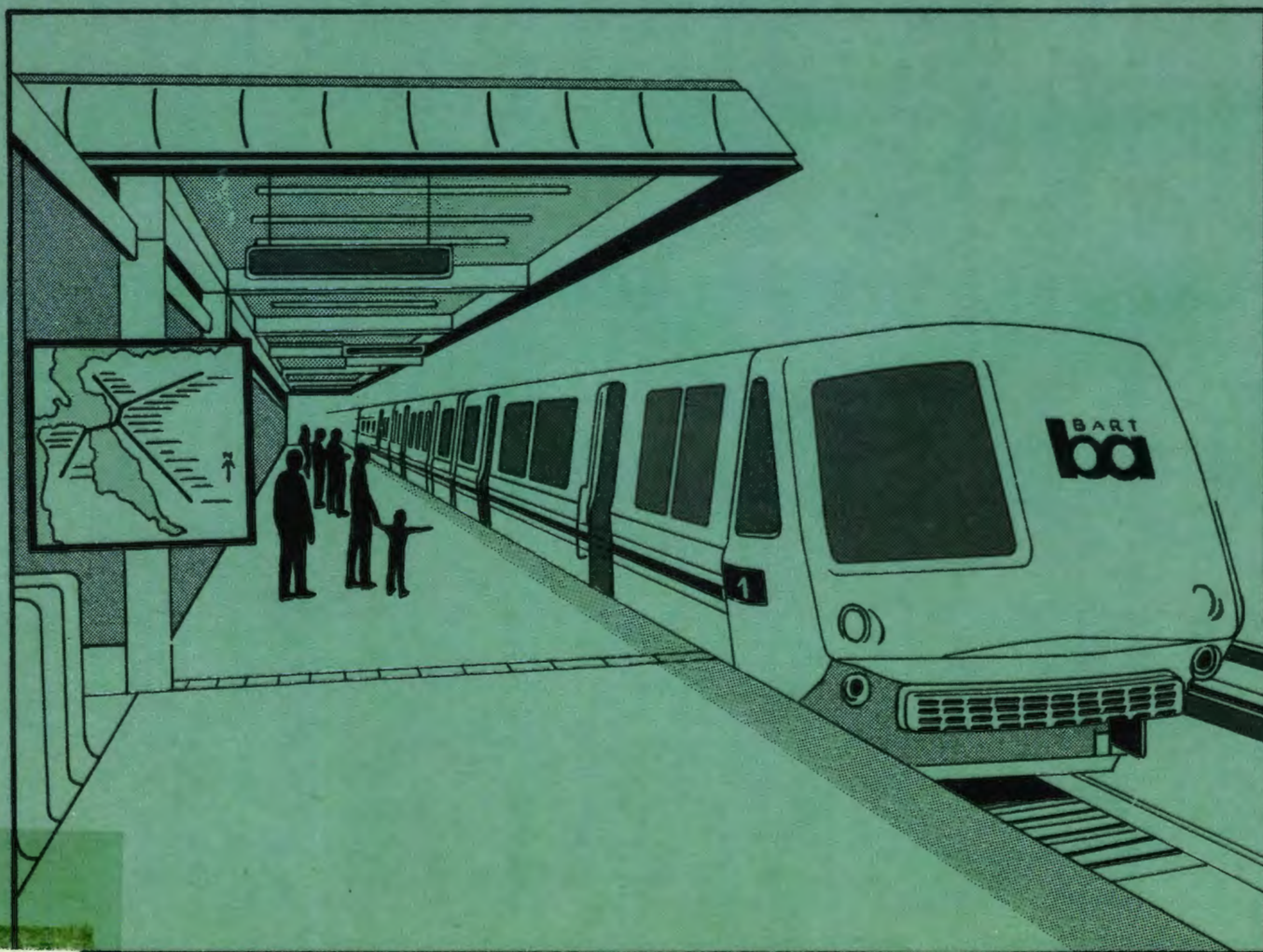


THE LOCAL IMPLICATIONS OF BART DEVELOPMENT



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FINAL REPORT

APRIL 1979



JEFF CARPENTER

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16. Abstract This report presents the final results of the Local Policy Implications Work Element. The report assesses whether BART has achieved the original objectives of local communities. The report also outlines local policy implications in the form of practical guidelines for local government officials either considering an investment in rapid rail transit or in the process of designing and constructing a rapid rail transit system. Implications are presented for each of nine original community objectives for the BART system. This material is further organized into five chapters relating to major areas of local policy: transportation, land use, finance, economic development and environment.					
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JEFF CARPENTER

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THE STATE OF TEXAS, COUNTY OF DALLAS, this 1st day of May, 1901, before me, the undersigned authority, personally appeared _____, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes and consideration therein expressed.

Given under my hand and seal of office this 1st day of May, 1901.

Notary Public in and for the State of Texas.

BART IMPACT PROGRAM

THE LOCAL POLICY IMPLICATIONS
OF BART DEVELOPMENT



DOCUMENT NO DOT-BIP-FR-15-8-78

FINAL REPORT

PREPARED FOR

U.S. DEPARTMENT OF TRANSPORTATION
AND
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, D.C.

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SPONSOR'S NOTE

The BART Impact Program was a comprehensive, policy-oriented study and evaluation of the impacts of the San Francisco Bay Area's new rapid transit system (BART). The program began in 1972, and was completed in 1978. Financing for the Program was provided by the U.S. Department of Transportation, the U.S. Department of Housing and Urban Development, and the California Department of Transportation. Management of the Federally-funded portion of the Program was vested in the U.S. Department of Transportation (DOT). The Metropolitan Transportation Commission (MTC), a nine-county regional agency established by California law in 1970, administered the Program as prime contractor to DOT; the research was performed by competitively selected subcontractors to MTC.

The BART Impact Program studied the broadest feasible range of potential rapid transit impacts, including impacts on traffic flow, travel behavior, land use and urban development, the environment, the regional economy, social institutions and life styles, and public policy. The incidence of these impacts on population groups, local areas, and economic sectors was measured and analyzed.

The results of the BART Impact Program have been synthesized in BART in the Bay Area, the BART Impact Program Final Report (PFR). That report was prepared by MTC and presents MTC's conclusions from and interpretation of the Program's findings. In addition to the PFR, final reports for each of the individual projects in the Program were prepared by the consultants who conducted the research. The reports are listed at the end of this Note. The final reports are supported by numerous technical memoranda and working papers. The conclusions in those documents reflect the viewpoints of the respective consultants based on their research.

Readers of BART Impact Program reports should be aware of the circumstances and the setting in which BART was planned and built and the conditions under which the Program was conducted. An understanding of these factors is critical for interpreting the Program's findings and attempting to apply them to other areas.

First, it is important to note that the San Francisco Bay Area has a sound economy, a good system of highways and public transportation, and distinctive land use and development patterns shaped by the Bay and the hills around it. BART was approved and built during a period of vigorous growth in the Bay Area. The economy was expanding, suburban development was burgeoning, and major increments of highway capacity were being added. Also, the Bay Area already had extensive public transportation services. There were public carriers operating dense networks of local transit services on both sides of the Bay, and there was frequent transbay bus service from many parts of the East Bay to San Francisco. In 1972 before BART opened, approximately 10% of the total daily trips in the three BART counties were made on transit. All of these factors made it difficult in the study to isolate BART's effects from other influences that were affecting such things as travel behavior and urban development.

A second important point is that BART was planned and designed primarily to facilitate travel from outlying suburbs to downtown areas. Multiple stops are provided in the major central business districts, but in other respects BART is

more like a commuter rail system (with long lines and widely-spaced stations) than a New York or Chicago-style subway system of interlocking crosstown lines and frequent stops. The BART system was intended to rival the automobile in comfort, speed, and convenience. Contemporary issues like energy conservation, air quality and service for the transportation disadvantaged were not widely recognized and publicized concerns during the period of BART's design.

The institutional setting in the Bay Area was a third important influence on BART's development. BART was developed as a separate institution without full coordination among existing transportation and regional development planning agencies. BART's planners had to make assumptions about policies and development, many of which turned out to be contrary to policies ultimately adopted by municipalities in the BART District.

A critical element in the study design of the BART Impact Program was the definition of the No-BART Alternative (NBA), the regional transportation facilities and travel patterns judged most likely to have evolved by 1976 if BART had not been built. The definition of an NBA was essential since the Program defined an impact as the difference between what actually occurred with BART and what would have resulted without BART. One cannot be certain about what the region would have been like had BART not been built. But based on an analysis of the political and economic decision history of the Bay Area and the professional judgment of those involved in the Program, it was determined that no significant changes to the area's freeway and bridge systems as they actually were in 1976 would have occurred without BART. It was concluded further that the public transit network and services would have been very similar to what they were just before the start of BART transbay service. One consequence of this assumption is that the NBA provides lower levels of service and less capacity than the with-BART system, and attracts fewer riders. The NBA does not extrapolate beyond 1976 and does not consider how much additional capacity in the transportation system might eventually have been required because of increasing travel demand and congestion.

An important factor affecting the findings was that BART was not operating at its full service level during the period of study by the BART Impact Program. The frequency of trains, their operating speeds, the reliability of their operations, and the capacities provided in peak periods of travel by BART were considerably lower than those originally planned. Trains were running on 12-minute headways instead of the 4.5 minutes originally planned for each of the four lines (90 seconds where three lines converged). BART did not initiate service on all lines simultaneously in 1972 but instead phased in service. The most critical link, the Transbay Tube, was not opened until late 1974. Night service did not start until the end of 1975, and Saturday service started in 1977. Direct Richmond to Daly City service still is not operating, and it now appears that "full service levels," when they are attained, will not achieve the headways and average speeds announced in the original plans.

The final point is that BART had only been operating for a relatively short period of time when its impacts were studied. The impact assessment largely depends on data collected in the first four years of BART's operations. It is likely that some of its impacts, particularly those relating to urban development, will require more time to mature.

Final Reports

These documents are available to the public through the National Technical Information Service, Springfield, VA 22151:

Metropolitan Transportation Commission, "BART in the Bay Area. The Final Report of the BART Impact Program," MTC, 1979.

Gruen Associates, Inc. and DeLeuw, Cather & Company, "Environmental Impacts of BART," MTC, 1979.

Peat, Marwick, Mitchell & Co., "BART's First Five Years: Transportation and Travel Impacts," MTC, 1979.

Jefferson Associates, Inc., "Impacts of BART on Bay Area Institutions and Life Styles," MTC, 1979.

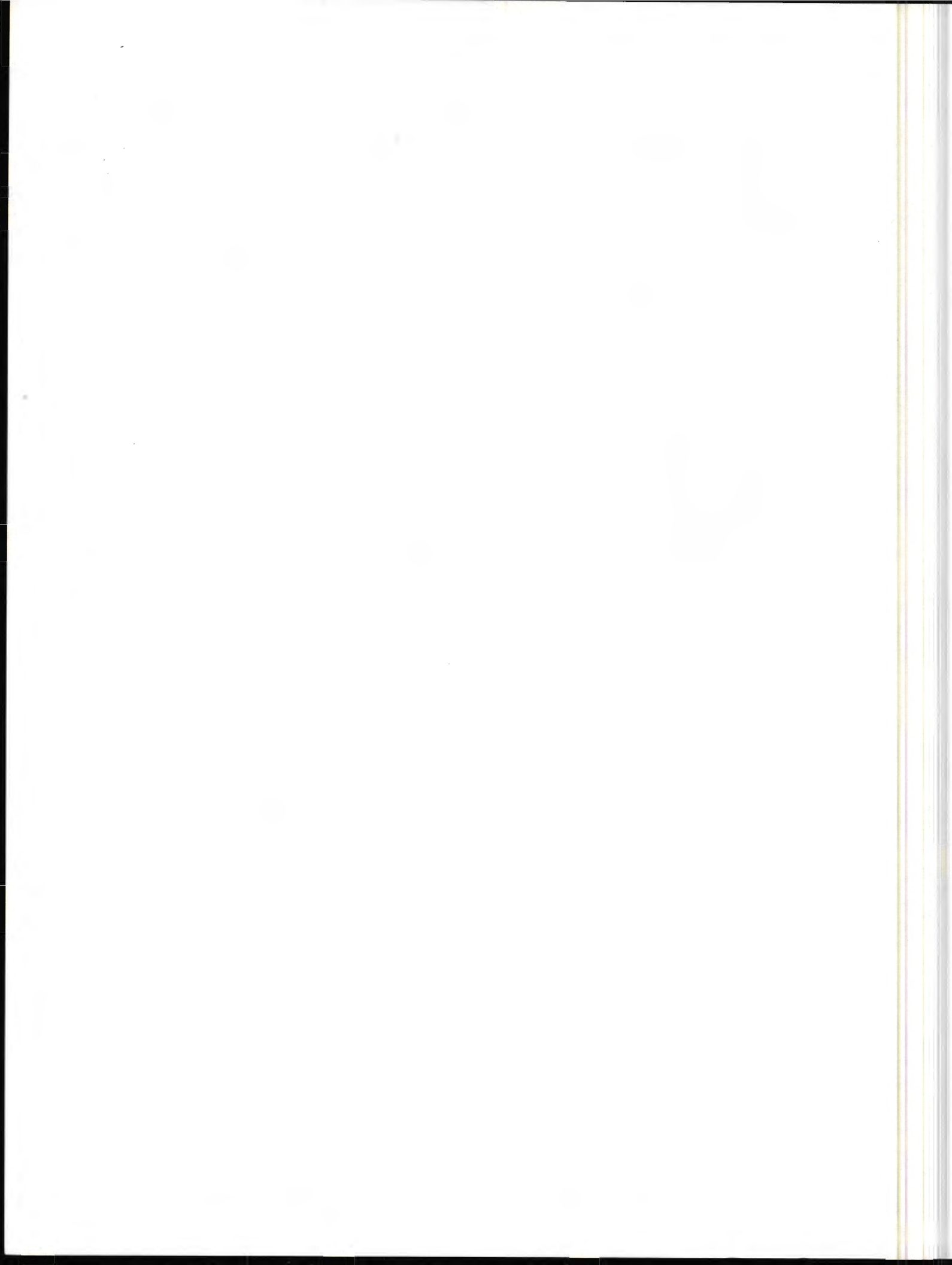
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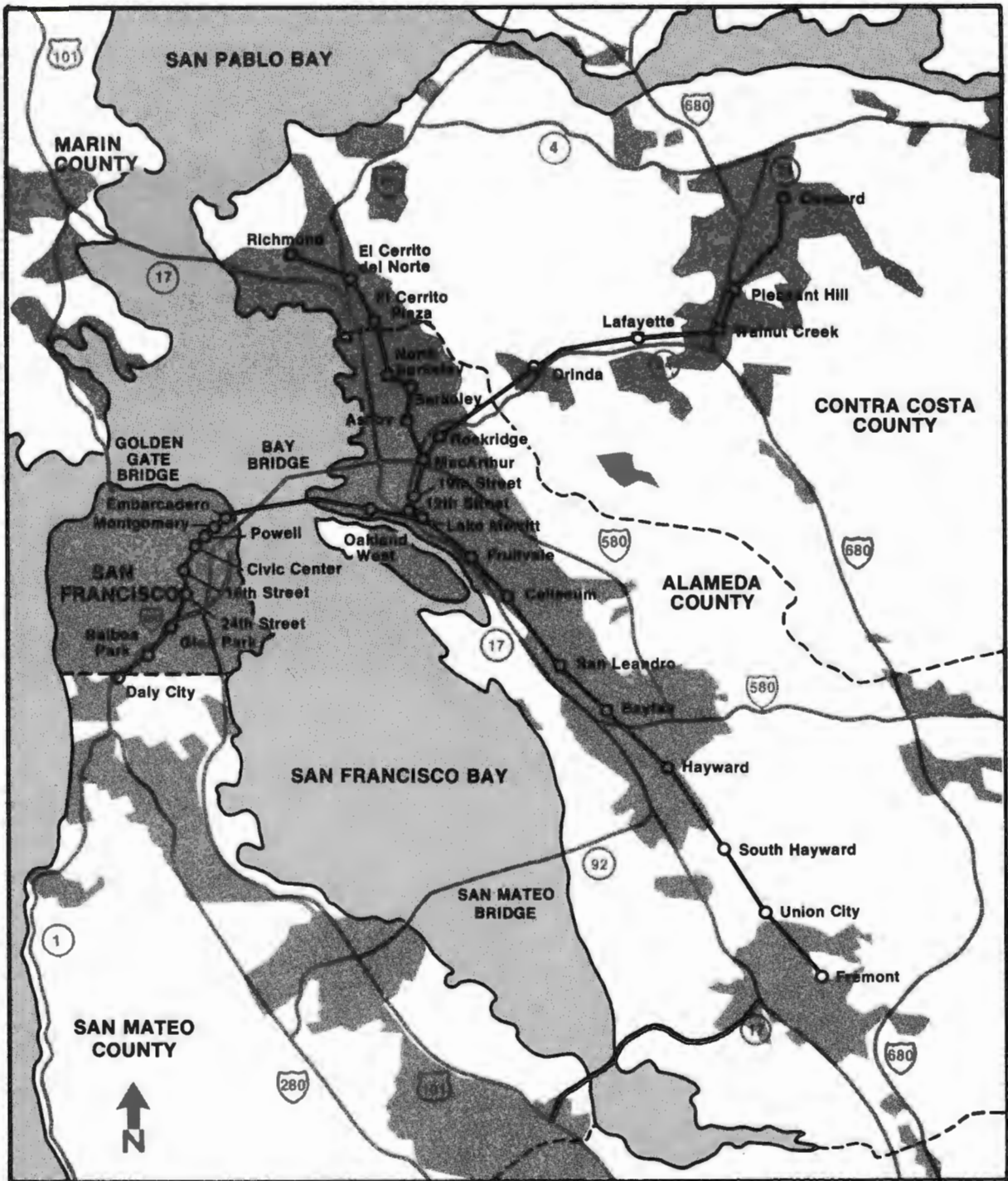
John Blayney Associates/David M. Dornbusch & Co., Inc., "Land Use and Urban Development Impacts of BART," MTC, 1979.

Booz, Allen & Hamilton Inc., "The Impact of BART on Public Policy," MTC, 1979.

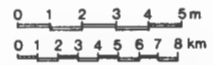
Urban Dynamics Associates, "Implications of BART's Impacts for the Transportation Disadvantaged," MTC, 1978.

Alan M. Voorhees & Associates, Inc., "Federal Policy Implications of BART," DOT, 1979.





- urbanized area
- state highway
- federal highway
- interstate highway
- BART
- BART station



- BART:** The Bay Area Rapid Transit System
- Length:** The 71-mile system includes 20 miles of subway, 24 miles on elevated structures and 27 miles at ground level. The subway sections are in San Francisco, Berkeley, downtown Oakland, the Berkeley Hills Tunnel and the Transbay Tube.
- Stations:** The 34 stations include 13 elevated, 14 subway and 7 at ground level. They are spaced at an average distance of 2.1 miles: stations in the downtowns are less than one-half mile apart, while those in suburban areas are two to four miles apart. Parking lots at 23 stations have a total of 20,200 spaces. There is a fee (25 cents) at only one of the parking lots. BART and local agencies provide bus service to all stations.
- Trains:** Trains are from 3 to 10 cars long. Each car is 70 feet long and has 72 seats. Top speed in normal operations is 70 mph with an average speed of 38 mph including station stops. All trains stop at all stations on the route.
- Automation:** Trains are automatically controlled by the central computer at BART headquarters. A train operator on board each train can override automatic controls in an emergency.
- Magnetically encoded tickets with values up to \$20 are issued by vending machines. Automated fare gates at each station compute the appropriate fare and deduct it from the ticket value.
- Fares:** Fares range from 25 cents to \$1.45, depending upon trip length. Discount fares are available to the physically handicapped, children 12 and under, and persons 65 and over.
- Service:** BART serves the counties of Alameda, Contra Costa and San Francisco, which have a combined population of 2.4 million. The system was opened in five stages, from September 1972 to September 1974. The last section to open was the Transbay Tube linking Oakland and the East Bay with San Francisco and the West Bay.
- Routes are identified by the terminal stations: Daly City in the West Bay, Richmond, Concord and Fremont in the East Bay. Trains operate from 6:00 a.m. to midnight on weekdays, every 12 minutes during the daytime on three routes: Concord-Daly City, Fremont-Daly City, Richmond-Fremont. This results in 6-minute train frequencies in San Francisco, downtown Oakland and the Fremont line where routes converge. In the evening, trains are dispatched every 20 minutes on only the Richmond-Fremont and Concord-Daly City routes. Service is provided on Saturdays from 9 a.m. to midnight at 15-minute intervals. Future service will include a Richmond-Daly City route and Sunday service.* Trains will operate every six minutes on all routes during the peak periods of travel.
- Patronage:** Approximately 146,000 one-way trips are made each day. Approximately 200,000 daily one-way trips are anticipated under full service conditions.
- Cost:** BART construction and equipment cost \$1.6 billion, financed primarily from local funds: \$942 million from bonds being repaid by the property and sales taxes in three counties, \$176 million from toll revenues of transbay bridges, \$315 million from federal grants and \$186 million from interest earnings and other sources.

March 1978

*Sunday service began in July, 1978

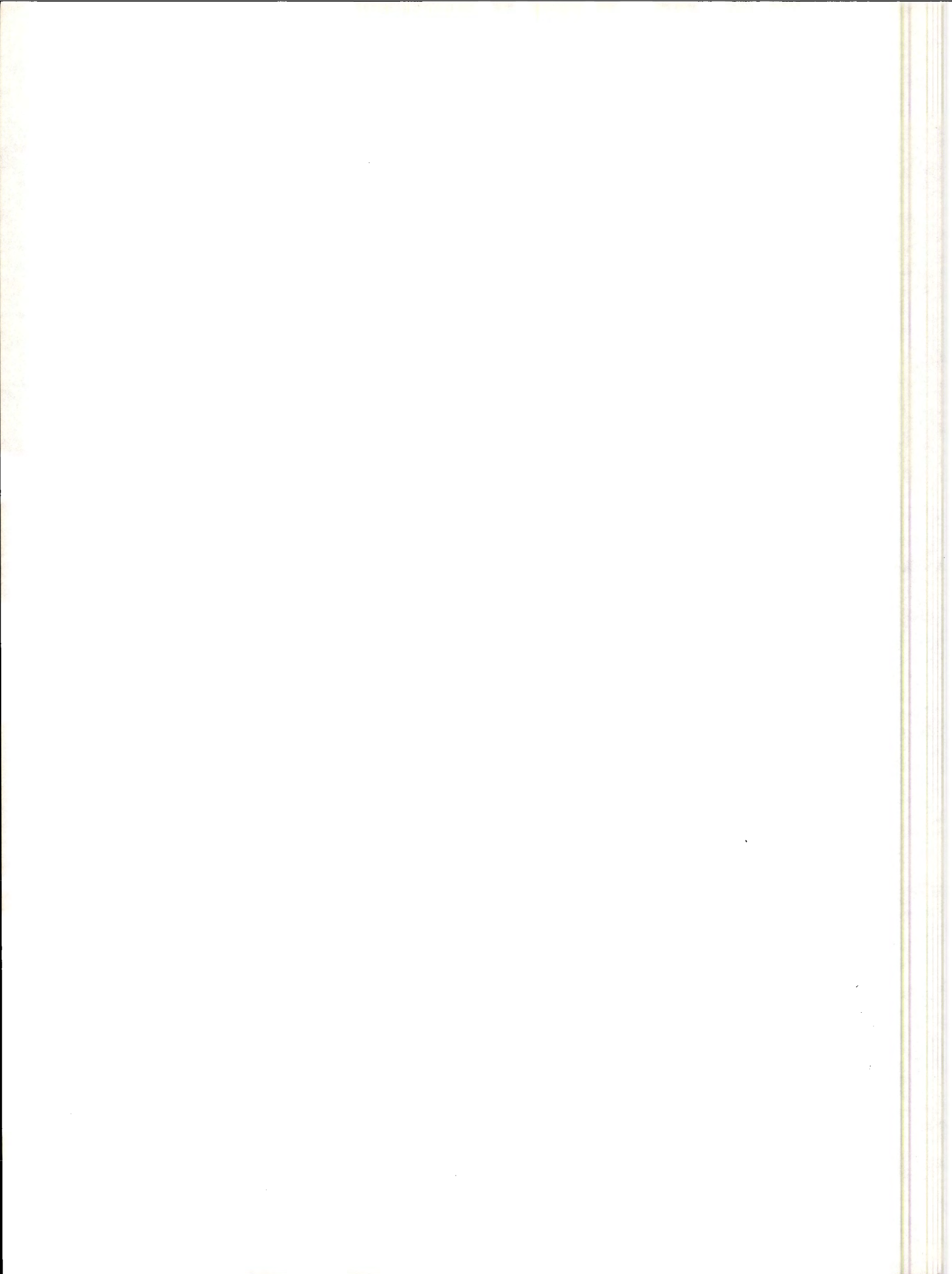
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SUMMARY AND FINDINGS

This report is designed primarily for use by local and regional government officials--elected officials, administrators and planners --who are either (1) considering an investment in transit, particularly rapid rail, or (2) in the process of designing and constructing a rapid rail transit system. The purpose of this report is to use the experience of BART as a basis for suggesting the types of local public policies that are likely to enable local officials to achieve their own objectives for rapid rail transit development.

This section briefly summarizes the BART experience as it relates to public policy decisions in other communities. Chapter VII of the report outlines conclusions in slightly more detail. However, for local officials interested in specific types of public policy actions, it is necessary to read the appropriate chapters for an in-depth discussion.

This report concentrates on the local policy implications of BART. Local policy implications are defined as improvements in the public policy-making process to enable local officials to make more informed decisions about rapid rail transit development to help achieve local community objectives. The local policy implications developed in this report are based on answers to four questions:

- . What were the original local goals for BART?
Were they attained?
- . Were the original local goals and expectations
for BART really attainable and/or appropriate?
- . If not, could a modification of goals and expectations
provide a better basis for local policy
decisions related to rail transit?
- . If so, what improvements in the local policy
formulation and implementation process can be
suggested to help local communities better achieve
their objectives for rapid rail transit?

Local officials should recognize that an analysis of the BART experience and its impacts has certain limitations for improving policy-making processes in other regions. Public priorities have changed and the Bay Area and BART development are relatively unique. Despite this, local decision-making processes have not changed dramatically and issues now confronting local officials in Washington, D.C., and Atlanta are remarkably similar to issues raised in the Bay Area not too long ago.

The following three sections summarize conclusions regarding the role of rapid rail transit in achieving local objectives; the institutional setting for rapid rail transit development; and the approach to planning, constructing and operating a rapid rail transit system.

1. A RAPID RAIL TRANSIT SYSTEM BY ITSELF HAS A LIMITED ABILITY TO MEET LOCAL COMMUNITY OBJECTIVES

As the BART experience shows, rapid transit alone will not allow a region to achieve all the varied objectives and expectations which led community officials and citizens to support such a system originally. BART Impact Program results suggest BART has not yet been very successful in achieving its objectives, but two qualifications should be added:

- . BART has only been in operation five years, hardly enough time to assess whether BART can be viewed as a success or failure.
- . Local officials generally overstated the expectations for BART in order to gain public support. Further, they did not always implement the kind of supportive public policies to complement BART.

In this light, local officials should make sure that their expectations are realistic based on BART's and other new systems' experience and begin planning early to identify appropriate public policy strategy to support rapid rail development.

2. SUPPORTIVE INSTITUTIONAL ARRANGEMENTS ARE CRITICAL TO ACHIEVING RAPID RAIL TRANSIT EXPECTATIONS

The BART experience suggests that metropolitan areas with strong local government control and lacking effective regional and state participation in transit planning will have a difficult time achieving rapid rail transit objectives. Creating a new regional agency (like BART) for rapid rail transit development will not alone solve this problem, as the Bay Area found. Further, combining all transit service under a single regional transit operator may be an improvement. But this approach removes any basis for competition and service decisions may be far removed from the local communities served by the system.

A preferred institutional approach would be a combination of the following components:

- . Individual transit operators within a region to foster a competitive spirit, but with sufficient oversight from a regional agency (like the Metropolitan Transportation Commission in the Bay Area) to prevent direct competition on individual routes. Public boards of directors for the individual transit operators should have the responsibility for policy decisions and liaison with local governments.
- . A regional or state transportation planning agency (like the Metropolitan Transportation Commission in the Bay Area) with funding leverage over individual transit operators.
- . A loosely structured regional association of transit operators to facilitate coordination of joint activities such as purchasing, marketing and public relations.
- . Local governments should retain the option to initiate transit on a contract basis, seeking bids from various public and private transportation companies.

The first two of these components are the most essential for avoiding problems faced in the Bay Area during BART development. The latter two components provide a number of benefits but are not critical to achieving the objectives of a rapid transit system.

3. SUPPORTIVE LOCAL POLICY ACTIONS ARE NECESSARY TO ACHIEVE COMMUNITY OBJECTIVES FOR RAPID RAIL TRANSIT DEVELOPMENT

For rapid rail transit development to meet community objectives, local officials must be involved in each stage of transit development. This section briefly outlines the types of supportive local policy actions which should be taken at each of five transit development stages.

(1) Planning

The initial rapid rail transit planning stage is where local officials have an opportunity to assess whether rapid rail transit is the appropriate choice for meeting local objectives and, if so, develop engineering and financing plans. Three major products which should flow from local officials' involvement are:

- . Local and regional plans for land use and development, the local economy and the environment are important inputs to the rapid rail transit planning process.

- . A transit system plan should be developed using the existing Federal procedures. At this point, local and regional plans are combined with specific transportation objectives to develop transportation alternatives.
- . A transit financing plan should be developed once rapid rail transit is determined to be the appropriate transit alternative. Financing for a rapid rail system should be considered in the context of total transit financing for a given region.

(2) Design

Rapid transit system design is the area where local government involvement can be most productive and essential. At this point, a region has decided to implement a rapid rail transit system, has approved a financing plan (including both Federal and local sources) and is now ready to begin detailed system planning and design.

Three categories of design decisions--route and station location, system configuration and station and train design--should be of greatest interest to local officials. The process by which these decisions are made and implemented should include three basic activities:

- . Preparing or assembling local land use, economic, environmental and transportation service plans and objectives as a basis for system design decisions. These should be consistent with regional plans.
- . Making system and station design decisions which seek to accommodate local preferences.
- . Taking steps to plan appropriate local policy strategies to take advantage of transit development. Specific steps include:
 - Station area and corridor land use and economic studies

- Capital improvement scheduling
- Joint development plans
- Local design review

(3) Construction

During transit construction, local officials should be involved in two distinct types of activities--construction coordination and pre-operations planning.

- . Construction coordination is necessary where rapid transit construction will take place along existing local rights-of-way or near existing residential and commercial development. Specific local government activities include:

- Construction planning
- Negotiation of agreements between local governments and the transit district
- Local capital improvement scheduling
- Coordination of local capital improvement projects with rapid transit construction (joint development)

- . Pre-operations planning relates to specific agreements which should be reached or plans which should be developed prior to operations startup. This local planning effort should include four major activities:

- Land use strategy development
- Parking and traffic management planning
- Facilities maintenance agreements
- Transit service coordination

(4) Startup

At the point rapid rail transit service actually begins, the role of local governments should be diminished greatly. Therefore, the only activities required by local officials are:

- . Implementation of public policy actions and strategies already determined.
- . Monitoring system progress to identify unexpected occurrences and develop new or revise existing local policies if necessary.

(5) Operations

Although BART has been operating for almost five years, all of the services and lines have not yet been phased in (Sunday service and the opening of direct service on the Richmond-Daly City line are not scheduled to begin before spring 1978) and operating problems remain high. Therefore, BART has not really reached the fifth stage of continuing operations and no specific implications have been developed. Based on experience thus far, the probable roles of local officials will be:

- . Monitoring system progress.
- . Planning for system extensions or modifications.

* * * * *

Overall, we have tried to provide some general policy guidance to local officials who want to take advantage of rapid rail transit development to meet some of their community's objectives as well as want to avoid some of the potential problems and disruptions of this development. However, it is difficult to transfer insights from the Bay Area to other, quite different jurisdictions--to avoid implications that are either too general or too specific. We have tended to err on the general and more universal side, hoping that local officials can use this report more as a checklist in structuring appropriate public policies for their own community.

I. INTRODUCTION

1. THE BART IMPACT PROGRAM

As the first regional rapid transit system built in the United States in more than 50 years, the San Francisco Bay Area Rapid Transit System (BART) is a potential learning model for metropolitan areas now considering investments in transportation facilities. The BART experience is also of interest to the Federal Government in allocating financial aid for local transportation improvements, urban development and environmental protection in urban areas. The BART Impact Program (BIP) is designed to meet immediate needs for accurate information on the BART investment and to provide input for future transportation decisions in the Bay Area and throughout the nation.

The BIP is a comprehensive, policy-oriented study and evaluation of the impacts of the BART system. The BIP covers the entire range of potential rapid transit impacts, with major projects covering traffic flow and travel behavior, land use and urban development, the environment, the regional economy, social institutions and life styles, and public policy. The incidence of these impacts on population groups, local areas, and economic sectors is being measured and analyzed.

2. THE LOCAL POLICY IMPLICATIONS PROJECT

The Local Policy Implications (LPI) Project--the final work element of the Public Policy Project--is one of three BIP integrating studies (the others are Federal Policy Implications and Implications for the Transportation Disadvantaged). The purpose of this project was to analyze and interpret the findings and conclusions of the six major BIP projects described in the preceding section and to develop public policy implications in the form of practical guidelines for local government officials either considering an investment in rapid rail transit or in the process of designing and constructing a rapid rail transit system.

For this project, a local policy implication can be defined as an improvement in the policy process to enable local officials to make more informed decisions about rapid rail transit development to help achieve local community objectives.

The LPI was intended to answer four major questions as a basis for developing local policy implications of the BART experience:

- . What goals and expectations did local officials have for BART development?

- . What policy actions did local officials take to realize these expectations?
- . What outcome resulted? What was the impact of BART (difference between BART and No-BART Alternative scenario)?¹
- . How does this eventual outcome compare with local officials' expectations? Has BART met local objectives?

The answers to these questions provide the necessary background on the relationship between BART and public policy. Specific local policy implications are developed by asking the following interpretive questions:

- . Were the original local goals and expectations for BART really attainable? Do other communities have similar expectations for transit?
- . If not, could a modification of goals and expectations provide a better basis for local policy decisions related to rail transit?
- . If local expectations are attainable, what improvements in the local policy process can be suggested to help local communities better achieve their objectives for rapid rail transit?

3. PROJECT APPROACH

The approach selected for the LPI project was intended to provide a practical means for assembling and analyzing BART Impact Program findings and conclusions and developing "policy improvements," our definition for local policy implications. This approach required six major analytical and review activities.

- . Local community goals and expectations for BART were identified. Successful completion of this task required an extensive review of documentary evidence (e.g., the Composite Report, other BIP

¹The No-BART Alternative (NBA) has been defined by the Metropolitan Transportation Commission as the transportation system judged most likely to have evolved in the central Bay Area by 1976 had the decision to build BART not been made in 1962. The purpose of the NBA is to provide a realistic estimate of the net effects of BART. A consistent definition of the NBA is being used by all of the projects in the BIP.

reports,² newspaper clippings) as well as interviews with local officials (e.g., mayors, council members, city managers). The product of this task was a summary statement of the community objectives for BART which, in our judgment, were most prominent in the minds of local decision-makers at some point in the BART development process (Exhibit I).

. BART Impact Program findings were analyzed. Findings and conclusions about BART impacts from each of the six major BIP projects were reviewed and those impacts with potential public policy implications were documented.

. BART Impact findings were clustered by community goals. This task integrated the independent efforts of tasks one and two above. Specifically, matrices were used to categorize BART impact findings from various projects according to the related community goal (for example, findings on local traffic congestion as well as highway traffic were organized under the objective of congestion reduction).

. Policy implications for selected community objectives were analyzed. Based on matrices developed in the previous task, nine categories of community objectives were selected (from an original group of 18) to represent most of the BART impact findings. For each objective, a number of tasks were accomplished:

- Relevant public policy literature was reviewed to provide a more informed basis for assessing the potential transferability of BART findings.
- Brainstorming sessions produced a long list of possible public policy improvements.
- These policy improvements were re-searched and refined and the most transferable were included in a draft policy paper.

² Primarily McDonald & Smart, Inc., A History of Key Decisions in the Development of Bay Area Rapid Transit, Document No. DOT-BIP-FR-3-14-75 (Berkeley: Metropolitan Transportation Commission, August, 1975).

EXHIBIT I
Local Policy Implications Project
BAY AREA COMMUNITY OBJECTIVES FOR
THE BART SYSTEM

Local Transportation Policy and Planning

- . Provide an integrated transportation system
- . Reduce vehicular congestion and the need for highway development
- . Improve mobility

Local Land Use Policy and Planning

- . Achieve local land use and development objectives
- . Use rapid transit to expedite other public improvement programs

Local Financial Policy

- . Develop an equitable financing plan for rapid transit construction and operations
- . Promote local government fiscal health

Local Economic Development Policy

- . Encourage regional economic growth and development

Local Environmental Policy

- . Enhance environmental quality through rapid transit development

- . The validity and usefulness of proposed policy improvements were tested. The draft policy papers prepared in the previous task were distributed to approximately 15 local governments, transit districts and regional agencies for comment. This review focused on determining the transferability of BART findings for other local areas.
- . A final report was prepared. Based on feedback from local and regional officials, policy papers were revised and incorporated in this final report.

4. ORGANIZATION OF THIS REPORT

This final report is organized into three major components.

First, the introduction outlines the objectives and approach for the LPI as well as the organization of this report.

Second, detailed implications are presented in five chapters corresponding with five major areas of local policy (transportation, land use, finance, economic development and environment). These five areas were chosen because they represented the most significant areas of local policy within which the BART findings fell. Within each policy chapter, one or more policy papers relating to a specific community objective are included. Each of these policy papers is organized by the original questions asked by the LPI project, namely:

- (1) BART Expectations--describing the original local community goals and expectations for BART, how those expectations may have changed over time and the relationship of objectives for BART with those expressed by other communities now investing in rapid rail transit.
- (2) The BART Experience--detailing specific BART impact findings and conclusions from the six major BIP projects which relate to the specific expectations outlined in section 1.
- (3) Experience Of Other Transit Systems--outlining any applicable evidence from public policy literature or the experience of other transit systems to support the BART findings. This section was added to try to enhance the transferability of BART impact results.

- (4) Policy Implications--suggesting whether community objectives for BART were or were not achieved, whether other communities can ever expect to achieve these expectations and, if so, what improvements in the local policy-making process as well as specific local actions could help local officials achieve their objectives.
- (5) References--including a list of all documentary sources used in preparing the policy paper.

Third, the final chapter outlines overall conclusions of this project including whether BART appears to have achieved its objectives, the role of institutional settings in rapid rail transit development and a time-phased approach for addressing local policy issues related to rapid transit development.

II. LOCAL TRANSPORTATION POLICY AND PLANNING

This chapter presents implications for local transportation policy and planning with respect to rapid rail transit system development. The implications are organized into three sections representing the three major transportation objectives for BART outlined in Chapter I:

- . Integrate various local transportation systems to improve the cost effectiveness of local transit service. Implications include:
 - Institutional arrangements for transit operations
 - Methods for coordinating transit services including schedules, routes, fares and transfers
 - The provision of new local and feeder transit services
- . Reduce vehicular congestion and the need for highway development. Implications include:
 - Pricing and auto restraint policies for transit service areas
 - Parking and traffic management plans
 - Approaches to integrating transit and highway planning
- . Improve accessibility and mobility to employment and for the transportation disadvantaged.

SECTION 1--IMPLICATIONS FOR PROVIDING AN
INTEGRATED TRANSPORTATION SYSTEM

1. BART EXPECTATIONS

Integration of transportation systems refers to the ease with which passengers may move from one system to another and the degree to which transportation services avoid duplication. Transportation planners would call a rail and bus system integrated if transfers between them were easy and if the trips served by the system did not run in parallel. Examples of cases where the planner's concept of integration might be improved are instances where no transfers between bus and rail are possible, where transfer information is lacking and where bus routes paralleling rail could be reduced and rerouted to feed rail.

Attention to the integration of BART with new and existing transit systems was seriously considered only after detailed planning for BART was under way. Stanford Research Institute (SRI) gave attention to transit integration at about the time that the Bay Area Rapid Transit District (BART) was formed in 1957. In a study for the organization which preceded BART, SRI recommended a single regional transit authority with the potential for amalgamating existing transit systems. According to a study in the BART Impact Program, this proposal was not seriously debated (McDonald & Smart, 1975). Only much later, as BART plans became more specific, were major efforts initiated to examine how two major transit operators, Alameda Contra Costa County Transit (AC Transit) and the San Francisco Municipal Railway (MUNI), might integrate services with BART. The first effort was the Northern California Transit Demonstration Project (NCTDP) conducted between 1965 and 1967. The second effort involved two coordination studies, one conducted in 1972, and the other in 1974. These studies generally paid little attention to the private carrier in the area, Greyhound, though there was probably the presumption that much of its service would be curtailed.

The NCTDP and the coordination studies of the early 1970's raised specific expectations about integration of BART with the services of AC Transit and MUNI. For example, the NCTDP project recommended modification and abandonment of 30 AC Transit routes in anticipation of BART. Similar recommendations were made for MUNI. The later coordination studies again recommended various route abandonments, rerouting, transfer and fare modifications.

Another important expectation about BART and the transit integration was that new feeder services in the outlying areas of Alameda and Contra Costa Counties might develop to connect to BART,

though later engineering studies were skeptical on this point. In 1966, BART planners thought bus transit would capture 15% of the trips connecting with BART in outlying areas (Quinby, 1966). At the time, these were areas largely without transit and there was no specific plan for how to provide the service, only the hope that BART would somehow be an impetus for feeder service.¹ By 1972, consultants examining possible transit systems in Contra Costa County doubted transit could compete with the auto as a feeder (Schmidt, 1972). Thus, early expectations on the possibility of feeders springing up to serve BART changed from optimistic to pessimistic as BART approached an operational phase.

2. THE BART EXPERIENCE

(1) BART-Related Changes In The Route, Schedule And Transfer Policies Of Existing Transit Operators Were Less Than Planners Had Expected

The interaction of BART with MUNI and AC Transit did bring about certain transfer policies and had some impact on routing. In addition, BART probably had some influence on the fare system of one operator (AC Transit), but has had an uncertain effect on the personnel policies of these operators.

BART agreed with AC Transit and MUNI, after several years of meetings and negotiations, on an interim transfer system. The system involves a free transfer one-way from BART for AC Transit and a two-way, two-part transfer ticket for MUNI (Booz, Allen & Hamilton Inc., 1977).

Both AC Transit and MUNI made several alterations in existing routes to connect with BART (Peat, Marwick, Mitchell & Co., 1977). However, only one parallel AC Transit line was abandoned and AC Transit weekday bus miles on transbay lines were cut back 15% as a result of BART. Greyhound, on the other hand, reduced transbay service by 80%. After BART began operations, AC Transit and MUNI found line-haul ridership losses due to BART were eventually offset by use of local buses to get to and from BART.

¹In the Northern California Transit Demonstration Project study, specific feeder routes were proposed for communities in Contra Costa County, southern Alameda County and northern San Mateo County. No operator or funding source was specified. However, three possibilities were implied: AC Transit, existing carriers (presumably Greyhound or Peerless Stages) or local service (Simpson & Curtin, 1967).

Another BART Impact Program study examined BART's effects on fares and labor policies. Fare policies were unaffected, except that AC Transit probably abandoned its zone fare system partially in response to BART. Labor policies, wages and benefits at AC Transit and MUNI appear to have little relationship to policies at BART (Booz, Allen & Hamilton Inc., 1977).

(2) BART Had Only A Small, If Any, Effect On Plans For New Transit Systems In Outlying Areas

A comparison of new transit services feeding BART with other new systems in the State of California suggests BART was not a major cause of new system development. Analysis of the public vote and positions pro and con underlying new transit in Fremont suggests BART was not crucial to the approval of this transit system, nor was BART crucial in the failure to develop new local transit service in Contra Costa County (Booz, Allen & Hamilton Inc., 1977). Transit in these outlying areas does serve BART stations, suggesting the presence of BART is an important connection for new systems. However, the majority of service (BART express bus service) is actually funded by BART.

(3) Reasons For The Lack Of Expected BART-Related Changes In Local Transit Are Largely Institutional And Political

Routes and service levels of existing systems were not changed as proposed in early studies mainly because operators of existing transit and BART disagreed on optimum routing policy (Booz, Allen & Hamilton Inc., 1977). Study projections on ridership and mode shift were viewed with skepticism by operators because there was little experience upon which to base projections, as well as a general distrust for the planning process used to determine appropriate system coordination. Also, no outside interests or the press took an active role for or against either party, and no compromises were discussed on the important issue of how to protect the revenues and patronage of existing transit should it lose patronage by complying with rerouting plans. Further, the development of new transit systems near BART in outlying areas appears more related to Federal and State subsidies than BART. Other reasons for the development of these new systems have to do more with the nature of local rather than feeder service. Successful development appears to hinge primarily on the amount and cost of service to and from local destinations.

(4) The Decision To Provide Duplicating Transit Services Depends On The Relative Efficiency Of Different Modes

Since AC Transit and MUNI have not done the extensive rerouting called for before BART was completed, it is important to know whether or not duplicating services among the systems have resulted since BART began. Many planners claim there is duplication; for example, AC Transit still runs many transbay lines paralleling BART. Yet, AC Transit transbay line frequencies were cut back as patronage was lost to BART, from 59,000 to 43,000 trips per day, a 27% decline (Peat, Marwick, Mitchell & Co., 1977). Ridership increased slightly in 1976 and has decreased since. BART, on its own merits, did not remove what appears to be a duplicate service. Should this service be removed in the name of reducing duplication?

Discussions of whether more AC Transit transbay service should be curtailed hinge on efficiency considerations. Those who argue for more curtailment claim BART is more efficient than buses carrying passengers for long line haul trips, e.g., transbay routes, and that curtailed bus service should be diverted to feeding BART, where it carries passengers most efficiently.

However, it is not yet clear that rapid rail, in combination with feeder buses, is more efficient in many corridors (including the Bay Bridge) than buses alone. There is loud controversy on the subject of which mode is most cost effective at which levels of patronage. It is not the purpose of this analysis to try to resolve the controversy. However, it is important to point to one study comparing the full costs of BART for a long haul peak hour trip, starting with bus feeder and ending in a short walk. The analysis shows the same trip on bus alone would cost less (Keeler et al., 1975). The full cost of a peak hour trip from Orinda to Montgomery Street in San Francisco is estimated to be \$6.77 by BART and \$3.21 by bus at current passenger volumes of about 8,000 persons per hour. Only as trip volumes on BART and buses approach 20,000 to 30,000 passengers per hour (as might be true when BART achieves normal operations) do the respective costs of the long haul trips to even approach one another, on the order of \$4.00 to \$5.00 for the bus and \$6.00 for BART plus feeder bus.

Study results are indicative of the cost relationship between BART and bus transit, but should be used with caution in that the assumptions used in the study have been severely criticized by BART. Further, the results depend on the definition of full cost which is subject to some controversial assumptions. These costs include monetary outlays, including operating maintenance and capital costs subject to interest rates; travel time expenditures including costs of wait, transfer and travel times, and social costs associated with each mode, such as the cost of pollution.

3. EXPERIENCE OF OTHER TRANSIT SYSTEMS

Whatever the rationale for integrating bus with rail systems, or selecting only bus, experience in other metropolitan areas suggests integration is rarely achieved to the satisfaction of transportation analysts and planners in cases where separate agencies provide their own transit services. The Lindenwold rail line to Philadelphia, when first opened, had no transfer system with the existing bus service; parallel bus lines were not abandoned; and little feeder bus service existed. On Chicago's Skokie Swift rapid rail system, one parallel bus route was altered to provide feeder services, but other nearby routes were not altered. In both cases, separate agencies operated transit service. Yet in Canadian cities, where a single agency operates both rail and bus service, route and transfer changes are made more easily (Pratt, 1971). In Toronto and Montreal, bus services were extensively rerouted to the new rail system, so much so, in fact, that some parallel lines had to be reinstated after abandonment when the rail system became overcrowded. These experiences suggest that the institutional arrangement between rail and bus operators is an important determinant to the ease of integration.

There are several available options in cases where decision-makers are considering new institutional arrangements between rail and bus providers to create improved integration. Three commonly employed options (Homburger, 1970), in addition to the most obvious --merger--are:

- . Tariff associations specifying by contract the distribution of jointly collected revenues. This is suitable where parties do not compete but make end-to-end connections. Example: single airline tickets covering different companies.
- . Transit communities bound by tariff which pool or exchange rolling stock. Example: U.S. railroads.

. Transit federations by which a new federated agency is created with power to plan and distribute revenues by negotiated formula. Example: Hamburg transit federation.

While merger or other institutional measures may ease integration (and possibly bring certain economies of scale), any institutional arrangement approaching a monopoly risks well known inefficiencies and slow responsiveness and would be extremely difficult to implement in an area such as the Bay Area with a strong tradition of independent operators. Of course, many cities have already opted for public monopolies to provide transit service. Yet, there are cities with rapid transit systems and bus companies where a multiplicity of public and private agencies still exists. Where this is the case, the literature suggests (Schemmer, 1976) that it may be possible to keep such diversity, even foster competition among private providers where they exist, and still obtain specified transfer and routing schemes. A study of transit service for cities in Connecticut suggests it may be feasible for a public agency to set ceiling fares, schedules and transfer policies (presumably with integration in mind) while encouraging separate bus companies to enter the market, bid and compete for certain route service. In such a case--operational in Sao Paulo, Brazil--it may be possible to gain integration without monopoly inefficiencies.

4. POLICY IMPLICATIONS

The experience of BART and other transit systems suggests that effective integration of transit service is difficult, but not impossible to achieve. The degree of integration achieved will primarily depend on institutional arrangements and cooperation, and secondarily depend on specific incentives to reduce the risk of changing existing or creating new transit service.

Cities planning for or already operating rail systems have a variety of institutional arrangements for providing bus and rail service. Thus, policy implications will differ by city. Some cities planning and building rapid rail systems already control or plan to control local bus systems, thereby minimizing the political problems of devising route alteration and transfer policies. Examples include Baltimore, Atlanta, Dade County, Washington D.C., Los Angeles and San Diego. However, there are many cities already with rapid transit systems and bus companies where a multiplicity of public and private agencies provide rail and/or bus services. New York, Chicago, Philadelphia, Boston and Cleveland are examples (Homburger, 1970).

(1) Integrating Rail And Bus Systems Will Require Formal Or Informal Institutional Arrangements That Promote Coordination

Where separate agencies provide rail and transit service, it is unlikely coordination studies prior to rail startup will alone result in agreement in route changes and transfer schemes. In this situation, the BART experience suggests compromise will evolve only if decision-makers interact on what proved to be a major stumbling block--ways to protect the revenues and jobs of existing bus operators after rail start-up. One possible way around this problem would be to compensate bus operators, perhaps through a federally sponsored demonstration, during some period after rail service starts. This would allow for some experimentation with bus route alignments. Based on the BART experience, it should be possible to evolve route alignments which maintain the patronage of existing bus systems.

Experience in other areas of transportation indicates it may also be possible to bring together services of separate agencies by changing institutional arrangements directly. In addition to merger, other organizational options are tariff associations, transit communities and transit federations. A group of private agencies providing some portion of the service, route-by-route bids for service under a public agency, is another option. This approach offers the promise of avoiding the inefficiencies associated with institutional arrangements approaching monopoly.

(2) In Plans For The Integration Of Bus And Rail Service, More Line Haul Bus Service May Be Warranted Than Is Commonly Supposed

The BART experience shows it is both politically and analytically difficult to arrive at the planner's conception of integration. Transit operators were most skeptical of predictions about the effects and merits of rerouting bus transit to accommodate rail. Analytically, it proved difficult to justify the drastic curtailing of line haul bus service and rerouting for feeder purposes. After BART startup, patronage declined on parallel bus lines, but not enough in the case of one public operator to make it politically easy to further curtail service. It has also been difficult to show analytically that there should be more replacement of bus service paralleling BART for feeder services. In fact, one recent controversial study (Keeler, et al.,

1975) has suggested society would be better off with buses serving entire long haul trips, instead of BART and feeder bus, at least until travel volumes reach over 20,000 to 30,000 passengers per hour.

Cities planning rapid rail should be most cautious about integration proposals, whether or not there are institutional and political hurdles to these proposals. It may be that rapid rail with feeder bus is justified in only very heavily traveled corridors. There is enough doubt on the most effective approach to argue for incremental development--start rapid rail only in high demand corridors, and extend only after demand on these routes meets expectations and expansion can be justified. Although a large system may be required to generate sufficient demand to justify rapid rail, it is not clear if and when BART (a large system) will gain sufficient demand along various routes to justify its cost compared to that of buses.³

(3) The Presence Of Rapid Rail In Suburban Communities Without Transit Will Probably Not Be Sufficient To Create Local Feeder Service

Planners originally hoped that BART would spawn local feeder transit service in outlying areas where it previously did not exist. Although some new feeder bus service has been initiated, it was mainly for reasons other than BART. While BART played a role in some local debates about transit, it appears the success or failure of proposals for new local service hinged on factors largely unrelated to BART. If rail feeder service is desired in outlying areas, local officials will have to take deliberate measures to create it, as well as ensure adequate funding, probably in the form of a subsidy.

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SECTION 2--IMPLICATIONS FOR REDUCING VEHICULAR CONGESTION
AND THE NEED FOR HIGHWAY DEVELOPMENT

1. BART EXPECTATIONS

Early BART planners and advocates expected BART to reduce congestion and highway capacity requirements that were projected for the Bay Area in the absence of rapid rail. In fact, congestion reduction was a primary, if not the primary, purpose of the BART system as presented to the public prior to the 1962 bond issue election. In a report to the 1956 San Francisco Bay Area Rapid Transit Commission, consultant engineers with Parsons, Brinkerhoff, Hall & MacDonald (PBHM) foresaw future traffic problems as "staggering" with the projected population increases of 50% in the 15 years subsequent to 1956 (Parsons, Brinkerhoff, Hall & Macdonald, 1956). Discussions among legislators instrumental in forming the BART Commission often stressed traffic problems. Newspaper editorials expressed hope for congestion relief as a result of BART.¹

Along with reduced congestion, though not as explicitly, came the belief that increasing road capacity to meet traffic demands was not feasible or worthwhile or both. This assertion appeared most explicitly in the PBHM report to the BART Commission in 1956. Here, highway expansion was rejected as a means for congestion relief because meeting peak hour requirements was not economically feasible.

BART planners also expected some additional traffic to and from parking lots at stations, but did not anticipate any severe congestion or accidents associated with this traffic. About 36,000 parking spaces were originally planned for BART parking lots, under the assumption that many patrons would drive to and from stations. However, only 18,000 spaces were built in order to reduce development costs and, in some cases, to respond to the objections of cities concerned with preserving neighborhoods, although about 2,200 additional spaces have been constructed since.

¹For example, Oakland Tribune Editorial, June 17, 1959.

2. THE BART EXPERIENCE

(1) BART Has Had Only A Small Impact On Traffic Congestion On Streets And Highways In Its Service Area

The effects of BART on congestion have been examined most closely on the Bay Bridge, the main corridor connecting Oakland and San Francisco. Here, BART ridership surveys indicate BART removed about 7,000 vehicles from daily bridge traffic by attracting people from their cars. Another 2,000 vehicles per day were removed by increases in gasoline prices at about the time BART began transbay service. The latter estimate comes from observed reductions in auto use on the other Bay Area bridges without parallel BART lines. Therefore, the total estimated reduction expected on the bridge after BART opened Transbay Tube service was 9,000 vehicles per day. In fact, the observed reduction was only 3,000 to 4,000. The conclusion of analysts studying the result is that the difference, 5,000 to 6,000 vehicles per day, represents trips previously not taken, so-called "induced" trips. While BART reduced some auto trips, it apparently encouraged others. On net, it reduced traffic by 3,000 to 4,000 vehicles per day in each direction. The reduction represents only between one and two years of normal growth in bridge traffic (2,000 vehicles per day in each direction or about 4% of total traffic), too small an impact to significantly affect congestion. Further, bridge traffic has now increased beyond pre-BART levels.

(2) BART Has Caused No Apparent Reductions In Highway Development In The Bay Area

The effect of BART on the development of highways is likewise small. A study of BART's role in major abandonments or "unadoption" of highway plans in the Bay Area, including the proposed Southern Crossing Bridge, shows BART was not a crucial factor in the abandonment process (Booz, Allen & Hamilton Inc., 1977). In public debates about the Southern Crossing, a transbay bridge plan defeated by public vote in 1972, plan opponents argued that BART should be given a chance before another bridge over the Bay was built. However, other arguments against the bridge figured prominently in debates and the voter return by county bears no relationship to proximity to BART. In other cases, where BART joined or crossed state highways, original plans for road capacity were never altered. BART's impact was merely to speed up or slow down plans, not to alter their basic character.

(3) BART Has Caused Some Slight Increases In Local Parking And Traffic Congestion

While BART has caused some slight reduction in Bay Bridge traffic, it has also increased local traffic congestion in some station areas because of the increased number of automobiles traveling to the station. In a few suburban station areas, BART-related traffic has caused some local congestion and a small increase in accident frequency. The most notable safety problem has been in Daly City where heavy commuter traffic and parking is concentrated along two-lane residential streets. A large percentage of residents surveyed near the Daly City and Concord stations expressed serious concerns about BART's effects on traffic congestion. Residents in other suburban areas were less concerned or indifferent to congestion caused by BART (Gruen Associates and DeLew, Cather & Company, 1977).

Heavy on-street parking in neighborhoods near BART stations is also a severe problem at 7 of the 34 stations. On-street parking is the result of a BART parking lot filled to capacity or the lack of any available BART parking facilities near a station. Parking overflow tends to be worst at terminal stations (except Richmond) and somewhat less severe at other outlying stations. In these areas, particularly Daly City and Concord, residents were more unhappy about parking overflow than with any other effect of BART. Residents complain that BART-related on-street parking limits parking availability for daytime guests and often blocks their access to some places in the neighborhood. BART has made some effort to expand parking lot facilities where feasible, such as sponsoring the construction of a parking garage at the Daly City station funded by Federal capital grants with some local matching funds.

(4) Reasons For BART's Limited Impact On Congestion And Road Building Relate, In Part, To The Local And State Political Processes

The causes of these minimal impacts of BART on congestion and road building are several.

- . BART may have induced some auto travel at the same time it diverted other trips. Experience suggests that any means of freeing up road capacity not accompanied by restrictions in new auto trips will usually induce new trips and only temporarily alleviate congestion.

- . Research into the interaction of BART and CALTRANS, the California state highway agency, shows the main causes of cutbacks in highway plans in the Bay Area are the same as those for other areas in the state--markedly higher costs and increasing political resistance to highway building. BART simply has not been a factor in this overall trend.
- . Where BART and CALTRANS interacted over joint use of rights-of way, it appears CALTRANS generally got the facilities it had planned sooner or later than what would have occurred without BART. CALTRANS also obtained most of its preferences on issues of cost sharing, compensation for delayed plans, slope and landscape maintenance, protections for motorists and other points spelled out in agreements between the agencies. Reasons for CALTRANS obtaining its preferences have to do with legal restrictions on gas tax funds at the time of joint use developments; the inactivity of outside interests, including the press, on agency negotiations; and the skill and perceptions of the respective negotiators and their use of legal resources.

3. EXPERIENCE OF OTHER TRANSIT SYSTEMS

(1) Transit Alone Is Unlikely To Noticeably Reduce And May Actually Increase Automobile Congestion On Streets And Highways

Studies of other transit systems outside the Bay Area generally support the conclusion that rapid rail systems cannot be expected to significantly reduce congestion, at least for long:

- . The effect of the Chicago Skokie Swift on its rival highway, the Edens-Kennedy Expressway, was to divert about 1,000 vehicles per day. The line was evaluated by the Chicago Area Transportation Study, which concluded: "The auto trips diverted ... are negligible" (Chicago Transit Authority, 1968).

- . The Cleveland rapid rail extension to the airport opened in 1968 and has been estimated to remove, at most, 7,000 private cars and taxi trips per day to the airport. The diversion of vehicles on a parallel freeway might reduce the running time of autos to the airport by 30 seconds (Wohl, 1972).
- . In Boston, the Massachusetts Bay Transportation Authority's rapid transit system into Quincy has been evaluated. The Quincy line was opened in 1971 and impacts on parallel highway traffic were monitored by the State Department of Public Works. The principal parallel facility, the Southeast Expressway, demonstrated a diversion to transit of under 1,000 vehicles per day, compared to 80,000 to 120,000 vehicles in normal service (Metropolitan Area Planning Council, 1973).

Experience with rapid rail systems elsewhere suggests some increase in traffic congestion around rail stations is not unique to BART. In the case of the Washington METRO, citizen objections to parking lot plans have reduced the number of spaces built in rapid transit station parking lots. Partly as a result of this situation, the public is now concerned about increased levels of on-street parking near METRO stations. The single parking lot on the Red Line fills to capacity before 7 a.m. each weekday morning. A daily parking fee of \$1.00 has not reduced demand significantly. Planners of the Atlanta MARTA system anticipate parking overflow will also be a problem. The Lindenwold line experienced sufficient demand for parking lots to cause planners and managers to significantly increase lot capacity at some outlying stations.²

Because reduction of highway or street congestion is often a goal of not only rail but other transit systems, it is useful to briefly examine some cases where congestion has and has not been alleviated by transit. Unfortunately, there are few examples of transit developments with significant and or lasting impacts on

²Based on interviews with planners at WMATA (Washington, D.C.) and MARTA (Atlanta), October, 1977.

congestion. Experience with the increase of fixed route bus service indicates generally small reductions in auto use as a result. For example:

- . In Los Angeles, experience with increasing the bus fleet indicates that tripling the number of buses and cutting fares in half might reduce auto vehicle miles travelled by less than 10% (Mikolowski et al., 1974).
- . Dial-a-ride, a door-to-door transit service, typically generates no more than 10 demands per square mile per hour with 25% or less of the riders shifting from autos (Higgins, 1976).
- . Busway experience shows few riders diverted from autos, generally less than 20%, and many passengers making new trips (R.H. Pratt and Associates, 1973).
- . Fare cuts on transit reduce some auto trips, but experience shows cuts of 10% generally reduce auto trip-making by only 1.4%, all else held constant (Charles Rivers Associates, 1968).
- . Even around guideway systems like Group Rapid Transit (small vehicles running at short headways on a network of guideways, including off line stations) are expected to divert less than 10% of auto trips in cities where analyzed, including San Diego, Los Angeles and Santa Clara County, California, and Minneapolis-St. Paul, Minnesota (Higgins, 1975).

(2) Transit, Accompanied By Disincentives To Automobile Use, Has Been More Effective In Reducing Congestion Than Transit Alone

Current literature suggests that transit diverts more auto trips when it is combined with disincentives to auto travel. For example:

- . Experience with changes in bridge tolls in the range of 10¢ to 35¢ shows small impacts on traffic (5%

to 10%) without a travel alternative, but larger impacts (15% to 25%) when a good travel alternative exists (Kirby, 1974).

- . Transit in Singapore had little impact on traffic until a road pricing scheme was combined with it. Road pricing takes the form of a priced permit required for entering the downtown during the morning peak. Then, a 46% reduction in traffic occurred (Watson, 1976).
- . A similar situation prevailed in Gothenburg, Sweden, until physical restraints on auto traffic were introduced--so called traffic cells--which reduced traffic by as much as 70% on some streets (Curt Elmberg, 1975).

Parking pricing policies combined with transit expansion might also reduce congestion, though only small impacts can be expected in many cities because:

- . From one to two-thirds of all peak hour traffic passes through most downtowns, thereby escaping parking charges.
- . About 75% of persons driving to work in this country have parking provided by private employers, thereby limiting the effectiveness of price changes in municipal lots (Sverd, 1973).
- . Revenue or space taxes on private lots do not guarantee that charges will be passed along to parkers in relation to periods of the most congestion.

Where restraints on auto use combined with transit are politically feasible to examine, pricing options have some advantages worth considering. Unlike physical restraints, e.g., traffic cells, parking bans and auto free zones, pricing has a fine tuning advantage because it can be adjusted by degree of restraint, time of application and even vehicle occupancy. Also, pricing generates revenues which can be used to support a transit alternative.

In the past, pricing mechanisms of this kind have generally been unacceptable politically to local officials. However, a combination of factors might increase the likelihood of implementing such a proposal in the future.

- . Congestion in most urban areas continues to grow and pricing appears to be one of the few effective means for relieving congestion.
- . Fiscal constraints at all levels of government and the rapidly increasing cost of highway and transit capacity expansion will make expansion of transportation capacity much more difficult.
- . Rigorous guidelines set forth in the Federal Clean Air Act will require some dramatic local actions, many otherwise politically unacceptable, to achieve compliance. Pricing schemes to reduce automobile use would be a possible approach.

Further, experience with the control of traffic and parking intruding on neighborhoods suggest permit programs may alleviate the problem. Several cities use preferential parking systems to restrict parking in residential neighborhoods. This practice has been upheld by the United States Supreme Court. Reportedly, preferential parking has protected some neighborhoods, but at the risk of relocating parking problems elsewhere.³

³In California, the cities of Pasadena, Inglewood and Hermosa Beach have employed residential permit programs for several years. City staff report much parking is relocated to whatever streets or lots are available outside the permit zone. Interviews with Pasadena City Attorney, Inglewood Assistant City Attorney and Hermosa Beach Planning Director, March, 1977.

4. POLICY IMPLICATIONS

Experience with BART and other rapid rail systems suggests several lessons for decision-makers contemplating rail development.

- . Decision-makers should not look to rapid rail alone to significantly or permanently reduce congestion. Thus, where plans for rapid rail hinge primarily on the goal of congestion relief, other options should be seriously considered. Where commitments to rapid rail have already been made, certain auto restraint policies--including pricing policies, if feasible--should be considered to accompany rail development.
 - . Rapid rail systems can create traffic and parking problems around stations, particularly in outlying suburban areas. Small parking charges will probably not alleviate this problem. Preferential permit programs may help, but must be sufficiently broad to not simply relocate the problem.
 - . The BART experience shows rapid rail systems do not automatically reduce the amount of highway construction. Why this is so depends very much on factors particular to the relationship of BART to the State Highway Department, CALTRANS, and may or may not apply to other areas. Nevertheless, joint use of highway right-of-way is a possible result of interactions between rail and highway agencies and may deserve careful monitoring on the part of regional agencies.
- (1) Policies To Reduce Highway Congestion Should Include Attention To Combining Transit Expansion With Auto Restraints

Rapid rail systems alone cannot be expected to significantly reduce congestion. Therefore, decision-makers and planners must seriously consider what goals, other than congestion relief, the planned system is to meet and whether rapid rail is the best way to achieve them. If relieving congestion is a primary objective, much evidence suggests developing transit capacity, rail and otherwise, will have small impacts on congestion. A more effective approach is combining transit expansion with measures which control demand for auto use.

Some of the most effective ways to restrain auto use in combination with transit development include pricing mechanisms. These can be fine tuned to the problem zone, period and driver and generate revenues for transit. Examples include:

- . Where rapid rail parallels bridges or highways and, together, comprises the main or only alternative means of travel in a corridor, peak pricing of road use combined with transit expansion will probably increase rail utilization and reduce congestion. Peak pricing can also be adjusted to deal with latent demand for auto travel, should it develop.
- . Parking pricing combined with transit expansion might also be effective, if one or more of several conditions are met:
 - A city might increase parking prices, particularly for long term parkers, in municipal lots if municipal spaces comprise a large percentage of total parking space and if the bulk of peak traffic is not through traffic.
 - Where private lots are predominant, space or revenue taxes may not be effective against congestion since there is no guarantee price increases will be passed along to parkers in ways related to the periods of most congestion. One way to ensure the price does fall on peak period drivers is to require priced permits on vehicles parked in all lots within a congested zone during peak periods.

Although these approaches are likely to reduce congestion, they are generally not acceptable politically. Therefore, it is unlikely anything can be done unless congestion problems are severe and public attention is high or such a program is mandated by a higher level of government.

(2) Planning To Cope With Traffic And Parking Problems Around Stations Should Primarily Include Attention To Land Acquisition And Preferential Parking

Parking planning policies for rail systems should vary by area. Experience with BART and other rapid rail systems suggests some specific policy choices which may be appropriate.

- . For suburban areas--If stations are constructed away from residential development, large parking lots encouraging extensive access by automobile will limit adverse environmental impacts.
- . For urban areas--Experience suggests that parking facilities at transit stations should be limited or not provided at all. Concurrently, parking restrictions and provision of feeder transit are necessary to minimize adverse impacts on neighborhoods and downtown areas.

Despite the best comprehensive planning and projections for system access, traffic and parking impacts are not likely to conform exactly to anticipated impacts. Therefore, it is important to develop effective contingency plans to account for any discrepancies. Specific policy measures in the area of parking include:

- . Land Acquisition--If feasible, land in excess of what is projected for parking lot use can be acquired at the time of initial system construction. This policy would allow later expansion of parking facility capacity with minimal difficulty. Excess land can always be attractively landscaped to try to improve the visual appearance of the parking facility. Such land can also be made available for transit-related joint development

at a later date if parking demand does not increase. This policy is reasonable only when dislocation of existing residents is minimal or not required and local officials concur.

- . Preferential Parking--In neighborhoods where rapid transit-related on-street parking is expected, parking policies can be established to restrict daytime commuter parking in the neighborhoods. A local jurisdiction would provide special parking permits to residents for a fee and limit all other parking in the neighborhood to a short time period, such as two hours. However, caution is needed to make the permit area sufficiently large so as not to simply shift the parking problem to another neighborhood.
- . Pricing--Parking fees will probably have a limited effect on reducing adverse parking impacts of rapid transit. In fact, the use of a charge for rapid transit parking lots may increase on-street parking in surrounding neighborhoods unless street parking restrictions have been implemented. The experience in Washington shows that a fee (in this case \$1 per day) to park in a suburban parking lot will have little or no effect on the level of parking.
- . Other Parking Restrictions--Local governments have a number of options for restricting parking in residential as well as commercial areas. Some examples are metering, time limitations, parking bans, all of which would eliminate all-day parking.

Specific policy measures in the area of traffic control include:

- . Streets--Specific alternatives include street widening or other reconstruction, changes in location and number of turning lanes, striping and creation of one-way streets.
- . Speed--Speed limit increases or decreases can result in noticeable changes in traffic flow and congestion.

(3) Policy Planning For Highway And Rapid Rail Development Should Pay Particular Attention To Joint Use Of Highway Right-Of-Way

The BART experience shows that, organizationally or as a physical system, rapid rail systems probably cannot be expected to significantly curtail plans for road construction. This lesson may or may not apply in other states and areas depending on the status of highway plans, their funding, legal constraints and the skills and resources of highway and rail negotiators.

However, as in the case of BART, other communities can influence the design, cost and obligations associated with joint use rights-of-way by entering into agreements with State Highway Departments. Because of the natural tendency of highway and transit agencies to negotiate joint use based on their perspectives and resources, it is a possibility that these agencies will develop an amount and character of joint use which are not optimal from a broad cost/benefit standpoint. For example, more lanes or more elaborate highway facilities might result from joint use negotiations than would have resulted without rail plans. One way to counteract this possibility is for a regional agency to evaluate joint use alternatives from the standpoint of costs and benefits to the entire region. The BART experience suggests the agency pay particular attention to proposed agreements which:

- . Compensate state highways for delayed plans.
- . Modify and accelerate plans for highway development.
- . Protect motorists and the state from accidents or right-of-way abandonments.
- . Allocate responsibilities for slope and landscape maintenance.

- . Arrange for purchase of right-of-way for transit and highways at later dates.

Joint development of highway facilities to include transit use can be a viable strategy for reducing overall transportation development costs and minimizing environmental disruption. However, planners should recognize that accessibility improvements within the region may not generally be as high as if new transportation rights-of-way are opened.

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SECTION 3--IMPLICATIONS FOR IMPROVING MOBILITY

1. BART EXPECTATIONS

As one transportation analyst has remarked, "One of the most frequently used but least well-defined concepts is that of mobility" (Popper, 1976). In transportation literature, one measure of mobility is the trip generation rate (Zahavi, 1974; also Hoel, 1968). With this measure, zones, households or income groups are commonly assessed for their "mobility" relative to some ideal trip generation rate. Another common measure of mobility (sometimes called accessibility) includes travel times and costs to certain opportunities or amenities, such as employment, shopping or recreation facilities (Sweek, 1970; also Wickstrom, 1971). Both approaches often preface evaluations of alternative transit systems, in which various locations and types of systems are weighed for the amount and travel time of trips by purpose, area, or user groups. Recently, the user groups of the most interest have included the elderly, low income and handicapped.

Early plans for BART indicate considerable expectations about increasing the mobility of Bay Area residents relative to travel patterns without BART. BART was expected to "increase the mobility and job potentials of workers, ... greatly expand the shopping, entertainment and cultural availabilities open to Bay Area residents in the 1970's and 1980's, ... the convenience (of BART) will appeal to elderly persons, ... provide improved transportation for those without an automobile, ..." (Van Beuren Stanberry, 1962). When increases and improvements in mobility were projected, they were in relation to existing and projected mobility without BART.

While general mobility was to be enhanced by BART, attention to the handicapped did not arise until well after initial design. Handicapped using wheelchairs were specifically excluded in circulation design at stations. Only after action by the California Legislature in 1969 was access to BART required for the handicapped.

2. THE BART EXPERIENCE

This section examines the mobility and accessibility impacts of BART by analyzing the volume and character of trips served by the system. Presented are total ridership, the source of patronage, the patterns of trips to certain destinations and the usage by certain groups.

(1) BART Has Caused Increases In Both Auto And Transit Mobility By Increasing The Capacity Of The Total Transportation System

To meet the goal of increasing mobility, BART needed to attract as much ridership as possible. However, BART has not met predicted patronage levels. According to 1962 estimates, about 260,000 daily passengers were expected to ride BART in 1975. In fact, average weekday trips were about 130,000 in 1976, roughly 50% of the forecast.

The source of ridership is as important to increasing mobility as the level of ridership. If, as is common, mobility is defined as an increase in total trips generated in an area, then BART has increased mobility somewhat. A 1976 BART passenger survey shows 72% of trips made are not new, but previously made by auto, transit or other mode (BART, 1976). The remaining 28% of trips were not made before BART, but not all of these new trips were created by BART. The survey shows of 18,300 new trips, 12,800 were made because the trip-maker's residence or job location changed. Only 1,600 of the trips were not made before because convenient transportation was not available. Thus, by the total trip generation definition of mobility, 8.8% of the new trips are attributable to BART or less than 3% of the total BART trips, new and old.

Aside from effective total transit trip-making, BART has influenced auto trip-making, thereby indirectly increasing total trip mobility. Taking the daily transbay vehicle trips, a BART Impact Program study indicates that the slight lessening of auto traffic due to BART has induced trips previously suppressed by traffic levels. It is not known whether these induced trips are totally new, or diverted from other destinations and routes. Assuming these are new person-trips by auto and adding them to the new transit person-trips previously discussed, it is estimated that perhaps 10,000 daily person-trips transbay in each direction represent total additional trip-making attributable to BART (Peat, Marwick, Mitchell & Co., 1977). This maximum contribution by BART to mobility transbay is equivalent to about three years of normal growth in total transbay trip-making by all modes.¹

¹About 3,200 trips per day by all modes represent the annual increase in transbay travel (Peat, Marwick, Mitchell & Co., 1977, p. 118). This should not be confused with growth in vehicular traffic which, as previously noted, amounts to an annual increase of about 2,000 vehicles per day in each direction.

Taking the definition of mobility as a measure of access to certain opportunities and amenities--such as employment, shopping, etc.--BART's impact has been somewhat greater than what could have been expected without BART. An analysis comparing transit travel times on the present transit system including BART with travel time on a bus system likely to have been in place without BART shows potential improvements with BART in peak and off peak travel time to selected major destinations. The improvements average 20% (8.7 minutes) for peak period trips from all parts of the region to employment destinations in San Francisco, Oakland, Richmond, Fremont and other cities. For shopping areas, improvements in travel times off peak average 8% (2.0 minutes)² (Blayney and Dornbusch, 1977). For cases where travel times are improved, costs to riders are from 12% to 30% greater than in the bus alternative.

(2) BART Has Had Varying Impacts On Mobility For Different Communities And Different User Groups

The measures of mobility discussed above vary considerably by area and user group. Looking first to areas, a BART Impact Program study (Blayney and Dornbusch, 1977) shows transit travel time reductions referred to in the previous paragraph range from 3% to 18% (1.3 to 7.6 minutes) for work trips to San Francisco, Oakland, Richmond, San Francisco Mission district and Berkeley, with savings of 28% to 32% (23.5 to 24.8 minutes) for trips to east Oakland and Fremont, respectively. For shopping trips to selected destinations, savings range from 1.5% to 12.5% (0.5 to 4.5 minutes). When trips from selected residential areas to other destinations are analyzed (e.g., El Cerrito, Fremont, Richmond, Walnut Creek), work trip surveys average 10% (5.1 minutes) and shopping trips 8.7% (3.4 minutes).

²These trips represent mobility gains defined by the BART Impact Program (BIP). In this program, travel times are weighted to reflect actual travel patterns in the Bay Area. These times are not accessibility measures as defined by the BIP, where all origins and destinations are unweighted by actual travel patterns.

Looking next at the patrons of BART, the findings about use and increased mobility are mixed (Peat, Marwick, Mitchell & Co., September 1977). Looking at BART ridership as a whole, there are less riders under 18 and over 45, less minorities and less low income people than their proportion in the population. There are more riders 18 to 45 and more male riders than in their proportion of the population. There are less physically handicapped as well. Generally, these findings suggest BART is used primarily by the suburban commuter.⁴

However, mobility is also associated with new trips attributable to BART and, on this measure, the young, old and minorities benefit in greater proportion than other users. The total volume of new BART trips attributable just to BART is not large--about 1,600 of 18,300 new trips, or 8.7% of new trips, and less than 3% of total trips. However, of the new trips on BART made by different age and racial groups, it is the young (16 to 24), old (over 55) and minorities (Blacks, Spanish Americans) who most often make these trips because there was no previous means of transportation. For example, 24.9% of those over 65 taking new trips on BART do so because no previous means of transportation was available, whereas only 5.7% of those 25 to 34 taking a new trip on BART give this reason. The same is true of minorities. Thus, new trips attributable to BART--not a job or residence change--are made by minorities and the elderly more in proportion to their makeup in the Bay Area population than are trips on BART taken as a whole.

(3) Characteristics Of The BART System Are The Primary Reasons For BART's Limited Impact On Mobility

There are many, varied reasons for BART's impacts on total ridership, new trips, auto trips and access to opportunities by area and user group.

- . There are several causes for the shortfall in overall ridership and new trips compared to early projections and hopes:

⁴ Another BART Impact Program project suggests the same finding, i.e., that the peak commuter has enjoyed more mobility than off-peak travelers, particularly the shopper (Jefferson Associates, 1977). An examination of BART's impacts on the social behavior of riders shows BART has stimulated a small increase in shopping trips to downtowns, but had more influence on work routines and selection of residential locations in suburbs.

- Mechanical and electrical problems have plagued BART and prevented it from operating at design standards.
- A lack of experience with similar systems prevented the projections themselves from being more realistic.
- Bus transit in the BART area has not been rerouted to access BART to the degree originally planned, and some BART parking lots are too small to meet demand.

. The reason that BART created new auto trips on the Bay Bridge probably has to do more with the nature of demand for vehicle use in heavily travelled corridors than with BART. It seems likely that any transit system which diverts autos from heavily travelled roads may only do so temporarily. It is the experience of many cities that adding road capacity to heavily travelled corridors only temporarily reduces heavy traffic flows. BART effectively added a small amount of road capacity to the Bay Bridge corridor, about 6% westbound and 3% eastbound in the peak period, which was then apparently taken up by new demand for auto use (Homburger, 1970).

. There are at least three main reasons for the narrow difference between the present transit system including BART and the bus system likely to be in place without BART when travel time and costs are compared as a measure of mobility.

- Bus fares are generally less than BART fares for many competing routes.

- BART does not offer express service, since each station along the route is a mandatory stop. Thus, with a capability of top speeds of 80 mph, average speeds are only 36 mph.
- The No-BART Alternative postulates a good bus alternative, the 1971 bus lines increased in service to accommodate actual 1976 transit ridership without BART, although this system would not be able to handle all the current patronage now served by BART and buses together.

There are two main reasons why trips on BART taken as a whole are not made by users in proportion to their representation in the Bay Area population, even though this is not so much the case for new trips attributable to BART:

- With respect to the handicapped, BART has included elevators in stations, but textured marking on station platforms are not provided. Also, transit systems serving BART do not yet have special provisions for the physically handicapped.
- Low income, youth and elderly persons have different trip needs than the suburban commuter. BART's routes and station locations were designed to entice the suburban commuter more than to serve the transportation disadvantaged.

(4) Changes In BART And Other Transit Services Are Unlikely To Improve Mobility Significantly

The prospects for improving overall BART ridership are difficult to estimate. From the start of transbay service in September 1974 until October 1976, ridership has changed very little, with monthly averages between 137,000 and 143,000 trips per day. Only in the West Bay has ridership grown from 28,000 trips per day in 1975 to 37,000 trips per day in 1976, mostly due to the opening of the Embarcadero Station (Peat, Marwick, Mitchell & Co., May 1977). Ridership figures have been steady in spite of some improvements in reliability and the inauguration of some new local and feeder services in outlying areas of the East Bay from 1974 onward (e.g., Fremont, Newark, Union City, Orinda, Walnut Creek, Concord and Pleasant Hill). It is not clear when more marked increases in reliability and feeder transit will take place to allow for further evaluations of impacts on ridership.

There is only a small chance that the auto use on the Bay Bridge induced by BART, or any and all auto use on the bridge, will be the target of public policy action. The Association of Bay Area Governments, with the Metropolitan Transportation Commission, is studying measures to deal directly with peak period traffic on the bridge. The study, part of a recent air quality plan, proposes \$1.25 bridge tolls during peak periods and \$1.00 off peak, with additional transit. Months of public review lie ahead for the plan and its peak pricing component and, based on past experience, any increase in bridge tolls will not be easily obtained.

Reductions in BART travel times and fares to enhance these indicators of mobility are not likely in the near term. Adding direct service from Richmond to San Francisco is likely (a transfer is now required for this trip), but express service bypassing stations is not planned. Fare reductions on BART are not likely, particularly in light of recent legislative requirements that a certain proportion (33%) of operating costs be met through fare revenues.

The prospects for improved utilization by the poor, elderly and minorities are not very good since the BART route alignment is probably one main reason for lesser patronage by these groups compared to suburban travelers. On the other hand, to the extent these groups use BART for non-work related purposes, the

advent of weekend service may be helpful. The handicapped may find improvements in BART and bus transit in the future, depending on how new Federal and State policy is interpreted. Recent changes in both Federal and State policy will require more extensive provisions for the transportation disadvantaged than was the case during the development of BART (California Transportation Plan Task Force, 1976). The California State Transportation Board has established the following State policy guidelines:

"The elderly and handicapped shall have the same rights as other persons to utilize regular public transportation facilities and services." Additionally, the Transportation Board has stated that, "The legislative intent of AB 69 would provide adequate transportation service for persons not now adequately served by any transportation mode."

The Urban Mass Transportation Act of 1964 as amended (49 U.S.C. 1601, et seq.) stated that:

"The urban transportation planning process shall ... ensure that no person shall on the grounds of race, color, sex, national origin, or physical handicap be excluded from participation in, be denied benefits of, or be otherwise subjected to discrimination under any program receiving Federal assistance from the Department of Transportation."

3. EXPERIENCE OF OTHER TRANSIT SYSTEMS

Information on ridership trends and mobility measured in other U.S. rapid rail systems shows some similar and different results compared to the BART experience, though evaluations have not been as intensive as in the case of BART. Unlike BART, many existing systems have shown overall declines in patronage. Like BART, many systems generate few new trips.

Ridership declines seem to be the case in several systems in spite of improvements, extensions and additions. The Cleveland Transit system ridership fell from 16,490,000 in 1969 to 13,288,000 in 1971 despite the one million passengers per year added in 1969 by virtue of the new airport extension. Some of the decline reflected increases in fares. As with BART, many of the riders on the airport extension (80%) were making trips made previously by another mode (Cleveland Regional Planning Commission, 1970). In

Chicago, the rapid rail line in the Dan Ryan Expressway, when it was opened, gathered 38% from buses, 35% from bus-rail trips, 8% from suburban trains, with only 6% of the passengers representing new trips (Railway Age, 1970). Total ridership as of 1972 was below projections, 109,000 vs. 165,000 per day. The new lines have shown growth in ridership, but not sufficient to offset declines in the Chicago Transit Authority's rail system as a whole. The Port Authority Transit Corporation of Pennsylvania and New Jersey (PATCO) Lindenwold line has differed from these cases. Its patronage has steadily climbed from 14,900 on opening day in 1967 to 142,000 in 1977. As in the case of BART, some of its outlying parking lots have been increased in size to accommodate demand. Here again, however, the great bulk of trips were not new, fully 87% previously made by car, bus and rail (Vigrass, Vol. 72).

There are few readily available evaluations of rapid rail systems on the subjects of induced auto trips, travel time and cost comparisons with competing bus systems and mobility by different user groups. It is clear that the handicapped as transit riders are receiving more attention and that alterations in bus systems will be made for them. This, in turn, should make access to rail systems easier for this group. However, because low income persons in many cities do not make work trips like the suburban commuter, this user group will probably not be well served by rapid rail systems designed for commuters. Evaluations of travel time and cost comparisons for rail vs. bus systems are most often done prior to developing rail systems, not as an evaluation after rail development. Where user travel time and fares are discussed as mobility measures for rail and bus systems, much of the discussion centers on appropriate and usable methodologies for local planners and engineers (Popper and Hoel, 1976). The subject of auto trips induced by rapid transit systems has not been carefully evaluated outside of the BART system.

4. POLICY IMPLICATIONS

- (1) Where Decision-Makers Are Considering Rapid Rail For Increasing Mobility, Policy Planning Should Pay Close Attention To Bus Alternatives And Comparisons Of Door-To-Door Travel Times And Costs

When mobility is defined in terms of travel time as well as out-of-pocket costs to riders, the BART experience shows the bus system likely to be in place without BART compares quite closely with the present transit system including BART. Where rapid rail plans include express service, average speeds greater than BART's, and low fares, these results may not hold. However, where BART-like design and fares are contemplated, the BART experience suggests buses are a close competition for generating mobility where travel time and costs are the relevant measure.

Mobility as commonly assessed in engineering studies of rapid rail, and the BART Impact Program, should probably be supplemented by a door-to-door cost analysis of bus, rail alternatives. While BART travel times compare favorably with bus travel times, riders count not only this time, but access and egress times. These times are important to users, and when they are considered, buses again may prove a close competition to rapid rail in the mobility analysis, particularly where they are able to work their way into residential areas to pick up and drop off commuters.

- (2) Because Increased Use Of The Auto Is A Possible Effect Of Increased Transit Capacity, Policies Aimed At Auto Use May Need Attention To Complement Rapid Rail Systems

The BART experience suggests the addition of new transit capacity, rail or otherwise, may temporarily reduce traffic levels which, in turn, attracts additional auto traffic. From the standpoint of increasing total trip mobility in an area, this result may be desirable, though it is not clear whether auto trips generated in this way are new trips or trips diverted from other locations and times. If, however, this type of increase in mobility is not desirable, measures to control the demand for auto travel will need consideration. Some possibilities include changes in road tolls where they exist or parking pricing at trip ends. (Some effectiveness considerations regarding these strategies are contained in the previous section of this chapter.)

(3) Where Increased Mobility For The Transportation Disadvantaged Is An Important Goal, A Variety Of Special Features Should Be Included When Designing A Rapid Rail System

Ridership and mobility analysis of BART shows the system is not utilized by the elderly, poor, minorities and handicapped in proportion to their representation in the Bay Area population. While this is true of all BART trips, it is less the case when new trips attributable just to BART are analyzed. In this small percentage of total BART trips (less than 3%), the transportation disadvantaged have benefitted proportionately more than others.

Policy-makers might consider several ways to increase utilization of rapid rail by the transportation disadvantaged:

- . Early decisions to design for the handicapped will undoubtedly be a better approach than the afterthought given to this user group by BART. Signing systems for use by the blind is one example of a design choice which should be considered early, not late in the system planning.
- . A much more difficult set of choices surrounds the route and station location decisions of rapid rail and its potential use by the poor, elderly and minorities.

It is important to realize there are several stations in the downtown areas of Oakland and San Francisco with connections to major bus lines. Assuming BART can be reached and is perceived as attractive and safe (there is evidence from the BART Impact Program to suggest this), this leaves line layout and/or fares as possible reasons for low utilization by the elderly and minorities. To the extent these groups make short trips to diverse destinations close to the urban core, it is probably not more, short rapid rail branches which should be considered, but other modes such as people movers and paratransit. To the extent fares dissuade use, consideration should be given to higher fares in the peak than off peak since this particular user group tends to travel more off peak. BART now provides substantial discounts in fares for the elderly (90%) and the handicapped (75%).

- (4) Since The Impact Of Transit Feeders On Rapid Rail Ridership Is Uncertain, Policy Options To Encourage Access Should Be Incremental And Experimental

The BART experience suggests that new feeder services, particularly in outlying suburban areas, may not significantly affect total ridership and associated mobility. Many of these services are new and still developing, but to date ridership on East Bay lines appears very steady in spite of these developments. The previous section of this chapter suggests suburban areas may require larger than anticipated auto parking lots. And, as indicated in the case of the Lindenwold line, driving to and parking at rapid rail lots has proved much more popular than anticipated.

Perhaps the lesson from all of this is to be most cautious in creating policies to improve system mobility by transit access. For example, outlying communities in a rail network wanting to initiate feeder services should probably contract for such service before starting their own or before annexing to a transit district. This way, an unsuccessful service could be easily terminated. Likewise, modest sized parking lots may be provided at first, but with a contingency for expansion. Should parking prove more desirable than transit feeders, decision-makers will not have foreclosed the option of providing expanded parking facilities.

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III. LOCAL LAND USE POLICY AND PLANNING

This chapter describes implications for local land use policy and planning as they relate to rapid rail transit system development. Implications are organized into two sections:

- . General discussion of local land use and development objectives for rapid transit, specifically:
 - Revitalize downtowns
 - Strengthen urban residential areas
 - Encourage higher density development near suburban transit stations
- . Use of rapid rail transit to expedite other public improvement programs.

SECTION 1--IMPLICATIONS FOR ACHIEVING
LOCAL LAND USE AND DEVELOPMENT OBJECTIVES

1. BART EXPECTATIONS

At the time of the BART bond issue vote, it was widely felt and reported in the press that BART would help revitalize the downtowns, strengthen older residential areas, and encourage higher density development near suburban stations.

- . Downtown revitalization was an important BART-related objective primarily in San Francisco, but also in the older downtowns of Oakland, Richmond and Berkeley. An article in Public Affairs Report (Zwerling, 1975) has gone so far as to say that, "The impetus for rapid transit seemed to arise not primarily from a concern for better transportation, but rather from a desire to rejuvenate the downtown retail, business and financial districts of San Francisco." Locally sponsored transit corridor studies also projected substantial BART revitalization impacts in the downtowns and these were reinforced by BART personnel and by reports of transit-related downtown developments in other cities (e.g., Toronto). BART was also designed and often later realigned specifically to aid floundering downtown redevelopment projects in Richmond and Oakland.
- . The strengthening of urban residential areas was not an important BART objective in the early years. Locally sponsored studies such as the "Economic Analysis of the Rapid Transit Corridor Study Area" (Development Research Associates, 1967) for downtown San Francisco and the Mission District, raised expectations that this objective of neighborhood revitalization could be supported by BART. In several residential areas of San Francisco, Oakland, Berkeley and Richmond, BART-related increases in demand for development were expected to increase residential renovation and new construction activity as well as residential densities.
- . The suburban land use objectives of BART were never made explicit by local officials, but the popular press includes references to a wide range of expectations. A huge boom in low density residential development was expected by some people, while others felt that BART would foster increased densities of residential/commercial development near the suburban stations.

Given the continuing importance of downtown and neighborhood revitalization objectives, it is likely that public transit investments will continue to be expected to address them. It will also be necessary to resist the temptation to overestimate the degree to which transit investments can realistically support these land use objectives.

2. THE BART EXPERIENCE

BART's impact on land use in different types of communities can be viewed in terms of three major indicators:

- Station area development as reported in "Indirect Environmental Impacts of BART" (Gruen Associates, 1977), and in "Development Around BART Stations" (BART, 1973).
- Growth and development activity along BART lines as reported in Working Papers of the Land Use and Urban Development Project, (Blayney & Dornbusch, 1977).
- Changes in land use policy and regulation as reported in "The Impact of BART on Land Use and Development Policy" (Booz, Allen & Hamilton Inc., 1977).

However, as noted in most recent studies, mass transit is only one factor affecting travel behavior, accessibility, congestion, and the physical environment. These factors, in turn, are only part of a larger network affecting potential demand, including investor confidence, public policy and the actual development process. Therefore, proximity impacts at some stations may be direct and immediate (e.g., plazas, parking lots, stations). In contrast, impacts as a result of accessibility to BART will be far less direct and less immediate.

Although it is probably still too early to assess the full land use impacts of BART, the following impacts have been documented in the research completed to date:

- (1) Downtown Development And Land Use Policy Changes Have Occurred In Response To BART In Most Downtown Areas Served By BART

BART did play a role in the location and timing of downtown development, but it was only one of several factors necessary to cause the downtown revitalization that has occurred in the Bay Area over the past ten years.

In the San Francisco CBD, downtown revitalization has exceeded expectations. Planning, zoning, redevelopment and public improvement policies were all successfully combined in an explicit effort to take maximum advantage of BART--to improve the rundown Market Street area and to facilitate the expansion of the financial district to the area south of Market Street, while protecting the character of viable residential and commercial areas to the north previously threatened by downtown expansion. BART was instrumental in a \$35 million street beautification program and also played an important role in the development of new downtown zoning provisions. This zoning permitted and encouraged major office development near the BART stations in areas previously viewed as too remote from the financial district center.

In the Oakland CBD, downtown revitalization has not yet been as extensive as in San Francisco, and downtown planning, zoning and public improvement programs have been far less focused on BART-related opportunities. However, BART played an important role in financing several public redevelopment projects which have, in turn, been instrumental in bringing a college campus and two major office buildings to declining parts of the downtown.

In the Richmond CBD, downtown revitalization has been dependent on a major downtown redevelopment project whose financial feasibility was also enhanced by BART. While new development has been limited, the site decision for one major office building (the \$30 million Social Security building, built by a private developer and leased back to the government) was directly related to BART because of the Federally required transit access. This building alone returns more property tax revenues to the city than did the whole project area prior to BART.

Based on the limited experience to date, it would appear that BART alone has done little to influence downtown development patterns--in part because it was designed to reinforce existing patterns, and in part because transit systems are but one of a myriad of influences on downtown growth and development. Where BART impacts have matched expectations, other public policies have been aggressively pursued to capitalize on BART and the potential demands had already existed.

(2) Urban Residential Development Resulting From BART Has Been Significantly Less Than Originally Projected

BART has only had a low level of impact on urban residential communities. However, development projections may have been largely responsible for neighborhood opposition to BART and subsequent strong support for downzoning and other neighborhood conservation programs.

- . In San Francisco's Mission and Glen Park neighborhoods, and in Oakland's Rockridge district, projected increases in transit-related development contributed heavily to successful campaigns for downzoning, reduced height limits, and revised development review procedures to preserve the existing neighborhood scale.
- . In residential neighborhoods of Berkeley and Richmond, initial objectives of increased residential densities near BART have now been replaced by neighborhood preservation objectives as expressed through plan changes and/or downzonings.

Based on the limited experience to date, it would appear that increased development as a result of BART has not been desired by urban residential neighborhoods. Even if public policy actions had encouraged development, it is likely that, where most land is developed and where residential/retail demand is already depressed, changes due to improved accessibility are likely to occur slowly, if at all. In the few cases where residents organized to take advantage of development opportunities caused by BART, the expectations were so high and the coordination so difficult that nothing has yet happened. Another problem has been the lower than projected BART patronage in these areas (80% less than projected in the Mission).

(3) Suburban Development Resulting From BART Has Also Been Significantly Less Than Originally Projected

Although some suburban development has occurred near BART stations, it is difficult to separate the influence of BART on development from that of other factors.

In areas such as Fremont, where there is limited out-commuting and limited BART patronage, the effect of BART has reportedly been minimal. This limited impact occurred despite substantial vacant land near the station and despite zoning incentives implemented to encourage higher density residential/commercial development near BART.

In areas such as Walnut Creek, where over half the labor force commutes to Oakland or San Francisco, the effect of BART on land use may have been greater. In these areas, higher density residential zoning has encouraged apartment development near the stations, and special zoning incentives have encouraged the construction of one BART-related office tower. However, community opposition to these types of transit-related suburban developments has been growing and the long term effect of BART is questionable.

Based on experience to date, it would appear that suburban communities have been somewhat equivocal about transit-related development and there have been few major changes in suburban land use policy. Since BART follows existing freeway corridors, it is difficult to see that suburban land use patterns will be changed due to BART without significant changes in other land use policy or development factors, such as utility hook-ups, land availability, etc.

3. EXPERIENCE OF OTHER TRANSIT SYSTEMS

Experience of other transit systems in North America generally reinforces the key findings of the BART Impact Program.

(1) Mass Transit Has Only Made A Significant Contribution To Downtown Revitalization Efforts Where It Has Been Supported By Public Redevelopment And Land Use Policy

While mass transit improvements may have facilitated downtown revitalization, they have not been viewed as the principal cause of this revitalization.

In downtown Toronto and Montreal, studies have documented the supportive role played by mass transit investments in the strengthening of the CBD (DeLeuw, Cather & Company, 1977). Downtown growth has been encouraged and resulting development has been dramatic. But the overall demand was somewhat independent of transit, and many supportive policies were needed to direct it to the downtowns and near transit. Supportive zoning policies permitted much higher densities

(four to five times) near the transit stations, and there was considerable public assistance in assembling air rights and land and in providing efficient feeder transit.

In cities such as Cleveland, Philadelphia and Chicago, transit investments have been more incremental and land use impacts more difficult to trace.

(2) Mass Transit Investment Has Had Little Effect On Land Use In Older, Established, Residential Areas

Neighborhoods have almost always organized to preserve the existing character of the community. The only land use changes that have occurred in these areas have usually been those related to station construction, parking, and associated public improvements.

In Toronto and Montreal, there has been little transit-related development in established residential neighborhoods--except where assembled and developable land was available and public support was strong. (There are reported examples in Toronto of 10 to 20 story buildings clustered around subway stations and surrounded by expanses of older structures from one to three floors in height.) However, as noted in the DeLeuw, Cather report cited earlier, "Neighborhood opposition has been seen to be a powerful deterrent to development even when all other factors are advantageous."

In Boston, there have been more examples of transit-related development in established neighborhoods. This has reportedly been due to the more aggressive zoning and redevelopment policies pursued by the local governments.

(3) Mass Transit Investment Has Been Related To Several Isolated Examples Of Substantial Land Use Changes At Suburban Stations

Despite examples of land use changes near suburban transit stations, intensive station area development has not generally occurred, particularly at those stations with commuter parking lots.

In Toronto and Montreal, some examples of high density apartment clusters at suburban stations can be found, but development has been more frequently discouraged by the unavailability of substantial vacant or developable land.

In Philadelphia/Camden, extensive research has revealed substantial transit-related increases in residential property values--particularly in the areas most distant from downtown Philadelphia. Research has also verified the strong contributory effect of the new Lindenwold transit line on related office and apartment developments, particularly the latter (Boyce, et al., 1972).

In Boston, transit investments have induced some development in outlying areas but the system has been designed primarily to serve existing residential and commercial activity centers. Impacts that have been reported have been largely a function of transit-related zoning and redevelopment actions in areas where development was supported by other factors (Urban Systems Research and Engineering, Inc., 1976).

4. POLICY IMPLICATIONS

Based on recent experience, one should not expect the development of a rapid transit system to significantly affect the aggregate level of residential/office/commercial demand in a region. However, one can expect mass transit to have an impact on how and where development occurs--particularly in the downtowns and particularly where supportive local policies will be pursued.

Since rapid transit's impact on land use is largely indirect, many factors will affect the degree of transit impact. These include the overall impact of demand for high density development, the existing congestion and accessibility patterns, projected transit patronage, etc. With the growing volume of research and information on this subject, it is increasingly important and possible to use this information to be realistic about potential opportunities for land use changes related to transit.

Past experience suggests that local officials tend to either overstate or understate their expectations for transit. For example:

- . The most prevalent tendency in the past has been to overstate the potential land use impacts of rapid transit improvements. This comes largely from rapid transit promoters who cite the dollar value of increased office/commercial construction which occurred in downtown Toronto, Montreal and San Francisco following decisions to invest in rapid transit. However, the development occurred

where it did because the market was there and because other public policies supported it there. The dangers in overstating impacts include unrealistically raised expectations, inadequate local policy support, and missed opportunities.

. There is also a tendency to understate potential land use impacts of rapid transit. Rapid transit critics cite the limited direct relationship between rapid transit and development for existing systems, and also cite the limited development which has taken place in most of the BART communities. However, the limited development that has taken place in the depressed downtowns of Oakland and Richmond as a result of BART has been more significant than any development that has recently occurred in the depressed sections of these two cities. The danger of understating rapid transit impacts on land use is that local governments may be less inclined to implement local programs to encourage development in marginal cases where feasibility appears limited.

Implications for local policy actions related to land use effects of rapid transit investment are described below.

(1) Local Governments Should Project Land Use Impacts Based On Market Studies Adjusted For The Varied Experience In Jurisdictions Which Have Undertaken Major Rapid Transit Investments

Widely varying circumstances in different communities have affected the relationships between rapid transit investment and land use. Research on these varying relationships could be an important input to local officials responsible for projections of rapid transit-related development. Based on recent experience, a number of generalizations can be made for potential rapid transit effects on three types of areas: the downtowns, the urban residential communities and the suburbs.

. The downtown areas--The downtown areas generally present the most potential for increased development related to rapid transit. However, rapid transit alone does not "cause" development in the downtowns, nor does it "prevent" decentralization to the suburbs. Where downtowns are already developed with established freeway and transit

systems, the effects of additional rapid transit investments alone are likely to be minimal and incremental. Where downtowns are in transition, or where they have restricted or congested automobile access and where the rapid transit system is designed to substantially affect travel behavior or improve accessibility, the opportunities for land use change will be greater. However, if mass transit investments are to significantly strengthen the downtowns, the investment must be planned with this in mind and it must be supported by coordinated local land use policy (examples of appropriate policy actions are discussed in the next section).

The urban residential areas--The urban residential areas generally present the least potential for land use effects related to rapid transit. Where urban residential areas have established land use patterns, good transit systems and good accessibility to major activity centers, new rapid transit investments may do little to attract new transit patrons or change accessibility patterns and land use. Transit investment in these cases may actually prove to be an important catalyst to neighborhood conservation initiatives.

Where these neighborhoods have poor access or poor transit service, and where there are marginal uses and available developable land, the potential for land use change will be greater. However, even where the demand can be realistically projected, there are likely to be few transit-related land use changes unless there is substantial community and political support (and little opposition), and unless the potential changes are supported by strong market demand and public policy.

. The suburban areas--The potential for transit-related land use effects in suburban areas will probably be the most difficult to project based on recent experience. Where rapid transit improvements reinforce existing automobile or transit corridors, changes in land use related to transit will probably be less than where new corridors are established or where rapid transit substantially affects accessibility or corridor capacity. Even where adequate market forces can be projected, the outcomes are liable to depend heavily on the availability of developable land, community support for higher density uses near transit, and the adequacy of local policy support.

(2) Alternative Transportation Improvement Strategies Should Be Analyzed In The Context Of Local And Regional Land Use Strategies

In conducting the Federally required "Alternatives Analysis," local officials should consider the extent to which rapid transit investment can help further local land use objectives or specific implementation tools such as public redevelopment. It is particularly important to consider the likely extent to which governments will support rapid transit investments with other public policies such as capital improvements, land assemblage, special zoning incentives, or downzoning and special neighborhood conservation programs.

There may be many alternative transportation strategies available to reduce congestion and improve accessibility. Each of these strategies may have different potentials for affecting land use and urbanization patterns. These relative potentials should be explicitly considered and measured in comparing transportation improvement strategies.

. For the downtowns, mass transit improvements, or at least transportation improvements, may be necessary to facilitate downtown growth or revitalization or to reverse decentralization trends. However, these improvements may not be sufficient to

stimulate these changes in the downtowns. Therefore, the relative importance of alternative transportation policies should be evaluated in the context of different approaches to downtown revitalization.

For the urban residential areas, alternative transportation improvement strategies are likely to have different implications for neighborhood conservation or revitalization strategies. Some strategies may do more to directly affect accessibility or land use while others may indirectly stimulate community involvement in conservation programs.

For the suburban areas, the development of rapid transit is likely to play only a minor role in the development of outlying areas with automobile transportation and other factors being much more important. However, where a demand for higher density residential and commercial uses exists, it may be useful to consider the degree to which transit investments can be used to direct the location of these developments. It would also be desirable to determine whether many suburban land use objectives cannot be met by much less expensive transit investments than fixed rail.

(3) Alternative Rapid Transit Route Alignments And Station Locations Should Be Considered In Light Of Local And Regional Land Use Objectives

During the rapid transit system planning phase, it is important to assure system design and supportive transportation policy (e.g., feeder transit) which can maximize the desirable rapid transit effects on accessibility and travel behavior. Station locations and route alignment have an obvious impact on a rapid transit system's ability to affect accessibility and travel behavior, and engineering and cost considerations should not be the only determinants of station and route decisions.

Past experience indicates that local and regional land use objectives may deserve a larger role than they have been given in the past. This may require a different organizational framework than was used for BART in the Bay Area, with greater local participation in some form of regional structure considering alternative route alignments and station locations.

- . Basic route alignment decisions will significantly affect transit's impact on land use patterns. Alignments can be designed to support existing transportation investments and existing activity concentrations or they can be designed to open up new areas or strengthen depressed areas not currently served by adequate transportation investments. In each case, gains in accessibility will be different, as will land use impacts.

- . Station location decisions may also have a considerable influence on the extent of station area development, and this factor should be a consideration from the beginning. Stations located near large developable parcels will obviously provide more support for changes in land use and more intensive development near the station.

- . The station design has also been found to be a critical factor. Stations surrounded by extensive parking lots or isolated by other barriers, e.g., freeways, are much less supportive of development opportunities than are stations which can be more easily linked physically and visually with developable sites. However, reductions in parking lot size, while encouraging development, would likely reduce accessibility.

(4) Prior To Rapid Transit Construction And Operation, Communities Should Conduct Detailed Station Area Land Use Studies And Develop Specific Implementation Strategies Where Appropriate

It is important to clarify systemwide land use strategies at an early date. Developing such a strategy may be difficult.

- . Most land use decision-making processes include the involvement of multiple local and regional jurisdictions and agencies, many with competing objectives.
- . A crisis-oriented local government will probably find it difficult to devote sufficient resources to the planning studies needed to determine the most effective transit-related land use strategy.

The lack of sufficiently detailed plans is likely to result in unrealistic expectations in policy-makers, in difficulty in developing needed community consensus on an action program, and in a delayed commitment to specific transit-related land use objectives. This, in turn, can result in inappropriate public policy response, if any, and missed opportunities.

Experience in the Bay Area suggests that without outside support or requirements for transit-related planning studies, they may not be completed in a timely manner. Federal assistance (primarily HUD grants) provided an important stimulus to these studies in the 1960's and early 1970's, but these grants are declining and other types of support may be needed in the future. Given limited planning resources, it may be desirable for the responsible regional planning agency to conduct a reconnaissance study to determine the relative potentials and desirabilities of land use changes at each station location. This study should then be used as a tool to allocate limited resources which may be available for more detailed station area land use studies.

Given the relatively limited impact that rapid transit usually has on land use in established areas, more detailed planning studies should focus on station areas where land use changes are most desirable and where these changes are most likely to be supported by market demands.

(5) Where Appropriate, Public Policy Implementation Strategies Should Be Pursued Once Route Alignment And Station Locations Have Been Determined

Because of the indirect relationship between rapid transit and land use, mass transit investments, at best, represent opportunities to affect land use and urban development patterns--they do not alone "cause" impacts. Therefore, local policy-makers must decide whether and how to take advantage of these opportunities and how to use the land use policy tools available. Without aggressive use of local land use policy, experience in the San Francisco Bay Area and elsewhere suggests that rapid transit's impact on land use and urban development may be minimal.

- . In the downtowns, rapid transit can significantly affect accessibility and travel behavior, but it will often be necessary to improve the downtown's physical environment and alleviate land assemblage problems if significant private development is to occur. Given the frequently deteriorated physical environment and the often fragmented land ownership patterns in the downtowns, aggressive joint development by the transit district and local governments may be essential to the realization of downtown improvement objectives. The four most important aspects of such a joint development policy appear to be public improvements, land acquisition, marketing and zoning incentives near transit.

- . In urban residential areas which are stable and fully developed without vacant or underutilized lands and in areas which are depressed and have limited improvements in accessibility, transit-related changes may be neither desirable nor likely. Where these patterns exist, officials may wish to quickly reaffirm this direction by recommending zoning and public improvement policy which helps maintain the area's existing scale and character. Although rezoning may not appear to be necessary at an

early date, the lack of such action is almost certain to provoke neighborhood opposition to (or reduce support for) the proposed rapid transit investment.

- . In urban residential areas where developable land is available and where potential demand already exists or will be strengthened by accessibility improvements, land use changes may be both desirable and possible. Local officials must be prepared to move aggressively to capitalize on the potential opportunities of rapid transit. Adequate resources must first be allocated to studies involving the community in the evaluation of realizable land use alternatives. Adequate resources must then be made available to support the appropriate combination of zoning, redevelopment, and public improvement programs. The greatest danger is the tendency to overestimate transit impact and therefore underinvest in an implementation strategy.
- . In suburban areas, land speculation may be the most significant impact of rapid transit investment. Some communities have found it useful to provide development incentives through the conditional permit procedure in order to assure that development proceeds once it is approved. Assistance with land assemblage as well as restrictive zoning away from the station are likely to be the most effective in encouraging higher density development to cluster near rapid transit stations.

(6) The Appropriateness Of Particular Land Use Policy Tools Will Depend On The Characteristics And Objectives Of Each Jurisdiction

Local governments have employed four principal tools in their efforts to implement land use policy related to rapid transit investment--public improvements, zoning, land assemblage and marketing. The most frequently and effectively employed has been a public

improvement or beautification program near transit stations. Zoning has also been used effectively to provide incentives for development near stations, to provide restrictions away from transit or to provide special compatibility guidelines for transit-related development. Zoning has been most effective where substantial demand and development opportunity already existed. Assistance with land assemblage has proven to be critical where large developable parcels were not available. Marketing has proven particularly effective with Federal agency development (which is often required to be near transit) and other public or institutional development. Examples are provided below:

- . Public improvements are clearly an essential tool for encouraging mass transit-related land use changes. They are needed to change the nature of the public spaces (streets, sidewalks, plazas), but they are also needed to demonstrate public commitment and encourage private investment in the area. They are particularly important in marginal or declining areas which are not viewed as desirable or safe for development.

However, governments are operating under increasing fiscal constraints. Without outside assistance for matching funds, transit-related public improvements may be reduced in the future. Experience in the Bay Area suggests that such a reduction could have a significant impact on rapid transit's ability to support local land use policy.

In the 1970's, the situation may be further aggravated by the reduction in Federal and state matching grants for public improvement and beautification programs. While tax increment financing and special assessment districts can be an effective device for financing public improvement projects, Bay Area experience suggests that they must be matched by substantial up-front investments from local, state and Federal governments if adequate improvements and incentives are to

result. The proposed Urban Development Action Grants (UDAG's) may prove to be an important tool now and in the future. The HUD sponsored UDAG grant program provided \$400 million in 1978 to local governments to fund public improvement projects in urban areas where commitments for significant private placement in the project (five to six times total public investment) are made.

. Land acquisition is obviously one of the most important land use policy tools in the area of joint development. This is due to the frequent need for land assemblage assistance in already developed areas.

Experience in the Bay Area suggests that the use of redevelopment in the downtowns was greatly assisted by the use of "local credit" from mass transit investments. These local credits are no longer available through redevelopment funding. The transition to community development block grants has meant that available redevelopment resources tend to be divided up among communities and spent incrementally on smaller, more immediate, projects. If redevelopment is to be a useful joint development policy tool for mass transit, an alternative funding source will probably be necessary. Again, tax increment financing or value capture may have some potential application, but substantial matching public funds will probably be needed to support land assemblage efforts. Urban Development Action Grants may again prove useful.

. Joint development marketing (local governments or redevelopment agencies using BART as an argument in their efforts to market their city to developers, private companies or other public agencies) has also proven to be an important tool related to development near mass transit. However, its effectiveness has been limited, in part, to the good faith cooperation

of other public entities or institutions. Experience in the Bay Area suggests that more incentives will probably be needed if joint development marketing is to become more useful. A good example is the GSA site selection criterion requiring public transit access for new Federal office buildings.

Changes in local zoning incentives and controls may often be necessary to encourage station area development. While zoning is usually used as a regulatory power, past experience suggests that a balanced use of incentives and controls may be needed to implement a transit-related land use policy. (Rhenkamp, Sachs, Wells and Associates, Inc.)

In terms of zoning controls, it appears that restrictions on higher density residential office/commercial uses located away from rapid transit may be necessary in any effective strategy for transit-related development.

In terms of zoning incentives, it appears that waivers or reductions in parking requirements are the most effective incentives for development near rapid transit. Height, bulk and floor area ratio bonuses have also been successfully employed.

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SECTION 2--IMPLICATIONS FOR USING RAPID TRANSIT
TO EXPEDITE OTHER PUBLIC IMPROVEMENT PROGRAMS

1. BART EXPECTATIONS

The use of rapid transit investment to leverage or support other public improvement programs was not an explicit objective during the early BART planning phase. However, immediately prior to the BART bond issue vote in 1962, a citywide citizens' planning organization in San Francisco presented a comprehensive program for the beautification of Market Street in conjunction with the construction of BART. Soon after, other jurisdictions began focusing on the use of BART to help construct local public improvements and to help provide local matching contributions for other funding sources such as state grade separation grants and Federal urban renewal grants. Negotiations over the financing of transit-related local public improvements were often one of the major factors in the contract talks between local governments and BART. In other regions the importance of public improvement objectives will likely depend largely on financial arrangements, institutional structures and the use of matching grant approaches to public investment.

2. THE BART EXPERIENCE

One of BART's greatest perceived benefits has been expedited local public improvement programs (Booz, Allen & Hamilton Inc., Land Use, etc., 1977). In addition to the improvements constructed directly by BART, other local BART-related improvements included street realignments, plazas, landscaping, parks, grade separations, other transportation facilities, etc. (Gruen & Associates, 1978). Many of these improvements, ranging from a \$35 million Market Street beautification project in San Francisco to minor landscaping, have also had important secondary impacts on land use and the environment along route alignments and at the stations (Gruen & Associates, 1978).

BART's positive effect on these improvements has been due to several factors:

- . BART focused public attention on the station areas, the alignments and the environmental or public facility problems of each area. Therefore, voter and merchant support was more evident than is often the case for public improvements such as plazas and street beautification.

- . BART created public improvement opportunities through the land acquisition and construction process. These opportunities were substantial enough to convince public officials, merchants and residents of the need for positive action. Further, these opportunities were not being created elsewhere in the Bay Area (an example being the original \$24 million bond issue for Market Street beautification).
- . BART provided direct financial assistance for the construction of many transit-related public improvements. These improvements were not often noted in plans prior to BART, but would most likely have been built without BART assistance (an example being the grade separated railroad crossing and malls in Richmond).
- . BART provided indirect financial support since its own capital investments could be used as eligible local shares for matching State and Federal grants. These included substantial sums that local government would have otherwise had to provide (examples include redevelopment projects, beautification projects, and grade separations and rail crossings).

3. EXPERIENCE OF OTHER TRANSIT SYSTEMS

Experience with other rapid transit investments also suggests the important spin-off effect of major public improvement projects which, in turn, have both direct and indirect impacts on land use. However, it is unclear how important a role the rapid transit investment has played in these transit-related public improvements outside the Bay Area.

- . In Boston, studies of recent and planned extensions of rapid transit facilities have emphasized the critical role of public improvements in maximizing the benefits of public transit investments. Public redevelopment has been the prime example in areas such as Malden and Quincy, while community development funded projects are becoming more important in areas such as Somerville.
- . In Toronto and Montreal, major public investment projects were initiated in conjunction with rapid transit.

4. POLICY IMPLICATIONS

Recent experience in rapid transit development shows that transit-related public improvements are important benefits of transit development that should be planned and constructed in close coordination with the rapid transit system itself. Although these public improvements were not an explicit objective or expectation of BART, their success and importance indicates that it would be worthwhile to consider them more explicitly in future transit system developments.

(1) When Comparing Alternative Transit Improvement Strategies, The Potential For Related Public Improvements Should Be Considered

Too often, transit-related public improvements have been considered as desirable spin-offs rather than as an integral part of each transit improvement alternative. The environment and land use benefits, which public officials feel their communities have gained from these improvements, are so significant that joint planning and programming from the beginning could help maximize the potential benefits. For this to happen, local governments cannot depend on the regional transit agency; local officials must, in addition, pursue joint planning and programming themselves.

(2) The Public Improvement Implications Of Alternative Route And Station Locations Should Be More Fully Considered Than They Have Been In The Past

Route alignments and station location decisions have often been made on the basis of engineering and construction costs alone. In the future, these important decisions should involve a more complete analysis of the public improvement implications of each alternative. Federal policy on this issue should be closely adhered to since this consideration alone can sometimes swing the balance of evidence to a different alternative.¹ In the past, these decisions have often been made without sufficient input or coordination from the local government or agency involved. Therefore, it may often be necessary to form joint planning or development organizations to do more than simply provide

¹An example of this was the station location dispute in Richmond, California, where a city study of public improvement implications and costs proved to be a primary decision-making factor.

liaison with the organization responsible for transit system planning. These joint development organizations must be able to effectively orchestrate the full range of decisions which must be made for joint development to occur at station locations.²

(3) A Major Problem In Local Government/Transit Development Coordination Has Been The Programming And Construction Of Transit-Related Public Improvements

Once transit decisions are finalized, transit system construction can often proceed faster than local governments can proceed with the final planning, programming, and construction of transit-related public improvements.³ Since one of the negative effects of rapid transit investment is often the prolonged construction period, improved coordination of construction projects should be pursued to assure that related public improvements do not unnecessarily extend this period. This coordination could be accomplished by assigning responsibility for these projects to one agency or to a more effective coordinating body or joint development authority, such as was done in Toronto and attempted in San Francisco.

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IV. LOCAL FINANCIAL POLICY

This chapter outlines policy implications for the financing of a regional rapid rail transit system. Two specific financial issues are considered:

- . Financing of the rapid rail transit system-- equity considerations.
- . The impact of transit system financing on other public agencies--local governments and other transit districts.

SECTION 1--IMPLICATIONS FOR DEVELOPING AN EQUITABLE
FINANCING PLAN FOR
RAPID TRANSIT CONSTRUCTION AND OPERATIONS

1. BART EXPECTATIONS

Equitable financing for a public investment can be defined as the allocation of investment costs to individuals both in proportion to the benefits received and in proportion to their ability to pay. Neither of these two dimensions emerged as a major issue when the financial plan for BART was developed, primarily because:

- . Concern with equity in taxation was mainly confined to academics and empirical evidence of the regressive nature of local taxation was largely unavailable (Hoachlander, 1976).
- . The original BART financing plan assumed that the \$792 million bond issue would cover all of the construction costs and fare box revenues would more than adequately cover operating expenses.

BART was conceived as a significant transportation and economic benefit to the entire Bay region. This early perception overrode the recurring concern that the benefits and costs were not evenly balanced throughout the region. Equity, however, as it relates to all forms of public investment and taxation, has become a more visible issue in the 1970's than it was in the early 1960's when BART was being planned. Further, BART construction was funded almost entirely through local property tax revenues. Because of the availability of sizeable Federal grants for rapid rail construction, other areas are unlikely to use the BART financing approach.

2. THE BART EXPERIENCE

Although a concern for equitable financing of transit systems was an academic issue in 1962, equity became a widely discussed issue, in part because of the publicity that arose when the completion of the BART system was threatened due to major cost overruns and a subsequent lack of funds. Proposing a 10¢ Bay Bridge toll increase, a State senator representing San Francisco indicated that it appeared reasonable to "obligate the source of our transportation problem--the automobile" (San Francisco Examiner, March 30, 1967). The toll increase plan was countered by Governor-supported proposals to levy a half-cent sales tax in all three BART counties. The sales tax was vigorously opposed on "equity" grounds, with a

local United States congressman maintaining that a sales tax would be "grossly unfair" to those who "will not be direct beneficiaries of BART service" (San Francisco Examiner, February 8, 1969). The sales tax was also resisted strongly by San Francisco officials, who favored instead a combination of bridge toll and in-lieu (auto registration) tax increases. Then San Francisco Mayor Alioto challenged the sales tax on the grounds that it imposed the added cost of transit on "those least able to afford it, and would aggravate what is already an inequitable tax structure" (San Francisco Chronicle, February 5, 1968).

The sales tax, however, was politically acceptable, easy to administer, and had the potential of increasing as regional sales increased and thus could increase more rapidly and painlessly than any other revenue source (including that of higher fares which would tend to reduce patronage). Strict consideration of equity could have placed a heavy, steady and very noticeable burden on a select few (namely, Bay Bridge travelers and auto owners). This approach was abandoned in favor of a sales tax that provided good growth potential and amounted to a lighter and less noticeable burden on everyone.

Thus, the real concern over both benefit/cost and ability to pay equity seemed to come about as the public became aware of the huge, unforeseen costs through sales taxes and additional bond issues which now had to be borne in addition to the original tax burden.

The Economics and Finance Project of the Bart Impact Program documented the distribution of BART's tax burden as follows:

- . Approximately 67% of the tax burden for system construction and operations falls primarily on households; less than half of the remaining tax burden falls on businesses, although a primary BART objective was to revitalize downtown business areas (McDonald & Grefe, Inc., 1978).
- . Lower income families pay about three times as much in sales and property taxes in relation to their income as higher income families (McDonald & Grefe, Inc., 1978).
- . Significant portions of BART operating costs are being financed by individuals who do not use BART.

There were several apparent reasons for these impacts:

- . Initially, little emphasis was placed on issues of equity in developing the BART financing structure.

. Secondly, when issues of equity did arise during BART's financial crisis, the issues were addressed in an atmosphere of extreme pressure and controversy. Consequently, the most politically acceptable but not necessarily the most equitable solution was adopted.

The distribution of benefits in relation to costs became an issue only when cost overruns and operating deficits became apparent.

3. EXPERIENCE OF OTHER TRANSIT SYSTEMS

The traditional approach to equity in transit financing has been to look at aggregate benefits in comparison to total costs. By definition, this approach overlooks the distribution of the benefits and costs among various social, economic, and geographic groups. Syrnick and Harvey describe the results of examining the distribution of benefits and costs among various "user districts" of the Delaware Valley Regional Planning Commission 1985 Transportation Plan for the Philadelphia Metropolitan Area. Essentially, their analysis showed that there were significant differences in net user benefits among various districts of users. Syrnick and Johnson further implied that net benefits could not be generalized solely on the basis of income or geography but that each proposed transit user district had to be examined as an individual entity. Thus, if equity is to be an objective, benefits and costs must be computed on a localized basis.

The Urban Mass Transportation Act of 1964 significantly reduced the magnitude of the cost of transit system construction to be funded by local governments. The new Federal policy has not, however, been generally accompanied by financing innovations at the local level. For example, the \$200 million local share of the \$2 billion Metropolitan Atlanta Rapid Transit Authority (MARTA) system will be paid for by a local sales tax, probably the most regressive form of taxation. The Metropolitan Dade County transit system will be financed from the proceeds of general obligation bonds matched by state general revenues. One notable exception to the traditional financing schemes appears to be the Baltimore system where local funds come from state sources comprising pooled motor vehicle and gas tax revenues.

4. POLICY IMPLICATIONS

In determining the policy implications of BART for equitable financing, it is apparent that a rapid transit investment is not likely to achieve pure equity. In the case of BART, the system financing plan failed to achieve this theoretical equity in that:

- . Investment costs were not allocated to individuals in proportion to benefits received.
 - . The local share of transit financing costs, for the most part, still relies on traditional local taxing mechanisms (such as sales and property taxes) which are generally considered regressive in nature and do not attempt to establish equity in financing.
- (1) Local Officials Should Assess The Importance Of Equity As An Objective Before Devising A Rapid Rail Transit Financing Plan

The experience of both BART and other transit systems suggests that other considerations will likely outweigh equity in financing as a policy objective. As Syrnick and Harvey point out, a truly equitable allocation of benefits received in proportion to costs paid among various user groups may require that the aggregate benefits may be reduced in relation to aggregate costs (Syrnick and Harvey, 1977).

However, this same experience does suggest that cost/benefit equity in transit financing can be more closely approached than was the case with BART. First, the right questions must be asked at the outset, namely:

- . What population subgroups will benefit and to what extent from the proposed system (for example, riders, auto users, nearby property owners and so forth)?
- . How much will various population subgroups pay for the development and operation of the system?
- . Finally, how important as a policy objective is equity financing in relation to other transit objectives, such as downtown revitalization, increased mobility, decreased pollution, economic development and so forth?

Although currently available economic tools are inadequate to accurately assess cost/benefit equity (Boyd, 1976), computing costs and benefits in terms of their impacts on subgroups rather than for the population as a whole, and making explicit the relative importance of equity as an objective, will, at least, begin to focus analysis and public dialogue on a sound conceptual approach to equity issues, if equity does become an important objective.

(2) A Truly Equitable Transit Financing Plan Can Probably Not Be Achieved

Overall, the policy objective of developing an equitable financing plan may have to give way to other objectives because:

- . Elected officials will likely prefer appearing to tax everyone equally rather than pursue equity by taxing select groups in proportion to benefits received and ability to pay.
- . Even if the basic questions of cost/benefit equity can be answered, it is difficult to distinguish among differences in benefits to various population subgroups.

Consequently, cost/benefit equity and ability to pay equity are likely attainable only if equity is the most important policy objective. If this is so, then two general solutions to the problem of equity must be pursued, namely:

- . A financing system must be designed that allocates benefits roughly equally to all potential transit users. For example, had equity been a transcendent concern with BART, less money may have been allocated to the main rail line extensions in Contra Costa County and a proportionately greater amount allocated to upgrading bus transit service to outlying areas to ensure roughly equal accessibility to the main line extensions. Obviously, equity as a policy objective in this example would have a far reaching influence on cost-related decisions including car design, route alignment, station investment, and so forth.
- . If the most effective system design is required and this system falls significantly short of providing equal accessibility to those who will pay for its construction, then innovative planning and political efforts must focus on devising a financing plan that is both progressive in nature

and taxes individuals in relation to benefits received. Examples of such taxation forms might include:

- Bridge and highway tolls for drivers who are potential system users
- State income tax surcharges assigned to transit development and operations
- Benefit taxation of the nature described earlier

The most equitable approach to financing rapid transit development and operations will likely involve a combination of both of these general approaches. These approaches are generally not politically feasible at this time. Therefore, the degree of equity achieved will, in the final analysis, depend upon the importance assigned to equity as a transit system objective.

(3) Certain Financing Approaches Can Help A Region More Closely Approach An Equitable Financing Plan

"Pure" equity in transit financing will undoubtedly require substantially more progressive and benefit-oriented taxing mechanisms than appeared feasible with BART. One of the most theoretically pure forms of equity taxation to support BART was a proposed plan to put additional taxes on lands specifically benefitted by their proximity to BART stations (San Francisco Chronicle, December 14, 1968). This proposal was never seriously pursued because political difficulties in securing implementation appeared insurmountable. In this case, State legislation permitting special benefit taxation of land near stations required that residents of the area vote to form the specially taxed "benefit district." Consequently, success of this seemingly equitable taxing approach hinged on the willingness of selected taxpayers to accept tax increases for benefits they would have received in any case.

Policy improvements in achieving more equitable financing using a "benefit district" approach should consider:

- . Legislation enabling the establishment of special benefit districts, whereby increments in assessed value or property income attributable in

part to transit system development, be established. The district would require approval by a vote of all taxpayers throughout the transit district. This would achieve some semblance of equity in rental or commercial areas where presumably the added tax costs would be passed on to those benefitting from the transit system, namely:

- Renters with improved transportation accessibility
- Shoppers, with improved accessibility
- Property owners, who supposedly experience increased income and value as a result of transit

. Assessing increased benefit taxes in residential and commercial areas only when properties are either sold or property rentals actually increase. This may then defer taxation on residential taxpayers until benefits are actually received, thus establishing a closer relationship between who pays and who benefits.

. Finally, benefit taxation should explore the option of acquiring undeveloped right-of-way areas where favorable impacts are potentially attributable to the transit system. Sale or lease of the developed land then could provide the opportunity of recovering the transit system's capital investment costs in the manner successfully employed in the Toronto system.

(4) Public Officials Should Develop A Strategy To Counter Public Concern About The Inequities In The Transit Financing Plan

Although the preceding sections suggest ways to make transit system financing more equitable, many of these approaches will not be politically feasible. Therefore, regardless of the degree of equity or inequity, citizens should require that equity issues be raised at the outset and be dealt with explicitly

and candidly. Local officials will generally tend to obscure issues of equity to gain broad political acceptance for project financing. As equity has become an increasingly visible public issue, local officials will most likely not be able to avoid the equity issue and should expect concerns to be raised at some point during the construction and operation of the system.

Since equity is unlikely to ever be the preeminent transit system objective, local officials should recognize the importance of tempering expectations of transit system benefits. Concerns over equity should not be explained away with broad generalities concerning benefits. Furthermore, as issues of equity are raised with regard to a transit system proposal, local officials should maintain the following perspectives:

- . No public investment, unless financed exclusively by user costs, can ever achieve full cost/benefit "equity." Unless substantial sacrifices are made to achieve equity, decision-makers will have to justify rapid transit on the basis of its total regional benefits.
- . A degree of inequity is inherent in the construction financing scheme but it will become less pronounced over time. In an inflationary period, dollars used to repay original capital investment actually represent an ever increasing capital discount because the debt is being paid in inflated dollars.

This perspective of equity in relation to rapid transit provides the basis for a constructive public dialogue that focuses public attention on:

- . Total social, transportation and physical benefits of transit.
- . The very illusive nature of all forms of equity in tax-subsidized enterprises.
- . The fact that equity increases over the long term of a capital investment due to the inflated values of repayment dollars.

This perspective should provide a suitable philosophical backdrop for the discussions of equity that will likely arise over the course of the project.

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SECTION 2--IMPLICATIONS FOR PROMOTING
LOCAL GOVERNMENT FISCAL HEALTH

1. BART EXPECTATIONS

In general, BART was expected to become a substantial financial asset to the local governments in the BART counties (Van Beuren Stanberry, 1962). Specifically, handsome returns to local governments were expected in the form of:

- . Increased suburban growth and development.
- . Downtown and neighborhood revitalization.
- . Reduced cost for public services by enabling higher density development.

Each of these effects would, in turn, have a favorable impact on local budgets by providing increased property and sales tax revenue while incurring somewhat lower increases in public service costs. However, some local officials felt the BART debt burden might injure the security offerings of small public agencies with low credit ratings.

Further, BART was originally expected to fund capital expenditures almost entirely through an \$800 million local general obligation bond issue and fund operating expenditures as well as purchase rolling stock entirely through fare revenues. Neither of these objectives was ultimately achieved.

Current approaches to transit financing involving heavy Federal support reduce the concern about financial impact for other local governments. Other expectations concerning economic development and efficient public service provision remain valid for other areas.

2. THE BART EXPERIENCE

Although BART construction costs exceeded original estimates by over \$600 million and fare revenues finance less than 40% of total operating requirements, BART has caused little or no change in local government fiscal health in the region. However, BART has caused some reduction in revenues available to other transit districts within its service area.

(1) BART's Impact On The Fiscal Position Of Other Public Agencies Appears To Be Limited

BART's impact on the fiscal health of local public agencies can be summarized as follows (McDonald & Grefe, Inc., 1978 and Booz, Allen & Hamilton, Inc., 1978):

- . BART appeared to have no effect on local bond issues, either on the decisions of local officials to present bond issues for a vote, or the willingness of the public to approve the bond issues.
- . There is no indication that awareness of BART financial obligations influenced officials to "hold the line" on, decrease, or postpone any local expenditures.
- . The only real costs incurred directly by local governments due to BART operations were limited to minor costs of maintaining BART rights-of-way.
- . BART was a significant factor in helping the Golden Gateway redevelopment area in San Francisco qualify for tax increment financing for the Embarcadero BART station. This financing approach is permitted in California and provides that such bonds are paid off from increased tax revenues resulting from property value appreciation in the redevelopment area.
- . Cities generally received positive financial benefits from BART construction to accomplish established city redevelopment and capital improvement objectives. Sources of funding were either BART construction funds or non-cash credits for Federal redevelopment grants.

There are three major reasons why the massive BART debt appears not to have adversely affected local government financial decisions.

- . BART was promoted from the first as a sound economic investment and perceived as such by both Bay Area politicians and the investment community.
- . The Bay Area enjoys a mature and diversified economy. Therefore, swings in the overall U.S. economy are not felt as dramatically in the Bay Area as in many metropolitan areas.
- . The BART District is a separate taxing and political authority. Therefore, local officials aside from those officials who also served on the BART Board of Directors were not accountable for BART financing decisions.

(2) BART Has Caused Some Reductions In Funding Available For Other Transit Systems

Although BART was expected to support its operations through fare revenues, it now requires a permanent source of local public financing to maintain its operations. This unexpected public financial burden required additional financial resources for transit within the region.

For this reason, local transit operators (other than BART) appear to have fewer financial resources available than in the absence of BART. Although new revenue sources for transit have been approved since BART's inception, these sources would probably have been available to meet recognized needs of other operators eventually, even without BART (Booz, Allen & Hamilton Inc., September, 1977). Local transit operators would also have been eligible for BART's share of Transit Development Act and Federal Section 5 funds which are now divided among all transit operators in the BART District counties.

3. EXPERIENCE OF OTHER TRANSIT SYSTEMS

Most metropolitan areas now planning rapid rail transit systems have a regional institutional setting somewhat similar to that of the Bay Area, that is, an independent transit authority (for rapid rail transit and possibly bus operations) and a host of independent local governments. In areas where the institutional setting differs (e.g., Miami/Dade County where the county government is directly

responsible for constructing and operating the rapid rail transit system), the financial policy impacts of rapid transit are expected to be quite different, although no specific evidence as to the type of impact is now available. Reasons for this difference are:

- . Local officials are politically accountable for rapid transit financing decisions since system financing is part of the local budget.
- . The rapid rail transit budget is not as politically visible as BART's because it is incorporated within a total city or county budget. Further, budgetary trade-offs between rapid rail transit and other public services are possible.

The potential for adversely impacting local government fiscal health has also been affected both positively and negatively by two events since BART construction began:

- . The passage of the Urban Mass Transportation Act in 1964 provided for Federal grants covering 80% of the capital costs of a new transit system. This significantly reduces the local funding requirement for other areas compared with that of the Bay Area.
- . On the other hand, the New York City financial crisis in 1975 has resulted in greater scrutiny of municipal security offerings.

Consequently, local governments participating in transit system development, while not facing the magnitude of the BART debt burden, may in fact have local bond sales affected in some way by their transit debt and overall municipal debt levels.

4. POLICY IMPLICATIONS

The BART experience provides some insights concerning how a transit system should be planned and financed. These policy implications do not relate directly to the decision of whether or not to build the transit system but, rather, to ways in which both planning and financing the system can be done to minimize adverse effects on local governments and transit districts and enable local governments to take advantage of transit development.

(1) Transit Financing Plans Should Have As Broad A Coverage As Possible To Minimize Potential Adverse Impacts On Local Debt

Recent fiscal problems in cities such as New York have probably increased the potential effect transit debt can have on local government financing. Therefore, there exists a compelling rationale for formulating a financing approach that spreads the debt burden over as large a base as possible. Approaches that distribute adverse impacts among state and local sources include the Maryland approach, where the 20% local share of the capital construction cost is being financed through State gas tax and vehicle registration funds, and Metropolitan Dade County, where the 20% local share is being financed half from local funds and half from State funds.

(2) Local Officials Should Not Expect Sizeable Transit Debt To Affect The Fiscal Health Of Their Jurisdiction

In an institutional setting such as the Bay Area, local officials should not necessarily expect that monies spent on a regional transit system will constrain city budgetary decisions. Further, there appears to be no evidence from the BART experience that additional monies spent to upgrade the system (as in the case of the Berkeley subway construction) in any way constrained cities in responding to other public needs. In areas where transit is not financed and operated through a separate transit authority (like the Bay Area), transit financing will require more trade-offs and more total dollars expended than under a single transit operator.

(3) A Policy To Handle Costs To Local Government Resulting From System Operations Should Be Developed

Cities served by BART generally experienced only one adverse impact on their budget as a result of BART operations--the additional cost of maintaining facilities or lands near BART rights-of-way. Cities may wish to consider forecasting estimated maintenance costs of these types of facilities. If, due to the design, location and other considerations, these costs may become substantial, local governments may consider establishing agreements to do one of the following:

- . Share in maintenance costs.

- . Arrange for the transit district to assume maintenance responsibility, or
- . Stipulate some reimbursement from the transit district for maintenance.

(4) Rapid Rail Transit Development Will Most Likely Reduce Financial Resources For Other Transit Services In A Given Area

Rapid transit development can be expected to increase the total ongoing financing needs for transit services within a given region. Any new rapid transit system cannot be expected to support its operations through fare revenues alone. Therefore, system planning should include projections of public funding requirements based on the latest experience with systems like that being planned.

If the rapid transit system is to compete with existing transit operators for funding, an effective regional or state authority should have responsibility for allocating available funds to various operators based on regional and/or state transit objectives. The Federal government should rely on the same regional and state authority to recommend trade-offs for transit capital funding.

In cases where one regional transit agency owns and operates the existing bus network and is responsible for the new transit system, the problem of service planning and funding coordination between the new system and the existing system is greatly simplified.

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V. LOCAL ECONOMIC DEVELOPMENT POLICY

This chapter presents policy implications for achieving local economic growth and development and employment objectives through rapid rail transit development. Specific issues addressed are:

- . Improvements in employment accessibility due to rail transit operations.
- . Rail transit as part of an economic development strategy for urban areas.
- . The economic significance of rail transit's capital expenditures on a region.

IMPLICATIONS FOR ENCOURAGING REGIONAL
ECONOMIC GROWTH AND DEVELOPMENT

1. BART EXPECTATIONS

One of the predominant arguments advanced in favor of the BART system was that it would encourage regional economic growth. The BART system was envisioned from the start as a stimulus to the Bay Area economy that would counteract trends of decline in the city centers of Oakland and San Francisco and open up new land for development throughout the Bay Area. Specifically, the long-term economic benefits foreseen in the original Composite Report (Van Beuren Stanberry, 1962) were to:

- . Preserve and enhance urban centers and subcenters
- . Increase property values
- . Reduce costs of urban sprawl
- . Improve employment accessibility

By improving employment accessibility and stimulating regional development, BART supporters expected that the new rapid transit system would be a significant factor in attracting an increased share of new businesses and industries to the Bay region. These expectations generally parallel those of areas where transit systems are now being planned.

2. THE BART EXPERIENCE

Research efforts to date have focused on the extent to which BART stimulated the regional economy and attracted new growth to the Bay Area. The nature of these BART impacts on the regional economy falls into four major categories:

- . BART's impact on employment accessibility.
- . BART's impact on the development of urban centers and subcenters.
- . BART's impact on regional sales, income and employment.
- . BART as a factor in influencing new business and industries to locate in the Bay Area.

(1) BART's Impact On Employment Accessibility

Of the original BART objectives for regional economic development, only the impact of BART on employment accessibility has been documented. The Economics and Finance Project results show that BART has improved employment accessibility for workers at all income levels compared with the No-BART Alternative, with the greatest potential transit travel time reduction for higher income workers. Lower income workers have experienced substantially less improvement in transit travel time, however, and there has been only an average reduction of five minutes in potential transit travel time for unemployed workers (McDonald & Grefe, Inc., 1978).

(2) BART's Impact on Urban Centers and Subcenters

In addition to improving employment accessibility, there are some preliminary indications that the BART system did make a substantial contribution to "the preservation and enhancement" of at least some "urban centers and subcenters." Private business decisions to locate in the City Center Project in Oakland and the Embarcadero station area (Golden Gateway Redevelopment Project) may have been influenced, in part, by the accessibility of rapid transit. Public decisions to encourage development and secure financing for improvements in these areas were definitely influenced and, to some extent financed, either directly or indirectly by BART.

(3) BART's Impact On Regional Sales, Income And Employment

The Economics and Finance Project has identified some other favorable impacts of BART which, although they were not explicitly identified in the original projection of BART benefits, are nonetheless regional economic consequences of BART construction and operations. These impacts were:

- . An increase of \$3.1 billion in the purchase of goods and services within the region resulting from the \$1.5 billion spent building BART.
- . An increase of \$149 million annually in regional sales (over what would have been expected with the No-BART Alternative) as a result of the nearly \$60 million 1975-76 operating budget. Changes in the operating budget in subsequent years will result in corresponding changes in total regional sales.

- . An increase in household income of \$927 million resulting from the BART construction expenditures and all the secondary economic impacts.
- . Finally, 1,265 permanent additional jobs in the Bay Area as a direct result of BART operations compared with the No-BART Alternative.

Although these impacts appear substantial, many were short term impacts of construction. Further, they did not amount in any one year to more than one half of one percent of the gross regional product, the total regional employment or the personal income in the region. Thus, the Economics and Finance Project concluded that the regional economic impacts did not have a "significant long term impact" on the total regional economy (McDonald & Grefe, Inc., 1978).

(4) BART As A Factor In Influencing New Businesses And Industries To Locate In The Bay Area

BART did not appear to significantly affect the decisions of businesses to locate in the Bay Area (McDonald & Grefe, Inc., 1978). However, BART may well have been one of several factors contributing to the generally positive impact that attracted business to the Bay Area.

5. EXPERIENCES OF OTHER TRANSIT SYSTEMS

BART impact findings to date have primarily focused on aggregate economic impacts, looking only at the region as a whole. As the BART impact findings on employment accessibility suggest, economic impacts within a region may vary. A more complete analysis of intra-regional economic effects of BART must await the completion of the BIP Land Use and Urban Development Project.

The economic effects of the extension of the Massachusetts Bay Transportation Authority (MBTA), however, offer some additional indications of intra-regional rapid transit system effects on a regional economy. Briefly, some major effects of this South Shore line extension from Boston to Quincy were (Metropolitan Area Planning Council, 1973):

- . Four hundred new jobs were created in the vicinity of the transit station as a result of several new service industry firms building offices to take advantage of transit access.

. Retail trade in Quincy has become increasingly less competitive with downtown Boston because:

- Rapid transit was not enough to offset barriers to a revival of retail trade, such as poor automobile access, obsolete facilities, and lack of expansion space.
- Quincy residents and workers now have convenient transit access to more diversified and attractive shopping areas in Boston.

Although the economic benefits of rapid transit in Quincy have been both positive and negative, the overall effect is generally considered to be positive. Thus, based on the Quincy experience, transit planning should estimate costs and benefits for local areas, in addition to the region as a whole, to provide a basis for mitigating negative impacts.

4. POLICY IMPLICATIONS

The nature of BART's effect on regional economic development supplemented by experience elsewhere provides a basis for formulating policy during rapid transit system planning stages, for understanding reasonable expectations of transit economic potential, and for establishing a process whereby the achievement of these objectives is monitored during the construction stage.

(1) Transit Policy Objectives For Economic Activity Should State Expected Benefits For Various Groups Within The Region

Higher income groups benefitted far more than others from the BART increase in employment accessibility. This result was entirely consistent with the original system objective of reducing congestion on the major transportation corridors between downtown and suburbs. If rapid transit development is expected to help meet certain regional economic and employment objectives, these objectives must be consistent with the broader transportation objectives of the system. For example, it is possible that, had the original BART projections suggested that improvements in employment accessibility could vary substantially according to income group and employment status, the BART proposal may have placed greater emphasis on such modifications as improved feeder services to offset negative or neutral effects of BART.

Regardless of the transit approach taken, however, some areas of a community will obviously receive greater benefits from transit than others. The nature of any projected inequalities can be made more explicit in the initial formulation of policy objectives, permitting a more complete evaluation of the economic benefits of alternative transit system proposals.

(2) A Transit-Related Economic Development Strategy Should Include Provisions For Offsetting The Likely Economic Disadvantages That Will Result In Some Areas

Effective economic growth objectives, as part of a transit system proposal, should deal with both positive and adverse economic effects of rapid transit within a region. As the experience with BART (in achieving unequal improvements in employment and accessibility) and the South Shore Line Extension to Quincy suggest, economic improvements in one area of the community may come at the expense of economic decline in another area. For example, the enhancement of the Boston retail trade by its improved accessibility to Quincy residents may have come at the expense of a decline in the retail trade in Quincy. In addition, the service industry in Quincy made substantial gain, possibly at the expense of another area. This may have been the case in the Bay Area as well, although the results of the Land Use and Urban Development Project, which is assessing intra-regional economic patterns, are not yet available.

Recognizing the likelihood of both positive and negative economic effects within a region, a balanced economic development policy requires that ways be found to offset the disadvantages to other areas. As an example, the seriousness of the decline in the retail trade in Quincy was mitigated somewhat by:

- . The acknowledgement, in advance, that further decline in an already weak retail base would probably occur as a result of the transit extension.
- . The concurrent upgrading of local bus service which made Quincy stores more accessible to Quincy residents.

An economic development strategy that compensates for disadvantages brought about by the transit system may require:

- . Conducting an economic study to identify areas and industries within the region on which rapid transit could have positive and adverse effects.
- . Developing measures to offset the adverse effects, including tax breaks, relocation assistance or special promotional attention.

For example, if analysis predicts that one area may suffer, part of the transit development strategy and cost may involve some promotional efforts designed to attract new businesses to that area that might not be adversely impacted by transit.

(3) The Impact Of Rapid Transit Expenditures On Economic Development Will Increase In Direct Proportion To The Amount Spent

A final major consideration in formulating transit policy objectives is the effect of transit construction expenditures on regional sales, employment and income. If regional economic stimulus is a primary transit objective, then the Bay Area experience provides two major policy implications:

- . The more money spent building the system, the greater the economic stimulus that will result. Consequently, a more expensive transit proposal may meet regional economic development objectives in that it provides greater short term stimulus. However, the degree of impact on the region will depend on what percentage of total transit expenditures are actually purchased within the region rather than imported from elsewhere.
- . The status and nature of the regional economy will determine the significance of the proposed transit expenditures in relation to the region as a whole. If the economy is a mature, diversified economy similar to the Bay Area, transit expenditures will likely not have a significant impact on regional incomes, sales or employment. If, however, the regional economy is stagnating or underdeveloped, the transit expenditures will be more likely to

provide significant one-time economic stimulus. The degree of long term benefit will largely depend on how well local governments plan for and take advantage of these expenditures, e.g., in job training programs.

(4) Local Officials Should Ensure That The Impact Of Technical Decisions On Economic Development Is Considered During Transit Planning

Unless specific provision is made to evaluate the impact of rapid transit technological and engineering decisions on regional economic objectives, these objectives are not likely to be fully achieved. Once the projected economic benefits of BART were presented in the Composite Report, it was almost as if the BART planners expected these benefits to flow automatically with the construction of the system. There was no provision for determining what specifically had to be done in planning and building BART in order to achieve regional economic development objectives. Further, no one questioned whether the originally stated objectives were even realistic.

Once the initial expectations of economic benefits had been established, the detailed system design and the countless location, alignment and equipment decisions were made by the consulting engineers. The scope of their work was restricted to technical and project management decisions. There was no established planning responsibility to evaluate carefully the implications of technical or locational decisions for the regional economic objectives. It is understandable that the economic development objectives became subordinate to the direct transportation objectives. Nonetheless, if economic development policy is to be more than an initial selling feature, the responsibility for and process of economic planning should be clearly defined at the same time the objectives are formulated.

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VI. LOCAL ENVIRONMENTAL POLICY

This chapter outlines policy implications for enhancing the local environment through rapid rail transit development. Specific issues addressed are:

- . Minimizing any adverse environmental impacts of rail transit construction.
- . Avoiding environmental problems associated with transit operations through careful design.
- . Developing a high quality environment within the new transit system.

IMPLICATIONS FOR ENHANCING ENVIRONMENTAL QUALITY
THROUGH RAPID TRANSIT DEVELOPMENT

1. BART EXPECTATIONS

The environmental impacts of rapid transit were not explicit concerns in the BART planning process. BART planning and design were accomplished during the 1950's and early 1960's, well before "the environment" became an important policy issue at either the local, state or Federal level. BART was not subject to any environmental impact review (as are transit systems developed since 1969), nor did the Composite Report or any other early BART publicity mention environmental objectives as an explicit planning concern. Only in the late 1960's, when BART construction was well under way, did local environmental groups become actively involved in transportation issues (McDonald & Smart, 1975). These groups expressed hope that BART would enhance air quality by reducing automobile traffic. Further, a 1972 survey of public attitudes toward BART indicated that residents hoped BART would improve air quality.

The potentially adverse impacts of rapid transit construction were also not very prominent in the early BART publicity and policy debates. Although not explicitly stated, BART planners appeared to have serious concerns about construction impacts as detailed system design began and initiated efforts to reduce any expected adverse construction impacts. Merchants along many of the proposed routes (particularly where subway construction was planned) expressed some early concern about how rapid transit construction might affect the economic viability of their businesses. As an example of local action, San Francisco Market Street merchants formed the Market Street Development Project, a private, non-profit organization. The group was designed to protect area merchants against BART's construction impacts as well as to consider programs to promote and take advantage of BART.

Although most environmental aspects of rapid transit were not prominent, system proponents were vocal in their desire to achieve a high quality environment within the BART system (Gruen Associates and DeLeuw, Cather & Company, 1977). The system was designed with the highest levels of passenger satisfaction and safety in mind as a means to lure suburban residents away from automobiles to the BART trains. This quality environment was expected to be achieved through both esthetic features and system reliability.

2. THE BART EXPERIENCE

The BART experience shows that a major new public rapid transit system can be built without significant harm to the environment. Despite limited initial planning to minimize environmental impacts, the observed environmental impacts of BART are small. The most significant adverse impacts occurred during the construction period in downtown areas. Conversely, environmental impacts of BART operations were most noticeable in quiet suburban residential areas with aerial or at-grade lines. In addition, BART itself has had only partial success in achieving its goals for a high quality transit environment.

(1) BART Construction, Particularly In Downtown Areas, Caused The Most Serious, Although Temporary, Adverse Environmental Impacts

Although only limited data were collected about the BART construction period, interviews with residents and public officials and a review of publicity at the time suggest that BART construction impacts were viewed as "bad" to "very bad." Adverse impacts of BART were particularly significant in downtown San Francisco where delays in reaching agreement between the City and BART and delays in the funding of the Market Street beautification project prolonged street excavation up to five years in any location. Impacts in other downtown areas with subway construction were less adverse due to shorter construction time, lower street activity and less disruptive construction methods (tunneling rather than cut and cover). However, suburban at-grade or aerial line construction resulted in the lowest level, yet some adverse impact, but over a considerably shorter period of time (at most one year in any location). The most pronounced effects of BART construction were as follows (Gruen Associates, Inc. 1976, 1977):

- . Neighborhood travel--Narrowed sidewalks, closed streets, detours and other changes in local traffic patterns to accommodate BART caused some increase in pedestrian accidents and travel delay. Impacts were most pronounced in busy downtown commercial areas, but were also noticeable in suburban residential areas.
- . Barriers--BART-related changes in traffic patterns and actual construction activities sometimes blocked

access to either building entrances or streets and eliminated parking spaces which were ordinarily available.

- . Atmosphere--Actual construction resulted in increased levels of dust and dirt which were viewed as particularly irritating in suburban communities.
- . Acoustics--Construction noise was primarily viewed as a problem in residential communities where normal noise levels are quite low.
- . Dislocation--Some downtown merchants were forced to vacate some basement space which was located underground in public right-of-way. Some housing dislocation occurred in suburban communities due to land clearance for BART parking lots.
- . Historic preservation--The lack of early coordination and planning resulted in the possible loss of historic artifacts discovered during BART construction.
- . Economic--A number of merchants along subway routes claim that BART construction caused their businesses to fail. Although no empirical evidence was collected, most observers claim that business failures probably did not result from BART construction alone. However, the effects of BART construction could have speeded up the failure of a business already weak economically.

Although minimizing construction disruption was not foremost in the minds of BART planners, BART did take some actions with this expected disruption in mind.¹ For example:

- . Pre-construction coordination--BART negotiated written agreements with each local jurisdiction affected by construction. BART staff worked

¹ Interviews with former BART Governmental Relations staff, June, 1977.

closely with local representatives to jointly develop workable traffic and utility relocation plans.

- . Construction activities--BART designers and contractors appeared to select construction techniques with environmental factors in mind. For example, tunneling was used for subway construction in San Francisco because it was less disruptive, although more expensive, than the alternative cut and cover technique.
- . Community relations--BART paid particular attention to citizen complaints and often provided free services, such as street improvements or landscaping, to compensate home owners and businesses near construction sites.

(2) BART Operations Have Caused Only Small, Generally Adverse Environmental Impacts

The environmental impacts of BART operations appear to be small, appear more often adverse than beneficial, affect only certain segments of the line and are noticeable only to people living or working within a short distance from a BART station or line (Gruen Associates and DeLeuw, Cather & Company, 1976 and 1977). The primary environmental impacts of BART operations are:

- . Acoustics--Probably the dominant adverse impact of BART is noticeably high noise levels along seven miles of aerial track in quiet residential neighborhoods. Law suits by two communities affected by noise are now pending. BART trains appear to cause some perceptible, but probably not damaging vibration within a block of some aerial lines.
- . Atmospheric--BART has had no noticeable effect on regional or local air quality. The fact that BART represents only about 3% of the region's travel is probably the reason for the lack of a more significant positive impact than was expected. Conversely, no significant degradation of local air quality has been noted because of traffic to and from BART parking lots.

- . Natural--BART has had no significant effect on the region's natural environment including biota, soils and geology and drainage and water. Most BART development is in urban areas or areas which are not ecologically unique and could not be noticeably disrupted.
- . Visual--Most residents surveyed found station architecture to be attractive and a positive impact of BART. Station lighting was either valued as a crime deterrent or of no importance. BART allowed local planning departments to review station design plans. However, few local planners were prepared early enough to give meaningful feedback.
- . Safety--BART has had no noticeable effect on the level of auto-related crimes or personal safety in station areas. Even the initiation of night service in early 1976 caused only slight increases in arrests.
- . Social--BART has caused some households to move closer to its stations, but population characteristics near stations or along lines do not appear to be changing as a result. Alternatively, increased noise and loss of privacy near aerial lines may cause residents to move away from these lines.

BART planners did incorporate system features which were intended to mitigate some of the expected adverse effects of BART (Gruen Associates, 1977). For example:

- . Continuously welded track was used to minimize the impact noise ("clickety-clack") usually made by a passing train.
- . Sound proofing was included in station design.

- . BART constructed a landscaped "linear park" under a 2.7 mile stretch of aerial line to improve visual appearance. However, residents did not regard the positive appearance as offsetting other negative impacts such as noise.

- . Nearly 85% of the BART line is located along existing railroad, highway or local street right-of-way, thereby reducing the potential environmental disruption.

(3) The BART System Is Considered Esthetically Pleasing, But Reliability Problems Reduce The Overall Perceived Quality Of The System

BART station and train design has received favorable comments from riders in recent surveys (Jefferson Associates, 1977, and Gruen Associates, 1977). In addition, interviews uncovered some BART riders who would not ride AC Transit buses but would ride BART because of the quality of the BART ride, thereby increasing the likelihood of automobile users switching to BART. This pleasant environment was provided at an additional, yet now unquantifiable, cost, the value of which will probably not be able to be assessed.

Riders' experience with schedule reliability has not been as positive. The unreliability of the schedule has resulted in some workers with fixed reporting times switching from BART to other modes to make work trips; some workers use other transit in the morning and use BART for the return trip.

Schedule unreliability is also the reason for some complaints about the lack of amenities in the station, especially on the platform loading area. In order to use the public telephone, the BART rider must leave the loading platform. As a result, when the train is late, the rider may miss the train while making a phone call to inform others of the delay in schedule. Regular riders complain the most about this problem. Also, long waits, without access to concessions, seem longer, according to some patrons interviewed by the Environment Project.

Interviews conducted by both the Institutions and Life Styles and Environment Projects also found some discontent with the automated equipment and signing

system in the station. The automated equipment presents a barrier for non-English speaking users, some elderly patrons and some of the less educated residents of the BART service area. Regular riders do not complain about the automated equipment, except for inoperative machines. Those who complain about the complexity of the automated equipment are usually infrequent riders of the system.

3. EXPERIENCE OF OTHER TRANSIT SYSTEMS

The experience of other transit systems suggests that careful system planning and design can keep adverse environmental impacts to a low level. Incorporation of environmental concerns early in the planning of a rapid rail transit system appears to be an effective way to identify potentially adverse environmental impacts and, where possible, design mitigation measures.

(1) Special Public Relations Programs And Careful Selection Of Construction Techniques Have Been Successfully Used To Reduce Construction Disruptions

Adverse effects of BART subway construction were well publicized in the Bay Area and elsewhere. Planners in Washington, D.C., and Atlanta, for example, were well aware of BART construction problems. Planners recognized that construction disruption was inevitable on a project of this magnitude. However, both areas developed special programs and devised strategies to try to minimize the disruption that was expected to occur. Specific examples of measures taken in Washington and Atlanta to mitigate adverse construction impacts include:

- . Both areas developed an extensive community relations program to keep residents and merchants aware of construction schedules and to coordinate with local officials to develop mutually agreeable traffic and parking plans.
- . Contractors and engineers in Washington made every effort to ensure continued access for residents, merchants, and other commercial establishments. Washington METRO had an engineer assigned as a full time ombudsman at each construction site to deal with citizen complaints.

Neither area attempted to implement any plan to compensate business losses during rapid transit construction. Although system planners in both cities considered a number of plans, no successful way was found to isolate the impact of rapid transit on the economic viability of a business.

(2) Federal Policies Established Since The Development Of BART Have Caused Other Communities To Become More Sensitive To Environmental Issues

New Federal legislation and regulations adopted in the late 1960's and early 1970's, since the development of BART, have required local planners to conduct a variety of detailed analyses of potential environmental impacts of rapid rail transit development.

Specifically, the Federal Environmental Policy Act of 1969 requires the preparation and approval of an Environmental Impact Report (EIR) prior to allocation of any Federal funds to rapid transit system construction. Although the quality and usefulness of these reports are uneven, the reports have provided some benefits for local jurisdictions. Based on the experience in Atlanta, Miami and other areas, preparation of an EIR did not result in any change in the selection of a transit system alternative, although it did result in some beneficial changes in the planning process or design specifications, for example (Johanning and Talvitie, 1976):

- . Modifications in construction methods were often made to make the project more environmentally sensitive.
- . Citizens and businesses were provided a concrete plan with expected impacts as a basis for comment and possible challenge.
- . A knowledge of expected adverse impacts allowed local governments to consider means to mitigate those impacts and provided a better bargaining position vis-a-vis the local transit district.

The Metropolitan Area Rapid Transit Agency (MARTA) in Atlanta was the first transit operator required to comply with the EIR procedure. Although delays of up to a year resulted, once the EIR was approved, construction has generally proceeded on schedule (Engineering

News Record, 1974). In contrast, the Washington Metropolitan Area Transit Authority (WMATA) in Washington, D.C., did not use any impact review process and is now facing a number of lawsuits challenging early route location decisions (Engineering News Record, 1974). In one case, the court required WMATA to conduct a specific environmental study on a line segment, adding about \$6.5 million in cost and delaying construction further.

Adherence to Department of Transportation regulations on alternatives analysis, encroachment on park land and historic preservation has caused some delays in rapid transit development. MARTA officials claim these regulations have been more troublesome to them than the EIR process.² Some MARTA plans were delayed by neighborhood groups and the State Historic Preservation Office, in some cases through litigation. As transit planners and engineers gained more experience dealing with community groups and other public officials, the many system delays were resolved satisfactorily.

4. POLICY IMPLICATIONS

Recent experience in rapid transit development shows that a major new rapid rail transit system can be constructed and operated without significant dislocation to the environment. There are, however, actions local and regional officials can take to mitigate any potential or existing adverse environmental impacts.

(1) Existing Federal Guidelines And Regulations Will Require Local Officials To Conduct Meaningful Environmental Analyses During Transit System Planning Stages

Other local jurisdictions will be required to analyze in detail expected environmental impacts of rapid rail transit development before proceeding. This process should provide a much better base of knowledge than what was available to BART planners. BART was planned before environmental issues became politically sensitive, and little economic analysis was conducted. The environmental impact assessment data now available to local officials should allow them to make more informed decisions about whether to proceed with rapid

² Interviews with MARTA planning officials, November, 1977.

rail transit initially, and later about route and station locations, line configuration and construction methods.

Further, the analysis and review process required by the Federal government also provides a good opportunity to inform and involve affected community groups in rapid rail transit planning. For example, station and route location decisions, when made, should be presented at public hearings in each neighborhood affected to avoid the possibility of later legal action by citizens, as happened in Washington, D.C.

(2) Early Planning And Continuing Coordination By Local Officials Can Help To Minimize Rapid Transit Construction Disruption

Rapid transit construction, particularly cut and cover subway construction, is generally the source for the primary adverse environmental impacts resulting from rapid transit development. As BART and other transit systems found, there are ways to reduce these adverse impacts by careful planning and coordination, although additional expenditures may be required.

If properly prepared, the rapid transit system Environmental Impact Report should outline projected adverse environmental impacts of rapid transit construction, as well as possible ways to mitigate those impacts. Local officials should use these findings and any additional analysis produced by their own staff as a basis for negotiation prior to agreement for use of right-of-way by the rapid transit operator. Often alternative construction methods and schedules can be developed which may be more expensive and time consuming, but would cause significantly less construction disruption. For example, tunneling vs. cut and cover subway construction is more expensive but disruption from street closings and other access limitations is less.

The potentially adverse economic impacts of rapid transit construction on small businesses appears to be an inevitable result. No effective method for assessing the level of economic impact resulting from rapid transit has yet been devised. Too many other external factors appear to be much more important determinants of the economic viability of small businesses than the construction of a rapid transit system. The courts have upheld this position in law suits filed by local merchants against BART.

The physical and economic disruption caused, in part, by rapid rail transit construction is inevitable. The key to minimizing this disruption appears to lie in open and continuing communications between rapid transit officials and local government officials, local merchants and community groups. Possible steps to help maintain continuing interaction include:

- . Local jurisdictions anticipating significant construction (particularly subway) activity should appoint a full-time liaison staff or ombudsman to facilitate planning for the expected disruption and interaction between local merchants and construction engineers or contractors. The size of the staff should depend on the expected level of construction disruption anticipated.
- . Local merchants should consider the creation of a merchants' organization at an early stage in transit development to coordinate their input with local government and/or transit district officials. This type of group could also initiate projects to take advantage of rapid transit development, such as the Market Street beautification in San Francisco which was originally initiated by the Market Street Development Project (a group of local merchants and business representatives).
- . Local government officials should make every effort to expedite any plans for transit-related public improvements. The objective should be to schedule transit system and public improvement construction simultaneously to minimize the total construction time and, thereby, lessen disruption.

Although protection against construction disruption is an important aspect of rapid transit development, local officials should spend equal energy and time on how to take advantage of rapid transit development. Rapid transit construction can provide an opportunity to improve local streets and neighborhoods at a lower overall cost than if done alone. Local officials

should consider modifications and improvements to areas most affected by construction as part of their local planning process. Some examples include street and sidewalk widening and repaving, improved signalization and lighting, pedestrian overpasses, vehicular grade separation and landscaping. In many cases, BART provided such amenities to Bay Area communities at little or no additional cost to the community.

(3) Local Planners Should Take Steps To Ensure Transit System Plans Conform With Local Objectives And Plans

In areas without a strong regional government, the BART experience in negotiating with local governments on facility location, construction processes and timing, etc., can provide useful lessons for local officials on ways to mitigate any adverse environmental impacts or generally take advantage of transit development. Local governments generally maintain jurisdiction over local streets and rights-of-way and thus can exercise a significant amount of leverage over the type, location and timing of transit development. Further, local officials should view the transit planning process as a means for ensuring conformity of transit development with a city's General Plan and Zoning Map.

Under these conditions, local governments and transit districts must negotiate joint agreements specifying the terms and conditions of transit's use of local rights-of-way. Lessons learned in the BART experience which should be considered by local officials in this agreement process include:

- . Route location and configuration--
Local governments should carefully analyze proposed rapid transit route locations to ensure they are desirable in terms of local as well as regional accessibility and development objectives. In many cases, a particular route location decision will involve a trade-off between environmental impacts and accessibility which should be evaluated at the local level. Three examples include:
 - Existing highway, street and railroad rights-of-way can be used for transit development, thereby

reducing the potential for adverse environmental impacts. However, improvements in overall accessibility are generally not as great as if a brand new right-of-way were chosen for rapid transit.

- A local government could insist on an option, like the City of Berkeley, to raise local funds to pay the additional cost to underground transit lines rather than allowing continuing disruption in a densely populated urban residential area.
- Adverse noise impacts can be reduced by locating transit routes in open space or sparsely populated residential areas. However, such a location will not serve the more densely populated residential areas very well.

. Station location and quality--Local officials should require some role in approving station location and architectural designs and plans. A local planning commission or department should incorporate such a review in its existing procedures for design review, if applicable. Local planners should be involved early in the design process to encourage conformity with other local development and to suggest modifications, such as special station mezzanines desired in San Francisco, which can help to meet other local objectives.

. Land acquisition--Local officials should establish recommendations for the appropriate amount of public land

set aside for transit operations. In residential areas, the acquisition of additional land can be expected to result in fewer adverse impacts of transit operations, particularly noise, and provide a more attractive, open environment. However, that same policy might also result in substantial dislocation of existing housing.

(4) Rapid Transit System Planning And Design Should Incorporate Specific Features To Ensure A High Quality Environment For Transit Patrons

If a high quality transit environment is desired, a number of specific features should be considered in the planning and design stages of a rapid rail transit system. For example:

- . Transit patrons with a fixed work reporting schedule, usually lower income employees and blue collar workers, require schedule reliability more than a quality ride. Incremental initiation of new service can probably help improve reliability somewhat. In addition, less technical innovation might reduce system failures, thereby improving reliability.
- . Signing and instructions for transit automated equipment should be designed to minimize barriers for less well educated passengers and non-English speaking patrons. Infrequent users of the system with little or no command of the English language and the less well educated will have difficulty in using the automated equipment and the signing system. System design should initially consider this type of patron.
- . Station facilities should be designed with transit waiting time in mind. Planners should also expect some schedule delays. Therefore, passenger amenities should be an important part of station design.

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VII. CONCLUSIONS

The preceding five chapters have assessed how well BART has achieved its original objectives and suggested improvements in local policy-making to help other metropolitan areas come closer to meeting their own transit objectives.

The purpose of this chapter is to tie together the findings in each of the individual policy papers to present some generalized implications of the BART findings. Readers should use this chapter as a basic overview to the material, referring to individual chapters which provide a more thorough discussion of policy options and processes.

Local officials should also recognize that an analysis of the history of BART and its impacts has certain limitations for developing policy improvements in other regions. Public priorities have changed and the Bay Area and BART development are relatively unique. Despite this, local decision-making processes have not changed that much and some of the issues now confronting local officials in Washington, D.C., and Atlanta are remarkably similar to issues raised in the Bay Area not too long ago.

This overview of implications for local officials is presented in three sections: the role of rapid rail transit in achieving local objectives; the institutional setting for rapid rail transit development; and a policy approach to planning, constructing and operating a rapid rail transit system.

1. THE ROLE OF RAPID RAIL TRANSIT IN ACHIEVING LOCAL OBJECTIVES

The ability of rapid rail transit development to meet local community objectives has been an important underpinning of the LPI Project analysis. This section outlines the original community objectives for the BART system and how those objectives have changed over time, assesses how well BART has done in meeting local officials' original expectations and suggests how the formulation of community objectives in other areas may benefit from the BART experience.

(1) Local Goals And Expectations For The BART System

BART was originally developed to meet a wide variety of objectives and expectations expressed by different organizations and officials. One task of the LPI Project included a review of the BART history through written documents, press accounts and interviews to isolate those goals and expectations which

were generally accepted and considered feasible (not just media propaganda). This review led to the selection of the nine general objectives used in the LPI analysis. These objectives for BART are of two distinctly different types (as specified in Exhibit II).

- . Direct objectives--specific objectives which BART was designed to achieve.
- . Induced objectives--certain objectives which were developed as a result of BART development, but were not alone reasons for BART to be built.

It is the direct objectives which were of most concern to decision-makers in formulating the plans for BART. Further, it appeared that land use and economic development objectives were more compelling reasons for moving ahead with BART than were the general transportation objectives.

(2) BART Results Compared With Objectives

BART Impact Program results lead to the conclusion that BART has not yet been very successful in meeting the original objectives expressed by local officials and community and business organizations. Exhibit III summarizes BART's accomplishments compared with original expectations for each of the nine objectives assessed in this study.

Although BART has not met all of its planned expectations, there is reason to believe that, over time, many of these objectives may be achieved. For example:

- . BART has only been in operation five years and is not yet operating at anticipated levels.
 - Trains on each line run on twelve minute headways rather than the six minute headways originally planned.
 - Only three of the four planned lines are now in operation.
 - Night service has only operated since 1976, Saturday service only

EXHIBIT II
Local Policy Implications Project
LOCAL OBJECTIVES FOR BART SYSTEM
DEVELOPMENT--BY TYPE

Direct Objectives

- . Reduce vehicular congestion and the need for highway development
- . Improve mobility
- . Achieve local land use and development objectives:
 - Revitalize downtowns
 - Strengthen urban residential areas
 - Encourage higher density development near suburban transit stations
- . Encourage regional economic growth and development

Induced Objectives

- . Provide an integrated transportation system
- . Expedite other public improvement programs
- . Develop an equitable financing plan for rapid transit construction and operations
- . Promote local government fiscal health
- . Enhance environmental quality

EXHIBIT III
Local Policy Implications Project
BART ACCOMPLISHMENTS COMPARED WITH
ORIGINAL OBJECTIVES

<u>Direct Community Objectives</u>	<u>BART Accomplishments</u>	<u>Where Public Policy Could Help</u>
<ul style="list-style-type: none"> . Reduce vehicular congestion and the need for highway development . Improve mobility . Achieve local land use and development objectives . Encourage regional economic growth and development 	<ul style="list-style-type: none"> . Only short term reduction in congestion (about one year's growth) . No reduction in highway development . Limited, for size of investment . Limited--may be too early to tell . No evidence of change 	<ul style="list-style-type: none"> . Traffic and parking management . Integrated transit and highway planning . Alternatives analysis . Design features . Demand must exist--then public policies such as land assemblage, public improvements, zoning and marketing can help . Better planning and marketing
<u>Induced Community Objectives</u>		
<ul style="list-style-type: none"> . Provide an integrated transportation system . Expedite other public improvement programs . Develop an equitable financing plan for rapid transit construction and operations . Promote local government fiscal health . Enhance environmental quality 	<ul style="list-style-type: none"> . Some integration, but much more possible . Effective in large urban areas, but not in urban residential or suburban areas . Plan is highly inequitable . Generally positive impact . Some adverse impacts, but generally small 	<ul style="list-style-type: none"> . Institutional arrangements . Incentives to operators . Coordination of capital improvement schedules with transit development . Not achievable unless equity is a paramount objective . Depends on institutional arrangements and politics . Transit system design

began in November 1977 and Sunday service is not expected until spring 1978 at the earliest.

- Reliability problems have made it difficult to maintain programmed speeds and headways.

- . BART service began during a period of significant economic slowdown in the Bay Area which particularly affected demand for residential and commercial construction. Thus, BART-related development may still be in the planning stages.
- . BART was developed in a region at a time when no effective institutional mechanism existed for coordinating local government or other transit district objectives and plans. As regional agencies in the Bay Area gain more authority over transportation planning and funding, BART impacts may be greater.
- . Local officials appear to have overestimated what BART could achieve and underestimated the importance of supportive local policy. For this reason, supportive changes in local policy were often not made.

Some of BART's objectives will probably not be achieved (e.g., economic development, equitable financing, etc.). These objectives were probably not very realistic in the first place. However, more appropriate and timely public policy actions could have helped in most cases, as described in earlier chapters of this report.

(3) Lessons For Other Metropolitan Areas

Rapid rail transit systems are being developed in a number of other jurisdictions based on many of the same objectives originally outlined for BART. Despite the discouraging nature of BART impact findings, local officials should not dismiss their system's objectives as impossible to achieve. Rather, these officials should reassess their objectives with the BART impact results in mind to ensure reasonable and achievable objectives.

Both publication of BART Impact Program reports and changes in Federal and local policy have already caused local officials to change their transit objectives. For example:

- . Direct objectives--Local officials in many communities appear to be tempering their once vocal land use and transportation service expectations, although system objectives have not been changed significantly.
- . Induced objectives--Local officials express much greater concern about induced transit objectives than did Bay Area officials. This change is primarily due to the greater prominence of issues such as the environment and service for transportation disadvantaged. Further, increasing fiscal strain in most urban areas has raised transit financing to much greater prominence than during the BART planning period.

2. THE INSTITUTIONAL SETTING FOR RAPID TRANSIT DEVELOPMENT

The institutional setting for rapid transit deserves special emphasis because it is a critical factor in policy development in each of the policy areas studied in this project. The institutional arrangements are also likely to affect the achievement of specific objectives for rapid rail transit development. This section briefly describes the Bay Area institutional setting, outlines what problems and opportunities were presented to BART and suggests ways other metropolitan areas can learn from the BART experience.

(1) The Bay Area Institutional Setting

The BART District was established in 1957 as the first truly regional transit district in the Bay Area. During much of BART's development, governmental authority was fragmented among a host of individual local jurisdictions. A number of regional agencies were formed in the late 1960's and early 1970's in response to specific regional issues (e.g., transportation, land use planning, air pollution). Few of these agencies had any real governing authority as it might relate to BART planning until the last two or three years. Likewise state agencies have not played a strong or active role in BART-related issues during the BART development period (except on issues related to the reliability and safety of operations).

(2) The Role Of Institutions In BART Development

The fragmented nature of Bay Area governmental institutions and the lack of any significant regional or State intervention is an important barrier to BART achieving its original objectives. Institutional arrangements affected a diverse range of policy decisions related to BART development, such as:

- . Integrating the services of various transit operators.
- . Developing comprehensive land use and economic plans to support transit planning.
- . Implementing the rapid rail transit plan itself.
- . Making transportation planning trade-offs among modes.

The problems BART faced with each of these policy decisions are outlined in Exhibit IV.

Alternatively, strong local government control did provide some benefits in BART development. For example:





- . At least the larger cities assigned special staff in an ombudsman or liaison function to help coordinate rapid transit construction and improve communications with local residents and businesses.
- . Local officials were involved in specific design and construction questions because BART had to reach individual agreements with local jurisdictions prior to using local right-of-way.

More recently, the State's delegation of increasing authority to the Metropolitan Transportation Commission for transportation planning and funding authorization has started to remedy many of the problems encountered by BART in its early development.

EXHIBIT IV
 Local Policy Implications Project
 PROBLEMS CAUSED BY INSTITUTIONAL ARRANGEMENTS
 AND THE RESULTING IMPACT ON BART

Institutional Problem*

Impact On BART

- | | | |
|---|---|---|
| <ul style="list-style-type: none"> . No organization responsible for encouraging cooperation among local transit districts |  | <ul style="list-style-type: none"> . Feeder service to BART inadequate . Parallel and possibly competing transit services continue . Transfer systems between operators are cumbersome |
| <ul style="list-style-type: none"> . No organization responsible for comprehensive land use and economic planning to support rapid transit development |  | <ul style="list-style-type: none"> . Some evidence of unrealistic expectations, missed opportunities and intra-regional competition |
| <ul style="list-style-type: none"> . No mechanism to gain regional participation in transit system planning and financing |  | <ul style="list-style-type: none"> . Some counties may benefit but not pay (for example San Mateo) . The most cost effective system may not have resulted |
| <ul style="list-style-type: none"> . No organization is responsible for comprehensive transportation planning across modes |  | <ul style="list-style-type: none"> . Highway development was not reduced as expected . Joint development occurred but was not a high priority and few of BART's preferences were realized . No coordination of highway/transit/parking policies to achieve regional objectives |

* Problems identified relate directly to the BART planning period (early 1960's) and may not be true today.

(3) Lessons For Other Metropolitan Areas

The BART experience suggests that metropolitan areas with strong local government control and lacking effective regional and state participation in transit planning will have a difficult time achieving rapid rail transit development objectives. Creating a new regional agency (like BART) for rapid rail transit development will not alone solve this problem, as the Bay Area found.

Other metropolitan areas have developed an improved institutional model--a single regional transit operator (e.g., Atlanta, Washington, D.C.). Here, the formation of a rapid rail transit agency was accompanied by the consolidation or purchase of other transit operators. This approach provides a better basis for transit planning, financing and coordination, but has two major weaknesses as well.

- . All transit provided by a single operator removes any basis for competition. Service may deteriorate and service decisions may become too far removed from the communities served by the system.
- . The establishment of a single transit operator does nothing to meet the needs for comprehensive regional transportation, land use and economic planning. A transit operator cannot make necessary trade-offs between various modes of transportation (transit, automobile, etc.). At least another agency will be necessary.

A preferred institutional approach might follow what is now being developed in the Bay Area. This type of arrangement includes the following components:

- . Individual transit operators within a region to foster a competitive spirit, but with sufficient oversight to prevent direct competition on individual routes. Further, a Board of Directors should be elected or appointed by local officials to be responsible for making policy decisions and providing a liaison with local governments.

- . A loosely structured regional association of transit operators to facilitate coordination, including such joint activities as purchasing, marketing and public relations.
- . A regional or state transportation planning agency with funding leverage over individual transit operators. The traditional regional planning agency meets the needs for comprehensive planning, but cannot exercise any real control over individual operators. Therefore, the control over allocation of a significant portion of funding for transit region-wide is a necessary element.
- . Local governments should retain the option to initiate transit on a contract basis, seeking bids from various public and private transportation companies. This option should encourage public operators to control costs more effectively than in the absence of competition.

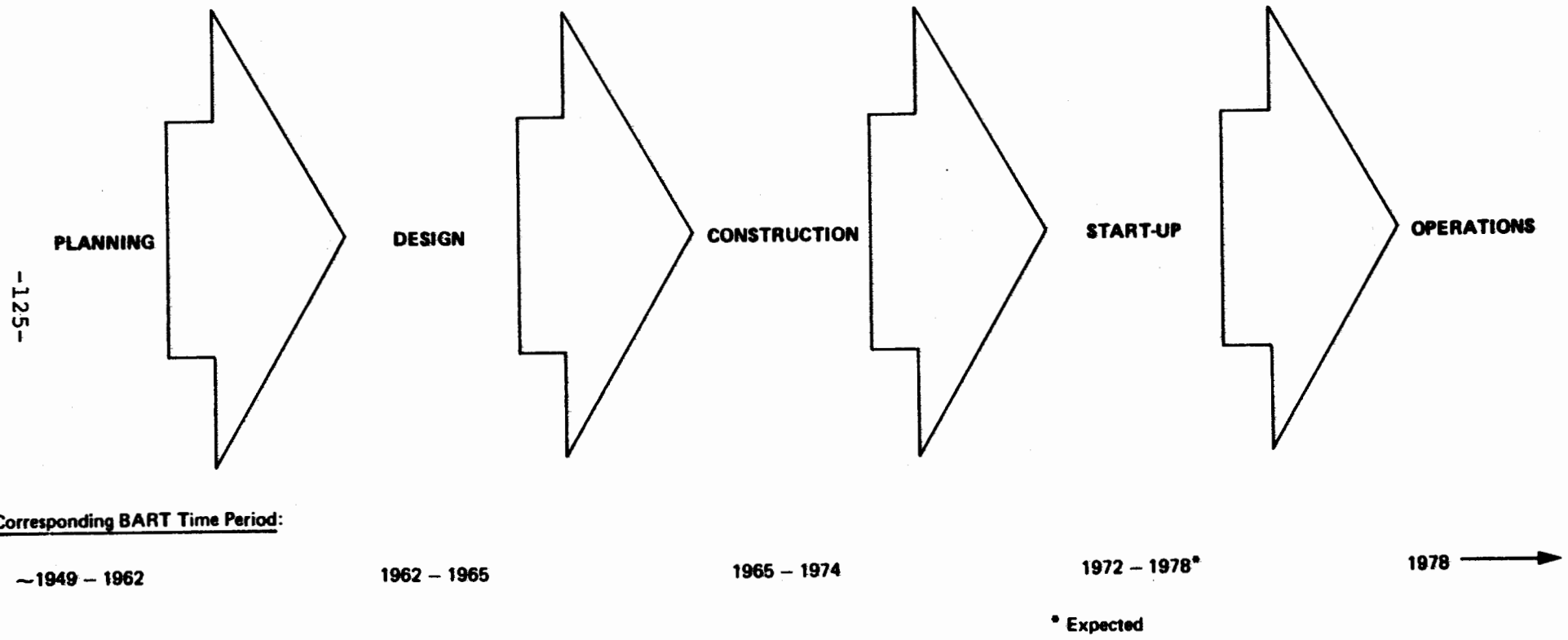
This description suggests the necessary components of an approach to improving institutional arrangements for transit. These components can be adapted to the individual situation in a given region, considering both the financial and political costs of implementation.

3. A POLICY PLAN FOR RAPID TRANSIT DEVELOPMENT

This section is designed to serve as a general "road map" for local officials, suggesting the appropriate types of local policy actions to consider at different time periods in the development of a rapid rail transit system. The use of a time-phased approach allows local officials from communities now at varying points in the transit development process to turn to implications most applicable to their current situation.

For purposes of this project, the process used to develop a rapid rail transit system has been generalized into five major stages (as depicted on Exhibit V).

EXHIBIT V
Local Policy Implications Project
THE FIVE STAGES IN A RAPID RAIL TRANSIT
DEVELOPMENT PROCESS



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Corresponding BART Time Period:

- . Planning--the initial alternatives analysis culminating in a decision to build a rapid rail system.
- . Design--the selection of route and station locations and system configuration as well as the detailed design of system components.
- . Construction--the physical construction of the system.
- . Startup--the initial stages of operations where lines are phased in and problems are resolved.
- . Operations--the continuing operations of the rapid rail transit system.

As the BART experience suggests, local policy-makers' involvement in rapid rail transit development will vary considerably from stage to stage. A compilation of policy implications presented in this report indicates when local policy involvement in transit development can be most effective (see Exhibit VI). This depiction of the likely local involvement should help local officials determine when financial and staff resources will be most needed.

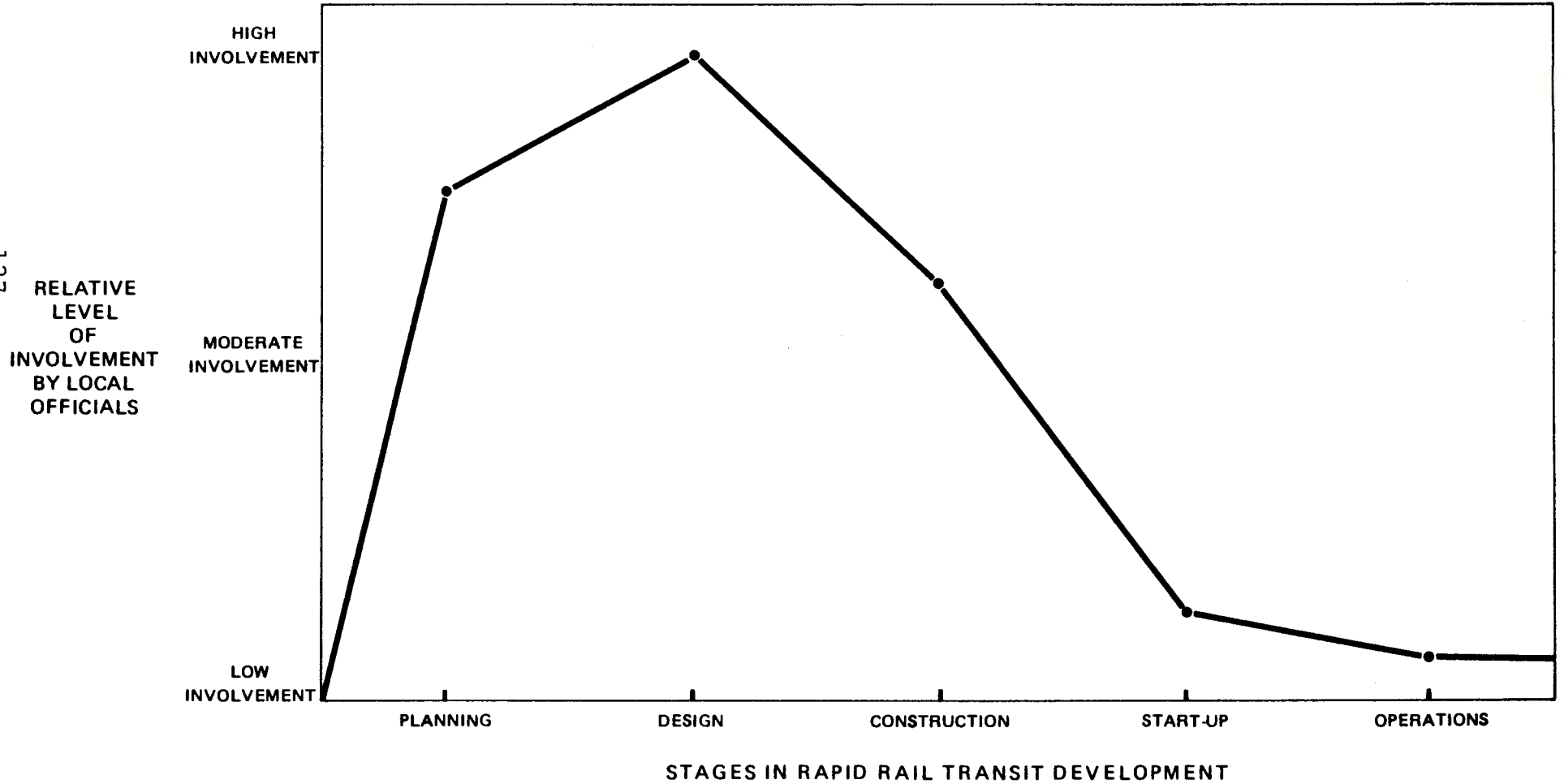
- . Clearly the highest level of involvement should be expected in system planning and design phases. This is the primary opportunity for local officials to influence system character and design to best achieve local objectives.
- . System construction requires a moderate involvement at the local level to help coordinate construction activities in the community, try to reduce any potential adverse construction impacts and plan for later system operations.
- . The least involvement is required in system operations, both startup and continuing. At this point, the system is in place and few local decisions or inputs are required.

Although the development of any rapid rail transit system will require each of these five stages, the stages are seldom discrete (some overlap between stages is bound to occur) and the types of decisions required for each stage may differ somewhat for different systems. For this reason, the categorization of policy implications within any single stage should be viewed as somewhat flexible.

The remaining parts of this section provide brief descriptions of the types of policy decisions local officials can expect to make in each of the five stages of transit development.

EXHIBIT VI
Local Policy Implications Project
**RELATIVE LEVEL OF INVOLVEMENT BY LOCAL
OFFICIALS WHICH APPEARS APPROPRIATE
AT VARIOUS STAGES OF TRANSIT DEVELOPMENT**

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(1) Planning

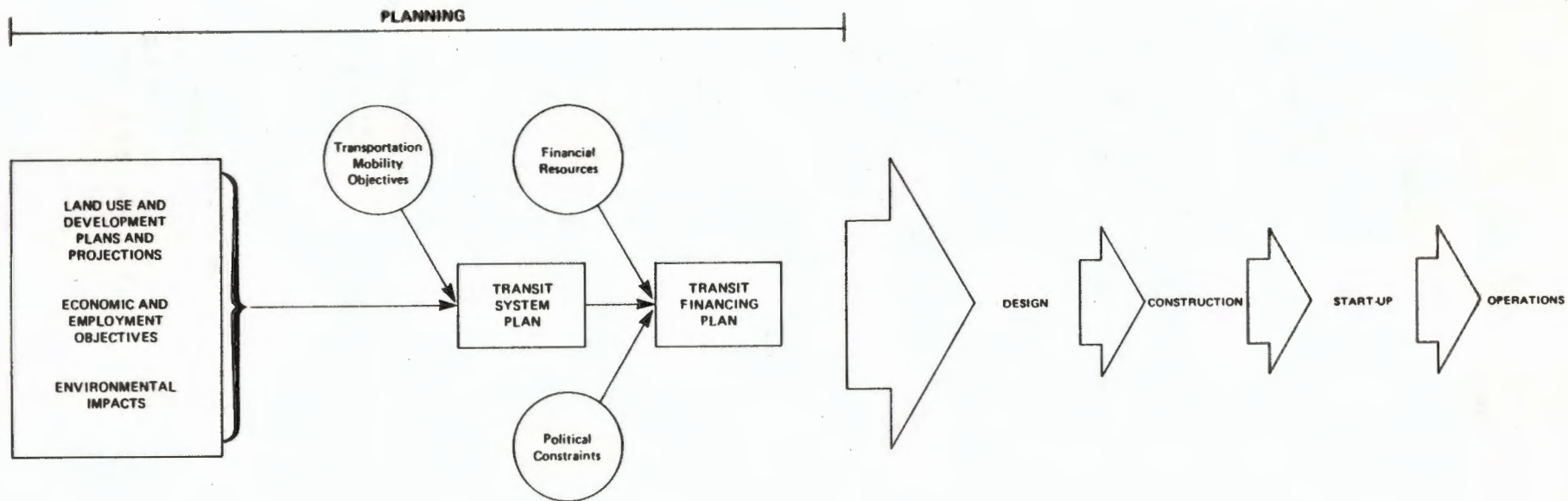
The initial rapid rail transit planning stage is where local officials have an opportunity to assess whether rapid rail transit is the appropriate choice for meeting local objectives and, if so, develop engineering and financing plans. The planning process will generally be the longest stage (it was about 15 years for BART), but this period of time is necessary to ensure that appropriate planning is completed, both at the local and regional level.

Exhibit VII depicts a possible framework for local involvement in the rapid rail planning process. The three major products of this process are:

- . Local and Regional Plans are important inputs to the transit planning process. Three types of plans and objectives should be developed:
 - Land use and development--incorporating objectives from local General Plans and realistic projections of development potential in areas being considered for transit.
 - Economic--including economic development plans and projections and employment objectives with consideration of expected improvements in accessibility.
 - Environmental--outlining the possible environmental impacts of various transportation alternatives.

Once these objectives and plans are developed on the local level, regional planners can begin to make trade-offs between conflicting or competing objectives and, hopefully, minimize the potential for overstated expectations.

EXHIBIT VII
Local Policy Implications Project
STAGE 1 - PLANNING



- . Transit System Plan should be developed using the existing Federal procedures. At this point, local and regional plans are combined with specific transportation objectives to develop transportation alternatives. As required, the alternatives analysis procedure should be open to public scrutiny as a means to gain early community consensus on transit plans and objectives.

- . Transit Financing Plan should be developed once transit is determined to be the appropriate alternative. Financing for a rapid rail system should be considered in the context of total transit financing for a given region, considering the following:
 - Project both capital and operating requirements of the new system, allowing for inflation.

 - Analyze the various existing and potential new financial resources. The political feasibility and equity of new sources should be important in weighing their potential availability.

 - Devise an appropriate strategy.

(2) Design

Rapid transit system design is the area where local government involvement can be most productive and essential. At this point, a region has decided to implement a rapid rail transit system, has approved a financing plan (including both Federal and local sources) and is now ready to begin detailed system planning and design.

Exhibit VIII presents the general process by which local officials become involved in transit design. Three categories of design decisions--route and station location, system configuration and station and train

EXHIBIT VIII
Local Policy Implications Project
STAGE 2 – DESIGN

DESIGN

INPUT

DECISIONS

NEXT STEPS

- . Local Plans
 - Land Use
 - Economic Development
 - Capital Improvement
- . Environmental Impacts
- . Existing Transportation Corridors and Local Transit Service



ROUTE AND STATION LOCATION



- . Station and Corridor Land Use Studies
- . Economic Development Strategies
- . Capital Improvement Scheduling

- . Land Use Objectives
- . Environmental Impacts



SYSTEM CONFIGURATION



- . Joint Development Plans and Agreements
- . Local Construction Planning and Coordination

- . Land Use or Urban Design Plan
- . Transit Quality Objectives
- . Needs of Transportation Disadvantaged



STATION AND TRAIN DESIGN



- . Local Design Review



CONSTRUCTION

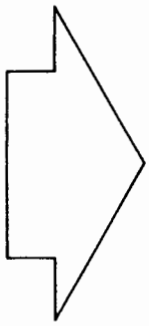


START-UP



OPERATIONS

PLANNING



design--should be of greatest interest to local officials. The process by which these decisions are made and implemented should include three basic activities:

- . Preparing or assembling local plans and objectives as a basis for system design decisions. Exhibit VIII lists a number of different plans and needs statements to serve as inputs in making transit design decisions. For each decision, local land use plans appear to be the most important input to ensure consistency with local General Plans and provide opportunities for directing future development.

This is also an appropriate time to consider what local capital improvement priorities can be coordinated with transit development and how that might affect system design.

- . Making design decisions. Although design decisions must be made in a regional forum, certain local preferences and desires can often be accommodated. Where Bay Area local governments presented plans and studies supporting suggested design modifications in their community, BART usually made such changes only if the financial impact was minimal or the locality agreed to fund additional costs. Communities with little prior planning were not as successful.
- . Taking steps to develop appropriate local policy strategies to take advantage of transit development. Once the system location, configuration and design have been determined, local officials should immediately begin local planning efforts to assemble information needed to develop local policy strategies. Examples are included on Exhibit VIII and described in more detail in individual chapters of this report.

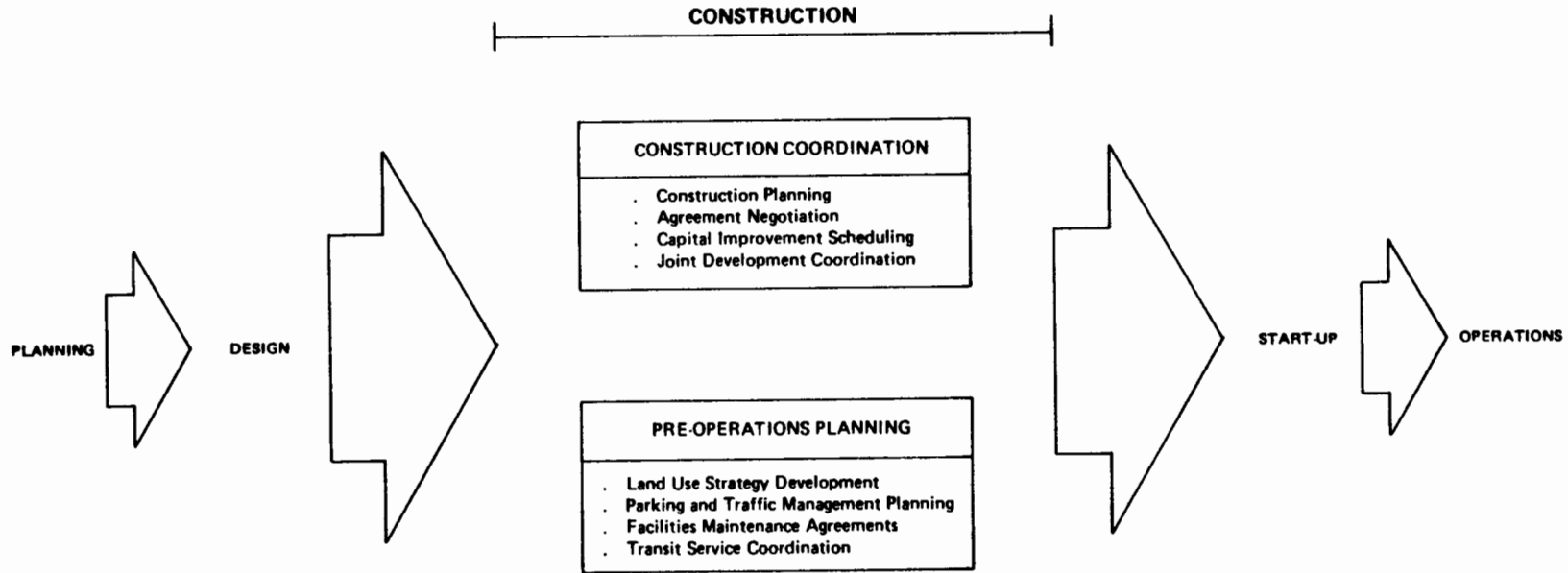
(3) Construction

During transit construction, local officials should be involved in two distinct types of activities--construction coordination and pre-operations planning (as shown on Exhibit IX).

Construction coordination is necessary where rapid transit construction will take place along existing local rights-of-way or near existing residential and commercial development. Specific local government activities include:

- . Construction Planning--Local officials should work closely with transit officials to assess the degree of disruption expected and devise plans to alleviate this disruption as much as possible. Larger cities with high levels of expected disruption should consider appointing a full time liaison or ombudsman to monitor transit construction. Specific local remedies for construction will primarily involve traffic and parking management and additional police protection.
- . Agreement Negotiation--In most states, transit officials must reach legal agreements with local officials prior to entering public rights-of-way. Local officials can use this step as a control vehicle to ensure their objectives are generally met.
- . Capital Improvement Scheduling--Local capital improvements to be coordinated with transit development should be scheduled to minimize the total disruption period.
- . Joint Development Coordination--Where projects are to be developed jointly, coordination is even more essential than with local capital improvements. Wherever possible, special staff should be assigned to these projects to manage the scheduling effort.

EXHIBIT IX
Local Policy Implications Project
STAGE 3 – CONSTRUCTION



Pre-operations planning relates to specific agreements which should be reached or plans which should be developed prior to operations startup. This local planning effort should include four major activities:

- . Land Use Strategy Development--Once station and corridor land use planning is complete, local officials should develop a strategy of land use policy actions to help direct land use and development as transit construction proceeds. Specific land use policy actions include land assemblage, public improvements, zoning and marketing.

- . Parking and Traffic Management Planning--Parking and traffic problems have been some of the most troublesome adverse impacts of BART operations. Therefore, local officials should prepare for such outcomes by initiating specific parking and traffic management plans before transit operations begin. These plans should be based on anticipated impacts of transit operations and can include such components as:
 - Bridge tolls or parking pricing to discourage auto use
 - Preferential parking or other parking restrictions near transit stations
 - Physical restraints or changes such as street widening, one-way streets, striping

- . Facilities Maintenance Agreements--As compensation for adverse impacts, transit officials might construct some special facilities (such as linear parks along transit lines) to benefit local residents. Where these types of facilities are developed, local officials should negotiate with transit officials on their maintenance.

- . Transit Service Coordination--A third party (preferably regional transportation agency) should conduct necessary planning and bring transit district officials together to reach agreements on routes, schedules, fares and transfer systems to ensure better integration of services once rapid rail transit operations begin. This process is simplified considerably when a single agency provides all transit service.

(4) Startup

At the point rapid rail transit service actually begins, the role of local governments should be diminished greatly. The detailed planning and local policy actions prior to startup should have resulted in strategies to take advantage of the new system as well as to deal with potential problems as they occur. Therefore, the only activities required by local officials are (see Exhibit X).

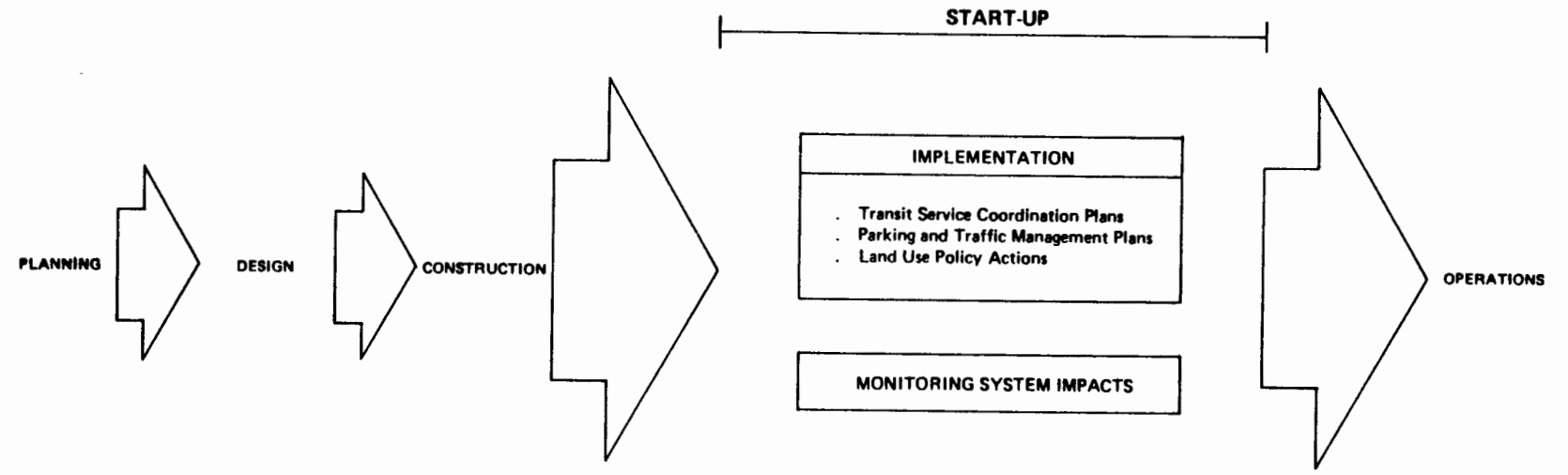
- . Implementation of public policy actions and strategies.
- . Monitoring system progress to identify unexpected occurrences and develop new local policies if necessary.

(5) Operations

Although BART has been operating for almost five years, all of the service and lines have not yet been phased in (Sunday service and the opening of the Richmond-Daly City line are not scheduled to begin before spring 1978) and operating problems remain higher than normal. Therefore, BART has not really reached the fifth stage of continuing operations and no specific implications have been developed. Based on experience thus far, the probable roles of local officials will be:

- . Monitoring system progress.
- . Planning for system extensions or modifications.

EXHIBIT X
Local Policy Implications Project
STAGE 4 - START-UP



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REPORT NUMBER

* * * * *

Overall, we have tried to provide some general policy guidance to local officials who want to take advantage of rapid rail transit development to meet some of their community's objectives as well as want to avoid some of the potential problems and disruptions of this development. However, it is difficult to transfer insights from the Bay Area to other, quite different jurisdictions--to avoid implications that are either too general or too specific. We have tended to err on the general and more universal side, hoping that local officials can use this report more as a checklist in structuring appropriate public policies for their own community.