4.5 Transportation System Findings

4.5.1 Summary

This section contains cost estimates for the transportation system, including road and transit costs, and transportation operating costs for both the public and private sectors.

The road capital costs account for more than three-quarters of the total capital cost of transportation. Common capital costs for road facilities total $1,500 million and account for more than 80% of the road cost. The Trend Scenario has the largest set of unique road capital costs, $331 million; followed by the Balanced Scenario at $267 million and the Downtown Scenario at $260 million. This means that the Downtown Scenario road capital costs would be $71 million, or 21%, less than the Trend Scenario. The Balanced Scenario costs would be $64 million, or 19%, less than the Trend Scenario.

The transit system capital costs amount to approximately one-quarter of the total transportation capital costs. The majority of this cost is attributable to the cost of expanding the bus fleet and replacing buses on a regular basis. The common transit capital costs account for $39 million or one-eighth of the total transit capital costs. The Trend Scenario has the highest unique transit capital costs, totaling $284 million. The Balanced Scenario and the Downtown Scenario have unique transit capital costs of $210 million, 27% less than the costs of the Trend Scenario. While all three scenarios assume the same size bus fleet, the cost differences are attributable to the greater number of daily miles traveled by the buses in the Trend Scenario. This higher mileage translates into more frequent vehicle replacement and, hence, higher capital costs.

The total transportation capital cost would be more than $2 billion over the forecast period and more than 80% of these costs are common to all scenarios. The Trend Scenario has the highest unique transportation capital cost, which total $615 million. At $477 million, the Balanced Scenario unique transportation capital costs would be $138 million less than the Trend Scenario. At $470 million, the Downtown Scenario unique transportation capital costs would be $145 million less than the Trend Scenario.

Transportation operating costs that were estimated for the year 2020 included the public cost of transportation, the private cost of transportation, and a portion of the societal cost of transportation. Analysis of the 2020 transportation costs provides an estimate of how much change there is in the day-to-day transportation cost as a result of the different land use scenarios. The difference in the operating cost starts at $0 in the first year of analysis and grows to between $83 and $115 million per year by 2020. This is a difference of about 3% in the operational cost of transportation and is nearly equal to the difference in the capital cost over the entire analysis period. Estimates of the cumulative difference in transportation operating cost were not undertaken as part of this analysis; however, a simplified calculation of this cumulative value would place it at between $1 billion and $1.4 billion over a 25-year period.

Private vehicle operating costs are the largest portion, more than 49%, of the annual vehicle transportation operating costs. Total operating costs are highest in the Trend Scenario at $4.38 billion per year in 2020. The Balanced Scenario has the lowest cost at $4.26 billion per year in 2020. The Downtown Scenario is similar with a total of $4.29 billion per year.

Transit operating costs include both public and private costs. The private costs are the fares that are paid by the riders of the system, and the public costs represent the costs paid by other governmental sources. Transit operating costs are the smallest portion of the annual transportation cost, totaling less than 1% of the total annual transportation operating costs. Transit costs are directly related to the level of service provided. Accordingly, the Trend Scenario has the highest annual operating costs, which total $37 million per year for both public and private costs. The Downtown and Balanced Scenarios have operating costs totaling $35 million per year.

The one societal cost of transportation that was estimated is the cost of air pollution. Air quality costs are directly related to the number of vehicle miles traveled and are largely comprised of private costs such as increased public health costs associated with dust and other airborne pollutants. The lowest societal costs are in the Downtown Scenario, which total $524 million per year. The Balanced Scenario has costs that total $525 million per year. The Trend Scenario has societal costs that total $540 million per year. The costs for the Trend Scenario are 2.8% higher than the costs for the Downtown and the Balanced Scenarios.

One other portion of the full cost of travel was estimated, the annual cost of travel time in private vehicles. The cost of travel time accounts for approximately one-third of the annual operational cost of travel. The lowest cost of travel time occurs in the Balanced Scenario, which totals $1.597 billion per year in 2020. The Downtown Scenario cost of travel time totals $1.636 billion in 2020, or 2% more than the Balanced Scenario. The Trend Scenario has the highest cost at $1.639 billion in 2020 (Table 70 (pg.160).

4.5.2 Introduction

In the sections that follow, we will evaluate the study area's existing roadway capacity and the extent to which that capacity is currently being used. Second, we will quantify the transportation costs associated with the implementation of each of three growth scenarios. We divided the costs associated with each growth scenario further by where they were located within the three service areas.

Westside roadways

Focusing on roadway infrastructure conditions and needs, we exclude pedestrian and bicycle improvements at this time, although the MRGCOG has issued plans

Table 70 Transportation Costs by Scenario, $ Millions

Road Capital Costs	Scenario: Trend	Balanced	Downtown
Common Capital Costs	$1,500	$1,500	$1,500
Unique Scenario Costs	$331	$267	260
Total in Millions	$1,831	$1,767	$1,760
Difference from Trend		$(64)	$(71)
Transit System Capital Cost			
Common Capital Costs	$39	$39	$39
Unique Scenario Costs	$284	$210	$210
Total in Millions	$323	$249	$249
Difference from Trend		$(74)	$(74)
Total Transportation Capital Cost			
Common Capital Costs	$1,814	$1,814	$1,814
Unique Scenario Costs	$615	$477	$470
Total in Millions	$2,429	$2,291	$2,284
Difference from Trend		$(138)	$(145)
2020 Annual Vehicle Transportation Operating Cost			
Annual Private Vehicle Cost	$2,162	$2,105	$2,099
Annual Public Transit Costs	25.8	24.6	24.6
Annual Private Transit Costs	11.0	10.5	10.5
Annual Private Cost of Travel Time	$1,639	$1,597	$1,636
Societal Costs	$540	$525	$524
Total Annual Operating Cost in Millions	$4,377	$4,262	$4,294
Difference from Trend		$(115)	$(83)

Source: Parsons Brinckerhoff

and cost estimates for such improvements. We consider these costs common to all three scenarios. See section 4.5.7 for further discussions of non-motorized travel demand. Subsequently, we offer findings regarding public transportation costs that draw from separate studies on the costs of providing bus services to the Middle Rio Grande region.

Next, this section contains an estimate of the annual operating cost of the transportation system. This cost estimate includes the total private cost of vehicle operation in the County as well as public road and transit cost. Finally, this section looks briefly at one of the societal costs of vehicle operation, air pollution. This cost is also included in the summary of cost for transportation.

4.5.3 Existing Capacity Analysis

Data on the existing capacity of the study area's major roads (those classified as collectors or above) and the traffic volumes carried were obtained from the Public Works Division of Bernalillo County. The most recent data available were for the year 1995. Figure 39(pg.163) shows graphically the volume-to-capacity (V/C) ratios for the evening peak hour. Roadways with excess capacity is shown in dark green, which signifies that V/C ratios are less than 0.9. Light green colored roadways have V/C ratios between 0.9–1.0, which while technically under capacity, are likely operating at a level-of-service "E," which is considered unacceptable by both the City's and County's standards. Pink (V/C of 1.0–1.3) and red (V/C over 1.3) roadways are currently operating over capacity in the evening peak hour.

Roadways with Excess Capacity

The preponderance of green on Figure 39 signifies that the majority of roads within the study area are currently operating below capacity. Outside the Water Service Area, roads in the South Valley as well as I–40 and I–25 currently have excess capacity. Within the Water Service Area, the roads in the Far Northeast Heights, South Valley, and West Side are also generally operating below capacity. In the 1960 City Boundary, most of the Northeast and Southeast Heights and Downtown roadways, as well as most of I–40, have low peak hour V/C ratios. However, excess capacity for the Interstates appears to have resulted from coding into the analysis a lower level-of-service capacity for these facilities. Consequently, the volume to capacity ratios reported probably are too liberal for the Interstate system.

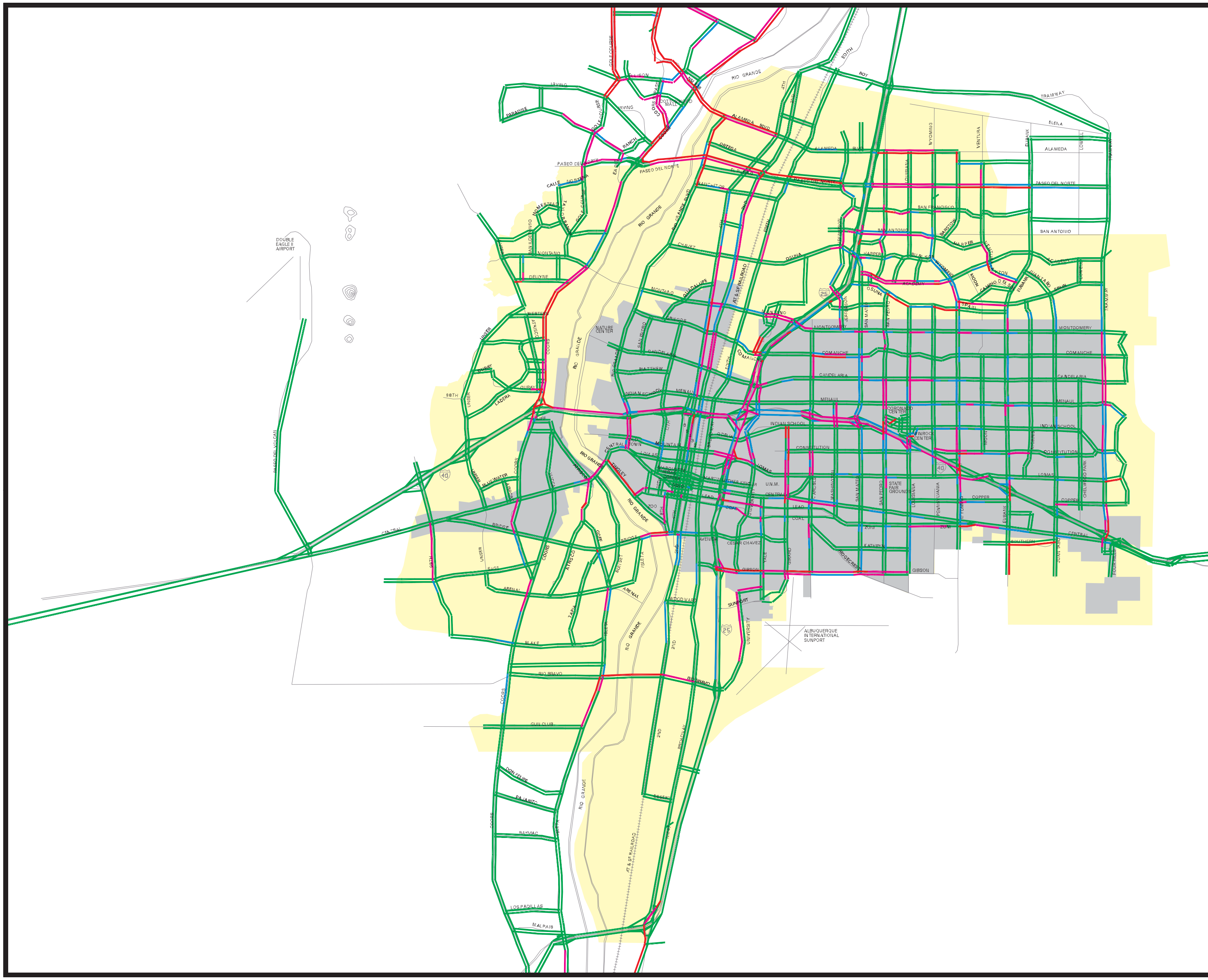
Roadways with Deficient Capacity

Isolated roadways and portions of roadways that are operating above capacity exist throughout the study area; however, larger groups of congested roadways appear on Figure 39 that deserve mention here. Outside the Water Service Area, the roadways operating over capacity are generally those linking Albuquerque to Rio Rancho and Corrales: Golf Course and Coors north of Paseo del Norte, Alameda west of Coors, and Corrales Road. Within the Water Service Area, the North Valley bridge crossings—Alameda and Paseo del Norte—are capacity deficient. Probably because the Montaño bridge was not constructed in 1995, Montaño is shown as operating below capacity in the 1995 evening peak; however, Coors from I–40 north to Montaño is shown over capacity. It is probable that the opening of the Montaño Bridge alleviated some of that congestion on Coors. Several of the roads just east of I–25, namely Alameda, Paseo del Norte, and Academy, are operating above capacity, as are many of the north-south streets in the North Valley—portions of 4th, 2nd, Edith, and Rio Grande. Both of these problem areas result from commuters leaving employment areas such as Downtown and the North I–25 corridor to travel home to neighborhoods in the North Valley and Northeast Heights. Within the 1960 City Boundary, the areas of congestion are more isolated: Gibson Boulevard, I–25 adjacent to the Big I, Tingley, and 4th and 2nd Streets, to name a few. The next section focuses on the costs of deficiencies and new construction.

4.5.4 Cost Analysis

The transportation costs associated with each growth scenario were broken down according to type: costs to mitigate future deficiencies on existing roads, costs to build new roads, and costs to rehabilitate and reconstruct existing roads.

Volume-to-capacity plots were developed for the year 2020 evening peak hour for each of the three growth scenarios and are shown in Figures 40–42 (pgs.165-169). Each scenario assumes that the improvements to mitigate future deficiencies and new construction projects identified in the sections below have been put in place.



1995 Peak P.M. Hour V/C Ratios

Legend

- < 0.9 V/C
- 0.9 to 1.0 V/C
- 1.0 to 1.3 V/C
- > 1.3 V/C

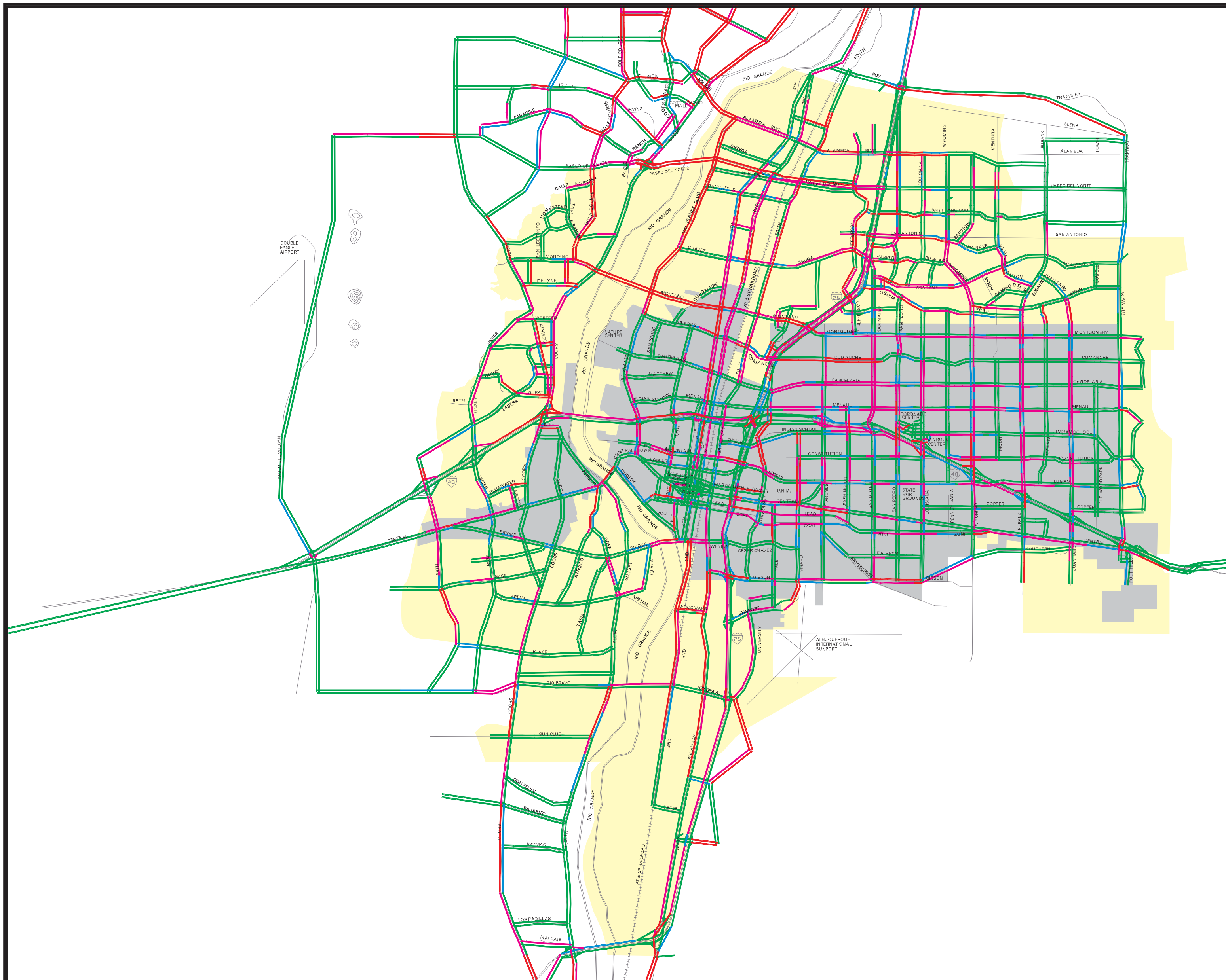
- 1960 City Limits
- Water Service Area

NORTH-SOUTH ROADWAYS
Rightside = North Bound
Leftside = South Bound

EAST-WEST ROADWAYS
Topside = West Bound
Bottom = East Bound

Figure 39

Scale: 1 inch = 2 miles
Map Printed January 2001



2020 Trend

P.M. Peak Hour V/C Ratios

Legend

- < 0.9 V/C
- 0.9 to 1.0 V/C
- 1.0 to 1.3 V/C
- > 1.3 V/C
- 1960 City Limits
- Water Service Area

NORTH-SOUTH ROADWAYS
Rightside = North Bound
Leftside = South Bound

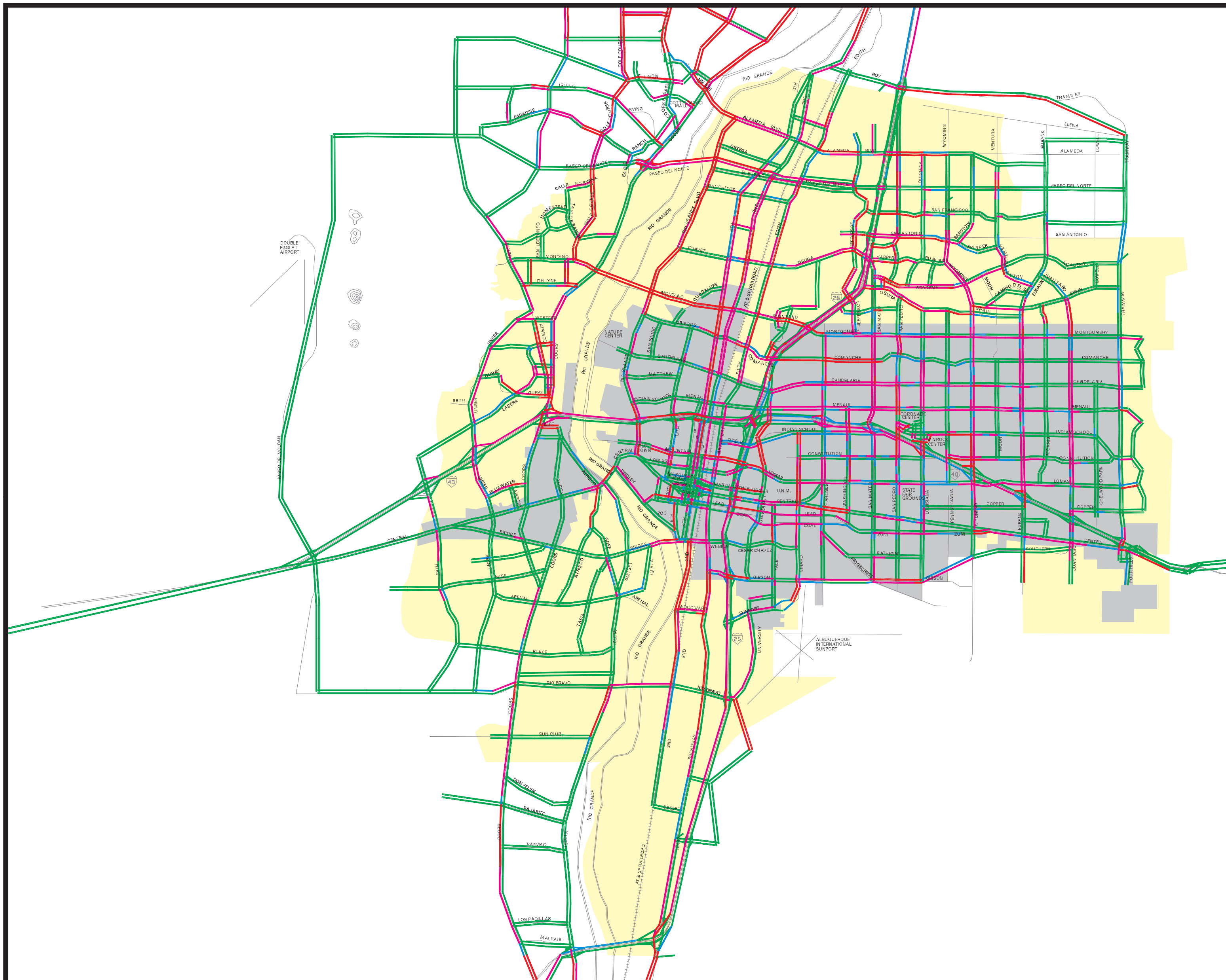
EAST-WEST ROADWAYS
Topside = West Bound
Bottom = East Bound

Figure 40

Scale: 1 inch = 2 miles
Map Printed January 2001

2020 Downtown

P.M. Peak Hour V/C Ratios



Legend

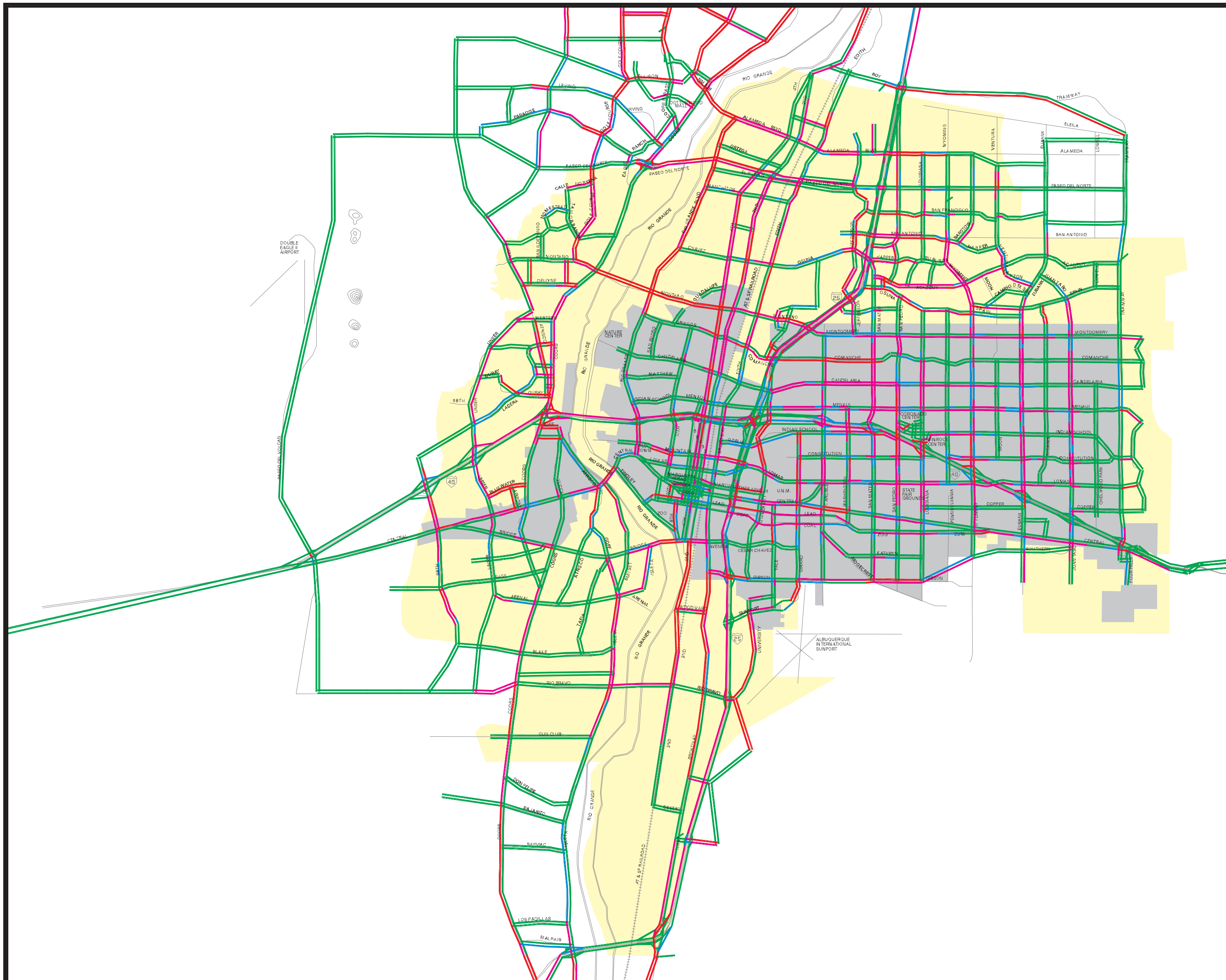
- < 0.9 V/C
- 0.9 to 1.0 V/C
- 1.0 to 1.3 V/C
- > 1.3 V/C
- 1960 City Limits
- Water Service Area

NORTH-SOUTH ROADWAYS
Rightside = North Bound
Leftside = South Bound

EAST-WEST ROADWAYS
Topside = West Bound
Bottom = East Bound

Figure 41

Scale: 1 inch = 2 miles
Map Printed January 2001



2020 Balanced

P.M. Peak Hour V/C Ratios

Legend

- < 0.9 V/C
- 0.9 to 1.0 V/C
- 1.0 to 1.3 V/C
- > 1.3 V/C

- 1960 City Limits
- Water Service Area

NORTH-SOUTH ROADWAYS

Rightside = North Bound

Leftside = South Bound

EAST-WEST ROADWAYS

Topside = West Bound

Bottom = East Bound

Figure 42

Scale: 1 inch = 2 miles

Map Printed January 2001

Costs to Mitigate Future Deficiencies

The Metropolitan Transportation Plan is a financially-constrained plan that lists a number of roadway improvements in an effort to develop an “integrated intermodal transportation system.” The Metropolitan Transportation Plan calls for several roadway widening projects, as listed in Table A.12 in Appendix A. The costs for each of the improvements listed in the Metropolitan Transportation Plan were provided in the document and were assumed to be in place for all three of the growth scenarios. Each improvement project was then inspected to see in which of the three service areas it was located. Some projects were located across service area boundaries, and their costs were divided proportionally.

Staff at Bernalillo County Public Works and consultant staff took the land use plans for each of the three growth scenarios and used the V/C plots shown on Figures 40–42 (pg.165-169) and professional judgment to developed a Network Optimization Summary. This lists feasible roadway widening and new construction projects applicable to each scenario to optimize the efficiency of each scenario’s roadway network. The costs for these projects were estimated by comparing them to similar projects listed in the Metropolitan Transportation Plan. Table A.12 lists the costs of projects identified in the Network Optimization Summary. It should be noted that in two places the Metropolitan Transportation Plan calls for improvements (widening Arenal from Isleta to Coors and Isleta from Rio Bravo to Arenal from two to four lanes) that the staff have taken out of the Balanced Scenario. All of the costs use1998 dollars.

Approximately $446 million in upgrade costs are common to all three scenarios. When looking at the differing costs, the Balanced plan has the greatest amount of costs to mitigate deficiencies: $42.6 million. The Trend Scenario’s costs are about $17.0 million, and the Downtown Scenario’s costs are projected at $14.9 million. In the Trend Scenario, 82% of the differing costs are for projects in the Water Service Area and 18% are outside. In the Downtown Scenario, nearly 100% of the differing costs are in the Water Service Area. In the Balanced Scenario, the differing costs are split between 52% in the 1960 City Boundary and 48% in the Water Service Area.

Costs for New Construction

In addition to widening projects, the Metropolitan Transportation Plan lists new roadway construction projects for the major network roads (Table A.13). The costs for each of the new roadways listed in the Metropolitan Transportation Plan were provided in the document and were assumed to be in place for all three growth scenarios. Each new roadway project was then inspected to see in which of the three service areas it was located. Some projects were located across service area boundaries, and their costs were divided proportionally.

The Bernalillo County Public Works’ Network Optimization Summary, as developed by staff, also lists new roadway construction projects. The costs for these projects were estimated by comparing them to similar projects listed in the Metropolitan Transportation Plan. Table A.13 lists the costs of major road projects identified in the Network Optimization Summary. Again there are exceptions to the Metropolitan Transportation Plan that should be noted. The Metropolitan Transportation Plan shows Los Picaros from Broadway to University as having two new lanes, while the Network Optimization Summary has that project removed from the Downtown Scenario. The Metropolitan Transportation Plan also has University from Rio Bravo to Mesa del Sol Parkway as having four new lanes, and this has been taken out of the Trend and Downtown Scenarios in the Network Optimization Summary. Additionally, Rainbow from Unser to McMahon was assumed to be unnecessary for the expected growth in the Downtown and Balanced Scenarios.

The costs for new major road construction for the Downtown and Balanced Scenarios are approximately 93% of the costs of new major road construction in the Trend Scenario. None of the new construction projects lies within the 1960 City Boundary. In the Trend Scenario approximately 18% of the costs for new roadways falls in the Water Service Area boundaries, with the other 82% being Outside the Water Service Area. In both the Downtown and Balanced Scenarios, approximately 20% of the costs for new roadways fall in the Water Service Area boundaries, with the other 80% lying Outside the Water Service Area.

Costs for minor roads were obtained using a table of population and employment growth for each of the three scenarios between the years 1995 and 2020. First, it was assumed that zones and areas that are currently built out could not have local roads added to them. Consultant staff visually analyzed each DASZ with Bernalillo County Public Works staff to determine which DASZs are already built out, so that no new local road costs would be assigned to these DASZs. Next, each DASZ was analyzed to determine whether it would be an employment center in the future. The criteria for being an employment center was chosen as having at least 600 employees in the 2020 scenario and having a ratio of employees to employees plus dwelling units of at least 90%. DASZs that are not already built out and that would not be considered employment centers in the future were then assigned a mileage of local roads for new residential development. In all scenarios for the East Mountain DASZs, this was assumed to be 0.0839 miles per each new dwelling unit, and in the Trend Scenario for other DASZs, was assumed to be 0.0095 miles per each new dwelling unit, based on a number of miles of local road per dwelling unit typically observed in these areas. A rate of 0.0076 miles per dwelling unit (25% more dense than 0.0095 miles per dwelling unit) was used for the Balanced and Downtown Scenarios in DASZs not in the East Mountain area. DASZs that are not already built out and that may be considered employment centers in the future were also assigned a mileage of local road, 0.00045 miles per employee in the Trend Scenario, based on a rate currently observed in industrial areas. Again, a 25% greater density was assumed for the Balanced and Downtown Scenarios, and a rate of 0.00036 miles per employees was used. Table A.14 in Appendix A shows the number of miles of local road required for each growth scenario by DASZ and also shows the costs of constructing the roads. All new local roads were assumed to be standard 24-foot wide paved roads (28-foot face-to-face section), although the roads in the East Mountain DASZs were assumed to be built without curb and gutter or sidewalk. Supporting information for the cost of local roads is presented later in this report.

The costs for new minor road construction for the Downtown and Balanced Scenarios are approximately 80% and 72%, respectively, of the costs for new minor road construction in the Trend Scenario. 1,362 miles of new road would be required for the Trend Scenario, 1,121 miles required for the Downtown Scenario, and 936 miles required for the Balanced Scenario. In the Trend Scenario, approximately 9% of costs fall within the 1960 City Boundary, 32% in the Water Service Area boundaries, and the other 59% are Outside the Water Service Area. In the Downtown Scenario, approximately 12% of costs fall within the 1960 City Boundary, 37% in the Water Service Area boundaries, and the remaining 51% are Outside the Water Service Area. In the Balanced Scenario the split is 14% of costs within the 1960 City Boundary, 32% in the Water Service Area boundaries, and 54% Outside the Water Service Area.

Rehabilitation and Reconstruction Costs

Street in need of rehab and street with repairs completed

In 1998, the City of Albuquerque assessed its street conditions and found 27% of its roads in poor or very poor condition, 43% in fair condition, 19% in good condition, and 11% in excellent condition. Figure 43 (pg.175) shows road conditions within the City of Albuquerque. Bernalillo County Public Works did not have an estimate of the number of lane miles in need of repair, but it did estimate that the cost of rehabilitating existing County roads was $188 million. City and County staff estimate that half of this cost is assumed to occur in the Water Service Area and the other half Outside the Water Service Area. The Metropolitan Transportation Plan lists roadways that will require rehabilitation or reconstruction by the year 2020; the costs for these projects are shown in Table A.15 in Appendix A. These costs were assumed to be common to all three growth scenarios.

Rehabilitation and reconstruction costs within the 1960 City Boundary make up about 42% of all costs; Costs for rehabilitation and reconstruction within the Water Service Area make up approximately 41.5% of all costs, and Outside the Water Service Area roughly 16.5% of all costs.

Summary of Costs

The capital costs for roads that are common to all three scenarios are approximately $1.3 billion, or more than 80% of the total in each scenario. This reflects the substantial common cost associated with two sets of capital improvements:

1. Rehabilitation and reconstruction of major and local facilities, and
2. Cost of the Metropolitan Transportation Plan facility projects that meet the 2020 transportation needs.

Reconstruction and roadway rehabilitation accounts for more than half ($724 million) of the common capital cost. The projects needed to correct common deficiencies in road capacity account for more than $446 million. An additional $142 million of capital costs are for the construction on new major roads that are common to all scenarios.

Scenario-specific costs show the greatest amount of variance in two areas—common deficiencies and new roads. The Balanced Scenario has the highest cost for the correction of deficiencies. Much of these costs are improvements for High Occupancy Vehicle facilities. The Trend Scenario is the most expensive of the three scenarios. The Downtown Scenario has the lowest capital cost.

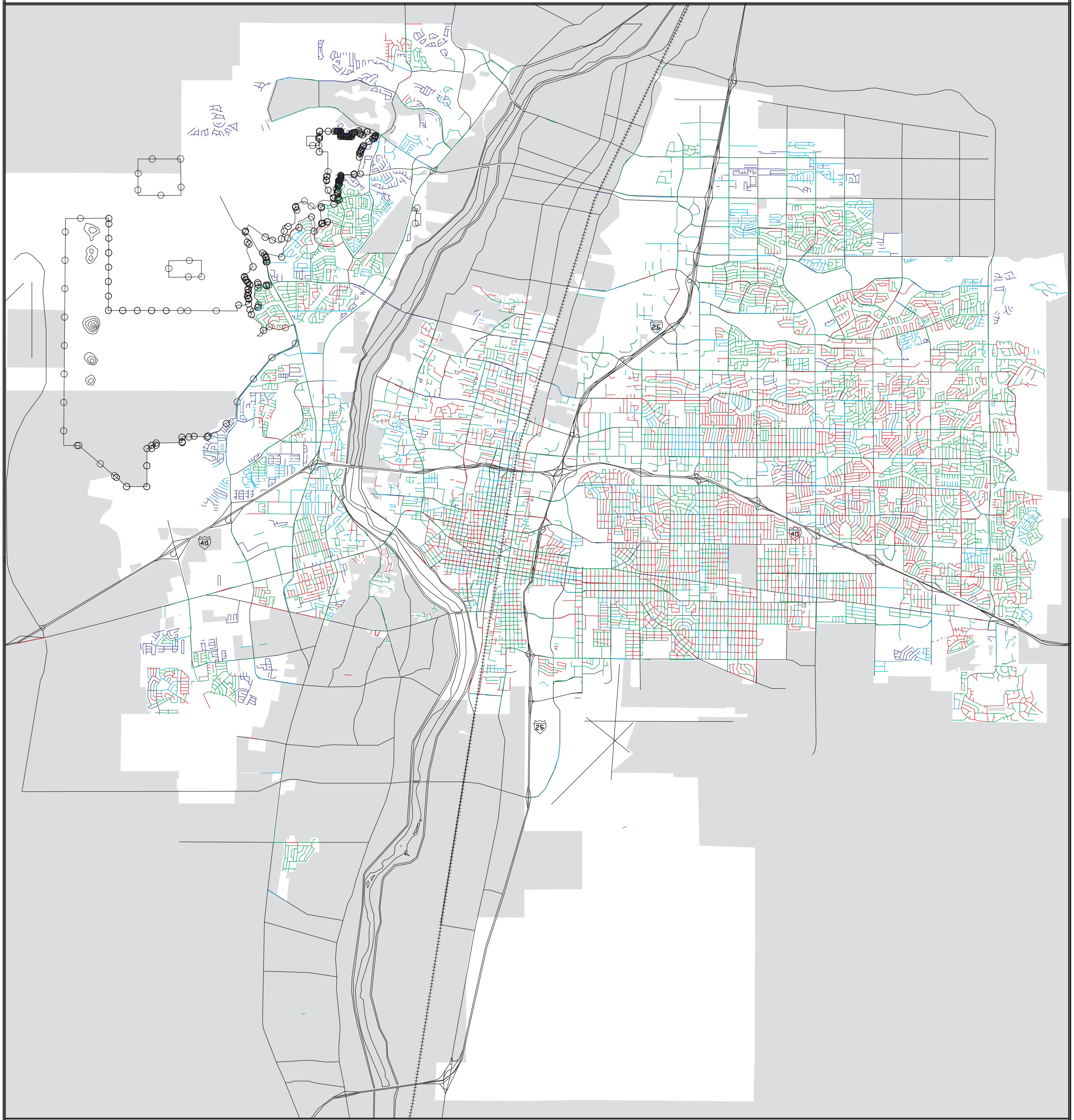
Within the 1960 City Boundary, the highest costs are estimated for the Balanced Scenario ($652 million). The Trend and Downtown Scenarios have lower costs. In the Water Service Area, all three scenarios have similar costs, ranging from $599 million (Balanced Scenario) to $618 million (Trend Scenario). However, the cost of providing roads to the area Outside the Water Service Area shows the most variation. The Balanced and Downtown Scenarios have costs that are similar. The Trend Scenario costs are approximately $66-$72 million higher than the other two scenarios, as shown in Table 71.

Table 71 Transportation Capital Cost (Roads) by Area

Scenario	1960 City Boundary	Water Service Area	Outside Service Area
Trend			
Mitigate Deficiencies	$295,134,400	$101,525,600	$66,494,000
New Major Roads	–	$31,392,500	$139,692,500
New Minor Roads	$25,025,700	$91,802,123	$167,918,214
Rehab/Reconstruction	$305,355,752	$299,975,688	$118,964,500
County Rehab	–	$94,000,000	$94,000,000
Total Capital Cost	$625,515,852	$618,695,911	$587,069,214
Balanced			
Mitigate Deficiencies	$317,414,650	$107,843,350	$63,494,000
New Major Roads	–	$31,500,000	$128,800,000
New Minor Roads	$28,890,121	$65,683,236	$110,149,114
Rehab/Reconstruction	$305,355,752	$299,975,688	$118,964,500
County Rehab	–	$94,000,000	$94,000,000
Total Capital Cost	$651,660,523	$599,002,274	$515,407,614
Downtown			
Mitigate Deficiencies	$295,134,400	$102,478,600	$63,494,000
New Major Roads	–	$30,892,500	$128,192,500
New Minor Roads	$26,966,946	$84,108,607	$116,583,137
Rehab/Reconstruction	$305,355,752	$299,975,688	$118,964,500
County Rehab	–	$94,000,000	$94,000,000
Total Capital Cost	$627,457,098	$611,455,395	$521,234,137

Source: Parsons Brinckerhoff

Figure 43
City Road Conditions
May 2000



Legend

- Excellent
- Fair
- Good
- Poor

4.5.5 Supporting Information

A number of assumptions were made in determining the cost estimates above. The sections below provide supporting information for those assumptions.

Costs for Mitigating Deficiencies and Constructing New Major Roadways

The roadway improvements included in this report are listed either in the Metropolitan Transportation Plan or the Bernalillo County Network Optimization Summary. Roadway improvements listed in the Metropolitan Transportation Plan include estimated construction costs, shown in Table A.16.

Table A.17 in Appendix A summarizes the assumptions made to estimate major roadway construction costs. The estimated construction costs of the roadways listed in the Network Optimization Summary were derived using several methods. First, the construction costs from the Metropolitan Transportation Plan were converted to a unit cost per mile of roadway. The roadway improvements listed in the Network Optimization Summary were then compared to those listed in the Metropolitan Transportation Plan. Where similar improvements located in similar areas were present in both the Network Optimization Summary and Metropolitan Transportation Plan, the unit cost per mile of roadway from the Metropolitan Transportation Plan was applied to the length of roadway described in the Network Optimization Summary, and a total cost was calculated. Where improvements in the Network Optimization Summary and Metropolitan Transportation Plan were dissimilar, two other methods were used. For improvements that required striping only (such as converting an existing lane to an High Occupancy Vehicle lane), a unit cost per mile of striping was calculated. The unit cost per mile was calculated using the New Mexico State Highway and Transportation Department price for 4-inch striping per foot and multiplying it by two lanes and then by 5,280 feet/mile. This gave a unit cost of roughly $25,000 per mile, which was then applied to the scenarios that included striping only. Engineering judgment based on consistent assumptions was used to estimate construction costs for the interchange ramps and overpasses, bridge construction and reconstruction, and signalization improvements.
Estimating New Local Street Mileage

Using the year 2020 population data for each of the three growth scenarios, DASZs were identified that had a growth in employment or number of dwelling units from the year 1995. A sample of existing residential DASZs in the area was then examined to calculate an average number of miles of local road required per dwelling unit—this value of 0.0095 miles per dwelling unit (about 50 feet/dwelling unit) was used for the Trend Scenario. It was assumed that densities in the Balanced and Downtown Scenarios would be approximately 25% greater, so a value of 0.0076 miles per dwelling unit was used in those cases. A sample of existing residential DASZs in the East Mountain area yielded an average of 0.0839 miles/dwelling unit (about 443 feet/dwelling unit), which was applied to the East Mountain DASZs in all three scenarios. Next, the DASZs in a sample of industrial areas were examined to calculate an average number of local road miles required per employee in DASZs that qualified as employment centers—this value of 0.00045 miles per employee (about 2.34 feet per employee) was used for the Trend Scenario. Again, the assumption was made that densities in the Balanced and Downtown Scenarios would be 25% greater than in the Trend Scenario, and a value of 0.00036 miles per employee was used for those scenarios.

Minor Street Costs

Local streets were priced based on the following assumptions:

- A 28-foot face-to-face section (24-foot wide paved section);
- Standard curb and gutter;
- A 4-foot sidewalk on both sides of the road;
- A paving section with two 2-inch asphalt lifts, two 6-inch lifts of subgrade compacted to 95%, natural ground compacted to 90%, and one layer each of tack coat and prime coat;
- Compaction of subgrade extending one foot behind the curb; and
- Clearing and grubbing, including sidewalk.

Because the land for minor streets is assumed to be furnished by the developer, no costs for right-of-way are included. If we were to include right-of-way costs, the effect would be to increase the cost for the Trend Scenario relative to the more compact scenarios.

Table 72 shows how the unit cost for one linear foot of local road at $58.39 was calculated. The City of Albuquerque's 1997 unit prices were used, since these have remained stable.

Table 72 Cost for One Linear Foot of Local Road

Item	Quantity in One Linear Foot	Unit Price	Cost
Site clearing and grubbing	4.4 cubic yards	$0.18/cubic yard	$0.79
Subgrade prep (2 6-inch lifts = 3.5 cubic yard/lift)	7.0 cubic yards	$1.01/cubic yard	$7.07
Asphalt paving (2 2-inch lifts = 2.7 cubic yard/lift)	5.4 cubic yards	$1.58/cubic yard	$8.53
Prime coat	2.7 cubic yards	$0.31/cubic yard	$0.84
Tack coat	2.7 cubic yards	$0.17/cubic yard	$0.46
Standard curb & gutter	2.0 linear foot	$11.14/ linear foot	$22.28
4 inch sidewalk, 4 feet wide	0.88 cubic yards	$20.93/cubic yard	$18.42
TOTAL			$58.39

Roads in the East Mountain area (DASZs 3111–3132 and DASZs 3142–3301) were assumed to be built to County standards; that is, without curbs, gutters, or sidewalks. This assumption brought the local road cost for these DASZs down to $17.69 per linear foot.

The proportion of the transportation capital costs to be borne by the public versus the private sector was determined using the following method and is summarized in Table 73. First, based on discussions with Bernalillo County Public Works staff,

Table 73 Public vs. Private Transportation Costs

Trend Scenario	1960 City	Public	Private	Water Service Area	Public	Private	Out of Service Area	Public	Private	TOTAL	Public	Private
Mitigate Deficiencies	$295,134,400	$175,117,040	$120,017,360	$101,525,600	$59,315,360	$42,210,240	$66,494,000	$39,390,800	$27,103,200	$463,154,000	$273,823,200	$189,330,800
New Major Roads	$0	$0	$0	$31,392,500	$18,635,500	$12,757,000	$139,692,500	$83,615,500	$56,077,000	$171,085,000	$102,251,000	$68,834,000
New Minor Roads	$25,025,700	$0	$25,025,700	$91,802,123	$0	$91,802,123	$167,918,214	$0	$167,918,214	$284,746,037	$0	$284,746,037
Rehab/Reconstruction	$305,355,752	$305,355,752	$0	$299,975,688	$299,975,688	$0	$118,964,500	$118,964,500	$0	$724,295,940	$724,295,940	$0
County Rehab	$0	$0	$0	$94,000,000	$94,000,000	$0	$94,000,000	$94,000,000	$0	$188,000,000	$188,000,000	$0
Total Capital Cost	$625,515,852	$480,472,792	$145,043,060	$618,695,911	$471,926,548	$146,769,363	$587,069,214	$335,970,800	$251,098,414	$1,831,280,977	$1,288,370,140	$542,910,837
Balanced Scenario	**1960 City**	**Public**	**Private**	**Water Service Area**	**Public**	**Private**	**Out of Service Area**	**Public**	**Private**	**TOTAL**	**Public**	**Private**
Mitigate Deficiencies	$317,414,650	$188,485,190	$128,929,460	$107,843,350	$64,706,010	$43,137,340	$63,494,000	$37,590,800	$25,903,200	$488,752,000	$290,782,000	$197,970,000
New Major Roads	$0	$0	$0	$31,500,000	$18,700,000	$12,800,000	$128,800,000	$77,080,000	$51,720,000	$160,300,000	$95,780,000	$64,520,000
New Minor Roads	$28,890,121	$0	$28,890,121	$65,683,236	$0	$65,683,236	$110,149,114	$0	$110,149,114	$204,722,471	$0	$204,722,471
Rehab/Reconstruction	$305,355,752	$305,355,752	$0	$299,975,688	$299,975,688	$0	$118,964,500	$118,964,500	$0	$724,295,940	$724,295,940	$0
County Rehab	$0	$0	$0	$94,000,000	$94,000,000	$0	$94,000,000	$94,000,000	$0	$188,000,000	$188,000,000	$0
Total Capital Cost	$651,660,523	$493,840,942	$157,819,581	$599,002,274	$477,381,698	$121,620,576	$515,407,614	$327,635,300	$187,772,314	$1,766,070,411	$1,298,857,940	$467,212,471
Downtown Scenario	**1960 City**	**Public**	**Private**	**Water Service Area**	**Public**	**Private**	**Out of Service Area**	**Public**	**Private**	**TOTAL**	**Public**	**Private**
Mitigate Deficiencies	$295,134,400	$175,117,040	$120,017,360	$102,478,600	$59,887,160	$42,591,440.00	$63,494,000	$37,590,800	$25,903,200	$461,107,000	$272,595,000	$188,512,000
New Major Roads	$0	$0	$0	$30,892,500	$18,535,500	$12,357,000.00	$128,192,500	$76,915,500	$51,277,000	$159,085,000	$95,451,000	$63,634,000
New Minor Roads	$26,966,946	$0	$26,966,946	$84,108,607	$0	$84,108,607.00	$116,583,137	$0	$116,583,137	$227,658,690	$0	$227,658,690
Rehab/Reconstruction	$305,355,752	$305,355,752	$0	$299,975,688	$299,975,688	$0.00	$118,964,500	$118,964,500	$0	$724,295,940	$724,295,940	$0
County Rehab	$0	$0	$0	$94,000,000	$94,000,000	$0.00	$94,000,000	$94,000,000	$0	$188,000,000	$188,000,000	$0
Total Capital Cost	$627,457,098	$480,472,792	$146,984,306	$611,455,395	$472,398,348	$139,057,047.00	$521,234,137	$327,470,800	$193,763,337	$1,760,146,630	$1,280,341,940	$479,804,690

all rehabilitation and reconstruction costs from Table A.15 were assigned to the public. The other assignments were done using these assumptions provided by the Planned Growth Strategy Management Committee based on discussions with private sector stakeholders:

- Costs associated with arterials would be assigned 60% to the public and 40% to the private sector,
- Costs associated with collectors would be assigned 20% to the public and 80% to the private sector, and
- Costs associated with local (minor) roads would be assigned 100% to the private sector.

Consequently, 100% of the minor road costs from Table A.14 were assigned to the private sector. Next, the roadway improvements listed in Table A.12 (costs to mitigate deficiencies), and Table A.13 (new construction costs for major roads), were categorized as arterial or collector improvements as shown on those tables. The costs were then divided as described above to yield totals for the public versus the private sector.

The proportion of the total transportation capital costs to be borne by the public varies little between scenarios. In the Trend Scenario, $1,288 million (70%) of the $1,831 million total were assigned to the public. In the Balanced Scenario, $1,299 million (74%) of the $1,766 million total were assigned to the public. Finally, in the Downtown Scenario, $1,280 million (73%) of the $1,760 million total were assigned to the public.

4.5.6 Transit Cost

The City of Albuquerque's existing transit system consists of SunTran, providing bus service, and SunVan, a paratransit service provider, supplying variable route service. SunTran reports that it carried a daily average of 16,804 passenger trips using its fleet of 128 buses in 1995. The annual operating cost for the existing system in FY 99 was $14,331,000 (Source: City of Albuquerque).

SunTran bus on Central

Existing SunTran ridership is considered to be modest when compared to peer cities, such as Austin, Tucson, or Salt Lake City. While ridership on the SunTran system has been increasing slowly in recent years, this trend follows a period of declining ridership. SunTran has begun a modest set of service expansions recently. These changes are intended to improve the efficiency of a system that until recently had some routes with no midday service, very limited weekend service, no evening service, and no service on six major holidays.

For purposes of this analysis, it is assumed that the bus system will be expanded until it reaches a total of 314 buses. A fleet of 314 buses was designated to serve the Albuquerque area in the recent proposal to establish a Regional Transit Authority in the Middle Rio Grande Region (Table 74).

Transit system operating costs are directly related to the size of the vehicle fleet and the total hours of operation. The capital cost of the bus system is closely associated with the acquisition of new buses and the frequency of bus replacement. All of the scenarios assume the same level of bus acquisition, but they assume two schedules of bus replacement. The bus fleet in the Trend Scenario will drive 5% more miles to cover more area to serve the same population than the Downtown and Balanced Scenarios. This is expected to result in a slightly shorter replacement schedule for the Trend Scenario.

Table 74 Comparable Transit System Data

City	Average Transit Trips Per Day	Transit Vehicles	Average Daily Trips Per Vehicle
Albuquerque SunTran	16,804	128	131
Austin, Texas	103,700	404	257
Salt Lake City, Utah	83,900	594	141
Tucson, Arizona	53,700	200	269
Capacity of Albuquerque fleet if operated more efficiently	25,600	128	200
2020 Bus Fleet, All Scenarios*		314	

* From Regional Transit Authority Service Plan

The process of estimating the number of transit trips in the Downtown, Balanced, and Trend Scenarios begins with the methodology set out in the Transportation Evaluation Study memorandum "Transportation-Related Impacts of Alternative Future Place Image" (Parsons Brinckerhoff 1997). This memo produced initial estimates of transit ridership based upon four alternative methods. For the purpose of this section, transit ridership estimates based on the memo's TCRP Report 16 equations will be used (see pages 3 and 4 of the 1997 memorandum). This is the most conservative of the four methods used in that memorandum. The results of this process for the Downtown Scenario are shown in Table 75.

Table 75 Updated Transit Ridership Projection for Downtown Scenario, Estimated by Corridor

Corridor	Daily Transit Riders	
	1995	2020
Balanced Scenario Corridors	8,664	14,100
Other Corridors	4,920	20,500
Simple Total	13,584	34,600
Corridor Total—no double counting	11,000	33,800
Ratio of Corridor to Total Ridership	68%	50%*
Estimated Total Ridership	16,174	67,600

* Projected

Source: Parsons Brinckerhoff

Current population and employment projections for all three scenarios were reviewed and organized by transportation corridor. In the Downtown Scenario, it is estimated that 33,800 transit trips per day will be generated in focused growth corridors. Furthermore, it is assumed that an expanded bus system serving Albuquerque will generate half of its trips from the area outside the focused growth corridors and half from the corridors themselves. Accordingly, the projected average daily transit ridership for the Downtown Scenario is 67,600 trips per day.

The “Balanced Scenario Corridors” are the focused growth corridors used in the Balanced Scenario. The “Other Corridors” contain the traffic analysis zones that comprise the remainder of the growth corridors in the Downtown Scenario. The traffic analysis zones in all these corridors produced 68% (11,000) of the total daily transit trips in 1995. They are also expected to be a primary source of transit riders in all of the planned growth scenarios.

Average daily transit ridership for the Balanced Scenario was estimated by comparing the projections for the Balanced and Downtown Scenarios. As a result of this analysis, it was determined that the transit ridership in the Balanced Scenario corridors is expected to be 90% of the ridership in the Downtown Scenario. It is assumed that like the Downtown Scenario, the Balanced Scenario gets half of its ridership from the corridor and about half from the remaining portion of the urban area. As a result of this analysis, the projected 2020 daily transit ridership is expected to be 61,000 trips (Table 76).

Table 76 Transit Ridership Projection for Balanced Scenario Estimated by Corridor

	Daily Transit Riders	
Corridor	**1995**	**2020**
Balanced Scenario Corridors	8,664	31,140
Other Corridors	4,920	30,420
Simple Total	13,584	61,560
Corridor Total—no double counting	11,000	30,500
Projected Ratio of Corridor to Total Ridership	68.01%	50%*
Estimated Total Ridership	16,174	61,000

* Projected

Balanced Population and Employment Projections = 90% of Corridors in Downtown Scenario

A similar process was followed to estimate the ridership for the Trend Scenario. A comparison of the corridor projections under the Downtown and the Trend Scenarios resulted in an estimate of Trend Scenario ridership that is 80% of ridership in the Downtown Scenario in the corridors. It was also assumed that the land use pattern for the remainder of the urban area would produce fewer transit riders than the Balanced or the Downtown Scenarios. Therefore the proportion of total transit ridership outside of the corridors was projected to decrease. As a result, the corridors are expected to produce more of the total ridership (55%) in the Trend Scenario than they produce in the other two scenarios. As a result of this analysis, it is estimated that the Trend

Scenario will produce 49,091 daily riders in 2020 (Table 77).

Table 77 Transit Ridership Projection for Trend Scenario' Estimated by Corridor

Corridor	Daily Transit Riders 1995	2020
Balanced Scenario Corridors	8,664	11,280
Other Corridors	4,920	11,280
Simple Total	13,584	22,560
Corridor Total—no double counting	11,000	27,000
Ratio of Corridor to Total Ridership	68.01%	55%*
Estimated Total Ridership	16,174	49,091

* Projected

Trend Population and Employment Projections = 80% of Corridors in Downtown Scenario

Land use is not the only factor contributing to this ridership estimate. All three bus systems assume the same size bus fleet—314 buses—and the same portion of operating cost recovery from passenger fares—30%. Taking this analysis to its logical conclusion, it can be determined that the transit fares paid by the riders in the Trend Scenario will be higher than in either the Balanced or the Downtown Scenarios.

For long-range planning purposes, a High Capacity Transportation system is assumed to be needed in each scenario in 2020, although the exact nature of this system has yet to be determined. The operating cost estimates for this system, based on the cost estimates developed for the proposed Regional Transit Authority in 1998, are projected at $8,600,000 in 2020. Capital costs for the High Capacity Transportation system were also estimated. These total $275,200,000 based on Regional Transit Authority cost estimates. Neither the capital nor the operating costs of High Capacity Transportation are included in the transit cost estimates here.

The transit operating cost for all of the scenarios assumes the utilization of a 314-vehicle fleet. The operating costs for the Balanced and Downtown Scenarios were estimated by expanding the existing fleet cost in direct proportion to the number of buses. For the Trend Scenario, 5% was added to this direct proportion to reflect the longer trip lengths under this scenario (Table 78).

Table 78 Estimated Transit System Annual Operating Costs, 2020

Cost	Scenario: Trend	Balanced	Downtown
Annual Bus Public Operational Costs	$25,839,465	$24,609,014	$24,609,014
Private Bus Operating Cost - Fares	$11,074,056	$10,546,720	$10,546,720
Total Annual Cost	$36,913,521	$35,155,734	$35,155,734

SunTran Operating Cost for 1999 = $14,331,000.

2020 Downtown, Balance and Trend assume larger bus fleets than 1995 and are adjusted proportionally.

Trend bus operating cost adjusted 5% to reflect increased miles of travel.

Assumes 30% Recovery of Operational Cost from Fee or Fares.

Transit capital cost estimates were derived for buses and bus facilities consistent with the cost estimates developed for the proposed Regional Transit Authority (Avid Engineering and Parsons Brinckerhoff 1998). The cost of a bus is estimated to be $335,000. It is assumed that an expanded bus system will need an estimated $210,000 per bus in transit-related facility capital costs such as bus shelters. Finally, it is assumed that the existing bus fleet of 128 buses, which is assumed as part of all three scenarios, will need to be replaced twice during the time period 1999–2020 in the Balanced and Downtown Scenarios and three times in the Trend Scenario. This replacement assumption is based on the Federal Transit Authority recommendation of replacing buses every 12 years. The new buses required to support all scenarios will be added incrementally as they are needed, and the bus fleets will reach their projected levels by 2020.

The Middle Rio Grande Connections Major Transportation Investment Study is an analysis of potential High Capacity Transportation systems in the Albuquerque area. This study is being conducted by the New Mexico State Highway and Transportation Department and the City of Albuquerque. The type of High Capacity Transportation system, nature of the necessary improvements, and exact location of the High Capacity Transportation service is unknown at this time. The High Capacity Transportation could be a Light Rail Transit line, a Bus Rapid Transit line, or an extensive system of High Occupancy Vehicle facilities. As previously noted, the capital and operating costs of a High Capacity Transportation system have not been included here.

Thus, the capital costs for the Trend Scenario would be $323 million for the bus fleet and related transit facilities. The capital costs for the Balanced and the Downtown Scenarios would be $249 million. The estimation of these costs is shown in Table 79.

Table 79 Projected Transit Capital Cost

	Scenario		
	Trend*	**Balanced****	**Downtown****
Replace Existing Buses	$128,640,000	$85,760,000	$85,760,000
Additional Buses to Meet Demand	186	186	186
Average Cost Per Bus	$335,000	$335,000	$335,000
New Bus Capital Cost	$155,775,000	$124,620,000	$124,620,000
New Transit Facilities for New Buses- Shelters, Bus Stops Etc.			
Average Cost Per New Bus	$210,000	$210,000	$210,000
New Transit Facilities	$39,060,000	$39,060,000	$39,060,000
Total Capital Cost	$323,475,000	$249,440,000	$249,440,000

* Assumes bus replacement every 10 years

** Assumes bus replacement every 12 years

Source: Parsons Brinckerhoff

4.5.7 Full Cost of Travel

The full cost of travel is an important part of the transportation costs of alternative land use scenarios. Most people think of the cost of travel in terms of the direct monetary costs to make a specific trip. Automobile drivers usually think that this cost includes the cost of gasoline and other direct costs such as parking. Transit riders view this cost as the transit fare, and pedestrians and bicyclists usually view their trip as being free. But the cost of travel actually includes substantial additional monetary costs. The higher the total travel costs, the greater the impacts on the local economy. Conversely, if the cost of travel is lower, more economic resources are available for other activities.

The estimation of the “full cost of travel” has received much attention recently. Various cost accounting procedures have been the topic of several studies during the last decade. A useful cost accounting approach (Apogee Research, Inc. 1994) was developed for Boston, Massachusetts, and Portland, Maine, which classifies all costs into three categories: User Costs, Governmental Costs, and Societal Costs. Additional research was conducted on the cost of travel by the Victoria Policy Institute (Litman 1995) and Mark Delucchi (Delucchi 1997), and on cost issues associated with land development patterns (Burchell et al. 1998). This cost of travel methodology has been used recently to estimate the cost of travel in Boulder, Colorado (Parsons Brinckerhoff July 1996) and to develop a prototype full cost model (Parsons Brinckerhoff 1998) for the Federal Highway Administration. These examples represent only a portion of the work that has been done on the subject of travel costs.

A complete cost of travel analysis looks at costs in three broad categories, which are described below.

User Costs: User costs include more than the gas and parking mentioned previously. In addition, it includes the cost of oil, tires, repairs, maintenance, and depreciation. These costs account for most of the direct out-of-pocket expenses that users pay. Additional out-of-pocket expenses include insurance, registration, licensing, and taxes levied by state or local governments on individual cars. Indirect user costs can include variables such as the cost of providing a parking space/garage at home and the average cost of accidents not covered by insurance. Finally there is the issue of user travel time cost. The cost of travel time can substantially increase the total cost of travel per mile.

Government Costs: Governmental costs include a wide range of expenditures that are not paid by gas taxes or other direct user fees. Government costs also include the local (City/County) cost associated with the transportation system that are paid from general funds, such as police traffic enforcement, traffic court, and fire/EMS service in response to accidents. These costs can also include the portion of accident costs that are not covered by the users or by insurance. Capital costs associated with the construction of state or local transportation system that are not paid by the gas tax and deferred investment for transportation facilities can also be included in this category. For transit, government cost is the net cost after transit fares have been deducted.

Societal Costs: Societal costs are typically what economists call "external" costs. Societal costs include air pollution, waste, water pollution, and noise. Numerous studies have estimated the cost of these externalities. In addition, this category can include the cost of building and maintaining parking spaces away from home.

The travel cost analysis conducted for this report uses a conservative set of user costs to estimate the annual cost of travel for vehicle operations (gas, oil, tires, maintenance, repairs, and depreciation) and for user travel time.

A recent analysis of Cost Benefit models conducted for the California Department of Transportation examined the components of vehicle operating cost per mile used by six transportation models; HERS[2]; Cal B/C[3]; STEAM[4]; RailDEC[5]; Rail B\C[6], and StratBENCOST[7]. These six models use the same or similar cost components and estimate that the range of vehicle operating costs is between $0.18–$0.32 per vehicle mile traveled in 1995. For purposes of this analysis, the cost data have been updated to current dollars using the Consumer Price Indicator—All Urban Consumers. The resultant high and low vehicle operating costs per mile are shown in Table 80.

Table 80 Vehicle Operating Cost Per Mile

Year	Cost per vehicle mile traveled	
	Low	High
1995	$0.18	$0.32
Adjusted Current Cost	$0.20	$0.35

It should be noted that the vehicle operating cost estimates produced for this report represent a low estimate of the total cost of travel. Research (Parsons Brinckerhoff 1997) has shown that the cost of travel is directly related to the land use patterns, vehicle ownership patterns, and vehicle mode choice decisions. In a transit-oriented land use pattern, the percentage of trips made by walk/bike is twice the level of a traditional suburban area. There is also a greater use of transit and a reduced use of single occupancy vehicles. The interconnection of land use and transportation affect the average vehicle miles traveled per household and can affect transportation costs to an even greater extent by reducing the need for some households to have a second car.

The annual cost of travel is estimated for the year 2020 and is expressed in current year dollars. The Bernalillo County Public Works Department, using the travel model developed by MRGCOG, estimated the total vehicle miles traveled for each of the three land use scenarios in 2020. These data are expressed in terms of peak and non-peak hour weekday vehicle miles traveled and are shown in Table 81(pg.186). The travel model uses the transportation network developed for the Albuquerque area. This travel network was adjusted to reflect the new road links assumed to be part of each of the 2020 land use scenarios.

The travel model estimates automobile travel but does not model vehicle mode choice decisions and does not model transit ridership. Therefore, it is necessary to

Table 81 Total Vehicle Miles Traveled by Development Scenario, 2020

	Scenario		
	Trend	Balanced	Downtown
A.M. Peak	4,380,627	4,287,400	4,315,548
P.M. Peak	5,978,556	5,866,073	5,884,507
Off Peak	13,424,888	13,204,926	13,101,100
Total	23,784,072	23,358,400	23,301,156

Source: Parsons Brinckerhoff

make adjustments to the total vehicle miles traveled for the Downtown and Balanced Scenarios that reflect changes in transit ridership associated with compact land use patterns. An analysis of these changes was developed as part of the Albuquerque Transportation Evaluation Study and is contained in the paper entitled “Comparison of Trend Alternatives and Alternative Future Place Image Concept (TES Alternative)” prepared by Parsons Brinckerhoff (March 1997). Adjustments to the total 2020 daily vehicle miles traveled based on projected increases in High Occupancy Vehicle trips and transit ridership were taken from that memo. The High Occupancy Vehicle adjustments reduce the number of vehicle miles of travel because the percentage of trips made by High Occupancy Vehicles increases while the population remains the same. This reduction in vehicle miles traveled is partially offset by an increased trip length for High Occupancy Vehicle trips. High Occupancy Vehicle trips are assumed to be 10% longer than single occupancy vehicle trips because of the need to pick up additional passengers (Source: Parsons Brinckerhoff). The vehicle miles traveled reduction attributable to High Occupancy Vehicle is estimated at 77,562 vehicle miles per day.

For the compact development scenarios, we assume the increase in the number of transit trips shown in Table 82, and a corresponding decrease in the number of single occupancy vehicle trips. This is estimated to reduce the single occupancy vehicle miles traveled by an additional 128,638 miles per day for the Downtown Scenario and 82,768 miles per day for the Balanced Scenario based on an average trip length of seven miles. The total reduction in daily vehicle miles traveled in the Downtown Scenario is 206,200 and in the Balanced Scenario it is 160,330. The resultant estimates of daily vehicle miles traveled for the three land use scenarios are shown in the Tables 82 and 83 (pg.189).

Table 82 Adjustments to Total Vehicle Miles Traveled

	Scenario		
Adjustment	**Trend**	**Balanced**	**Downtown**
Single occupancy vehicle trips shifted to high occupancy vehicle	0	12,400	12,400
Average single occupancy vehicle trip length	7.08	6.95	6.95
Change in single occupancy vehicle miles traveled	0	(86,180)	(86,180)
Increased vehicle miles traveled due to longer high occupancy vehicle trips (+10%)	0	8,618	8,618
Net vehicle miles traveled reduction—high occupancy vehicle	0	(77,562)	(77,562)
Single occupancy vehicle trips shifted to transit			
Increase in number of trips (Trend = 49,091)	0	11,909	18,509
Net vehicle miles traveled reduction—transit	0	(82,768)	(128,638)
Total Net Vehicle Miles Traveled Adjustment	0	(160,330)	(206,200)

Source: Parsons Brinckerhoff

Table 83 shows the adjusted vehicle miles traveled estimates, assuming 90% of the change occurs in A.M. and P.M. Peak Hours (Source: Parsons Brinckerhoff). Reductions in total vehicle miles traveled shown above equal about 3% of the projected vehicle miles traveled. While this number is relatively small in comparison to the total vehicle miles traveled, most of the change occurs in peak hour travel time, which reduces congestion on key road links.

Table 83 Adjusted Total 2020 Daily Vehicle Miles Traveled by Scenario

	Scenario		
	Trend	Balanced	Downtown
A.M. Peak	4,380,627	4,215,252	4,222,758
P.M. Peak	5,978,556	5,793,925	5,791,717
Off Peak	13,424,888	13,188,893	13,080,480
Total	23,784,071	23,198,069	23,094,955

The conversion of daily vehicle miles traveled to annual vehicle miles traveled is based on the assumption that there will be 250 days each year with an average level of traffic, and 115 days where vehicle miles traveled will be 70% of average.

Daily user costs of travel for the three scenarios are shown in Table 84 . The differences between the Trend, Downtown, and Balanced Scenarios range from $125,000–$241,000 per day depending on the user cost per mile.

Table 84 Daily Cost of Travel by Scenario, 2020

	Scenario		
	Trend	Balanced	Downtown
Projected Vehicle Miles Traveled			
Daily A.M. Peak	4,380,627	4,215,252	4,222,758
Daily P.M. Peak	5,978,556	5,793,925	5,791,717
Daily Off Peak	13,424,888	13,150,744	13,080,480
Daily Total	23,784,071	23,159,920	23,094,955
Vehicle Operating Cost—Low Estimate			
A.M. Peak Hour Cost	$876,125	$843,050	$844,552
P.M. Peak Hour Cost	$1,195,711	$1,158,785	$1,158,343
Off Peak Cost	$2,684,978	$2,630,149	$2,616,096
Total Daily Cos t	$4,756,814	$4,631,984	$4,618,991
Difference from Trend Scenario		$(124,830)	$(137,823)
Vehicle Operating Cost—High Estimate			
A.M. Peak Hour Cost	$1,533,219	$1,475,338	$1,477,965
P.M. Peak Hour Cost	$2,092,495	$2,027,874	$2,027,101
Off Peak Cost	$4,698,711	$4,602,760	$4,578,168
Total Daily Cost	$8,324,425	$8,105,972	$8,083,234
Difference from Trend Scenario		$(218,453)	$(241,190)

Value of Time

Everyone values their time. This is one reason why we dislike being stuck in traffic. Regional land use patterns that reduce the amount of time spent traveling in cars offer an important benefit to the citizens of the region. This section of the transportation cost report quantifies this benefit.

Travel model forecasts developed by Bernalillo County include forecasts of the number of hours of daily travel in 2020 associated with each of the scenarios. These estimates are shown in Table 85.

Table 85 2020 Projected Vehicle Hours of Travel by Scenario

	Scenario		
	Trend	**Balanced**	**Downtown**
Daily Hours Traveled			
A.M. Peak Hour	162,701	155,447	163,386
P.M. Peak Hour	234,876	227,044	236,689
Off Peak Hour	341,943	338,074	338,295
Daily Total	739,520	720,565	738,370
Daily Difference from Trend Scenario		(18,955)	(1,150)
Annual Hours Traveled			
A.M. Peak Hour	53,772,681	51,375,234	53,999,073
P.M. Peak Hour	77,626,518	75,038,042	78,225,715
Off Peak Hour	113,012,162	111,733,457	111,806,4 98
Annual Total	244,411,360	238,146,733	244,031,285
Annual Difference from Trend Scenario		(6,264,628)	(380,075)

We can use the daily hours of vehicle travel to calculate the number of hours traveled annually in 2020 by assuming that there will 250 days when the hours of travel are equal to the model estimates and 115 days when the hours of travel will be equal to 70% of the model estimates. These annual hours of travel estimates are also shown in Table 85.

Lastly, we need to apply an estimate of the value of travelers' time. Naturally, people value their time differently. They may value time more highly when traveling to work than when traveling for leisure, for example. It is commonly assumed that a reasonable value for travelers' time is one-half their hourly wage. This is the value used in benefit-cost analyses supported by the United States Federal Highway Administration.

For Albuquerque, we have assumed the value of travel time to be $6.71 per hour, based on one-half the 1997 average wage for the Albuquerque metropolitan area as reported by the Bureau of Labor Statistics and adjusted to current dollars using the Consumer Price Indicator—All Urban Consumers. Multiplying this value of travel time by the annual vehicle hours of travel produces estimates of the user cost of travel time as shown in Table 86.

Table 86 Projected User Cost of Travel Time by Scenario

	Scenario		
Daily	**Trend**	**Balanced**	**Downtown**
A.M. Peak Hour Vehicle Hours of Travel	$1,090,950	$1,042,310	$1,095,543
P.M. Peak Hour Vehicle Hour of Travel	$1,574,901	$1,522,386	$1,587,058
Off Peak Hour Vehicle Hours Traveled	$2,292,812	$2,266,869	$2,268,351
Daily Total	$4,958,664	$4,831,566	$4,950,952
Daily Difference from the Trend Scenario		($127,098)	($7,711)
Annual			
A.M. Peak Hour Vehicle Hours of Travel	$360,559,051	$344,483,579	$362,077,069
P.M. Peak Hour Vehicle Hour of Travel	$520,504,900	$503,148,531	$524,522,660
Off Peak Hour Vehicle Hours Traveled	$757,774,344	$749,200,316	$749,690,071
Annual Total	$1,638,838,295	$1,596,832,427	$1,636,289,799
Annual Difference from the Trend Scenario		($42,005,869)	($2,548,496)

It should be noted that these travel time benefits, on first examination, do not take into account the separately calulated travel time of people using transit. We have previously estimated the number of miles traveled by transit, and the associated costs and benefits. The regional travel model does not have procedures to estimate, in any economical manner, the travel time by other modes. Thus we need another approach for taking these benefits and costs into consideration.

We note that each time a person chooses to take transit, they make their own calculation of the costs and benefits of using that mode relative to other modes. By choosing transit, they implicitly conclude that it offers benefits in excess of costs. While there may be additional benefits to transit users (as well as people who change their mode of travel from auto to pedestrian, for example), we do not estimate or include them here. Rather, we assume, for purposes of this analysis, either that the user's travel time is the same, or that he/she values it the same as they would the trip in the automobile. Therefore the change in automobile hours of travel for each of the scenarios is a reasonable estimate of the total changes in travel time associated with all trips made in 2020 by all modes.

We thus conclude that the Balanced Scenario will afford the region's residents a user travel time benefit of $42,005,869 in the year 2020, compared with the Trend Scenario. The Downtown Scenario will afford a benefit of $2,548,496 in travel timesaving in comparison to the Trend Scenario. We include these benefits in our overall estimate of transportation costs and benefits at the end of this chapter.

Table 87 (pg.190) includes the total public and private transportation operating costs using a range of low and high costs per mile traveled. The annual cost of travel nearly doubles between 1999 and 2020. The annual cost of travel in 2020 includes the cost of the expanded transit system as estimated in the previous section. The range of estimates for the annual cost of travel is between $3.7 billion and $5.0 billion depending on the estimated cost per vehicle mile traveled.

Table 87 Range of Estimates for Annual 2020 Transportation Operating Cost, Public and Private, by Scenario

	Scenario		
	Trend	Balanced	Downtown
Projected Vehicle Miles Traveled			
A.M. Peak	1,447,797,224	1,393,140,688	1,395,621,586
P.M. Peak	1,975,912,758	1,914,892,114	1,914,162,535
Off Peak	4,436,925,484	4,346,320,826	4,323,098,655
Total	7,860,635,466	7,654,353,628	7,632,882,776
Transportation Operating Cost—Low Estimate			
Private A.M. Peak Hour Cost	$289,559,445	$278,628,138	$279,124,317
Private P.M. Peak Hour Cost	$395,182,552	$382,978,423	$382,832,507
Private Off Peak Cost	$887,385,097	$869,264,165	$864,619,731
Public Transit Costs	$25,839,465	$24,609,014	$24,609,014
Private Transit Costs	$11,074,056	$10,546,720	$10,546,720
Private Cost of Time of Travel	$1,638,838,295	$1,596,832,427	$1,636,289,799
Societal Costs	$540,112,328	$525,421,874	$524,168,649
Total	$3,787,991,237	$3,688,280,760	$3,722,190,738
Difference from Trend Scenario		($99,710,477)	($65,800,500)
Transportation Operating Cost—High Estimate			
Private A.M. Peak Hour Cost	$506,729,028	$487,599,241	$488,467,555
Private P.M. Peak Hour Cost	$691,569,465	$670,212,240	$669,956,887
Private Off Peak Cost	$1,552,923,919	$1,521,212,289	$1,513,084,529
Public Transit Costs	$25,839,465	$24,609,014	$24,609,014
Private Transit Costs	$11,074,056	$10,546,720	$10,546,720
Private Cost of Time of Travel	$1,638,838,295	$1,596,832,427	$1,636,289,799
Societal Costs	$540,112,328	$525,421,874	$524,168,649
Total	$4,967,086,557	$4,836,433,805	$4,867,123,154
Difference from Trend Scenario		($130,652,752)	($99,963,403)

The Downtown and Balanced Scenarios cost of travel are approximately 2–3% less than the Trend Scenario. The annual Downtown Scenario cost of travel is estimated to be between $66–$100 million less than the Trend, and the Balanced Scenario is estimated to be between $100–$131 million less than the Trend.

For this analysis, a mid-point between the two estimates, whose value is $0.275 per vehicle mile traveled, has been used. The annual 2020 cost of travel using this value is between $4.38 billion and $4.26 billion. The annual Downtown Scenario cost of travel is estimated to be $83 million less than the Trend Scenario and the Balanced Scenario is estimated to be $115.1 million less than the Trend Scenario (see table 88 (pg.193).

Table 88 Total 2020 Annual Transportation Operating Cost*

	Scenario		
	Trend	Balanced	Downtown
Private A.M. Peak Hour Cost	$398,144,236	$383,113,689	$383,795,936
Private P.M. Peak Hour Cost	$543,376,008	$526,595,331	$526,394,697
Private Off Peak Cost	$1,220,154,508	$1,195,238,227	$1,188,852,130
Public Transit Costs	$25,839,465	$24,609,014	$24,609,014
Private Transit Costs	$11,074,056	$10,546,720	$10,546,720
Private Cost of Time of Travel	$1,638,838,295	$1,596,832,427	$1,636,289,799
Societal Costs	$540,112,328	$525,421,874	$524,168,649
Total Annual Cost	$4,377,538,897	$4,262,357,282	$4,294,656,946
Difference from Trend Scenario		($115,181,614)	($82,881,951)

* Cost at $0.275 per vehicle mile traveled for the year 2020. Intervening years will be proportionally less.

Non-Motorized Travel

It is important to note that some benefits result from implementing either of the compact land use scenarios (the Balanced and Downtown Scenarios) at a geographic scale that eludes measurement in large regional models and cost estimates. In particular, this is true of the mixed-use neighborhoods, corridors and employment centers proposed for the Balanced and Downtown Scenarios. Extensive research has shown that in such places, the following types of travel behavior occur:

1. A reduction in the number of motorized trips
2. An increase in the number of transit trips
3. An increase in the number of non-motorized trips (e.g., walk trips)
4. A reduction in the average trip length for trips of all kinds

Each of these changes has important consequences for air quality, quality of life, and the efficient operation of transportation systems. The following statistics illustrate the potential impacts of these changes in urban form and urban design on future travel in Albuquerque. All are from well-recognized research studies recently conducted around the United States.

- In a study of neighborhoods in the San Francisco area (Cervero and Kockelman), researchers found that for each 10% point increase in neighborhood density, there was an increase of 4% in the use of modes other than the auto for work trips.
- In the same study, the authors concluded that pedestrian oriented designs, such as buildings that front on the street, rather than being pulled back and replaced by parking, reduces automobile dependence for trips other than work trips. Specifically, for each 10% point reduction in the proportion of businesses with parking in the rear (rather than in the front or side of their store), there was an 11% increase in the probability of travel by non-auto modes for these trip purposes.

• Comparable findings have resulted from work in Seattle (Frank and Pivo), where neighborhood population density increases of 10% are associated with increases of 17% in walk trips for shopping, and 11% increases in walk trips to work.

• Studies of the effects of street design have shown that traditional, connected street networks are associated with dramatic declines in auto travel (Kulash et al. 1990). Where neighborhood streets are connected in a traditional grid, miles traveled for local trips has been shown to decline by 43% over what would occur with the contemporary patterns of cul-de-sacs and wide arterials, such as prevails on Albuquerque's West Side.

The Albuquerque region will have 236,000 pedestrian trips per day in the year 2020, according to the Bernalillo County Public Works Department. These numbers will increase significantly under either of the compact scenarios, for the reasons described.

All of these studies demonstrate the clear benefits of compact, mixed-use, pedestrian friendly corridors and centers. These benefits are in addition to those quantified in the regional analysis above. The changes in neighborhood travel patterns will not only save auto operating costs, but also offer the benefits of improved air quality by eliminating the pollution caused by operating a car at cold engine temperatures, with associated inefficient fuel use. We describe air pollution costs more fully in the section that follows.

4.5.8 Air Pollution Cost of Travel

The full cost of travel estimates should include the environmental or social costs associated with driving. This section is intended to illustrate the magnitude of these costs in the Albuquerque urban area (Table 89).

Substantial research exists on this issue and numerous estimates of these costs have been developed. A frequently quoted source is Transportation Cost Analysis (Litman 1995). In that report the author determined that the best estimate of the cost of air pollution is $0.08 per peak hour vehicle mile traveled and $0.06 per non-peak hour vehicle mile traveled. Using these cost estimates, one can easily estimate the 2020 annual cost of air pollution associated with travel as shown in the table below. As shown in this table, the cost of air pollution would be in excess of $500 million per year. The Downtown and the Balanced Scenarios have annual costs that are approximately 5% lower than the Trend Scenario.

Table 89 2020 Annual Cost of Air Pollution Associated with Vehicular Travel

	Scenario		
	Trend	Balanced	Downtown
	(millions)		
A.M. Peak Hour Cost	$116	$107	$108
P.M. Peak Hour Cost	$158	$149	$149
Off Peak Cost	$266	$261	$259
Total Cost	$540	$516	$516
Difference from Trend Scenario		$24	$25

Estimates based on projected vehicle miles traveled. Urban Peak $0.08 per vehicle mile traveled and Non Peak $0.06 per vehicle mile traveled.
Source: Transportation Cost Analysis, Todd Litman, Victoria Transportat ion Institute.