ARAPAHO PH II BACKGROUND

From Interlocal Agreement between Town & NTTA

values or awards described above, the Authority shall promptly deposit the appraised values or the special commissioners award, as the case may be, and such deposit shall, to the extent of the deposit, satisfy the Authority's obligation under Subsection II.C.(2.) to pay to Addison a corresponding portion of the Retained Award; the Authority shall have no obligation to deposit or otherwise become obligated for sums in excess of the Retained Award. In any proceeding of the type described in this Subsection II.H.(2.), the Authority shall not be permitted to accept or offer any settlement, or to file any action or appeal, without the written authorization of Addison. The Authority and its counsel shall permit Addison and its counsel to fully participate in and support any such eminent domain action. The outcome of any such proceeding, including the amount of any resulting award or settlement, shall not modify or abrogate the obligations of the parties under this Agreement or increase or diminish the Award. The Authority and Addison acknowledge and agree that the Authority, at its option, may include at any time Addison as a property owner whose interest is being acquired under the Authority's eminent domain action(s), and that none of the provisions of this Agreement shall be abrogated, modified or affected thereby.

I. **The Arapaho Road Extension.** Addison currently intends to upgrade and extend Arapaho Road (the "Arapaho Road Extension"). It is anticipated that the Arapaho Road Extension will be generally constructed in the following three (3) phases:

Phase I: Upgrade Arapaho Road for the entire length of its existing alignment, terminating at Addison Road. Phase I is projected to open to traffic on December 31, 1997.

Phase II: Extend Arapaho Road along a new alignment from its existing junction at Addison Road to Midway Road. Phase II is projected to open to traffic on January 1, 2000.

Phase III: Extend Arapaho Road along a new alignment from its junction with Midway Road to Marsh Lane. Phase III is projected to open to traffic on January 1, 2003.

The planned alignment of the Arapaho Road Extension is indicated on Exhibit H attached hereto.

Addison agrees that, at least sixty (60) days before it intends to solicit construction bids for either Phase II or Phase III of the Arapaho Road Extension, it will provide written notice to the Authority of such intent. Thereafter, the Authority shall have an opportunity to review the effect, if any, that the proposed Phase II or Phase III construction will have on the Toll Tunnel. If the Authority, based upon its review, reasonably and in good faith concludes that the construction of Phase II or Phase III, as applicable, of the Arapaho Road Extension will have a materially adverse effect upon the financial performance of the Toll Tunnel (e.g., the Phase II or Phase III construction would have a reasonable likelihood of causing a deterioration in the financial performance of the Toll Tunnel that will result in revenues from the operation of the Toll Tunnel becoming insufficient to satisfy corresponding debt service, operating and maintenance costs, and reserve and similar requirements under the applicable trust agreement), the Authority may, not less than fifteen (15) days prior to the proposed date for the solicitation of bids, request in writing to Addison that the proposed solicitation and construction be postponed. Such request shall be accompanied by all of the evidence considered by the Authority in reaching its conclusion. Upon receiving such evidence, Addison shall review the same and give it significant weight in making its final determination as to whether or not to proceed with the Phase II or Phase III construction. The determination to proceed with the Phase II or Phase III construction shall be at Addison's sole discretion.

J. Operational and Maintenance Rights and Responsibilities. Except as otherwise provided in this Section II.J. and in Section II.K. below, the Authority agrees to construct, operate, maintain, and regulate, all at its sole expense, the Toll Tunnel from its

BARTON-ASCHMAN ASSOCIATES, INC.

5485 Belt Line Road, Suite 199 • Dallas, Texas 75240 USA • (214) 991-1900 • Fax: (214) 490-9261

DRAFT
MEMORANDUM

TO: John Baumgartner

FROM: Robert Wunderlich
Gary Jost

DATE: February 4, 1994

SUBJECT: Analysis of Cross-Section Requirements For Arapaho Road

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This memorandum presents the findings of an evaluation of two alternative roadway cross sections for the proposed extension of Arapaho Road in Addison, Texas. The alternatives include a four lane divided (with median) roadway constructed in an eighty-four foot right-of-way and a four lane undivided roadway constructed in a sixty foot right-of-way. This study evaluates the benefits and impacts of each of the alternatives on roadway operations and safety, capacity, and cost.

BACKGROUND

The Town of Addison has long recognized the need for additional east-west roadway capacity within the Town limits. Presently, the demand for east-west capacity if served predominantly by Belt Line Road. Development along this regional six-lane arterial has steadily increased traffic volumes over the past several years. Recent traffic counts conducted along Belt Line Road revealed 24-hour volumes in excess of 50,000 vehicles, well above the design capacity of the roadway. Traffic volumes have increased along the roadway at an annual rate of over three percent (3%).

Thoroughfare Planning

There have been several alternatives discussed for providing additional east-west capacity within the Town. These alternatives, as well as other transportation needs, were analyzed in December 1992, as part of the development of a comprehensive transportation plan to meets the existing and future needs of the Town. This plan was adopted by the Town's Council in January, 1993.

As part of the Thoroughfare Plan Study, a roadway functional classification system was developed to serve the variety of transportation needs within the Town. This functional classification of roadways was prepared to provide an underlying basis for determining the following:

- Desired degree of continuity
- Capacity level
- Traffic control strategy
- Design speeds and other design standards
- Degree of access control

Using these characteristics, the Town adopted the following five roadway classifications:

- Principal arterial - six lane divided
- Minor arterial - four lane divided
- Commercial collector - four lane undivided
- Residential collector - two lane undivided (36')
- Residential local - two lane undivided (27')

These classifications were used to develop a system of roadways where the specific performance characteristics of each roadway we matched to the demand.

Planning Capacity

An important element of the Thoroughfare Plan Development process was to provide the necessary roadway capacity to meet the existing and future travel demand within the Town. The effective capacity of any particular roadway is dependent on several factors, including horizontal and vertical curvature, signal spacing, signal operation, and level of access control to adjacent properties.

Considering these elements, the North Central Texas Council of Governments has developed capacities for various roadway classifications for use in their transportation planning efforts throughout the region. These planning capacities are typically used in determining roadway cross-section requirements and classifications. These same capacities were used in the Town's Thoroughfare Plan for Four Lane Roadways. The following daily capacities were assumed:

Four lane divided:	28,000	vehicles per day
Four lane undivided:	25,000	vehicles per day

Projected Arapaho Road Volumes

Several roadway network alternatives were evaluated using the NCTCOG's travel demand forecasting models and projected and recommended cross-section population and employment levels. To provide additional east-west capacity, the preferred roadway network included both the planned Keller Springs Toll Tunnel and the extension of Arapaho Road from Addison Road to Marsh Lane. The daily volumes on the Arapaho Road extension are projected to be as high as 40,000 vpd in certain segments of the roadway. This projected volume exceeds the planning capacity of a four lane design, but the assessment of the Town staff and

thoroughfare plan steering committee concluded that a four lane divided roadway was the most realistic designation for this arterial. This recommendation was contained in the final thoroughfare plan document approved by Town Council.

COMPARISON OF ALTERNATE CROSS-SECTIONS

The following sections contain comparisons of the two alternative cross-sections for the proposed Arapaho Road extension. Separate sections describe the operations and safety characteristics, PM peak hour level of service and cost differences between the two alternatives.

Operations and Safety Characteristics

The four lane undivided roadway does not provide special provisions for left turning vehicles and that through vehicles are frequently delayed by left turning vehicles. Traffic turning to other streets and driveways can create rear-end conflicts and lane change maneuvers by drivers seeking to avoid delay which in turn can create capacity and safety problems. Undivided roadways also do not provide a refuge area for pedestrians crossing the street and the entire width must be crossed in one movement.

In terms of capacity, left turning vehicles create disruptions to through traffic at intersections and mid-block areas. Through vehicles are delayed until the left turning vehicles can complete their turn. This is particularly critical at signalized intersections, where left turns are delayed because opposing traffic is concentrated and the lack of left turn lanes limits the ability to provide left turn signal phases to reduce delay. Operational analyses conducted as part of a national research effort indicate that the four lane undivided is less desirable in terms of level of service and capacity in mid-block areas than the divided cross-section under high volume conditions such as those projected for Arapaho Road.[1] An analysis of the projected peak-hour intersection is detailed in a subsequent section of this memo.

The undivided cross-section generally has a higher accident rate than roads which make provisions for left turning vehicles. Research indicates that accidents can be reduced an average of 45 percent by implementing left turn provisions on a previously undivided roadway.[1] Other recent research indicates that in suburban areas, raised curb medians provide a significantly lower vehicle accident rate than undivided cross-sections. The pedestrian accident rate was also found to be significantly lower on divided than undivided roadways.[2]

PM Peak Hour Intersection Operations

The ability of a roadway to meet the transportation needs of the Town is dependent on many variables. The optimum operation of signalized intersection is one such key element. Traffic signals assign the right-of-way to the various movements allowed at the intersection. When right-of-way is assigned to compatible movements, all conflicting movements must stop,

effectively causing the capacity of that movement to be zero. The ability to effectively supply signal timing plans which minimize the stops at the intersection allows us to maximize the effective capacity of the intersections.

Turning movements at intersections are often sufficiently high to require special phasing operations for optimum operation. Without the opportunity to separate turning vehicles from through vehicles, signal operation cannot be optimized and traffic conditions are impacted.

An analysis of projected PM peak hour conditions at Midway and Arapaho was performed to quantify the differences between the divided and undivided cross-sections. Turning movements levels were estimated based on NCTCOG projected volumes and Highway Capacity Manual methods were used to analyze the level of service provided by each option.

Two scenarios were evaluated, the long-term projections and an interim period where Arapaho volumes were one-half of the ultimate projection. The results of this analysis are shown in Table 1.

TABLE 1
PM PEAK HOUR LEVEL OF SERVICE
ARAPAHO AT MIDWAY INTERSECTION

Scenario	Divided	Undivided
Long-term	E (At Capacity)	* (Failure)
Interim	D (Acceptable)	E (Capacity)

At the full projected volume condition, the intersection is at capacity with a divided roadway on Arapaho. Without left turn lanes on Arapaho, east-west capacity is overwhelmed by traffic demand and the result would be very high levels of congestion.

In the interim scenario, an acceptable level of service is provided by the divided cross-section but the undivided roadway results in at-capacity conditions. The resulting average delay to individual vehicles of about 52 seconds is forty percent greater than that experienced with the divided cross-section.

Estimated Costs

Costs have been estimated for each cross-section. Barton-Aschman has prepared an engineer's estimate of probable construction costs and the Town staff has prepared an estimate of probable right-of-way acquisition costs. These costs are provided in Table 2.

TABLE 2
PROBABLE IMPLEMENTATION COSTS
ARAPAHO ROAD FROM DALLAS PARKWAY TO MARSH LANE

	Divided	Undivided
Construction	$5.2 million	$4.5 million
Right-of-Way	$8.0 million	$6.6 million
Total	$13.2 million	$11.1 million

The divided cross-section roadway is expected to cost $2.1 million more than the undivided roadway. The additional cost is directly related to the provision of turn lanes for left turning vehicles which provide the capacity and safety benefits detailed in other sections of this memo.

Conclusions

Based on this evaluation, the following conclusions can be drawn.

- Projected traffic volumes prepared as part of the development of Addison's Transportation Plan indicate the need for a four lane divided roadway.
- The construction of Arapaho Road as a four lane divided arterial, as approved in the Town's Thoroughfare Plan, will provide the following benefits over an undivided cross-section:
    - Increased Capacity
    - Increased Safety
    - Improved Signal Operation
- The cost of constructing Arapaho Road as a four lane divided arterial will cost approximately nineteen percent more than an undivided roadway.

References

1. Harwood, D. W., "Effective Utilization of Street Width on Urban Arterials," NCHRP Report 330, Transportation Research Board (August 1990) 49 pp.

2. Bowman, Brian L. and Robert L. Vecellio, "The Effect of Urban/Suburban Median Types on Both Vehicular and Pedestrian Safety," presented at the 73rd Annual Meeting of the Transportation Research Board, January 9-13, 1994, Washington, D.C.

ARAPAHO ROAD EXTENSION - TOLLWAY TO MARSH LANE
RIGHT-OF-WAY COSTS

Parcel No.	Owner Address	$ / SF	60' R.O.W. Area (S.F.)	60' R.O.W. Cost	84' R.O.W. Area (S.F.)	84' R.O.W. Cost
1		$10.00	1,575	$15,750	1,575	$15,750
2	J.B. Cline	$5.00	33,000	$165,000	58,500	$292,500
3	Ben Pinnel	$15.00	20,000	$300,000	30,000	$450,000
4	Brick Yard - right-of-way	$5.00	0	$0	7,000	$35,000
	Brick Yard - unusable remainder	$5.00	8,300	$41,500	8,300	$41,500
5	Southern Pacific Lines	$5.00	56,000	$280,000	78,000	$390,000
6	City of Dallas - Beltway Reservior	$5.00	0	$0	11,000	$55,000
7	Brinker Tract	$5.00	0	$0	16,900	$84,500
8	Roadway Inn	$7.50	22,200	$166,500	29,700	$222,750
9	Yoplait Yogurt	$12.50	12,000	$150,000	19,400	$242,500
10	15101 Midway - right-of-way	$20.00	32,000	$640,000	47,000	$940,000
	15101 Midway - unusable remainder	$20.00	121,000	$2,420,000	106,000	$2,120,000
11	4139 Centurion Way	$10.00	1,100	$11,000	5,400	$54,000
12	4131 Centurion Way	$10.00	0	$0	3,100	$31,000
13	4125 Centurion Way	$10.00	0	$0	2,400	$24,000
14	4101 Centurion Way	$10.00	450	$4,500	2,000	$20,000
15	Mini- Warehouses	$18.00	42,600	$766,800	60,300	$1,085,400
16	Bob Hall - 15115 Surveyor	$20.00	79,200	$1,584,000	79,200	$1,584,000
17	TU Electric	$0.00	6,000	$0	8,400	$0
18	Vacant tract on Realty Lane	$5.00	0	$0	5,800	$29,000
19	3801 Realty Lane	$10.00	0	$0	8,400	$84,000
20	3799 Realty Lane	$10.00	5,000	$50,000	9,900	$99,000
21	Developed tract s.w. corner Marsh & Realty	$10.00	0	$0	11,200	$112,000
22	South side Realty between Business & Commercial	$5.00	0	$0	5,500	$27,500
23	Tract north of Addison Bank	$5.00	0	$0	4,000	$20,000
24	S.E. corner of Runyon & Centurion Way	$10.00	0	$0	2,800	$28,000
25	tract to the east of tract 24	$10.00	0	$0	2,100	$21,000
26	tract to the east of tract 25	$10.00	0	$0	6,300	$63,000
		TOTAL		$6,595,050		$8,171,400

BARTON-ASCHMAN ASSOCIATES, INC.

5485 Belt Line Road, Suite 199 • Dallas, Texas 75240 USA • (214) 991-1900 • Fax (214) 490-9261

April 1, 1993

Mr. Ron Whitehead
City Manager
Town of Addison
5300 Belt Line Road
Addison, Texas 75001

RE: Arapaho Road Alignment

Dear Mr. Whitehead:

Barton-Aschman Associates, Inc. is pleased to provide a thoroughfare alignment study for Arapaho Road from Marsh Lane to Dallas Parkway.

The alignment study for Arapaho Road from Addison Road to Dallas Parkway will consist of the following:

- Field surveying to establish existing property lines, building locations, existing right-of-way.
- Calculated right-of-way alignment based on field surveys.
- Detailed right-of-way alignment map.
- Right-of-way descriptions for proposed right-of-way.

The alignment study for Arapaho Road from Marsh Lane to Addison Road will consist of the following:

- Establish existing property lines from recorded subdivision plats.
- Locate buildings and existing pavement by on-the-ground observation.
- Establish alignment on a large scale alignment map.

The anticipated costs for field surveying, expenses, and engineering effort is $9,500.00. We are prepared to begin the work immediately with completion within four (4) weeks.

We have initiated work based on your verbal authorization. If this does not agree with your understanding, please contact me immediately. We appreciate to opportunity to work with you again.

Sincerely,

BARTON-ASCHMAN ASSOCIATES, INC.

Gary D. Jost, P.E.
Vice President

GDJ:tdb

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FILE

RESOLUTION R93-034

A RESOLUTION BY THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS, APPROVING AN EXPENDITURE IN THE AMOUNT OF $9,500. FOR AN ALIGNMENT STUDY FOR THE EXTENSION OF ARAPAHO ROAD, TO BE CONDUCTED BY BARTON-ASCHMAN ASSOCIATES, INC.

WHEREAS, Barton-Aschman Associates, Inc. serves as the traffic consultant to the Town; and

WHEREAS, the Town has adopted a Transportation and Thoroughfare Plan which includes the extension of Arapaho Road west to Marsh Lane; and

WHEREAS, Barton-Aschman has agreed to provide: field surveying, calculated right-of-way alignment, detailed right-of-way alignment map, right-of-way descriptions for proposed right-of-way, establishment of existing property lines from recorded subdivision plats, location of buildings and existing pavement by on-the-ground observation, and establishment of alignment on a large scale alignment map; and

WHEREAS, The anticipated costs for field surveying, expenses, and engineering effort is $9,500.; and

WHEREAS, the Town has funds available for the work;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS:

THAT, the Town of Addison does hereby approve an expenditure in the amount of $9,500. for a thoroughfare alignment study for Arapaho Road, to be conducted by Barton-Aschman, Associates, Inc.

DULY PASSED BY THE CITY COUNCIL OF THE TOWN OF ADDISON, TEXAS, this the 13th day of April, 1993.

MAYOR

ATTEST:

CITY SECRETARY