5.0 COST AND PERFORMANCE CONSIDERATIONS

This section provides a financial analysis of the Mid-City/Exposition LRT Project. The financial analysis includes an estimate of capital and operating costs, and the Metropolitan Transportation Authority's ability to afford the alternatives.

A comparative analysis of alternatives is then discussed, where different measures are applied to evaluate the Mid-City/Exposition LRT Project.

5.1 FINANCIAL ANALYSIS

The cost of a transportation investment falls into two categories: capital costs, and operations and maintenance (O&M) costs. Capital costs are the start-up costs for the proposed Project, including the costs of guideway construction, vehicles, and any system facilities necessary before the Project can begin operation. Operations and maintenance costs are the costs associated with the regular running of a new transportation facility. Costs such as labor, vehicle maintenance, and overall facility maintenance all fall into this category.

5.1.1 CAPITAL COSTS

Original and Revised Locally Preferred Alternative. The original Locally Preferred Alternative (LPA) for the Mid-City/Exposition Transit Corridor was adopted by the Metro Board of Directors in June 2001, and modified in December 2003. This alternative is described in Section 2.4 and generally follows the Hill Street alignment in Downtown Los Angeles. The original LPA includes grade-separations and aerial stations at La Brea Avenue and La Cienega Boulevard.

The revised Locally Preferred Alternative (revised LPA) includes changes to the original LPA as recommended by Metro Staff. This alternative is described in Section 2.7 and generally follows the Flower Street alignment in Downtown Los Angeles and includes grade separations at Figueroa Street and Jefferson Boulevard. It also includes grade-separations with aerial stations at La Brea Avenue and La Cienega Boulevard.

In addition, both the original LPA and the revised LPA include possible phased implementation segments. These optional project lengths were evaluated in the event that there was insufficient funding to build the full project to Venice/Robertson Station in Culver City. Possible phased length segments would stop at Vermont Station, Crenshaw Station or La Cienega Station.

Table 5.1-1 documents the length of the original LPA, the revised LPA and the possible phased implementation segments. The revised LPA (8.6 miles in length) is 0.9 mile shorter than the original LPA (9.5 miles in length) primarily because the Flower Street design option in Downtown Los Angeles is approximately 0.6 mile shorter than the Hill Street alignment. In addition, the revised LPA includes an interim station at Venice/Robertson that is located east of National Boulevard. Locating the interim station east of National Boulevard shortens the alignment by approximately 0.3 mile as compared to the original LPA station that is located west of Washington and National Boulevards.

TABLE 5.1-1: LENGTH OF TRACKWORK FOR MID-CITY/EXPOSITION LRT PROJECT (MILES)

	Original LPA	Revised LPA (Metro Staff Recommendation)
MID-CITY/EXPOSITION LRT		
New Track	7.9	7.3
Shared Track with Metro Blue Line	1.6	1.3
Total Project Length	**9.5**	**8.6**
MINIMUM OPERATING SEGMENT LENGTHS		
7th/Flower to Vermont Ave	4.2	3.5
7th/Flower to Crenshaw Blvd	6.6	6.0
7th/Flower to La Cienega Blvd	8.4	7.8

SOURCE: Metro June 2005

Table 5.1-2 provides the capital cost estimates for the Mid-City/Exposition Transit Corridor Original LPA and Revised LPA alternatives. Capital costs are broken out by construction category; additional costs for indirect costs, project contingency and escalation are also identified. Costs are expressed in Year of Expenditure dollars. Year of Expenditure dollars follow the project schedule that calls for an opening of revenue service in 2010, taking into account anticipated inflation (escalation) over approximately five years of project development and construction.

TABLE 5-2: CAPITAL COST ESTIMATE FOR MID-CITY/EXPOSITION LRT (IN YEAR OF EXPENDITURE MILLIONS OF DOLLARS)

Mid-City/Exposition LRT	Original LPA /a/	Revised LPA (Metro Staff Recommendation) /b/
Construction Elements (Guideway, Track, Stations, Systems,Yards/Shops, Special Conditions, Sitework, Art Program)	$283.8	$313.3
Right-of-Way, Land	$32.3	$33.3
Vehicles (16 Light Rail Vehicles)	$40.4	$40.4
Indirect Costs	$79.9	$79.9
Contingency	$65.3	$71.7
Escalation	$88.0	$96.2
Subtotal Year of Expenditure Dollars (millions)	**$589.9**	**$635.0**
Bikeway	$5.0	$5.0
TOTAL YEAR OF EXPENDITURE DOLLARS (millions)	**$594.9**	**$640.0**

/a/ Original LPA was adopted by the Metro Board of Directors in June 2001. It follows Hill Street in Downtown Los Angeles and includes grade separations at La Brea Avenue and La Cienega Boulevard.
/b/ The Revised LPA (Metro Staff Recommendation) follows Flower Street in Downtown Los Angeles and includes grade separations at Figueroa Street, La Brea Avenue, La Cienega Boulevard, and Jefferson Boulevard. The Venice/Robertson station design option is located east of National Boulevard on the existing ROW.

The 16 light rail vehicles included in the Mid-City/Exposition LRT Project cost reflect start-up operations, which are a part of the project's capital costs. Another 15 light rail vehicles are estimated to be needed once the Project's ridership builds and reaches maturity. In addition, while not reflected in the Project cost, anywhere from 45 to 109 buses (costing $16 to $38 million in 2005 dollars) may be needed to support the bus system that feeds the Mid-City/Exposition LRT Project. The bus feeder services are envisioned as a multi-phased implementation strategy and would be funded separately as part of the overall bus service plans for Metro and other applicable municipal operators.

A number of phased implementation segments have been identified for the Mid-City/Exposition LRT. **Table 5.1-3** provides total capital costs for each of the optional segments, as well as the full project. **Figure 5.1-1** provides an illustration of the alternative segments.

Figure 5.1-1 Phased Implementation Segments

TABLE 5.1-3: PHASED IMPLEMENTATION SEGMENTS		
PHASED IMPLEMENTATION ALTERNATIVE	Original LPA	Revised LPA
Vermont Station - Phased Implementation Segment	$231.5	$313.6
Crenshaw Station - Phased Implementation Segment Project Total including Bike Path	$342.0	$426.6
La Cienega Station - Phased Implementation Segment Project Total including Bike Path	$478.0	$557.0
Venice/Robertson Station - Locally Preferred Alternative Project Total including Bike Path	$594.9	$640.0
SOURCE: Metro, July 2005.		

Vehicle costs are based on calculated vehicle needs for each of the Phased Implementation Segments and the full project. **Table 5.1-4** presents the total vehicle needs for start-up, and once ridership reaches maturity.

TABLE 5.1-4: LRT VEHICLE REQUIREMENTS FOR MID-CITY/EXPOSITION LRT PROJECT		
Project Implementation Segment	Light Rail Vehicles Required at Start-Up (2010)	Light Rail Vehicles Required (2020)
Downtown LA to Vermont Station	8	17
Downtown LA to Crenshaw Station	12	24
Downtown LA to La Cienega Station	14	29
Full Project to Venice/Robertson Station	16	31
SOURCE: Manuel Padron & Associates 2005		

Budget Implications of Design Options. In April 2005 the Metro Board of Directors adopted a project budget of $640 million for the Mid-City/Exposition Transit Corridor. "5.1-3 Financial Capability to Build and Operate" describes the approved funding plan for the project including the types of combination of specific federal, state and local funds that are being committed to the proposed project.

Both the original LPA and the staff recommended revisions to the LPA have therefore been fiscally constrained to remain within the approved project budget. Design options that were described in Section 2.4 Description of LRT Build Alternative Considered in this Final EIS/EIR have therefore been screened for affordability within the approved budget. The following is a discussion of the budget considerations for the design options that have been considered in this Final EIS/EIR.

1. Downtown Los Angeles Design Options - The Flower Street Design Option was higher in cost than the Hill Street Couplet Design Option due primarily to required upgrades of the Flower Street Bridge over the I-110 Freeway to accommodate the addition of light rail tracks and a required undercrossing between Jefferson Boulevard and Trousdale Parkway.

In spite of the higher initial cost, staff is recommending the adoption of the Flower Street Design Option because of superior operating characteristics and lower environmental impacts. This routing is approximately 0.6 mile shorter than the Hill Street alignment and four minutes faster in total running time. The Flower Street area is more densely developed than the Hill Street area and future plans envision much more redevelopment activity along the Flower Street than along Hill Street. Development of the line along the Flower Street will support these economic development goals of the City of Los Angeles better than would the Hill Street alignment. Additionally, the Hill Street alignment was found have an adverse impact on parking. The only feasible mitigation to avoid an adverse impact to on-street parking was to operate the LRT vehicles in shared-use or streetcar mode along Hill Street in the

downtown area. The impacts of such an operation on LRT travel time and service reliability would be significant if such an operating scenario were required for the project. For these reasons, the Flower Street Design Option is considered better than the Hill Street Couplet and Hill Street alignment options, despite higher initial capital cost.

2. Flower Street Design Options at USC/Exposition Park - The University of Southern California has requested, and helped to fund, additional design studies to consider enhancements to the planned Flower Street Design Option. These studies have considered an extension of the proposed Flower Street Design Option undercrossing that would extend from Jefferson Boulevard to Trousdale Parkway. One enhancement would provide a roof covering with enhanced landscaping and architectural finishes to the currently proposed undercrossing. A second possible enhancement would extend the proposed undercrossing to the vicinity of Menlo Avenue and provide a similar roof covering with enhanced landscaping and architectural finishes.

Neither of the above design enhancements is included in the approved project budget. Since additional funding would need to be found outside of the approved project budget to provide for these improvements, neither has been recommended for inclusion in the recommended revised LPA.

3. La Cienega Station Parking Facility - The original LPA provides for the construction of a parking garage on the City of Los Angeles owned East Central Interceptor Sewer construction site located on the southeast corner of La Cienega Boulevard and Jefferson Boulevard. Funding for the parking facility has been included in the project budget for both the original LPA and the revised LPA assuming the site is made available by the City of Los Angeles at no cost to the Project. Because there is still some uncertainty regarding whether the City of Los Angeles will make this site available for use as a part of the proposed La Cienega LRT Station, an alternative site on the southwest corner of La Cienega Boulevard and Jefferson Boulevard has been identified as an alternative parking site. The alternate parking site would require the displacement and relocation of an existing public storage business and acquisition of a larger site than is proposed at the southeast corner. For this reason, the alternative parking site is considerably more expensive than the original LPA parking site.

No funds are available in the approved project budget if the existing parking site is unavailable and the alternative site is required for the project. Additional funding would need to be found for such a change in the project scope.

4. Jefferson Boulevard Grade Separation/Widening Options - The original LPA did not provide for a grade-separation at Jefferson Boulevard. The LRT line was proposed to be grade-separated at La Cienega Boulevard and return to grade just east of the Ballona Creek to cross Jefferson Boulevard at-grade and utilize the historic Pacific Electric railroad bridge to cross the Ballona Creek. In response to concerns from the cities of Los Angeles and Culver City, this crossing was further evaluated in the *LRT Grade Crossing Policy for Light Rail Transit* that was adopted by the Metro Board of Directors in December 2003. Although the analysis indicates that this intersection could operate safely with an at-grade crossing, the crossing occurs on a curve in the Jefferson Boulevard alignment at the intersection where Jefferson merges with National Boulevard. The geometry of this intersection reduces sight lines for motorists and requires complex geometric layouts for railroad crossing gates and traffic stop bars. Furthermore, grade separation of the LRT train can be more easily accomplished at this intersection that at most other crossings because of the nearby grade-separation that is planned for La Cienega Boulevard. The planned aerial guideway structure at La Cienega will already be elevated and extending an existing aerial guideway is easier to accomplish than would be the case if the line were at-grade.

The extension of the aerial guideway segment to the west side of the Ballona Creek would provide significant benefit to the travel times of the light rail vehicles and would reduce impact to traffic in the

vicinity of the Jefferson crossing. For these reasons, staff has included the Jefferson Boulevard grade-separation in the revised LPA.

Also at Jefferson Boulevard, there are two street widening options to mitigate traffic impacts. The northside widening option would require the displacement of three businesses on the north side of Jefferson Boulevard between La Cienega Boulevard and La Cienega Place in order to widen Jefferson Boulevard by 14 feet. The south widening option would not require the displacement of these businesses but would require that a much more costly aerial structure be built to allow the LRT guideway to be elevated on structural columns instead of retained earth thereby allowing the required new traffic lanes on Jefferson Boulevard to be built on Metro-owned land under the aerial LRT structure. A review of the costs of these two options has revealed that the north side widening would be less costly than the southside widening and would therefore be more affordable within the approved project budget. For this reason, the north side widening is included in the scope of both the original LPA and the Revised LPA. Additional funding would be required if a scope change were made to select the southside widening.

5. Venice/Robertson Station Design Options - The original LPA that was approved in June 2001 at Venice/Robertson Station included at an at-grade station platform and at-grade crossings of Washington and National Boulevards. In December 2003 the Metro Board approved the *Grade Crossing Policy for Light Rail Transit* and used the policy to re-evaluate the need for grade separation at the Venice/Robertson Station. The recommendation at that time was to provide an interim at-grade station in accordance with the original LPA but not preclude a future grade-separation at the time when the line is extended to the west across Venice Boulevard in the future. Culver City has supported the future grade-separation of Venice Boulevard but has maintained that an interim at-grade crossing of Washington and National Boulevards would not be acceptable due to traffic impacts of the LRT crossing. The Final EIS/EIR traffic impact analysis has re-evaluated the Washington and National Boulevard at-grade crossings and determined that such crossings would be feasible, but only if National Boulevard is widened to accommodate additional lanes.

In response to the above concerns of the City of Culver City, three design options have been developed that would not require at-grade LRT crossings of Washington and National Boulevards. The first design option would provide an aerial grade-separation and aerial station. The second design option would locate the Venice/Robertson Station east of National Boulevard on the site of an existing lumber/roofing supply business at the southeast corner of Washington and National Boulevards. This option would require the taking of an existing business but would allow an at-grade station to be built that would not need to cross either Washington or National Boulevards. A third design option was also developed the would locate the Venice/Robertson Station east of National Boulevard on the Metro railroad right-of-way in the vicinity of Wesley Street. This option would not require the taking of any private businesses and would allow an at-grade station to be built that would not require track crossings of either Washington or National Boulevards.

Of the four station options considered for the Venice/Robertson Station, only one of the options would be affordable within the approved project budget of $640 million. This is the option that would locate an interim, at-grade station east of National Boulevard on the Metro right-of-way near Wesley Street. For the reason, the recommended revised LPA includes the east of National Boulevard interim Station as the recommended design option for the Venice/Robertson Station. If the baseline LPA interim at-grade crossing, the aerial station design option or the north of right-of way interim design option were to be adopted, additional funding outside of the currently approved project budget would be required.

5.1.2 OPERATIONS AND MAINTENANCE (O&M) COSTS

O&M costs for rail operations and bus operations are discussed in the following section.

5.1.2.1 Rail O&M Costs

O&M costs to operate the Mid-City/Exposition LRT Project were determined using a cost build-up method derived from existing Metro staffing levels, organizational policy, productivity factors, and material consumption rates. LRT O&M costs are calculated for five categories:

- Staffing
- Utilities
- Risk management
- Contract services
- Materials and supplies

Staffing costs were calculated by assessing current staffing levels for other Metro rail lines and applying them to the Mid-City/Exposition LRT Line. It was assumed that management positions would be similar to those for other Metro light rail lines. For job classifications with a variable number of staffed positions, a driving variable was assigned to the number of employees in that job classification so that staffing needs would change with increases or decreases in service proportional to other Metro light rail lines. The driving variables to calculate Mid-City/Exposition LRT Project O&M costs include:

- Annual revenue train hours
- Peak vehicles
- Route miles
- Passengers (for revenue collection functions only)

Utility costs, mostly to power light rail vehicles, were estimated by multiplying the cost of energy consumption (in terms of cost per Kilowatt Hour) for other Metro light rail lines with the estimated number of vehicle miles to be operated on the Mid-City/Exposition LRT Project.

Risk management costs -- which include uninsured losses (workers compensation), property claims, passenger claims, physical damage premiums, and property liability and property damage premiums — were calculated using actual claims experience for Metro. These rates include the cost per property claim per light rail vehicle mile and the number of incidents per passenger trip. Both rates are multiplied with estimated Mid-City/Exposition LRT Project vehicle miles and passenger trips to estimate risk management costs.

Contracted services include security/fare inspection, revenue equipment maintenance, and other contracted services. Security/fare inspection costs were estimated based on current contracts that Metro has with the Los Angeles County Sheriff's Department using a deployment plan similar to that for the Gold Line. Revenue equipment maintenance costs were derived from actual Metro cost experience for other rail lines applied to the estimated number of ticket vending machines and ticket validation machines estimated for the Mid-City/Exposition LRT Project (one machine for each station). Other contract services costs were estimated as ten percent of other estimated project costs.

Material and supply costs were estimated based on actual Metro consumption rates and then applied to the Project. Costs were estimated separately for fuel and lubricants, and tires and other material. Unit costs based on consumption rates for these two categories were multiplied with estimated Project vehicle miles to determine costs. The operating and maintenance cost shown in **Table 5.1-5** represents the

operating cost after the line has been open for several years and has a 25-vehicle light rail fleet. The initial year operating cost with the opening fleet of 16 light rail vehicles would be somewhat lower.

TABLE 5.1-5: RAIL OPERATING & MAINTENANCE COST FOR MID-CITY/EXPOSITION LRT PROJECT

Cost Element	2005 Dollars (millions)
Staffing	$11.9
Utilities	$1.9
Risk Management	$1.2
Contract Services	$6.0
Materials and Supplies	$1.5
Subtotal	**$22.5**
Contingency (10%)	$2.3
TOTAL	**$24.8**

SOURCE: Metro, 2005

Average annual costs to operate the Mid-City/Exposition LRT Project are estimated to be $24.8 million (in 2005 dollars).[1]

5.1.2.2 Bus O&M Costs

Bus-related O&M costs are associated with any modifications to bus service that occur due to the introduction of the Mid-City/Exposition LRT. "3.1.2 Transit Operations Concept" describes the bus service concept assumed for No Action, a Transportation Systems Management Alternative (TSM Alternative), and the LRT Build Alternative.

While the bus service concept assigns routes to either the Metro, Los Angeles Department of Transportation (LADOT), Santa Monica Municipal Bus Lines, or Culver City Municipal Bus Lines, it should be noted that no determination has been made regarding which operator would provide these routes, and the extent to which the full bus service concept would be implemented. The actual implementation of these assumed route modifications is at the discretion of each individual operator. As noted earlier, bus feeder services are envisioned as a multi-phased implementation strategy. Each operator would define which components of the bus feeder system would be initiated when the Project first opens, and successive improvements/modifications would be evaluated and implemented as ridership matures.

Metro (Metro) Bus O&M Costs. Bus O&M costs were determined using the Metro O&M cost model that estimates staffing requirements, labor costs, and non-labor expenses. The model is calibrated to Metro's fiscal year (FY) 2000-01 Adopted Budget[2].

The model calculates costs separately for each labor and non-labor item in Metro's FY 2001 budget. The driving variables to calculate bus O&M costs include:

- Annual boardings (unlinked passengers)
- Peak and total fleet vehicles
- Operating divisions
- Annual revenue bus miles

[1]After the Mid-City/Exposition LRT Revenue Operations Date, and integration of the line into the Metro light rail network and total county-wide system, additional overhead costs may be included in the operating budget for the line.

[2]Los Angeles County Metropolitan Transportation Authority. Fiscal 2000-2001 Adopted Budget. June 2000.

- Annual revenue vehicle hours
- Contract/BDOF service hours.

The Metro transportation demand model generates most of these bus input statistics for Year 2020.

For each alternative, Metro Bus O&M costs were calculated. To convert from 2001 dollars to 2004 dollars, an inflation factor of 1.095 was used based on a 2.9 percent growth rate in FY2002, a 3.3 percent growth rate in FY2003, and a 3.01 percent growth rate in FY2004 (based on UCLA economic data used by Metro).

Bus O&M Costs for Other Municipal Operators. If service provided by another municipal operator is affected, incremental service statistics such as annual revenue vehicle hours and fleet size are reported based on output from the Metro transportation simulation model. Three other operators besides Metro potentially are affected by proposed modifications to transit service for this study corridor: Los Angeles Department of Transportation (LADOT), Santa Monica Municipal Bus Lines, and Culver City Municipal Bus Lines. O&M cost estimates for these municipal operators are based on multiplying the incremental annual revenue vehicle hours by the municipal operator's operating expense per revenue vehicle hour.

The assumed operating cost per revenue vehicle hour is based on what is reported in the 2001 National Transit Database for each of these municipal operators. To convert from 2001 to 2005 dollars, an inflation factor of 1.129 is used, based on a 2.9 percent growth rate in FY2002, a 3.3 percent growth rate in FY2003, a 2.58 growth rate in FY2004, and a 3.53 percent growth rate for FY2005 (based on UCLA economic data used by Metro).

TABLE 5.1-6: OPERATING COST PER VEHICLE HOUR FOR MUNICIPAL OPERATORS

Municipal Operator	Operating Cost per Vehicle Hour/a/ (2001 Dollars)	Operating Cost per Vehicle Hour2/b/ (2005 Dollars)
Santa Monica Municipal Bus Lines	$67.21	$75.88
Culver City Municipal Bus	$72.45	$81.79
LADOT	$57.81	$65.27

/a/ From 2001 National Transit Database
/b/Escalation factor provided by Metro (UCLA Economic Forecast 2005)
SOURCE: 2001 National Transit Database; Metro 2005.

O&M costs were estimated for No Action, the TSM Alternative, and the Mid-City/Exposition LRT Build Alternative. The cost of the TSM Alternative is representative of a future bus network without the LRT Project.

As discussed in "5.2.1 Ridership" LRT ridership is still strong whether the bus feeder network is provided at the level defined for the TSM Alternative, or as defined for the LRT Build Alternative. Therefore, the bus O&M costs associated with the Mid-City/Exposition LRT Project is provided as a range. The lower end of the range is determined by comparing TSM total O&M costs against No Action. The upper end of the range is determined by comparing the LRT feeder bus network defined for the Exposition LRT total O&M costs against No Action. **Table 5.1-7** reports this range of incremental annual bus O&M costs for the Mid-City/Exposition LRT Project for Metro and other municipal operator services.

TABLE 5.1-7: ANNUAL BUS O&M COST (IN 2005 $ MILLIONS)	
Operator	**2005 Dollars (Millions)**
Metro (Bus)	$4.0 to $8.8
LADOT	-$3.3 to $0.0
Santa Monica Municipal Bus Lines	$3.3 to $16.8
Culver City Municipal Bus Lines	$1.1 to $10.7
TOTAL BUS O&M COST	$8.4 to $33.1
SOURCE: Manuel Padron & Associates, 2005	

For the Mid-City/Exposition LRT Project, Metro O&M bus costs could increase from $4 to $8.8 million to modify Metro bus service to best complement the Mid-City/Exposition LRT service. Other assumed modifications to Culver City, LADOT and Santa Monica bus services add anywhere from $4 to $24 million compared to No Build. Potential elimination or truncation of LADOT routes allows a possible reduction in LADOT's O&M cost.

As stated earlier, the actual implementation of these assumed route modifications is at the discretion of each individual operator. Bus feeder services are envisioned as a multi-phased implementation strategy. Each operator would define which components of the bus feeder system would be initiated when the Project first opens, and successive improvements/modifications would be evaluated and implemented as ridership matures.

5.1.3 FINANCIAL CAPABILITY TO BUILD AND OPERATE

In April 2005, the Metro Board of Directors adopted a project funding plan, which no longer relies on federal discretionary Section 5309 New Starts funds. Instead, Metro has identified alternate local and federal funding sources to provide for the project's implementation. The adopted project funding plan is within Metro's financial capacity to build and operate.

Table 5.1-8 lists the anticipated source of capital funds and the expected amount (in future years of expenditure dollars) for the Mid-City/Exposition LRT Project. Under this plan, the majority of funds (60 percent) come from Local sources, with 38 percent expected from Federal sources and about 2 percent provided by State sources.

TABLE 5.1-8: PROPOSED FUNDING PLAN FOR MID-CITY/EXPOSITION LRT PROJECT		
	Year of Expenditure Dollars 2003-2012 (Millions)	
Funding Source	**Amount**	**Total**
Transportation Enhancement Act Funds (TEA) Section 5309 Bus Facilities/Other Discretionary Allocations Congestion Mitigation & Air Quality Funds (CMAQ)	$13.6 $15.0 $215.0	
Subtotal Federal Sources		$243.6 (38%)
Traffic Congestion Relief Program (TCRP)		
Subtotal State Sources	$11.0	$11.0 (2%)
Proposition C 10% Proposition C 25% Local Contribution from Others	$4.2 $331.2 $50.0	
Subtotal Local Sources		$385.4 (60%)
TOTAL (ALL FUNDING SOURCES)	**$640.0**	**$640.0 (100%)**
SOURCE: Metro Full Funding Plan, April 2005.		

5.2 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section provides a discussion of the relative benefits of the project compared to No Action. Where applicable, analysis is provided for variations between the various design options for the Mid-City/Exposition LRT project.

Analysis is provided for the following measures:

- Ridership
- Travel Time Savings
- Equity (discussion of demographic factors)

Other analysis for measures related to air quality and transit supportive land use can be found in Sections 4.1 Land Use/Neighborhoods and 4.5 Air Quality. This chapter ends with a synthesis of trade-offs between the alternatives.

5.2.1 RIDERSHIP

Ridership is an indicator of improved mobility in the study corridor. Ridership describes the amount of people using any one of the Project alternatives, as estimated through a transportation demand model. For all Project alternatives, ridership is a function of travel time and cost. All else being equal, the faster technologies attract more riders. Longer segments have higher ridership because they serve a larger area, incorporate more stations, and potentially reduce transfers. Alignment choice also affects ridership, as does the amount of delay at intersections, which is affected by the amount of signal priority that can be assumed for an alternative.

Ridership has been estimated for each alternative through the Metro's travel simulation model, year 2020. Individual model runs were performed for the following scenarios:

No Action
Transportation Systems Management (TSM)
Light Rail Transit Build Alternative

The projected ridership for each alternative is shown on **Table 5.2-1** below. The "Daily Fixed Guideway Boardings" column represents the number of passengers expected to use the system within the Study Area, that is, board and disembark at stations constructed as part of the Mid-City/Exposition LRT Project. While boardings give an indication of transit activity, these numbers should not be used in trying to assess how many more riders are attracted to transit. Riders may merely be shifting off other bus and rail routes or a single rider may need to transfer one or more times, accounting for more than one boarding to complete a single trip. The estimate of new transit riders is set forth in the column entitled "Incremental Trips (Daily)," which is the appropriate measure for determining the number of additional transit riders, since this measure deals with "linked" (end-to-end) trips, for people who were not previously using transit. New transit riders are reported for each alternative as increments over the No Action alternative and TSM alternative, which provides enhanced bus services as described in "3.1.2 Transit Operations Concept."

The No Build Alternative traditionally represents the conditions in the future year (2020 and 2025) with no changes over existing conditions other than small changes that have already been approved for implementation but have not yet been put into operation. In the case of the Mid-City/Exposition Transit Corridor, the No Build Alternative includes a significant amount of new transit service, representing the full implementation of the Metro Rapid Program that was approved by the Metro Board of Directors for implementation countywide between 2003-2008. Within the Project Corridor, several new Metro Rapid

lines either have already been implemented, or will be implemented in the next few years. Metro Rapid service will be implemented at many locations that would be served by the LRT Build Alternative, including Vermont Avenue, Western Avenue, Crenshaw Boulevard and La Cienega Boulevard.

TABLE 5.2-1: RIDERSHIP IN YEAR 2020

Alternative	Daily Fixed Guideway Boardings	Incremental Linked Trips (Daily)	
		To No Action	To TSM
TSM Alternative	N/A	2,000	N/A
LRT Build Alternative	43,600	22,200	20,200

SOURCE: Metro Transportation Demand Model 2003

The TSM alternative (which makes improvements to the future No Build Alternative and provides some additional Metro Rapid bus service in the Exposition corridor above the Board approved levels contained in the No Action Alternative) would lead to relatively modest additional increases in new ridership, with about 2,000 additional daily transit riders when compared to the No Action Alternative. This is expected because most of the Metro Rapid Program has already been included in the Year 2020 and 2025 No Action Alternative. The LRT Build Alternative would provided some further improvements to bus service, by providing transfer stations between existing lines and the proposed LRT Project. It would also consolidate the West Los Angeles Transit Center at the planned La Cienega and Venice/Robertson LRT Stations, thereby providing further improvements to the feeder bus network. Based on the above, the LRT Build Alternative would have greater potential to attract new ridership than the TSM Alternative, adding over 22,000 new daily transit trips compared to No Action and 20,200 new daily transit trips compared to TSM.

Metro has subsequently prepared updated estimates for year 2025. **Table 5.2-2** presents daily fixed guideway boardings as updated for the Year 2025 (see also discussion in Section 3.1 Transit and Table 3.1-8). Estimates are similar but somewhat reduced compared to the Forecast Year 2020 results. Estimated boardings for the phased implementation options to La Cienega, Crenshaw, and Vermont Stations are also included.

TABLE 5.2-2: DAILY FIXED GUIDEWAY BOARDINGS FOR YEAR 2025

	Average Boardings/Day
LRT to Venice Blvd./Robertson	42,900
LRT to La Cienega Station (Phased Implementation)	39,400
LRT to Crenshaw Station (Phased Implementation)	28,300
LRT to Vermont Station (Phased Implementation)	18,100

SOURCE: Metro Trasportation Demand Model, July 2004 and October 2004; MPA, 2005.

Average boardings per day are based on the bus feeder network as described in Section 3.1.2 "3.1.2 Transit Operations Concept".

Daily Boardings Based on Different Feeder Bus Assumptions. An additional model run was performed to determine the effect on the LRT Build Alternative boardings if a less aggressive bus feeder network was assumed. To test how the project would perform with a less extensive bus feeder network, Metro performed a sensitivity model run (based on Year 2025) which used the bus transit network defined in the TSM Alternative, simply by adding the Mid-City/Exposition LRT line to this transit network with no further modifications (see "3.1.2 Transit Operations Concept" for discussion of TSM bus network). The TSM bus feeder network was not designed to provide bus stations immediately adjacent to the proposed fixed guideway, so this method exaggerates the impact on ridership; however, it is useful as a

demonstration of the general effect of reducing the bus feeder system to a more modest component of the proposed LRT Build Alternative.

The sensitivity model run showed that when the bus feeder system was reduced to the levels contained in the TSM Alternative, average weekday boardings on the LRT fixed guideway were estimated to be 41,800, which is a minor reduction of about 2 percent from the 42,900 daily boardings based on the full feeder bus plan.

Daily Boardings Based on Different Downtown Los Angeles Connections. Ridership runs used the LPA alignment as the route represented in the transportation demand model. The Hill Street Couplet and Flower Street alignment variations are geographically close enough to the LPA to not have an appreciable effect on the way the alternative is modeled. However, these alignments lead to minor variations in travel time, which could have an effect on ridership.

Previous model runs completed for this corridor used two travel times, which vary by about three minutes (or about an 11 percent difference in end-to-end run time). The difference in boardings is about 3 percent that is an 11 percent increase in travel time leads to about a 3 percent decrease in boardings.

As discussed in more detail in the following section on travel time comparison, the downtown design options have similar run times, though the Flower Street design option is about three minutes faster than the Hill Street alternatives (LPA and Hill Street Couplet). Since the travel time of the Flower Street design option most closely matches what was coded in the travel demand model, it is reasonable to anticipate that the slower travel times on the Hill Street options would lead to somewhat fewer boardings, on the order of about three percent. This translates to about 1,300 to 1,500 fewer boardings.

5.2.2 TRAVEL TIME COMPARISON

Change in travel time is another indicator of improved mobility in the study corridor. A travel time comparison of average speeds and overall travel times provide an understanding of how the transit alternatives perform during an average trip between two points.

Table 5.2-3 compares the runtimes, average speed, and headways for the Project alternatives. This table provides a direct comparison of these selected service characteristics. Depending on the mode of transit, different models are used to calculate the runtimes. Bus runtimes are estimated through the use of the travel demand model, where bus speeds are a function of highway speeds. Rail runtimes are calculated using an algorithm that accounts for maximum speed, geometry, distance between stops, acceleration/deceleration near stops, dwell times at stops, and average delay expected at intersections.

TABLE 5.2-3: COMPARISON OF TRAVEL TIME CHARACTERISTICS

Alternative	Total Runtime (minutes)	Average Speed (mph)	Peak Period, Base Headways (minutes)
TSM (rapid bus on Jefferson Blvd.)	42 (Downtown L.A.-WLA Transit Ctr.)	13	5, 10
LRT Build Alternative	27 - 31 (Downtown L.A.-Venice/Robertson)	19 - 20	5, 10

SOURCE: Manuel Padron & Associates, Metro Transportation Demand Model 2003, forecast year 2020

Travel times for the Mid-City/Exposition LRT Project, based on each of the downtown Los Angeles design options, are detailed in **Table 5.2-4.**

TABLE 5.2-4: MID-CITY/EXPOSITION LRT DESIGN OPTIONS - TRAVEL TIMES (IN MINUTES) YR 2020			
LRT Route Segment	Hill Street LPA	Hill Street Couplet	Flower Street Option
Downtown LA to Vermont	17 min	16 min	13 min
Downtown LA to Crenshaw	24 min	23 min	20 min
Downtown LA to La Cienega	28 min	27 min	24 min
Full Project to Venice/Robertson	31 min	30 min	27 min
SOURCE: Booz Allen Hamilton, November 2004.			

The LPA and Hill Street Couplet options have a similar calculated end-to-end travel time of about 30 minutes. The Flower Street alternative allows a reduced travel time of about 27 minutes.

5.2.3 EQUITY

For purposes of this analysis, and consistent with the Reference Manual, National Transit Institute Training Program for Major Investment Studies (National Training Institute and Parsons Brinckerhoff Quade & Douglas, 1995[3]), equity refers to the relative relationship of costs and benefits for a Project alternative. Equity considerations generally fall into three interrelated classes: (1) the extent to which the transportation investments improve transportation service to various population segments (i.e., the extent to which transit improvements benefit the transit dependent); (2) the distribution of Project costs across the population through the funding mechanisms used for the local contribution for construction and operation; and (3) the incidence of significant environmental impacts.

All of the analysis conducted for the Mid-City/Westside Transit Corridor Project, including the Re-Evaluation/Major Investment Study Report (Metro, 2000), as well as Chapter 1.0 Purpose and Need, and Section 4.3 Environmental Justice, and Socioeconomics sections of this document, indicate that the Study Area warrants a significant investment for transit investments, as supported by the following facts:

The Need for Transit Improvements has been Established in Previous Studies. Providing high-capacity transit service improvement has been long recognized in the Mid-City/Westside Area. Since the 1970s, the Metro and its predecessors (SCRTD, LACTC) have conducted numerous transportation planning and environmental impact studies that establish the need and feasible locations for either bus, light rail and/or heavy rail east-west service in various parts of the Study Area. There is substantial peak hour congestion in the northern portion of the Study Area. Vehicular travel to the East and West San Fernando Valleys must ultimately pass through the Sepulveda or Cahuenga passes. Access patterns to these routes are congested during the peak travel hours as motorists attempt to pass northward at either the western or eastern ends of the Study Area.

Study Area Contains A Major Concentration of Activity Centers and Destinations. The area contains the largest concentration of major activity centers and destinations within the Los Angeles metropolitan region. Many of these centers are located within the most congested portion of the Study Area north of the Santa Monica Freeway (I-10) and east of the San Diego Freeway (I-405).

The "Centers Concept" Land Use Policy is Transit Based. Land use policies in the Los Angeles metropolitan region have traditionally been founded upon the framework that access to major activity centers would be facilitated through a network of transit connections. The recently completed Los

[3]Pursuant ot Guidelines 15150, the reference manual National Transit Institute Training Program for Major Capital Investment Studies is incorporated herewith as set forth in full. A copy of the document is available for review in Metro's Library at Metro Headquarters.

Angeles General Plan Framework reinforces this concept as a continuing policy framework for the City of Los Angeles. New growth is planned and encouraged to occur only in areas that are served by transit.

There is an Existing Concentration of Transit Supporting Land Uses. The existing activity centers in the Study Area are a central part of a large concentration of land uses that are considered to be transit supporting (high-density housing, commercial and retail). In fact, roughly 30 percent of the land area within the Study Area falls into this category. Patterns of transit supporting land uses are concentrated along the Santa Monica/Wilshire Boulevards corridors. A lesser concentration is evident along a southern oriented Venice Boulevard corridor.

High Study Area Population and Employment Densities Support Transit. Population and employment densities in the Study Area are the highest within the metropolitan region, averaging approximately 13,883 persons per square mile and 9,167 employees per square mile.

There is a History of Transit Usage in the Study Area. Existing transit usage within the Study Area is proportionally higher than any other area in Los Angeles County (13.64 percent for the study area versus 6.8 percent for the County). Because there is a large base of existing transit service and transit patrons, increasing the transit mode share through increased service represents a natural extension of existing patterns and trends.

There is a Significant Transit Dependent Population in the Study Area. Part of the underlying reason for high transit usage in the Study Area is that a significant number of households do not own an automobile and have low incomes. According to the 1990 Census, approximately 18.33 percent of households did not have a vehicle compared to 10.90 percent for the County. The majority of these households are concentrated in the eastern and northeastern portion of the Study Area. In addition, in 1990, 20.91 percent of the population of the Study Area was below poverty status compared to 14.76 percent in the County.

The Study Area Is Expected to Continue to Capture a Large Share of Regional Population and Employment Growth. Population and employment forecasts to the year 2020 adopted by the Southern California Association of Governments clearly suggest that the Study Area will capture a large share of growth over the next 20 years. This growth will place further demands on transit service, as well as result in increasing congestion on local roadways and regional highways serving the Study Area.

Continued Growth in the Business Services Sector (Entertainment and Media Related) Underlies the Future Development Potential in the Study Area. Growth in the Study Area will continue to be fueled by the fact that entertainment and media-related businesses are concentrating in the western part of the corridor. Currently, the Study Area is the center of approximately one-third of all new office construction underway in Los Angeles County, which makes it the largest office market in Los Angeles. Real estate analysts expect that the demand for production and creative spaces will continue to be robust. The industries and businesses that are attracted to the Study Area are those that are expected to be the foundation of the local and regional economy for many years into the future.

There are Substantial East-West Travel Patterns that are Not Currently Served by a High Capacity Transit System. Travel patterns currently indicate that the Study Area is a primary attraction for work trips with origins in the West and East San Fernando Valleys. A simplified "spider network" of travel patterns derived from origin-destination data in the Metro travel model suggests north-south travel patterns from the San Fernando Valley convert to east-west demand within the Study Area. The spider network for 1997 and 2020 conditions both indicate there is strong east-west travel demand along major east-west corridors: Santa Monica Boulevard, Wilshire Boulevard, Santa Monica Freeway and Exposition/Venice Boulevards. None of these corridors are currently served by a high capacity transit system, with the exception of Metro Red Line partially serving Wilshire Boulevard.

Local Policies are Oriented Toward Demand Management and Transit Solutions rather than on Physical Roadway Improvements. Because of the level of buildout and density within the Study Area, local jurisdictions have generally determined through their local policies that congestion relief improvements should focus on travel demand management rather than on physical improvements such as widening and new roadways. In a number of cases, local communities desire to eliminate cut through and neighborhood traffic or to support more livable downtown or commercial areas, are supporting initiatives to limit roadway capacity or further slow traffic flow; thus leaving transit improvements as one of the only viable remaining alternatives to reduce traffic volumes and congestion-related delays.

The benefits of installing an improved public transportation system to an area of target users outweighs potential negative environmental impacts. The majority of the Census Block Groups identified as high minority and low-income overlap within the Exposition route, indicating distinct patterns of correlation and possible disproportionality with regard to minority populations and low-income populations and their socioeconomic conditions. As a whole, the Exposition Corridor contains a large low-income and minority population, specifically concentrated near the stations located between 7th/Flower Street and La Cienega Boulevard.

Because the Exposition Corridor contains a disproportionately high concentration of both low-income and minority households, the physical and environmental impacts associated with the proposed alternatives using the Exposition Corridor would disproportionately affect those households. Evaluation of the possible Metro transit routes was based largely on lands owned by the Metro. The right-of-way proposed for use with the Exposition alternatives is currently owned and operated by the Metro and allows the alternatives to be fiscally feasible. Public transportation projects are beneficial to low-income households because of the reliance those individuals have on public transit for mobility. The Project would result in greater access into and out of the Exposition Corridor via public transit. Furthermore, the Project's design characteristics and applicable mitigation measures would eliminate nearly all impacts related to noise or traffic. These impacts do not outweigh the benefits of installing an improved public transportation system to an area of target users.

5.2.4 TRADEOFFS AMONG ALTERNATIVES

The No Action Alternative would not achieve an enhanced level of mobility and accessibility to communities along a route that contain disproportionately high concentrations of low-income and minority households. Additionally, it would not provide alternative transportation to vehicular travel and therefore, would not contribute to lowering pollutant emissions, as the Project would. While a TSM alternative improves transit service, it would still limit the ability to significantly improve ridership and would not take advantage of economic development opportunities that could occur at station areas associated with a major investment in a transportation facility.

The LRT Build Alternative would provide improved access to a broader range of employment, shopping, educational and cultural opportunities since it would tie these communities into the regional rail transit network as well as making important intermodal connections and transit hubs. Currently, there are over three-billion dollars worth of development activities occurring within walking distance to a Mid-City/Exposition LRT station along the Project's alignment. When compared to alternative options, the Project's higher carrying capacity, availability and operational reliability, and development potential around station areas would have a greater chance of being realized for transit-oriented land uses and improved economic opportunities. Greater benefits of economic sustainability and environmental sustainability would result because of the implementation of the Mid-City/Exposition LRT Project.