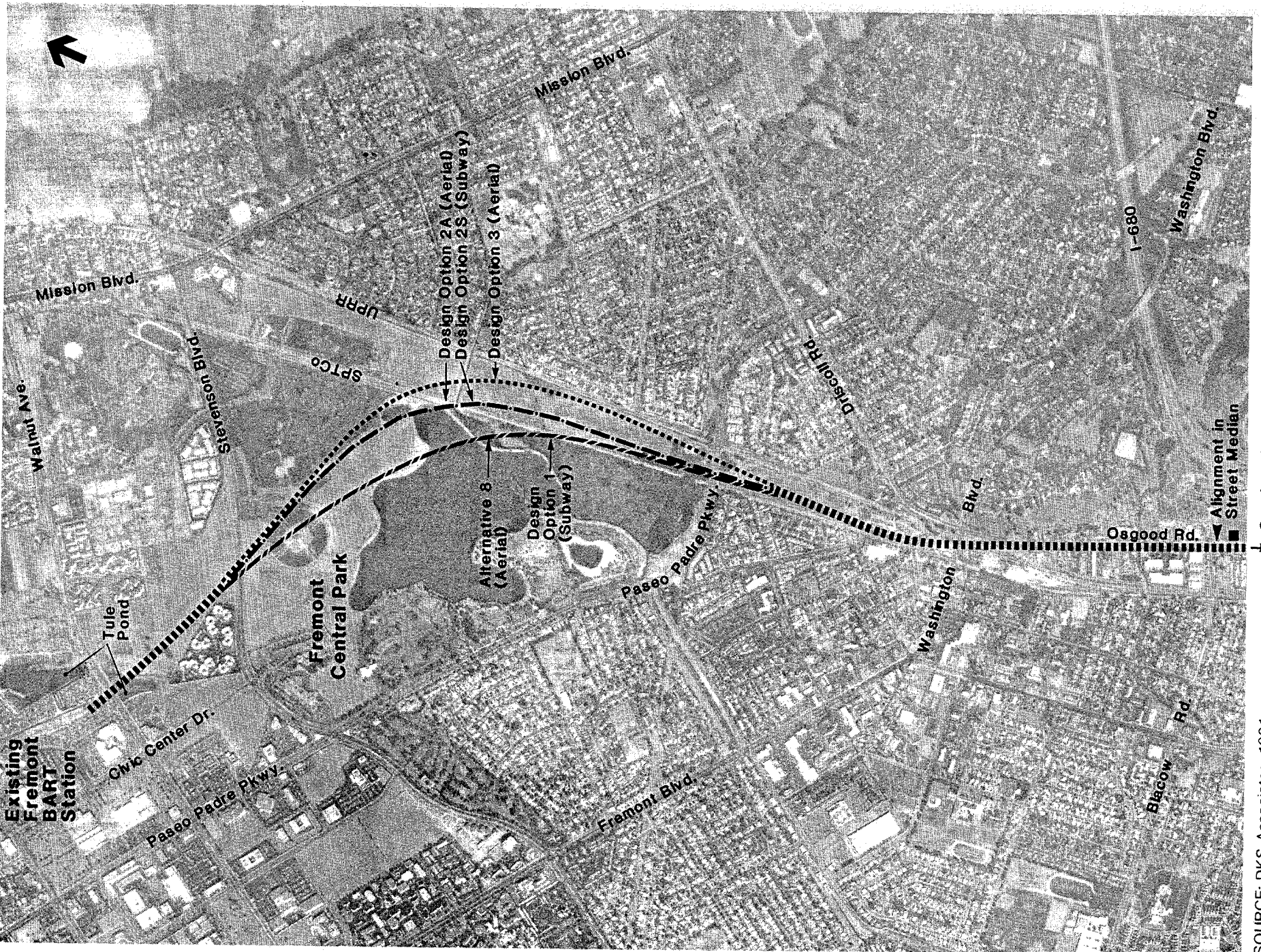
PANEL 2

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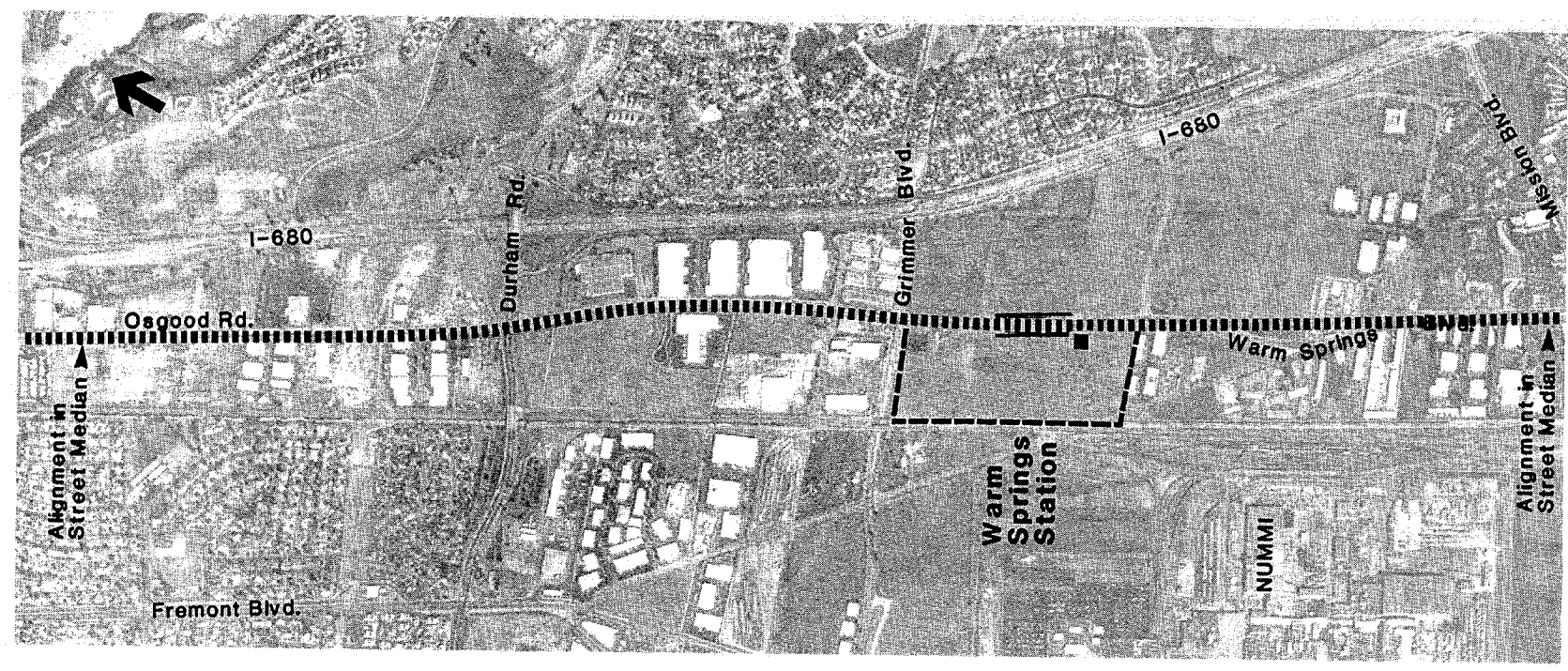
PANEL 3

Figure 2-13
ALTERNATIVE 7 ALIGNMENT



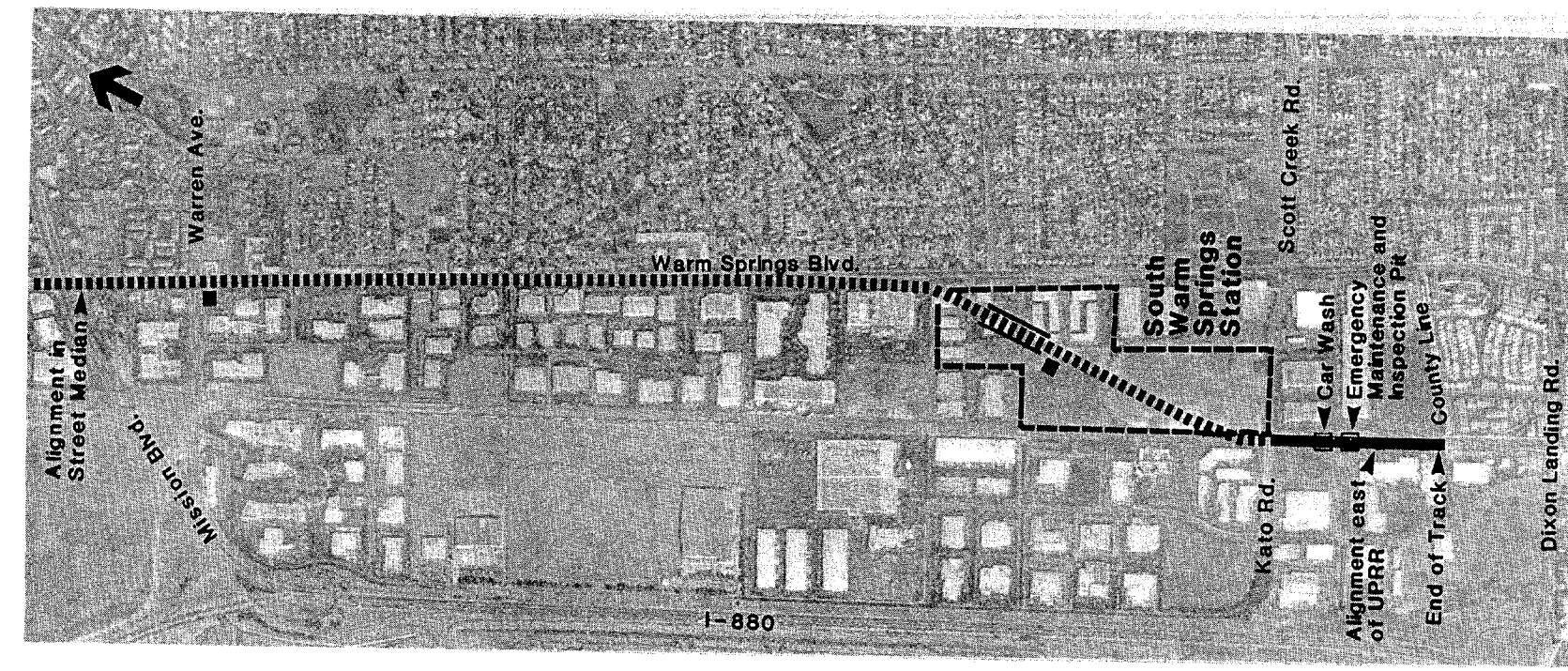
PANEL 1

Continued on Panel 2



PANEL 2

Continued on Panel 3



PANEL 3

Figure 2-14
ALTERNATIVE 8 ALIGNMENT

2. Project Description

Leaving the Warm Springs Station, the alignment would continue on an aerial structure (in the center of Warm Springs Boulevard) over Mission Boulevard and Warren Avenue and would turn to the west just north of Whitney Place and terminate at an elevated station south of Whitney Place, between Warm Springs Boulevard and the UPRR tracks. From the South Warm Springs Station, tailtracks would be extended for about 3,000 feet, curving toward the UPRR tracks and then running parallel to the UPRR tracks crossing over a Kato Road underpass. The tailtrack area will contain a rail car wash facility and a small emergency maintenance and inspection pit. With Alternative 8, there would be no subway structures or embankments. Except for the tailtrack (0.6 miles), all of this alternative would be built on aerial structures. (The Central Park design options and the vertical alignment design option at Paseo Padre Parkway apply to this alternative.)

The proposed Warm Springs and South Warm Springs Station designs are different from those in the Proposed Project, since the alignment here would be along Warm Springs Boulevard. The Warm Springs Station site boundary is relatively the same as in the Proposed Project, except that the three-acre parcel at the southwest corner of the intersection of Warm Springs and Grimmer Boulevards is included in the site (Figure 2-15). The alignment near the Warm Springs Station would move west, out of the median of Osgood Road/Warm Springs Boulevard and onto the east side of the station site. The platform would be on the east side of the site. The alignment south of the platform would move towards the east into the median of Warm Springs Boulevard. The kiss-and-ride and bus loading and unloading areas would be located just west of the platform. A total of about 2,100 parking spaces would be provided.

The South Warm Springs Station site is similar to the Proposed Project but the parcel near the intersection of Scott Creek/Kato Road and Warm Springs Boulevard, which is included in the site for the Proposed Project, would not be part of the station site while additional parcels northeast of the site (not a part of the Proposed Project) are included (Figure 2-16). The alignment near the South Warm Springs Station would move west, out of the median of Warm Springs Boulevard and cross the station site towards the railroads. The parcel in the northeast corner of the site would include the bus loading area and the platform. The kiss-and-ride areas would be on the west side of the platform area. A total of about 2,400 parking spaces would be provided.

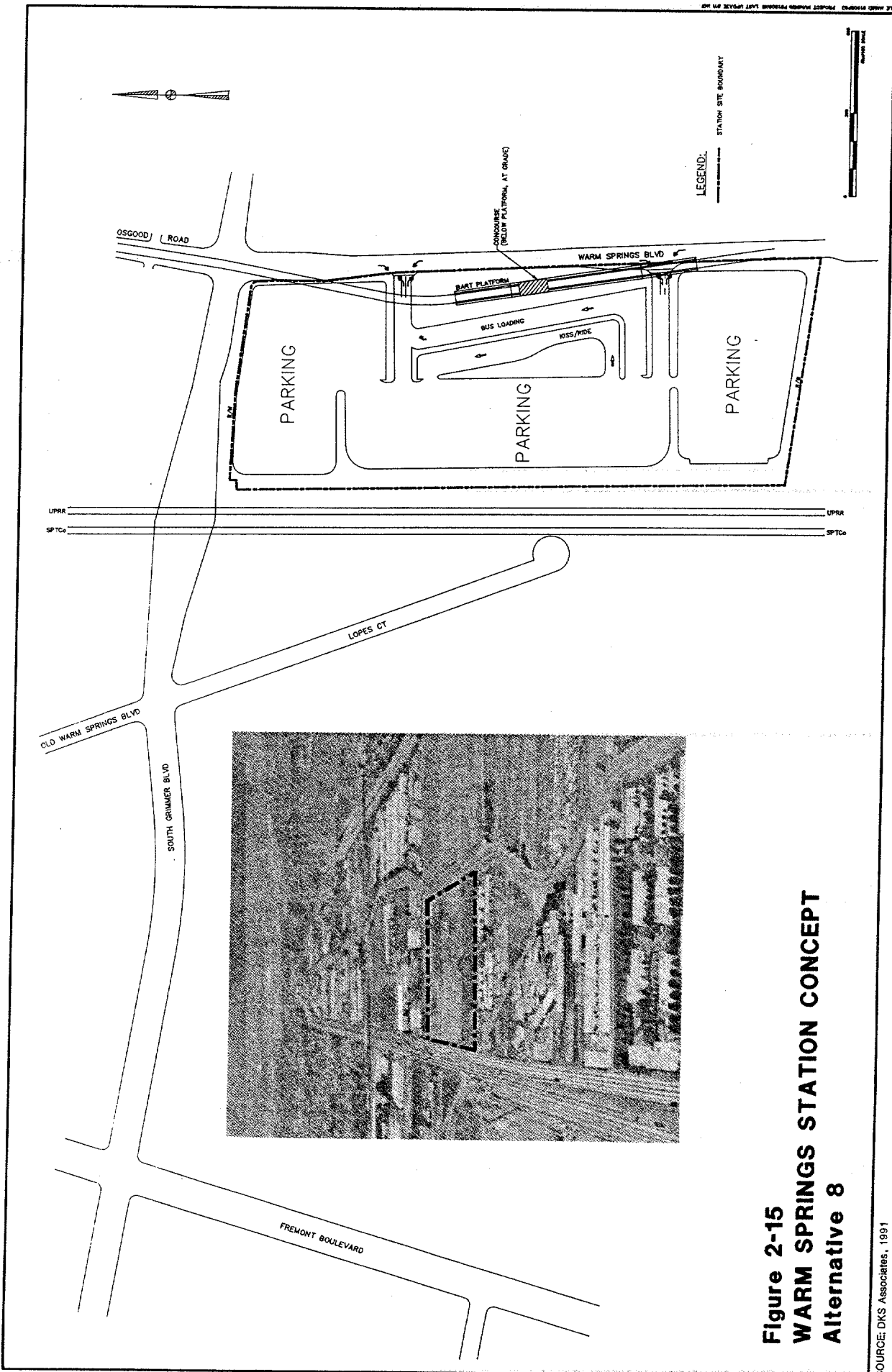


Figure 2-15
WARM SPRINGS STATION CONCEPT
Alternative 8

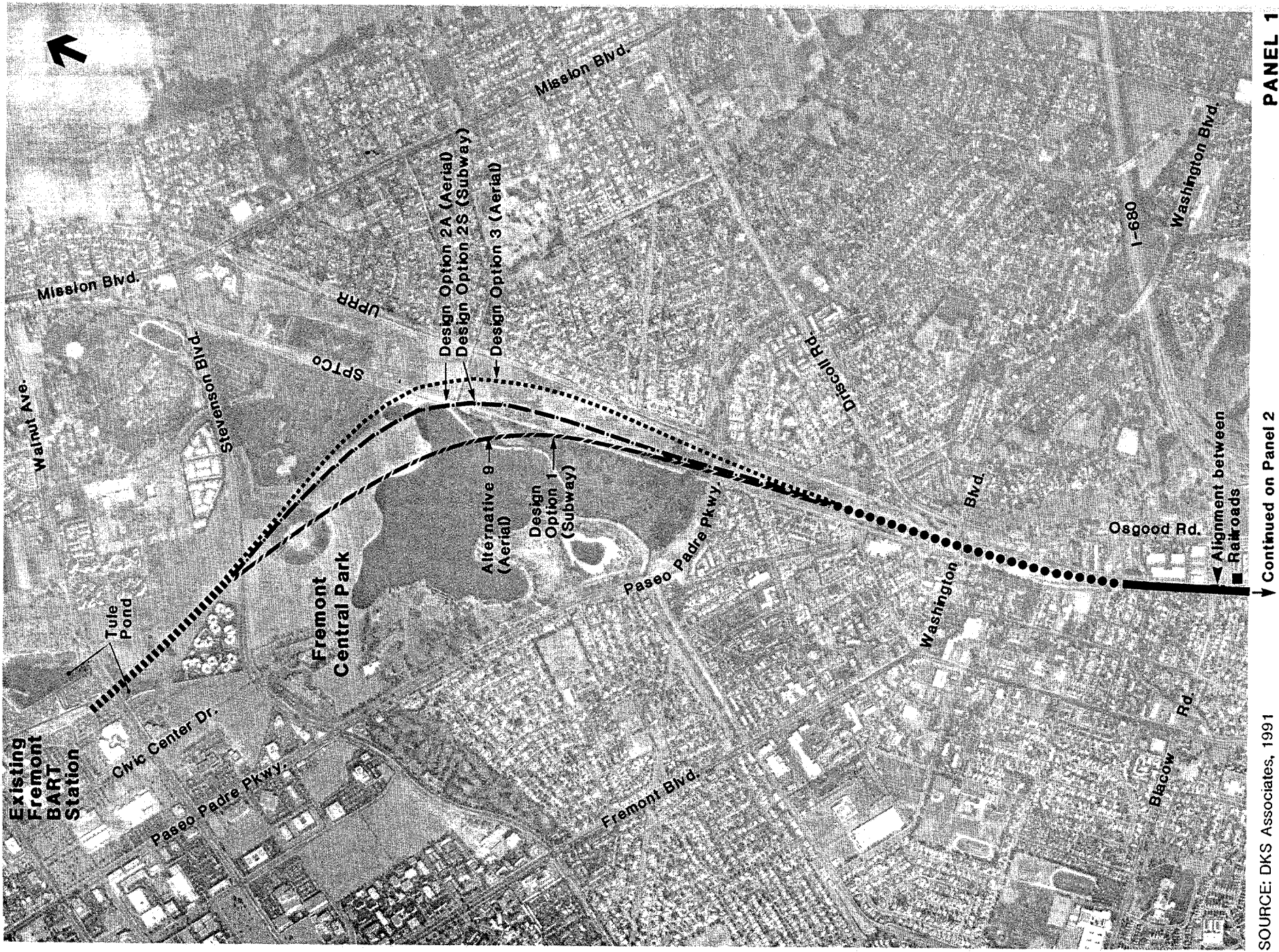
SOURCE: DKS Associates, 1991

2.4.9 ALTERNATIVE 9: A 5.4-Mile BART Extension with One Station (Warm Springs)

Alternative 9 is a 5.4-mile, one-station extension along the same route as the Proposed Project. The single proposed station would be located in the Warm Springs District (Figure 2-17). From the Warm Springs Station, tailtracks would be extended at grade for about 3,000 feet. The tailtrack area will contain a rail car wash facility and a small emergency maintenance and inspection pit. A vertical alignment design option occurs at Washington Boulevard. In Alternative 9, the BART alignment would be below grade, passing under Washington Boulevard (just as in the Proposed Project). However, since there would be no Irvington Station in Alternative 9, a design option is introduced with an aerial crossing over Washington Boulevard. (The Central Park design options and the vertical alignment design option at Paseo Padre Parkway also apply to this alternative.) Since the Warm Springs Station is the terminal station for this alternative, a larger station site area is needed for this site than in the Proposed Project. The three-acre parcel at the southwest corner of Grimmer and Warm Springs Boulevards will be included in the alternative's station site. Parking supply at Warm Springs would be approximately 2,300.

2.4.10 ALTERNATIVE 10: A 7.8-Mile BART Extension with One Station (South Warm Springs)

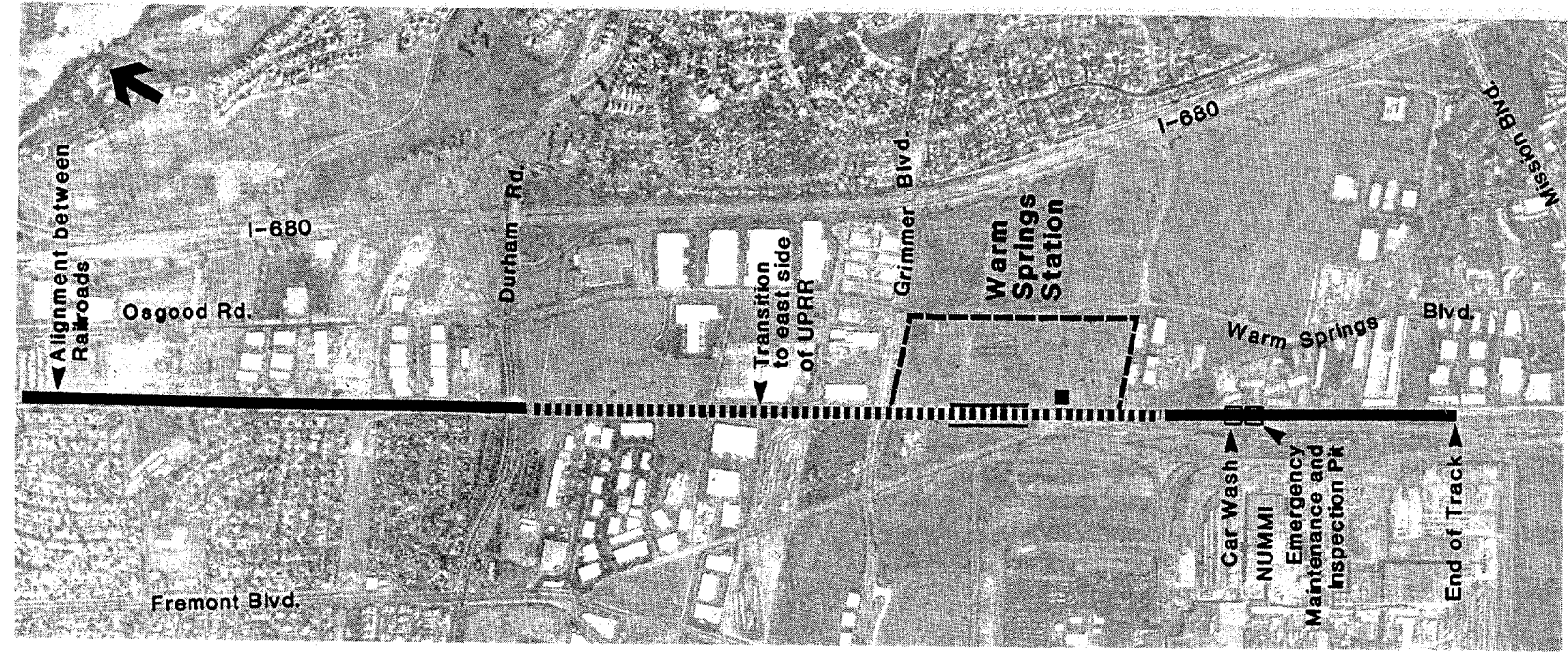
Alternative 10 is a 7.8-mile, one-station extension along the same route as the Proposed Project, with a single proposed station to be located in the South Warm Springs area of Fremont, near Scott Creek Road/Kato Road (Figure 2-18). The vertical alignment with this alternative would be essentially the same as Alternative 6 and have the same tailtrack and ancillary facilities. Like Alternative 6, a vertical design option is introduced at Washington Boulevard. Since there would be no Irvington Station, the design option provides for an aerial crossing over Washington Boulevard. (The Central Park design options also apply to this alternative, as do the vertical alignment design options at Paseo Padre Parkway, and Warren Avenue, and the UPRR relocation option occurring south of Warren Avenue.)



PANEL 1

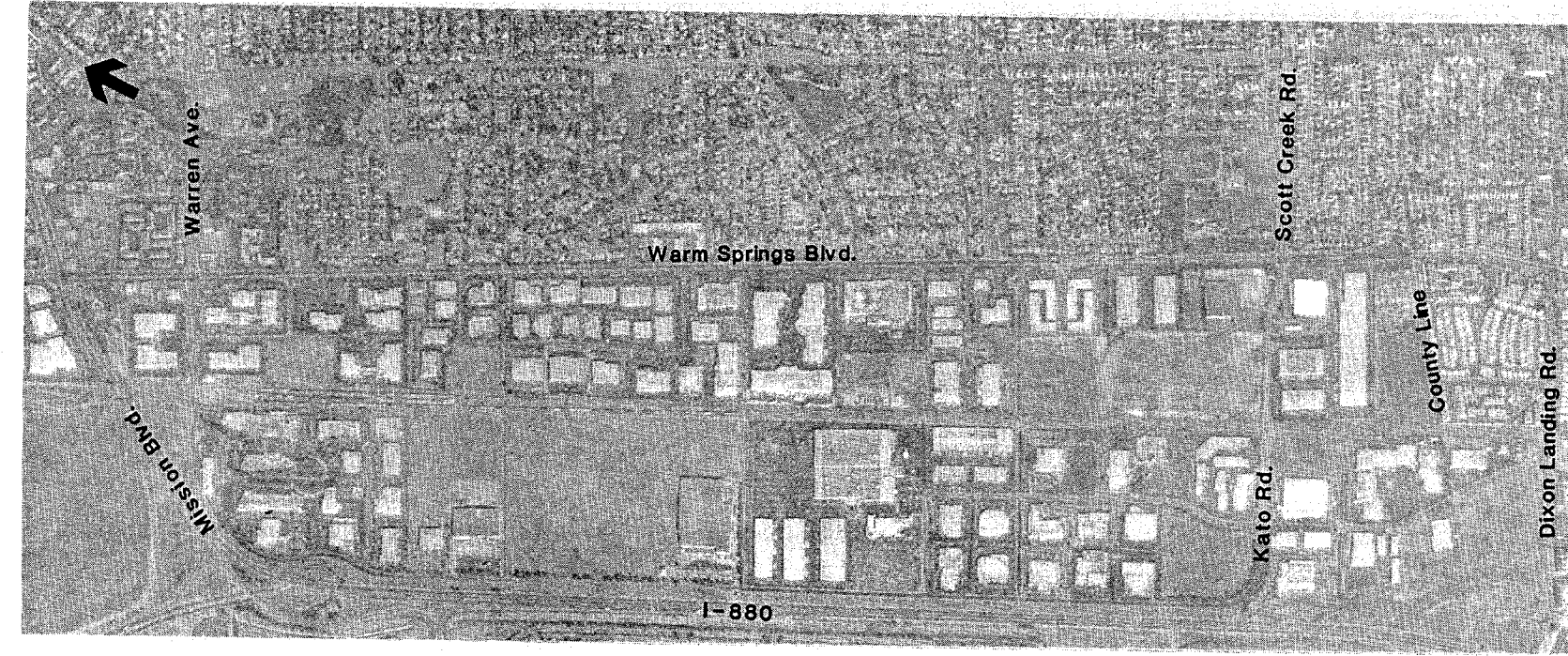
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SOURCE: DKS Associates, 1991
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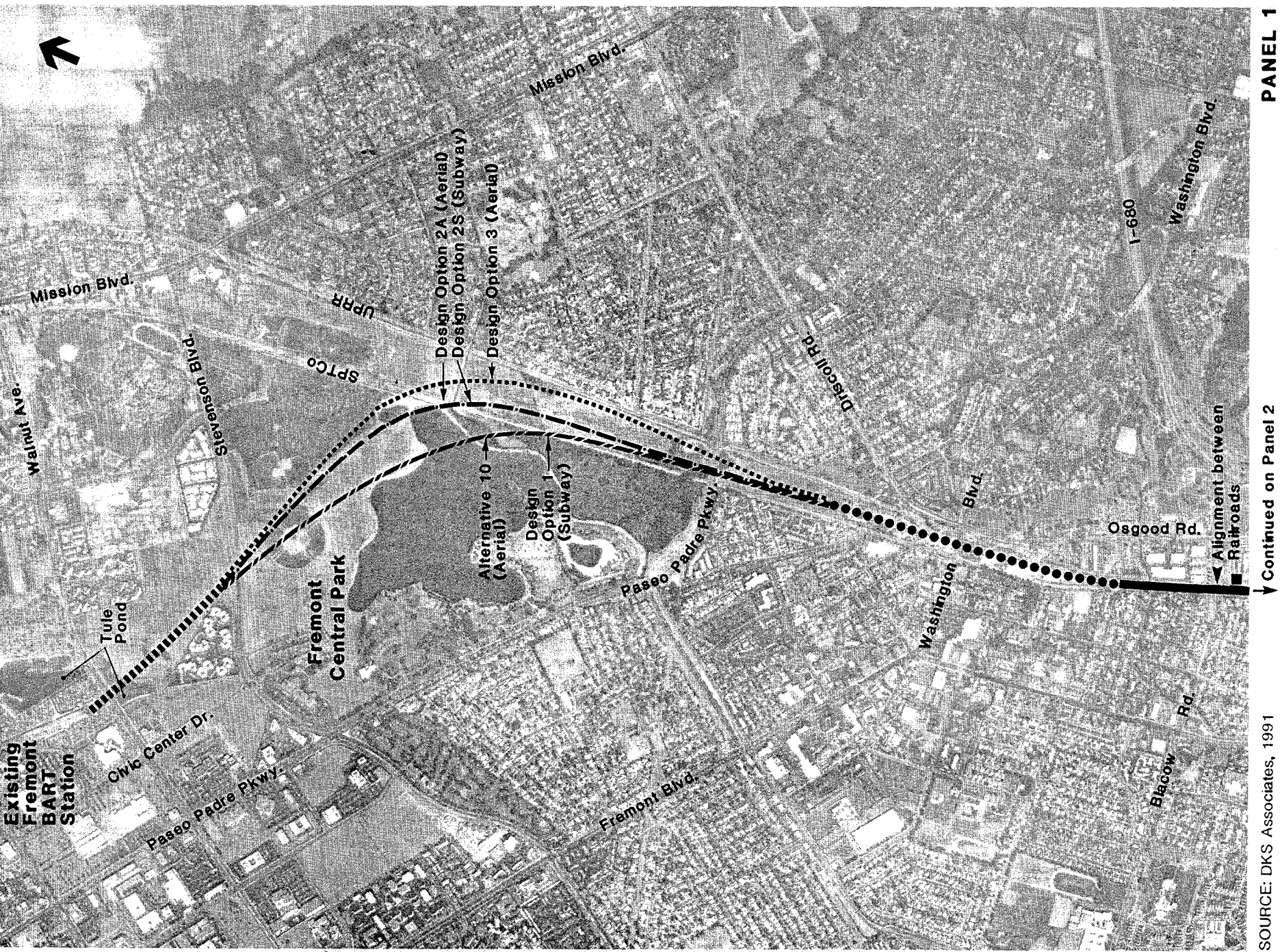
PANEL 2

- ▬ Aerial
- ▬ At-grade
- Below-grade
- ▬ Station Boundary
- ▬ Station Platform
- Traction Power Substation

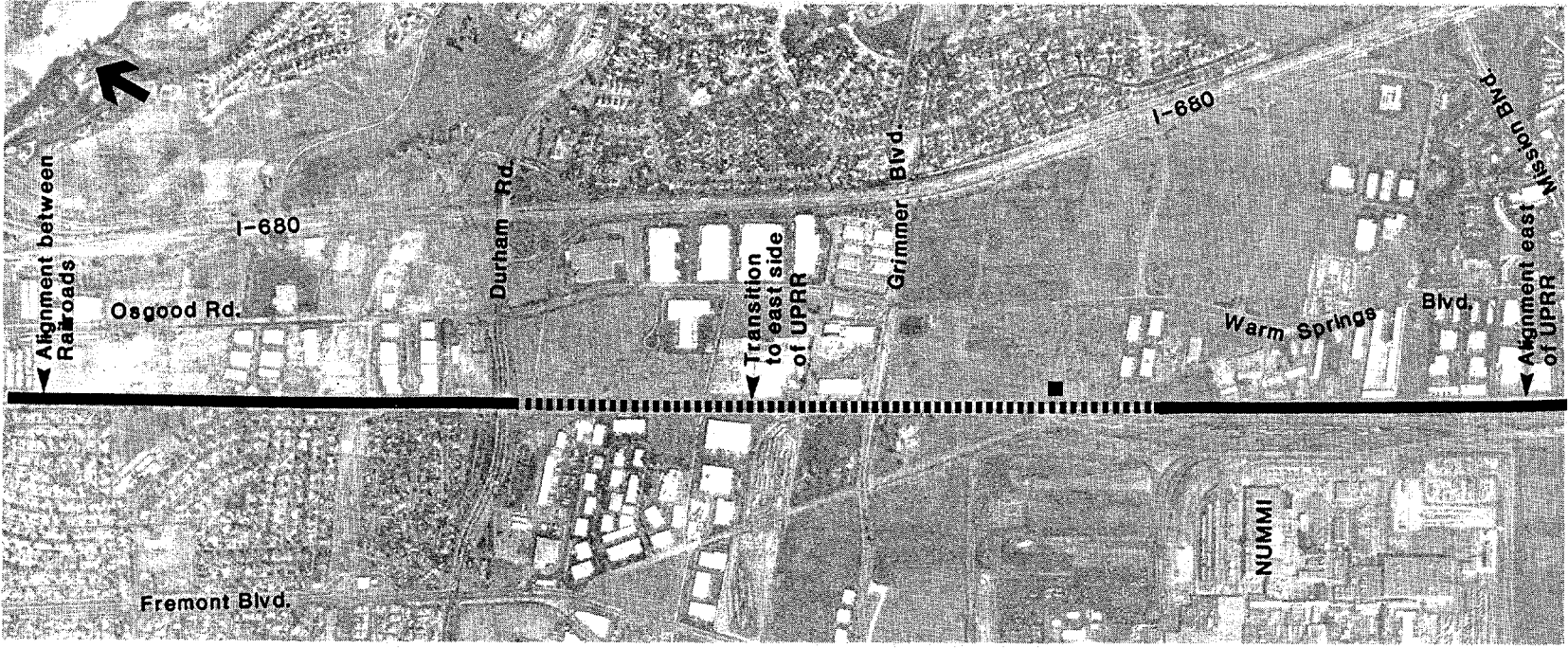


PANEL 3

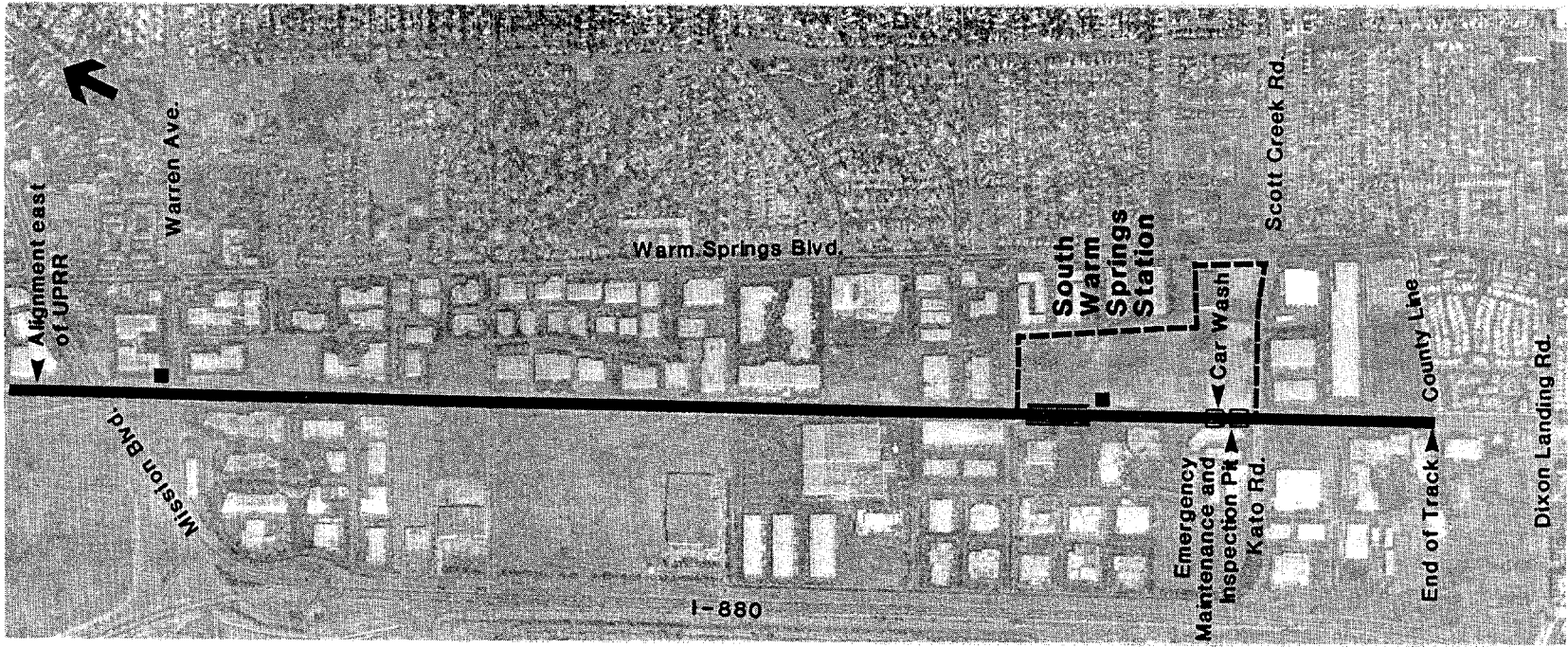
Figure 2-17
ALTERNATIVE 9 ALIGNMENT



PANEL 1
 SOURCE: DKS Associates, 1991
 NOT TO SCALE



PANEL 2
 Continued on Panel 3



PANEL 3

Figure 2-18
ALTERNATIVE 10 ALIGNMENT

2. Project Description

This alternative has a larger parking area at the South Warm Springs Station than the parking area in the Proposed Project since it is the only station on the extension. The station site area is the same as in Figure 2-5 but a parking deck would be located on the southwest parcel to accommodate approximately 1,000 more parking spaces. The total parking supply would be approximately 3,400 spaces.

2.4.11 ALTERNATIVE 11: A 7.8-Mile BART Extension with Two Stations (No Warm Springs Station)

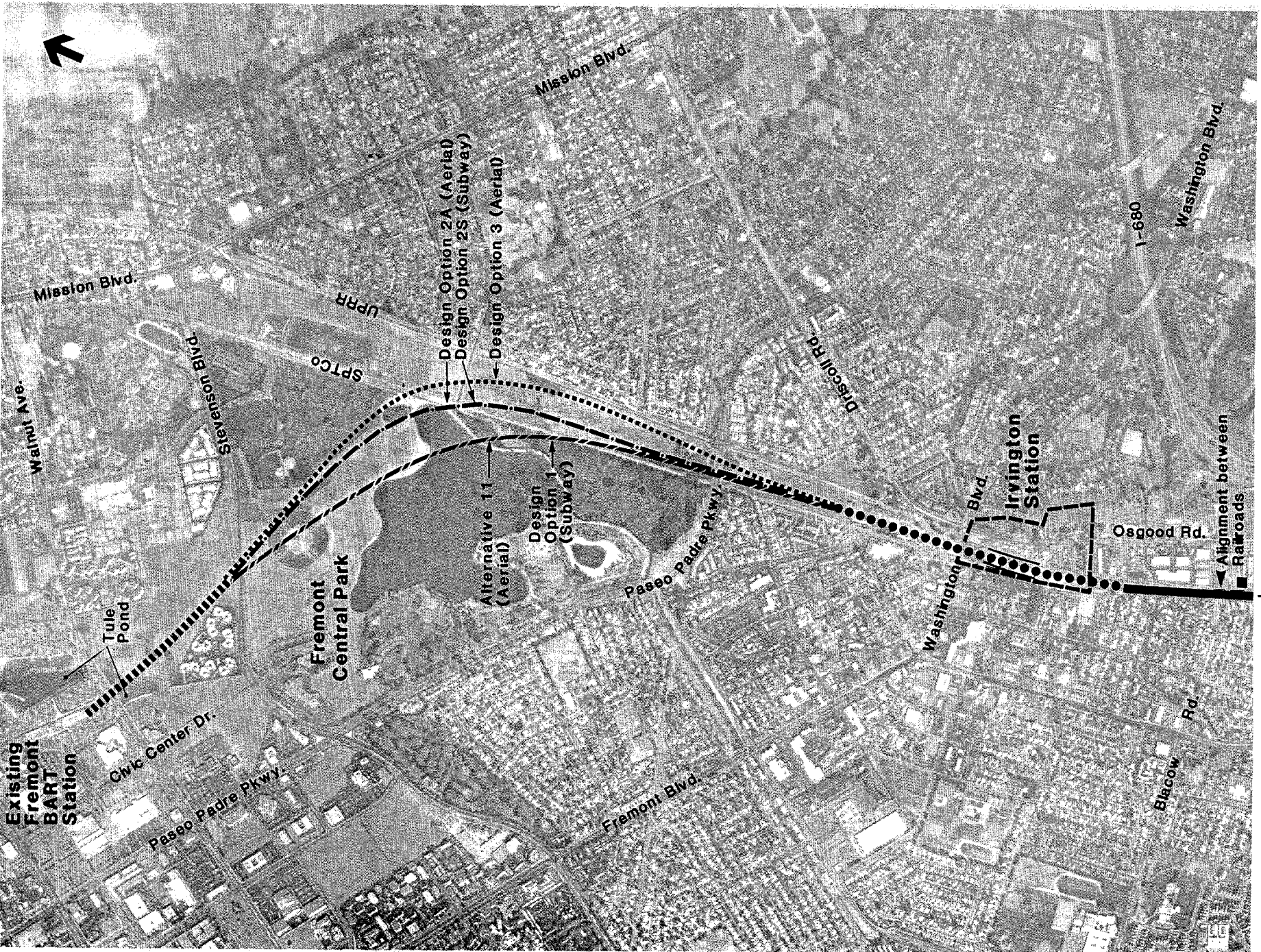
Alternative 11 consists of a 7.8-mile, two-station extension with no Warm Springs Station. From the existing Fremont BART Station south to the County line, the Alternative 11 alignment would be the same as the Proposed Project, except for the deletion of the Warm Springs Station (Figure 2-19).

The aerial crossing of the UPRR tracks and Grimmer Boulevard is the same as in the Proposed Project. Other station locations (Irvington and South Warm Springs) and alignment characteristics also remain the same as the Proposed Project including the tailtrack and ancillary facilities. The Central Park design options also apply to this alternative, as do the vertical alignment design options at Paseo Padre Parkway, Warren Avenue, and the UPRR relocation option occurring south of Warren Avenue.

2.5 OPERATING PLAN

2.5.1 OPERATING FACILITIES

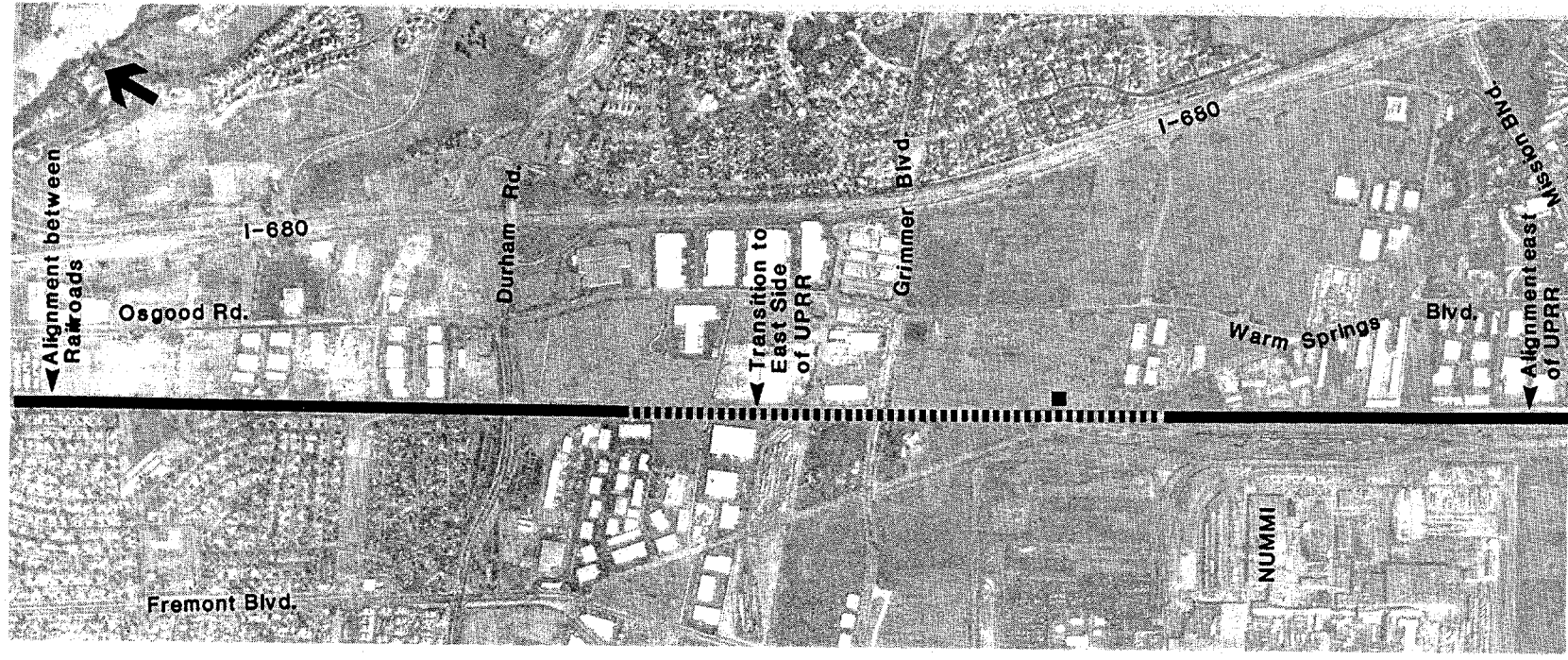
The Proposed Project would use operational equipment similar to and compatible with the existing BART system. All aspects of train operation, control and communication would be integrated with the existing BART system. The trains would be controlled centrally through the main control room at BART headquarters in Oakland. On-board train control would also be provided. Traction power substations will generally be located at each station and approximately every 1.5 miles between stations. These substations convert the incoming 34.5-kv AC distribution voltage to 1,000 volts DC required for train operation.



PANEL 1

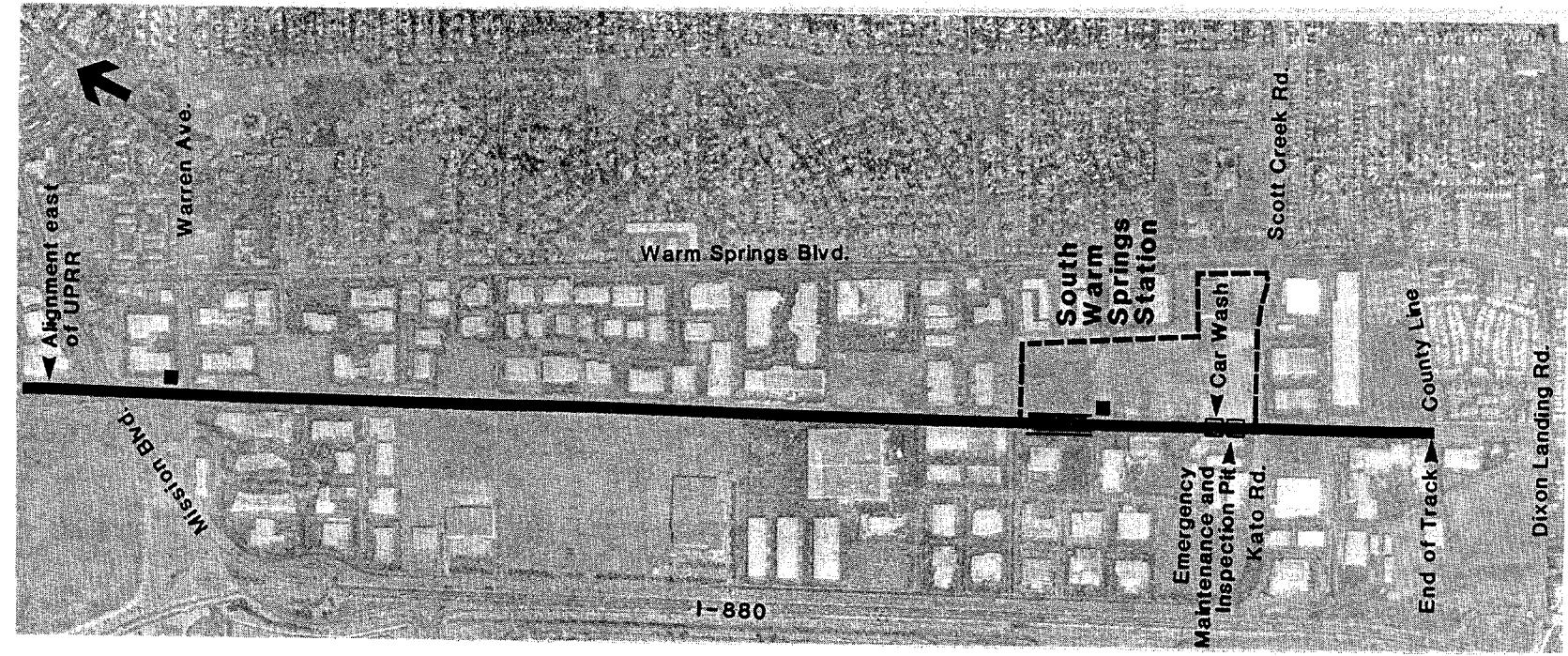
Continued on Panel 2

SOURCE: DKS Associates, 1991
NOT TO SCALE



PANEL 2

Continued on Panel 3



PANEL 3

Figure 2-19
ALTERNATIVE 11 ALIGNMENT

2.5.2 OPERATIONS PLAN

The proposed operations of the Warm Springs Extension are the result of preliminary planning and will be revised as information regarding the Proposed Project is updated. Key facets of system operation, discussed below, include service levels and travel times.

Service Levels. BART defines Level of Service as the time interval between trains, called "headway", usually expressed in minutes. Trains on the Fremont-Daly City and Fremont-Richmond lines currently operate every 15 minutes during the day on weekdays and every 20 minutes during the day on Saturday. The Fremont-Richmond line operates every 20 minutes during evenings and Sunday; the Fremont-Daly City line operates weekdays between 5:00 A.M. and 7:00 P.M. and on Saturdays between 6:00 A.M. and 6:00 P.M. Completion of the Capacity Expansion Program currently being implemented by BART, e.g., new C-car procurement, Daly City Turnback/Yard, electrical capacity expansion, automatic train control and wayside train control/system performance modifications and brake rate algorithm modifications, would provide 2.25-minute spacings on transbay lines.

A peak period transbay service plan of a train from Concord, then Fremont, then Concord, then Richmond, would correspond to 9-minute peak-hour headways on the Fremont-Daly City line. For this analysis, minimum 9-minute headways are assumed for the year 2010 peak period operation on both Fremont lines. Fifteen-minute headways are assumed for mid-day operations for both routes and 20 minute headways are assumed during late-evening operations for the Fremont-Richmond line. Actual operating headways would depend on patronage needs at any given time. This operations plan was used in the analysis for the Proposed Project and the build alternatives.

Travel Times. BART will develop a full computerized travel-time performance evaluation following further engineering. It is currently estimated that one-way travel from the existing Fremont terminal station to the proposed South Warm Springs terminal station would take about 12½ minutes assuming maximum cruise speeds ranging from 80 miles per hour on level tracks to slower speeds on curves or grades. Passenger loading and unloading would take approximately 20 seconds at each station. It is currently estimated that one-way travel from the South Warm Springs station to the Montgomery Street Station in downtown San Francisco would take 62 minutes.

2.5.3 BUS OPERATIONS

The primary transit routes to the proposed extension will be via AC Transit, the primary operator of public transit bus service in Alameda County. Fifteen bus routes currently serve the project area, operating on 30-minute headways in the peak hours and 30-60 minute headways during non-peak periods, carrying in excess of 1,000 daily passengers. Fourteen routes serve the Fremont BART station and central Fremont. Three routes (Routes 47, 22 and 28) serve future station sites. Route 47 connects Mission San Jose and central Fremont via Washington Boulevard and the Irvington Station. Route 22 connects Central Fremont (and the Fremont BART station), the Irvington and Warm Springs Districts and Milpitas via Grimmer Boulevard, and the Warm Springs Station and the South Warm Springs Station via Warm Springs Boulevard. Route 28 connects central Fremont (and the Fremont BART station), Mission San Jose, the Warm Springs Districts and Milpitas via Mission Boulevard and Warm Springs Boulevard and the South Warm Springs Station.

AC Transit plans to restructure its services to southern Alameda County as part of its Comprehensive Service Plan, anticipated for implementation in 1994. Bus service will be increased to a total of 19 routes, operating on 15- and 30-minute headways in the service area. A transit center is proposed at the site of the Irvington Station with seven routes using the center. One route would serve the Warm Springs station and two routes would serve the South Warm Springs station. This proposal would be further refined to serve the extension station sites as they become operational.

The Santa Clara County Transit District (SCCTD) currently operates three commuter express bus routes (Routes 120, 140, and 180) connecting to BART in Fremont carrying in excess of 1,400 daily passengers. Routes 120 and 140 connect the Fremont BART station to the Lockheed/Moffett Field area in Sunnyvale and the San Antonio Mall in Mountain View, respectively. Both routes make extensive use of I-880 and SR 237 to provide relatively direct service to major employment sites. Routes 120 and 140 have headways of 15 and 10 minutes, respectively, during commute hours. Route 180 provides more complete service coverage between the Fremont BART Station and the CalTrain Depot in San Jose. Route 180 has a scheduled headway of 10 minutes during commute hours and 15 minutes during the day. It has been assumed that the three SCCTD bus routes now serving the Fremont Station would relocate to the end station for each of the proposed project alternatives. Three local SCCTD lines (Routes 20, 71 and 33) would provide 15-minute peak and off-peak frequencies.

2. Project Description

In addition, as part of the Tasman Corridor LRT Project, two other express lines are planned to connect with the BART terminal station: Route 201 from the BART terminal station to San Jose Airport and Route 202 from the BART terminal station to Mission College, both with frequencies of 20 minutes during commute hours. Furthermore, for those alternatives where the terminal station is either Warm Springs or South Warm Springs, local SCCTD service would be extended to connect with BART.

2.6 RIDERSHIP

2.6.1 RIDERSHIP PROJECTION

The Metropolitan Transportation Commission (MTC) Regional Travel Model was utilized to develop Year 2010 patronage forecasts for the Warm Springs Extension alternatives. Person trip tables developed from Association of Bay Area Government (ABAG) land-use projections were uniform across all alternatives. Bus networks for AC Transit and SCCTD were re-routed to serve as feeders routes at each station. SCCTD routes were routed to the terminal station for each alternative. The results of a ridership survey at the existing Fremont BART Station were used to refine access mode projections and adjust auto access trips for long commute trips to BART.

Table 2-2 summarizes the projected total daily entries and exits at each station in the corridor for each alternative assuming no station capacity constraints. An estimated 21,900 total daily riders are projected for the Year 2010 Proposed Project (three stations) and the Fremont Station. Of these, approximately 7,200 daily person trips are expected to enter/exit at the Fremont Station, 3,000 person trips at the Irvington Station, 4,000 person trips at the Warm Springs Station, and 7,600 person trips at the terminal station, South Warm Springs.

Ridership at the Fremont Station would be affected in two major ways. Many existing trips within the extension corridor would be shifted to the new stations and new trips associated with travel from existing stations to the new stations would be added. For the Proposed Project this represents a 37% net reduction in the approximate 10,000 existing patrons at the Fremont Station.

Table 2-3 identifies projected access/egress mode percentages at each station for each alternative. Projected access/egress mode distribution (for walk, auto and transit) were derived from an analysis of the Regional Travel Model outputs and the results of a recent passenger

**Table 2-2
Weekday Entries and Exits
BART to Warm Springs EIR (Year 2010)**

Station	Proposed Project	Alt 1	Alt 2	Alt 3	Alt 4-5	Alt 6-8	Alt 9	Alt 10	Alt 11
<i>Fremont</i>									
Walk	1,182	789	915	791	974	1,088	883	1,050	1,143
Auto	4,810	7,212	8,869	8,524	4,899	6,120	6,231	4,948	4,810
Local Bus	1,247	1,371	2,058	1,420	1,069	1,515	1,137	1,466	1,316
<u>Express Bus</u>	<u>0</u>	<u>1,850</u>	<u>410</u>	<u>738</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
TOTAL	7,239	11,222	12,252	11,473	6,942	8,723	8,252	7,464	7,269
<i>Irvington</i>									
Walk	578				396				540
Auto	1,939				1,902				2,830
Local Bus	496				427				446
<u>Express Bus</u>	<u>0</u>				<u>0</u>				<u>0</u>
TOTAL	3,013				2,725				3,816
<i>Warm Springs</i>									
Walk	452				342	390	355		
Auto	3,514				4,479	3,602	4,460		
Local Bus	42				723	322	1,100		
<u>Express Bus</u>	<u>0</u>				<u>1,803</u>	<u>0</u>	<u>1,890</u>		
TOTAL	4,008				7,347	4,314	7,805		
<i>South Warm Springs</i>									
Walk	389					371		303	341
Auto	2,794					2,923		7,134	5,217
Local Bus	1,186					1,139		1,287	1,376
<u>Express Bus</u>	<u>3,255</u>					<u>3,235</u>		<u>3,038</u>	<u>3,083</u>
TOTAL	7,624					7,668		11,762	9,997
TOTALS (New Stations and Fremont Station)									
Walk	2,601	789	915	791	1,712	1,849	1,238	1,353	2,024
Auto	13,057	7,212	8,869	8,524	11,280	12,645	10,691	12,082	12,857
Local Bus	2,971	1,371	2,058	1,420	2,219	2,976	2,237	2,753	3,138
<u>Express Bus</u>	<u>3,255</u>	<u>1,850</u>	<u>410</u>	<u>738</u>	<u>1,803</u>	<u>3,235</u>	<u>1,890</u>	<u>3,038</u>	<u>3,063</u>
TOTAL	21,884	11,222	12,252	11,473	17,014	20,705	16,056	19,226	21,082

Source: DKS Associates

**Table 2-3
Access/Egress Mode Percentages
BART to Warm Springs EIR**

Station	Proposed									
	Project	Alt 1	Alt 2	Alt 3	Alt 4-5	Alt 6-8	Alt 9	Alt 10	Alt 11	
<i>Fremont</i>										
Walk	16%	7%	7%	7%	14%	12%	11%	14%	16%	
Auto	67	65	73	75	71	71	75	66	66	
Local Bus	17	12	17	12	15	17	14	20	18	
<u>Express Bus</u>	<u>0</u>	<u>16</u>	<u>3</u>	<u>6</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	
<i>Irvington</i>										
Walk	19%				15%				14%	
Auto	65				69				74	
Local Bus	16				16				12	
<u>Express Bus</u>	<u>0</u>				<u>0</u>				<u>0</u>	
TOTAL	100%				100%				100%	
<i>Warm Springs</i>										
Walk	11%				5%	9%	5%			
Auto	88				60	84	57			
Local Bus	1				10	7	14			
<u>Express Bus</u>	<u>0</u>				<u>25</u>	<u>0</u>	<u>24</u>			
TOTAL	100%				100%	100%	100%			
<i>South Warm Springs</i>										
Walk	5%					5%		3%	3%	
Auto	37					38		60	52	
Local Bus	16					15		11	14	
<u>Express Bus</u>	<u>43</u>					<u>42</u>		<u>26</u>	<u>31</u>	
TOTAL	100%					100%		100%	100%	
TOTALS (New Stations and Fremont Station)										
Walk	12%	7%	7%	7%	10%	9%	8%	7%	10%	
Auto	59	65	73	75	66	61	66	63	60	
Local Bus	14	12	17	12	13	14	14	14	15	
<u>Express Bus</u>	<u>15</u>	<u>16</u>	<u>3</u>	<u>6</u>	<u>11</u>	<u>16</u>	<u>12</u>	<u>16</u>	<u>15</u>	
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Source: DKS Associates

2. Project Description

interviews and vehicle license plate surveys at the Fremont Station. (The model does not calculate bicycle, carpool and kiss-and-ride access to the station.)

The patronage forecast results suggest that alternatives ending at South Warm Springs Station increase overall corridor ridership by 3,000 to 4,000 riders a day over alternatives that end at a Warm Springs Station.

Projected parking needs at each station were also developed from model outputs and survey results by modifying daily drive to transit person trips auto occupancy rate (i.e., average number of persons per car, 1.05) and the percent of kiss-and-ride trips (18 percent) to estimate the expected parking demand at each station. Table 2-4 identifies the projected parking demand at each station for the Year 2010.

Table 2-4
Weekday BART Parking Demand at BART Stations
BART to Warm Springs EIR (Year 2010)

Station	Proposed Project	Alt 1	Alt 2	Alt 3	Alt 4-5	Alt 6-8	Alt 9	Alt 10	Alt 11
<i>Fremont</i>	1,878	2,816	3,463	3,328	1,913	2,390	2,433	1,932	1,878
<i>Irvington</i>	757				743				1,105
<i>Warm Springs</i>	1,372				1,749	1,406	1,742		
<i>South Warm Springs</i>	1,091					1,117		2,786	2,037
Total New Stations	3,220				2,492	2,523	1,742	2,786	3,142
TOTAL INCLUDING FREMONT STATION	5,098	2,816	3,463	3,328	4,405	4,913	4,175	4,718	5,020

Source: DKS Associates, 1991

2.7 CONSTRUCTION ACTIVITIES/METHODS

The types of activities and equipment that are expected to be required for construction of the proposed BART Warm Springs Extension are described below. Although construction activities are relatively short-term and temporary in nature, the construction of a major public works project such as the proposed BART extension would still involve a significant period of time. It is estimated that as much as four years could elapse between the initiation of construction work and commencement of service along the new extension. At this time, it is anticipated that an extension would open for service over its entire length and not be phased in (i.e., service to all stations would start at the same time). The types of construction activities and the duration of work would vary depending upon length of the extension, the number of stations, and the design options selected.

Because the project involves a long and very narrow construction corridor, the intensity of construction activity at any one location would be variable and sporadic. While there would be months of almost continuous activity at the station sites, and subway sections, if selected, construction work would progress quickly along the aerial and at-grade portions of the alignment. Major portions of the aerial structures and trackbeds would be completed far in advance of track-laying, electrification and completion of other systems.

BART anticipates that construction of the proposed extension would involve as many as nine separate construction contracts. Up to five contracts would be let for the civil and structural construction within specified segments of the corridor. Work under these contracts would be performed concurrently, and each contractor would have approximately two years to complete work. Each of the station parking lot areas would probably be constructed under a separate construction contract. If Alternative 4 and/or the UPRR Relocation design option were selected, another separate contract might be let for the relocation of the SPTCo and/or UPRR tracks. The specialized work of completing the placement of track ballast and installation of ties, fasteners and trackwork along the entire corridor would also be completed under a single separate contract. Finally, the provision of electrification, communications, automatic train control, automatic fare collection, installation of elevators and escalators and other related work would be completed under other systemwide contracts.

2. Project Description

2.7.1 CIVIL AND STRUCTURAL CONSTRUCTION - FREMONT BART STATION TO PASEO PADRE PARKWAY

The Proposed Project and any of the alignment design options or build alternatives would require the excavation of poor load-bearing soils in the Tule Pond area south of Walnut Avenue. In addition, excavation would be necessary for the replacement of the southern portion of Tule Pond west of the alignment. Fill for the alignment would be replaced and compacted and a detour for Walnut Avenue would be constructed. The concrete box structure for the Walnut Avenue crossing would be built using concrete placed in formwork from concrete mix trucks. South of the structure, construction of the embankment would begin continuing to a concrete abutment south of the fault area where an aerial structure would commence. Although the source of fill for the embankment is not known, it is likely that a portion of it would have to be trucked in via I-680 or I-880 and connecting city streets, except in the case of a subway design option.

Although the construction could progress from the north or south or both depending on the starting point(s), the sequence of construction for the aerial structure would be the same; *i.e.*, piles would be driven for the footings, concrete pile caps, the hexagonal columns, and pier caps would be cast in place and then the girders placed.

For all methods of aerial alignment construction, a construction roadway is expected along the alignment. The Proposed Project and all of the build alternatives (but not Central Park Design Options 2A, 2S and 3) would necessitate temporary fill across Lake Elizabeth.

Central Park Design Option 1 or 2S (Subway). With Central Park Design Option 1 or 2S (subway), the construction from the Fremont BART Station to the embankment at Walnut Avenue is the same as for the aerial design options. South of this embankment, a U-wall structure would transition into an underground box structure at a portal just north of Stevenson Boulevard. The sides of the excavation for the U-wall and box structures could either be supported by temporary support walls or simply sloped back. Excavated material from the subway could be used to build the embankment. Construction through Central Park would be cut and cover and would consist of placing temporary support walls, excavating, concreting, backfill and removal of the temporary support wall. Construction of the section under Stevenson Boulevard would be undertaken first, with a traffic detour along the south side of the work site. Any excess excavated material would be transported through local streets to either I-680 or I-880.

2. Project Description

For the subway alignment of Design Option 1 at Lake Elizabeth, an earth coffer dam would be placed just west of the alignment, and water in the isolated arm of the lake would be pumped into the lake. After completion of the subway structure, the impervious lake bed would be restored, the dam would be removed and water would be returned to the arm of Lake Elizabeth. Necessary measures would be taken to protect the impervious lake bed.

The civil and structural construction contractor for this segment would require a temporary storage yard and staging area nearby. This could be located within undeveloped areas in the vicinity of the alignment.

Construction equipment would include bulldozers, front-end loaders, backhoes, cranes with clamshell or drag buckets, graders, compactors, drilling equipment for concrete and cast-in-place piles, pile drivers, jackhammers, concrete saws, cranes for lifting girders, a crane for placing precast girders, dump trucks, water trucks for dust control, flatbed trucks, transit mix concrete trucks, concrete pumps, concrete vibrators, mobile generators, compressors, pumps, welding equipment, paving machines and general-purpose pick-up trucks.

2.7.2 CIVIL AND STRUCTURAL CONSTRUCTION - PASEO PADRE PARKWAY SOUTH TO IRVINGTON STATION

For the Proposed Project, and for project alternatives with an Irvington Station (Alternatives 4, 5 and 11), BART would consider issuing two civil and structural contracts for work in the section of the alignment running from Paseo Padre Parkway south to the Irvington Station. Work would probably begin with the relocation of the railroad tracks and utilities and continue with construction of a detour for Washington Boulevard. Construction of a temporary railroad track (called a shoo-fly) for the UPRR rail line would also be necessary at this location for Alternative 4. For the Proposed Project, Alternative 5 and Alternative 11, it may be possible to install temporary crosstracks and reroute the railroad traffic from one line to the other to facilitate the passage of trains through the construction zone.

A box structure would be built under Washington Boulevard using soldier piles or steel sheet piling driven prior to excavation. When excavation is complete, the box structure for the two railroads and BART lines would be cast, the backfill placed and compacted, and the street restored.

2. Project Description

Work between Paseo Padre Parkway and Washington Boulevard would progress in a linear fashion. The BART structure, including the emergency ventilation housing, would be built within a shored excavation and much of the permanent railway would be in a sloped cut. Construction of the section south of Washington Boulevard probably would start at the south end of the contract area and work north toward Washington Boulevard, especially if there were two contractors working in this segment. Temporary support walls or sloped sides would be used and most of the excavation would be completed before the concrete structures would be poured so that truck access directly into the excavation could be provided.

Structural elements of the Irvington Station would be made of reinforced concrete cast by conventional methods. The station parking lot could be used as a contractor's layout area and for equipment storage. Construction of the line and station would employ the same types of equipment as noted above, plus rail removal and rail laying machines for the rerouting of the existing railroad tracks.

Construction of an aerial structure through this segment would not involve construction of the subway structure or the station and would progress much more quickly. This work could be done under a single civil and structural construction contract. The sequence of construction would be the same as described above: piles would be driven for the footings, then concrete pile caps, the columns, and pier caps would be cast in place and the girders placed.

2.7.3 CIVIL AND STRUCTURAL CONSTRUCTION - IRVINGTON STATION TO WARM SPRINGS STATION

Work under the civil contract for this segment would probably begin simultaneously on the Blacow Road underpass (proposed by the City of Fremont and not included in Alternatives 6, 7, 8, 9 and 10), the underpass at Grimmer Boulevard, and the Warm Springs Station.

The Blacow Road underpass would likely be built in sections. The sequence of construction would probably be as follows: route the SPTCo rail tracks to the east, drive piles for abutment footings, place temporary support wall in the underpass, excavate, construct the west side of the underpass, reroute SPTCo tracks to their permanent location and route UPRR tracks to the west, and construct the east side of the underpass and reroute UPRR tracks to their permanent location and then complete the BART track. The roadway area could then be completed for traffic.

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The Warm Springs Station platform and trackway are expected to be part aerial and part on retained fill (except in Alternative 8, where it would be entirely aerial). Aerial girders would be required for the trackway over the station concourse and over Grimmer Boulevard. Pile footings would be used for the aerial structure, and spread footings would be used for the retaining walls. While the girders over the station concourse would probably be cast-in-place concrete, precast or steel girders may be installed over Grimmer Boulevard in order to minimize the disruption to traffic.

The remainder of the work in this segment under the Proposed Project and all of the alternatives, except Alternative 8, would consist of track bed preparation involving primarily of clearing and grubbing followed by the placement and compaction of fill materials. Under the alternatives that do not continue to South Warm Springs (Alternatives 4, 5 and 9), this work would extend south of the station to prepare for the installation of the required storage tracks, maintenance track, crossovers, turnback, rail car wash facility and emergency maintenance and inspection pit. For Alternative 8, this contract would provide for the construction of the footings, columns, pier caps and girders for the aerial structure down Osgood Boulevard to the Warm Springs Station site.

The parking lot area of the Warm Springs Station would be used as a contractor's storage and staging area. Work under this contract would employ essentially the same types of construction equipment as described above.

2.7.4 CIVIL AND STRUCTURAL CONSTRUCTION - WARM SPRINGS STATION TO THE COUNTY LINE

For the Proposed Project or Alternatives 6, 7, 8, 10 and 11, a separate civil and structural contract would be let for work in this segment. Work would probably begin with the South Warm Springs Station construction, the structural elements of which would be made of reinforced concrete cast by conventional methods. If required, work on the aerial structure over Warren Avenue could start at the same time as work on the station.

With the Proposed Project or Alternatives 6, 7, 10 or 11, the remainder of the work in this segment would consist of track bed preparation for the 2.3 mile distance between the Warm Springs and South Warm Springs Station plus the approximately 3,000-foot turnback and storage track, rail car wash facility and emergency maintenance and inspection pit. For Alternative 8, this contract would provide for the construction of the footings, columns, pier caps and girders

2. Project Description

for the aerial structure in the middle of Warm Springs Boulevard to the South Warm Springs Station site and then transitioning to grade level for the turnback and storage track and related facilities.

The parking lot area of the South Warm Springs Station would be used for the contractor's storage and staging area. While the work under this contract would require most of the construction equipment described above, the work on the at-grade alternatives sited between the two existing rail lines would involve less excavation, concrete work and backfilling than under the other contracts. Construction of the aerial line down Warm Springs Boulevard would require minimal excavation work but extensive pile drilling, concrete forming and placement.

2.7.5 PARKING LOT CONSTRUCTION

Upon completion of each station, the parking lots would be constructed. Work would consist of clearing and grading, installation of drains, lighting systems, landscaping areas and placement of asphalt pavement. The heaviest equipment required under these contracts would be the paving machines and the trucks delivering paving materials to the sites.

2.7.6 TRACKWORK CONSTRUCTION

All BART trackwork for the project would be constructed under one contract. For the at-grade portions of the alignment as well as the segments on embankments where ballasted track would be required, the construction work would involve the following sequential activities: final preparation of the trackbed, initial placement of ballast, positioning of the ties and rails and then final placement of the ballast and adjustment of the rails by a rail laying machine.

For the aerial and underground segments where rail is fixed directly to the structure, the rail fasteners are secured by grouting over the trackwork concrete. Typically the rail would be delivered on a rail car from BART's Hayward yard and the concrete would be trucked in with transit mix trucks. The installation of the electric third rail would also be included in this contract.

2.7.7 OTHER CONTRACTS

Specialized work needed to integrate the extension into the BART system and finish the stations would be handled through other systemwide contracts. Electrification contractors would install the electrical substations and other electrification equipment, while other contractors would install the communications equipment, automatic train control system equipment, fare collection equipment and other systems equipment.

2.8 COST COMPARISONS

Costs for the Proposed Project and the alternatives are divided into two categories: capital costs, and operating and maintenance costs. Capital costs involve the design and construction of the extension, right-of-way procurement, and the vehicles and equipment necessary to operate and maintain it. Operation and maintenance costs include the recurring annual funds necessary to operate and maintain the extension. The capital costs and operating and maintenance costs, further detailed below, are conceptual and subject to revision after preliminary engineering.

2.8.1 CONCEPTUAL CAPITAL COSTS

Capital cost items include the basic construction of the rail line and station facilities; relocation of utilities; installation of train control systems, communications, fare collection and other system elements; development of parking facilities; and procurement of vehicles. Other construction-related items, such as design, insurance, construction management, and right-of-way acquisition, are also included in capital costs. The conceptual capital cost estimates also include escalation due to inflation to the point of expenditure. The estimates also include BART staff costs, environmental studies and legal fees. These estimated conceptual capital costs (project costs) do not include allowance for mitigation, including hazardous material removal and noise, vibration and other mitigation, and will change based on further preliminary engineering design work.

Table 2-5 summarizes the cost, in escalated dollars, of the Proposed Project and Alternatives 4 through 11. The estimated conceptual capital cost for the Proposed Project (7.8 miles with 3 stations) with "Basic Features" is \$610 million which includes all construction, systemwide elements, engineering and management, and right-of-way acquisition, but not including the cost

2. Project Description

for procurement of vehicles. As indicated, the project costs including the procurement of vehicles, range from \$375 million for Alternative 9 to about \$820 million for Alternative 8.

Table 2-6 shows the basic features included in the cost estimate for the Proposed Project and each alternative as well as the estimated conceptual capital cost adjustments associated with each design option. For example, Alternative 5 (5.4 miles with 2 stations) (\$440 million) with design options for the subway under Lake Elizabeth (+\$60 million), at-grade at Paseo Padre Boulevard (-\$17 million), and including vehicles (+\$55 million) but without mitigation is estimated at \$538 million.

Table 2-6 also includes the estimated costs of proposed mitigation in the various subject areas. The costs for mitigations are not included in the Total Project Costs on Table 2-5. Again, these estimated conceptual capital costs are very preliminary and will be refined as engineering work progresses.

2.8.2 OPERATING AND MAINTENANCE COSTS

Included in operating and maintenance costs are: electrical power; maintenance of vehicles, ways and structures; and subsystems operation of all equipment, labor and administrative expenses. The total annual incremental operating and maintenance costs for the Proposed Project and alternatives in 1991 dollars are shown in Table 2-7 for the proposed operating plan of 9 minute peak period headways and 15 minute mid-day headways on both the Fremont-Richmond and Fremont-Daly City lines. As indicated, the operating and maintenance costs range from \$16.8 million (in 1991 dollars) for the Proposed Project to about \$9.0 million for Alternative 9.

**Table 2-5
Estimated Conceptual Capital Costs for Proposed Project and Alternatives with Basic Features
(Millions of Dollars - Escalated to Time of Expenditure)**

Item	Description (miles/number of stations)	Proposed Proj. (7.8/3)	Alt 4 (5.4/2)	Alt 5 (5.4/2)	Alt 6 (7.8/2)	Alt 7 (7.8/2)	Alt 8 (7.8/2)	Alt 9 (5.4/1)	Alt 10 (7.8/1)	Alt 11 (7.8/2)
1	Construction and Procurement	\$340	\$280	\$270	\$260	\$270	\$470	\$180	\$230	\$320
2	Engineering and Management	\$90	\$70	\$70	\$60	\$70	\$120	\$50	\$60	\$80
3	Start-up and Agreements	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10	\$10
4	Total Construction Cost (items 1 + 2 + 3)	\$440	\$360	\$350	\$330	\$350	\$600	\$240	\$300	\$410
5	Right-of-way Cost	\$170	\$110	\$90	\$160	\$180	\$140	\$80	\$140	\$150
6	Subtotal Project Cost (items 4 + 5)	\$610	\$470	\$440	\$490	\$530	\$740	\$320	\$440	\$560
7	Vehicle Cost	\$80	\$55	\$55	\$80	\$80	\$80	\$55	\$80	\$80
8	TOTAL PROJECT COST (items 6 + 7)*	\$690	\$525	\$495	\$570	\$610	\$820	\$375	\$520	\$640

*The above cost estimates do not include hazardous material removal and noise, vibration and other mitigations.

**Table 2-6
Estimated Conceptual Cost for Proposed Project and Alternatives with Design Options (\$ in Millions)**

	Prop. Proj.	Alt. 4	Alt. 5	Alt. 6	Alt. 7	Alt. 8	Alt. 9	Alt. 10	Alt. 11
1. BASIC FEATURES OF PROPOSED PROJECT AND ALTERNATIVES									
Length (miles)	7.8	5.4	5.4	7.8	7.8	7.8	5.4	7.8	7.8
Stations:		X	X	X	X	X	X	X	X
Irvington		X	X	X	X	X	X	X	X
Warm Springs		X	X	X	X	X	X	X	X
South Warm Springs									
Alignment at Park	Aerial	Aerial	Aerial	Aerial	Aerial	Aerial	Aerial	Aerial	Aerial
Vertical Align. at Pasco Padre	Aerial	At-grade*	Aerial	Aerial	Aerial	Aerial	Aerial	Aerial	Aerial
Vertical Align. at Washington Blvd.	Subway	Subway	Subway	Subway	Subway	Subway	Subway	Subway	Subway
Project Cost with Basic Features (w/o vehicles)	\$610	\$470	\$440	\$490	\$530	\$740	\$320	\$440	\$560
2. ADDITIONAL COSTS FOR DESIGN OPTIONS:									
a) For Central Park Design Options		+\$60	+\$60	+\$60	+\$40	+\$40	+\$60	+\$60	+\$60
1 - Subway under Lake Elizabeth		+5	+5	+5	+5	+5	+5	+5	+5
2A - Aerial around Lake		+65	+65	+65	+45	+45	+65	+65	+65
2S - Subway around Lake		+7	+7	+7	+7	+7	+7	+7	+7
3 - Aerial around Park									
b) For other Design Options in combination with (a) above:									
At-Grade Pasco Padre		+9	+9	+10	+7	+6	+9	+8	+9
with basic aerial alternative		-17	-17	-16	+2	0	-16	-16	-17
with subway design options 1 and 2S									
At other locations see NOTES below.									
3. COST FOR PROPOSED MITIGATIONS									
	\$32	\$29	\$29	\$31	\$27	\$46	\$29	\$32	\$32
4. COST FOR BART VEHICLES									
	\$80	\$55	\$55	\$80	\$80	\$80	\$55	\$80	\$80

* Includes overpass in cost estimate.
** Basic with Central Park Options.

NOTES: For Aerial Option over Washington Blvd., subtract \$2m from applicable alignments (Alternatives 6, 9, 10, 11).
For Aerial Option over Warren Ave., add \$13m to the applicable alignments (Alternatives 6, 7, 10, 11, and Proposed Project).
For End Option (UPRR Relocation), add \$3m to the applicable alignments (Alternatives 6, 7, 10, 11, and Proposed Project).

Table 2-7
Summary of BART Annual Operating and Maintenance
Cost Estimates

	Incremental Annual O&M Cost (\$ 1991 in Millions)
Proposed Project	\$16.76
Alternative 4	10.34
Alternative 5	10.34
Alternative 6	15.63
Alternative 7	15.63
Alternative 8	15.63
Alternative 9	9.00
Alternative 10	11.55
Alternative 11	15.63