

Review of the Sunset Coast
Line Rail Rapid Transit Proposal
for Los Angeles

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REVIEW OF THE SUNSET COAST LINE RAIL RAPID TRANSIT PROPOSAL
FOR LOS ANGELES

The Sunset Coast Line proposal represents the most ambitious public works project in California history. Our review of this plan is focused on those elements which we believe are critical to the project's viability. Primary among the concerns expressed are questions relative to the feasibility of the \$7.5 billion financing plan. In addition, we review factors associated with (1) construction scheduling and feasibility, (2) operational considerations, and (3) regulatory functions.

Because of time constraints and other related factors, our comments on the above topics are not as detailed as a project of this size and complexity warrants. However, we believe we have raised and discussed most of the significant issues which the Legislature and the developers of the proposal should resolve before presenting the Sunset Line proposal to the voters of Los Angeles County.

FINANCIAL CONSIDERATIONS

The investment required to develop the Sunset Coast Line would be the largest single public commitment to financing in the state's history. Because the financial plans are critical to the viability of project construction, we have reviewed the proposed financing in considerable detail. This analysis includes (1) an explanation of the proposed bonding and taxation arrangement, (2) review of major factors related to financial feasibility, (3) a discussion of market acceptability, particularly the role of debt service, (4) the impact of the proposed issue on future municipal debt

offerings in the state, (5) the availability of alternative revenue sources, (6) the role of federal funding, (7) the contractual arrangement between the county and the transit district, and (8) recommendations regarding enabling legislation.

Basics of the Bond Proposal

The Sunset Line system construction will be funded by tax bonds totaling \$7.5 billion and issued by the Southern California Rapid Transit District (SCRTD). The current issue schedule (page 111 of the proposal) shows annual offerings of \$500 million over a period of 15 years beginning in 1977, with the series carrying an interest rate of 8 percent per annum. Imposition of a one percent sales tax will provide revenue for the principal and interest payments. The taxation rate applicable to bond support will be reduced to three-quarters of a percent during the first year of system operations (1982) and to one-half percent five years later (1987), to provide funds for operational costs. Sales tax revenues remaining after payment of debt requirements will be invested to provide additional revenues. The interest rate on such investment is forecast at 7.5 percent annually. According to the proposal, outstanding bonds will mature by 2016.

Financial Feasibility

Completion of the Sunset Line's construction is dependent upon the adequacy of financing from bond issues. Conversely, additional revenue sources or alterations in the funding schedule may be required if delays or cost overruns are incurred during construction. In this section, we review several elements of the financing plan which impact development of

the system. Among the items discussed are (1) the relationship of construction staging to bond offerings, (2) the application of cash basis accounting to sales tax revenues, (3) the effect of interest rates on tax revenue investments and the impact of such rates on funding needed for debt requirements, and (4) additional cost factors which require external funding sources.

1. Bonding as Related to Construction Scheduling. The staging of construction for system development affects the bonding schedule both in the total level of indebtedness required and in the amount of bond issues made annually. If commencement of construction is delayed for any reason, capital costs will increase because of inflation. In addition, the estimate made in the proposal includes a questionable procedure for incorporating the effects of inflation which underestimates the system cost.

The proposal estimates a cost for the system of \$7.2 billion, ^{/1} which assumes five years of inflation compounded at 10 percent per year, above 1976 dollars. This inflation methodology assumes that about half of the construction will have been completed by 1981. Other comments in the proposal suggest a ten-year construction cycle, starting in 1977.

By contrast, if we assume that at least two years would be needed for system design and planning, issuance of contracts, and right-of-way transfer or acquisition, rather than one, costs are increased significantly. Assuming that (a) construction would begin in 1978, (b) more construction would occur in the mid-part (1983) of the ten-year construction period,

^{/1} This system cost figure does not include expenditures for the Starter Line, which is discussed later in the section.

and (c) costs are inflated at 10 percent per year over 1976 levels, then total construction expenditures for the same system would increase to between \$8.4 billion and \$8.6 billion. The proposed bonding level would therefore be inadequate to fund system construction.

The scheduling of construction is also critical relative to the amount of debt issued each year. Typically, the bond offering schedule coincides with anticipated construction expenses. These expenses are usually low in the first years of development, with rapid escalation in costs as construction activity increases and gradual expenditure reductions as completion of the system nears. The proposal indicates that the amount of issue would be \$500 million annually over the entire 15-year period. Bond proceeds would therefore accumulate in anticipation of construction expenditures. While this procedure may facilitate the staging of bond sales, it probably will add to the net interest costs. Alternatively, if bonding relates to the typical construction schedule, debt issues initially would be below the \$500 million level and would increase above this level during the height of construction. Although interest costs would be reduced initially, annual issues could potentially be as high as \$1 billion during a particular year, which would affect the bond market's ability to absorb the offering.

An additional concern related to construction scheduling is that a substantial discrepancy exists between the period of bond offers and the proposed time of system construction. The majority of capital costs (\$6.7 billion) will be incurred by 1987. However, the total bond issue by 1987 will be \$5.5 billion, or \$2 billion less than the total \$7.5 billion

proposed debt offering for the system and \$1.2 billion less than capital costs incurred by 1987. If it is proposed that this \$1.2 billion difference is to be funded by available sales tax revenues (excluding debt principal and interest payments), then payment of future debt requirements is jeopardized because any diversion of excess sales tax revenues results in a loss of interest revenue that is necessary to fund future debt requirements. In our judgment, the shortfall between capital costs and bond proceeds indicates that the proposed construction schedule cannot be realistically met, because the capital required for building the system will not have been accumulated.

2. Accounting for Sales Tax Revenues. According to the proposal, receipts from the imposition of a one percent sales tax are used to pay debt obligations and provide funding for system operations. Sales tax revenues are estimated to increase at a rate of 6.4 percent annually, as illustrated on page 109 of the plan. Accounting of tax receipts is handled on an accrual basis, i.e., anticipated sales tax monies, rather than actual cash received.

We believe that sales tax receipts should be accounted for on a cash basis. The State Board of Equalization has stated that a two and one-half month lag exists in the distribution of tax revenues to the recipient agency. Cash basis accounting will more accurately indicate the amount of sales tax receipts available at any given time because only cash receipts can be used to earn interest income. Table I illustrates the application of cash basis accounting to sales tax revenues. As shown in the table, the time lag involved in transfer of tax receipts reduces the amount of tax revenues actually available in the proposal.

TABLE I

PROJECTED CASH FLOW ASSUMING 7.5 PERCENT RETURN
ON REVENUE BALANCE INVESTMENTS,
PROPOSED SCR TD BOND ISSUE

(All amounts are in thousands of dollars)

YEAR	BEGINNING BALANCE	DEBT SERVICE	COVERAGE RATIO	NET BALANCE	SALES TAX REVENUE	COMPOUND INTEREST	ENDING BALANCE
1977	0	0	*****	0	\$ 278969	\$ 11239	\$ 290207
1978	\$ 290207	\$ 140000	2.07	\$ 150207	296822	23619	470648
1979	470648	172000	2.74	298648	315818	35908	650375
1980	650375	194000	3.35	456375	336031	48967	841373
1981	841373	236800	3.55	604573	357537	61339	1023448
1982	1023448	268800	3.81	754648	310308	71804	1136761
1983	1136761	290800	3.91	845961	303574	77904	1227439
1984	1227439	303600	4.04	923839	323003	84733	1331575
1985	1331575	348000	3.83	983575	343675	90203	1417454
1986	1417454	436600	3.25	980854	365671	90878	1437403
1987	1437403	430800	3.34	1006603	293562	90949	1391113
1988	1391113	462800	3.01	928313	276121	83191	1287626
1989	1287626	494800	2.60	792826	293733	73385	1160003
1990	1160003	526800	2.20	633203	312595	61751	1007549
1991	1007549	558800	1.80	448749	332601	48237	829588
1992	829588	640800	1.29	188788	353888	28913	571589
1993	571589	628800	0.91	-57211	376537	10967	330292
1994	330292	616800	0.54	-286508	400635	1508	115636
1995	115636	604800	0.19	-489164	426276	0	-62889
1996	-62889	592800	-0.11	-655689	453557	0	-202131
1997	-202131	580800	-0.35	-782931	482585	0	-300346
1998	-300346	568800	-0.53	-869146	513470	0	-355676
1999	-355676	606800	-0.59	-962476	546333	0	-416143
2000	-416143	590800	-0.70	-1006943	581298	0	-425645
2001	-425645	624800	-0.68	-1050445	618501	0	-431944
2002	-431944	679800	-0.64	-1111744	658085	0	-453659
2003	-453659	703800	-0.64	-1157459	700202	0	-457257
2004	-457257	748800	-0.61	-1206057	745015	0	-461041
2005	-461041	762800	-0.60	-1223841	792696	0	-431145
2006	-431145	717800	-0.60	-1148945	843429	0	-305516
2007	-305516	628200	-0.49	-933716	897408	0	-36308
2008	-36308	547600	-0.07	-583908	954843	6213	377148
2009	377148	450600	0.84	-73452	1015952	35227	977728
2010	977728	393800	2.48	583928	1080973	88881	1753782
2011	1753782	294400	5.96	1459382	1150156	159632	2769170
2012	2769170	231000	11.99	2538170	1223766	246346	4008282
2013	4008282	191200	20.96	3817082	1302087	348787	5467955
2014	5467955	138400	39.51	5329555	1385420	469562	7184537
2015	7184537	88800	80.91	7095737	1474087	610247	9180071
2016	9180071	32400	283.34	9147671	1568429	773345	11489445

Cash basis accounting has a more significant impact on interest earned on the balance of sales tax receipts. The proposed financial plan includes the investment of accumulated sales tax revenues remaining after payment of debt requirements (see page 110 of the proposal). The estimated interest rate of 7.5 percent is applied both to the balance of accumulated sales tax and to the total estimated amount of sales tax revenues received each year.

Further, the 7.5 percent interest rate cannot be applied to the annual total of sales tax revenues because distribution of sales tax revenues to the recipient agency occurs monthly (see Appendix for detail). This causes annual interest income to be substantially less than 7.5 percent of the annual sales tax revenue balance available for investment at the end of a given year. Table 1 illustrates the application of 7.5 percent annual interest to monthly sales tax receipts and shows that interest income derived in this manner is reduced significantly in comparison to the proposed financial plan. In fact, the reduction in interest income causes sales tax revenues to be potentially inadequate for debt requirement payments from 1995 through 2007.

3. Effect of Interest Rates on Tax Revenue Investments. As previously mentioned, the rate of return on investments of excess sales tax revenues has been estimated at 7.5 percent annually in the proposal. Current yields on short-term government securities are between 5 and 6 percent. Although such yields fluctuate in relation to economic conditions, we believe that the yield rate used in the proposal is too optimistic. Table I-A illustrates the application of a 6 percent return rate on funds

TABLE I-A

PROJECTED CASH FLOW ASSUMING 6 PERCENT RETURN
ON REVENUE BALANCE INVESTMENTS,
PROPOSED SCRTD BOND ISSUE

(All amounts are in thousands of dollars)

YEAR	BEGINNING BALANCE	DEBT SERVICE	COVERAGE RATIO	NET BALANCE	SALES TAX REVENUE	COMPOUND INTEREST	ENDING BALANCE
1977	0	0	*****	0	\$ 278969	\$ 8950	\$ 287919
1978	\$ 287919	\$ 140000	2.06	\$ 147919	296822	18647	463387
1979	463387	172000	2.69	291387	315818	28105	635311
1980	635311	194000	3.27	441311	336031	38000	815342
1981	815342	236800	3.44	578542	357537	47154	983233
1982	983233	268800	3.66	714433	310308	54590	1079331
1983	1079331	290800	3.71	788531	303574	58375	1150480
1984	1150480	303600	3.79	846880	323003	62597	1232480
1985	1232480	348000	3.54	884480	343675	65579	1293735
1986	1293735	436600	2.96	857135	365671	64598	1287404
1987	1287404	430800	2.99	856604	293562	63027	1213193
1988	1213193	462800	2.62	750393	276121	55142	1081656
1989	1081656	494800	2.19	586856	293793	45622	926270
1990	926270	526800	1.76	399470	312595	34668	746733
1991	746733	558800	1.34	187933	332601	22263	542797
1992	542797	640800	0.85	-98003	353888	6023	261908
1993	261908	628800	0.42	-366892	376537	48	9693
1994	9693	616800	0.02	-607107	400635	0	-206472
1995	-206472	604800	-0.34	-811272	426276	0	-384996
1996	-384996	592800	-0.65	-977796	453557	0	-524238
1997	-524238	580800	-0.90	-1105038	482585	0	-622453
1998	-622453	568800	-1.09	-1191253	513470	0	-677783
1999	-677783	606800	-1.12	-1284583	546333	0	-738250
2000	-738250	590800	-1.25	-1329050	581298	0	-747752
2001	-747752	624800	-1.20	-1372552	618501	0	-754052
2002	-754052	679800	-1.11	-1433852	658085	0	-775766
2003	-775766	703800	-1.10	-1479566	700202	0	-779364
2004	-779364	748800	-1.04	-1528164	745015	0	-783149
2005	-783149	762800	-1.03	-1545949	792696	0	-753252
2006	-753252	717800	-1.05	-1471052	843429	0	-627623
2007	-627623	628200	-1.00	-1255823	897408	0	-358415
2008	-358415	547600	-0.65	-906015	954843	244	49072
2009	49072	450600	0.11	-401528	1015952	12266	626691
2010	626691	393800	1.59	232891	1080973	49046	1362910
2011	1362910	294400	4.63	1068510	1150156	102805	2321471
2012	2321471	231000	10.05	2090471	1223766	168199	3482436
2013	3482436	191200	18.21	3291236	1302087	244772	4838095
2014	4838095	138400	34.96	4699695	1385420	334317	6419432
2015	6419432	88800	72.29	6330632	1474087	437754	8242473
2016	8242473	32400	254.40	8210073	1568429	556701	10335203

available for investment. The reduction in this rate compounds the inadequacy of revenues used for debt requirements, such that a deficit results from 1994 through 2007, reaching a maximum of approximately \$783.1 million during the year 2005. Application of a less optimistic rate of return on invested tax revenues indicates that the possibility of inadequate funding for debt obligations is increased.

4. Additional Cost Factors. The proposed system cost figures do not include items relative to the Long Beach-Los Angeles corridor (commonly called the "Starter Line" in the proposal), and the participation of cities in land acquisition and line upgrading. The original concept of the Sunset Line system viewed the Starter Line as a complement to the transit plan. Therefore, costs to the county for participation in the Starter Line project were excluded from the Sunset Line expenditure levels. Construction of the Starter Line would involve the participation of the Cities of Los Angeles and Long Beach, the County of Los Angeles, and the State Department of Transportation, as well as federal matching funds. However, in the January 12 additions and revisions to the county plan (pages 133-135 of the proposal), cost figures for the Starter Line are presented, because separate construction of the Starter Line is not considered feasible at this time. We believe that the costs associated with the Starter Line should therefore be added to the Sunset Line system expenditures of \$7,152 million, causing total system costs to rise to \$7,840 million in the proposal.

Additional costs are a result of the requirement that cities served by the system provide the land for station parking areas. Although the

proposal indicates that land currently owned by municipalities could be used for this purpose, it appears that some additional expenses would be incurred by the cities. Another area of potentially significant expense is based on the assumption in the proposal that each segment of the system (excluding lines requiring tunneling through mountain ranges) will cost an equal amount regardless of location. If a particular municipality desires its stations to be embellished, or wishes the lines to be an underground rather than an aerial structure, the incremental cost would have to be paid by the city through increased taxes, federal funding, or other revenue sources. This requirement would have a particular impact on the segment along the Wilshire-La Brea corridors (pages 86-87 of the proposal) for which the City of Los Angeles has apparently indicated the desirability of an underground line.

Debt Coverage and Market Acceptability

Discussions with personnel in numerous financial institutions indicate that the expected revenues from the one percent sales tax (as presented on page 113 of the proposal) appear adequate to pay debt obligations arising from the bond issues. However, the institutions suggest that funds available for annual debt requirements should be 50 percent greater than the amount of debt obligations. Application of this measure of funding, known as debt coverage, to the financing structure in the proposal indicates that the debt coverage ratio approaches one-to-one, rather than the suggested 1.5 to 1, during the years 1999 - 2004 assuming an annual interest return rate of 7.5 percent on idle cash balances. Using the funding schedule developed in Table I, which assumes a 7.5 percent

interest rate, the coverage ratio is below the 1.5 to 1 level from 1992 through 2007. If a 6 percent annual return rate is used, as in Table 1-A, lack of coverage occurs over approximately the same period of 16 years. Because funding of debt requirements is essential to market acceptability of these transit bonds, the potential inability of sales tax revenues to support the traditional debt service ratio is a serious problem.

Following our discussion of a one-year delay in construction to allow adequate design and planning, we have included tables in the Appendix which illustrate the effect of a one-year delay in initial bond issues. Because sales tax revenues are being invested without debt requirement payments for an additional year, it would seem that substantial reserves would accumulate. As seen in Tables IV and IV-A, even a year's delay in bond issue will not provide adequate coverage if the interest rate on investment is 6 percent annually. Although funds are adequate to meet debt obligations with a 7.5 percent return on invested tax revenues, we have already stated that this return rate is too optimistic for inclusion in the proposed financial plan.

The financial institutions have also stated that assurances must be made in the bond proposal for debt obligations to have first lien on such revenues. The failure to provide these assurances will, in the opinion of the institutions, also have a significant effect on market acceptability of the proposed bond issue.

Beyond debt coverage and tax revenue claims, market acceptability of a bond issue of this magnitude would be determined in part by several other factors which are discussed below:

1. Annual level of bond issuance. The proposal schedules bond issues of \$500 million annually over a period of 15 years. Introduction of debt into the national bond market at this level will cause the contribution of municipal debt from California to rise substantially. There is some question as to whether the bond market could absorb approximately \$500 million annually for 15 years.

2. Cumulative level of indebtedness. The total amount of debt issued by a single entity is an area of interest to potential investors. With limited dollars available for such investments, the proposed \$7.5 billion of bonds issued by the district may exceed the level of acceptability to such investors.

3. Bond yield and rating. The county proposes that these limited tax bonds would carry an interest rate of 8 percent, which corresponds to the statutory limit for municipal debt in California. Because Los Angeles County currently enjoys an AA rating for its debt, this rating could apply to debt issued by the district.

4. Voted versus nonvoted debt. Debt that has been approved by referendum is generally considered preferable to bonding issued without voter approval, according to the financial institutions.

5. Limitation on total indebtedness. The bond market favors limitations on the total debt that can be incurred by a governmental entity to prevent the issue of subordinate debt. The current limit on indebtedness for the district is 15 percent of the assessed valuation for property in the district. This limit appears adequate for the estimated indebtedness if assessed valuation grows at a rate exceeding approximately 3 percent annually.

6. Underwriting capacity. Bond issues are underwritten by investment banking institutions to aid the issuer in the selling of securities and to reduce the risk to the issuer if anticipated bond sales do not materialize. Because the proposed bonds for the transit district are supported by sales tax revenues, statutory limitations would preclude commercial banks from underwriting these securities. Institutions which could participate in underwriting would be limited to private investment firms, which do not have resources as large as banking institutions for underwriting purposes. Limitations on underwriting institutions may mean reductions in bidding prices for purchase of the securities and difficulties in selling the bonds to the national market.

Because the factors related to market acceptability are most significant to the viability of system financing, we believe that expert testimony from individuals in the securities field would aid the committee's review of this proposal. We therefore recommend that the committee seek such expert witnesses to testify when this item is heard.

Effect on Other Government Bonds

The issue of \$7.5 billion in bonding by the district will have an impact on the issuance of municipal debt by other government agencies. While there is a lack of consensus as to the magnitude of this impact, probable effects can be identified.

Municipal bond issues originating in California during 1975 have been estimated to equal approximately \$1.8 billion of which \$500 million was issued by the state and the remaining \$1.3 billion by local governmental entities. The annual issuance of \$500 million in bonds for rapid

transit in Los Angeles would be equal to total state offerings and approximately 27.8 percent of the 1975 market total for all California-originated governmental bonds. There is considerable doubt whether sufficient capital is available in the bond market to absorb such an increase over the 15-year period. State officials indicate that they have already experienced difficulty in selling bond issues in amounts greater than \$100 million. The state could experience additional problems with its bond offerings if the transit district's bonds were made attractive enough. For example, if water improvement bonds are offered by the state with interest of 7 percent and if both the proposed district debt and the improvement bonds have equal ratings, investors would clearly prefer the debt with higher yield. Therefore, the state would be penalized for offering lower interest on its debt. By raising the yield on its bonds the state would be more competitive in the bond market but at increased state cost. A one percent increase in the interest rate for a bond offering of \$100 million with 15-year maturity could cost the state an additional \$8 million.

The effect on the sale of bonds by local governmental agencies will be more pronounced. The lack of available capital in the bond market would be a more severe constraint on the issue of local bonds because of the direct competition and high level of annual offerings by the transit district. Local entities could be forced to raise bond yield rates, which currently range from approximately 5.5 percent to 7.0 percent, or sell them at a discount, increasing local costs. Existing statutory

limits on the allowable yield of some types of municipal bonds would be an additional constraint on the absorption by the market. The end result could well be a substantial increase in costs for other local bond projects or the inability to sell such bonds at all.

Significant Statewide Fiscal Impacts

The Legislature, in 1955, adopted the Bradley-Burns Uniform Local Sales and Use Tax to eliminate variations in local tax rates and to avoid economic disruptions because some areas had local sales taxes while neighboring trading jurisdictions did not. For about ten years (1958 to 1968), most jurisdictions in California had the same state and local sales tax rate. The adoption of the 1/2 percent local sales tax for BART (in 1969), introduced an element of nonuniformity that affected 12 percent of the total statewide sales tax base. Last week, the voters in Santa Clara County approved a 1/2 percent local sales tax for transit purposes.

The SCRTD proposes to levy a one percent local sales tax to fund its transit system. The combined sales tax rate, therefore, would be 7 percent in Los Angeles County, one of the highest rates in the nation. Only New York City, with its 8 percent rate, exceeds this level. If this one percent sales tax rate is adopted, it will further erode the uniformity in sales tax rates. It also will erect an impediment against the use of this revenue source to fund a future state fiscal requirement such as a Serrano solution.

In 1976-77, three major tax sources will account for 90 percent of total General Fund tax revenues. These are: retail sales, 41.5 percent;

personal income, 35.0 percent; bank and corporation, 13.9 percent. If the imposition of a 7 percent combined sales tax rate in Los Angeles County (which is one-third of the state tax base) discourages the Legislature from using this source for its own future needs, then by necessity, future tax increases will have to rely on personal or corporate income taxes because these are the only remaining state sources which have broad bases.

A Complementary Local Revenue Source

We would suggest that consideration be given to using a combination of the one-half percent sales tax with approximately a 53 cent per \$100 assessed valuation property tax, rather than using a one percent sales tax. This approach could produce the same amount of revenues with several advantages.

First, such an approach is consistent with our financing proposal for BART. ^{/1} In the San Francisco Bay Area, we have proposed continuation of the one-half percent sales tax to provide an operating revenue foundation for BART. ^{/2}

The one-half percent sales tax is complemented by property taxes applied in the three Bay Area counties served by BART. A rate of 5 cents per \$100 of assessed valuation is applied for BART operations, and a rate of approximately 50 cents per \$100 is applied to finance BART capital bonds. ^{/3} In addition, AC Transit and MUNI operations are financed by

^{/1} See Financing Public Transportation in the San Francisco Bay Area, Office of the Legislative Analyst, November 1975.

^{/2} Such monies would also provide support for both capital and operations of MUNI, AC Transit, and BART.

^{/3} Rate varies by locale. In 1975-76: San Francisco County, 50 cents; Alameda County, 47 cents (Berkeley has an additional 19.2 cents); and Contra Costa County, 44 cents.

property taxes. Our proposal for Los Angeles would be consistent with this approach to transit financing.

The use of a one-half percent sales tax would raise the total rate to 6-1/2 percent in Los Angeles county. This would match the existing rate in the BART district and the new rate in Santa Clara County, and would mean that approximately 10.5 million people, or approximately 50 percent of California's total population would be subject to the same sales tax rate. ^{/1}

Finally, use of a mix of sales and property taxes will spread the distribution of the initial tax burden and improve the income stability of the tax receipts. About 65 percent of sales taxes are paid by individual residents of the area, with the remainder paid by business firms for items which they consume, and by governments and tourists. By contrast, the property tax is essentially a levy on business firms with over half of the collections coming from the owners of nonresidential property, about 23 percent from the owners of rented residential property and the remaining 21 percent from homeowners. The sales tax also is more sensitive to downturns in economic conditions than the property tax. The combination of these sources would add to the stability of tax receipts.

Federal Assistance

The Sunset Line plan for system financing does not include any participation from federal UMTA funds. Construction and operation of the system is supported entirely by the anticipated one percent sales tax increment. As we have noted in previous sections, some questions exist

^{/1} The 1975 population of the BART district was approximately 2.23 million, of Los Angeles County approximately 6.97 million, and of Santa Clara County approximately 1.3 million.

relative to the ability of sales tax revenues to provide adequate bond coverage. In fact, if we assume that the Starter Line is included in the county plan and that two years would be required for planning and land acquisition, total system cost would increase from the original estimate of \$7.2 billion to approximately \$9.4 billion. Cost overruns from extended labor disputes, delays from legal and administrative actions, and expenses incurred by municipalities are additional factors that would result in an even higher total system cost.

Given these factors, we believe that a conscious effort must be made to incorporate federal funds into the project financial package. Federal grants should be used only to offset the need to float \$7.5 billion in bonds or to cover unanticipated cost overruns. If federal funding is accepted, system plans must incorporate applicable federal regulations.

Contractual Arrangement

Proposed legislation indicates that the SCRTD would be the issuer of name for the transit bonds and the County of Los Angeles would act as prime contractor for system construction. The SCRTD would not be active in the construction phase of the project and yet it would be responsible for debt obligations under the current plan. A certain degree of protection should be afforded the district if cost overruns or other fiscal effects resulting from system construction impinge on the district's ability to meet such obligations.

We believe that an indemnification clause should be incorporated in enabling legislation to protect the district from fiscal effects beyond

its control. The contractual arrangement between the SCRTD and the county would therefore be subject to the county's ability to control capital expenditures.

Recommendations for Enabling Legislation

In view of the issues discussed in this section, we make the following recommendations which can serve as a basis for possible amendments to legislation pertinent to the Sunset Coast Line's proposed financing arrangement, assuming that the proposal is funded by a one percent sales tax.

1. We recommend that the cumulative total of debt issued by the district for system construction be limited to \$7.5 billion.
2. We recommend that a first lien be placed on sales tax revenues to insure funding of debt obligations from the proposed bond issue.
3. We recommend that the one percent sales tax be reduced to one-half percent upon bond maturation, because tax support for debt obligations will no longer be necessary.
4. We recommend that an indemnification clause, to protect the Southern California Rapid Transit District from fiscal effects resulting from county management of the construction phase, be included in the bill.

SYSTEMS STAGING AND FEASIBILITY

The magnitude of the Sunset Coast Line proposal combined with various uncertainties surrounding the project suggest a cautious approach to development of the transit system. As implementation proceeds, financial considerations discussed in the preceding section as technical problems may make it impractical or unwise to complete the full 282 miles of rail lines envisioned in the proposal. Consequently, a rational approach to building the system should include a carefully planned staging of construction. In addition, system planning should include an assessment of the benefits and impacts of each proposed line.

Lack of Detail

The proposal as currently constituted reflects a considerable lack of detail regarding such items as precise route alignment, station location, types of structures to be built and earth work required. By contrast, the "Composite Plan" for BART which was prepared before the BART bond election in 1962 was very detailed. It indicated precise type, location, and grade of lines as well as station location and type. Although some changes were later made, such as placing the Berkeley line underground after city financing was approved, the changes were relatively minor.

The lack of such precise plans for the Sunset Line is representative of a number of the uncertainties surrounding the proposal. Costs could vary dramatically from the estimates made in the proposal for any of several reasons. Any delays in construction will result in inflationary cost increases as discussed on page 4 of our report. Construction costs could vary from estimates. Line upgrading and land acquisition may cost more than anticipated.

Such unexpected contingencies should be recognized in construction cost estimates. The proposed system costs include a 15 percent contingency allowance. However, the example of BART illustrates that cost overruns may cause eventual construction expenditures to be 50 percent greater than initial estimates. We believe that adequate revenue sources for contingency funding should be incorporated in the proposal or, alternatively, the extent of the system should be limited to the total funds actually available for the project.

Systems Staging

Section 30836.1 of the Public Utilities Code requires that SCRTD planning for rail transit include detailed staging of construction. Basically, this staging should be based upon two major characteristics of each proposed line in the system: (1) its cost-effectiveness and (2) detailed considerations in construction.

Cost-effectiveness

If the voters of Los Angeles should decide in favor of making a major commitment to mass transit, it is imperative that some constraints on expenditures and flexibility in systems design be instituted.

The increased mobility provided by transit improvements can require significant expenditures, and cost-effectiveness measures should be applied to weigh the appropriateness of specific investments. Cost-effectiveness should be applied to (1) select those corridors which represent the highest priorities for improvement, and (2) select the most cost-effective approach from among alternatives within a corridor.

Several useful indices can be developed in a cost-effectiveness analysis. Capital costs of a line can be converted to an annual expenditure level if assumptions about the life of the project are made. Then, capital expenditure per rider on an annual basis provides useful data for comparing alternatives. For example, heavily patronized rail lines in dense areas would likely have much lower capital costs per passenger than lines through sprawling suburban areas. Similarly, operating costs per passenger provide useful insight in comparing lines. A recent report on the Washington Metropolitan Area Transit Authority (WMATA) suggests that both operating and capital costs per passenger will be increased as that system expands.

In Los Angeles, some lines will carry considerably more patronage and hence have lower unit costs than other lines. Consequently, such lines can be viewed as having a higher priority. Rail transit is most efficient in corridors of high transit demand, because large ridership is necessary to make the relatively high capital investment associated with rail transit reasonable on a per passenger basis. In addition, transit can provide good access to corridors which have a relatively high density of development and may be difficult to serve with autos and buses.

A 1973 consultant study for SCRTD, for example, indicated the Wilshire, San Fernando and El Monte corridors as the top priorities for a rail system. This study also indicated that patronage densities would be low in many of the corridors where the Sunset Line is recommending that rail service be implemented. ^{/1} The Sunset Line proposal does not address this aspect of

^{/1} See the August 1973 consultant studies prepared for SCRTD by Peat, Marwick, Mitchell & Co., Alan Voorhees, and others.

analysis at all. It does not include any measures of cost effectiveness and it fails to provide a mechanism to select corridors according to effectiveness measures or needs.

It is imperative that a priorities assessment of corridors be included when construction staging is being planned. Where possible, improvements in the most important corridors should be implemented first. Then the most critical transit needs of the region will be met even if unforeseen difficulties arise.

The Washington Metropolitan Area Transit Authority (WMATA) experience to date suggests a critical need for such clearly staged construction. A recent congressional report presents strong arguments for reducing the projected size of that rail system from 98 miles to either 68 or 41 miles. The major reasons given for a reduction are financial in nature. The 98-mile system is now slated to cost approximately twice the original estimate, and high projected operating costs together with lower than originally anticipated revenues make operational financing a major potential problem. A reduced system would serve the core of the Washington, D.C. urban area, where transit needs are greatest. ^{/1}

An adequate assessment of alternatives within corridors is also missing from the Sunset Line proposal. In the past, many transit alternatives have been proposed and discussed for Los Angeles. For purposes of illustration, we will comment briefly on one such proposal, "Preferential Facilities for High-Occupancy Vehicles", done by Wilbur Smith and Associates for SCRTD. The proposal is at the opposite end of the cost spectrum from the Sunset

^{/1} This area has greater transit trip densities and higher levels of "transit dependents" - individuals without the alternative of an auto.

Line. It suggests potential transit alternatives which might be implemented in conjunction with elements of the Sunset Line, or instead of the Sunset Line.

The "Preferential Facilities" report emphasizes an approach which we have supported in the past, i.e., making efficient use of the enormous existing investment in freeways and highways in Los Angeles. Preferential and exclusive bus lanes were recommended which would service the entire Los Angeles County region. Total right-of-way capital costs in 1973 dollars was projected at \$29.5 million, with an additional \$8.5 million for park and ride facilities. Anticipated operating costs were \$5.4 million and \$1.4 million respectively for these facilities. The total capital costs of \$38.0 million is only one two-hundredth of the cost of the Sunset Coast Line. However, it should increase transit accessibility and patronage considerably. Such alternatives need to be carefully examined to determine the proper "mix" of transit services for Los Angeles. Factors in selecting the mix should include an appraisal of the "cost-effectiveness" of each corridor alternative.

Basically, we find that two aspects associated with cost-effectiveness are missing from the Sunset Coast Line proposal. These need to be included before implementation begins. First, individual corridors need to be selected according to effectiveness and need. Second, the cost-effectiveness of alternative improvements within each corridor should be carefully addressed so that the most financially feasible alternative can be selected in each corridor.

Other Staging Considerations

Several additional factors must be included in a detailed staging of construction, notably: (1) station and line location, (2) station and line financing, (3) characteristics of construction, and (4) operational considerations.

In the Sunset Coast Line proposal, station and line location is determined by local municipalities and the County of Los Angeles. It should be noted that Section 30836.1 of the Public Utilities Code provides the authority for SCRTD to negotiate with localities on station and line location. Under present statutes, SCRTD presents a plan and local municipalities have 60 days to review it. If agreement is not reached, an arbitration panel is formed and 30 days are provided for agreement. If agreement is still not reached, then a final and binding decision is imposed by the State Director of Transportation. To avoid delays and disputes, full advantage should be taken of this process. Planning for the system should proceed by incorporating the arbitration process into the timetable for each part of systems staging. Otherwise, delays in construction could raise costs significantly and hamper effective staging of operations.

Another potential problem area is station and line financing. In the proposal, there is a maximum allocation per mile of line and per station throughout the system. This maximum is insufficient to pay for subways or other high-cost items. The concept is that each locality, such as the cities of Beverly Hills and Los Angeles, should pay the differential costs if they desire something other than an elevated line. In our judgment, this approach is too inflexible. While it may be

appropriate for local jurisdictions to pay some of the extra costs of improvements such as subways, they may not have reasonable capacity to carry the full incremental cost burden. In addition, subways are likely to be built on the most densely used lines, and will serve passengers from throughout the region. Therefore, the upper limit on dollars available per line should be removed, and actual allocation of costs made subject to negotiation.

Staging will also be necessary for the Sunset Line because of considerations relative to construction. Use of freeway right-of-ways involving traffic dislocation during construction will require extensive planning. Tunneling and subway construction will also need to be carefully phased. These considerations should be linked and balanced with the corridor selection process discussed earlier.

Finally, staging of construction should be coordinated with staging of operations. If service in the most important corridors can be opened first, operating income should be relatively high compared to alternative lines. Further, initial satisfaction of the largest transit corridor demand will enhance the public image of the system.

Staging of operations will permit testing of the system hardware and design concepts. If BART had staged its operations more carefully, major technical problems could have been uncovered and addressed much earlier. Instead, major hardware and systems problems are still encountered, well after large-scale operations began. Problems such as train detection difficulties, traction motor arcing, and brake failure have increased engineering and maintenance costs considerably.

Impact and Benefits

The major impact of the Sunset Line will be on land use and mobility and each should be assessed for all of the proposed lines in the system. To establish a perspective in this area, we review below some of the anticipated impacts and benefits of the overall system which are grouped into four categories: (1) land use, (2) mobility, (3) air quality, and (4) congestion relief.

With regard to land use, the proposed system will probably encourage continued suburban growth, as the freeways have, by permitting relatively high speed travel to selected work sites. It should also encourage more and denser development of employment at selected sites. This has been the major impact of BART in the Bay Area. Downtown San Francisco has experienced a major increase in employment densities which could not effectively be served without BART. Simultaneously, the suburban areas served by BART, particularly eastern Contra Costa County, have shown rapid growth. Much of this growth is probably attributable to BART. It is interesting to note that in the five years from 1970 to 1975 there was no net population growth within the three-county BART district, but there was a redistribution of population outward to those areas near the ends of the BART lines.

The Sunset Line might bring about some mobility improvements, travel time reductions and an increase in access for the individual. The system could increase the range of travel opportunities available to individuals within the service area. However, total travel time on most journeys would probably be greater by transit than by automobile, because the trips to and from the transit stations, plus waiting time, would be a significant part of the journey. This is especially true with stations

located in freeway medians, somewhat removed from population centers. In addition, line haul speeds on the system can be anticipated to average 40 to 45 miles per hour ^{/1} and will not compensate for time lost in station access and egress.

To expand on this point, travel patterns in Los Angeles have extremely diverse origins and destinations. While the rail system may theoretically provide widespread access, many journeys would be difficult to make in practice because they would require several transfers. Extensive point-to-point nontransfer service to match the majority of journey patterns is just not feasible, either economically or in terms of the logistics of train operations.

Air quality improvement is another of the benefits which would be anticipated from implementation of a rail transit system in Los Angeles. However, past studies have indicated that proposed systems of approximately the same magnitude ^{/2} as the Sunset Coast Line would have a small impact on total vehicle miles traveled (VMT) in the region. If projected transit ridership increases by approximately 100 percent by 1985, studies indicate that the decline in VMT would be only 7 percent, with a corresponding reduction in emissions. While this is a positive reduction in vehicle emissions, it will not have a major impact on air quality.

^{/1} As at BART and Lindenwald, the two highest-speed systems on the continent. Projected averages of 60 miles per hour are unrealistically high.

^{/2} The RTD proposal of 1974, which included 140 miles of high-speed rail transit, extensive express-bus service, and local feeder bus service blanketing the service area and connecting to the higher speed lines.

Another benefit often attributed to mass transit is a reduction of congestion. For comparison, the opening of BART across the San Francisco-Oakland corridor reduced vehicle corridor trips on a typical weekday by 5 percent, and decreased the length of the peak period by approximately 15 percent. This is not a dramatic impact upon congestion. However, the role of BART (and AC Transit) in this corridor is more critical than these figures would indicate. Because BART and AC Transit carry approximately 32 percent of the people who use this corridor on a typical weekday, the capacity provided by them is essential to the smooth functioning of this corridor. Provision of significant movement capacity is one of the major benefits which transit can provide.

Recommendations for Systems Staging

1. We recommend that a detailed plan for design and staging of construction be formulated. This plan should be based upon:
 - a. Priorities for corridors based on "cost-effectiveness" (i.e., build corridors of heaviest demand first).
 - b. Construction considerations (i.e., the needs for diversion of auto traffic, length of time to construct various types of line, etc.).
2. We recommend that construction staging be linked to operational staging:
 - a. Build and open the most important lines first.
 - b. Have operational testing linked with construction staging.
3. We recommend placing more planning authority in the SCRTD and enforcing the arbitration process found in Public Utilities Code 30836.1 to avoid delays and disputes. The many uncertainties found in the systems planning process in the report should be clarified.

4. We recommend that the upper limit currently placed on revenues available per mile of construction be reconsidered. While it may be appropriate for local areas to play some additional role in financing local improvements, the mechanisms laid out in the proposal could delay or prohibit construction of some of the most significant lines.

OPERATIONAL CONSIDERATIONS

As proposed, the Sunset Coast Line would be owned and operated by the Southern California Rapid Transit District (SCRTD). In our view, there are several aspects of system management and operations which must be addressed, particularly because of increasing operating deficits in public transit. ^{/1} First, we comment on proposed service and train characteristics. Second, major financial and institutional aspects of Sunset Line operations are discussed. The emphasis throughout this section is upon management and operational efficiencies which will help assure the financial stability of the SCRTD.

Train and Service Operating Characteristics

Train characteristics include such items as car configurations and design. It is our judgment that the variety of train types included in the report will not prove financially feasible. Significant capital cost savings could accrue from using a standardized car design, and maintenance costs and associated parts inventory expenses would be significantly reduced. We recommend the use of "married pairs" for operational efficiencies, where two-car pairs can be used independently or coupled with other pairs to make larger trains. BART has limited flexibility regarding train size because they do not have this capability. ^{/2} Furthermore, the proliferation of designs for feeder-line

^{/1} For example, see Financing Public Transportation in the San Francisco Bay Area, Office of the Legislative Analyst, November 1975.

^{/2} Currently, BART trains must be taken out of service and to the yards for train size to be changed, a 10 to 15 minute procedure (minimum).

cars suggested in the proposal also seems unwise from a cost standpoint. Standardization should mean lower unit costs and more reliable, less expensive maintenance.

We have several concerns which relate to operation of the proposed system. First, operational speed is not discussed adequately. The projected average speed of 60 miles per hour is too high; both BART and Lindenwald, the two fastest systems in the country, have average speeds on the order of 40 to 45 miles per hour. Speed depends on station spacing, station dwell time, and acceleration/deceleration profiles, and is unlikely to be more than 45 miles per hour in Los Angeles, even with an 85 miles per hour top-speed capability.

Train control also requires more detailed discussion. The system has many proposed merges and the suggested routings would require bypass capabilities. The train control system is an important element of such systems operations and it could influence operational flexibility and costs considerably. We recommend that the train control system provide a wide range of capabilities in routing, merging, and train protection. At the same time, train control should take advantage of existing and proven technology to avoid the problems which have plagued BART.

The proposed multiple routings also warrant comment. From a service standpoint, such things as nonstop airport service and nontransfer service for many origin-destination pairs is desirable. However, the expense, including higher numbers of required cars and more yard and storage space, may not economically justify such service. As noted above, it would also have an effect on operations by increasing costs due to more extensive track requirements (for bypass) and/or more sophisticated controls.

Financial and Institutional Aspects

The financial and institutional aspects of operations contain numerous uncertainties. In particular, the role and responsibilities of SCRTD, the relationship between bus operations and rail operations, and the coverage of bus operating expenses are not addressed in adequate detail.

In the proposal, SCRTD would have responsibility for operating the rail system. However, it is implied that sales tax revenues would only be available to fund rail transit. SCRTD bus operational funding would be considered separately. This would essentially require two separate operating budgets and would preclude SCRTD management from making efficient trade-offs between bus and rail service. It also could mean that some complementary and feeder bus service might face curtailment from a lack of operating funds. The projected arrangement could prohibit operational funding of some bus routes as alternatives to rail transit service, although such alternatives might prove more cost-effective in many circumstances (as discussed in the "staging" section). In short, the proposal removes management flexibility which the SCRTD should possess. To budget for rail operations separately from bus operations is a potentially inefficient constraint of major proportions.

The subject of bus operating costs and deficits is one which cannot be ignored in discussing rail transit for Los Angeles. It is assumed in the report that bus operational financing will remain unchanged with the construction of the rail system or that adjustments can be made without additional financing. This may not be the case for the following reasons:

1. Rail transit service would supplant buses from corridors served by rail. Many of these corridors may have relatively favorable operating revenue characteristics. In the Sunset Coast Line proposal, buses are relegated to primarily a feeder role. Such service will probably have poorer revenue characteristics. For example, feeder-bus service to BART in the suburban areas is heavily subsidized and has low patronage volumes. Thus, the rail system could aggravate the problem of bus operational deficits. Only through linking of financing can appropriate trade-offs be considered.

2. SCRTD bus operations currently have a partial subsidy from the County of Los Angeles. This amounted to approximately \$10.9 million in fiscal year 1974-75, and will be approximately \$15.4 million in 1975-76. Continuation of this subsidy or other mechanisms to finance bus operations is ignored in the proposal.

3. Operational financing of the rail system is not covered adequately in the report. Two aspects of rail operational financing must be addressed: the adequacy of short-term operational revenues to cover expenditures and the long-term financial stability of system operations.

The initial stage of operations is projected to have adequate operational financing, though full systems operations may not. Table II shows income available for operations in 1976 dollars alternatively assuming a 6 percent and a 7 percent inflation rate for systems operating costs. Operating income is indexed on the basis of income per system mile because of a lack of detailed projections of operating conditions.

The first 25-mile segment of the system is projected in the proposal to have an annual operating cost of \$40 million per mile in 1982, or

\$26.65 million in 1976 dollars at a 7 percent rate of inflation for the system. This is just over \$1 million per mile, and compares reasonably to BART's current expenses. As seen in Table II, approximately \$2.58 million per mile in revenue would be available for initial operations, if the inflation rate were 7 percent. An operational surplus could therefore occur during the initial years of operation.

However, projected operating income from the full system in 1987 is considerably below the initial level on a per-mile basis. Table II displays projected fare and sales tax income used in the proposal for the full system in 1987. These sources would provide between \$0.74 million per mile and \$0.78 million per mile in 1976 dollars. If operating costs continue at approximately \$1 million per mile, estimated operating income will be inadequate in covering such costs. The possibility for operating deficits arising from inadequate sales tax and fare revenues indicates that operational stability for the full system in 1987 may not be possible. ^{/1}

Beyond 1987, stability in operational financing will require that income from all sources grow at the same rate as operating expenditures, so that fare income and sales tax revenues combined growth would have to match such growth in expenditures. In all probability this would require periodic fare increases, a topic which is not addressed in the proposal.

^{/1} Further delays in the system completion date could worsen the financial picture as shown in Table II.

TABLE II

OPERATING INCOME FOR THE SUNSET COAST LINE

Year	Service Provided	System Inflation Rate	Income (millions of 1976 dollars)					
			Fares <u>/a</u>		Sales Tax <u>/b</u>		Total	
			Total	per mile	Total	per mile	Total	per mile
Initial Service:								
1982	25 miles	6%	--	--	\$68.17	\$2.73	\$68.17	\$2.73
1982	25 miles	7	--	--	64.43	2.58	64.43	2.58
Projected Schedule:								
1987	230 miles main 15 miles feeder	6	\$52.67	\$0.22	138.94	0.57	191.62	0.78
1987	230 miles main 15 miles feeder	7	47.51	0.19	125.31	0.51	172.82	0.71
Two-year Delay:								
1989	230 miles main 15 miles feeder	6	46.88	0.19	139.99	0.57	186.87	0.76
1989	230 miles main 15 miles feeder	7	41.50	0.17	123.90	0.51	165.40	0.68

/a Fare income is assumed to be \$100 million in 1987 dollars or in 1989 dollars depending upon timing of this stage of operations. No estimate has been made for fare income in 1982.

/b Sales tax revenues in current dollars are assumed to be: 1982, \$96,695,000; 1987, \$263,750,000; 1989, \$298,590,000. Estimates based on Sunset Coast Line financial plan.

Recommendations for Train and Service Operating Characteristics

1. We recommend that there be one standardized car design for main line operation and one for feeder line operations.
2. We recommend that the "married pairs" car configuration should be standard.
3. We recommend that the system average speed estimate should be revised to 45 miles per hour.
4. We recommend that the train control system be flexible but make use of existing technology.
5. We recommend that the proposed multiplicity of routings suggested in the report be reduced.

Recommendations on Financial and Institutional Aspects of Operations

1. We recommend that the role and capabilities of the SCRTD as operator of the system be carefully addressed. Possible use of sales tax revenues for support of some bus services should be considered. This would encourage management flexibility and operational efficiency, and permit adequate funding of:
 - a. Complementary and feeder bus services;
 - b. Substitution of bus service for rail when economically appropriate.
2. We recommend a more thorough discussion of bus system operational financing.
3. We recommend that long-term operational financing of the rail system be addressed, including the likely need for periodic fare increases for the system.

REGULATION AND REVIEW

The two newest rail rapid transit systems in the United States, BART in the San Francisco Bay Area and WMATA in Washington, D.C. have both encountered major problems in construction and implementation. Consequently, for the significantly larger Sunset Coast Line proposal for Los Angeles we are recommending careful regulation and continuing review to minimize potential difficulties.

The Public Utilities Commission

The Public Utilities Commission (PUC) is required in Section 30646 of the Public Utilities Code to set safety standards for SCRTD and to monitor achievement of these standards. In our judgment, the PUC should be intimately involved at each stage of system implementation: design, construction, and operation.

Basic safety criteria and requirements for the system should be established at the design stage, and reviewed by the PUC for conformance with minimum safety standards. These criteria and requirements should be applied at the construction stage to contractual arrangements, construction procedures, and to all facilities, equipment and testing procedures. In the operations phase, the PUC should monitor daily operations and sample operating data, develop standardized trouble reporting and analysis procedures, and monitor systems modifications.

An Outside Analyst

In an effort to avoid the kinds of technical problems which have plagued BART, and are beginning to appear at WMATA, we recommend that an

outside technical analyst be involved at each phase of design, construction, and operation. This outside analyst would perform a role which should be very similar in nature to that currently performed by Lawrence Berkeley Laboratory (LBL) of the University of California for BART.

Basically, an outside analyst provides an independent review and consulting capability concerning cost, reliability, maintainability, safety, and performance of the system and its hardware. Such a technical analyst can assist also in quality control and testing, including safety aspects, and should review and propose (when necessary) systems modifications.

This analyst must display a very high level of technical competence. The BART experience has demonstrated that significant problems and considerable expenditures could have been avoided if LBL had been involved with BART at a much earlier date.

Regarding the role of LBL in analyzing BART district problems, the California State Senate first retained the services of LBL as consultants to the Senate Public Utilities and Corporations Committee. This contractual arrangement began in 1973 and remains in force at the present time. Recognizing the valuable services performed by these highly qualified specialists, the BART Board of Directors has retained LBL for a variety of special tasks.

Retention of such an outside analyst in the early stages of BART development should have resulted in avoidance and/or early detection and correction of many of the problems associated with the system.

Internal Audit Group

Control of costs is a major consideration in construction of a system as large as the Sunset Coast Line. Consequently, it is our judgment that a strong internal audit group should be established within SCRTD to review income, expenditures, and cash flow of the Sunset Coast Line if the voters approve the proposal.

Recommendations Pertaining to Regulatory Functions of the California Public Utilities Commission

1. We recommend that the California Public Utilities Commission (PUC) set minimum safety standards for the system and monitor the system to assure that such standards are met. Authority for this function is provided in Section 30646 of the Public Utilities Code.

2. We recommend that the PUC be involved in setting standards and in review at the design, construction, and operating phases of the system.

3. We recommend that PUC regulation should be of a similar nature to that defined in PUC General Order No. 127 of August, 1967. It should include requirements for such items as detailed modes of failure analysis and mean-time-between-failures analysis.

Recommendations on Review by an Outside Analyst

1. We recommend that an independent analyst (such as the Lawrence Berkeley Laboratory of the University of California) be retained to review technical aspects of the system regarding cost, reliability, maintainability, safety, and performance.

2. We recommend that technical analysis and review occur during design, construction, and initial operations.

Recommendation on Internal Audit

We recommend that a strong internal audit group be established within SCRTD to review expenditures, income, and cash flow.

Responsibilities of the SCRTD

SCRTD, as issuer of the bonds and eventual operator of the proposed Sunset Coast Line system, must assume ultimate responsibility for the effective and efficient management of the proposed system.

Accordingly, we recommend that SCRTD adopt a comprehensive systems management approach to implement this proposal if it is passed by the voters. Such an approach will be a significant factor in assuring the safety, reliability, efficiency, utility, and performance of the system.

The importance of systems management at each phase of implementation (design, construction, and operation) cannot be overemphasized. Many of the problems encountered at BART have arisen because of deficiencies in the design and construction phases, specifically car design, braking, train control, and computer problems. We have summarized the major elements of the systems management approach for the Sunset Coast Line proposal in Table III.

TABLE III

SYSTEMS MANAGEMENT RESPONSIBILITIES OF THE TRANSIT OPERATOR

A. Design Phase

1. Clarify system goals and objectives.
2. Establish systems management and systems engineering functions with clear systemwide responsibilities.
3. Evaluate in terms of traditional designs and procedures to ascertain strengths and weaknesses.
4. Perform extensive analyses of alternatives:
 - (a) Modes of failure, redundancy, fail-safe aspects
 - (b) reliability, safety, maintainability
 - (c) operational and management procedures
 - (d) relative satisfaction of systems goals and objectives.

B. Construction Phase

1. Originate design and construction contracts with emphasis on:
 - (a) detailed technical contract specifications, carefully controlled and monitored, with clear quality control and acceptance procedures; not performance contracts.
 - (b) emphasis on mean-time-between-failure and modes of failure analyses and testing.
 - (c) change order control; incorporate incentives and penalties.
2. Have test procedures for: components, devices, subsystems, and the overall system. Assure interfaces are satisfactory. Run extensive systemwide operational tests.
3. Set up trouble reporting and reliability monitoring system.
4. Set up preventive maintenance schedule and procedures.
5. Define operating procedures.

C. Operational Phase

1. Extensive monitoring of daily operations.
2. Revise operating procedures and make systems changes as appropriate.

APPENDIX

CASH FLOW ANALYSIS FOR THE SCRTD BOND PROPOSAL

Methodology for Calculating Cash Flow

Cash flow for debt repayment is a critical element of the Sunset Coast Line proposal. Accordingly, we have outlined our methodology for calculating the cash flow in detail below.

1. Repayment of revenue bonds with sales tax proceeds must consider the cash flow of such receipts. Sales tax receipts are collected as they accrue by the State Board of Equalization, and then distributed to the local agency in monthly installments. The first distribution of quarterly receipts is made on approximately the 20th day of the last month of the quarter. Subsequent distribution of a given quarter's receipts follow on approximately the 20th day of each of the three months of the next quarter.

The distribution of receipts for the fourth quarter of a year, October, November, and December, will be presented as an example.

- a. The Board of Equalization estimates quarterly receipts based on prior year receipts and growth estimates derived from initial collections.
- b. The estimated receipts are distributed as follows: 22.5 percent about December 20th, 22.5 percent about January 20th, 45 percent about February 20th, and the remaining 10 percent about March 20th. The last payment is adjusted to match the actual level of the fourth quarter receipts to be

distributed by the Board of Equalization. This actual level of receipts is not available until approximately March 1, due to time delays in the collection process.

2. The proposal indicates application of one percent sales tax receipts from 1977 to 1981, dropping to 3/4 percent for 1982 through 1986, and then to a 1/2 percent rate in 1987 and thereafter (page 113 of the proposal). We have retained this rate assumption, and assumed that collection would begin in fourth quarter 1976 (because of the cash flow of receipts discussed in (1)).

3. To estimate interest earned on sales tax receipts and on the balance carried over from the prior year, we have made several important assumptions:

- a. Interest is compounded monthly on cash available at the beginning of that month. The monthly rate for compounding is assumed to be one-twelfth of the listed annual rate.
- b. Debt repayment is assumed to take place on January 1, unless obligations exceed the fund balance on that date. In that case, monthly sales tax receipts are applied to the debt service until debt obligations have been met. Accruing sales tax revenues begin earning interest after these obligations have been met, through the remainder of the year.
- c. Sales tax receipts accrue monthly, and earn interest accordingly. In our estimates, receipts distributed by the Board of Equalization on the 20th of a month are assumed to earn interest from the first day of the next month.

- d. No penalty or interest has been assumed for debt service obligations not met in a particular year.
- e. Our cash flow analysis has been carried out over a 480 month, 40-year period for Tables I and I-A, and a 492 month, 41-year period for Tables IV and IV-A.

4. We have assumed the debt repayment schedule used in the proposal (page 113). It has been applied directly in Tables I and I-A, and shifted later by one year in Tables IV and IV-A for comparison. Thus, Tables IV and IV-A show the case where two years of sales tax receipts are accumulated before debt repayment begins, and consequently also assumes that bond sales would be delayed one year to 1978.

Analysis of the Case of a One-year Repayment Delay

The one-year delay in debt service repayment appears on the surface to be feasible as shown in Table IV, assuming a 7.5 percent annual interest rate. The proposal appears "almost" feasible assuming the lower 6 percent interest rate, as shown in Table IV-A. However, each case realistically must be viewed as problematic and therefore probably infeasible.

First, an annual rate of 7.5 percent return on short-term investments is exceptionally high. Short-term interest rates presently range from 5 to 6 percent and are likely to decline further when inflationary trends in the general economy slow. A rate above 6 percent can only be assumed if double-digit inflation becomes permanent. In addition, short-term rates will fluctuate, and assuming an average of 7.5 percent would be overly optimistic.

The more reasonable application in Table IV-A of a 6 percent short-term interest rate (see page 7 of the text for further discussion) is

infeasible because of low debt coverage ratios (for example, below one from 2000 through 2003) and negative beginning year balances where debt obligations could not be met. Thus, neither of these cases represents a feasible bonding program.

TABLE IV

PROJECTED CASH FLOW ASSUMING 7.5 PERCENT RETURN
ON REVENUE BALANCE INVESTMENTS,
WITH ONE YEAR DELAY IN BOND ISSUE,
PROPOSED SCRTD BOND ISSUE

(All amounts are in thousands of dollars)

YEAR	BEGINNING BALANCE	DEBT SERVICE	COVERAGE RATIO	NET BALANCE	SALES TAX REVENUE	COMPOUND INTEREST	ENDING BALANCE
1977	0		0*****	0	\$ 278969	\$ 11239	\$ 290207
1978	\$ 290207		0*****	\$290207	296622	34488	621517
1979	621517	\$ 140000	4.44	481517	315818	50105	847440
1980	847440	172000	4.93	675440	336031	65974	1077444
1981	1077444	194000	5.55	883444	357537	82988	1323969
1982	1323969	236800	5.59	1087169	310308	97619	1495096
1983	1495096	268800	5.56	1226296	303574	107431	1637301
1984	1637301	290800	5.63	1346501	323003	117545	1787050
1985	1787050	303600	5.89	1483450	343675	129010	1956135
1986	1956135	348000	5.62	1608135	365671	139575	2113381
1987	2113381	436600	4.84	1676781	293562	142977	2113320
1988	2113320	430800	4.91	1682520	276121	141742	2100383
1989	2100383	462800	4.54	1637583	293793	138966	2070341
1990	2070341	494800	4.18	1575541	312595	134907	2023044
1991	2023044	526800	3.84	1496244	332601	129557	1958402
1992	1958402	558800	3.50	1399602	353888	122912	1876401
1993	1876401	640800	2.93	1235601	376537	111092	1723231
1994	1723231	628800	2.74	1094431	400635	101104	1596169
1995	1596169	616800	2.59	979369	426276	93204	1498850
1996	1498850	604800	2.48	894050	453557	87680	1435287
1997	1435287	592800	2.42	842487	482585	84846	1409918
1998	1409918	580800	2.43	829118	513470	85053	1427641
1999	1427641	568800	2.51	856841	546333	88684	1493858
2000	1493858	606800	2.46	887058	581298	92283	1560639
2001	1560639	590800	2.64	969839	618501	100209	1688549
2002	1688549	624800	2.70	1063749	658085	109094	1830928
2003	1830928	679800	2.69	1151128	700202	117574	1968904
2004	1968904	703800	2.80	1265104	745015	128228	2138347
2005	2138347	748800	2.86	1389547	792696	139809	2322053
2006	2322053	762800	3.04	1559253	843429	155028	2557710
2007	2557710	717800	3.56	1839910	897408	178991	2916309
2008	2916309	628200	4.64	2288109	954843	216100	3459051
2009	3459051	547600	6.32	2911451	1015952	266953	4194357
2010	4194357	450600	9.31	3743757	1080973	334187	5158917
2011	5158917	393800	13.10	4765117	1150156	416265	6331537
2012	6331537	294400	21.51	6037137	1223766	517980	7778883
2013	7778883	231000	33.67	7547883	1302087	638419	9488389
2014	9488389	191200	49.63	9297189	1385420	777579	11460189
2015	11460189	138400	82.80	11321789	1474087	938326	13734202
2016	13734202	88800	154.66	13645402	1568429	1122515	16336346
2017	16336346	32400	504.21	16303946	1668008	1332949	19305703

TABLE IV-A

PROJECTED CASH FLOW ASSUMING 6 PERCENT RETURN
ON REVENUE BALANCE INVESTMENTS,
WITH ONE YEAR DELAY IN BOND ISSUE,
PROPOSED SCRTD BOND ISSUE

(All amounts are in thousands of dollars)

YEAR	BEGINNING BALANCE	DEBT SERVICE	COVERAGE RATIO	NET BALANCE	SALES TAX REVENUE	COMPOUND INTEREST	ENDING BALANCE
1977	0		0*****	0	\$ 278969	\$ 8950	\$ 287919
1978	\$ 287919		0*****	\$ 287919	296822	27281	612022
1979	612022	\$ 140000	4.37	472022	315818	39246	827087
1980	827087	172000	4.81	655087	336031	51186	1042303
1981	1042303	194000	5.37	848303	357537	63793	1269632
1982	1269632	236800	5.36	1032832	310308	74228	1417369
1983	1417369	268800	5.27	1148569	303574	80581	1532724
1984	1532724	290800	5.27	1241924	323003	86962	1651890
1985	1651890	303600	5.44	1348290	343675	94186	1786152
1986	1786152	348000	5.13	1438152	365671	100434	1904256
1987	1904256	436600	4.36	1467656	293562	100716	1861934
1988	1861934	430800	4.32	1431134	276121	97128	1804383
1989	1804383	462800	3.90	1341583	293793	92172	1727547
1990	1727547	494800	3.49	1232747	312595	86062	1631405
1991	1631405	526800	3.10	1104605	332601	78801	1516007
1992	1516007	558800	2.71	957207	353888	70393	1381488
1993	1381488	640800	2.16	740688	376537	57765	1174989
1994	1174989	628800	1.87	546189	400635	46542	993366
1995	993366	616800	1.61	376566	426276	36902	839744
1996	839744	604800	1.39	234944	453557	29043	717545
1997	717545	592800	1.21	124745	482585	23177	630507
1998	630507	580800	1.09	49707	513470	19540	582717
1999	582717	568800	1.02	13917	546333	18387	578637
2000	578637	606800	0.95	-28163	581298	16913	570048
2001	570048	590800	0.96	-20752	618501	18564	616313
2002	616313	624800	0.99	-8487	658085	20591	670189
2003	670189	679800	0.99	-9611	700202	21873	712464
2004	712464	703800	1.01	8664	745015	24437	778117
2005	778117	748800	1.04	29317	792696	27241	849254
2006	849254	762800	1.11	86454	843429	32393	962276
2007	962276	717800	1.34	244476	897408	43871	1185756
2008	1185756	628200	1.89	557556	954843	65024	1577422
2009	1577422	547600	2.88	1029822	1015952	96113	2141888
2010	2141888	450600	4.75	1691288	1080973	138997	2911258
2011	2911258	393800	7.39	2517458	1150156	192173	3859787
2012	3859787	294400	13.11	3565387	1223766	259169	5048321
2013	5048321	231000	21.85	4817321	1302087	338898	6458306
2014	6458306	191200	33.78	6267106	1385420	430991	8083517
2015	8083517	138400	58.41	7945117	1474087	537332	9956537
2016	9956537	88800	112.12	9867737	1568429	658942	12095107
2017	12095107	32400	373.31	12062707	1668808	797543	14529059