

Executive Summary

RTSRP Phase V

Prepared for:
North Central Texas Council of Governments

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Prepared in cooperation with the Regional Transportation Council, NCTCOG, and the Texas Department of Transportation.

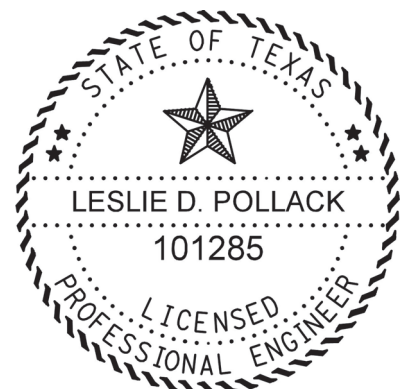
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1.0 Introduction

The North Central Texas Council of Governments (NCTCOG) contracted HDR. to assist local agencies to coordinate traffic signal timing for 201 traffic signals along various corridors within the Metroplex. This summary covers traffic signals operated by Cities of Arlington, Coppell, Carrollton, Fort Worth, Keller, and the Dallas and Fort Worth Districts of the Texas Department of Transportation. Figure 1 illustrates the locations of these traffic signals. This project has improved progression along these arterial streets without regard to jurisdictional boundaries.

2.0 Project Scope

The assigned intersections were grouped into designated corridors that ranged in size from 11 to 31 intersections. For each corridor, the scope included the following tasks:

- A baseline assessment to document the conditions as of the beginning of the project.
- Development, implementation, and fine-tuning of the new signal timing plans.
- An after assessment to quantify and document the project results.

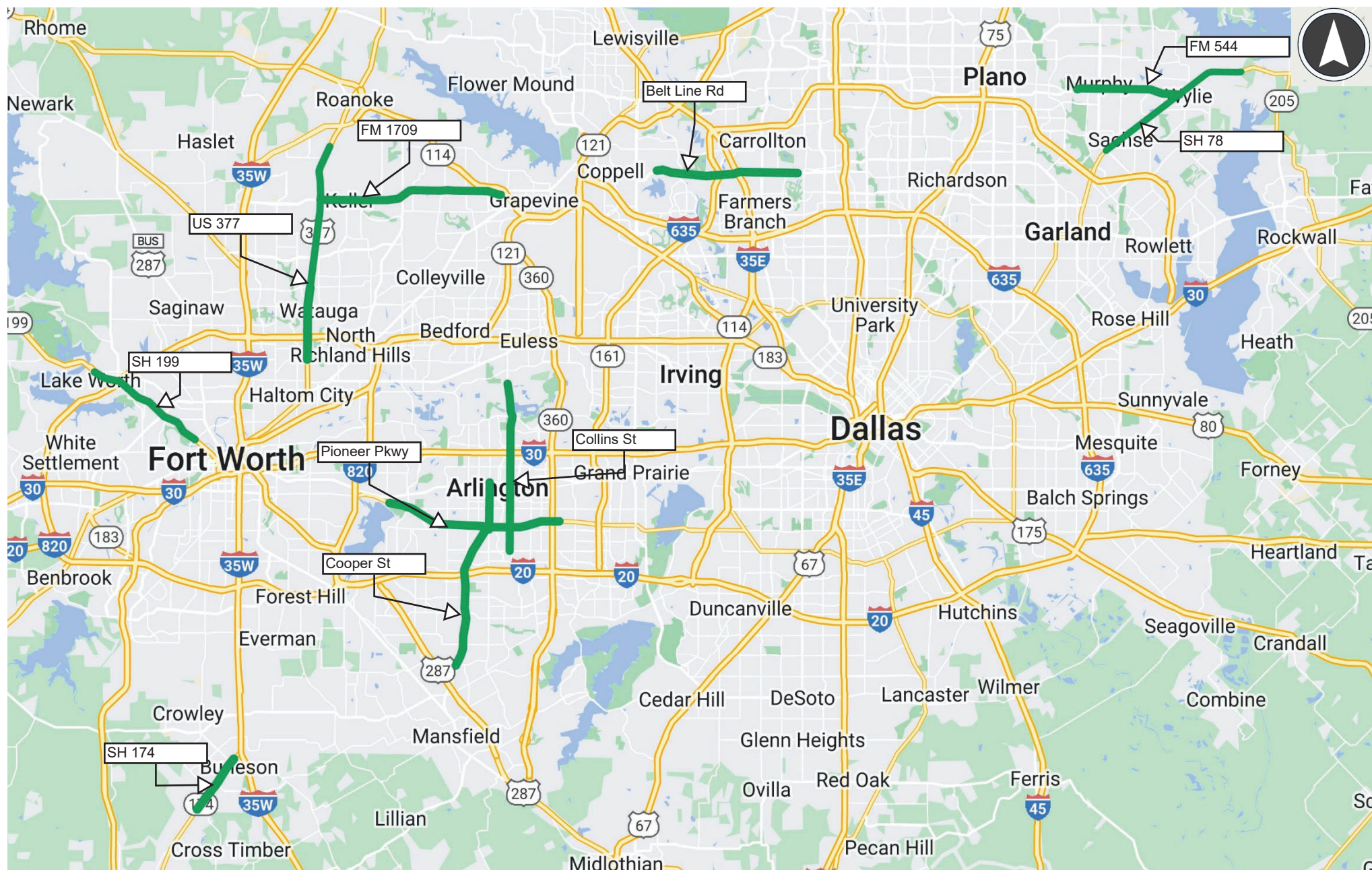
3.0 Data Collection

The project included extensive data collection:

- For all intersections, peak-hour turning movement counts were made either by human observers who used electronic count boards or video data recorders to document the number of vehicles by approach direction and by movement (i.e., left turn, straight through, or right turn).
- Bi-directional machine counts were made with pneumatic tube-type counters that digitally record the number of vehicles in 15-minute increments, totaled on an hourly basis. These included seven-day counts, 24-hour counts, and vehicle classification counts.

4.0 Signal Timing Plans

For all corridors, new timing plans were developed for the AM, Midday, PM and a weekend peak. In some cases, plans were required for times when school speed zones are in operation. Some corridors required timing plans for other periods unique to that corridor. After the new timing plans were operational, extensive “fine-tuning” was performed to improve on-street performance.



**RTSRP PHASE V
CORRIDOR MAP**



5.0 Project Results

The project results were also estimated from the Synchro™ models that were used to develop the new traffic signal timing plans. The measures of effectiveness (MOEs) that were compared included total signal delay, corridor stops, corridor travel time, and fuel consumption along with three categories of emissions (CO, NOx, and VOC). The following improvements were estimated by the Synchro™ comparison:

- Signal Delay
 - Weekday
 - 8.44% overall vehicle-hour reduction per day
 - Saturday
 - 7.63% overall vehicle-hour reduction per day
- Fuel Consumption
 - Weekday
 - 1.71% overall gallon reduction per day
 - Saturday
 - 2.65% overall gallon reduction per day
- Emissions
 - Weekday
 - VOC reduction of approximately 3.89% per day
 - CO reduction of approximately 3.89% per day
 - NOx reduction of approximately 3.91% per day
 - Saturday
 - VOC reduction of approximately 3.52% per day
 - CO reduction of approximately 3.51% per day
 - NOx reduction of approximately 3.5% per day

5.1 Estimated Economic Benefits

The following rationale was used to estimate the daily user savings from the new timing plans:

- On each weekday there will be:
 - Three hours of benefit from the AM peak period timing plan
 - 3.75 hours of benefit from the PM peak period timing plan
 - 5.5 hours of benefit from the midday peak period timing plan
- On Saturday, there will be four hours of benefit from the timing plan.

For the purpose of economic analysis of transportation improvements, NCTCOG's Mobility 2045 value of time of \$21.71 per vehicle-hour of delay was used.

For each corridor, the “before” and “after” Synchro™ models were compared for each of the timing plans. Considering the composite total signal delay for all corridors and using the above-described rationale, the estimated user benefit is \$127,633 per weekday. Assuming 248 weekdays per year, this equates to an annual savings of approximately \$32 million.

The attached Table 1 provides a summary of the project benefits. The data provided include the following statistics per travel time route: number of signals, average daily traffic volume, and project benefits (reductions in travel time, stops, and delay). Also provided were the following statistics per corridor: number of signals, project benefits as derived from the Synchro™ models (reductions in total signal delay,



stops, travel time, fuel consumed, and emissions). Daily user savings are calculated using \$21.71 per vehicle-hour of delay and total signal delay (veh-hours) from the Synchro™.

The greatest per-intersection improvements were attained in the following corridors:

- FM 1709
- Cooper Street
- US 377

These corridors saw daily delay savings of more than \$570 per intersection. These benefits were realized through improved phasing, adjusted cycle lengths, and improved coordination between intersections.

NCTCOG Regional Traffic Signal Retiming Program
Final Technical Memorandum

		Contract Number of Signals	Average Daily Traffic	From Synchro										Daily User Savings ^B	
				Total Signal Delay (veh-hours)	Stops	Total Travel Time (veh-hours)				Fuel Consumed (gallons)	VOC Emissions (grams)	CO Emissions (grams)	NOx Emissions (grams)	Corridor Total	Per Intersection
						AM	MD	PM	WE						
SH 199	Weekday	20	43,000	-193.10	-18,015.00	-47.00	-22.00	8.00		-55.50	-5,007.50	-21,725.00	-4,530.00	\$4,192.20	\$209.61
	Weekend			-60.40	-4,868.00				-17.00	-15.20	-880.00	-3,640.00	-680.00	\$1,311.28	\$65.56
SH 174	Weekday	11	48,000	9.50	-14,881.00	-1.00	-10.00	18.00		-202.00	-3,167.50	-13,832.50	-2,672.50	-\$206.25	-\$18.75
	Weekend			-64.00	-8,152.00				-16.00	-156.00	-2,520.00	-10,880.00	-2,120.00	\$1,389.44	\$126.31
FM 544	Weekday	13	33,000	-326.45	-18,690.25	19.00	13.00	22.00		-158.40	1,260.00	5,472.50	1,092.50	\$7,087.23	\$545.17
	Weekend			161.20	-3,168.00				4.00	-26.40	-2,440.00	-10,440.00	-2,000.00	-\$3,499.65	-\$269.20
US 377	Weekday	24	46,000	-746.70	-37,314.50	-235.00	-58.00	-200.00		-518.03	-28,385.00	-122,727.50	-23,870.00	\$16,210.86	\$675.45
	Weekend			-281.20	-13,652.00				-141.00	-185.20	-8,960.00	-38,720.00	-7,520.00	\$6,104.85	\$254.37
SH 78	Weekday	16	55,000	-158.35	-8,773.75	7.00	7.00	6.00		-28.60	3,105.00	13,602.50	2,690.00	\$3,437.78	\$214.86
	Weekend			21.20	-1,844.00				12.00	-45.20	1,880.00	8,040.00	1,560.00	-\$460.25	-\$28.77
FM 1709 (Keller Parkway)	Weekday	21	34,000	-1,710.25	-25,165.50	-159.00	-87.00	-143.00		-264.00	-36,195.00	-156,120.00	-30,430.00	\$37,129.53	\$1,768.07
	Weekend			-298.40	-15,108.00				-88.00	-92.80	-11,520.00	-49,600.00	-9,640.00	\$6,478.26	\$308.49
Pioneer Parkway	Weekday	20	37,000	-337.50	5,341.25	3.00	-141.00	-184.00		-178.75	-85,827.50	-370,397.50	-72,085.00	\$7,327.13	\$366.36
	Weekend			-324.00	1,420.00				-107.00	-224.00	-5,720.00	-24,680.00	-4,800.00	\$7,034.04	\$351.70
Collins Street	Weekday	25	35,000	-582.25	-22,278.25	-33.00	-7.00	49.00		-732.00	2,572.50	10,825.00	2,115.00	\$12,640.65	\$505.63
	Weekend			-460.00	4,552.00				-62.00	-288.00	-1,760.00	-7,480.00	-1,440.00	\$9,986.60	\$399.46
Cooper Street	Weekday	31	57,000	-1,390.00	6,124.25	14.00	39.00	-64.00		-921.00	14,982.50	64,605.00	12,570.00	\$30,176.90	\$973.45
	Weekend			-624.00	-10,868.00				-97.00	-584.00	-3,200.00	-13,880.00	-2,680.00	\$13,547.04	\$437.00
Beltline Road	Weekday	20	36,000	-443.88	-12,316.75	-49.00	3.00	-58.00		-183.90	-4,430.00	-19,140.00	-3,800.00	\$9,636.53	\$481.83
	Weekend			20.40	-704.00				12.00	1.60	-600.00	-2,600.00	-520.00	-\$442.88	-\$22.14
Average	Weekday			-587.90	-14,596.95	-48.10	-26.30	-54.60		-324.22	-14,109.25	-60,943.75	-11,892.00	\$12,763.25	\$572.17
Average	Weekend			-190.92	-5,239.20				-50.00	-161.52	-3,572.00	-15,388.00	-2,984.00	\$4,144.87	\$162.28
Total	Weekday			-5,878.98	-145,969.50	-481.00	-263.00	-546.00		-3,242.18	-141,092.50	-609,437.50	-118,920.00	\$127,632.55	\$5,721.68
Total	Weekend			-1,909.20	-52,392.00				-500.00	-1,615.20	-35,720.00	-153,880.00	-29,840.00	\$41,448.73	\$1,622.79

Note A: Based on the following hours of benefit per weekday from the three timing plans: 3 hours per weekday for AM Peak plan; 5.5 hours per weekday for the Midday plan; 3.75 hours per weekday for PM Peak plan; 4 hours per day per Weekend plan

Note B: Based on \$21.71 per hour of Synchro™ total signal delay



5.2 Mid and Long-Term Recommendations

The following mid- and long-term improvements were identified at study intersections during the signal retiming process. These improvements were not required for implementation of the traffic signal timing plans, but instead are recommended for agency consideration for further evaluation and potential implementation. The following recommendations were identified as part of this study to improve operations and safety at intersections:

SH 199

- Provide Americans with Disabilities Act (ADA)-compliant pedestrian curb ramps at the following intersections:
 - Long Avenue - west corner
 - University Drive - all corners
- Relocate pedestal poles with push buttons closer to ramps to be compliant with the Texas Manual Uniform Traffic Control Devices (TMUTCD) guidelines at the following intersections:
 - Long Avenue west corner
- Modify phasing at the following approaches from split phase to permissive/protected left-turn phase. This will require additional geometry at the approaches as followed:
 - Roberts Cut Off Road – provide left-turn bays for the northbound and southbound approaches
- Study median openings along SH 199 for closure or the installation of dedicated left-turn lanes to improve traffic operations and safety.

SH 174

- Add capacity to SH 174 corridor from four lanes to six lanes between Elk Drive and Hulen Street.
- Remove split-phased operations on the cross streets of:
 - Elk Drive
 - McNairn Road/Hidden Creek Parkway
 - Summer Crest Boulevard/Gardens Boulevard
 - Newton Road
 - Hillery Street
- Provide ADA-compliant pedestrian curb ramps on the corridor.
- Provide ADA-compliant APS push buttons and pedestal poles at signalized intersections on SH 174 (Wilshire Boulevard).

FM 544

- Provide ADA-compliant pedestrian curb ramps at all intersections on the corridor.
- Relocate pedestal poles with push buttons closer to ramps to be compliant with TMUTCD guidelines.
- Recommendations of storage length based on 95th percentile queue:
- Construct dual left-turn bays at:
 - Westgate Way eastbound approach
 - McCreary Road eastbound approach
 - Murphy Road both eastbound and westbound approaches
 - Heritage Parkway eastbound approach
- Construct left-turn bays at the intersection of FM 544 and SH 78 in the eastbound and westbound directions to allow for protected – permissive phasing.
- Modify the geometry for southbound right-turn at FM 544 and SH 78 to operate as a free right-turn movement.
- Construct a left-turn bay in the southbound direction at Murphy Road.



US 377

- Provide ADA-compliant curb ramps at
 - Glenview Dr (northeast and southeast corner)
 - Springlake Pkwy (northwest corner)
 - White Creek Dr (northwest and southwest corner)
 - Watauga Rd (southeast corner)
- Relocate pedestal poles with push buttons closer to ramps at
 - Springlake Pkwy (northwest corner)
 - White Creek Dr (southwest corner)
 - Watauga Rd (northeast and southeast corner)
 - N Tarrant Pkwy (all corners)
 - Bear Creek Pkwy (southwest corner)
- Extend northbound and southbound right-turn bays at IH 820 EBFR and WBFR intersections
- Construct dual left-turn lanes on northbound approach at IH820 WBFR intersection
- Construct right-turn bays at
 - Basswood Blvd southbound approach
 - N Tarrant Pkwy southbound approach
 - Kroger Dr southbound approach
- Modify N Tarrant Pkwy from split-phasing to protected left-turn phasing (eastbound/westbound)
- Modify the following approaches from split-phasing to permissive/protected left-turn phasing. This will require geometric modifications at the approaches as followed:
 - Wall Price Keller Rd – provide left-turn bay eastbound approach
 - Keller Hicks Rd – provide left-turn bay eastbound & westbound approaches
 - Keller Haslet Rd – provide left-turn bay eastbound & westbound approaches
- Change signal indications from traditional “green ball” to flashing yellow arrow at
 - Bear Creek Pkwy eastbound & westbound approaches
 - FM1709 northbound & southbound approaches
 - Johnson Rd northbound & southbound approaches

SH 78

- Provide ADA-compliant pedestrian curb ramps at all signals on the corridor.
- Install pedestal poles, crosswalk, and APS push buttons at the intersection of SH 78 and Eubanks Lane to be compliant with TMUTCD guidelines.
- Remove split-phased operations on the cross streets of:
 - 5th Street
 - Sanden Boulevard/ Alanis Drive
 - Ballard Avenue
- Construct a westbound left-turn bay at SH 78 and FM 544/W Kirby Street and implement permissive left-turn phasing.
- Construct eastbound and westbound left-turn bays at SH 78 and Brown Street and implement protected permissive left-turn phasing.

FM 1709 (Keller Parkway)

- Provide ADA-compliant pedestrian curb ramps at the following intersections:
 - Shady Oaks Drive - southeast corner
 - Central Avenue – southwest corner
- Provide pedestrian crossings:
 - South leg of Pearson Lane
 - East leg of Watermere Drive/Jellico Drive



- West leg of Tower Boulevard
- West leg of Carroll Avenue
- West leg of Commerce Street
- Relocate pedestal poles with push buttons closer to ramps to be compliant with TMUTCD guidelines at the following intersections:
 - Central Avenue – southwest and northwest corner
- Consider construction of dual left-turn bays at the following intersections:
 - Rufe Snow Drive southbound approach
 - Kimball Avenue eastbound approach
- Provide flashing yellow arrow signal heads at northbound and southbound at Cindy Street and Keller Smithfield and change phasing from traditional “green ball” to flashing yellow arrow
- Modify the following intersections from split-phasing to permissive-protected at the following intersections:
 - Anita Avenue/Bourland Road
 - Provide left-turn lane at northbound approach
 - Change southbound approach to left-turn only and shared through/right-turn
 - Pate Orr Road
 - Provide left-turn lane at northbound approach
 - Pearson Lane
 - Provide left-turn lane at northbound approach
 - Change southbound approach to left-turn only and shared through/right-turn

Pioneer Parkway, Collins Street, Cooper Street

- Railroad grade separation would greatly reduce delays and coordination issues related to railroad preemption, in addition to improving safety for road users.
- Additional pedestrian treatments should be considered to reduce jaywalking across Pioneer Parkway and Collins Street. Public outreach could be conducted to highlight the danger to pedestrians, and a study should be conducted for the installation of pedestrian signals or pedestrian hybrid beacons at locations where jaywalking is prevalent.
- Additional lane drop warning striping and/or signing should be considered at southbound Collins Street at IH 30 to provide advance warning for drivers that their lane will become a mandatory turn lane.

Beltline Road

- Provide ADA-compliant pedestrian curb ramps, to improve pedestrian safety and accessibility, at the following intersections:
 - Moore Road to Mockingbird Lane
 - Fairway Drive
 - Luna Road
 - Larner Road to Josey Lane
 - Columbian Club Drive to Trend Drive
- Provide pedestrian signal heads, to improve pedestrian safety and accessibility, at the following intersections:
 - Luna Road south and east leg crossings
- Add maximum recall, to provide cross coordination for:
 - MacArthur Boulevard phases 2 and 6 on Belt Line Road
- Extension of the left-turn bays, to avoid queues extending beyond the provided storage lengths, at the following intersections:
 - Moore Road, southbound approach
 - Mockingbird Lane, southbound approach
 - Milam Way/Metrocrest Drive, southbound approach



- Fairway Drive, northbound and southbound approaches
- MacArthur Boulevard, northbound and eastbound approaches
- Nix Road, northbound approach
- PGBT On-Ramp, westbound approach
- Luna Road eastbound, westbound, and northbound approaches
- Josey Lane eastbound, westbound, and southbound approaches
- Webb Chapel Road, westbound and northbound approaches
- Extension of the right-turn bays, to avoid queues extending beyond the provided storage lengths, at the following intersections:
 - Broadway Street, southbound approach
 - Kelly Street, southbound approach
 - Webb Chapel Road, eastbound approach
- Modify phasing at the following approaches from split phase to permissive/protected left-turn phase. This will require additional geometry at the approaches as followed:
 - Broadway Street, provide left-turn bays for the northbound and southbound approaches
 - Milam Way/Metrocrest Drive, provide left-turn bay for the northbound approach
- Upgrade to Flashing Yellow Arrow at the following approaches as a safety improvement:
 - Moore Road (eastbound)
 - Mockingbird Lane (eastbound)
 - Fairway Drive (eastbound & westbound)
 - PGBT On-Ramp (westbound)
 - IH 35 SBFR (westbound)
 - IH 35 NBFR (eastbound)
 - Main Street (eastbound & westbound)
 - Larner Road (westbound)
 - Perry Road (eastbound & westbound)
 - Milam Way/Metrocrest Drive (eastbound & westbound)
 - Nix Road (eastbound & westbound)
 - Kelly Boulevard (eastbound)
 - Columbian Club Drive (eastbound & westbound)
 - John Connally Drive (eastbound & westbound)