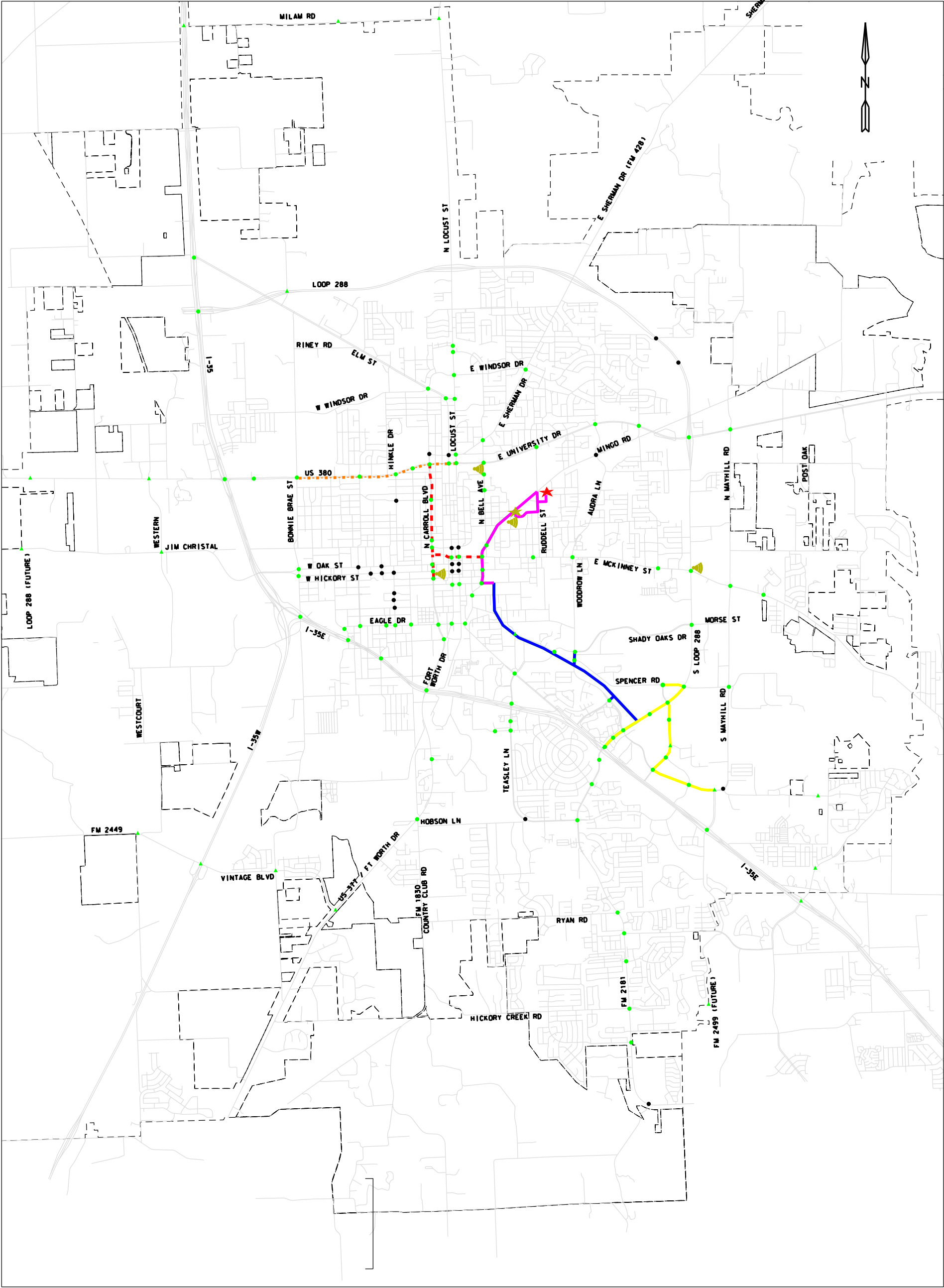


CITY OF DENTON ITS MASTER SYSTEM
APPENDIX E - PHASE 1 FIBER DESIGN
SEPTEMBER, 2015



LEGEND

- | | |
|--|----------------------|
| ● EXISTING TRAFFIC SIGNAL ON FUTURE FIBER | — PHASE 1A FIBER |
| ● EXISTING TRAFFIC SIGNAL TO REMAIN ON RADIO | — PHASE 1B FIBER |
| ▲ FUTURE TRAFFIC SIGNAL ON FUTURE FIBER | - - - PHASE 1C FIBER |
| ▲ FUTURE TRAFFIC SIGNAL ON RADIO | - - - PHASE 1D FIBER |
| ★ EXISTING CITY TRAFFIC MANAGEMENT CENTER | — PHASE 1E FIBER |
| ★ FUTURE CITY TRAFFIC MANAGEMENT CENTER | |
| ▲ EXISTING WIRELESS BACKHAUL SITE | |

SCALE: 1" = 1 MILE



Stantec

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2435 N Central Expressway, Suite 750
Richardson, TX 75080

Appendix E - Denton ITS Phase 1A Fiber Cost Estimate

	Phase	From	To	Length (mi)	# Signals	TMC Connection?
Phase Information	1A	Existing TMC	DCTA Handhole at Downtown Denton Station	2.01	4	Yes

Adjust these items for various field conditions

Percentage of overhead fiber Assume 0% average
 Percentage of bored conduit Assume 20% average

Number of signals per mile

ITS Equipment Cost Estimate				
Item	Unit	Estimated price	Phase 1A Total	Comments
CONDT (PVC) (SCHD 40) (3")	LF	\$8.50	\$72,134	
CONDT (PVC) (SCHD 40) (3") (BORE)	LF	\$18.25	\$38,719	
OVERHEAD HANGER FOR FIBER	EA	\$150.00	\$0	Assume 200 ft pole spacing
OVERHEAD SLACK LOOP	EA	\$550.00	\$0	Assume one for each signal
ADDITIONAL AERIAL INSTALLATION COSTS	LS	\$20,000.00	\$0	Costs of bucket truck labor, extra traffic control, etc.
GROUND BOX TY D (162922) W / APRON	EA	\$740.00	\$17,827	Assume 10 per conduit mile + one per signal
FIBER OPTIC CBL (SNGLE - MODE) (72 FIBER)	LF	\$4.75	\$50,388	
FIBER OPTIC CBL (SNGLE - MODE) (12 FIBER)	LF	\$3.75	\$3,750	Assume 250 feet per signal
FIBER OPTIC PATCH PANEL (12 POSITION)	EA	\$2,100.00	\$8,400	Assume one for each signal
FIBER OPTIC SPLICE ENCLOSURE	EA	\$3,600.00	\$21,633	Assume one for each signal + one per mile
FIBER OPTIC PATCH PANEL (144 POSITION) (TMC)	EA	\$4,000.00	\$8,036	Assume one for the entire project
MISC. COSTS FOR TMC CONNECTION	LS	\$0.00	\$0	Costs to be paid with TMC construction

Total estimated cost: \$220,900
 20% contingency: \$44,180
 Total project construction cost: \$265,100

 Engineering (assume 20%) \$53,100

Grand Total For Phase 1A \$318,200

Does not include remove/replace sidewalk, pavement. These costs to be covered by the contingency.
 Does not include utility relocates or permitting costs
 Does not include ROW acquisition or easement document prep costs

Note: source of prices is TxDOT low bid item list, except prices for aerial equipment which are based upon the engineer's estimate.
 All costs are estimated based on 2015 prices and are intended to provide planning level estimates only.

Appendix E - Denton ITS Phase 1B Fiber Cost Estimate

	Phase	From	To	Length (mi)	# Signals	TMC Connection?
Phase Information	1B	DCTA Handhole at Downtown Denton Station	DCTA Handhole at Loop 288	2.45	4	No

Adjust these items for various field conditions

Percentage of overhead fiber	0	Assume 0% average
Percentage of bored conduit	0	No Bore; Existing Conduit

Number of signals per mile 1.64

ITS Equipment Cost Estimate				
Item	Unit	Estimated price	Phase 1B Total	Comments
CONDT (PVC) (SCHD 40) (3")	LF	\$8.50	\$0	Existing conduit; none needed for this phase
CONDT (PVC) (SCHD 40) (3") (BORE)	LF	\$18.25	\$0	Existing conduit; none needed for this phase
OVERHEAD HANGER FOR FIBER	EA	\$150.00	\$0	Assume 200 ft pole spacing
OVERHEAD SLACK LOOP	EA	\$550.00	\$0	Assume one for each signal
ADDITIONAL AERIAL INSTALLATION COSTS	LS	\$20,000.00	\$0	Costs of bucket truck labor, extra traffic control, etc.
GROUND BOX TY D (162922) W / APRON	EA	\$740.00	\$2,960	Conduit boxes existing; assume one box per signal
FIBER OPTIC CBL (SNGLE - MODE) (72 FIBER)	LF	\$4.75	\$61,337	
FIBER OPTIC CBL (SNGLE - MODE) (12 FIBER)	LF	\$3.75	\$3,750	Assume 250 feet per signal
FIBER OPTIC PATCH PANEL (12 POSITION)	EA	\$2,100.00	\$8,400	Assume one for each signal
FIBER OPTIC SPLICE ENCLOSURE	EA	\$3,600.00	\$23,204	Assume one for each signal + one per mile

Total estimated cost: \$99,700
20% contingency: \$19,940
Total project construction cost: \$119,700

Engineering (assume 20%) \$24,000

Grand Total For Phase 1B \$143,700

Does not include remove/replace sidewalk, pavement. These costs to be covered by the contingency.

Does not include utility relocates or permitting costs

Does not include ROW acquisition or easement document prep costs

Note: source of prices is TxDOT low bid item list, except prices for aerial equipment which are based upon the engineer's estimate

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Appendix E - Denton ITS Phase 1C Fiber Cost Estimate

	Phase	From	To	Length (mi)	# Signals	TMC Connection?
Phase Information	1C	Bell Avenue & McKinney St	N. Carroll Blvd & University Drive	1.72	9	No

Adjust these items for various field conditions

Percentage of overhead fiber	0	Assume 0% average
Percentage of bored conduit	20	Assume 20% average

Number of signals per mile 5.24

ITS Equipment Cost Estimate				
Item	Unit	Estimated price	Phase 1C Total	Comments
CONDT (PVC) (SCHD 40) (3")	LF	\$8.50	\$61,656	
CONDT (PVC) (SCHD 40) (3") (BORE)	LF	\$18.25	\$33,095	
OVERHEAD HANGER FOR FIBER	EA	\$150.00	\$0	Assume 200 ft pole spacing
OVERHEAD SLACK LOOP	EA	\$550.00	\$0	Assume one for each signal
ADDITIONAL AERIAL INSTALLATION COSTS	LS	\$20,000.00	\$0	Costs of bucket truck labor, extra traffic control, etc.
GROUND BOX TY D (162922) W / APRON	EA	\$740.00	\$19,368	Assume 10 per conduit mile + one per signal
FIBER OPTIC CBL (SNGLE - MODE) (72 FIBER)	LF	\$4.75	\$43,068	
FIBER OPTIC CBL (SNGLE - MODE) (12 FIBER)	LF	\$3.75	\$8,438	Assume 250 feet per signal
FIBER OPTIC PATCH PANEL (12 POSITION)	EA	\$2,100.00	\$18,900	Assume one for each signal
FIBER OPTIC SPLICE ENCLOSURE	EA	\$3,600.00	\$38,582	Assume one for each signal + one per mile

Total estimated cost:	\$223,200
20% contingency:	\$44,700
Total project construction cost:	\$267,900
Engineering (assume 20%)	\$53,600
Grand Total For Phase 1C	\$321,500

Does not include remove/replace sidewalk, pavement. These costs to be covered by the contingency.

Does not include utility relocates or permitting costs

Does not include ROW acquisition or easement document prep costs

Note: source of prices is TxDOT low bid item list, except prices for aerial equipment which are based upon the engineer's estimate

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Appendix E - Denton ITS Phase 1D Fiber Cost Estimate

	Phase	From	To	Length (mi)	# Signals	TMC Connection?
Phase Information	1D	Bonnie Brae & University Drive	Locust Street & University Drive	1.69	6	No

Adjust these items for various field conditions

Percentage of overhead fiber	0	Assume 0% average
Percentage of bored conduit	20	Assume 20% average

Number of signals per mile 3.56

ITS Equipment Cost Estimate				
Item	Unit	Estimated price	Phase 1D Total	Comments
CONDT (PVC) (SCHD 40) (3")	LF	\$8.50	\$60,520	
CONDT (PVC) (SCHD 40) (3") (BORE)	LF	\$18.25	\$32,485	
OVERHEAD HANGER FOR FIBER	EA	\$150.00	\$0	Assume 200 ft pole spacing
OVERHEAD SLACK LOOP	EA	\$550.00	\$0	Assume one for each signal
ADDITIONAL AERIAL INSTALLATION COSTS	LS	\$20,000.00	\$0	Costs of bucket truck labor, extra traffic control, etc.
GROUND BOX TY D (162922) W / APRON	EA	\$740.00	\$16,913	Assume 10 per conduit mile + one per signal
FIBER OPTIC CBL (SNGLE - MODE) (72 FIBER)	LF	\$4.75	\$42,275	
FIBER OPTIC CBL (SNGLE - MODE) (12 FIBER)	LF	\$3.75	\$5,625	Assume 250 feet per signal
FIBER OPTIC PATCH PANEL (12 POSITION)	EA	\$2,100.00	\$12,600	Assume one for each signal
FIBER OPTIC SPLICE ENCLOSURE	EA	\$3,600.00	\$27,668	Assume one for each signal plus one per mile

Total estimated cost:	\$198,100
20% contingency:	\$39,700
Total project construction cost:	\$237,800
Engineering (assume 20%)	\$47,600
Grand Total For Phase 1D	\$285,400

Does not include remove/replace sidewalk, pavement. These costs to be covered by the contingency.

Does not include utility relocates or permitting costs

Does not include ROW acquisition or easement document prep costs

Note: source of prices is TxDOT low bid item list, except prices for aerial equipment which are based upon the engineer's estimate

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Appendix E - Denton ITS Phase 1E Fiber Cost Estimate

	Phase	From	To	Length (mi)	# Signals	TMC Connection?
Phase Information	1E	DCTA Handhole at Loop 288	S. Loop 288 & IH 35E; Various Traffic Signals	2.77	13	No

Adjust these items for various field conditions

Percentage of overhead fiber	0	Assume 0% average
Percentage of bored conduit	20	Assume 20% average

Number of signals per mile 4.70

ITS Equipment Cost Estimate				
Item	Unit	Estimated price	Phase 1E Total	Comments
CONDT (PVC) (SCHD 40) (3")	LF	\$8.50	\$99,382	
CONDT (PVC) (SCHD 40) (3") (BORE)	LF	\$18.25	\$53,345	
OVERHEAD HANGER FOR FIBER	EA	\$150.00	\$0	Assume 200 ft pole spacing
OVERHEAD SLACK LOOP	EA	\$550.00	\$0	Assume one for each signal
ADDITIONAL AERIAL INSTALLATION COSTS	LS	\$20,000.00	\$0	Costs of bucket truck labor, extra traffic control, etc.
GROUND BOX TY D (162922) W / APRON	EA	\$740.00	\$30,103	Assume 10 per conduit mile + one per signal
FIBER OPTIC CBL (SNGLE - MODE) (72 FIBER)	LF	\$4.75	\$69,421	
FIBER OPTIC CBL (SNGLE - MODE) (12 FIBER)	LF	\$3.75	\$12,188	Assume 250 feet per signal
FIBER OPTIC PATCH PANEL (12 POSITION)	EA	\$2,100.00	\$27,300	Assume one for each signal
FIBER OPTIC SPLICE ENCLOSURE	EA	\$3,600.00	\$56,765	Assume one for each signal + one per mile

Total estimated cost:	\$348,600
20% contingency:	\$69,720
Total project construction cost:	\$418,400
Engineering (assume 20%)	\$83,700
Grand Total For Phase 1E	\$502,100

Does not include remove/replace sidewalk, pavement. These costs to be covered by the contingency.

Does not include utility relocates or permitting costs

Does not include ROW acquisition or easement document prep costs

Note: source of prices is TxDOT low bid item list, except prices for aerial equipment which are based upon the engineer's estimate

All costs are estimated based on 2015 prices and are intended to provide planning level estimates only.