

**BART EXTENSION TO SAN FRANCISCO INTERNATIONAL AIRPORT  
AND THE PEOPLEMOVER PROJECT**

**KAMRAN MOSTASHAR NEMATI**

**PROFESSIONAL REPORT**

Submitted in partial satisfaction of the requirements for the degree

of

**MASTER OF CITY PLANNING**

in the

**Department of City and Regional Planning**

of the

**UNIVERSITY OF CALIFORNIA, BERKELEY**

**APPROVED**

**Professor Elizabeth Deakin**

**Professor Robert B. Cervero**

**Mr. John H. Bergerson**

**SPRING SEMESTER, 1989**

**KAMRAN M. NEMATI**

**BART EXTENSION TO SAN FRANCISCO INTERNATIONAL AIRPORT  
AND THE PEOPLEMOVER PROJECT**

**TABLE OF CONTENTS**

<b><u>SUBJECT</u></b>	<b><u>PAGE</u></b>
1. INTRODUCTION.....	1
2. BART EXTENSION PLANS.....	6
3. RIDERSHIP IN BART.....	8
4. PARKING AT BART STATIONS.....	10
5. BART FINANCIAL CONDITION.....	11
6. THE LOCAL IMPLICATION OF BART DEVELOPMENT.....	12
7. BART EXTENSION TO SAN MATEO COUNTY.....	16
8. BART EXTENSION TO SAN FRANCISCO INTERNATIONAL AIRPORT.	20
9. BART'S INTERNAL/EXTERNAL AIRPORT STATION ALTERNATIVES.	22
10. PEOPLEMOVER AS AN INDEPENDENT SYSTEM.....	30
11. CONCLUSIONS.....	31

**REFERENCES**

## LIST OF FIGURES & TABLES

<u>FIGURE NO.</u>	<u>PAGE</u>
1 San Mateo Peninsula Mass Transit Study.....	3
2 BART Extension Alternative.....	4
3 BART's Airport Station.....	5
4 SFO Peoplemover System.....	23
5 South Terminal Station.....	24
6 International Terminal Station.....	25
7 North Terminal Station.....	26

### TABLE NO.

1 Cost Estimate for San Francisco International Airport's Peoplemover Project.....	22
2 Airport's BART Station Alternatives Comparison.....	29

## **1. INTRODUCTION**

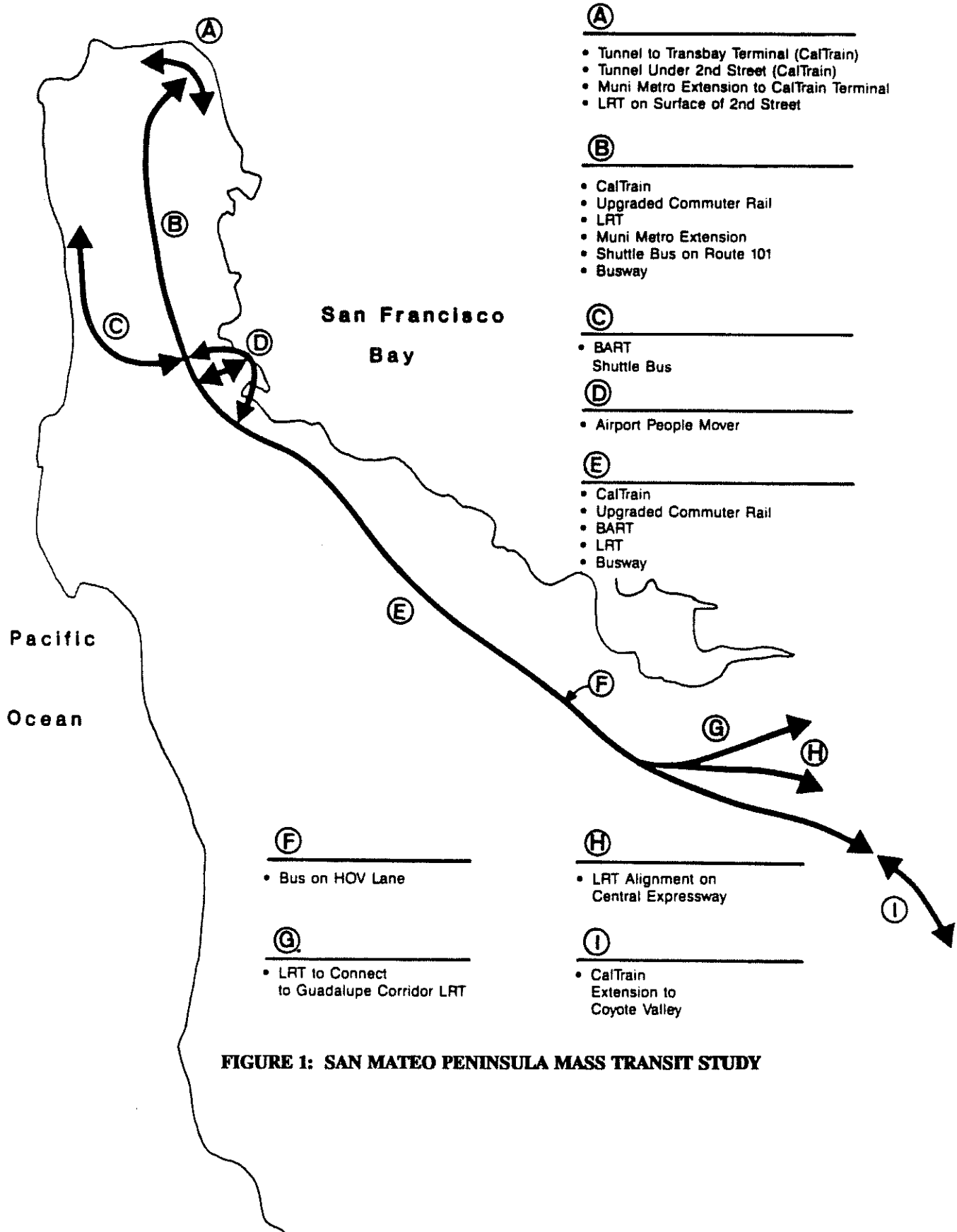
Over the years the San Mateo peninsula corridor has been the focus of numerous transit studies, including two major BART extension studies and studies that helped create the local bus systems in San Mateo and Santa Clara counties (Figure 1). One of the tasks of this study was to develop a set of potentially feasible transit alternatives in the corridor. Among these alternatives is BART extension to San Jose. In this alternative, existing CalTrain service would be replaced by BART on the peninsula. The BART extension would be fully grade-separated and would generally follow the Southern Pacific San Bruno branch line from the end of the Daly City tail track and would then follow the Southern Pacific mainline to San Jose. Alternatively, the BART alignment would deviate from the railroad mainline in San Bruno (I-380) proceed underground through the Airport Garage and then return to Southern Pacific right-of-way in Millbrae (Figure 2).

The external airport extension would be at-grade connected to the airport terminal by an elevated peplemover system above this station (Figure 3). The peplemover system will be designed to circle the outside of the airport's south, international and north terminals (Figures 4-7) placing the air passengers close to ticketing and baggage check-in facilities and giving the air passenger the impression of being at the airport after making the transfer at the Airport Station. The peplemover will operate on demand, much like a normal elevator.

BART extension to the San Francisco International Airport will satisfy the following objectives:

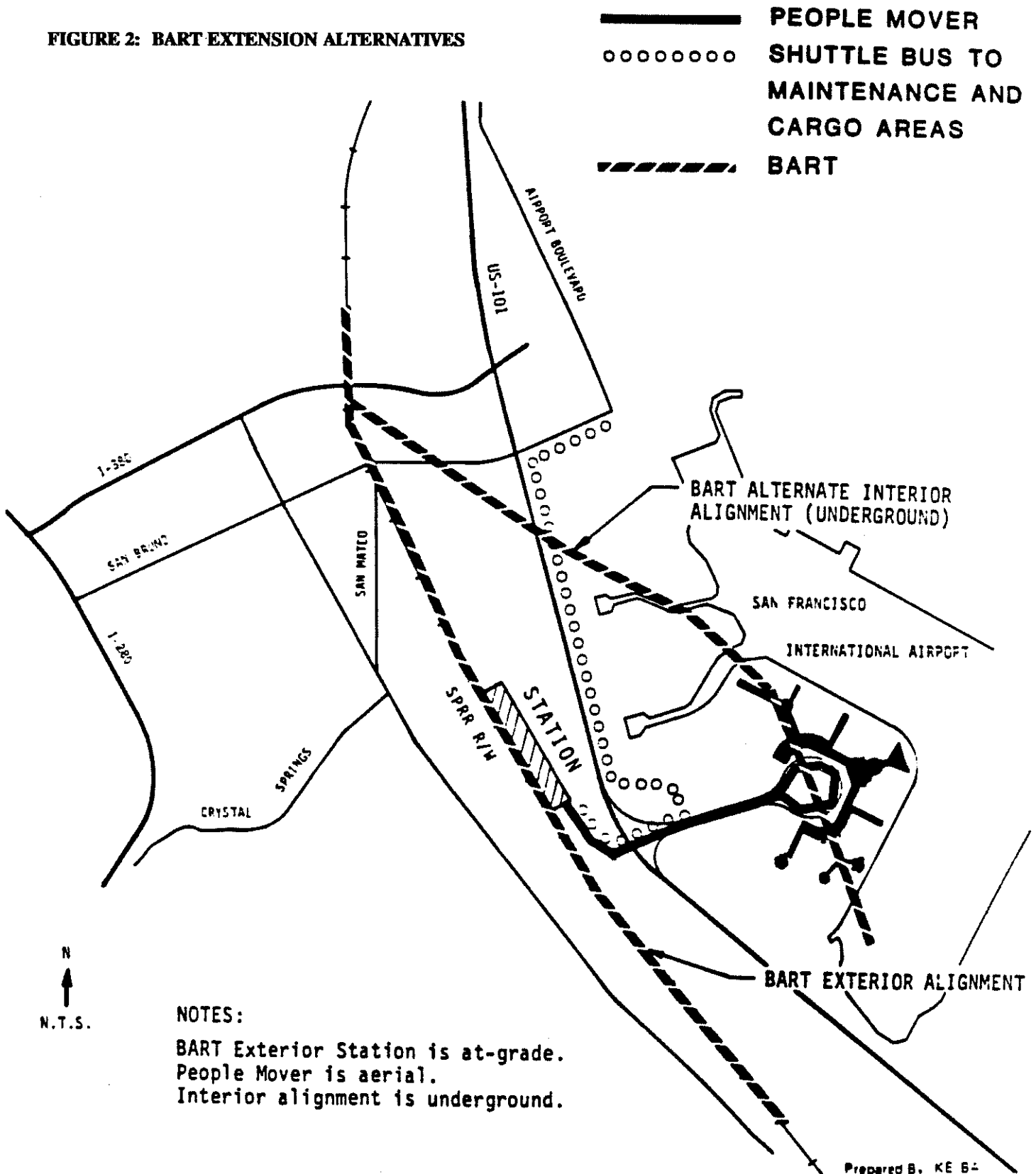
1. Provide rapid rail connection to SFO for residents of the three BART counties.
2. Improve access to SFO.
3. Provide potential for a significant increase in transportation capacity between San Mateo County and San Francisco.

### Corridors and Transit Technologies



**FIGURE 1: SAN MATEO PENINSULA MASS TRANSIT STUDY**

FIGURE 2: BART EXTENSION ALTERNATIVES



SFO AIRPORT  
INTERMODAL STATION  
SECTION A-A

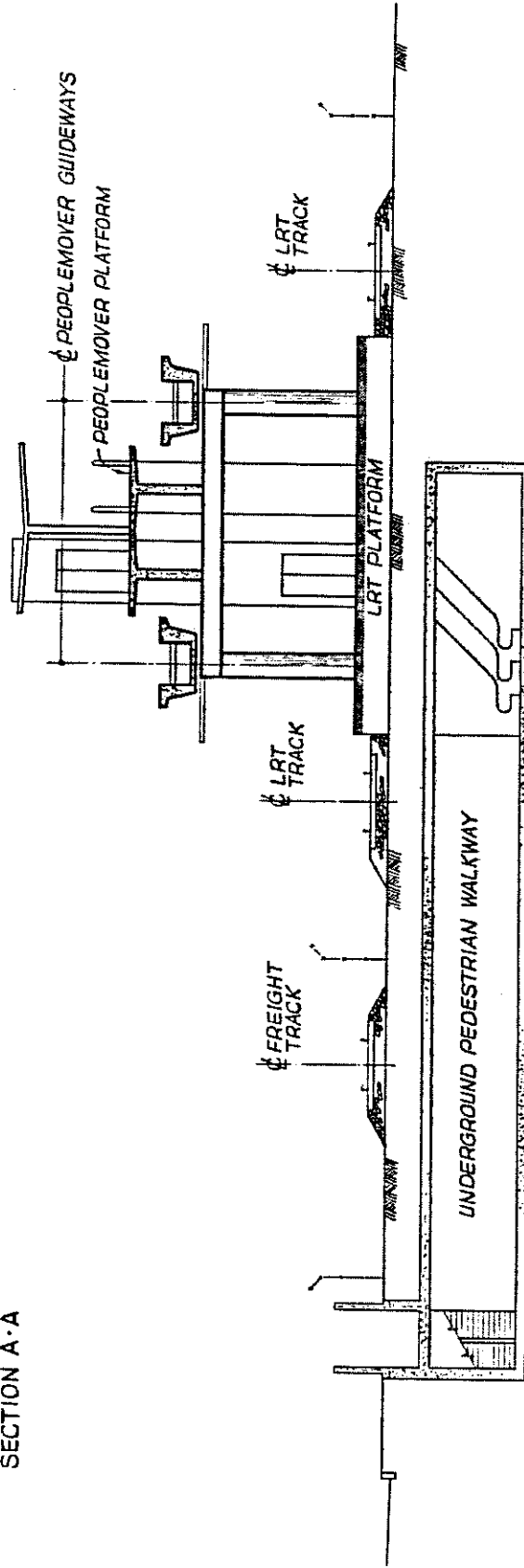


FIGURE 3: BART'S AIRPORT STATION



## **2. BART EXTENSION PLANS:**

The extension of BART to the San Francisco International Airport is a very dynamic and controversial issue involving the Bay Area transit authorities and also the Bay Area residents, specially in San Mateo, San Francisco, Alameda, and Contra Costa counties.

The main idea behind the development of BART was to design a system that would be a desirable alternative to the automobile. The original designers expected that BART would divert 48,000 workday autos from the streets and highways by 1975, and that 258,500 daily passengers would be riding BART in 1975; 157,400, or 61 percent, diverted from automobiles, 31 percent from existing transit system (reference 1). BART's daily ridership from April to June 1987 averaged 195,260. Fifteen years of tinkering with cost overruns, broken deadlines, system breakdowns, equipment failures, computer malfunctions and many other problems have been the cause of BART's under-achievement. It has decreased the traffic congestion on some routes, specially across bridges spanning San Francisco Bay, but it has not been able to even come close to becoming a major alternative to the automobile. Buses and BART now carry 52 percent of all people who cross the Bay.

After fifteen years in service, BART's directors point of view is that the system has solved most of the mechanical problems, has a near perfect safety record, and is beginning to live up to its claims. They believe that it is the time for BART to move forward and they see the expansion of the system as the key element to eventually offer service

throughout the entire Bay Area. In 1980, directors adopted a 20 year expansion policy with extension of existing BART tracks to Pittsburg, then Antioch; to the Irvington and Warm Springs districts of Fremont; to Castro Valley and Dublin, then Livermore or Pleasanton.

A \$500 million program has also started to increase the BART capacity by 80 percent. Other elements in BART's expansion program include fireproofing the original fleet of cars, upgrading of electrification and the controversial new computer control system. Cost of the new computerized "dispatcher" system has escalated from \$16 million to \$36 million. This is a good example of BART's inability in controlling costs. The new computer system would increase the number of trains BART can run and reduce the wait between trains. Without the system, BART cannot extend service to east Contra Costa county or Livermore Valley, officials have said.

### **3. RIDERSHIP IN BART:**

One of the main problems of BART these days is the decline in ridership. Higher gas prices have not sent commuters back to BART, and directors are now calling the lack of riders a crisis. A recent performance record indicates that BART ridership has sunk below projections since 1985. The 1986 fare increase caused average daily ridership to sink below 200,000 per day for the last five quarters. Fare increase averaged 30 percent, rising the minimum fare from 50 cents to 80 cents. In spite of an advertising campaign to lure back riders, daily ridership from April to June 1987 averaged 195,260. That number is 7.6 percent below the 211,338 riders BART planners had predicted would be using the system by the end of 1986-87 fiscal year. In spite of decrease in ridership, BART's extracted revenue increased, specially for mid-day and evening riders, due to fare increase. Ridership seems to be the biggest problem at BART. The trend of jobs moving out of downtown San Francisco to East Bay has caused less BART ridership. It is predicted that this movement towards the suburbs will be overcome by the general growth in the region; since there are still building offices being constructed in San Francisco. The loss of riders is apparently due to the high fares. BART had not initially recognize the trend to the suburbs.

BART's declining ridership is a serious matter, and the transit district has employed various advertising methods to motivate riders back to the rails. BART's ridership among

East Bay commuters travelling to work in San Francisco has dropped nearly 8 percent since 1986.

Some conservationists argue against the BART expansion program demanding that BART pull up the draw bridge and work to improve the system that already exists before it can expect to grow. In BART directors discussion of ways to attract more riders, three elements figured in their thinking: lower fares, expansion and more parking.

There is no doubt that BART must be a desirable alternative to the automobile before people will begin using it regularly.

BART directors must find ways to lower fares and present consumers with a reasonably priced way to travel. Otherwise, consumers will continue to depend on their cars to move around the Bay Area. BART's across-the-board fare boost in January, 1986 and falling gasoline prices coincide with the decline in ridership.

Expansion will be the toughest hurdle to clear because it will be the costliest. However, BART's current 72-mile system that includes only parts of three of nine Bay Area counties - Alameda, Contra Costa and San Francisco - is indeed limited considering the scope of the Bay Area. Trains still operate on the same number of tracks that were built when they first started rolling in the early 1970's. New markets must be opened if ridership is to grow significantly.

#### **4. PARKING AT BART STATIONS:**

Increased parking facilities for BART would also lure additional riders. Currently, weekly commuters fill the parking stalls very early in the morning and they remain full until late afternoon and early evening. Potential midday BART riders are often turned off after several fruitless spins around station parking lots searching for empty spaces.

The 1986 fare increase was somewhat caused by the BART's debts on bonds for parking construction. The parking capital cost is \$4-\$6/space/day. Many parking spaces are currently being used for car pooling rather than riding BART. A recent investigation at the Orinda BART station showed that 1/2 parking spaces were actually occupied by car-poolers. BART was considering charging a \$30 a month parking fee to commuters. This proposal was sent back to the staff for more study by BART's directors arguing that selling parking permits at BART stations is an idea whose time has not yet come. They are concerned with the fact that parking charges add to the cost of commuting and would be a hidden fare increase. A better idea may be to develop a control mechanism, such as a ticketing counter, through which BART inspectors could make sure that all the people who park are actually BART riders.

**5. BART FINANCIAL CONDITION:**

According to a BART spokesman, BART's problem now is not technology, it is money. "We know where to go and how to built it and how to operate it," he said. "The problem now is money, pure and simple." Despite subsidies, BART faces a \$4.4 million to \$28.6 million annual deficit within the next five years and still can't control spiraling costs (reference 2). BART will increase the number of trains it runs, but the cost of operating is expected to increase from 21.3 cents a mile this year to 24.4 cents in 1992.

BART cost \$1.38 billion to built, of which \$792 million came from bonds approved by voters in 1962. Voters in San Francisco, Alameda, and Contra Costa counties approved a \$792 million bond issue that required 60 percent "yes" votes; it got 61.2 percent. During the 1985-86 fiscal year, BART received \$84.2 million from 75 percent of the one-half cent added to the sales tax in its three counties, Alameda, San Francisco and Contra Costa. Fares added \$73 million.

## **6. THE LOCAL IMPLICATION OF BART DEVELOPMENT:**

In 1962, San Mateo spurned BART and quit the district. Supervisors in Marin County were pressured to drop out after opposition raised to a transit deck on the Golden Gate Bridge.

The idea of BART expansion is not new. After all the original plan for BART was to circle the Bay Area. The heavy congestion on most of the highway networks around the Bay Area has had a tremendous affect in rising the public and political support for extensions.

The three BART districts, San Francisco, Alameda, and Contra Costa counties are studying the extensions of existing BART tracks to Pittsburg, then Antioch; to the Irvington and Warm Springs districts of Fremont; to Castro Valley and Dublin, then Livermore or Pleasanton. The growing communities in eastern Contra Costa County (Pittsburg, Antioch and Brentwood), like communities in the Livermore and San Ramon Valleys, have been paying into the BART district since its creation and have only an inefficient BART feeder bus system to show for it. Their residents demand that BART is obligated to provide rail service to their transportation-starved area (reference 3).

Other non-BART counties, especially San Mateo County, have also shown a great interest in BART expansion into their counties. Voters in San Mateo have voted twice in

the last three years in favor of BART extension into their county. In 1985 they voted for the negotiation of the proposed Colma BART station between the San Mateo Transit Authority (SamTrans) and the BART. November 3, 1987 elections, Proposition K, the controversial measure to extend BART to a station near San Francisco International Airport in San Mateo County won by a ratio of 3 to 2 (61% Yes, 31% No). The policy, which outlines long-range planning for San Mateo, also reaffirms the SamTrans support for the extension of the CalTrain tracks into downtown San Francisco, which is termed "essential to survival of the rail service."

With growing congestion, the residents of San Mateo County have realized that there is a significant demand for transit service between Northern San Mateo County and San Francisco. This is the largest travel market in the corridor for regional trips. U.S. highway 101, the common way to get to the San Francisco International Airport, is operating at 80 to 90 percent capacity during commute periods and is heavily used for both short and long distance trips. There are more than 200,000 cars per day on the Bayshore system presently, and by the year 2000 there would be an estimated 334,000 cars on the corridor. Planners have estimated that a BART extension to the airport would relieve traffic by taking some 40,000 cars off San Mateo County freeways each weekday. Some experts, including a SamTrans director, challenge this claim, arguing that it cannot be substantiated. This BART extension would also bring an estimated 44,000 new riders to the system which now carries 199,000 passengers a day.



San Mateo County's BART extension plans have created a furor in the East Bay. Taxpayers in the large areas of Alameda and Contra Costa counties have been paying property and sales taxes to BART since 1962, but receive no rail service. They argue that residents of San Mateo County did not pay anything for the Daly City station and now they are buying into a \$2 billion transit system for a very low price of \$200 million. They demand that their expansion plans be constructed first and that San Mateo should officially become a BART county and pay their share of back taxes since 1962. Contra Costa's BART tax contribution since 1962 is about \$140 million alone.

There was an ongoing battle between the three BART counties, BART and San Mateo County on the issue of expansion. On June 7, 1988 election, voters in San Mateo County approved a transportation sales tax of half-cent on the dollar. Listed as Measure A , the San Mateo half-cent sales tax was resoundingly approved by a 62-percent margin. The county's sales tax will now be 7 cents on a dollar, with a full penny devoted to transportation purposes (an earlier half-cent transportation tax was approved in 1974). Over the next 20 years, the new half-cent tax will pay for \$804 million worth of transportation improvements, half of which will go for public transit projects, including \$375 million to upgrade the CalTrain commuter rail system.

SamTrans who would be financially responsible for the extension, through local taxes and 50 percent federal fund, has a projected cumulative surplus of \$340 million to the year 2000. If San Mateo could persuade the federal government for aid, it would actually have the money to pay for the extension. The estimated cost of the extension to the San

Francisco International Airport is between \$590 million to \$945 million (1987 dollars) depending on BART's configuration at the airport. The stations would be paid for with a half-cent sales tax San Mateo residents approved for transportation.

The regional rail plan recently passed another hurdle when BART and SamTrans signed an agreement regarding construction of the BART extension to the San Francisco International Airport. Under agreement, SamTrans will contribute \$200 million to "buy into" the BART system- money that will go for BART extension in the East Bay, and \$148 million - or 25 percent of the cost - for a BART extension to the vicinity of San Francisco International Airport. San Mateo is also expected to commit \$243 million for a CalTrain extension in San Francisco. These figures are pending an agreement between BART and San Mateo County. The first \$50 million installment on San Mateo County "buy in" would be due upon federal grant approval of a BART station at Colma, the first stop along the leg to the San Francisco Airport, with another \$50 million due at the beginning of construction of the Colma station.

**7. BART EXTENSION TO SAN MATEO COUNTY:**

The proposed BART extension into the San Mateo County consists of four stations.

They are:

1. Colma Station
2. South San Francisco Station (in Chestnut Avenue)
3. Tanforan Station
4. Airport Station

Construction of the \$149 million Daly City Turnback and yard Project will soon be completed. Three new tracks reach about 1-1/2 miles down Highway 280, allowing trains at the Daly City Terminal to return more quickly or stay in overnight storage. BART hopes to provide trains every 2.25 minutes during rush hour, compared to the current maximum frequency of 3.5 minutes. The storage will have capacity for 165 cars. The goal is to eliminate the need to return empty cars to the East Bay storage yards after the morning and evening commute hours.

The project makes possible a new station in Colma adjacent to the designated yard site. The Colma station would reduce the congestion at the Daly City BART station considerably. Daly City BART Station currently serves as a major commuter hub for residents on the Peninsula. Parking capacity is exhausted at this station and SamTrans and

Muni buses have to share the relatively small loading zone. Some 500 buses serve Daly City Station daily carrying 10,000 passengers. The 1,600 parking spaces are all filled by 7 AM. Due to these limitations, trains from Daly City to the Financial District have excess capacity, even during peak hours.

As most commuters live south of the Daly City Station, a southern extension makes sense. A major rationale for a BART station at Colma is to mitigate the heavy congestion at the Daly City BART Station.

The negotiation for the construction of this station is already underway between SamTrans and BART authorities. The main points of principles of agreement between BART and SamTrans are as follows:

1. SamTrans will pay BART a capital contribution:
  - a. Based upon present value of BART taxpayers contributions and a station/track mileage sharing factor.
  - b. Fifteen million dollars to be paid within six months of signing an agreement, the balance to be paid when station construction begins. Net, total to BART project estimated to be \$25 million.
2. SamTrans will fully fund construction cost of Colma Station.
3. SamTrans to guarantee BART's additional Colma Station operating costs will be covered.
4. SamTrans and BART agree to work together to seek federal funding for BART Phase I Extensions.

The agreement also calls for SamTrans to pay half the \$84 million cost of the proposed station, which would be two miles south of the present Daly City station. SamTrans also would pay BART about \$3 million a year for operating the station. Under state law, BART cannot spend money outside of its three counties.

There is a clause in this agreement which calls for refunding the \$25 million to SamTrans in the unlikely event that so many riders use the Colma station that it shows a profit. Surprisingly, this clause was not noticed by BART directors until after the agreement. BART directors of El Sobrante and San Francisco are for overturning this agreement. On the other hand, some other directors call the agreement "first class" and believe that rescinding it would "just make BART credibility zero." Meanwhile Contra Costa County supervisors are threatening a lawsuit to block the agreement and may try to pull the portion of their county without rail service from the BART district.

SamTrans would spend \$148 million on the South San Francisco station in the years 1993-1995, and \$103 million on the Tanforan station during 1997-1999.

Future trends of employment in San Mateo - San Francisco corridor will have major impact on BART ridership. In 1970 San Francisco had approximately 509,000 jobs and 323,000 employee residents. This accounted for 181,000 more jobs than local workers. The deficit of workers increases to 261,000 by the year 2000 due to 32 percent increase in employment versus 25 percent in workers living in San Francisco. In 1970 San Mateo County had 30,000 more workers than jobs. This surplus of workers grew to 56,000 in 1980.

The proposed development in San Mateo would reduce this surplus to 41,000 by the year 2000. In any case, San Mateo County remains an exporter of employees past the turn of the century (reference 4). Some of these workers would be hired by new businesses in Santa Clara county, where there are many proposals for new developments. Many others though, would seek employment in San Francisco. With increasing congestion of U.S. Highway 101, BART can become a very desirable alternative for their transportation to and from the city.

**8. BART EXTENSION TO SAN FRANCISCO INTERNATIONAL AIRPORT:**

San Francisco International Airport served 24.5 million air passengers in 1983. Passengers connecting between flights accounted for about 19 percent. Eighty-one percent of the passengers arrived and departed the airport using ground transportation. Of these passengers 41 percent originate in San Francisco, 16 percent in San Mateo County, 12 percent in Santa Clara County, and others are from other counties (reference 4). These figures indicate that, ideally, BART can be an alternative mode of transportation for many of the passengers who pass through the San Mateo - San Francisco corridor.

San Francisco Airport has already reached its policy limit of 31 million annual passengers. This number is expected to increase to 42.3 million by the year 1996. There are 25,000 employees at the airport on an average weekday. Average daily traffic into and out of the airport is approximately 130,000 vehicles (reference 19). A BART extension to the airport can attract many of the employees who live in San Mateo or San Francisco. This can reduce the problem of employee parking at the airport and transfer some of the employee parking to passenger parking at the going rate bringing more revenues to the airport. With 31 million annual passengers, the airport is facing a shortage of on-airport parking and major problems with curbspace at both levels have arisen (reference 6).

Two more alternatives have been studied for the configuration of the BART station at the airport. There is a possibility of a subway system under the parking garage or an external station across U.S. Highway 101, in an empty lot near a housing area.

## **9. BART'S INTERNAL/EXTERNAL AIRPORT STATION ALTERNATIVES:**

As discussed earlier, there are two alternatives with regard to BART extension to the airport: internal (garage station) or external (peplemover alternative).

The external airport station would be fully grade-separated and at-grade, while for the garage station BART alignment would deviate from the railroad mainline in San Bruno, proceed underground through the airport garage and then return to Southern Pacific right-of-way in Millbrae (see Figure 2).

Since the external station uses the Southern Pacific right-of-way, there will be no land acquisition involved and at-grade alignment construction would be a simple one. On the other hand, the garage station would require establishing a new right-of-way from San Bruno to the center of the garage and back to Millbrae. It also involves underground tunneling in an area where there is mostly landfill with very high groundwater level, which will impose a very difficult and costly construction. The construction cost for the garage station is estimated to be around \$565 million excluding the construction cost from the garage station back to Southern Pacific right-of-way, which can add up to another \$380 million. In January 1985, a cost estimate for San Francisco International Airport's peplemover project was prepared by Kaiser Engineers, Inc. (Table 1), based upon the schematic design mentioned earlier in chapter 1 (see Figures 4 through 7). The total project cost is estimated to be approximately \$164 million (1987 dollars).



**TABLE 1: COST ESTIMATE FOR  
SAN FRANCISCO INTERNATIONAL AIRPORT'S  
PEOPLEMOVER PROJECT (1987 DOLLARS)**

<u>DESCRIPTION</u>	<u>SYSTEM DATA</u>	<u>UNIT COST</u>	<u>AMOUNT \$</u>
<b>FACILITIES</b>			
<b>TRACKWAY (At grade)</b>			
<b>STATIONS</b>			
Aerial	7 EA	2,203,100	15,421,700
At Grade			
Underground			
	-----		-----
<b>TOTAL STATIONS</b>	7 EA		15,421,700
<b>YARD AND MAINTENANCE SHOPS</b>			
<b>MAJOR STRUCTURES</b>			
Tunnels			
Cut and cover			
Retained Cut or Fill			
Grade Separations			
Aerial Guideway	9,400 RF	4,928	46,232,200
Mod. to Exist. Fac.	1 LS	8,761,200	8,761,200
Highway Improvements			
	-----		-----
<b>TOTAL MAJOR STRUCTURES</b>	9,400 RF		55,084,400
<b>TRACKWORK/GUIDANCE</b>			
Ballasted			
Ballastless			
Guidance (Peplemover)	29,340 TF	151	4,430,340
Special Trackwork			
Grade Crossing			
Other			
	-----		-----
<b>TOTAL TRACKWORK/GUIDANCE</b>	29,340 TF		4,430,340
<b>SURFACE MODIFICATION</b>	9,400 RF	223	2,096,200
<b>UTILITY RELOCATION</b>	9,400 RF	178	1,673,200
	-----		-----
<b>TOTAL FACILITIES</b>	9,400 RF		78,705,840
<b>SYSTEMS AND EQUIPMENT</b>			
<b>ROLLING STOCK</b>			
TRACTION POWER & DISTRIBUTION	9,400 RF	1,942	18,254,800
SIGNALS	9,400 RF	1,661	15,613,400
COMMUNICATIONS	9,400 RF	203	1,908,200
<b>MAINTENANCE VEHICLES/EQUIPMENT</b>			
	-----		-----
<b>TOTAL SYSTEMS AND EQUIPMENT</b>	1 LS		35,776,400
			-----
<b>SUBTOTAL</b>			114,482,240
<b>Right-OF-WAY</b>			
			-----
<b>SUBTOTAL</b>			114,482,240
*ENGINEERING & MANAGEMENT		15%	17,172,336
*OWNER COSTS		4%	4,579,290
			-----
<b>SUBTOTAL</b>			136,233,866
<b>CONTINGENCY</b>		20%	27,272,044
			-----
<b>SUBTOTAL</b>			163,505,910
<b>ESCALATION</b>			
			-----
<b>SUBTOTAL</b>			163,505,910
<b>PROGRAM RESERVE</b>			
			-----
<b>SUBTOTAL</b>			163,505,910
<b>PROGRAM RESERVE</b>			
			-----
<b>TOTAL PROJECT COST</b>			163,505,910
* NOTE: DO NOT APPLY TO RIGHT-OF-WAY COST			

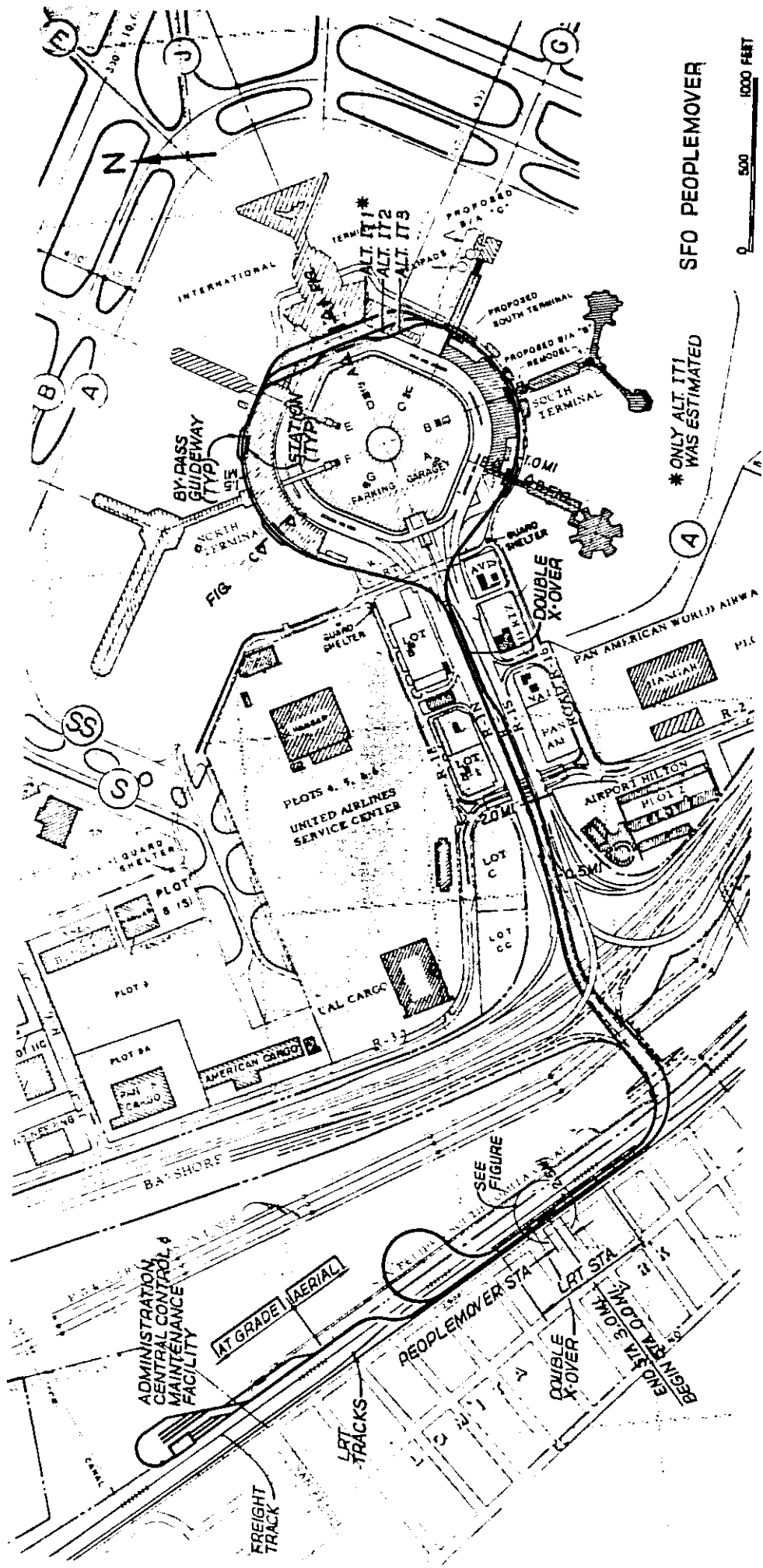
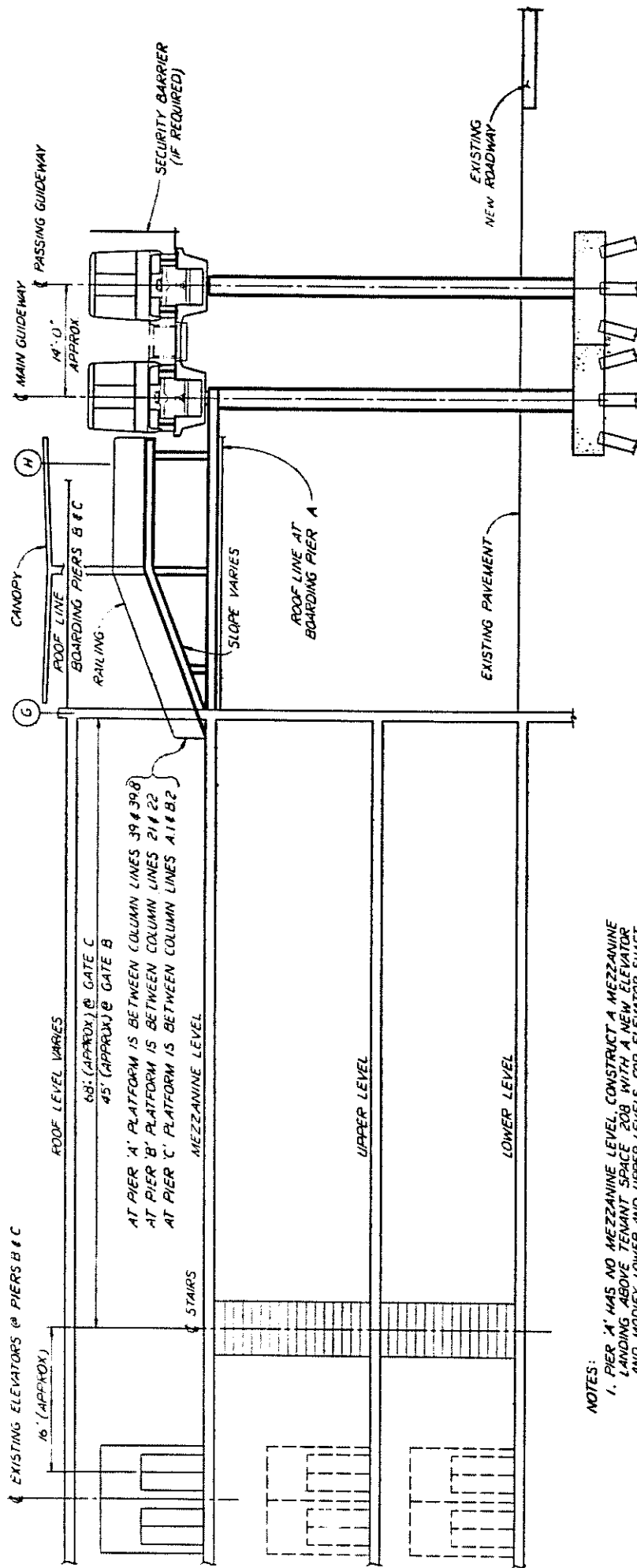


FIGURE 4: SAN FRANCISCO AIRPORT'S PEOPLEMOVER SYSTEM



SFO PEOPLEMOVER  
SOUTH TERMINAL  
SECTION B-B

- NOTES:
1. PIER 'A' HAS NO MEZZANINE LEVEL, CONSTRUCT A MEZZANINE LANDING ABOVE TENANT SPACE 208 WITH A NEW ELEVATOR AND MODIFY LOWER AND UPPER LEVELS FOR ELEVATOR SHAFT.
  2. MODIFICATIONS REQUIRED AT BOARDING PIERS 'B' AND 'C' PEOPLEMOVER TO PASS THROUGH THE INTERIOR OF THE PIERS. THESE PIERS HAVE INTERIOR CEILING HEIGHTS IN EXCESS OF 30'.

FIGURE 5: SOUTH TERMINAL STATION

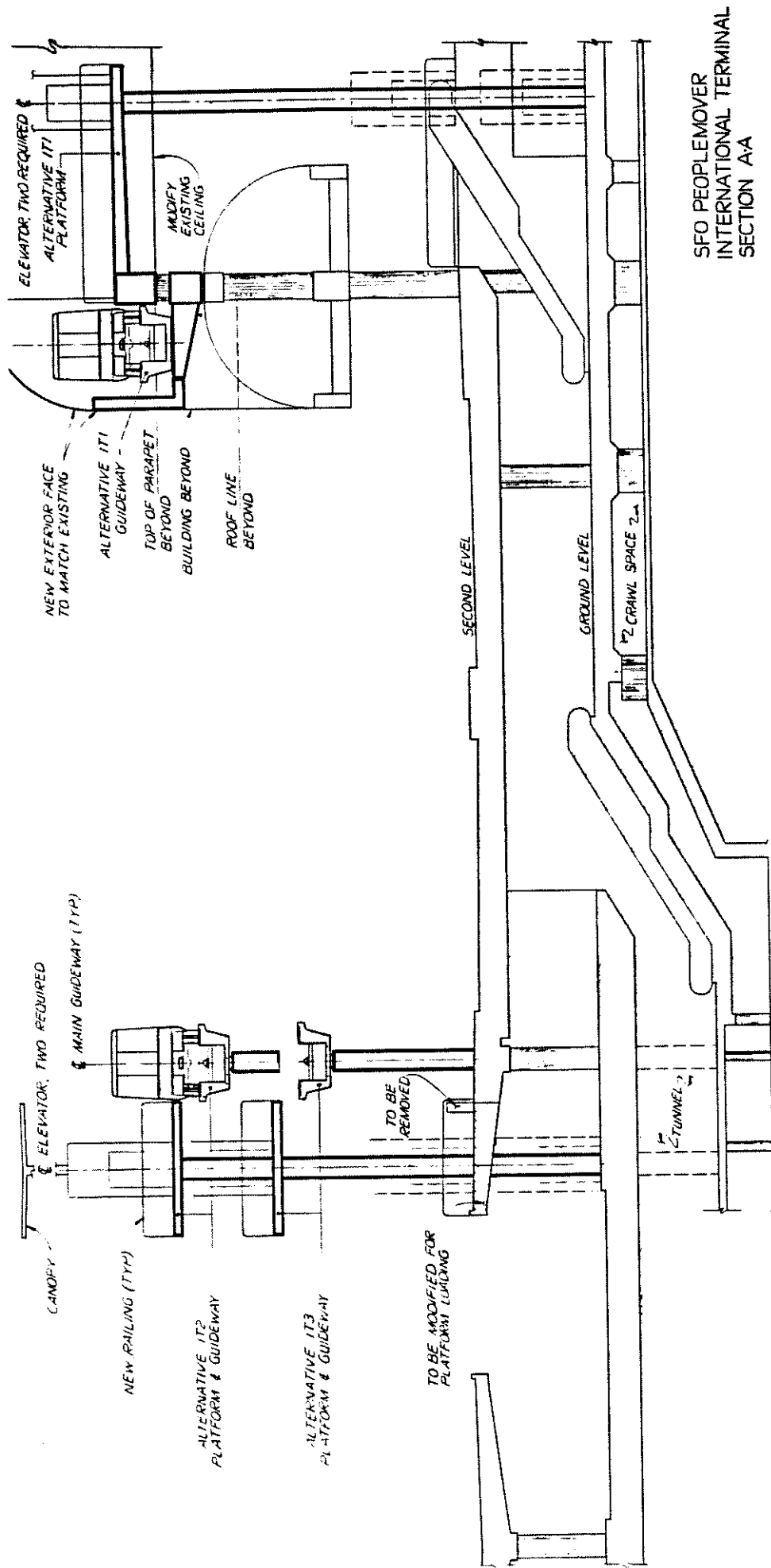
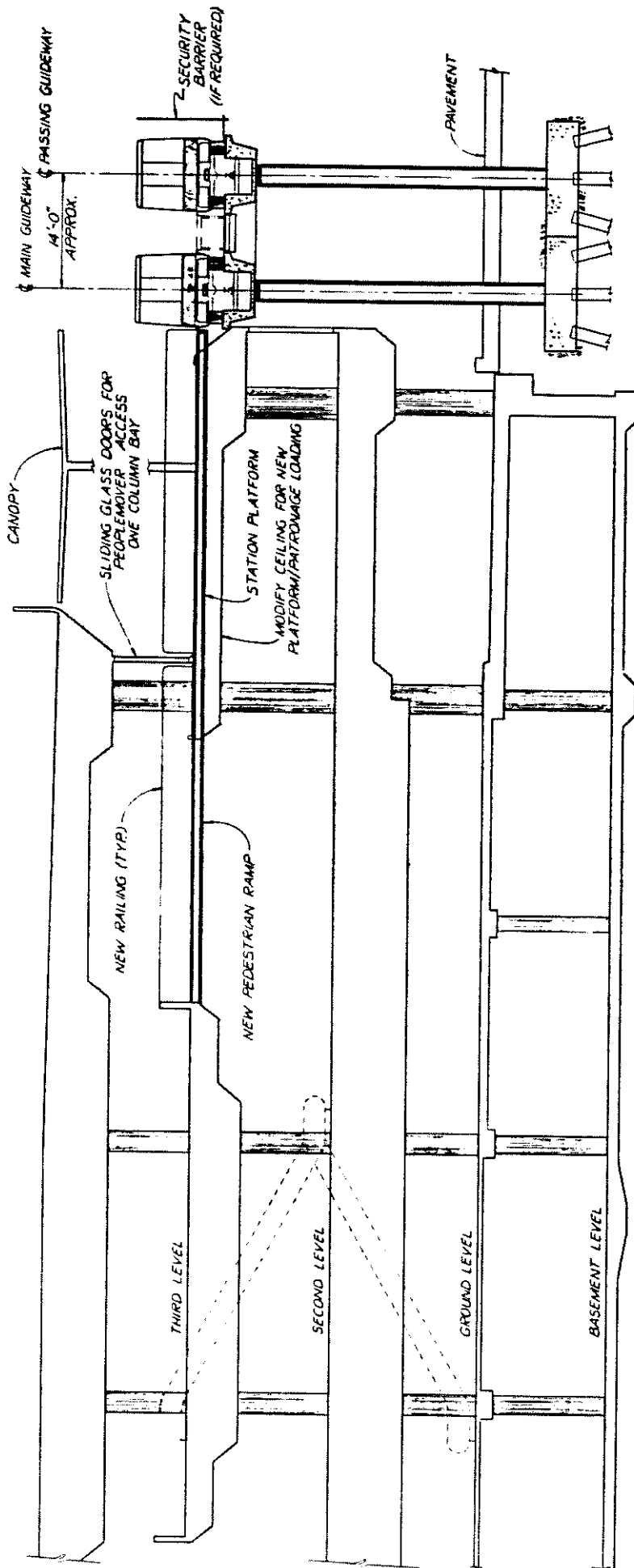


FIGURE 6: INTERNATIONAL TERMINAL STATION



SFO PEOPLEMOVER  
 NORTH TERMINAL  
 SECTION C-C

FIGURE 7: NORTH TERMINAL STATION

The internal alignment may save riders a few minutes in getting to the airport. However, an external alignment with a fully automated peplemover system would provide more direct access to the terminals and ticket counters once the passengers have reached the airport. Peplemover would operate "on demand" so there would be little transfer delay (reference 14). Peplemover can satisfy the expectations of the passengers by providing short waiting times at the stations, ride quality consistent with accepted comfort levels, passenger comfort consistent with expectations, and most important, a reliable and dependable form of transportation.

In a study titled "Ground Access to San Francisco International Airport" (reference 21), ground access models to SFO were developed to estimate the number of air passengers to use BART, at the total airport passenger volume of 40 million. These forecasts assume that other access services will remain about as they are today, but that congestion throughout the Bay Area highway network will worsen considerably. According to the models, BART mode share would be 8.6 percent (or 7,516 riders per day) with the external airport station connected by a fast peplemover, and 8.9 percent (or 7,798 riders per day) with the interior airport station in the basement of the main garage.

The trip from downtown San Francisco to the airport would take approximately 34 minutes by BART. As the roads become more congested riding BART would be much faster than getting to the airport by car (reference 18). Furthermore, the availability of BART at the airport would provide an important margin of safety in the event that highway

congestion impeded access, or air travel growth outstripped efforts to expand landside capacity.

The airport garage station saves time when traveling to the airport proper and it does not give the impression of mode of transportation change. The peplemover alternative will provide more direct access to the counter once the passenger has reached the airport, though it does give the rider the impression of mode of transportation change which is not considered to be desirable. On the other hand, if BART is extended to San Jose, the external airport station will provide service both to the airport passengers and Burlingame residents.

San Mateo is much more interested in the idea of an external airport station. They feel that an external system would not only carry air travel passengers but it can also serve the community around the airport.

Today's technology allows a single track operation for the peplemover with reverse movement capability, similar to that of an elevator. Vehicles traveling in the opposite direction will wait in the bypasses at terminal stations giving way to passing vehicles. Upon clearance, they proceed to their destination.

Table 2 compares the two proposed alternatives for BART station at San Francisco International Airport.

TABLE 2

**AIRPORT'S BART STATION ALTERNATIVES  
COMPARISON**

	<b><u>INTERNAL STATION</u></b>	<b><u>EXTERNAL STATION</u></b>
<b>COST</b>	\$945 MILLION	\$590 MILLION
<b>CONSTRUCTION METHOD</b>	TUNNELING	ABOVE GRADE
<b>PEOPLEMOVER SYSTEM</b>	NO	YES
<b>MODE CHANGE</b>	NO	YES
<b>NEED FOR SHUTTLE BUSES</b>	YES	NO
<b>BART RIDERSHIP SHARE</b>	8.9%	8.6%
<b>TRAVEL TIME TO SFO</b>	SHORTER	LONGER
<b>LEVEL OF SERVICE</b>	HIGHER	LOWER



**10. PEOPLEMOVER AS AN INDEPENDENT SYSTEM:**

San Francisco International Airport, like many other airports, has serious congestion problems and they will be escalating within the next decade. It is important to create more open space around terminal areas for possible future growth. One way of doing this, is to create a "Ground Transportation Center" by moving the rent-a-car facilities from the airport proper to another location such as west of U.S. Highway 101, where there is vacant land. Also additional remote parking space can be utilized in that area. The scenario will especially make the peplemover alternative more attractive, since by utilizing it, car rental customers and people who use the remote parking facilities can be accommodated by peplemover, hence eliminating the rent-a-car courtesy buses. Courtesy buses for hotels around the airport may also operate from the ground transportation center. Since peplemover will provide inter-terminal transfer, it also eliminates the airport shuttle buses and ultimately create more curbside capacity.

The San Francisco International Airport's peplemover system can be feasible and operational today and it does not have to be postponed until BART is extended to the airport. Ideally, when the BART extension to the Airport is completed, it can be integrated into a set of remote transfer facilities, all of which could share the cost of the peplemover.

## **11. CONCLUSIONS:**

If everything goes as planned, the BART extension to the San Francisco International Airport will take 15 years to complete. It will serve the airport and will increase BART ridership. It will take some riders off the congested freeways but it is not clear if it would actually reduce the congestion on San Mateo highways, since regional growth would put more cars on the highways anyway. The expansion may not even reduce air passenger delays either. San Francisco International Airport has been rated as one of the worst airports when it comes to passenger delays at the terminals. The airport blames the airlines for over-booking. In any case, if this trend continues, it does not make any sense to expand BART to the airport, at such a high capital cost, to get the passengers to the airport faster so that they would be delayed at the terminals.

The Economics and Finance Project found little quantitative evidence that BART had contributed substantially in expanding employment opportunities, enabling businesses to operate more efficiently, and promoting better utilization of the region's resources. "A new transit system may affect location decisions by businesses within its region, but not the region's ability to compete with other areas. Commercial development near transit stations - often cited as evidence of a system's impact on regional development - may merely represent relocation, not new growth induce by transit" (reference 7).

The above statement should be a lesson to people who believe that expanding BART to Colma, south San Francisco, and Tanforan would revive that area. The future economical and land development patterns of these areas do not justify the extremely high capital investment of BART expansion. A better solution to the immediate transportation needs is to improve highways and local roads in the area at a much cheaper cost. Up to \$400 million in federal highway money could be made available to California within five years. It is a potential source for significantly increasing the ability to fund local roads.

BART's obligation to its three districts should not be forgotten. The East Bay corridor is highly congested and is in need for transit improvements. BART's idea of "expanding the system to where the money is" can have a disastrous outcome. The issue of financing the construction and operation of the system is a relatively short term problem; the biggest issue would be to "expand the BART to where the demand is." BART needs consistent and high demand for its service if it is to become profitable one day.

Even with more highways congested, BART must become more convenient, accessible and reasonably priced if it is to be an attractive alternative to the automobile.

The construction of the Colma BART station seems to be going through. It will be an excellent means to actually "test the water" for any future expansion into San Mateo County. The land use impacts, potential ridership, and the outcome of the struggle between the three BART districts and San Mateo and BART would be much clearer by then.

If the airport is asked to commit resources to a BART extension and provide supporting infrastructure, they have to make sure that any BART station in the vicinity of the airport does not create a node of congestion that impedes airport access traffic. The airport station should not serve as a major terminus for conventional transit service from San Mateo, at least not in a way that could interfere with access road capacity to the airport.

On the subject of internal/external airport stations, over the past decade, the automated peplemover has emerged as an innovative transportation technology adaptable to the requirements of any area of medium-to-high population use. It has been proven in operation and has achieved levels of service and passenger comfort unequaled by other transportation modes. The inherent flexibility of the technology permits adaption to widely fluctuating passenger volume demand without compromising performance. The system can efficiently and economically handle 2,000 to 25,000 passengers per hour.

In the case of San Francisco International Airport, the peplemover alternative will not only save several hundred million dollars as to garage station alternative, but it also will provide a more efficient airport planning, more curbside capacity, inter-terminal transfer and help utilize the vacant land west of the Bayshore Freeway, hence providing more space and flexibility for the airport authorities in planning future needs of the airport.

### REFERENCES

1. Land Use and Urban Development of BART, Department of Transportation, April, 1979.
2. BART in the San Francisco Bay Area, Department of Transportation, April, 1979.
3. The Local Implications of BART Development, Department of Transportation, April, 1979.
4. BART's First Five Years; Transportation and Travel Impacts, Department of Transportation, September 1979.
5. The BART Experience, What have we learned?; Melvin M. Webber, University of California, Berkeley.
6. The Final Report of the BART Impact program, Metropolitan Transportation Commission.
7. The Impact of BART on Land Use and Urban Development, September, 1979.
8. Peninsula Mass Transit Study, Bay Area Monitor, June, 1985.
9. Regional Transit for the 21st Century, Bay Area Monitor, February, 1984.
10. An Evaluation of the Interaction between Urban Transport and Land Use Systems, Goldberg.
11. BART West Contra Costa Extension Study, Wilber Smith and Associates, 1983.
12. Livermore-Pleasanton BART Extension Study, Levinston and Blaney, 1974.
13. Westinghouse Transportation Division, Automated Transit System Planning Guide, 1987.
14. Sheakley, T.J., Walz, G., APM System Performance and Guideway Design Parameters, Proceedings of a conference sponsored by ASCE on Automated Peoplemovers, Miami, Florida, March 25-28, 1985.
15. De Silva, C.W., Wormley, D.N., Automated-Transit Guideways: Analysis and Design, Heath, 1983.

16. Ashford, N., Airport Peplemovers Prove that Unmanned Trains Really Do Work, Railway Gazette International; April, 1983.
17. U.S. Department of Transportation, Summary of Capital and Operation & Maintenance Cost Experience of Automated Guideway Transit Systems, 1983.
18. Peninsula Mass Transit Study, prepared by Kaiser Engineers (California) Corporation and Barton-Aschman Assoc. Inc., 1984.
19. Interview with Mr. Robert Epifanio, Department of Transportation Planning, San Francisco International Airport, April 21, 1989.
20. Interview with Ms. Karen M. Wallsten, Extensin Planner, Planning and Analysis Department, Bay Area Rapid Transit District, Oakland, California, March 14, 1989.
21. Harvey, Greig, Ground Access to San Francisco International Airport, San Francisco Airports Comossion, December 1988.
22. Metropolitan Transportation Commission Transactions, April, 1988.
23. Metropolitan Transportation Commission Transactions, June/July, 1988.

ENVIRONMENTAL DESIGN LIBRARY

PR2  
1989  
N422  
ENVI