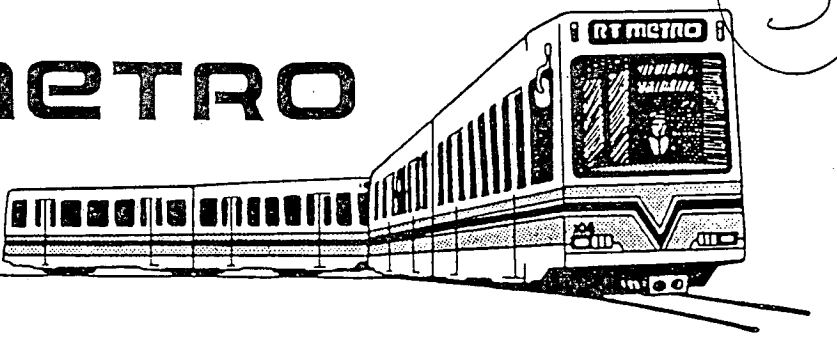
RT METRO



LIGHT RAIL OPERATING PLAN UPDATE

ALTERNATIVES DEVELOPMENT

STAFF REPORT

MARCH 12, 1986

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LIGHT RAIL OPERATING PLAN UPDATE

ALTERNATIVES DEVELOPMENT REPORT

I. INTRODUCTION

On January 20, 1986, staff presented an in-progress report to the Board on the status of the updated Operating Plan attached as Appendix A. In summary, that report concluded that the 1983 Operating Plan, which was based on an assumed system alignment and vehicle data points, was no longer feasible for 15-minute headway operation.

The 1985 update simulation had a run time of 104-3/4 minutes; a 3-1/4 minute increase over the 1983 simulation. The increase in run time occurred primarily between 8th and O Street and 23rd and R Streets. The increased run time caused the train meets in the Folsom Corridor to shift away from the double track passing zones and make a 15-minute headway operation no longer feasible on the facilities now planned for construction.

On January 30, 1986, the Board, in recognition of the need to preserve the opportunity for cost savings associated with double tracking the UPRR/Bee Bridge, authorized staff to enter into a design contract with Engineering Computer Cooperation (ECC). Staff has executed the agreement with ECC and the preliminary results--a general plan, the foundation plans, and an estimate--were completed on February 14, 1986. The final design will be completed by March 14, 1986. Results of the preliminary estimate were received on February 14, 1986, and have been used in the preparation of this report.

On February 10, 1986, staff reviewed and received input from the Board on the Work Program, attached as Appendix B, proposed for developing the alternatives, defining, and implementing a solution to the headway issue. On February 24, 1986, the Board established a public hearing date of March 17, 1986, for the Light Rail Transit Double Tracking Phase I and adopted the following schedule for concluding the Operating Plan Update.

March 6	- Staff complete Alternative Development Report
March 15	- Board Workshop for discussion of Report
March 17	- Public Hearing
March 24	- Regular Board Meeting - Board decision on preferred alternative

The preliminary environmental work is complete. The report focused on Alternative C: 15-minute headways with the addition of six LRVs. The report briefly assesses the other alternatives and will serve as the basis for the public hearing on March 17, 1986.

The methodology utilized in developing these alternatives is focused on changes or deviations from the 1983 Operating Plan which was utilized as the base case in the analysis. Travel times, capacity, operating cost and other operational parameters, therefore, are reflected and costed as differences from the 1983 plan.

This approach provides a consistent base for comparison of the relative changes inherent in the various alternatives. Therefore, in reviewing the comparisons, it is necessary to remember that the information is comparative, not absolute. As an example, the report indicates that Alternate A, 20-Minute Headways, has 25% less capacity than the base case or Alternative C, 15-Minute Headways, with 4 - 6 additional light rail vehicles. The 25% less capacity is significant if demand equals or exceeds the capacity of the 20-minute headway alternative. With this understanding, the following alternatives are presented:

Alternative A - 20-Minute Headways
Alternative B - 15-Minute Headways (Non-Engineering)
Alternative C - 15-Minute Headways (Double Track Plus LRVs)
Alternative D - 15-Minute Headways (Double Track - No New LRVs)

II. 20-MINUTE HEADWAYS AND REDUCED CAPACITY - ALTERNATIVE A

A. Operating Plan Description: 20-Minute Headway, 7 Trains, No Added Facilities or Vehicles

Utilizing this alternative, seven trains would operate on 20-minute headways seven days per week. Scheduled round trip time would approximate 118-3/4 minutes with a 7-3/4 minute layover at Watt/80 Station, the northerly terminal, and a 13-1/2 minute layover at the Butterfield Station, the southerly terminal.

This option would provide a generous amount of slack time in the schedule and allow for the possible interferences that might occur in the downtown segment.

Typical passenger trip times would be:

Watt/80 to Capitol/7th	28.9 minutes
Butterfield to Capitol/8th	29.8 minutes

The distance and time ("X-T") diagram and pertinent data for the option are reflected in Table No. 1 attached.

B. Capacity Implication

Exercising Alternative A would provide a peak hour capacity of 2100 passengers in the I/80 Corridor and 1050 passengers in the Folsom Corridor. In addition, this alternative provides peak period* capacity of 3150 in the I/80 Corridor and 1575 in the Folsom Corridor.

*Peak period is defined as 1.5 hours in length.

The following table summarizes the operating characteristics of the alternative:

CAPACITY	ALTERNATIVE A 20 MINUTE FREQUENCY
PEAK HOUR	
I-80	2100
Folsom	1050
PEAK PERIOD*	
I-80	3150
Folsom	2187
LRVs	
In Service	22
Spares	4
CONSISTS	
7 trains (4-4 car, 2-3 car, 1-2 car, 2 spares)	

*Peak period calculations based on 4.5 trains operating.

C. Additional Facilities and Equipment

No additional facilities or equipment are required for this alternative.

D. Other Implications

1. Bus Support Network

The following impacts will occur in the off-peak if the buses continue to operate at 60 and 30 minute headways and the RT Metro operates at 20 minute headways:

Total Trips Impacted -	123 daily
* Total Patrons Impacted -	1,470 daily
* Total Patrons Impacted -	374,850 annually

The patrons impacted are those in the off-peak ending at Rio Linda Boulevard (#15), Greenback Lane (#90), Elkhorn-Watt-Kaiser and North Highlands-Watt-Rosemont (#80), Coloma Road and Folsom Boulevard, and Fair Oaks. There will be no impact on peak period bus patrons as the buses can be scheduled to meet LRT trains.

If the Board should elect to pursue this alternative, the Scheduling Department should modify the bus network to reflect a 20/40 minute bus system.

2. Operating Cost Impacts

The result of operating 7 trains on a 20-minute headway, seven days per week are:

- At least one additional train operator will be required at an annual cost of $41,712.
- At least one more inspector/controller will be required at an annual cost of $57,312.
- At least one electromechanic and two utility workers will be required resulting in a $118,968 annual cost.
- Car miles will be reduced resulting in a $15,000 savings in maintenance and a $120,706 savings in traction power.

*These passengers could have as much as a 10-minute wait before wait before getting a train.

- Annual cost to operate the LRT system is $4,235,840.
- 18 buses required on the I-80 Corridor to meet the required capacity.

DESCRIPTION	LRT OPERATING COST FY - 1988	SUPPLEMENTAL BUS SERVICE*	TOTAL COST
20-Minute Frequency 7 days a week	$4,235,840	$569,160	$4,805,000

3. Feasibility

This is the most feasible of the four alternatives in that no physical modification of the system is required. The 20- minute headway can reliably be maintained throughout the operating hours proposed for the system.

E. Capital Cost Implications

None; no added capital investment required.

F. Staffing Plan

At least one additional train operator, inspector controller, electromechanic, and two utility workers may be required. No added design effort required. May require the redesign or modification of the bus support network. Consultant would be required to do environmental work.

G. Environmental Implications

This alternative, operating the system with 20-minute headways, would require modifications throughout the bus transit network as well as to the LRT system. The scope of this alternative would indicate that a Supplemental EIS would be appropriate. Preliminary consideration indicates that ridership would be reduced with other resulting potential environmental impacts.

*Assumes full cost of $62.00 per hour of bus service and 70 passengers per bus trip. Additional service required to meet peak period capacity of 1983 plan, 18 bus trips to downtown at 2 hours each weekday.

H. Implementation Schedule; Relationship to Starter Line

There are no physical modifications to be made. The Starter Line schedule and this schedule are essentially the same.

III. 15-MINUTE HEADWAYS NON-ENGINEERING/LOW CAPITAL APPROACH - ALTERNATIVE B

A. Operating Plan Description: Maintain baseline project headway and capacity with little or no capital cost.

The intent of this option was to reduce run times in the downtown portions of the alignment where run times did not meet the original expectations and thereby restore feasibility to the 1983 Operating Plan. If the run time reductions could be achieved, then 8 trains on 15-minute headways would provide the baseline project capacity.

RT design and operating staff reviewed the entire downtown segment of the system and sought input from Les Frink, Deputy Director of Public Works for the City, and members of his staff. A number of specific concepts have been identified as having the potential to reduce run time yet require little or no capital cost to implement. These include suggestions received from the Modern Transit Society (MTS), interested individuals and groups, as well as operations and design staff and consultants.

These concepts were again investigated in detail to determine their feasibility and practicality. All of the concepts had been considered earlier during the design process in 1983 and 1984. These concepts were considered and implemented or discarded during the design phase. A detailed analysis of these concepts again reveals ramifications on operations or construction costs.

In reviewing the six items below, RT, City and consultant staff expanded the effort to include all aspects of operation in the downtown. City staff input and concerns focused primarily on items 4, 5 and 6.

1. Delete Station Stops

a. Omit Stops from Peak Hour Schedules Only

Omitting any station stop during peak hours only is not a feasible alternative. Meet locations for a single track operation are constrained to occur at the location of passing tracks. This constraint requires end to end run times to be constant throughout the day. Consequently, it is not possible to "save" time during the peak period by omitting station stops without also omitting those stops during

the rest of the day. This would, in essence, delete the station from the balance of the system.

b. Delete Stops From All Schedules

A rational basis upon which to select candidate stations for deletion is low expected patronage. Although no patronage breakdown for individual downtown stops was done for the Baseline Project, it could be assumed that initially the 12th Street station would be lightly patronized. As a comparison, the FEIS notes that stations such as Royal Oaks, Globe, Tiber, Starfire, and College Greens also will probably be lightly patronized (50 or less in A.M. Peak). During the various planning stages, stations were not always located to maximize initial patronage. Exact locations were selected to accommodate future development, enhance redevelopment, reduce the downtown walking distance to a station and, of course, as a response to pressure from special interest groups. Capitol Area Development Authority (CADA) was very supportive of locating the 12th Street Station at its present site, as major private and public development is being projected to occur in that vicinity.

The potential for time savings by eliminating the 12th Street Station would at best be a temporary solution and is not recommended.

c. Delete Stations from Construction Program

Another way to save time is to delete one or more stations from the Base Project construction program. This concept saves construction dollars as well as time but it also reduces the project funding dollars by an equal amount through the provisions of the UMTA Full Funding Agreement. This concept, which could reduce system patronage, would also require a FEIS supplement and would subject RT to criticism for not fulfilling its promises. Therefore, it is not recommended.

2. Eliminate Coupling at 12th Street

The Base Project Operating Plan calls for the use of two-car trains on the Folsom Corridor and four car trains on the I-80 Corridor at 15-minute head-

ways during the peak hours. The number of LRVs included in the Base Project requires that two cars be transferred between the inbound and outbound trains at the 12th Street Station. Train lengths are based upon expected ridership from Park and Ride and bus passenger transfers.

It is estimated that during the peak 1-1/2 hours, 80%* of the 2200 parking spaces at the I-80 Corridor stations will be occupied. Based upon BART's experience, patronage is assumed to be 1.2 passengers per automobile. Thus, 1950 Park and Ride passengers are expected to be generated.

Bus ridership in the I-80 Corridor as of February 1984 was approximately 2400 passengers. This was measured during the approximate 1-1/2 hour duration when peak express service was provided. A conservative estimate of bus ridership increase is 1.5% per year. When LRT service commences in 1987, approximate bus patronage is expected to have reached 2500 passengers.

Total peak period ridership for combined Park and Ride and bus passengers is estimated at 4400. It is planned to operate six LRT trips at maximum train lengths to provide service for these passenger loads. LRT capacity during that period will be 4200. The net capacity deficit for four car trains will be 200 passengers. Contingency plans are being prepared which will provide additional transit coaches to supplement LRT service. Three coaches will be required to accommodate the 200 passengers not served by LRT.

In the event three car trains are operated during this period, LRT capacity will be reduced to 3200 passengers, requiring RT to operate an additional 17 transit coaches to provide service for those remaining 1200 passengers.

Estimates for ridership in the Folsom Corridor are considerably less than for I-80. Park and Ride capacity is 40% and bus usage is at approximately 30%. Using the method described earlier, total LRT passengers will be 2075 during the peak period. LRT capacity using two car trains is 2100.

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*Usage at Swanston Station was assumed to be one-half of the available parking spaces of that at other stations.

Elimination of the coupling would require use of three-car trains in the Folsom Corridor where only two-car trains will be needed during the first years of LRT operations. It also limits the capacity available in the I-80 Corridor, resulting in a $569,160 annual cost for supplemental bus service to meet capacity needs. The extra power used for the trailing cars would be approximately 13,270 kwh per day--$663 per day; $169,065 per year. In addition, the extra nonproductive mileage would increase the wear and tear on the LRV fleet; the 1658 car miles per day would cost about $420,000 per year. The coupling operation is needed to provide the train capacity required for the I-80 Corridor. RT does not have sufficient LRVs to operate all four-car trains. Midday storage at 12th and Whitney Street allows minor maintenance or repair items to be performed during non-peak hours.

The potential high cost and increased maintenance makes this item not feasible and is not recommended.

3. Redesign Downtown Curves to Allow Faster Speeds

The downtown curves were designed to consider existing conflicts with buildings, utilities, pedestrian areas, vehicular traffic, etc. The possibility of increasing their radii and/or spirals has been reviewed at all locations, and in each case it was not possible to modify them without incurring interference, conflicts or safety problems.

As part of this review, two alternative curve designs were considered. The first alternative was a 110-foot radius curve with 30-foot spirals and one-half inch of superelevation, giving a design speed of 10 miles per hour. The second alternative was a 94-foot radius curve with 30-foot spirals and one inch of superelevation, giving a 10 mile per hour design speed.

The results of the review of each curve are:

a. 12th and K Streets - Both alternatives provide too little clearance to buildings at the inside of the curve, the greatest being 8 feet. This distance is unsafe and the flat sweep of the curve would cause pedestrian interference at the crosswalks.

b. 8th and K Streets - Clearance to buildings is satisfactory but conflicts with a critical telephone utility vault that has recently been altered to accommodate LRT.

c. 7th and K Streets - Both alternatives provide too little clearance to building at the inside of curve, the greatest being 6 feet. This clearance distance is unsafe and does not meet design criteria. The handicapped ramp would move towards 8th Street causing shorter length trains to block 8th Street during stops.

d. 7th and O Streets - Both alternatives provide too little clearance to building at the inside of curve, the greatest being 6 feet. This distance is unsafe and does not meet design criteria.

e. 8th and O Streets - Increasing curve radius eliminates possibility of turnback at this location and displaces handicapped ramp towards 7th Street. Clearance to buildings is sufficient.

f. 12th and O Streets - Insufficient clearance to future buildings on inside of curve. The sweep of the larger curves would cause pedestrian interference at crosswalks.

g. 12th Street and Whitney Avenue - It is not possible to place the larger radius curves within the trackwork requirements for this location. Increased curves would move the storage track turnout mechanism farther into station area and handicapped ramp towards 13th Street causing shorter length trains to block 13th Street during stops.

4. Increase Operating Speeds Through Central City on Streets and Pedestrian Malls

All LRT trains will operate at the speed limits established for vehicular traffic on Sacramento streets. When an LRV is operating in mixed traffic, it is also subject to all other provisions of the Vehicle Code. When operating in separated lanes on City streets, the LRV will be operating at the established speeds of adjacent parallel traffic. It is not legally possible to increase LRV speeds above vehicular traffic speed limits.

In the "K" Street Mall, operating speeds are controlled by State PUC regulations and safe operating practice. The presence of a large number of pedestrians within the mall and crossing the tracks will dictate that caution be exercised. For the purpose of the simulation, a conservative approach was utilized. After gaining operating experience, it may be possible to increase the speed on the "K" Street Mall.

On "O" Street, trains are allowed to run up to 25 miles per hour for the two blocks between 7th and 9th Streets. On the other three blocks between 9th and 12th Streets, the trains are allowed 20 miles per hour on the raised right-of-way which is available for pedestrian flow but not classified as a mall such as the "K" Street Mall. Higher speed limits on "O" Street are not feasible.

5. Closure of City Streets

It would be possible to close certain streets by City action. However, closing the street crossings at 13th, 14th, 17th, and 18th would not improve operating speeds. No allowance was made in the simulation for delays associated with street crossings since all these crossings are protected by crossing gates. These gates provide a barricade which is equivalent to a closed street from an operating speed standpoint. Nevertheless, street closings were investigated as an enhancement to system safety.

The City Traffic Department has provided the following traffic count for a 24-hour period in two directions:

13th Street:	1090 vehicles
14th Street:	1310 vehicles
17th Street:	1560 vehicles
18th Street:	1430 vehicles

This is a relatively low to medium volume of traffic and it compares to a typical subdivision street count of about 1000 vehicles per day.

The City would require that RT pay for all costs involved in alley improvements for circulation, elbow from alley to street, or cul-de-sacs. Modified

traffic patterns would also have to be analyzed for local trucks and fire vehicles.

The Traffic Department estimates that the time required to obtain the City's approval to close streets should not exceed two months assuming no local objections.

City staff estimated the cost of one block of alley improvement to be $30,000, plus $15,000 per cul-de-sac, plus an additional $5,000 for signs and contingencies. Four street closures could be accomplished for approximately $200,000.

The capital investment has already been committed to provide gated crossings. Closing of the streets at 13th, 14th, 17th and 18th does not improve operating speeds and would only marginally improve the operating safety.

From the operations perspective, RT would like to have as many streets closed as possible to reduce the possibility of conflicts with vehicular traffic and pedestrians. With no benefit gain in operating speeds, this additional capital investment would not be warranted, and this recommendation as it relates to decreasing run times has little merit.

6. Preemption of Traffic for Trains

Traffic signal system interfaces with transit operation typically are one of two alternatives, prioritization or preemption. When a light rail train approaches a series of intersections with prioritized signals, the signal phase permitting the train to proceed (transit phase) is the first phase in the next cycle to be displayed. A delay results from this arrangement which is necessary to complete the current cycle and clear the intersection of vehicular and pedestrian traffic. Once the light rail train is sequenced into the first intersection's transit phase, the transit phase of all subsequent intersections will be timed to coincide with the train's scheduled progress through that series of intersections.

In contrast, when a light rail train approaches an intersection with preempted signals, the transit phase is immediately displayed without allowance for traffic clearing. This immediate display without clearing time would be repeated independently for each signal through the series of

preempted intersections.

As currently designed, the City traffic signal system interface with light rail operations employs the priority alternative. This system minimizes the total delay through a series of intersections. However, time must be allowed in the schedule for the light rail train to sequence into the transit phase of the signal system.

It may appear that a traffic signal preemption scheme could eliminate even the initial delay necessary for a train to sequence into the transit phase. From a practical standpoint, however, the apparent time savings does not materialize because a preemption scheme does not allow traffic to clear from the intersection before changing the signal phase. Consequently, an approaching train would have to slow or stop to allow the conflicting vehicular and pedestrian traffic to clear before proceeding. One disadvantage of the preemption approach is that it would materially increase the risk of intersection collisions because it exposes the train operator and his train to more conflicting street traffic than does the priority system.

The priority system chosen for implementation yields the least impact on running time consistent with the needed degree of safety.

B. Capital Cost Implications

Very small; slight increased cost may be associated with revising curve alignment since this work is currently under contract. Closure of streets could cost as much as $200,000. Skipping stations would have no capital cost impact but could have Federal funding implications if considered by UMTA to be a scope change.

C. Staffing Plan

Small; some additional design staff effort required. Consultant would be required to do environmental assessment.

D. Environmental Implications

The measures proposed to reduce running time all involve potential environmental changes from those assessed in the EIS. Additional environmental studies would be called for to determine the level of significance of the changed impacts.

The proposed items considered include:

1. Delete Station Stops

   If stops at one or several stations were deleted, either from the schedule or from the construction program, changes in patronage, access to transit, the bus network, trip times, traffic volumes on local streets, mobility of persons and groups, land use patterns, and redevelopment potential could be expected to occur. Since there is a wide range of potential impacts, further study of the effects, including possibly a supplement to the EIS and public hearings, would be required. Additional investigation would have to follow to detail the scope of environmental impacts.

2. Eliminate Coupling at 12th Street

   The coupling operation is designed to provide the needed four-car train capacity in the I-80 Corridor, yet not operate more cars than are needed in the Folsom Corridor. From the environmental perspective, if the uncoupling and coupling were not done, longer than necessary trains would be run in the Folsom Corridor, and extra energy would be consumed. This energy would total nearly 300,000 kilowatt hours per year or about the consumption of 50 average residential users on the SMUD system. In addition, carrying capacity in the I-80 Corridor would be less than required causing the excess passengers to be carried by buses that are less cost effective than the LRVs anticipated in the Base Project EIS. These impacts cumulatively may be significant and would require further investigation.

3. Redesign Downtown Curves to Allow Faster Speeds

   Since the downtown curves have all been designed to minimize conflicts with buildings, utilities, and pedestrian areas, increasing their radii and/or spirals to improve design speeds would result in increased impacts on adjacent areas. These impacts could include additional right-of-way acquisition, relocation of utilities, access changes, landscaping modifications and building changes. Such conflicts could be potentially significant. Further environmental studies would probably be required to determine the extent of the impacts.

4. Increase Operating Speeds Through the Central City on Streets and Pedestrian Malls

If speeds in excess of those designed into the present alignment were sought, vehicular traffic and pedestrian safety impacts would have to be carefully assessed through traffic and operation studies. In particular, operations on the malls in the midst of large numbers of pedestrians would have to be evaluated.

5. Closures of City Streets

Potential environmental impacts of street closures include modifications to property access, travel patterns, and safety and emergency response services. Community disruption as well could result. These factors would most appropriately be studied in the context of an Environmental Impact Report.

6. Preemption of Traffic for Trains

The environmental effects of signal preemption would have to be studied systemwide with respect to potential impacts on safety, traffic flow, congestion, crisis response systems, and other factors. This would warrant a supplement to the EIS.

E. Implementation Schedule; Relationship to Starter Line

Any changes in curve radii would have a potential impact on the Starter Line Phase I Revenue Service line opening date. Design revisions would be required as well as a change order executed with the contractor currently building the trackway through the downtown area. Since the CU#4G contractor plans to be working in this area by mid-summer, it is feasible that these revisions could be incorporated in time as to not adversely affect the work plan. But as this contract is critical to line opening, any delay in procurement of additional rail material would in turn affect the starter line schedule.

Any other items, such as operating speeds, deletion of station stops, elimination of coupling, street closures, and preemption signaling would have little or no impact on the construction program. However, the environmental review process required to investigate their impacts could result in a delay of as much as one year on the starter line schedule.

IV. 15-MINUTE HEADWAYS WITH 4 TO 6 ADDITIONAL LRVS-ALTERNATIVE C

A. Operating Plan Description: 15-Minute Headway, 9 Trains, Additional Facilities plus 4 to 6 Additional LRVs to maintain baseline project capacity.

In this alternative, 9 trains would run on 15-minute headways. Scheduled round trip time would approximate 111-3/4 minutes with a 16-1/2 minute layover at Watt/80 and a 6-3/4 minute layover at Butterfield. This alternative provides for adequate slack time in the schedule.

Typical passenger trip times would be as follows:

Watt/80 to Capitol/7th	26.5 minutes
Butterfield to Capitol/8th	28.5 minutes

The distance and time ("X-T") diagram and pertinent data for the alternative are reflected in Table 2 attached.

B. Capacity Implications

This alternative maintains the base project 15-minute headway and peak maximum capacity of 2800 passengers per hour in the NE Corridor and 1400 in the Folsom Corridor. It also maximizes the reliability of the system. However, it requires the expenditure of additional capital funds to provide an additional train and a larger amount of double tracking to insure that train meets will occur on the planned passing tracks.

The following table reflects the operating characteristics of the alternative:

CAPACITY	ALTERNATIVE C, 4-6 ADDED LRVS 15-MINUTE FREQUENCY
PEAK HOUR	
I-80	2800
Folsom	1400
PEAK PERIOD	
I-80	4200
Folsom	2100
LRVs	
In Service	30
Spares	2
CONSISTS	
9 trains (6-4 LRV, 3-2 LRV, 2 spares)	

C. Additional Facilities and Equipment

To maintain the Baseline Project capacity requires the following additional facilities:

- Double track bridge at R Street between 18th and 23rd.
- Additional double tracks between 17th and 18th Street to line up with the foregoing structure and eliminating #10 turnouts now needed for the transition from double track to single track operation at each end of the structure.
- Construct an additional 1700 feet of double track between the present #20 turnout northerly of Swanston Station to the vicinity of the Arden Way Overpass.
- At the northerly end of the system approximately 5000 feet of double track would be constructed extending westerly from the Watt/80 Station to the vicinity of the Longview overcrossing.

In addition, this alternative includes the procurement of 4 to 6 light rail vehicles by negotiation at an estimated price of $1,000,000 each. Because of the lead time required for vehicle manufacture, the system would initially be operated at reduced capacity. The system would achieve the Baseline Project capacity after delivery of the additional LRVs.

Some of the foregoing improvements could be in place by the date of commencement of revenue service on the starter line in March 1987 while some will be ongoing and integrated into the system upon completion of construction.

D. Other Implications

1. Bus Support Network

The bus support network with 15/30-minute headways has been developed.

2. Operating Cost Impacts

In order to operate 9 trains at 15-minute headway on weekdays and 5 trains on weekends, it will be necessary to hire at least four additional train operators at an annual cost of $166,848. No significant change in car miles.

DESCRIPTION	LRT OPERATING COST FY - 1988	SUPPLEMENTAL BUS SERVICE*	TOTAL COST
9 train 15-minute frequency with 30-minute frequency on Sat/Sun and Holidays	$4,403,848	0	$4,403,848

3. Feasibility

Will be able to meet original proposed 15-minute headways since the additional double tracking will provide reasonable assurance that the operating plan will work as designed. Areas of meets are lengthened at critical locations that were found to impact operating schedules as currently designed. Funding the proposed improvements is the largest restraint for implementation. It must be considered that no additions to the system are being proposed but, rather, that certain segments of future double tracking are being moved forward in time for construction.

E. Capital Cost Implications

The added facilities and vehicle procurement would require a current expenditure of $11,531,000. This is itemized on the following breakdown:

1400 feet double track bridge @ UP crossing	$1,440,000
1600 feet of addl track between 17th & 18th Sts.	352,000
1700 feet of addl track @ Swanston Station	374,000
5000 feet of addl track W of Watt/80 Station	1,100,000
Electrification, Signaling, Stations	832,000
TOTAL CONSTRUCTION COSTS	$4,098,000
Engineering construction management and contingency.(Source: PBQ&D/DMJM Estimate - Feb/Mar '85)	$1,433,000
SUBTOTAL	$5,531,000
Additional Light Rail Vehicles (Assume 6)	$6,000,000
TOTAL	$11,531,000

*Assumes full cost of $62.00 per hour of bus service and 70 passengers per bus trip. Additional service required to meet peak period capacity requirement. Would require investment of $411,060 for supplemental buses until new LRVs are put in service in 1989.

The foregoing amounts shown for the improvements include the cost of structures, trackwork, electrification, signals, and station modifications. The required additions must be considered as a package with no choice to eliminate any one element, except the reduction of vehicles from 6 to 4.

F. Staffing Plan

Increased staff support and consulting assistance will be required for the additional design effort associated with this alternative. It is estimated that three additional civil engineers, three systems engineers, two architectural designers and two draftspersons will be required for approximately five months. The environmental investigation will require the services of a consultant.

G. Environmental Implications

The environmental impacts of this alternative were assessed in the Initial Study/Negative Declaration recently prepared for RT by consultants Jones and Stokes Associates, Inc. This study determined that the proposed double tracking at three locations and acquisition of six additional LRVs would have no significant adverse effects on the environment. It would involve no additional right-of-way acquisition; no additional nor fewer cars would be in revenue service; and no capacity changes would result. The construction impacts would be minor and not significant or less than significant levels under this alternative.

Therefore, a negative declaration is proposed as the appropriate environmental document for this project under the California Environmental Quality Act and RT environmental guidelines. Under the National Environmental Policy Act, this alternative qualifies as a "categorical exclusion" which applies to a project having no significant environmental impacts. This alternative and its environmental study will be considered at the public hearing on March 17, 1986.

H. Implementation Schedule

Environment work-ups, design drawings for the trackwork, electrification, signal system and stations would have to be prepared and a bid document developed and advertised, or, as an alternative, it could be possible to issue change orders to ongoing construction contracts. The double track bridge at the UP crossing is currently being designed and would be constructed under a contract change

order to CU#4H. The track approach would be issued as a change order to CU#4G.

The NE Corridor could open in March 1987 with 15-minute headways with the added facilities being constructed concurrently with the opening phase and would be completed by the fall of 1987 if funding permits. Start-up on the Folsom corridor, when the entire system would be in service, is scheduled for September 1987.

The additional LRVs would be ordered and delivered as future funds become available. See Section VI - Funding Analysis for timing of vehicle procurement. There would be an impact on the system capacity before the additional LRVs were delivered and put into service.

V. 15-MINUTE HEADWAYS WITHOUT ADDITIONAL LRVS - REDUCED CAPACITY ALTERNATIVE D

A. Operating Plan Description: 15-Minute Headway, 9 Trains Additional Facilities, But no Added LRVs

In this alternative, 9 trains would run on 15-minute headways with identical times and "X-T" diagram as in Section IV. Train lengths would be shortened from four to three cars on the NE Corridor.

B. Capacity Implications

The use of 9 trains at 15-minute headways will reduce the peak maximum capacity to 2450 passengers per hour in the NE Corridor since the maximum train length would be limited to three LRVs. However, the corresponding capacity for the Folsom Corridor would be 1050. One possible combination would be 6-3 car trains and 3-2 car trains. The capacity is further impacted when accidents or regular maintenance removes LRVs from service.

The following table reflects the operating characteristics of the alternative:

CAPACITY	ALTERNATIVE D, NO ADDED LRVS 15-MINUTE FREQUENCY
PEAK HOUR	
I-80	2450
Folsom	1400
PEAK PERIOD	
I-80	3500
Folsom	2100
LRVs	
In service	26
Spares	0
CONSISTS	

9 trains (2-4 LRV, 4-3 LRV, 3-2 LRV, no spares

C. Additional Facilities and Equipment

The additional facilities described in Section IV would be provided under this option with the exception that additional LRVs would not be added to the fleet.

D. Other Implications

1. Bus Support Network

The bus support network with 15/30-minute headways has been developed.

2. Operating Cost Impacts

In order to operate 9 trains at 15-minute headway and 5 trains on weekends, it will be necessary to hire at least four additional train operators at an annual cost of $166,848. No significant change in car miles.

DESCRIPTION	LRT OPERATING COST FY - 1988	SUPPLEMENTAL BUS SERVICE*	TOTAL COST
9 train 15-minute frequency with 30-minute frequency on Sat/Sun and Holidays	$4,403,848	$411,060	$4,814,908

3. Feasibility

With the added improvements, as stated in Section IV, the reliability of operation of the system will be substantially enhanced. The same elements of reliability are present. The capacity of the system, however, is reduced.

E. Capital Cost Implications

Since this option requires the same added facilities, the facility costs are identical to those in Section IV. No additional equipment costs for LRVs would be required. The total construction cost for this alternative is $4,098,000. Design cost associated with this work is approximately $1,433,000.

F. Staffing Plan

Increased staff support for consulting assistance will be required for additional design associated with this alternative. It is estimated that RT will require three additional civil engineering persons, three systems design people, and two architectural designers for five months.

*Assumes full cost of $62.00 per hour of bus service and 70 passengers per bus trip. Additional service required to meet peak period capacity of 1983 plan, 13 bus trips to downtown at 2 hours each weekday.

The environmental investigation will require the services of a consultant.

G. Environmental Implications

Similar to that discussed in the previous section, the double tracking improvements would result in only minor construction impacts. These would be not significant or at less than significant levels. There would be no adverse environmental impacts from the additional trackage or bridge construction. However, in that it would result in a loss of passenger capacity in the system, there is the potential for other significant environmental impacts. For instance, if fewer trips are taken on transit, it is likely that automobile trips and miles traveled, congestion, emissions and parking demand would increase across the region. Therefore, this alternative would warrant additional examination. A probable format for this evaluation would be an addendum or supplement to the EIS.

H. Implementation Schedule

Since the same added facilities are involved, the schedule referred to in Section IV will apply to this alternative, also.

VI. FUNDING ANALYSIS

A. Listing of funds and Probability Analysis

The funding analysis previously submitted to the Board was based on the Five-Year FY 86-90 Capital Program which accepted the assumptions that were valid at the time the analysis was completed. Since that time, the picture for funding has changed dramatically. UMTA has stated that Section 3 money will be awarded on the basis of privatization on a project-by-project basis. Therefore, no Section 3 dollars appear in the analysis. In light of the Gramm-Rudman Act, Section 9 dollars have also been considered to be unavailable beyond FY 1986. This has resulted in a reduction in the estimate of available funds from the estimate contained in the In-Progress Report of $1,600,000. Table 3 identifies potential funds for double tracking which are necessary to implement Alternatives C and D discussed above. Additional funds are not required to implement alternatives A and B since no significant capital cost outlay is associated with these alternatives.

The FY86 Article 19 funds identified in the table have been approved by the CTC and are awaiting only completion of the SB 580 Review before they are available. The review should be finalized by the end of March. The 48% TDA match for these funds is the amount required by the CTC Resolution. The TDA non-match amount of $302,000 for the bridge represents the difference between the approved amount and the balance of the total needed to complete the bridge. The total amount of TDA funds utilized for the bridge represents $129,000 less than the total amount programmed for local match in FY1985-86.

The $1,600,000 in Section 9 money is contained in the FY85-86 application currently pending with UMTA. If approved, it should be available for drawdown in September or October. The $400,000 TDA match for Section 9 was approved in last year's program. With the other amounts of TDA funds utilized for the bridge, the total utilized in FY85-86 exceeds the amount programmed by $271,000.

The FY86-87 Article 19 funds of $324,000 have received preliminary approval from the CTC with final approval scheduled for March 27, 1986. A local match of 30% TDA funds is utilized to make the project more competitive, although 20% is the statutory minimum. If approved, the Article 19 funds should become available in early 1987.

The additional FY86-87 Article 19 funds of $1,295,000, with local match, is the balance needed to complete Phase I, and the CTC has indicated that $1,400,000 may be

available. The final decision by the CTC will be made on March 27; and if approved, these funds should be available in early 1987 also. The balance from the $1,400,000 is $105,000, which is programmed with local share into purchasing LRT vehicles in early 1987.

The remaining funding is the CTC minimum allocations with a 30% match each year. The figures come from the latest Caltrans projections.

It has been assumed there would be no added City, County or sales tax funding available.

B. Cash Flow Projections for Funding Availability

The cash flow spreadsheet, attached as Table 4, shows the availability of funds through 1992 for a Double Tracking Program. One of the assumptions in this analysis is that Federal funds will not be available for the purchase of any additional vehicles. With the funding sources identified, the American River Bridge cannot be built until 1991, and a cash flow deficit of $769,000 occurs early in 1992. The Folsom Corridor cannot be double tracked unless additional funds can be secured.

The District's ability to issue a Grant Anticipation Note (GAN) to cover cash flow problems may be doubtful in light of the Federal situation and the current District GAN issue. With the District's current GAN issue of approximately $16 million, it would seem unlikely that the District would be able to obtain as high a rating as the initial GAN which would make subsequent GAN issues financially unattractive.

C. Cash Flow Analysis of Various Alternatives

1. 20-Minute Headways - Alternative A

No additional funds are required for capital cost outlay since no additional facilities are to be built. There will, however, be additional costs associated with this alternative on Regional Transit's bus network and overall operating budget. Funds to cover increased RT operating costs are identified in Section II.

2. 15-Minute Headways - Non-Engineering/Low Capital Alternative B

Other than minimal engineering costs, minor construction costs to cover possible change order work for greater curve radii, and approximately $200,000 for

street closures, capital cost outlay for this alternative would be very low. Funds will be available to implement this alternative according to current projections.

3. 15-Minute Headways - Additional Improvements with 4 to 6 Additional LRVs - Alternative C

The cash flow spreadsheet indicates that all four phases of the Double Tracking Program for this alternative cannot be completed in its entirity. Funds run out by early 1991. An additional $7.374 million in funding will be required to complete Folsom Corridor (Phase III) and the American River Bridge (Phase IV). Adequate funds would not be available to complete the procurement of additional vehicles until mid-1989.

4. 15-Minute Headways - Additional Improvements Without Any Additional Vehicles - Alternative D

The initial phase (Bee Bridge and Phase I) of this alternative can be implemented with the proposed available funding if UMTA Section 9 monies become available as scheduled in Table 3. If the SB 580 review is completed in March, this work can proceed immediately and be completed by mid-1987 in time to meet the currently projected line opening dates for the starter line system. The Phase II and Phase IV work will not be completed until 1992. Phase III for double tracking of the Folsom Corridor cannot be completed without an additional $1.374 million in funding.

VII. PUBLIC COMMITMENT/ACCEPTANCE

A. Intangibles - There are several intangible issues which deal with the public perception of the usefulness of the LRT system inherent in the alternatives that are harder to quantify than headways and capacities. The list of un-quantifiable items includes:

1. The longer travel times associated with LRT on Alternative A, in particular.

2. The effect that the reduced capacity in Alternative A or D may have on transit choice; i.e., overcrowding or having to wait for another train.

3. In Alternative A, having only three trains an hour to chose from as opposed to four in Alternative C or D; i.e., less frequent service, less attractive to public.

4. The feeder network for Alternative A due to the frequency of service may cause more people to drive to the LRT parking lots, particularly during the off-peak and on weekends and holidays.

B. Coordination of the Findings - The following is a list of individuals that will receive briefings from RT management and staff on the alternatives and recommendations:

INDIVIDUAL	ORGANIZATION
Brian Richter	Sacramento County Executive
Walter Slipe	City Manager, City of Sacramento
Anne Rudin	Mayor, City of Sacramento
Illa Collin	Chairwoman, Sacramento County Board of Supervisors
Brigid Hynes-Cherin	UMTA Administrator, Region XIX
Vic Fazio	Congressman
Robert Matsui	Congressman
Tom Chinn	Sacramento City Council
Grantland Johnson	Sacramento City Council
Terry Kastanis	Sacramento City Council
Douglas Pope	Sacramento City Council
Lynn Robie	Sacramento City Council
Joe Serna	Sacramento City Council
David Shore	Sacramento City Council
William Smallman	Sacramento City Council
Bill Bryan	Sacramento County Board of Supervisors
Toby Johnson	Sacramento County Board of Supervisors

Ted Sheedy	Sacramento County Board of Supervisors
Sandra Smoley	Sacramento County Board of Supervisors
William Edgar	Executive Director, SHRA
Phil Isenberg	Assemblyman
LLoyd Connelly	Assemblyman
Leroy Greene	State Senator
Robert Nielsen	Executive Director, CTC
John Roberts	Executive Director, SACTO
Mike Seward	Executive Director, Sacramento Metropolitan Chamber of Commerce

VIII. CONCLUSION AND STAFF RECOMMENDATIONS

The methodology utilized in developing these alternatives is focused on changes or deviations from the 1983 Operating Plan which was utilized as the base case in the analysis. Travel times, capacity, operating cost and other operational parameters, therefore, are reflected and costed as differences from the 1983 plan.

This approach provides a consistent base for comparison of the relative changes inherent in the various alternatives. Therefore, in reviewing the comparisons, it is necessary to remember that the information is comparative, not absolute. As an example, the report indicates that Alternative A, 20-Minute Headways, has 25% less capacity than the base case or Alternative C, 15-Minute Headways. The 25% less capacity is significant if demand equals or exceeds the capacity of the 20-minute headway alternative. With this understanding, the alternatives' characteristics have been summarized in the matrix reflected in Table 5. The table attached has been prepared to summarize the discussion and analysis presented in the preceding sections of this report. A review of the table provides the analytical framework to support the recommendation. The following is a brief summary of each alternative:

A. Alternative A, 20-Minute Headways - The operating schedule for this alternative has a 104.7 minute run time. Utilizing 7 trains also results in the availability of two vehicles which can be utilized as spares. The ample schedule and spare vehicles result in this alternative having the highest schedule reliability rating. However, trip times from the Watt/80 and Butterfield terminuses to downtown have increased by three minutes.

   The annual operating cost for this alternative is $557,000 higher than the baseline and is estimated at $4,805,000 annually. The system offers a peak period capacity of 4,725 places--a 25% reduction (1,575 places) in the 6,300 places offered by the baseline.

   The impact of the less frequent service, reduced capacity, and the longer trip times on patronage and fares are difficult to quantify and have not been addressed in this report.

B. Alternative B, 15-Minute Headways - Non-Engineering - The concepts inherent in this alternative were considered and discussed during the design phase. A detailed analysis of these concepts again reveals ramifications on operations and/or cost impacts that make this solution unfeasible. In addition, this alternative cannot assure

schedule adherence and no further analysis has been pursued. Any item implemented from this alternative would be a supplement to the adopted alternative.

C. Alternative C, 15-Minute Headways (Phase I Double Track Plus 4 to 6 Added LRVs) - The operating schedule for this alternative has a 104.7 minute run time which provides adequate slack time to absorb normal run time delays and adequate layover times at Watt/80 and Butterfield. With the addition of six more vehicles, operating 9 trains, this alternative has two vehicles available for spares. This alternative has a high degree of schedule reliability. Trip times from Watt/80 to downtown has increased less than a minute--1.5 minutes in the Folsom Corridor.

The annual operating cost for this alternative is $156,000 higher than the baseline and is estimated at $4,404,000 annually. This system provides no decrease in capacity over the baseline alternative. There would be a cost of $411,000 annually for supplemental bus service until the added vehicles could be acquired and put in service.

The impact of the short increase in trip times on patronage and revenues are difficult to quantify and have not been addressed in this report.

D. Alternative D, 15-Minute Headways (Phase I Double Track - no new LRVs) - The operating schedule for this alternative has a 104.7 minute run time which provides adequate slack time to absorb nominal run time delays and adequate layovers at Watt/80 and Butterfield. This alternative provides no spare vehicles. This alternative has a high degree of schedule reliability. Trip times from Watt/80 to downtown have increased less than a minute--1.5 minutes in the Folsom Corridor.

The annual operating cost for this alternative is $567,000 higher than the baseline and is estimated at $4,815,000 annually. This system offers a peak period capacity of 5,600 places--a 12% reduction (700 places) in the 6,300 spaces offered by the baseline.

The impact of the short increase in run time--a decrease in capacity--is difficult to estimate and has not been addressed in this report.

RECOMMENDATION

Staff's strong feeling is that the Phase I Program (Alternative C or Alternative D) is essential to assure the system's capacity, the trip times and the service

frequency necessary to fulfill the system's operational expectations and early commitments. Other double tracking phases can be implemented as demand requires shorter headways or as congestion requires added driving time in the schedule.

20-minute headways raise the concern that the impact of less frequent service (4 versus 6 trains in the peak period), the longer trip times (an added three minutes from the terminus to the CBD), and the reduced capacity (4,725 spaces versus 6,300 spaces during the peak period) will have an undetermined impact on patronage and fares. Included in this concern is the negative impact that express bus service in the Northeast corridor may have on LRT utilization due to its providing an attractive alternative with shorter trip times and no transfer requirements.

The funding identified in the In-Progress Report has been revised to reflect the elimination of UMTA Section 9 monies--a decrease of $1,600,000 in near-term funding. This funding reduction makes the implementation of Alternative C or D unfeasible at this time. The prospects of no Section 9 monies beyond 1986 leaves the double tracking program substantially underfunded without some long-term locally dedicated source of revenue.

Section VI, Funding Analysis, is, therefore, the predominant decision factor influencing staff's conclusions and recommendations. Staff is currently negotiating with the CTC staff for additional funding in this year's Article 19 and TDA funding and working with UMTA on a commitment to fund the Section 9 grant application, pending approval. These sources provide the potential for an additional $ 3 - 8 million in funding:

UMTA Section 9	-	$1,600,000
TDA Local Match	-	400,000
		$2,000,000
Additional FY87 State Article XIX/TP&D	-	$1,400,000
		420,000
		$1,820,000

With a concerted Board-supported political effort with UMTA and the CTC, and a review and reprioritization of our current capital program, it may be possible to fund Alternative D, Phase I Double Tracking (no new LRVs).

The second driving factor is that a bus network supporting the preferred alternative must be refined and the bus and LRT network marketed. The process of refining, costing and marketing the network will take approximately 9-12 months. With revenue service scheduled for March 15, 1987, the decision on headways must be made as soon as possible in order that staff have adequate time to accomplish this effort.

Based on a review of evaluations contained in the report and summarized above, the following are staff's recommendations to the Board:

In view of the funding level identified at this time, there are only two affordable choices: Alternative A, 20-Minute Headways, and Alternative B, 15-Minute Headways - Non-Engineering/Low Capital. From the detailed discussion of Alternative B in Section III, it has been determined that Alternative B does not provide adequate schedule reliability and should be considered only as a supplement to enhance the preferred alternative and the eventual double tracking.

IT IS, THEREFORE, STAFF'S RECOMMENDATION THAT THE 20-MINUTE HEADWAY, ALTERNATIVE A, BE SELECTED. An RFP for consultant preparation of a supplement to the LRT Project EIS will be prepared for Board approved release at the March 24, 1986, meeting. Contract award will be scheduled for April 1986, with preparation and 45-day circulation of the draft supplement occurring in May and June of 1986. Certification of the supplement will be scheduled for Board action in July 1986. Also, staff will refine a bus network and LRT network that operates on 20-minute headways. The double tracking money secured to date, approximately $1,559,000, would be utilized to pursue the double track design for the balance of the system. Construction would be implemented as funds become available in a sequence defined by the design process and operational considerations and as approved by the Board.

If an additional $3,670,000 in committed funding can be identified, staff recommends implementing Alternative D. If an additional $1,440,000 can be committed, it would be advisable to construct the WPRR/Bee Bridge as a double track versus two single track structures and save money and avoid the construction and right-of-way impacts that would result at a later date.

A hearing is scheduled for the March 17, 1986, Board meeting to consider public testimony on the draft negative

declaration which addresses the bridge expansion. If funding has not been identified for the bridge by March 24, 1986, it will be necessary to proceed with the single track structure to prevent a delay in the Folsom Line revenue service date.

REGIONAL TRANSIT
P.O. BOX 2110 • 1400 29TH STREET • SACRAMENTO, CA 95810-2110 • (916) 321-2800

3

March 17, 1986

CITY MANAGER'S OFFICE
RECEIVED
MAR 18 1986

Mr. Solon Wisham, Jr.
Assistant City Manager
CITY OF SACRAMENTO
City Hall, Room 109
915 I Street
Sacramento CA 95814

Dear Mr. Wisham:

Enclosed for inclusion on the agenda of the March 25, 1986, meeting of the Transportation and Community Development Committee is a copy of the staff report on alternatives for the Light Rail Operating Plan.

If you have any questions, please do not hesitate to call me (321-2989).

Sincerely,

David A. Boggs
General Manager

Enclosure

Approved for Committee Information:

Walter J. Slipe

FOR Solon Wisham, Jr.
Assistant City Manager

REGIONAL TRANSIT MEMO

3

DATE: January 17, 1986

TO: RT Board of Directors

FROM: David A. Boggs, General Manager

RE: IN-PROGRESS REPORT - LIGHT RAIL OPERATING PLAN

Enclosed for your review is an In-Progress Report on the Light Rail Operating Plan. This will be discussed at the continued Committee of the Whole meeting on January 20, 1986. This report provides the chronology of development of the operating plan for the light rail system.

The 1983 Plan, which was based on an assumed system alignment and vehicle data points, is no longer feasible for 15-minute headway operation. This has been determined by updating the assumptions in the 1983 Plan based on the system as now reflected in the contract documents, with a December 1985 simulation, which includes approximately 1500 data points, and is summarized on Table 1 of the attached report. The difference between the 1983 plan and 1985 Plan is a 3-1/4 minute increase in running time (1983 - 101.5 minutes; 1985 - 104-3/4 minutes), which is a change of only 3%. The increase in run time results in the meets being shifted enough in the 8th and O Street to 23rd and R Streets and on the Folsom Corridor to no longer provide for a 15-minute headway operation without accelerating the double tracking program.

In summary, the first step in dealing with the headway issue will be to request your approval of a contract on January 30, 1986, with Engineering Computer Corporation, the original designer of the Western Pacific/Bee bridge for $30-35,000 to expedite the design of double track bridge modification. Further steps are discussed in Table 3 of the report.

It should be noted that we will continue to refine the Operating Plan throughout project completion and will update you as additional data becomes available. I must stress that this is an evolutionary process and that the final solution for the Starter Line is an 18.3 mile double tracked system with 32 vehicles.

LIGHT RAIL OPERATING PLAN UPDATE

IN-PROGRESS REPORT

JANUARY 1986

OPERATING PLAN UPDATE

CONTENTS PAGE

January 18, 1986

OPERATIONS PLAN UPDATE

I. Background: During the Interim Administration of STDA--September 1984 through January 1985--we assessed:

1. The Organization, Management and Legal Authority,
2. Budget and Accounting,
3. Project Master Schedule,
4. Project Financing,
5. Project Scope,
6. Project Design Criteria,
7. Start-up and Operations Plan, and
8. Future Extensions

The three assessment reports issued by the Interim Administration team were adopted in November 1984, December 1984, and January 1985, respectively by the Sacramento Transit Development Agency (STDA) Board. The Final Assessment Report No. 3 was adopted by the Regional Transit (RT) Board by Resolution No. 85-6 on January 28, 1985.

With the exception of the Start-up and Operations Plan and

the Future Extensions, the above listed items were addressed and recommendations made in the assessment reports that were translated into updates that were adopted, when appropriate, by the RT Board in the transition from STDA to RT during the spring and summer of 1985.

Development of the Start-Up Plan and Operating Plan were scheduled to proceed in parallel. When it became apparent that the Operating Plan would be delayed due to the lack of available data, development of the Master Start-Up Plan proceeded and has remained on schedule.

Decisions or recommendations on the extension study were deferred, pending completion of the SACOG LRT Extension Study.

II. Introduction

In November 1984, we initiated an update of the Start-up and Operations Plan. The scope was defined in the Preliminary Assessment Report No. 2 as follows:

> "As with the rest of the "design criteria," the operations plan that defines operating parameters for the system is outdated. It is necessary to update the operating plan to include the physical characteristics

of the system that have evolved with the civil and systems design (i.e., plan or profile changes in alignment, vehicle power or gear box changes, etc.).

"We need to determine that our assumptions about fleet size, station dwell times, meets, schedule, trackwork and operating plan are still valid before completing the staffing plan, formalizing power consumption estimates for operating cost and making input changes to the civil and procurement effort as required."

A team consisting of RT, STDA, Foster Engineering, Inc. (FEI), L.T. Klauder and Parsons Brinckerhoff Quade and Douglas/Daniel, Mann, Johnson and Mendenhall (PBQ&D/DMJM) was formed to pursue the Operating Plan update. The effort of collecting the required data continued through the summer and fall of 1985, culminating with a presentation by FEI of an updated preliminary simulation run to RT staff on December 13, 1985.

In summary, the presentation concluded that, due to a 3-1/4 minute increase in running time (101.5 to 104-3/4 minutes--a 3% change) and the localized impact of that change in running time, the preliminary Operating Plan formalized in April 1983 is no longer feasible at 15-minute headways. There are, however, alternatives.

Since December 13, 1985, staff has been working with FEI to verify assumptions and to define the parameters for an updated operating plan. The objective of this update is to provide the Board with an "in-progress" report on the status of the Operating Plan Update.

Our "in-progress" report includes:

1. The background leading to the April 1983 Plan,
2. The April 1983 Plan (major assumptions and operating characteristics),
3. The December 1985 Update (changes in assumptions), and
4. A progress report on the efforts at developing an acceptable solution.

III. Evaluation Leading to the April 1983 Operating Plan

In December 1982, FEI reviewed the existing Preliminary Operating Plan generated by George Beetle & Associates for the Light Rail Project. The Preliminary Operating Plan was developed in 1981 to assist with the Design Concept Resolution. The preliminary plan assumed a relatively high-powered vehicle whose round trip time was an estimated 92 minutes over a schematic alignment based on limited detail. The plan resulting from these inputs employed seven trains to provide four, 4-car trains from

Watt/80 to 12th Street and three, 2-car trains from 12th Street to Butterfield--all on 15-minute headways (frequency). The resulting operation required 24 cars to provide the service and two cars for spares--a total of 26 cars.

IV. The April 1983 Operating Plan

In order to refine the Preliminary Operating Plan, FEI gathered existing alignment data from the several civil and systems design teams who were at that time just beginning the contract document preparation task. In April 1983, a mathematized horizontal and vertical alignment for the 18.3 mile system did not exist. Approximately 600 data points were used to describe the alignment. Where data was ambiguous or incomplete, alignment details were assumed and those assumptions checked with the responsible design team. Vehicle procurement document preparation had also just commenced so vehicle characteristics consistent with the lower power requirements outlined in the Project Design Criteria were assumed by FEI. A Siemens/Duewag car, as operated in Edmonton, Alberta, was selected for the simulation and confirmed with the STDA and its vehicle consultant, L. T. Klauder. Vehicle weight was modified to reflect the addition of the air conditioning, brake requirements, and structure to support the added equipment being specified for Sacramento.

The simulation produced a round trip time of 101-1/2 minutes, too long for the seven-train, 15-minute headway scheme in the preliminary Operating Plan; consequently, a new plan had to be devised. Five constraints, which precluded further development without an increase in the project budget, were identified:

1) fixed 15-minute headway,
2) fixed length of single track across the American River and 12th Street,
3) fixed line length,
4) fixed number of cars, and
5) fixed car power limit.

After several trials and feasibility discussions, the length of single track on 12th Street was deemed to be one constraint readily removable so development of the plan proceeded under this assumption with an appropriate modification to the budget. The resulting Operating Plan required eight trains: five, 4-car trains between Watt/80 and 12th Street and three, 2-car trains between 12th Street and Butterfield. At this point, FEI was advised that the cars for the eighth train could be furnished from the two retained as spares. This would be possible because these cars would be required to run downtown and back once each day during the a.m. peak and

would be available as spares the rest of the time. It was then possible to develop a 15-minute headway operating plan based on several recommended changes; increase speed limits in three areas; extend double track on 12th Street; increase number of trains from seven to eight; and relocate the passing tracks. Several other recommendations were made to facilitate system recovery.

The unyielding constraint governing this plan, however, was a budget which restricted the extent to which reliability could be built into the plan. Consistent with this constraint, the plan provided reliability sufficient to serve as the base upon which final design could proceed. However, further confirmation of the plan was required as the design progressed. The results of the Preliminary and 1983 Plan are reflected on Table 1, Summary of Operating Plans.

V. The December 1985 Operating Plan Update

Throughout the subsequent design process, system integration reviews monitored designers' proposals for consistency with the operating plan. Changes that had potential impact on the Operating Plan were evaluated. Some proposed changes, such as the addition of Dos Rios Station were rejected on the basis of material adverse impact on the plan. Other proposals had only minor

changes and were judged to have no significant impact on the plan.

In retrospect, a valid criticism of the 1983 Plan might be the collective failure to recognize the sensitivity of the plan to a localized change; i.e., the collective impact of so many of the minor individual changes when that impact is localized geographically.

In July and September 1985, the vehicle supplier's data for the Sacramento car was received. Also in September, the last construction document package was finalized. At this point, the Operating Plan recheck was started. Data more closely reflecting design conditions were input for this run. About 1500 data points, instead of the previous 600, taken from the contract documents described the now designed alignment. Characteristics calculated from laboratory test data supplied by Siemens/Duewag were used to describe the vehicles' performance characteristics.

The simulation output showed a new round trip time of 104-3/4 minutes--some 3-1/4 minutes longer than in 1983. After detailed analysis, the cause of the increase in run time was traced to a series of alignment details and speed limit restrictions different from those assumed in 1983. Most of the changes occurred in a relatively short segment from 8th and O Street to 23rd Street. This segment lies

between the train meets which occur at 23rd Street and at 8th and O Street. This three-plus minute increase in the 15-minute round trip time between these two meet points cannot be absorbed in the slack time provided between these two meets in the 1983 Plan, so the meet at 23rd Street, along with meets further out on the Folsom line, no longer occur on their passing tracks. Consequently, the 1983 Operating Plan is no longer feasible. The quantification and impact of these changes is reflected on Table 2, Watt/80 to Butterfield (S.B.) - Run Time Difference Analysis.

The major run time increases were caused by alignment changes necessitated during development of the final design. Penalties of up to 30 seconds at several locations were caused by a reduction in curve radius. This reduction was necessary because of physical constraints, utilities, station locations, traffic considerations and right-of-way constraints.

Specifically, physical constraints included building corners, sidewalk clearance at track curves and major utilities, such as water, sewer and power. Station locations contributed to track curvature reduction and a corresponding speed reduction. Traffic considerations also required very tight track curvature to minimize automobile lane reduction and auto-train impact.

The approved Design Criteria assumed speed zones along the entire route. Even if the speed zones were changed, it has been determined that the vehicles could not safely operate at the higher speed. This decision has contributed to the increase in running time in the 8th and O Street to 23rd and R Street zone.

The April 1983 Plan was in many ways very good in that, with the more than 600 data points assumed, it closely reflects the update nearly two years later. The small percentage of change also speaks well of the systems integration function.

Before moving into an assessment of our alternatives and their impacts, it is necessary to point out that, while many assumptions regarding the system in the 1983 Plan have been replaced with data based on design, three major unknowns remain:

1. Will the vehicle perform as specified?

2. Will the operators be able to perform consistently in the manner we have assumed?

3. Will we be able to transverse the CBD within the modeled parameters? What impact will traffic light

prioritization, elderly and handicapped and traffic in general have on the operation?

While historically transit vehicles have met or exceeded the acceleration and braking parameters specified and assumed in the simulation, and drivers can perform consistently at the level assumed in the simulation, these questions or concerns will remain until we accumulate some actual operating data.

VI. Current Options

The 1985 updated simulation was presented to staff on December 13, 1985. The Board was briefly informed of the preliminary findings orally on December 16, 1985. The period from then until now has been spent analyzing and quantifying the difference in the April 1983 and 1985 updated simulation. At least another week is required to complete and document this effort.

Based on the analysis completed to date, two basic options, with possible variations on the second, have surfaced. The options and their consequence in terms of operational characteristics, reliability, and capital and schedule impact are still under development. By January 30, 1986, we will be in a better position to focus on the options in more detail and recommend the first steps

of a program enabling us to establish a viable Operating Plan.

The two basic options that surfaced are:

Option 1: 20 minute headways

Option 2: Open the Northeast Line and Central City (Watt/80 through 18th and R - Phase I) on 15-minute headways with an accelerated Double Tracking Program.

1. Option 1 - 20-Minute Headways - While this is an alternative, a minimum of effort has been expended on analyzing it at this time. The plan operates at a headway which is different than that previously presented. Operationally, it provides less capacity than 15-minute headways, and would offer a reduced level of service when integrated with a revamped bus network in the Northeast.

   Its advantage is that the schedule would be reliable until adequate double tracking could be implemented and a 15-minute headway adopted. It requires minimal additional capital investment at this time.

   The system under a 20-minute headway would have a 104-3/4 minute round trip time and operate with seven

trains: four, 4-car trains from Watt/80 to 12th and R and three, 2-car trains from Butterfield to 12th and R. The system would have 22 cars in service with four spares for a total of 26 cars. For a summary of the 20-minute headway option, see Table 1, page 20.

2. Option 2 - 15-Minute Headways With An Accelerated Double Tracking Program

Review and analysis to date has indicated that we can implement double tracking in a phased program and retain the 15-minute headways. This would require accelerating construction of:

- A 500' section of double track at Butterfield,
- Constructing approximately a mile of double track to provide an added two minutes flexibility in run time. Our analysis has not fixed the exact location at this time.
- Double tracking the Western Pacific/Bee Bridge, as well as the track between 17th and R and the bridge abutment,
- Constructing a 500' section of double track at Watt/80, and
- Extending the double track south of Swanston 3,000'.

These changes would require that we quickly complete the design for this effort. The Western Pacific/Bee bridge and bridge approach would be incorporated into the Herzog contract for CU#4H. Building a double track structure now as opposed to a single track structure now and another single track structure at a later date will save $600-800,000. The double track section at Butterfield and the double track extensions would be issued as changes to contract CU#5C. The double track at Watt/80 and the Swanston extension could also be issued as changes to CU#5C or packaged and bid separately.

These estimated costs would be approximately $3,600,000 and could be implemented by the fall of 1987 with start-up of the Folsom Line. This civil effort will need to be augmented with the acquisition of another six vehicles. Grants in hand, those submitted with approval expected by fall of 1986, and RT revamping a portion of its capital program appear to generate adequate funding to enact the first phase of the Double Tracking Program.

Option 2 would have a round trip run time of 104-3/4 and operate 9 trains on 15-minute headways; six, 4-car trains Watt/80 to 12th, and three, 2-car trains from Butterfield to 12th. The system would require

30 cars in service and provide for two spares for a total of 32 cars. The system is summarized on Table 1.

VII. Actions Required to Accelerate Phase I of the Double Tracking Program

Due to delays associated with the award of Contract #4H and #5C, Folsom Line Revenue Service had slipped from June 1, 1987, to September 30, 1987. The changes necessary on the Folsom Line would not result in any added delay to revenue service. The changes on the Northeast Line could be accomplished without impacting the revenue service date of March 1987.

The estimate of cost was developed by PBQ&D/DMJM as Task 520 of the Design Audit and Technical Support effort and is dated March 1985. The schedule data was developed by staff. Both are preliminary information. The following is a summary of the actions necessary to start.

1. Double Track Bridge at WP/Bee (CU#4H)

We currently have until February 21, 1986, to issue NTP on the subject contract to Herzog Contracting Corporation. The low bid submitted by Herzog was $4,628,324.00. Herzog's bid was based on a single track structure. The added engineering design work,

the bridge and trackwork, and the support systems (traction power and signals) are estimated to cost $1,600,000. To incorporate the double track bridge into the CU#4H contract, we need to:

- Quickly complete a double track design from roughly 17th & R Streets to 24th and R Street. Effort would be done with current team: RT, Caltrans (TSD) and consultants ($100-150,000).

- Would have to amend the Engineering Computer Corporation (ECC) contract--designer of the original bridge, for $30-35,000 to redesign for a double track structure. Foundation design could be done in three weeks; the balance of the design three weeks later. ECC would also design trackwork on the bridge and approach(es) and review falsework submittals.

The necessary trackwork, catenary and signal materials would be procured and installed (or furnished and installed by our current contractors). While the system was generally designed to be double tracked, the additional impact of right-of-way and utilities in this area has not been assessed.

- The double tracking at Watt/80 and Butterfield,

the double tracking at Swanston, and the mile of additional double track could be issued as change orders to the #5C contract in whole or in part or a portion (the Northeast Line) packaged and bid separately.

The added engineering and design work, the bridge and trackwork, and the support systems (traction power and signals) are estimated to cost $2,000,000. To incorporate these changes into the system, it would be necessary to:

- Quickly complete the design utilizing the current team: RT, Caltrans (TSD), and consultants. We will also need to contract for some drafting support and accelerate filling the additional engineering position planned for RT-TSD in July 1986.

- The design would be complete by July 1986 implementing Option 2.

- Authorize staff to request Siemens/Allis for a proposal for six added vehicles. This would result in entering into a negotiated contract with Siemens/Allis after evaluation of the proposal. Place order on or before June 30,

1986, with delivery required no later than 18 months from placement of order.

- Begin review of Capital Program to ensure that funding supports Phase I Double Tracking needs.

VIII. Financing the Alternatives

Financing for the alternatives is not a major issue as capital dollars have already been identified in RT's existing 5-Year Capital Development Plan. In the current year, $4 million has been programmed for double tracking, and in the subsequent year, $9.5 million was reserved for additional double tracking, as well as $6 million set aside for six new vehicles.

In the 20-minute headway alternative, the only expedited capital outlay required would be the completion of 500 feet of pocket track at both ends of the system. At approximately $115,000 each, this would require spending about $230,000 of the funds programmed for FY85-86.

Financing for the proposed alternatives to maintain 15-minute headways and desired vehicle spares is more extensive. Six elements of the current complete double tracking plan would need to be immediately programmed for completion as well as beginning the process of procuring

the six additional LRV's. The double tracking elements are estimated to cost approximately $3.64 million, with the breakdown as follows:

Pocket Track-Butterfield	$ 115,000
Bridge at Bee	1,440,000
Track - 17th St to Bee	150,000
Track - Swanston	660,000
Pocket Track - Watt/80	115,000
Additional Double Track	1,160,000
	$3,640,000

The majority of the funds required for these double tracking elements are available in RT's FY85/86 Capital Plan. Of the $3.64 million required, $1.6 million of Federal Section 9 monies are awaiting approval; $800,000 of TDA Local have been approved, and $768,000 of Article XIX has been granted. The balance of approximately $470,000 would have to be financed from RT's Capital reserves or from a reprioritization of the existing capital projects.

The six new vehicles are estimated to cost approximately $6 million. These funds are already in the District's FY86-87 Capital Program with the following various sources

identified: Federal Sections 3 and 9 - $2.4 million; Article XIX - $2.4 million, and TDA - $1.2 million.

OPERATING PLAN UPDATE
SUMMARY

TABLE 1
01/17/86

	PRELIMINARY PLAN		1983 PLAN		OPTION 1 20-MINUTE HEADWAY PLAN		OPTION 2 15-MINUTE HEADWAY PLAN	
	(SEC)	(MIN)	(SEC)	(MIN)	(SEC)	(MIN)	(SEC)	(MIN)
ROUND TRIP TIMES								
THEORETICAL	-	-	5686	94.8	5835	97.3	5835	97.3
COUPLING ALLOWANCE	-	-	60	1.0	60	1.0	60	1.0
TRAFFIC SIGNAL INTERFERENCE	-	-	110	1.8	110	1.8	110	1.8
DRIVING ALLOWANCE	-	-	229	3.8	278	4.6	278	4.6
SUBTOTAL		92	6085	101.4	6283	104.7	6283	104.7
LAYOVER TIMES								
WATT/80	-	9	180	3.0	600	10.0	960	16.0
BUTTERFIELD WAY	-	4	540	9.0	856	14.2	462	7.7
SLACK TIMES								
NORTHEAST LINE	-	-	82	1.4	81	1.4	82	1.4
CENTRAL CITY	-	-	193	3.2	400	6.7	193	3.2
FOLSOM LINE	-	-	120	2.0	180	3.0	120	2.0
TOTAL		105	7200	120	8400	140	8100	135
HEADWAYS	-	15	-	15	-	20	-	15
CAPACITY (PEAK HOUR, PEAK DIRECTION)								
WATT/80 - 12TH STREET	2800 PASS/HR		2800 PASS/HR		2100 PASS/HR		2800 PASS/HR	
BUTTERFIELD-12TH STREET	1400 PASS/HR		1400 PASS/HR		1050 PASS/HR		1400 PASS/HR	
CONSISTS	7 TRAINS		8 TRAINS		7 TRAINS		9 TRAINS	
WATT/80 - 12TH STREET	4-4 CAR		5-4 CAR		4-4 CAR		6-4 CAR	
BUTTERFIELD - 12TH STREET	3-2 CAR		3-2 CAR		3-2 CAR		3-2 CAR	
12TH STREET STORAGE	1-2 CAR		-		-		-	
CARS								
IN SERVICE	24		26		22		30	
SPARE	2		-		4		2	
TOTAL	26		26		26		32	

OPERATING PLAN UPDATE
RUN TIME DIFFERENCES
WATT/80 - BUTTERFIELD (S.B.)

TABLE 2
01/17/36

STATION NAME	1983 (SEC)	CAR CHANGES (SEC)		DRIVING ALLOWANCE CHANGES (SEC)		STATION LOCATION (SEC)		STATION DELETIONS (SEC)	POSTED (SEC)	ALIGNMENT CHANGES SPEED LIMIT CURVE (SEC)	TURNOUT (SEC)	CURVE LENGTH (SEC)	TOTAL (SEC)	RESIDUAL (SEC)		1985 (SEC)	
WATT/80-WATT/80 WEST	92		-3		-1									+2		90	
WATT/80 WEST-ROSEVILLE RD	83		-3		+2									-0-		82	
ROSEVILLE RD-MARCONI/ARCADE	173		-7		+1									+2		169	
MARCONI/ARCADE-SWANSTON	136		-6		+3									-1		132	
SWANSTON-ROYAL OAKS	136		+2		+1									-1		138	
ROYAL OAKS-ARDEN/DEL PASO	91		+1		+3									+3		98	
ARDEN/DEL PASO-GLOBE AVE	102		+4		-2		+12				+7		+19	+2		125	
GLOBE AVE-ALKALI FLAT	267		-3		+4		-12						-12	-6		250	
ALKALI FLAT-12TH & H	94		+3		+1									+3		101	
SUBTOTAL		1174		-12		+12								+7	+4		105
12TH & H-CATHEDRAL SQ	83		-0-		+7		+31			-10	+13	+6	+40	+2		132	
CATHEDRAL SQ-ST. ROSE OF LIMA	147		+2		-9		+15-31						-16	+2		126	
ST. ROSE OF LIMA-CAPITOL & 7TH	85		+3		+4		-15			+10			-5	+1		88	
CAPITOL & 7TH-7TH & O	79		+5		-3					+10			+10	+2		93	
7TH & O-11TH & O	70		-0-		+2				+3				+3	+3		78	
11TH & O-12TH ST	119		-0-		+1				+3	+25	+5		+33	-0-		153	
12TH ST-16TH ST	61		+1		+1				+4				+4	+1		68	
SUBTOTAL		644		+11		+3								+69	+11		738
16TH ST-23RD ST	108		+3		+2				+1	+4	+29		+34	-0-		147	
23RD ST-29TH ST	90		+1		+1				+9				+9	+1		102	
29TH ST-59TH ST	243		-6		-1			-25					-25	-3		208	
59TH ST-65TH ST	83		-1		-0-									-1		81	
65TH ST-POWER INN	140		-6		+3									+1		138	
POWER INN-COLLEGE GREENS	108		-5		-0-									-0-		103	
COLLEGE GREENS-WATT/MANLOVE	134		-5		-0-						+7			+2		138	
WATT-MANLOVE-NORCADE	102		-4		-1									-0-		97	
NORCADE-TIBER	92		-2		+2									-0-		92	
TIBER-BUTTERFIELD	58		-2		-0-		—		—	—	—	—	—	-1		55	
SUBTOTAL		1158		-27		+6								+25	-1		1161
TOTAL		2976		-28		+21	-0-	-25		+20	+39	+61	+6	101	+14		3004

SUMMARY OF ACTIONS

Immediate: 01/30/86

- o Authorize Amendment of Bridge Design Contract
- o Authorize staff to request a proposal for additional cars

Near Term: Next 60 days

- o Review and approve budget and schedule for Phase I Double Tracking
- o Authorize staff to amend contract for CU#4H
- o Authorize staff to procure long-lead materials
- o Authorize staff to contract for added design assistance

Longer Term: Next 120 - 180 days

- o Authorize construction contracts for Phase I Double Tracking
- o Authorize procurement of six vehicles
- o Authorize Subsequent Phases of Double Tracking

APPENDIX B
February 10, 1986

WORK PROGRAM; RESOLUTION OF 15 MINUTE - 20 MINUTE HEADWAY ISSUE

- Narrative - Work Program - 15 versus 20 Minute Headway Analysis
- Alternatives
- Scope of Alternative Review
- Outline Actions by Board Meeting

February 10, 1986

WORK PROGRAM; 15 VERSUS 20 MINUTE HEADWAY ANALYSIS

On January 20, 1986, Staff presented an in-progress report to the Board on the status of the updated Operating Plan. In summary, the report concluded that the 1983 Operating Plan, which was based on an assumed system alignment and vehicle data points, was no longer feasible for 15-minute headway operation.

The 1985 update simulation had a run time of 104-3/4 minutes; a 3-1/4 minute increase over the 1983 simulation. The increase in run time resulted in the meets being shifted enough in the 8th and O Street to 23rd and R Streets and on the Folsom Corridor to no longer provide for a 15-minute headway operation.

On January 30, 1986, the Board in recognition of the need to preserve the opportunity for cost savings associated with double tracking the UPRR/Bee Bridge, authorized staff to enter into a design contract with Engineering Computer Cooperation (ECC). Staff has executed the agreement with ECC and the preliminary results, a general plan, the foundation plans, and an estimate will be completed by February 14, 1986.

Tonight Staff will present the Work Program proposed to explore the options associated with Board selection of a twenty-minute or fifteen-minute headway for light rail operation.

ALTERNATIVES

- 20-Minute Headways
- 15-Minute Headways (Non-Engineering Approach)
- 15-Minute Headways (W/4-6 added LRV's)
- 15-Minute Headways (W.O. added LRV's)

SCOPE OF ALTERNATIVE REVIEW

- Operating Plan Implications
  - Capacity
  - Bus Support Network
  - Cost
  - Feasibility
- Capital Cost Implications
- Staffing Plan (Resources to Implement
- Funding Implications
  - Existing Grants
  - Future Grants
  - Timeliness
- Environmental Implications
  - Impact on Existing EIS
  - Added EIS Effort
  - Define Preferred Solution
- Implementation Schedule/Relationship to Starter Line Schedule
- Public Commitment/Acceptance
  - Coordination with City, County, Federal and State Funding Partners
  - Local Interest Groups
  - Public

OUTLINE ACTIONS BY BOARD MEETING

- o 01/20/86
  - Reviewed In-Progress Report

- o 01/30/86
  - Approval of ECC Contract

- o 02/10/86
  - Outline Work Program
    - o Agree on Alternatives
    - o Agree on Scope of Alternative Review
    - o Agree on Board Action Schedule
    - o Agree on Schedule for Review of In-Progress Operating Plan (01/20/86) and Work Program with City, County, State, Federal and Public Groups

(Written Report to Board)

- o 02/24/86
  - Review and Discuss Alternatives and Estimated Impacts

  - Review ECC Preliminary Bridge Design

  - Define and Agree on a Preferred Solution

  - Actions
    - o Set EIS Public Hearing Date
    - o Staff to take appropriate action regarding bridge
    - o Other Actions Resulting from Defined Solution

- o 03/10/86
  - Hold Public Hearing

  - Set next Board Meeting to deal with the following actions:
    - o Review and take appropriate action regarding bridge.
    - o Authorize the implementation of the preferred solution.

NEGATIVE DECLARATION/INITIAL STUDY
LIGHT RAIL TRANSIT
DOUBLE TRACKING - PHASE I

Regional Transit
P.O. BOX 2110 • 1400 29TH STREET • SACRAMENTO, CA 95810-2110 • (916) 321-2800

NEGATIVE DECLARATION

Lead Agency: Sacramento Regional Transit District

Address: P. O. Box 2110, 1400 29th Street, Sacramento, CA 95810-2110

This Negative Declaration has been prepared pursuant to Section 15070 of the State CEQA Guidelines (Division 6, Title 14, Chapter 3, Article 6 of the California Administrative Code) and Regional Transit (RT) Environmental Guidelines (Title 2 of RT's Administrative Code).

Project Description

Light Rail Transit Double Tracking - Phase I. This proposed project involves Light Rail Transit (LRT) facilities, consisting of double tracking to be constructed at three locations and the acquisition of six light rail vehicles (LRVs). The three separate sites of the double tracking are located within the LRT alignment in the Sacramento Metropolitan Area:

- Watt/80 Median - From a point approximately 250 feet east of the Watt Avenue overcrossing to a point approximately 1,400 feet west of the Longview Drive overcrossing, a distance of approximately 6,500 feet.

- Swanston - From a point approximately 300 feet west of the El Camino Avenue overcrossing to a point approximately 100 feet west of the Arden Way overcrossing, a distance of approximately 1,700 feet.

- Downtown - Within the Q and R Street alley between 16th Street and 19th Street, and within R Street between 19th Street and 23rd Street, a distance of approximately 3,000 feet.

The proposed project is scheduled for construction during the spring and summer of 1986.

It has been determined that the above project will not have a significant adverse effect on the environment.

PROJECT DESCRIPTION

Purpose of Study

This Initial Study/Negative Declaration has been prepared to assess the potential impacts of the Sacramento Regional Transit (RT) District's proposal to construct additional double tracking along the Sacramento Light Rail Transit (LRT) system right-of-way and to acquire and operate six additional light rail vehicles (LRVs) as part of the system. It has been prepared to satisfy the California Environmental Quality Act (CEQA), (Public Resources Code Section 21000 et seq.), the State CEQA Guidelines (14 California Administrative Code Section 15000 et seq.), and RT's Environmental Guidelines (Title 2 of RT's Administrative Code).

Location

The proposed project sites for the additional double tracking are shown in Figures 1 and 2. The three sites are located within the Sacramento Metropolitan Area. The Watt/80 Median site is located from a point approximately 250 feet east of the Watt Avenue overcrossing to a point approximately 1,400 feet west of the Longview Drive overcrossing. The Swanston site is located from a point approximately 300 feet west of the El Camino Avenue overcrossing to a point approximately 100 feet west of the Arden Way overcrossing. The downtown site is located within the Q and R Street alley between 16th Street and 19th Street, and within R Street between 19th Street and 23rd Street.

The additional LRVs would operate on the entire system, shown in Figure 2.

Background

In August 1983 the Sacramento Transit Development Agency (STDA) certified an Environmental Impact Report/Environmental Impact Statement (EIR/EIS) that analyzed the impacts of constructing an 18.3-mile LRT system in the Sacramento area. One characteristic of the LRT project was the proposal to double-track portions of the project to allow LRVs traveling in opposite directions to pass each other. Approximately 6.4 miles of the system were to be double tracked. Although only a portion of the system was to be double tracked, sufficient right-of-way was acquired to double track most of the system if funding became available.

SACRAMENTO COUNTY

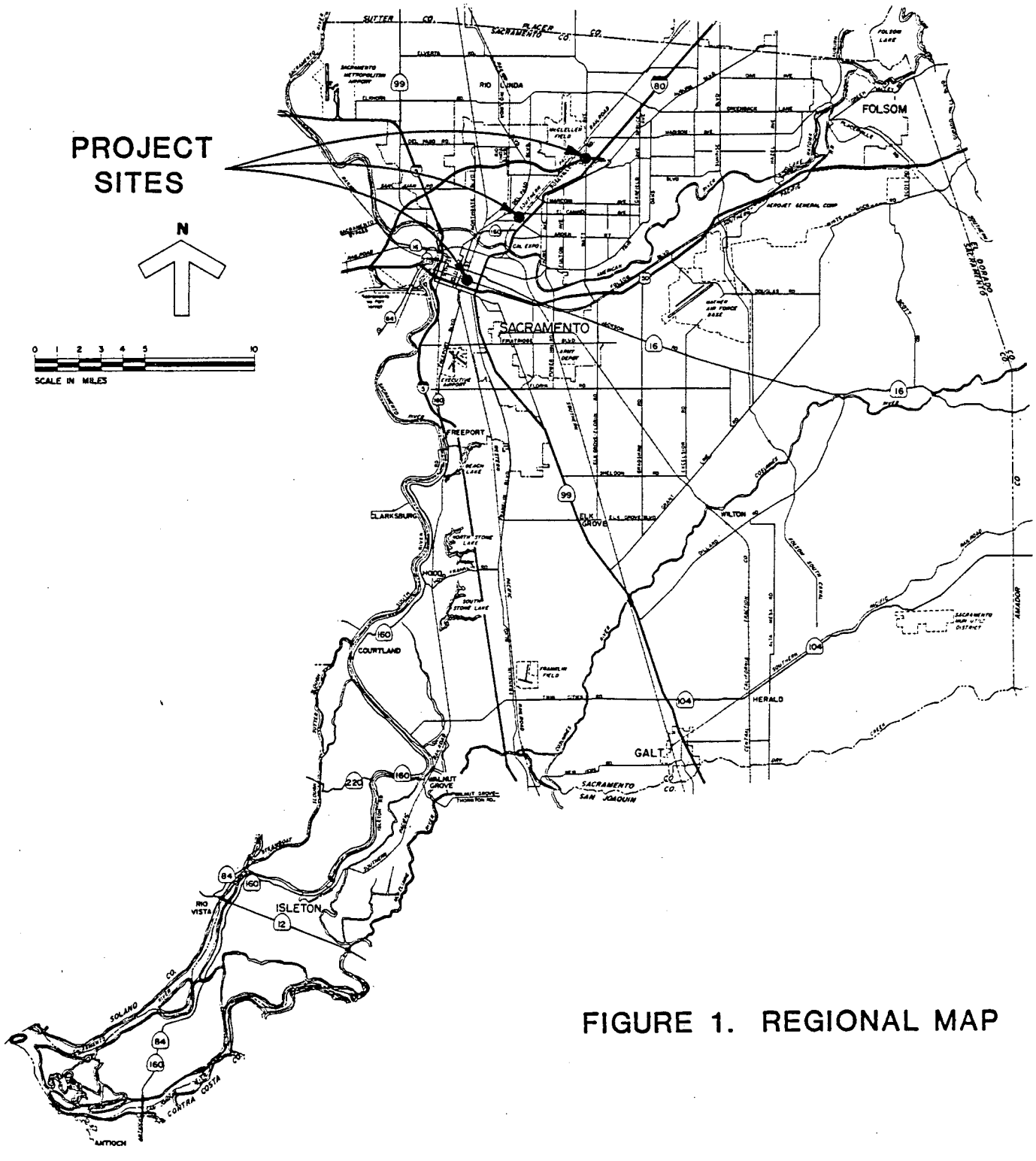
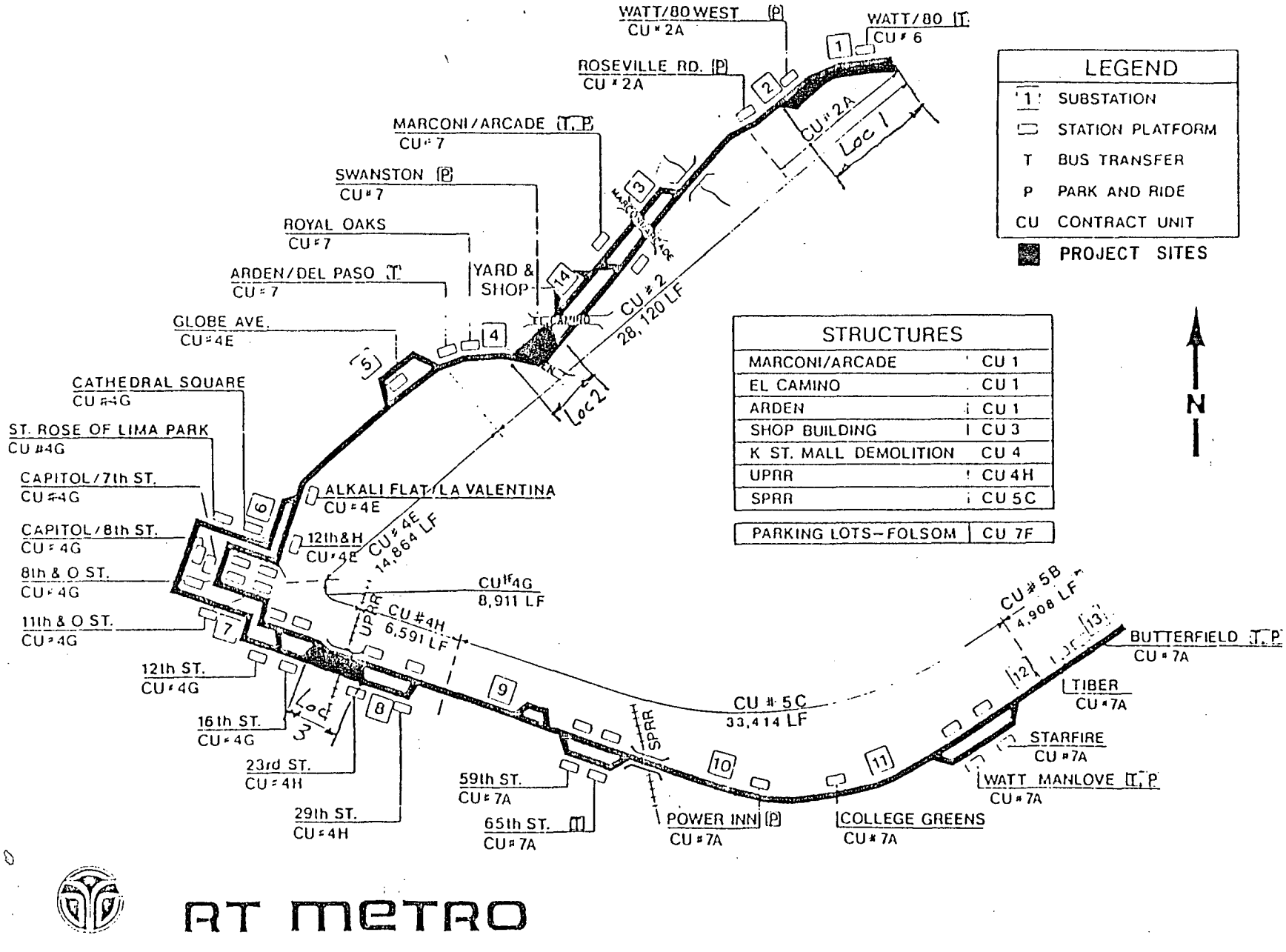


FIGURE 1. REGIONAL MAP

Base map courtesy of:
Sacramento Area Council Of Governments

FIGURE 2. PROJECT SITES



RT METRO

In August 1985 RT assumed responsibility for construction of the LRT project from STDA. RT is currently proposing to add six LRVs and an additional 11,200 feet of double tracking to the system. These additional vehicles and trackage are proposed to increase the potential reliability of the system and assure that the train schedules described in the EIR/EIS can be attained.

During the light rail project's development, the system's design and operating plans were prepared concurrently based upon the best information available at that time. At numerous points, the plans were coordinated and adjusted so that the most optimal design and operations would result within the budget and given parameters of the project. This evolutionary process was recognized in the EIS, which noted that both the operating plan and final construction design were subject to modification.

Late in 1985, a more detailed analysis that incorporated the performance characteristics of the vehicle, and operating the design characteristics of the line was performed. This analysis indicated that it was highly probable that running times would be several minutes slower and that round-trip times would, therefore, be longer than previously thought. Because of the increase in running time, an inadequate amount of layover time (only 1 minute) was projected at the Watt/80 station. This situation can best be rectified through the addition of a train. But, without acquiring new vehicles a new train can only be created with a loss in overall capacity. In addition to affecting recovery time and layovers, the increased running time would result in trains meeting or passing at locations where double tracking was not planned to be constructed. The need to provide solutions for these newly projected conditions has resulted in the proposed project.

In proposing both double tracking construction and adding vehicles, this project presents a comprehensive approach to ensure a system that runs smoothly with planned capacity. The additional double tracking is anticipated to enable trains to meet and pass and stay on scheduled 15-minute headways. The LRVs will also aid in achieving on-time performance, while maintaining planned capacity.

Adding six LRVs would result in a 32-vehicle fleet. With such a fleet, the proposed operating plan calls for operating nine trains, instead of the previous eight trains thought to be needed. There would be six 4-car trains in the Interstate 80 (I-80) Corridor and three 2-car trains in the Folsom Corridor. The extra, or ninth train, would allow sufficient layover time--16 minutes at the Watt terminal and 7.7 minutes at the Butterfield station. These layovers, one of which is longer than the 15-minute system headway, typically would result in one four-car train waiting at the Watt/80 station. This train, theoretically, would always be ready to start at the scheduled time.

The system capacity and schedule would remain the same as under the previous operating plan. Since there still would be only eight trains, with a maximum of 26 cars on the line in service at one time, the capacity would be unchanged.

The additional vehicles would also allow two spare cars to be available at all times. Having the spares is desirable to ensure that the system operates on schedule and maintains the needed capacity.

Relationship to CEQA and the National Environmental Policy Act (NEPA)

The decision to construct additional double tracking and to acquire additional LRVs is considered a "project" under 15378 of the State CEQA Guidelines. Section 15063 of the Guidelines requires RT to prepare an Initial Study to determine if there is substantial evidence that the project may cause a significant effect on the environment. Such an Initial Study has been prepared and is included as a part of this report. Since the Initial Study concluded that the project would not result in a significant effect on the environment, RT has concluded that a Negative Declaration is appropriate. Further, since no important new significant effects are identified in the Initial Study, the proposed revisions to the project do not require the preparation of a Supplement to the EIR under section 15163 of the CEQA Guidelines.

As a federally funded activity, the LRT project required compliance with NEPA as well as CEQA. Therefore, the current proposal also requires NEPA clearance. RT has consulted with the U. S. Department of Transportation Urban Mass Transportation Administration (UMTA) to determine the appropriate NEPA review for the project. According to UMTA's NEPA Regulations, the double tracking project would fall within a Categorical Exclusion under 23 CFR 771.115(b)(21). Consequently, neither an Environmental Assessment nor Supplemental EIS is required for the project.

Proposed Facilities

The primary purpose of double tracking is to improve the potential reliability of the system while maintaining the initially proposed 15-minute headways. LRT facilities proposed to be constructed consist of double tracking at the following three locations:

- Watt/80 Median - Approximately 6,500 feet of new line consisting of grading, drainage, trackage, signal work, overhead catenary, station platform modification, and three additional platforms to accommodate double tracking at currently planned stations. These platforms would have amenities such as lighting, access ramps for

the elderly and handicapped, landscaping, and provisions for future shelter and vending machines.

- Swanston - Approximately 1,700 feet of new line consisting of grading, drainage, trackage, signal work, overhead catenary, station platform modification, and one additional platform to accommodate double tracking at currently planned stations. These platforms would have amenities such as lighting, access ramps for the elderly and handicapped, landscaping, and provisions for future shelter areas and vending machines.

- Downtown - Approximately 3,000 feet of new line consisting of a new double track bridge (previously designed as single track) 1,376 feet long with approaches, new grading, drainage, trackage, signal work, and overhead catenary.

Site Characteristics

Watt/80 Median

The Watt/80 Median site is located from a point approximately 250 feet east of the Watt Avenue overcrossing to a point approximately 1,400 feet west of the Longview Drive overcrossing. The site is located within the I-80 median. The site is currently under LRT construction. Heavy industrial uses are situated in the vicinity of the site, across the freeway.

Swanston

The Swanston site is located from a point approximately 300 feet west of the El Camino Avenue overcrossing to a point approximately 100 feet west of the Arden Way overcrossing. The site is currently under LRT construction. Heavy industrial uses and vacant land are situated adjacent to the site.

Downtown

The downtown site is located within the Q and R Street alley between 16th Street and 19th Street, and within R Street between 19th Street and 23rd Street. The portion between 16th Street and 19th Street is the abandoned Western Pacific Railroad right-of-way. At present, the site is vacant. Light industrial uses and scattered residences are situated adjacent to the site.

Vehicles

The six additional LRVs proposed for acquisition would be the same as those vehicles now being constructed for the Sacramento Metro project. These cars are the U2 Advanced Light Rail vehicle manufactured by Siemens-Allis/Duewag. They are a double ended, six-axle, articulated car powered by a direct current (750 volts) drawn from an overhead wire. Each LRV has 64 seats and a capacity of 175 passengers with standees. The height of the car from rail to top of locked pantograph is 12.6 feet; its exterior width is 8.7 feet; its length including couplers is 79.6 feet; and its weight when empty is 77,800 pounds. The vehicles will be air conditioned and heated. The acquisition of the six additional vehicles is estimated to cost approximately $6 million.

Project Alternatives

RT has proposed the following alternatives to the proposed project. The alternatives are summarized in Table 1.

No-Project Alternative

This alternative would involve no change from the project analyzed in the EIR/EIS. The system will consist of 18.3 miles, of which approximately 40 percent will be double tracked. Twenty-six vehicles will operate in eight trains on 15-minute headways. There will be five 4-car trains in the I-80 Corridor, three 2-car trains in the Folsom Corridor, and no spares in the peak. Cars will be coupled and uncoupled near 12th and R Streets.

According to a recent analysis of this system, however, it appears that it may not be able to operate as planned. An increase in running time has indicated that train meets would shift in the 8th and O Street to 23rd and R Streets portions of the system and in the Folsom Corridor. These shifts would result in the system no longer being able to provide a 15-minute headway operation.

The decreased reliability in meeting schedules and making connections may result in patronage below projected levels. Impacts would include fewer transit trips, more auto trips, more vehicle miles traveled, and more air pollution than anticipated with the project. These impacts would warrant analysis of an additional environmental study such as an Addendum or Supplement to the EIS.

Table 1

COMPARISON OF PROPOSED PROJECT AND ALTERNATIVES

	Base Case	Proposed Project	Alternative	Alternative	Alternative
	No Project	Phase I Double Tracking/Added LRVs	Phase I Double Tracking/ No New LRVs	Modifications to System	Scheduled Twenty Minute Service
Headways	+15 min.	15 min.	15 min.	15 min.	20 min.
Consists I-80 Corridor Folsom Corridor	8 trains 5-4 car 3-2 car	9 trains 6-4 cars 3-2 cars	9 trains 6-3 car 3-2 car	8 trains 8-3 car	7 trains 4-4 car 3-2 car
Cars In Service Spares	 26 0 in peak 2 other times	 30 2	 24 2	 24 2	 22 4
Capacity Loss From EIS	No	No	Yes	Yes	Yes
Schedule Reliability	Not Likely	Likely	Likely	Not Likely	Likely
Potential Major Changed Conditions & Environmental Impacts	Less Ridership: Fewer transit trips, more auto trips. Less Beneficial regional impacts of system for congestion, air quality.	Increased Double Tracking & LRVs: No significant adverse impacts.	Increased Double Tracking: No significant adverse impacts. Less Ridership: Same type impacts as "No Projects".	Delete Stations: access adjacent development impacted. Redesign curves: conflicts, safety for pedestrians, buildings. Increased speeds: safety, traffic flow. Street closures: access, community disruption. Traffic Pre-emption: safety, traffic flow. Less ridership: Same type impacts as "No Project.	Less Ridership: Same type impact as "No Project," Systemwide transit changes.

15-Minute Headway/Additional Double Tracking/No New LRVs

This alternative would construct additional double tracking at the three proposed locations but not acquire any additional LRVs. This alternative would save approximately $6 million in capital costs.

No adverse environmental impacts would result from double tracking.

The major operational and capacity differences between this and the proposed project stems from the fact that the latest operations simulation has indicated that nine trains will be required to maintain reliable service. An eight-train operation will not provide adequate recovery time; only 1 minute of lay-over would be allocated to the Watt/80 median station. Thus, even with double tracking, the former operations plan of eight trains would potentially not work.

A nine-train operation, with the existing 26 vehicle fleet, would operate six 3-car trains in the I-80 Corridor and three 2-car trains in the Folsom Corridor, with two spares. This would result in two fewer cars in service than anticipated under the former operating plan or the proposed project. It would also result in a loss of passenger capacity for the system. With fewer transit trips taken, it is likely that auto trips and miles traveled, congestion, auto emissions, and parking demand would increase.

This alternative would warrant additional examination. The likely format for this examination would be a Supplemental EIS.

15-Minute Headway/Modifications to Systems

This alternative includes a combination of engineering, construction, and operational changes to reduce running time. Among these measures are suggestions proposed by interested individuals and groups as well as those from RT staff and consultants.

The proposed items considered include:

Deletion of Station Stops During Peak Periods. During peak periods deletion of station stops, such as the 12th Street station or others anticipated to be lightly patronized, has been suggested as a time savings measure.

If one or several stations were deleted, changes would result in the system. These include changes in patronage, access to transit, the bus network, trip times, traffic volumes on local streets, mobility of persons and groups, land use patterns, and redevelopment potential. Since there is a wide range of potential impacts, further study of the effects, in-

cluding possibly a supplement to the EIS, would be required. Also, a public hearing should be held on any station deletion issue.

Operationally, the elimination of stops appears to have limited feasibility. To save the time involved in stopping at a station, the stop would have to be eliminated entirely since all the schedules are based on a fixed headway. The meets on the system are based on a fixed schedule in use at all times. There cannot be two schedules in operation with all the meets occurring at the same places on each cycle.

Elimination of Coupling at 12th Street. Elimination of the proposed coupling of cars at the 12th Street station during peak periods for deadheading to the I-80 Corridor terminus has been proposed as a time-saving measure.

The coupling operation is designed to provide the needed four-car train capacity in the I-80 Corridor, yet not operate more cars than are needed in the Folsom Corridor. From an environmental perspective, if longer trains were run in the Folsom Corridor (where they are not expected to be needed), extra power would be used. Although the amounts of energy consumed probably would not be significant, this would increase operating costs. In addition, nonproductive mileage would increase the wear and tear on the LRV fleet. Mid-day storage at 12th and Whitney Streets also allows minor repair and maintenance to be performed when the cars are not in service. This would reduce operating costs.

Redesign of Curves to Allow Faster Operation. The redesign of curves at 12th and O Streets and at 12th and R Streets has been suggested to allow faster operations. Since the downtown curves have all been designed to minimize conflicts with buildings, utilities, and pedestrian areas, increasing their radii and/or spirals would increase impacts on adjacent areas and would cause interference. These conflicts could be potentially significant. A Supplement to the EIS including engineering studies would probably be required to determine the extent of the impacts.

Increase Operating Speeds Through the Central City on Streets and Pedestrian Malls. Another proposal for shaving running time is to seek approval to operate the trains at the same speeds as other vehicles on City streets and to increase speeds on the "O" Street Pedestrian Mall.

All LRT trains will operate at the established speed limits on Sacramento streets. When an LRV is operating in mixed traffic, it is subject to the provisions of the California Vehicle Code. When operating in separated lanes on City streets, the LRV will be operating at the established speeds of adjacent parallel traffic.

On the "K" Street Mall, operating speeds are controlled by the State Public Utilities Commission (PUC) regulations at 10 miles per hour (mph). However, the trains were allowed to run up to 25 mph in the computer-simulated run for the two blocks on "O" Street between 7th and 9th Streets. On the other three blocks between 9th and 12th Streets, the trains were allowed 20 miles per hour on the raised right-of-way, which is available for pedestrian flow but not classified as a mall such as the "K" Street Mall.

If greater speed increases for the trains were sought, traffic and safety impacts would have to be carefully assessed through a traffic study as part of a Supplemental EIS.

Street Closures to Allow Increased Operating Speeds. The closure of 13th, 14th, 17th, and 18th Streets has been proposed for faster operating speeds and improved safety on the Whitney Alley route.

Potential environmental impacts include access, travel patterns, community disruption, and safety and emergency access. These factors would most appropriately be studied in the context of a Supplement to the EIS.

Operationally, it appears that closing the above-mentioned streets would do little to improve operating conditions.

Preemption of Traffic for Trains. Traffic signals will be prioritized for the LRT trains. As trains approach the signalized intersection, the upcoming phase of the signal will permit trains to proceed. The signal prioritization program has been developed over the last 3 years in meetings between STDA and RT staffs, City traffic engineering staff, and consultants. It provides transit priority with minimal impact on automotive traffic.

Signal preemption for LRT would result in traffic signals immediately changing from their current phase to permit trains to go directly through as they approach the intersection. The effects of preemption would have to be studied systemwide with respect to potential safety, traffic flow, congestion, and other impacts. This should be done in a traffic study as part of a Supplement to the EIS.

20-Minute Headways

This alternative would operate the system with 20-minute headways. This would involve changes throughout the entire transit network as well as to the LRT system.

The scope of this alternative would indicate that a Supplemental EIS would be appropriate. Preliminary consideration indicates that ridership would be reduced with other resulting potential environmental impacts.

INITIAL STUDY CHECKLIST

Environmental Impacts

(Explanations of all "yes" and "maybe" answers are provided in the expanded discussion following the checklist.)

PHYSICAL ENVIRONMENT	YES	MAYBE	NO
1. Earth. Will the proposal result in:			
a. Unstable earth conditions or in changes in geologic substructures?	____	____	X
b. Disruptions, displacements, compaction or overcovering of the soil?	X	____	____
c. Change in topography or ground surface relief features?	____	____	X
d. The destruction, covering or modification of any unique geologic or physical features?	____	____	X
e. Changes in land forming processes?	____	____	X
f. Any increase in wind or water erosion of soils, either on or off the site?	X	____	____
g. Loss of soil nutrients needed for plant life (if plants are to be retained or introduced to the site)?	____	____	____
h. Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake?	____	____	X
i. Exposure of people or property to earthquakes?	____	____	X
j. Exposure of people or property to other geological hazards such as landslides, mudslides, ground failure, vulcanism or similar hazards?	____	____	X
2. Air. Will the proposal result in:			
a. An increase in air emissions or deterioration of ambient air quality?	X	____	____
b. The creation of objectionable odors?	____	____	X

	YES	MAYBE	NO
c. Alteration of air movement, moisture or temperature, or any change in climate, either locally or regionally?	____	____	X
d. Exposure of people or property to wind hazards?	____	____	X
3. Water. Will the proposal result in:			
a. Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff?	X	____	____
b. Change in the amount of surface water in any water body?	____	____	X
c. Discharge into surface waters or in any alteration of surface water quality, including but not limited to temperature, dissolved oxygen or turbidity?	____	X	____
d. Alteration of the direction or rate of flow of ground waters?	____	____	X
e. Change in the quantity or quality of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?	____	____	X
f. Substantial reduction in the amount of water otherwise available for public water supplies?	____	____	X
4. Flooding. Will the proposal result in:			
a. Alterations to the course of flow of flood waters?	____	____	X
b. Exposure of people or property to water related hazards, such as flooding or tidal waves?	____	____	X
5. Navigable Waterways and Coastal Zones. Will the proposal result in:			
a. Changes in currents, or the course or direction of water movements, in either marine or fresh waters?	____	____	X
b. Changes in the channel of any waterway?	____	____	X

	YES	MAYBE	NO
6. Wetlands. Will the proposal be located in or near:			
a. Wetlands or riparian areas, such as marshes, bogs, lakes, or streams?	____	____	X
7. Ecologically Sensitive Areas. Will the proposal be located in or near:			
a. Ecologically sensitive areas such as woodlands, prairies, geological formations or pristine natural areas?	____	____	X
8. Plant Life. Will the proposal result in:			
a. Change in the diversity of species, or number of any species of plants (including trees, shrubs, grass, crops and aquatic plants)?	____	____	X
b. Reduction of the numbers of any unique, rare or endangered species of plants?	____	____	X
c. Deterioration to the habitat of the plant community?	____	____	X
d. Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species?	____	____	X
e. Reduction in acreage of any agricultural crop?	____	____	X
9. Animal Life. Will the proposal result in:			
a. Change in the diversity of species, or numbers of any species of animals (birds, land animals, including reptiles, fish and shellfish, benthic organisms, or insects)?	____	____	X
b. Reduction of the numbers of any unique, rare or endangered species of animals?	____	____	X
c. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?	____	____	X
d. Deterioration to existing fish or wildlife habitats?	____	____	X

	YES	MAYBE	NO
10. Natural Resources. Will the proposal result in:			
a. Increases in the rate of use of natural resource?	____	____	X
b. Substantial depletion of any non-renewable natural resource?	____	X	____
11. Energy. Will the proposal result in:			
a. Use of fuel or energy in its construction?	X	____	____
b. Use of energy in its operations?	X	____	____
c. Substantially increase demand upon existing sources of energy, or require the development of new sources of energy?	____	X	____
d. Utilize any energy conservation equipment or design features?	X	____	____
e. Result in obstruction of surrounding facilities' solar access?	____	____	X
12. Noise. Will the proposal result in:			
a. Increases in existing noise levels?	X	____	____
b. Exposure of people or noise-sensitive receptors to severe noise levels?	____	____	X
c. Increases in vibration for adjoining areas?	X	____	____

SOCIAL/ECONOMIC ENVIRONMENT

13. Land Acquisition. Will the proposal result in:			
a. Acquisition of land or interests in land?	____	____	X
b. Decreases to the tax base of the area?	____	____	X
c. Effects upon property values?	____	____	X

	YES	MAYBE	NO
14. Land Use Consistency. Will the proposal result in:			
a. Substantial alteration of the present or planned land use of an area, including surface, subsurface and air space uses?	____	____	X
b. Incompatible uses with surrounding land uses?	____	X	____
c. Zoning changes in the area?	____	____	X
d. Changes to local, State or Federal plans?	____	____	X
15. Secondary Development. Will the proposal result in:			
a. Secondary development which would be inconsistent with existing or proposed land uses in areas, exceed service capacities, disrupt community, or increase congestion?	____	____	X
16. Community Disruption. Will the proposal result in:			
a. Major displacements altering stability, lifestyle, social or economic character of neighborhood area?	____	____	X
b. Disruptions in access or service areas of community services and facilities?	____	____	X
c. Creation of barriers between segments of community?	____	____	X
d. Affect minority or other specific interest groups?	____	____	X
e. Substantial public controversy?	____	____	X
17. Population. Will the proposal alter the:			
a. Location, distribution, density, or growth rate of the human population of an area?	____	____	X
18. Business and Labor Force Interruptions. Will the proposal result in:			
a. Displacements or relocations of businesses?	____	____	X

	YES	MAYBE	NO
b. Constraints in business or industry?	X		
c. Cause a decrease in revenues for a business enterprise?			X
d. Increased demand that may induce growth?			X
e. Eliminate any jobs or positions?			X
f. Create a demand for jobs which cannot be met in the forseeable future?			X
g. Restrict the mobility of a sector of the labor force (eliminate a means of transportation)?			X
19. Housing. Will the proposal result in:			
a. Housing displacements or relocations?			X
b. Creation of a demand for additional housing?			X
20. Parklands and Recreation. Will the proposal result in:			
a. An alteration to or affect the use of parkland?			X
b. An impact upon the the quality or quantity of existing recreational opportunities?			X
21. History/Archaeology. Will the proposal result in:			
a. An effect upon a significant archeological or historical site, structure, object or building?		X	
b. Any physical change that would affect unique ethnic cultural values?			X
22. Transportation/Circulation. Will the proposal result in:			
a. Generation of substantial additional vehicular movement?		X	
b. Effects on existing parking facilities, or demand for new parking?	X		

	YES	MAYBE	NO
c. Substantial impact upon existing transportation systems?		X	
d. Alterations to present patterns of circulation or movement of people and/or goods?	X		
e. Alterations to waterborne, rail or air traffic?	X		
f. Increase in traffic hazardous to motor vehicles, bicyclists or pedestrians?			X
23. Safety and Security. Will the proposal result in:			
a. Safety or security problems for individuals or facilities?	X		
b. Risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?			X
24. Human Health. Will the proposal result in:			
a. Creation of any health hazard or potential health hazard (excluding mental health)?			X
b. Exposure of people to potential health hazards?			X
25. Public Services and Requirements. Will the proposal have an effect upon any governmental or political entity or result in a need for new or altered governmental services in any of the following areas:			
a. Fire protection?			X
b. Police protection?			X
c. Schools?			X
d. Parks or other recreational facilities?			X
e. Maintenance of public facilities, including roads?	X		
f. Other governmental services?			X

	YES	MAYBE	NO
g. Other jurisdictional requirements?	X		
26. Utilities. Will the proposal result in a need for new systems, or substantial alterations to the following utilities:			
a. Power or natural gas?	X		
b. Communications systems?			X
c. Water?			X
d. Sewer or septic tanks?			X
e. Storm water drainage?	X		
f. Solid waste and disposal?			X
27. Visual Aesthetics and Scenic Resources. Will the proposal result in:			
a. The obstruction of any scenic vista or view open to the public?			X
b. The creation of an aesthetically offensive site open to public view?		X	
c. Change to any scenic resource such as a unique natural or manmade feature of the terrain, landscape, period of time, style or peoples?			X
28. Light and Glare. Will the proposal produce new light or glare?	X		
29. Construction. Will the proposal result in substantial impacts during construction of any of the following areas:			
a. Noise?	X		
b. Disruption of utilities?			X
c. Disposal of debris and spoil?		X	
d. Water quality and runoff?	X		
e. Access and distribution of traffic?	X		
f. Air quality and dust control?	X		

	YES	MAYBE	NO
g. Safety and security?	X		
h. Disruption of businesses?	X		
30. Cumulative Impacts.			
a. Do any of the separate impacts described in items 1-29 above contribute to cumulative impacts?			X
b. Are there any reasonable, foreseeable future projects that contribute to cumulative impacts?		X	

MANDATORY FINDINGS OF SIGNIFICANCE

a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate important examples of the major periods of California history or pre-history?			X
b. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief definitive period of time while long-term impacts will endure well into the future)?			X
c. Does the project have impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effects of the total of those impacts on the environment is significant.)			X
d. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?			X

EXPANDED DISCUSSION FOR LRT DOUBLE TRACKING - PHASE I

The following discussion identifies and analyzes the potential effects of the proposed project and provides mitigation measures where impacts may be significantly adverse. The mitigation measures described herein will mitigate the environmental impacts to less than significant levels to avoid significant environmental impacts.

1. Earth

1b

Watt/80 Median. The addition of approximately 6,500 feet of new line would require grading and excavation of soil to provide trackage and permit the construction of three additional platforms. Presently, the area consists of vacant land within the I-80 median; therefore, various earthmoving and grading activities are not expected to create significant adverse environmental impacts.

Swanston. The addition of approximately 1,700 feet of new line would require grading and excavation of soil to provide trackage and permit the construction of one additional platform. Presently, the area consists of vacant land; therefore, various earthmoving and grading activities are not expected to create significant adverse environmental impacts.

Downtown. The addition of approximately 3,000 feet of new line would require grading and excavation of soil to provide trackage. Excavation and grading activities would occur within the alley between Q and R Streets, between 16th Street and 19th Street, and within R Street from 19th Street to 23rd Street. The project would occur within the abandoned railroad right-of-ways; therefore, various earthmoving and grading activities are not expected to create significant adverse environmental impacts.

1f

Construction activities would expose soil surfaces, presenting a potential for soil erosion. Because grading activities would occur when rainfall is minimal, the potential for water erosion is expected to be a less than significant adverse environmental impact.

Standard construction practices would greatly reduce the potential for wind erosion. These measures include minimizing the amount of time surfaces are left exposed, periodic sprinkling of exposed areas and soil piles with water, and covering soil piles with plastic sheeting or tarpaulins to limit disturbance. Also, vehicles traveling on exposed surfaces should not be driven at excessive speeds.

2. Air

2a

The potential impacts of the proposed project on air quality relate to three distinct areas: construction-related impacts, regional air quality impacts, and local air quality impacts. The construction-related impacts are directly attributable to the proposed project itself. The link between the proposed project and local and regional air quality impacts is indirect. These potential impacts are discussed below.

Construction-Related Impacts. Construction equipment equipped with internal combustion engines would emit an undetermined quantity of nitrogen oxides, hydrocarbons, particulates, sulfur dioxide, and carbon monoxide. The amount of emissions is expected to be less than significant. In addition, maintenance of construction equipment in proper operating condition would act to minimize emissions from internal combustion engines.

Construction of the proposed project would cause an undetermined amount of dust particles to be emitted into the atmosphere. A major fraction of these dust particles would settle out on and immediately adjacent to the proposed project site, while a minor fraction would contribute to the area's ambient particulate level. In general, particles larger than 30 microns (effective aerodynamic diameter) would settle out within a short distance of the roadway.

Standard construction practices would greatly reduce the amount of dust particles emitted due to construction activities. These measures include:

- Minimizing the amount of time surfaces are left exposed;
- Periodic sprinkling of exposed areas and soil piles with water during construction;
- Covering soil piles with plastic sheeting or tarpaulins to limit disturbance;
- Prohibiting vehicles traveling on exposed surfaces from driving at excessive speeds;

With implementation of these mitigation measures, construction-related impacts are expected to be less than significant.

Regional and Local Air Quality Impacts. Construction of the proposed project would result in the LRT system operating with potentially greater reliability. This would tend to result in a slight increase in the use of the transit system. The slight increase in ridership would be expected to have incremental regional and local air quality impacts.

On a regional scale, the increase in transit ridership would result in a slight decrease in areawide motor vehicle travel. This would be a result of people using the transit system rather than automobiles. This reduction in vehicle travel would be expected to result in a nominal reduction in ozone concentrations - a slight improvement in areawide air quality.

On a localized scale, the increase in transit ridership would result in increased motor vehicle travel in the immediate vicinity of the LRT stations. This localized effect would be a result of an increase in the use of park-and-ride lots and an increase in the number of people being dropped off at the LRT stations. This increase in localized vehicle travel would be expected to result in a nominal increase in carbon monoxide concentrations - a slight degradation in localized air quality.

The regional and localized air quality impacts of the proposed project are both considered to be less than significant.

3. Water

3a

Watt/80 Median. Construction of three additional platforms may result in a slight increase in the amount of surface water runoff. The amount of additional runoff is expected to be small and to result in a less than significant adverse impact on the drainage system.

Swanston. At present, an existing drainage ditch is located along the south side of the LRT single track (see Figure 27-2). The proposed second track would displace the drainage ditch. RT proposes to relocate the drainage ditch 10 feet to the south, still within the LRT right-of-way. Therefore, no significant adverse impacts would occur from implementation of the proposed project. Thus, no mitigation measures are proposed.

Construction of one additional platform may cause a slight increase in the amount of surface water runoff. The amount of

additional runoff is expected to be small and to result in a less than significant adverse impact on the drainage system.

3c

Water quality in the drainage facilities could be affected by construction activities. Increased turbidity and potential contamination by construction-related substances, such as vehicle fuels and oils, are possible. These water quality impacts would be minimized because construction activities would occur when rain is minimal. Limiting or preventing discharge of fuels and lubricants on the construction sites would also serve to protect water quality (Jones & Stokes Associates 1984).

A potential impact to water quality is erosion from newly-constructed slopes for the LRT trackbed. However, the LRT double tracking would use existing City streets, and existing or abandoned railroad and highway rights-of-way with minimum new embankment construction. By revegetating slopes that are 4:1 or steeper, erosion would not be expected to create significant adverse impacts to water quality (UTMA and STDA 1983).

4. Flooding

No adverse flooding impacts would be expected from the proposed project.

5. Navigable Waterways and Coastal Zones

No adverse environmental impacts to navigable waterways or coastal zones would result from the proposed project due to geographical location.

6. Wetlands

No wetlands would be affected by construction and operation of the proposed additional LRT double tracking; therefore, no adverse environmental impacts to wetlands would result from the proposed project.

7. Ecologically Sensitive Areas

The proposed project sites are located within urbanized, disturbed areas; therefore, ecologically sensitive areas would not be affected.

8. Plant Life

The proposed project sites are located in developed and/or heavily disturbed areas which no longer retain biological communities (UMTA and STDA 1983); therefore, no adverse environmental impacts to plant life would result from the proposed project.

9. Animal Life

The proposed project sites are located in developed and/or heavily disturbed areas which no longer retain biological communities (UMTA and STDA 1983). The only animal life which are known to occur within the project areas are those adapted to an urban environment. No adverse environmental impacts to animal life would result from the proposed project.

10. Natural Resources

10b

Nonrenewable resources would be committed by implementing the proposed project. Construction of the LRT trackbed and additional platforms would irretrievably commit mineral resources in the form of aggregate, cement, petroleum fuel, steel, and other miscellaneous materials. Similarly, construction of the vehicles would irretrievably commit mineral resources such as steel, aluminum, petrochemicals, and other miscellaneous materials. Energy would be utilized during construction and manufacturing, primarily as diesel fuel, electricity, and gasoline. The amount of resources that would be committed is considered to have a less than significant impact.

11. Energy

11a

Construction of the proposed project would result in the use of energy, primarily diesel fuel and gasoline, from activities such as hauling construction material, and excavation and grading equipment to production of railway material. Because of the small size of the proposed project, this impact is expected to be less than significant.

11b

The proposed project is expected to result in a small increase in energy use by the additional LRT vehicles. Also, energy will be required on a long-term basis to operate station

platform lighting and other electrical equipment at the stations. The amount of energy that would be used is considered to have a less than significant impact.

11c

As noted above, the proposed project is expected to result in some increase in demand for energy. The short-term increase in demand would result from construction activities. The long-term increase in demand would result from platform lighting and other electrical equipment at the LRT stations and from the operation of the new LRVs. The increase in demand for energy is expected to be less than significant.

11d

Lighting control at the LRT stations will be designed to use energy efficiently. Automatic and manual control arrangements will ensure efficient utilization of energy and maintenance procedures. All exterior site areas will be illuminated when ambient daylight drops below 30 footcandles, and all but necessary security lighting will be turned off one-half hour after revenue service on the LRT system stops. Photocell switches with timeclock or manual overrides will be provided. Ancillary areas will be individually switched (STDA 1982).

12. Noise

12a

The potential noise impacts of the proposed project result from construction-related activities. Although the operation of the LRT vehicles in general would result in noise, the proposed project itself would not result in an increase in operational-related noise impacts.

Construction activities would raise the ambient noise levels at the site over and above normally existing noise levels. This increase in noise levels would occur with construction of both single track and double track LRT facilities. Noise is typically generated by:

- o Construction equipment, such as
  - Compressors
  - Concrete mixers and pumps
  - Generators
  - Pavement breakers
  - Other construction equipment

- Construction vehicles, such as
  - Compactors
  - Pavers
  - Tractors
  - Trucks
  - Other construction vehicles

The absolute degree of change would vary with construction activity and cannot accurately be estimated. The only potentially sensitive structures in the vicinity of the proposed project are along the downtown portion of the project. The occupants of these structures would experience noise from excavation, grading, paving, and from the flow of construction vehicles. Figure 12-1 presents noise level ranges that can be anticipated 50 feet away from a variety of construction equipment.

Various construction practices that would significantly reduce the amount of noise generated during the construction process will be employed. These methods include:

- Restricting construction activities to the hours between 7 a.m. and 5 p.m.
- Utilizing equipment that is designed with noise-suppressing devices.
- Periodic and proper maintenance of construction equipment including:
  - Exhaust systems
  - Mufflers
  - Cooling fans
  - Engines
  - Transmissions

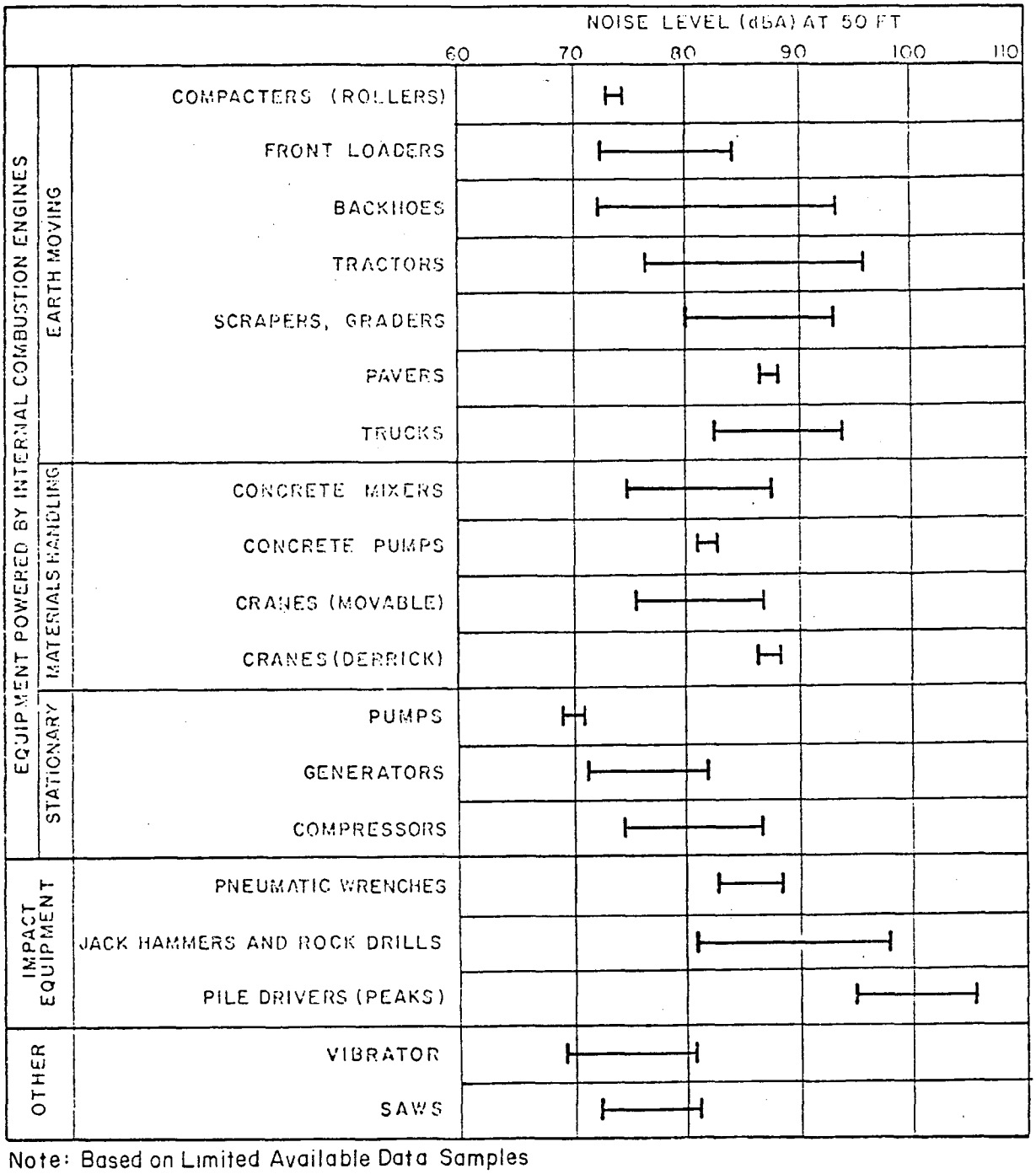
Construction-related noise impacts would be temporary, and utilization of the above construction practices would reduce the noise impacts of the proposed project. Therefore, the noise impacts would be expected to have a less than significant adverse environmental impact.

12c

The potential vibration impacts of the proposed project result from construction-related activities. Although the operation of the LRT vehicles in general would result in vibration, the proposed project itself would not result in an increase in operational-related vibration impacts.

Vibrations from construction operations are generally not expected to cause architectural damage. However, some archi-

Figure 12-1. Construction Equipment Noise Ranges



Note: Based on Limited Available Data Samples

Source: Bolt, Beranek, and Newman 1971.

tectural damage may occur if pavement breakers are used close to buildings (UMTA and STDA 1983). This potential for damage only exists in the downtown portion of the proposed project. Construction specifications will be written to preclude any construction equipment, which could cause architectural damage in areas where buildings are present.

Vibrations created by construction equipment may annoy some people. However, these vibrations will be intermittent and temporary. In addition, construction activities will be limited to the hours between 7 a.m. and 5 p.m.

By utilizing the above construction specifications and limitations, construction-related vibration impacts would be expected to have a less than significant adverse environmental impact.

13. Land Acquisition

No significant adverse impacts due to land acquisition would result from the proposed project. Construction would occur within the LRT right-of-way with no land acquisition, or displacement of businesses or residences.

14. Land Use Consistency

14a

No adverse land use conflicts would result from the proposed project. The additional trackage would be located within the LRT right-of-way; therefore, land use is consistent with adopted land use plans. Figures 18-1, 27-1, 27-2, and 27-3 depict adjacent land uses for the proposed project sites.

14b

Downtown. Several scattered residences are located along the northern side of the proposed LRT tracks. Double tracking would occur south of the proposed single track, further from the residences than if single tracking were retained.

15. Secondary Development

No adverse secondary development impacts would result from the proposed project.

16. Community Disruption

No adverse impacts to the existing communities would result from the proposed project.

17. Population

No adverse population impacts would result from the proposed project since double tracking and operating the additional LRVs is not considered to be growth-inducing. The proposed project would not alter the location, distribution, density, or growth rate of the human population in the proposed project sites.

18. Business and Labor Force Interruptions

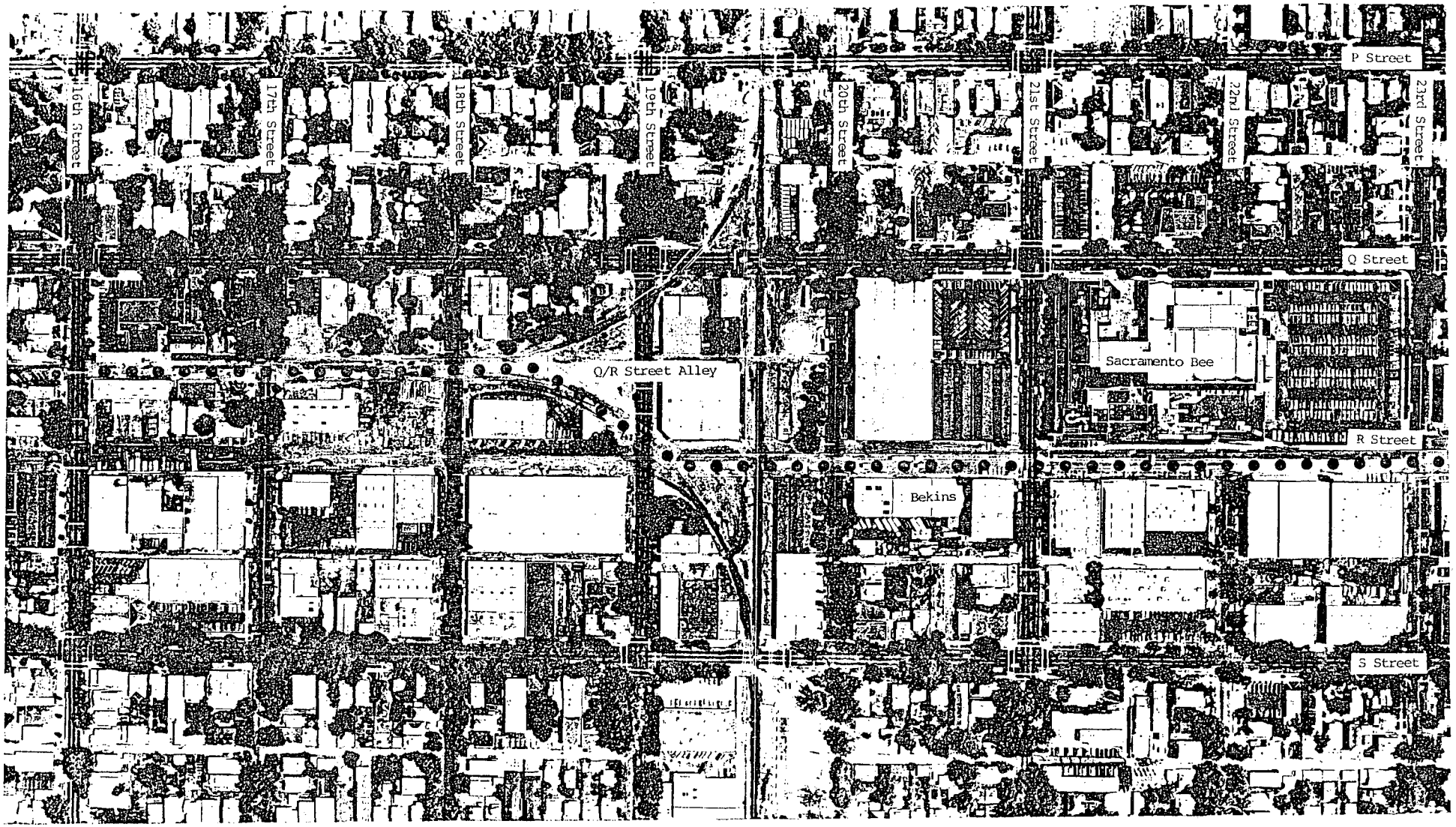
18b

The potential for some constraint on business or industry exists along the downtown portion of the proposed project. The Sacramento Bee, located between Q and R Streets on 21st Street, currently uses the R Street railway access for delivery of necessary material (see Figure 18-1). This access will not be directly affected by the proposed double tracking. However, the access will be affected by the LRT system in general. In order to alleviate this potential constraint, an alternative railway access using a different alignment will be provided (Gualco pers. comm.). Therefore, this impact is considered to be less than significant.

Another potential constraint in the downtown portion of the proposed project exists at the Bekins Moving and Storage Company. The Bekins loading docks are on the south side of R Street between 20th and 21st Streets (see Figures 18-1 and 18-2). With construction of the single track LRT bridge along R Street, sufficient space for Bekins' vehicles to access the loading docks was ensured. However, because the alignment of the second track is on the south side of the original single track, sufficient space for Bekins' vehicles may not be available during the construction phase of the proposed project. Exacerbating this potential problem is Bekins' plan to begin moving their operation in June 1986 (Russell pers. comm.); this would be during the expected construction period for the downtown portion of the LRT system. The potential constraint is not due to the LRT bridge support structure itself. Rather, the constraint is due to the construction scaffolding, falsework, and hazard avoidance requirements.

At present, both the Bekins staff and the RT staff are aware of this potential conflict. Design for the construction phase of this portion of the proposed project is not yet com-

FIGURE 18-1. DOWNTOWN SITE



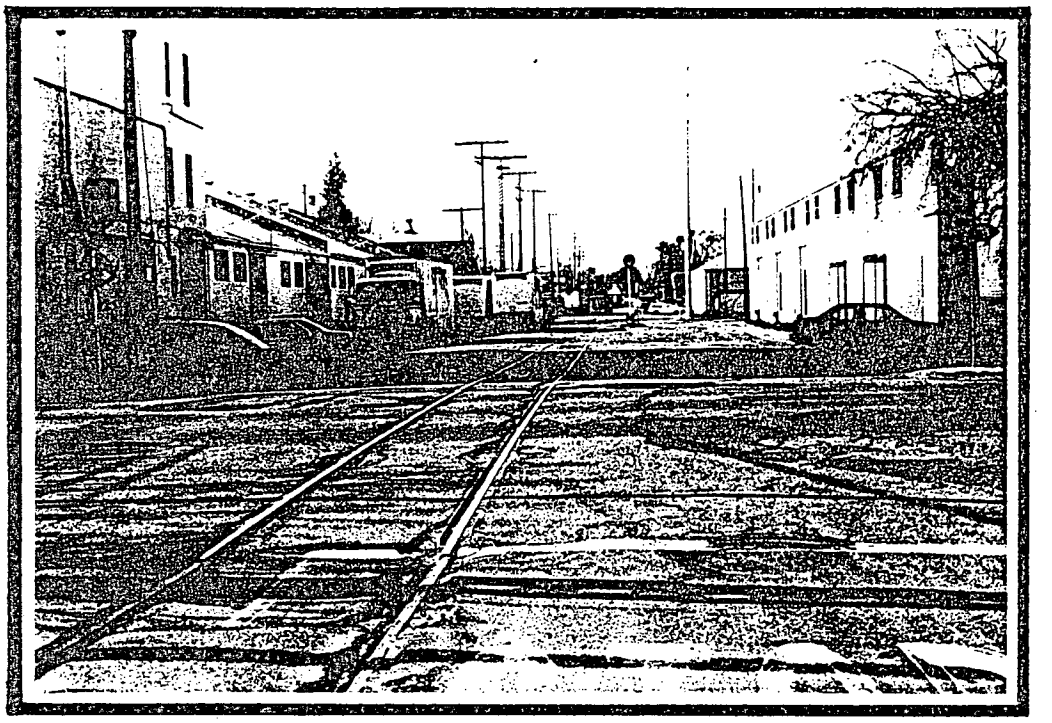
-LEGEND-

● ● ● ● ● PROPOSED PROJECT ALIGNMENT

0 100 200 300 400

SCALE IN FEET

Figure 18-2. Downtown Site



View looking west from 22nd Street. Bekins Moving and Storage Company is on the left.

pleted, and the actual existence or extent of this potential constraint will not be known until the design work is completed (Gualco pers. comm., and Russell pers. comm.). To the extent possible, the proposed project will be designed to minimize the constraint on Bekins. Even if the constraint does manifest itself, it would be considered a less than significant impact because of its temporary nature.

19. Housing

The proposed project would not affect existing housing nor create a demand for additional housing.

20. Parklands and Recreation

The proposed project is not expected to result in an impact upon either the quality or quantity of existing recreational opportunities.

21. History/Archeology

A record and literature search was performed for the LRT system to determine whether any archeological sites have previously been identified within the LRT alignment. This review disclosed that a number of archeological resources have been identified in the project vicinity. However, field surveys conducted by Caltrans staff archeologists over the LRT alignment did not find any archeological resources (UMTA and STDA 1983).

If, during construction activity, unusual amounts of historic glass, ceramics, metal, nails and the like, or prehistoric artifacts such as projectile points, beads, mortars, or human bones are discovered work shall be halted immediately and a professional archeologist called in to assess the find and determine its significance (Jones & Stokes Associates 1984).

22. Transportation/Circulation

22a

The acquisition of the additional LRVs would make possible a ninth train. However, according to the LRT operating plan, only eight trains would be operating on the system at any point in time. The ninth train would always be in layover at the Watt terminal. Therefore, no additional vehicle movements on the LRT line would result from the LRV acquisition.

Both the additional LRV and construction of the proposed double tracking would result in the LRT system operating with

potentially greater reliability. This would tend to result in a slight increase in the use of the transit system. The slight increase in ridership would be expected to have incremental regional and local traffic circulation impacts.

On a regional scale, the increase in transit ridership would result in a slight decrease in areawide motor vehicle travel. This would result from people using the transit system rather than automobiles. This reduction in vehicle travel would be expected to lead to a nominal improvement in areawide traffic circulation.

On a localized scale, the increase in transit ridership would result in increased motor vehicle travel in the immediate vicinity of the LRT stations. This localized effect would be a result of an increase in the use of park-and-ride lots and an increase in the number of people being dropped off at the LRT stations. This increase in localized vehicle travel would be expected to result in a nominal degradation in localized traffic circulation.

The regional and localized traffic circulation impacts of the proposed project are both considered to be less than significant.

22b

The proposed project would result in the loss of some existing parking along the downtown portion of the project (see Figure 27-3). Because of the small number of spaces that would be lost and the availability of nearby alternative parking sites, this is considered to be a less than significant impact.

As noted above, the proposed project is expected to result in a slight increase in the demand for park and ride spaces at the LRT stations. Because of its small size, the expected increase in demand for park and ride facilities is considered to be a less than significant impact.

22c

Construction operations would interfere with traffic flow and may cause occasional delays to vehicles in the vicinity of the downtown portion of the proposed project. This impact would occur with construction of the single track LRT facility, and would be only marginally exacerbated by construction of a double track facility. R, 19th, 20th, 21st, 22nd, and 23rd Streets would be affected by construction to varying degrees. Some motorists may use alternate routes during construction, such as Q, S, 15th, 16th, 24th, 29th, and 30th Streets, thus increasing traffic on those routes.

Among the streets that would be affected by the proposed project, 19th and 21st Streets have the highest traffic volumes. These streets would be closed intermittently to avoid potential construction hazards. Other than these intermittent closures, 19th and 20th Streets will remain open with each having three 10-foot lanes. Among the less heavily-used streets, 20th Street will be restricted to one lane, and 22nd Street will be closed at night to avoid potential safety hazards. The public will be informed as to the nature of the operations and potential delays. By minimizing lane closures, the impact of motorists using alternative routes would be minimized. With mitigation, construction-related impacts are expected to be less than significant.

22d

The construction of the proposed project would interfere with traffic flow to the extent that some vehicles may use alternate routes during the construction period. In addition, construction of the proposed project would have a potential impact on the Bekins facility as described above. The construction-related impacts would be temporary, and are considered to be less than significant.

22e

The proposed project would result in a potential improvement in the reliability of the LRT system.

The proposed project would also result in a change to rail service used by the Sacramento Bee. Please see Section 18b for a description of this change.

23. Safety and Security

23a

Construction of the proposed project would result in some potential safety and security impacts along the downtown portion of the project. These would include potential impacts on vehicle traffic, pedestrians, and bicycle riders. These potential impacts will be mitigated with the intermittent roadway closures described previously in Section 22c, and with appropriate signs to warn motorists, pedestrians, and bicycle riders of potential hazards. These mitigation measures would reduce the degree of the potential safety and security impacts to a level considered to be less than significant.

The proposed project would also result in construction of platforms close to the eastbound I-80 freeway lanes. This potential safety impact will be mitigated to less than significant levels by use of concrete barriers.

24. Human Health

No adverse impacts to human health would result from the proposed project.

25. Public Services

25e

Maintenance of public facilities (additional trackage, platforms, signals, catenaries, and landscaping) would increase as a result of the proposed project. The cost is estimated to be approximately $70,000 per year (Chandler pers. comm.). However, maintenance and operating costs are financial impacts, not an environmental impact. The financial situation should be resolved prior to implementation of the project.

25g

Caltrans has previously issued an encroachment permit to RT for work being performed at the Watt/80 Median location. RT has been informed that it would have to prepare a "rider" to the existing permit that would describe the work to be performed as a part of the proposed project (Chandler pers. comm.). RT has been further informed that this rider would not need to be submitted until after RT has taken action on the proposed project. This is considered to be a less than significant impact.

26. Utilities

26a

The downtown portion of the proposed project would result in the need to relocate power lines that are currently on the south side of R Street (see Figure 18-1). The Sacramento Municipal Utility District is aware of the need for relocation, and is currently deciding on what relocations and alterations would be needed. Alternative solutions are considered to be available and the need for relocation is considered to be a less than significant impact.

26e

The Swanston portion of the proposed project would result in the need to relocate an existing stormwater drainage ditch. Please refer to the discussion in Section 3a for a description of this relocation.

27. Visual Aesthetics and Scenic Resources

27b

Watt/80 Median. No adverse aesthetic impacts would result from the proposed project. The project site is characterized as heavy industrial located within the I-80 median with freeway lanes on both sides. The site is devoid of plant life, with the exception of weeds. Figure 27-1 depicts the proposed site. The project is consistent with the existing setting of developed properties and traffic in an urban environment. Views of the project would be most prominent to motorists. However, only the two additional station platforms and overhead catenaries would be subject to view. The trackbed would be concealed by existing freeway barriers. Landscaping would be incorporated into platform design, which would provide an aesthetically pleasing amenity.

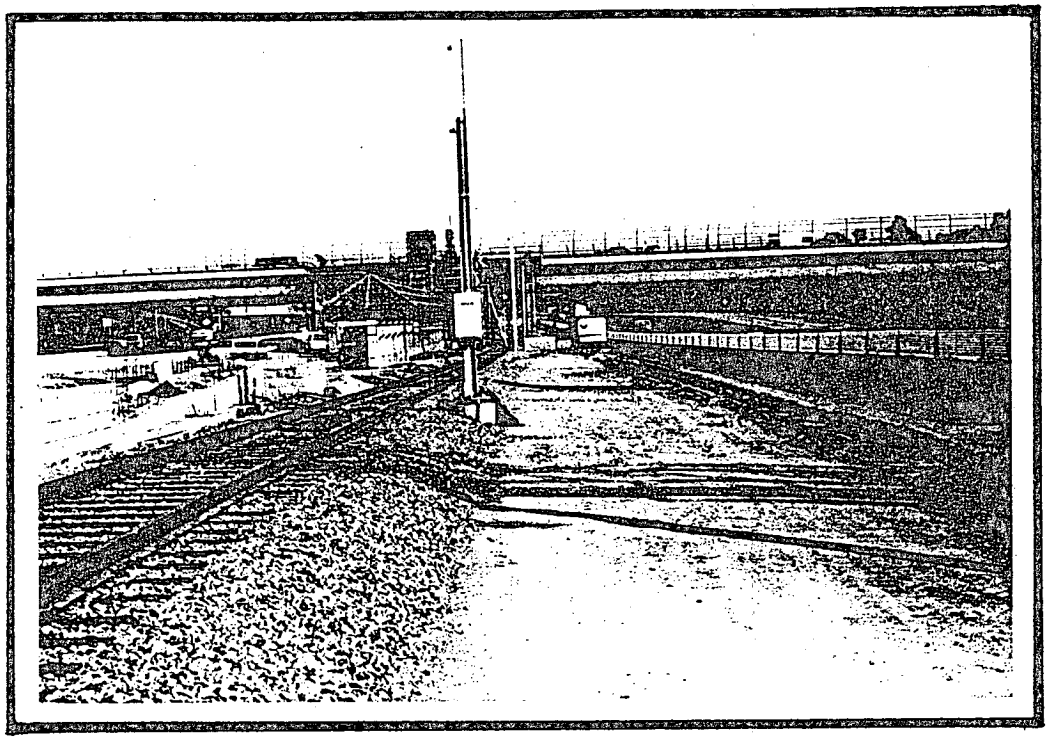
Swanston. No adverse aesthetic impacts would result from the proposed project. The project site is characterized as heavy industrial. The site is devoid of plant life, with the exception of weeds. Figure 27-2 depicts the proposed site. The project is consistent with the existing setting of developed properties and traffic in an urban environment. Views of the project would be most prominent to industrial uses located on either side of the project site. Landscaping would be incorporated into platform design, which would provide an aesthetically pleasing amenity.

Downtown. No adverse aesthetic impacts would result from the proposed project. The project site is characterized as light industrial. The site is located within the alley between Q and R Streets, between 16th Street and 19th Street, and within R Street between 19th Street and 23rd Street. Several scattered residences, the Sacramento Bee, Bekins Moving and Storage, and other light industrial buildings are located along the project area. Figure 27-3 depicts the proposed site. The project is consistent with the existing setting of developed properties and traffic in an urban environment. Views of the project would be most prominent to industrial and residential uses located on either side of the project site. However, the trackbed would resemble the abandoned railroad tracks that once ran through the proposed project site.

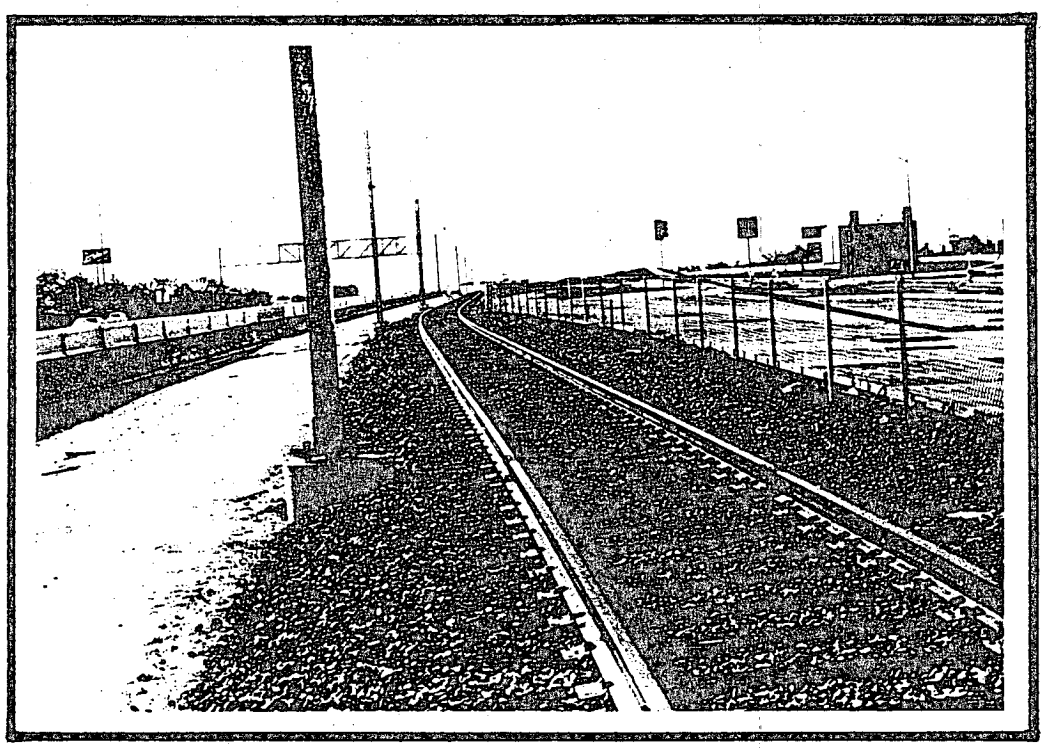
28. Light and Glare

Watt/80 Median. Implementation of the proposed project would create new light and glare from the operation of three additional platforms. However, there are no sensitive land uses which would be impacted by the additional light and glare. Nighttime use of lighting would be short, which would result in a less than significant impact.

Figure 27-1. Watt/80 Median Site

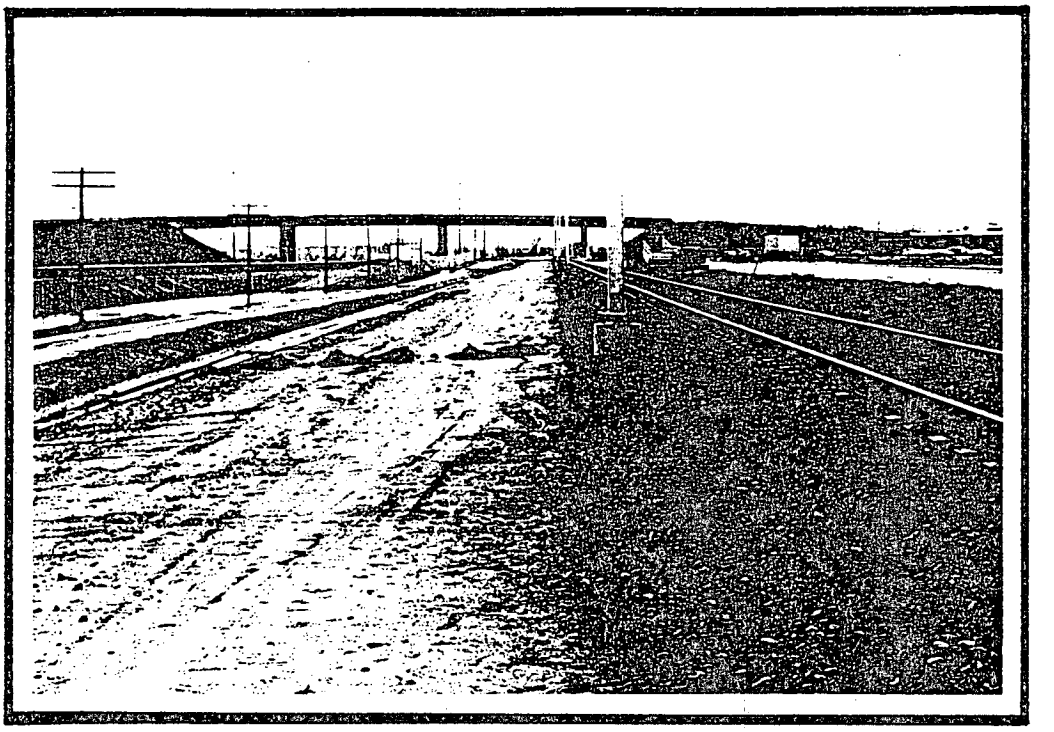


View looking northeast at the Watt Avenue overcrossing, showing the existing single LRT track and platform on the left, catenary and graded area for the second track in the center, and Interstate 80 on the right.

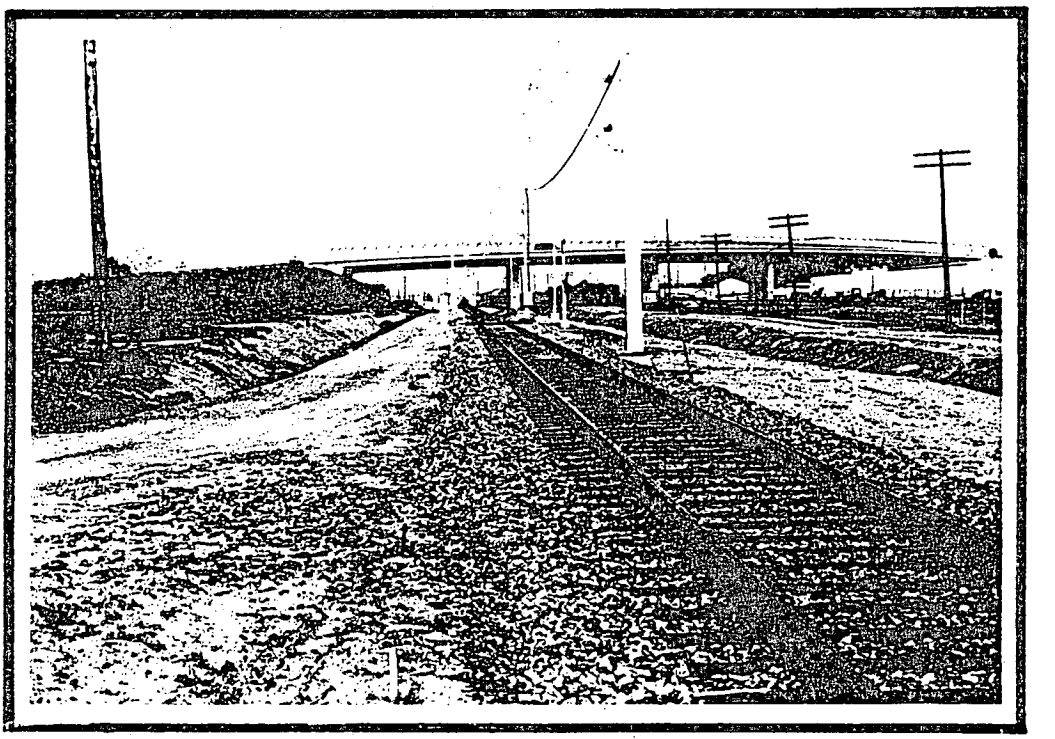


View looking southwest showing Interstate 80 on the left, the single LRT track in the center, and the Watt/80 Median station on the right.

Figure 27-2. Swanston Site



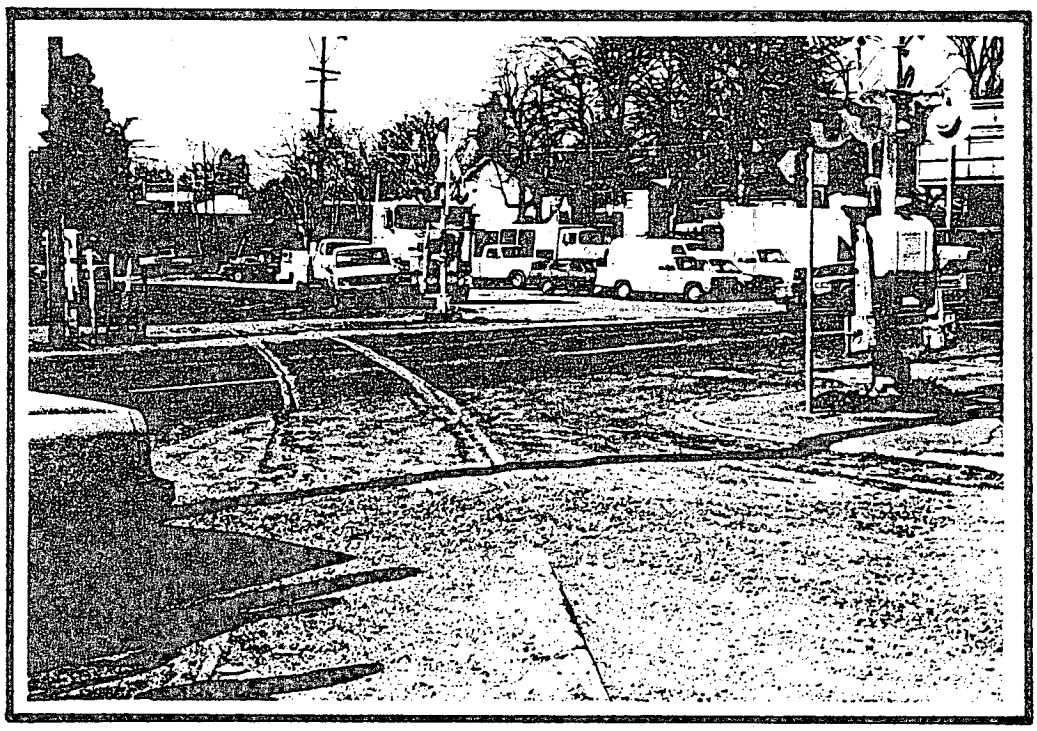
View looking southwest at the Arden Way overcrossing, showing the Southern Pacific Railroad on the left, drainage ditch and graded area for the second track in the center, and existing single LRT track on the right.



View looking northeast at the El Camino overcrossing, showing the maintenance road on the left, existing single track in the center, and drainage ditch and graded area for the second track on the right.

Figure 27-3. Downtown Site

View looking west at the intersection of 23rd and R streets.



View looking northwest at the intersection of 19th and R Streets.

Swanston. Implementation of the proposed project would create new light and glare from the operation of one additional platform. However, there are no sensitive land uses which would be impacted by the additional light and glare. Nighttime use of lighting would be short, which would result in a less than significant impact.

29. Construction

29a

Construction of the proposed project would have noise impacts. Please see Section 12a for a discussion of these impacts.

29c

Debris and spoil from the previously constructed portions of the LRT system has been disposed of by contractors. Since most of the necessary grading and land moving has already occurred, the impacts of the proposed project will be small. In addition, the contractors are required to obtain all necessary permits, approvals, and environmental clearances. This practice will be employed with debris and spoil from the proposed project. The impact of this practice is expected to be less than significant.

29d

The proposed project could impact water quality and runoff. Please see Sections 3a and 3c for a discussion of this issue.

29e

Construction of the downtown portion of the proposed project would impact access and distribution of traffic. Please see Section 22 for a discussion of these impacts.

29f

Construction of the proposed project would have air quality impacts. Please see Section 2a for a discussion of these impacts.

29g

Construction of the downtown portion of the proposed project would potentially impact safety and security. Please see Section 23a for a discussion of these potential impacts.

29h

Construction of the downtown portion of the proposed project would potentially result in a disruption of businesses. Please see Section 18b for a discussion of these potential impacts.

30. Cumulative Impacts

30b

While RT may construct additional double tracking in the future, at the present time there are no specific plans or locations for such construction.

Mandatory Findings of Significance

No adverse environmental impacts that would trigger mandatory findings of significance would result from the proposed project.

REFERENCES

Literature Cited

Bolt, Beranek & Newman. 1971. Noise from construction equipment and operations, building equipment, and home appliances. NT1D300.1. Prepared for: U. S. Environmental Protection Agency Office of Noise Abatement and Control. 188 pp. plus appendices.

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Sacramento Transit Development Agency. 1982. Sacramento Light Rail Transit Starter Line Design Criteria.

U. S. Department of Transportation, Urban Mass Transportation Administration, and Sacramento Transit Development Agency. 1983. Sacramento Light Rail Transit Project Final Environmental Impact Statement.

Personal Communications

Chandler, Hinda. February 12, 1986. Project Development Administrator. Regional Transit. Telephone conversation.

Gualco, Jeff. February 12, 1986. Deputy Project Director for Track and Roadbed. Caltrans. Telephone conversation.

Russell, Ed. February 12, 1986. Operations Manager. Bekins Moving and Storage Company. Telephone conversation.

REPORT PREPARATION

This negative declaration has been prepared for the Sacramento Regional Transit District by Jones & Stokes Associates. The persons involved in its preparation are:

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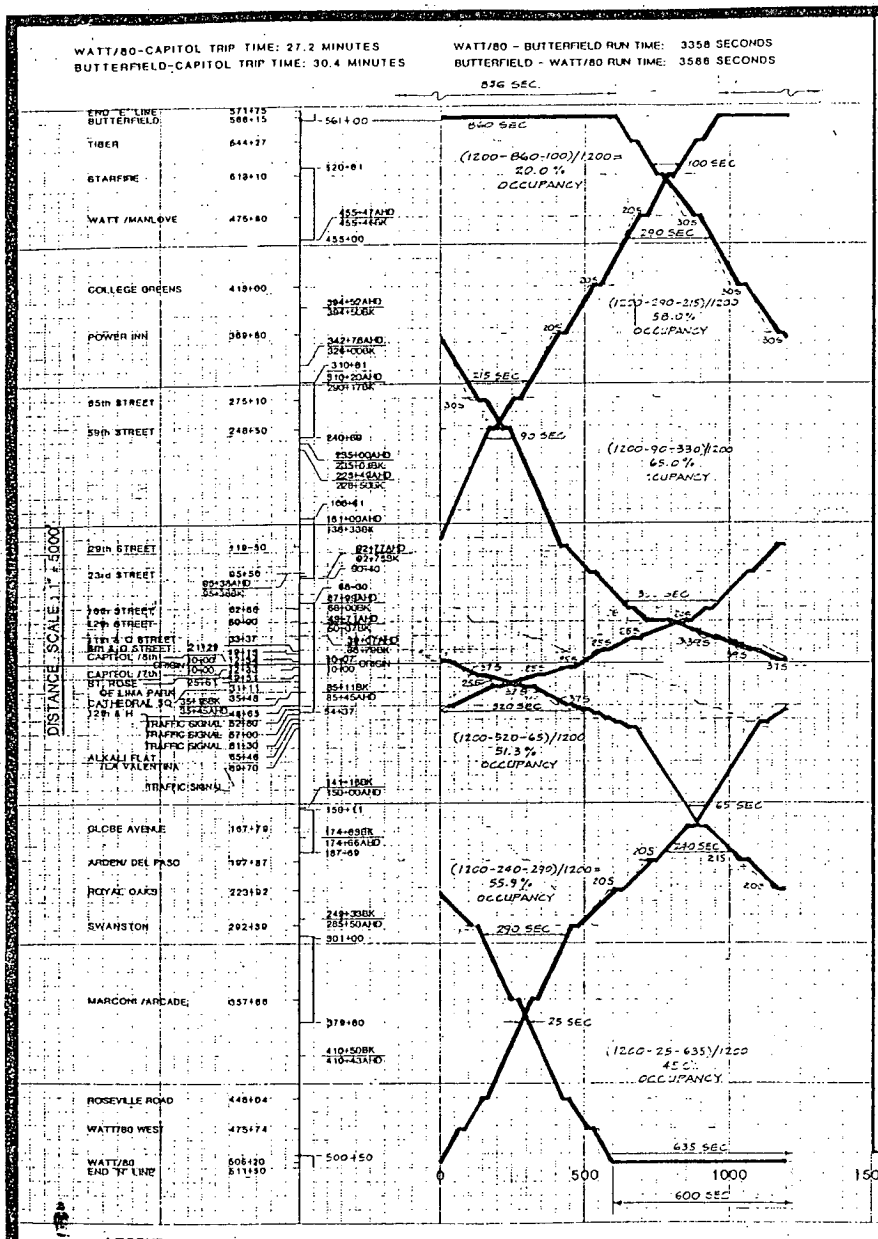


LEGEND:

- DOUBLE TRACKS
- SINGLE TRACK
- (A) U2a CAR, 750V ON DESIGN ALIGNMENT
- 105 DASHED LINE INDICATES REQUIRED RUN TIME
- SOLID LINE INDICATES SCHEDULED RUN TIME
- NUMERAL INDICATES SCHEDULED SLACK TIME

OPERATING PLAN UPDATE
SUMMARY

TABLE NO. 1
1/17/86

	PRELIMINARY PLAN (SEC)	(MIN)	1983 PLAN (SEC)	(MIN)	OPTION 1 20-MINUTE HEADWAY PLAN (SEC)	(MIN)	OPTION 2 15-MINUTE HEADWAY PLAN (SEC)	(MIN)
ROUND TRIP TIMES								
THEORETICAL	-	-	5686	94.8	5835	97.3	5835	97.3
COUPLING ALLOWANCE	-	-	60	1.0	60	1.0	60	1.0
TRAFFIC SIGNAL INTERFERENCE	-	-	110	1.8	110	1.8	110	1.8
DRIVING ALLOWANCE	-	-	229	3.8	278	4.6	278	4.6
SUB-TOTAL		92	6085	101.4	6283	104.7	6283	104.7
LAYOVER TIMES								
WATT/80	-	9	180	3.0	600	10.0	960	16.0
BUTTERFIELD WAY	-	4	540	9.0	856	14.2	462	7.7
SLACK TIMES								
NORTHEAST LINE	-	-	82	1.4	81	1.4	82	1.4
CENTRAL CITY	-	-	193	3.2	400	6.7	193	3.2
FOLSOM LINE	-	-	120	2.0	180	3.0	120	2.0
TOTAL	-	105	7200	120	8400	140	8100	135
HEADWAYS	-	15	-	15	-	20	-	15
CAPACITIES (PEAK HR/PEAK DIRECTION)								
WATT/80 - 12TH STREET	2,800 PASS./HR		2,800 PASS./HR		2,100 PASS./HR		2,800 PASS./HR	
BUTTERFIELD - 12TH STREET	1,400 PASS./HR		1,400 PASS./HR		1,050 PASS./HR		1,400 PASS./HR	
CONSISTS	7 TRAINS		8 TRAINS		7 TRAINS		9 TRAINS	
WATT/80 - 12TH STREET	4-4 CAR		5-4 CAR		4-4 CAR		6-4 CAR	
BUTTERFIELD - 12TH STREET	3-2 CAR		3-2 CAR		3-2 CAR		3-2 CAR	
12TH STREET STORAGE	1-2 CAR		-		-		-	
CARS								
IN SERVICE	24		26		22		30	
SPARE	2		-		4		2	
TOTAL CARS	26		26		26		32	

FOSTER ENGINEERING, INC.
SAN FRANCISCO, CALIFORNIA

REGIONAL TRANSIT

SACRAMENTO LIGHT RAIL PROJECT

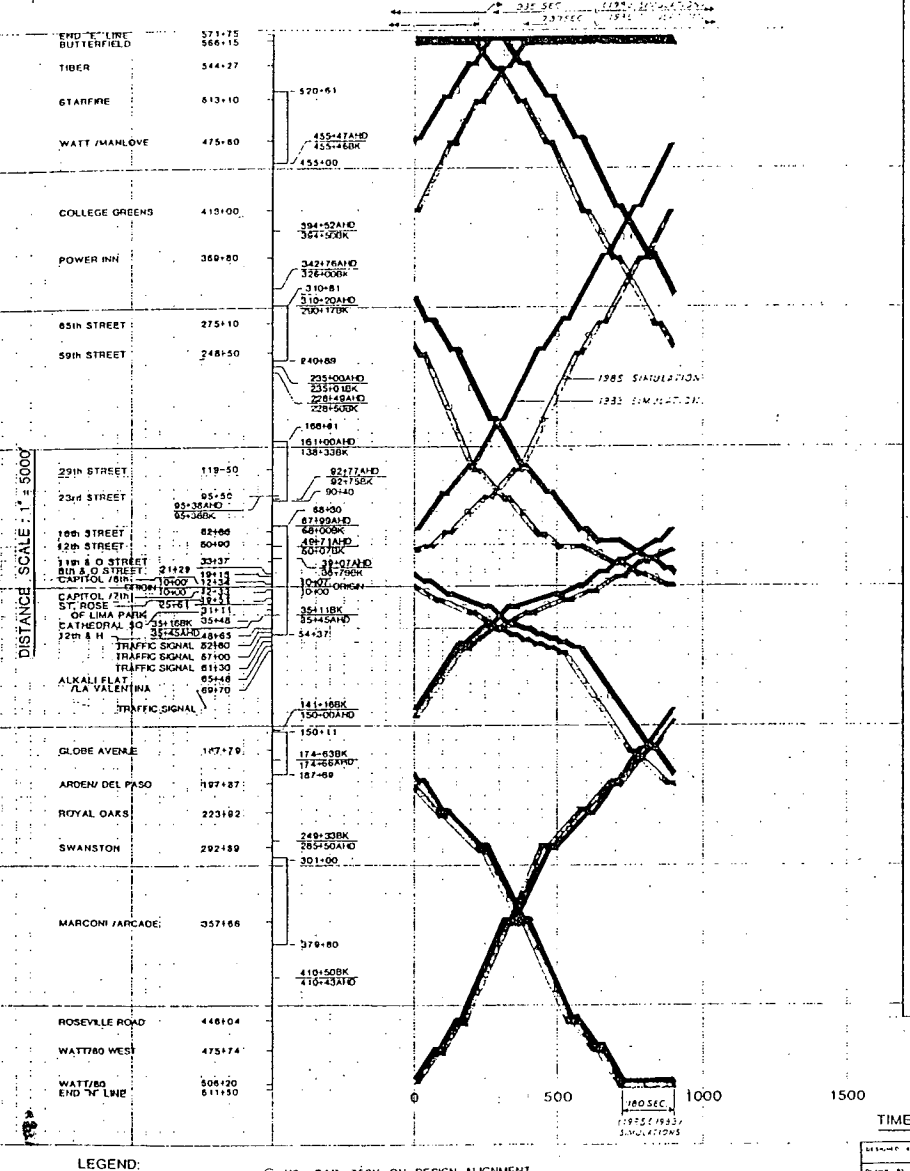
DISTANCE TIME (X-T) DIAGRAM
20 MINUTE HEADWAY, 7 TRAINS
333 Amp Motor, Distributed Slack

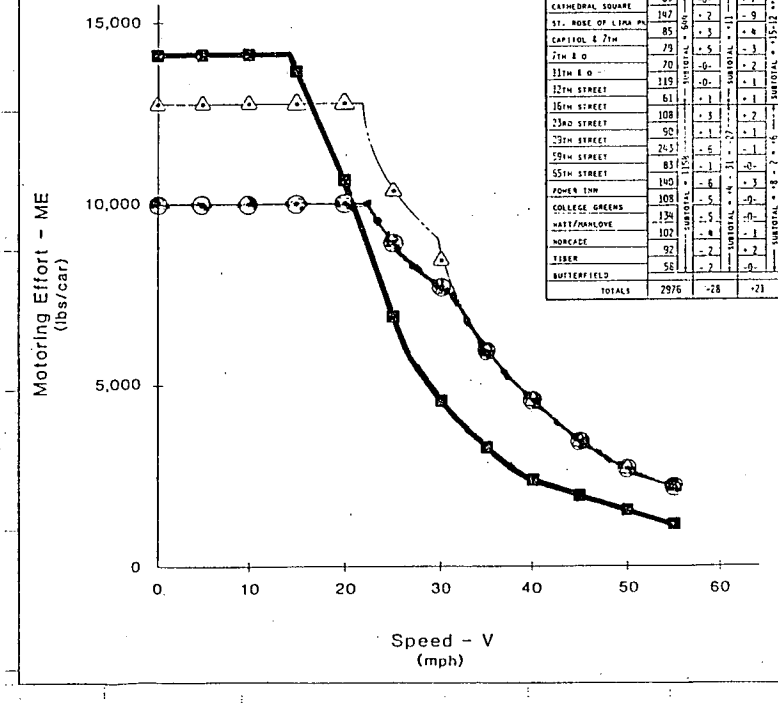
OPTION 1

SHEET NUMBER 3

TRIP TIMES	1985 SIMULATION	1983 SIMULATION
WATT/80-CAPITOL	25.2 MINUTES	24.5 MINUTES
BUTTERFIELD-CAPITOL	26.1 MINUTES	25.4 MINUTES

RUN TIMES	1985 SIMULATION	1983 SIMULATION
WATT/80-BUTTERFIELD	3084 SECONDS	2976 SECONDS
BUTTERFIELD-WATT/80	3199 SECONDS	3109 SECONDS





Sacramento 333 amp | Sacramento 400 amp | Edmonton

TABLE NO. 2

ANALYSIS OF RUN TIME DIFFERENCES

WATT / 80 - BUTTERFIELD
(Southbound Only)

NOTE: ALL FIGURES IN SECONDS

STATION	1983 RUN TIME	VEHICLE RELATED DIFFERENCES: CAR CHAR.	VEHICLE RELATED DIFFERENCES: DRIVING ALLOW.	ALIGNMENT RELATED DIFFERENCES: STATIONS	ELECTRICAL	POSTED SPEED	CURVES	TURNOUTS	LENGTHS	TOTALS	RESIDUAL	1985 RUN TIME
WATT/80	92	- 3	- 1								+ 2	90
WATT/80 WEST	83	- 3	+ 2								-0-	82
ROSEVILLE ROAD	173	- 7	- 12								+ 2	167
MARCONI/ARCADE	136	- 6	+ 3								- 3	132
SWANSTON	136	+ 2	+ 10								- 1	138
ROYAL OAKS	93	+ 1	+ 3								+ 3	98
ARDEN/DEL PASO	102	+ 4	- 2					+ 7		+19	+ 2	125
GLOBE AVENUE	267	- 3	+ 4	-12						-12	- 6	250
ALKALI FLAT	99	+ 3	+ 1	-12							+ 3	101
12TH & H	83	-0-	+ 7	+51			-10	+13	+ 6	+60	+ 2	132
CATHEDRAL SQUARE	147	+ 2	- 9	-15 -31						-16	+ 2	125
ST. ROSE OF LIMA PK	85	+ 3	+ 4	-15			+10			- 5	+ 1	88
CAPITOL & 7TH	79	+ 5	- 3				+10			+10	+ 3	93
7TH & O	70	-0-	+ 2			+ 3				+ 3	+ 5	78
11TH & O	119	-0-	+ 1			+ 5	+25	+ 5		+33	-0-	153
12TH STREET	61	+ 1	+ 1			+ 9				+ 9	+ 1	58
16TH STREET	108	+ 3	+ 2			+ 1	+ 4	+29		+34	-0-	147
23RD STREET	90	+ 1	+ 1			+ 9				+ 6	- 1	102
29TH STREET	243	- 6	- 1		-25					-25	- 3	203
59TH STREET	83	- 1	-0-								+ 1	83
65TH STREET	140	- 6	+ 3								+ 1	138
POWER INN	108	- 5	-0-								-0-	103
COLLEGE GREENS	134	- 5	-0-					+ 7		+ 7	+ 2	138
WATT/MANLOVE	102	- 4	+ 1								-0-	97
MORCADE	92	- 2	+ 2								-0-	92
TIBER	56	- 2	-0-								- 1	55
BUTTERFIELD												
TOTALS	2976	-28	+23	-0-	-25	+20	+39	+61	+ 6	+101	+19	3094

LEGEND:
- DOUBLE TRACKS
- SINGLE TRACK
- U2a CAR, 750V ON DESIGN ALIGNMENT
- DASHED LINE INDICATES REQUIRED RUN TIME
- SOLID LINE INDICATES SCHEDULED RUN TIME
- NUMERAL INDICATES SCHEDULED SLACK TIME

FOSTER ENGINEERING, INC.
SAN FRANCISCO, CALIFORNIA

REGIONAL TRANSIT

SACRAMENTO LIGHT RAIL PROJECT
DISTANCE-TIME (X-T) DIAGRAM
15 MINUTE HEADWAY, 8 TRAINS
SIMULATION COMPARISON

SHEET NUMBER 2

TABLE NO. 3

FUNDING SOURCE ESTIMATES DOUBLE TRACKING

Segment	Fund Source	$x1000	Available to Draw(cash)	Probability	
WPRR Bridge	FY86 - State-Article 19	769	03/86	95%	
	TDA - Local Match(48%)	369	03/86	100%	
	TDA - Non-Match	302	06/86	95%	⑥
WPRR Bridge -	TOTAL	1440			
Phase I	Federal - Section 9	1600	10/86	50%	①
	TDA - Local Match (20%)	400	10/86	100%	
	FY87-State-Article 19, TP&D	324	01/87	95%	
	TDA - Local Match (30%) ④	97	01/87	95%	
	FY87-State-Article 19 TP&D	1295	01/87	50%	②
	TDA - Local Match (30%) ④	375	01/87	95%	
Phase I -	TOTAL	4091			
LRT Vehicles	FY87-State-Article 19,TP&D	105	01/87	50%	②
	TDA - Local Match (30%) ④	45	01/87	95%	
	FY88-State-Article 19, TP&D	1650	01/88	50%	③
	TDA - Local Match (30%) ④	495	01/88	95%	
	FY89-State-Article 19,TP&D	2867	01/89	50%	③
	TDA - Local Match (30%) ④	838	01/89	95%	
LRT Vehicles -	TOTAL	6000			
Phase II	FY89-State-Article 19,TP&D	173	01/89	50%	③
	TDA - Local Match (30%) ④	74	01/89	95%	
	FY90-State-Article 19, TP&D	3270	01/90	50%	③
	TDA - Local Match (30%) ④	981	01/90	95%	
	FY91-State-Local 19, TP&D	1073	01/91	50%	③
	TDA - Local Match (30%)	130	01/91	95%	
Phase II -	TOTAL	5701			
Phase III -	TOTAL	0			⑦
Phase IV	FY91-State-Article 19, TP&D	1487	01/91	50%	③
	TDA - Local Match	638	01/91	95%	
Phase IV -	TOTAL	2125			⑤
	TOTAL	$19,357			

1. Based on discussions with UMTA, the decision to fund this is unresolved.
2. Based on CTC decision to be made on March 27, 1986.
3. Caltrans projection of county minimum CTC allocation.
4. The statutory minimum local match is 20%, but 30% is used because it makes projects more competitive.
5. Phase IV potential funding short of estimated costs is $769,000.
6. This date represents the date a TDA amendment would be completed.
7. Funds are not available to build Phase III - Folsom Corridor Double Tracking - $6,605,000.

FUNDING CASH FLOW ANALYSIS

DOUBLE TRACKING - ALTERNATE C

SACRAMENTO LIGHT RAIL PROJECT
DOUBLE TRACKING WORK PROGRAM
PROJECTED FUNDING AVAILABILITY
AS OF 03/12/86, G.E. WEST
(000's Omitted)

FUND SOURCE	TOTAL $	JAN/JUNE 1986	JULY/DEC 1986	JAN/JUNE 1987	JULY/DEC 1987	JAN/JUNE 1988	JULY/DEC 1988	JAN/JUNE 1989	JULY/DEC 1989	JAN/JUNE 1990	JULY/DEC 1990	JAN/JUNE 1991	JULY/DEC 1991	JAN/JUNE 1992	JULY/DEC 1992	TOTAL $
REVENUE:																
Local Support - Currently Unfunded																
Sales Tax	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
City	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
County	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Regional Transit																
Section 3	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Section 9	$1,600	$0	$1,600 (10/86) (1)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,600
TDA-Local Match (20%)	$400	$0	$400 (10/86)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$400
Article 19	$13,013	$769 (05/86) (2)	$0	$1,724 (01/87)	$0	$1,650 (01/88) (4)	$0	$3,040 (01/89) (4)	$0	$3,270 (01/90) (4)	$0	$2,560 (01/91) (4)	$0	$0	$0	$13,013
TDA - Non Match	$302	$302 (06/86) (5)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$302
TDA-Local Match (30%)	$4,042	$369 (03/86)	$0	$517 (01/87) (3)	$0	$495 (01/88) (6)	$0	$912 (01/89) (6)	$0	$981 (01/90) (6)	$0	$768 (01/91) (6)	$0	$0	$0	$4,042
Total:	$19,357	$1,440	$2,000	$2,241	$0	$2,145	$0	$3,952	$0	$4,251	$0	$3,328	$0	$0	$0	$19,357
Cumulative Total:	$19,357	$1,440	$3,440	$5,681	$5,681	$7,826	$7,826	$11,778	$11,778	$16,029	$16,029	$19,357	$19,357	$19,357	$19,357	$19,357
COST:																
WPRR Bridge at Bee	$1,440	$470	$500	$470	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,440
Phase I Design	$438	$438	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$438
Phase I Const. (Excl. Bridge)	$3,653	$350	$1,500	$1,603	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$3,653
Phase II, NE Corridor	$5,701	$0	$0	$0	$0	$0	$0	$0	$225	$2,500	$1,750	$1,226	$0	$0	$0	$5,701
Phase III, Folsom Corridor	$6,605															$0
Phase IV, American River Bridg	$2,894	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$1,000	$1,000	$894	$0	$2,894
Six Add'l LRT Vehicles	$6,000	$0	$0	$150	$0	$850	$1,250	$3,750	$0	$0	$0	$0	$0	$0	$0	$6,000
Total	$26,731	$1,258	$2,000	$2,423	$0	$850	$1,250	$3,750	$225	$2,500	$1,750	$2,226	$1,000	$894	$0	$20,126
Cumulative Total:	$26,731	$1,258	$3,258	$5,681	$5,681	$6,531	$7,781	$11,531	$11,756	$14,256	$16,006	$18,232	$19,232	$20,126	$20,126	$20,126
Difference:	($7,374)	$182	$182	$0	$0	$1,295	$45	$247	$22	$1,773	$23	$1,125	$125	($769)	($769)	($769)

1) Based on grant pending from UMTA now - TDA local match of $400,000 for a total of $2,000,000 - Dependent on UMTA's decision to fund.

2) Dependent on completion of SB 580 Review by Caltrans.

3) Includes $324,000 based on CTC County minimum, and $1,400,000 to be decided upon by CTC on March 27th. If $1,400,000 is not approved, local match drops from $517,000 to approximately $97,000.

4) CTC minimum allocations - Alternatives Analyses funded from Section 9 - again dependent on UMTA's decision.

5) Requires Board approval for use of TDA funds as non-match.

6) 30% local share is an estimate. 20% is a minimum, but projects are more competitive with a higher local share.

NOTE: Based on current assumptions, if the Section 9 funds are available, the Board must decide whether to apply it to this project or reserve as much as possible for future operating deficits.

TABLE NO. 4
March 10, 1986

COMPARISON OF PROPOSED ALTERNATIVES

Evaluation Criteria	Starter Line 1983 Baseline Project	20 Minute Headway Alternative A	15 Minute Headway Non-Engineering Alternative B	15 Minute Headway Double Track Plus Added LRV's Alternative C (Phase I Double Track Plan + LRV)	15 Minute Headway Double Track With No New LRV's Alternative D (Phase I Track Plan)
Headways	15 minutes	20 minutes	15 minutes	15 minutes	15 minutes
Consists I-80 Corridor Folsom Corridor	8 trains 5-4 car 3-2 car	7 trains 4-4 car 2-3 car 1-2 car	8 trains 5-4 car 3-2 car	9 trains 6-4 car 3-2 car	9 trains 2-4 car & 4-3 car 3-2 car
Cars In Service Spares Total	 26 0 in peak,10 other times 26	 24 2 26	 26 0 26	 30 2 32	 26 0 in peak, 8 other times 26
Schedule Reliability	Not Likely.	Highest.	Not Likely. (1)	Likely.	Likely.
Capacity Loss From EIS	No NE: 2,800 pass./hr. Fol: 1,400 pass./hr.	Yes NE: 2,100 pass./hr. Fol: 1,050 pass./hr.	Yes NE: 2,800 pass./hr. Fol: 1,400 pass./hr.	No NE: 2,800 pass./hr. Fol: 1,400 pass./hr.	Yes NE: 2,450 pass./hr. Fol: 1,400 pass./hr.
Round Trip Time	101.4 minutes	104.7 minutes	101.4 minutes (1)	104.7 minutes	104.7 minutes
Watt 80/Capitol Trip Time	25.8 minutes	28.9 minutes	25.8 minutes (1)	26.5 minutes	26.5 minutes
Butterfield/Capitol Trip Time	26.9 minutes	29.8 minutes	26.9 minutes (1)	28.5 minutes	28.5 minutes
Potential Major Changed Conditions & Environmental Impacts	N/A	Less Ridership: Fewer transit trips, more auto trips. Systemwide transit changes.	Delete Stations: Access adjacent development impacted. Redesign curves: Conflicts, safety for pedestrians, buildings. Increased speeds: Safety, traffic flow.	No significant adverse impacts.	No significant adverse impacts. Less Ridership: Fewer transit trips, more auto trips.
Operating Cost for Supplemental Bus Service	0	$0.569 million annually	0	0	$0.411 million annually
LRT Operating Costs	$4.248 million annually	$4.236 million annually	$4.248 million annually	$4.404 million annually	$4.404 million annually
TOTAL OPERATING COSTS	$4.248 million annually	$4.805 million annually	$4.248 million annually	$4.404 million annually	$4,815 million annually
Capital Cost	0	0	$0.250 mil	$11.531 mil (Ph 1 + LRV's)	$5.531 mil (Ph 1 No LRV's)
Feasible	No	Yes	No	Yes	Yes

TABLE 5
March 12, 1986