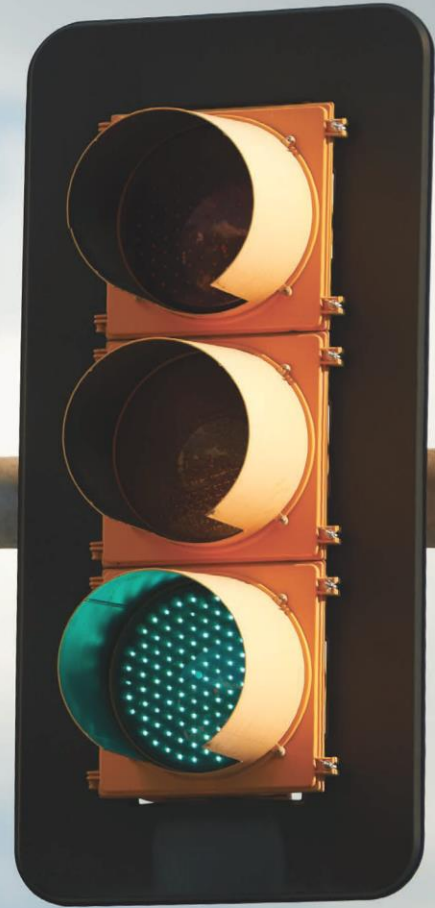




**North Central Texas
Council of Governments**

Phase V

Executive Summary
Dallas, Garland, and Richardson
Corridors



*RTSRP
Phase V*

May 2023

Updated July 2023

Kimley»Horn

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Regional Traffic Signal Retiming Program Phase V

*Executive Summary
Dallas, Garland, and Richardson Corridors*

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North Central Texas Council of Governments*

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7/12/2023

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

The contents of this report reflect the views of the authors who are responsible for the opinions, findings, and conclusions presented herein. The contents do not necessarily reflect the views or policies of the Regional Transportation Council, NCTCOG, the Federal Highway Administration, and the Texas Department of Transportation.

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Table of Contents

1. Introduction	1
1.1 Project Scope	1
1.2 Data Collection	12
1.3 Signal Timing Plans	12
2. General COVID-19 Impacts	13
3. Summary of Recommended Improvements	15
3.1 Dallas Corridors	15
3.2 Garland Corridors	15
3.3 Richardson Corridors	16
4. Project Results	17
4.1 Synchro Measures of Effectiveness	17
4.2 Annual Delay Reductions	31
5. Conclusions and Recommendations	33



1. Introduction

In 2010, the North Central Texas Council of Governments (NCTCOG) launched the Regional Traffic Signal Retiming Program (RTSRP), the goal of which is to maximize the capacity of the existing roadway system by improving traffic operations through signal retiming along selected corridors, in addition to reducing mobile source emissions, improving mobility, and enhancing safety.

Through the RTSRP program, North Texas residents benefit from improved air quality, reduced delay, higher reliability, reduced fuel consumption and vehicle emissions, reduced congestion, and improved efficiency throughout the region.

Phase V of RTSRP started in April 2019 and included corridors in Dallas, Garland, and Richardson. A team of consultants led by Kimley-Horn and Associates, Inc. was selected to complete 290 RTSRP Phase V signalized intersections. Figure 1 through Figure 4 illustrate the locations of these traffic signals. This project has achieved interlocking, seamless progression along more than 70 miles of arterial streets without regard to jurisdictional boundaries.

Of the 290 project intersections, 73 were identified as “on-system”, i.e., they were on the designated state highway system, and 217 intersections were “off-system”, i.e., they were not on the state highway system.

1.1 Project Scope

Project intersections were grouped into designated corridors that ranged in size from 8 to 103 intersections. For each corridor, the scope included the following tasks:

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

The project area included twenty major corridors in Dallas, Garland, and Richardson:

- Dallas (106 intersections)
 - Webb Chapel Corridor
 - Midway Road Corridor
 - Frankford Road Corridor
 - Greenville Avenue Corridor
 - IH 635 (LBJ) Corridor
 - Forest Lane Corridor
 - Abrams Road Corridor
 - Walnut Hill Road Corridor
- Garland (103 intersections) (considered as a single network)
 - NW Garland Group
 - SW Garland Group
- Richardson (80 intersections)
 - Arapaho Road Corridor
 - Campbell Road Corridor
 - Renner Road Corridor

Regional Traffic Signal Retiming Program Phase V

Executive Summary

*RTSRP
Phase V*

The project intersections listed in Table 1 are part of the regional super-network, a cross-jurisdictional control group spanning hundreds of intersections and nearly a dozen municipalities in North Texas. In this situation, peak period cycle lengths are likely to be determined based on the regional super-network to maintain regional coordination, rather than characteristics of intersections on the corridor.

Table 1. RTSRP Phase V Project Intersections

COG#	Intersection	City	Corridor	TxDOT
2491	Webb Chapel Road & IH 635 (LBJ) WBFR	Dallas	Webb Chapel Road	On-System
2490	Webb Chapel Road & IH 635 (LBJ) EBFR	Dallas	Webb Chapel Road	On-System
2489	Webb Chapel Road & Forest Lane	Dallas	Webb Chapel Road	-
2488	Webb Chapel Road & Northaven Road	Dallas	Webb Chapel Road	-
2766	Webb Chapel Road & Royal Lane	Dallas	Webb Chapel Road	-
2765	Webb Chapel Road & Merrell Road	Dallas	Webb Chapel Road	-
2764	Webb Chapel Road & Walnut Hill Lane	Dallas	Webb Chapel Road	-
2763	Webb Chapel Road & Park Lane	Dallas	Webb Chapel Road	-
5116	Midway Road & Horizon North Parkway	Dallas	Midway Road	-
3715	Midway Road & PGBT WBFR	Dallas	Midway Road	-
3714	Midway Road & PGBT EBFR	Dallas	Midway Road	-
3713	Midway Road & Rosemeade Parkway	Dallas	Midway Road	-
5115	Midway Road & Timberglenn Road SB	Dallas	Midway Road	-
3711	Midway Road & Timberglenn Road NB	Dallas	Midway Road	-
3696	Midway Road & Frankford Road	Dallas	Midway Road	-
3695	Midway Road & Briargrove Lane	Dallas	Midway Road	-
2831	Frankford Road & Appleridge Drive	Dallas	Frankford Road	-
2832	Frankford Road & Kelly Boulevard	Dallas	Frankford Road	-
3681	Frankford Road & PGBT EBFR	Dallas	Frankford Road	-
3682	Frankford Road & PGBT WBFR	Dallas	Frankford Road	-
3684	Frankford Road & Marsh Lane	Dallas	Frankford Road	-
3686	Frankford Road & Vail Street	Dallas	Frankford Road	-
3712	Frankford Road & Voss Road	Dallas	Frankford Road	-
3716	Frankford Road & Gibbons Drive	Dallas	Frankford Road	-
3717	Frankford Road & Dallas Parkway SBFR	Dallas	Frankford Road	-
3739	Frankford Road & Dallas Parkway NBFR	Dallas	Frankford Road	-
3740	Frankford Road & Pear Ridge Drive	Dallas	Frankford Road	-
3741	Frankford Road & Coral Ridge Drive	Dallas	Frankford Road	-
3743	Frankford Road & Stonehollow Way	Dallas	Frankford Road	-
3814	Greenville Avenue & Restland Road/Walnut Street	Dallas	Greenville Avenue	-
3813	Greenville Avenue & Amberton Parkway	Dallas	Greenville Avenue	-
3812	Greenville Avenue & IH 635 (LBJ) WBFR	Dallas	Greenville Avenue	On-System
3811	Greenville Avenue & IH 635 (LBJ) EBFR	Dallas	Greenville Avenue	On-System
3801	Greenville Avenue & Markville Drive	Dallas	Greenville Avenue	-
3800	Greenville Avenue & Forest Lane	Dallas	Greenville Avenue	-
3793	Greenville Avenue & Whitehurst Drive	Dallas	Greenville Avenue	-
5823	Greenville Avenue & Fire Station 28	Dallas	Greenville Avenue	-
3535	Greenville Avenue & Royal Lane	Dallas	Greenville Avenue	-
3534	Greenville Avenue & Meadow Road	Dallas	Greenville Avenue	-
3533	Greenville Avenue & Walnut Hill Lane	Dallas	Greenville Avenue	-
3529	Greenville Avenue & Pineland Drive	Dallas	Greenville Avenue	-
3528	Greenville Avenue & Phoenix Drive	Dallas	Greenville Avenue	-
3526	Greenville Avenue & Twin Hills	Dallas	Greenville Avenue	-



Regional Traffic Signal Retiming Program Phase V

Executive Summary

*RTSRP
Phase V*

COG#	Intersection	City	Corridor	TxDOT
3495	Greenville Avenue & Park Lane	Dallas	Greenville Avenue	-
3576	IH 635 (LBJ) WBFR & Midway Road	Dallas	IH 635	On-System
3575	IH 635 (LBJ) EBFR & Midway Road	Dallas	IH 635	On-System
3611	IH 635 (LBJ) WBFR & Welch Road	Dallas	IH 635	On-System
3610	IH 635 (LBJ) EBFR & Welch Road	Dallas	IH 635	On-System
3612	IH 635 (LBJ) WBFR & Inwood Road SB	Dallas	IH 635	On-System
3617	IH 635 (LBJ) EBFR & Inwood Road SB	Dallas	IH 635	On-System
3619	IH 635 (LBJ) WBFR & Inwood Road NB	Dallas	IH 635	On-System
3618	IH 635 (LBJ) EBFR & Inwood Road NB	Dallas	IH 635	On-System
3620	IH 635 (LBJ) WBFR & Noel Road	Dallas	IH 635	On-System
3631	IH 635 (LBJ) WBFR & Montfort Drive	Dallas	IH 635	On-System
3630	IH 635 (LBJ) EBFR & Montfort Drive	Dallas	IH 635	On-System
3636	IH 635 (LBJ) WBFR & Preston Road	Dallas	IH 635	On-System
3635	IH 635 (LBJ) EBFR & Preston Road	Dallas	IH 635	On-System
3762	IH 635 (LBJ) WBFR & Hillcrest Road	Dallas	IH 635	On-System
3761	IH 635 (LBJ) EBFR & Hillcrest Road	Dallas	IH 635	On-System
3771	IH 635 (LBJ) WBFR & Coit Road	Dallas	IH 635	On-System
3770	IH 635 (LBJ) EBFR & Coit Road	Dallas	IH 635	On-System
3791	Forest Lane & Schroeder Road	Dallas	Forest Lane	-
3792	Forest Lane & TI Boulevard	Dallas	Forest Lane	-
5343	Forest Lane & TI Entrance	Dallas	Forest Lane	-
3794	Forest Lane & Shepherd Road	Dallas	Forest Lane	-
3800	Forest Lane & Greenville Avenue	Dallas	Forest Lane	-
3804	Forest Lane & Meadowknoll Drive	Dallas	Forest Lane	-
3810	Forest Lane & IH 635 (LBJ) WBFR	Dallas	Forest Lane	On-System
3809	Forest Lane & IH 635 (LBJ) EBFR	Dallas	Forest Lane	On-System
4212	Forest Lane & Oakshire Place	Dallas	Forest Lane	-
5829	Forest Lane & Forest Lane Academy	Dallas	Forest Lane	-
4217	Forest Lane & Audelia Street	Dallas	Forest Lane	-
3538	Abrams Road & Walnut Street	Dallas	Abrams Road	-
3815	Abrams Road & Flickering Shadow Drive	Dallas	Abrams Road	-
3808	Abrams Road & Chimney Hill Lane	Dallas	Abrams Road	-
3507	Abrams Road & IH 635 (LBJ) WBFR	Dallas	Abrams Road	On-System
3506	Abrams Road & IH 635 (LBJ) EBFR	Dallas	Abrams Road	On-System
3805	Abrams Road & Forest Lane	Dallas	Abrams Road	-
3803	Abrams Road & Meadowknoll Drive	Dallas	Abrams Road	-
3533	Walnut Hill Lane & Greenville Avenue	Dallas	Walnut Hill Lane	-
2718	Walnut Hill Lane & IH 35E (Stemmons) SBFR	Dallas	Walnut Hill Lane	On-System
2719	Walnut Hill Lane & IH 35E (Stemmons) NBFR	Dallas	Walnut Hill Lane	On-System
2720	Walnut Hill Lane & Composite Drive	Dallas	Walnut Hill Lane	-
2746	Walnut Hill Lane & Ables Lane	Dallas	Walnut Hill Lane	-
2747	Walnut Hill Lane & Shady Trail	Dallas	Walnut Hill Lane	-
2751	Walnut Hill Lane & Harry Hines Boulevard	Dallas	Walnut Hill Lane	-
2752	Walnut Hill Lane & Denton Drive	Dallas	Walnut Hill Lane	-
2760	Walnut Hill Lane & Monroe Drive	Dallas	Walnut Hill Lane	-
2761	Walnut Hill Lane & Brockbank Drive	Dallas	Walnut Hill Lane	-
2764	Walnut Hill Lane & Webb Chapel Road	Dallas	Walnut Hill Lane	-
3137	Walnut Hill Lane & Marsh Lane	Dallas	Walnut Hill Lane	-
3138	Walnut Hill Lane & Lenel Place	Dallas	Walnut Hill Lane	-
3141	Walnut Hill Lane & Midway Road	Dallas	Walnut Hill Lane	-



Regional Traffic Signal Retiming Program Phase V

Executive Summary

*RTSRP
Phase V*

COG#	Intersection	City	Corridor	TxDOT
3184	Walnut Hill Lane & Inwood Road	Dallas	Walnut Hill Lane	-
3186	Walnut Hill Lane & DNT SBFR	Dallas	Walnut Hill Lane	-
3187	Walnut Hill Lane & DNT NBFR	Dallas	Walnut Hill Lane	-
3190	Walnut Hill Lane & Preston Road	Dallas	Walnut Hill Lane	On-System
3480	Walnut Hill Lane & Tibbs Street	Dallas	Walnut Hill Lane	-
3482	Walnut Hill Lane & Hillcrest Road	Dallas	Walnut Hill Lane	-
3488	Walnut Hill Lane & Boedecker Street	Dallas	Walnut Hill Lane	-
6510	Walnut Hill Lane & Reflection Place	Dallas	Walnut Hill Lane	-
3496	Walnut Hill Lane & US 75 (Central) SBFR	Dallas	Walnut Hill Lane	On-System
3497	Walnut Hill Lane & US 75 (Central) NBFR	Dallas	Walnut Hill Lane	On-System
3498	Walnut Hill Lane & Walnut Glen Tower	Dallas	Walnut Hill Lane	-
3503	Walnut Hill Lane & Glen Lakes Drive	Dallas	Walnut Hill Lane	-
3531	Walnut Hill Lane & Rambler Road	Dallas	Walnut Hill Lane	-
4232	Buckingham Road & Plano Road	Garland	NW Garland	-
4231	Plano Road & Lawler Road	Garland	NW Garland	-
4230	Plano Road & Walnut Street	Garland	NW Garland	-
4258	Forest Lane & Shepherd Drive	Garland	NW Garland	-
4259	Forest Lane & Purdue Drive	Garland	NW Garland	-
4263	Buckingham Road & Yale Drive (south leg)	Garland	NW Garland	-
4264	Buckingham Road & Timbercreek Drive/Yale Drive	Garland	NW Garland	-
4268	Jupiter Road & Buckingham Road	Garland	NW Garland	-
4267	Jupiter Road & Lawler Road	Garland	NW Garland	-
5292	Jupiter Road & Western Drive	Garland	NW Garland	-
4265	Jupiter Road & Walnut Street	Garland	NW Garland	-
4262	Forest Lane & Jupiter Road	Garland	NW Garland	-
4282	Belt Line Road & East Park Drive/Laurel Oaks Drive	Garland	NW Garland	-
4283	Belt Line Road & Galaxie Road	Garland	NW Garland	-
4272	Buckingham Road & Diamond Oaks Drive	Garland	NW Garland	-
4273	Buckingham Road & Potomac Drive	Garland	NW Garland	-
4271	Walnut Street & Barnes Drive	Garland	NW Garland	-
4269	Forest Lane & Barnes Drive	Garland	NW Garland	-
5296	Forest Lane & DART Station	Garland	NW Garland	-
4270	Forest Lane & International Road	Garland	NW Garland	-
4284	Arapaho Road & Galaxie Road	Garland	NW Garland	-
4391	Arapaho Road & Shiloh Road	Garland	NW Garland	-
6640	Shiloh Road & Lawrence Drive	Garland	NW Garland	-
4390	Shiloh Road & Apollo Road	Garland	NW Garland	-
4387	Belt Line Road & Shiloh Road	Garland	NW Garland	-
5384	Shiloh Road & Big Oaks Drive/Homestead Place	Garland	NW Garland	-
4360	Buckingham Road & Shiloh Road	Garland	NW Garland	-
6639	Shiloh Road & Western Drive	Garland	NW Garland	-
4358	Shiloh Road & Walnut Street	Garland	NW Garland	-
4355	Forest Lane & Shiloh Road	Garland	NW Garland	-
4393	Arapaho Road & Garland Avenue	Garland	NW Garland	-
4392	Garland Avenue & Apollo Road/Spring Creek Drive	Garland	NW Garland	-
5964	Garland Avenue & Apollo Road/Wagon Wheel Road	Garland	NW Garland	-
4388	Belt Line Road & Sam Houston Drive	Garland	NW Garland	-
4389	Belt Line Road & Wagon Wheel Road	Garland	NW Garland	-
4361	Buckingham Road & Sam Houston Drive	Garland	NW Garland	-
4359	Walnut Street & Clara Barton Drive	Garland	NW Garland	-



Regional Traffic Signal Retiming Program Phase V

Executive Summary

*RTSRP
Phase V*

COG#	Intersection	City	Corridor	TxDOT
6638	Forest Lane & Kraft Driveway	Garland	NW Garland	-
4356	Forest Lane & State Street	Garland	NW Garland	-
5962	Forest Lane & Marion Drive	Garland	NW Garland	-
4394	Belt Line Road & Garland Avenue	Garland	NW Garland	-
4382	Buckingham Road & Garland Avenue	Garland	NW Garland	-
4381	Garland Avenue & Travis Street	Garland	NW Garland	-
4380	Garland Avenue & Walnut Street	Garland	NW Garland	-
4366	Garland Avenue & Austin Street/State Street	Garland	NW Garland	-
4365	Garland Avenue & Main Street	Garland	NW Garland	-
4364	Garland Avenue & Avenue B	Garland	NW Garland	On-System
4363	Garland Avenue & Avenue D	Garland	NW Garland	On-System
4362	Garland Avenue & Avenue F/Park Av	Garland	NW Garland	On-System
4395	Belt Line Road & Brand Road	Garland	NW Garland	-
4396	Belt Line Road & Kingsbridge Drive	Garland	NW Garland	-
4397	Belt Line Road & Idlewood Drive	Garland	NW Garland	-
4412	First Street & Crist Road	Garland	NW Garland	-
4386	Buckingham Road & Glenbrook Drive	Garland	NW Garland	-
4383	Walnut Street & Glenbrook Drive	Garland	NW Garland	-
5968	Walnut Street & Sixth Street	Garland	NW Garland	-
4384	Walnut Street & Fifth Street	Garland	NW Garland	-
4385	Walnut Street & DART Streets/Fourth Street	Garland	NW Garland	-
4371	Avenue B & Glenbrook Drive	Garland	NW Garland	On-System
4370	Avenue D & Glenbrook Drive	Garland	NW Garland	On-System
4377	Avenue B & Fifth Street	Garland	NW Garland	On-System
4376	Avenue D & Fifth Street	Garland	NW Garland	On-System
4407	Buckingham Road & First Street	Garland	NW Garland	-
4405	First Street & Walnut Street	Garland	NW Garland	-
4402	First Street & Lavon Drive/Main Street	Garland	NW Garland	On-System
4401	First Street & Avenue B	Garland	NW Garland	On-System
4400	First Street & Avenue D	Garland	NW Garland	On-System
4403	SH 66 & Dairy Road	Garland	NW Garland	On-System
4404	SH 66 & Davidson Drive	Garland	NW Garland	On-System
4409	SH 66 & Country Club Road	Garland	NW Garland	On-System
4471	SH 66 & Centerville Road	Garland	NW Garland	On-System
5223	Lavon Drive & Firewheel Parkway	Garland	NW Garland	On-System
5389	Lavon Drive & Town Center Drive	Garland	NW Garland	On-System
5277	Lavon Drive & SH 190 WBFR	Garland	NW Garland	On-System
4414	Lavon Drive & Naaman School Road	Garland	NW Garland	On-System
4413	Lavon Drive & Crist Road	Garland	NW Garland	On-System
4408	Lavon Drive & Buckingham Road	Garland	NW Garland	On-System
4406	Lavon Drive & Castle Street	Garland	NW Garland	On-System
4086	Kingsley Road & IH 635 EBFR	Garland	SW Garland	On-System
4261	Jupiter Road & Miller Park Drive	Garland	SW Garland	-
4260	Jupiter Road & Marquis Drive	Garland	SW Garland	-
4093	Jupiter Road & Security Street	Garland	SW Garland	-
4092	Jupiter Road & Miller Road	Garland	SW Garland	-
4091	Jupiter Road & Regency Crest Drive	Garland	SW Garland	-
4090	Jupiter Road & Wood Drive	Garland	SW Garland	-
4088	Jupiter Road & Kingsley Road	Garland	SW Garland	-
4087	Jupiter Road & IH 635 EBFR	Garland	SW Garland	On-System



Regional Traffic Signal Retiming Program Phase V

Executive Summary

*RTSRP
Phase V*

COG#	Intersection	City	Corridor	TxDOT
4085	Jupiter Road & IH 635 WBFR	Garland	SW Garland	On-System
4096	Miller Road & Merritt Drive	Garland	SW Garland	-
4097	Miller Road & Lonnecker Drive/Kings Road	Garland	SW Garland	-
4095	Kingsley Road & National Drive	Garland	SW Garland	-
4354	Shiloh Road & Marquis Drive	Garland	SW Garland	-
4098	Shiloh Road & Miller Road	Garland	SW Garland	-
4174	Shiloh Road & English Drive/Wood Road	Garland	SW Garland	-
4180	Garland Avenue & Miller Road	Garland	SW Garland	On-System
5539	Miller Road & Saturn Road	Garland	SW Garland	-
4181	Miller Road & Glenbrook Drive	Garland	SW Garland	-
4182	Miller Road & Fifth Street	Garland	SW Garland	-
5275	First Street & Casalita Drive/Washington Street	Garland	SW Garland	-
4203	First Street & Armstrong Drive/Southwood Drive	Garland	SW Garland	-
4202	First Street & Miller Road	Garland	SW Garland	-
5279	First Street & Carolyn Drive	Garland	SW Garland	-
4201	Broadway Blvd & First Street	Garland	SW Garland	-
3790	Arapaho Road & Coit Road	Richardson	Arapaho	-
3827	Arapaho Road & Mimosa Drive	Richardson	Arapaho	-
3828	Arapaho Road & Waterview Drive	Richardson	Arapaho	-
3829	Arapaho Road & West Shore Drive	Richardson	Arapaho	-
3841	Arapaho Road & Floyd Road	Richardson	Arapaho	-
3846	Arapaho Road & Hampshire Ln	Richardson	Arapaho	-
3847	Arapaho Road & Custer Road	Richardson	Arapaho	-
4241	Arapaho Road & US 75 SBFR	Richardson	Arapaho	On-System
4242	Arapaho Road & US 75 NBFR	Richardson	Arapaho	On-System
4243	Arapaho Road & Greenville Ave	Richardson	Arapaho	-
4245	Arapaho Road & Grove Road	Richardson	Arapaho	-
4253	Arapaho Road & Bowser Road	Richardson	Arapaho	-
4254	Arapaho Road & International Parkway	Richardson	Arapaho	-
4256	Arapaho Road & Glenville Drive	Richardson	Arapaho	-
4257	Arapaho Road & Plano Road	Richardson	Arapaho	-
4296	Plano Road & Collins Boulevard	Richardson	Arapaho	-
4295	Collins Boulevard & Glenville Drive	Richardson	Arapaho	-
4290	Collins Boulevard & Alma Road	Richardson	Arapaho	-
4280	Arapaho Road & Yale Boulevard	Richardson	Arapaho	-
4281	Arapaho Road & Jupiter Road	Richardson	Arapaho	-
4333	Jupiter Road & Collins Boulevard	Richardson	Arapaho	-
3855	Campbell Road & Coit Road	Richardson	Campbell	-
3856	Campbell Road & Mimosa Drive	Richardson	Campbell	-
3885	Campbell Road & Waterview Drive	Richardson	Campbell	-
3886	Campbell Road & University Parkway	Richardson	Campbell	-
3888	Campbell Road & Floyd Road	Richardson	Campbell	-
3889	Campbell Road & Nantucket Drive	Richardson	Campbell	-
3890	Campbell Road & Custer Parkway	Richardson	Campbell	-
4285	Campbell Road & Canyon Creek Drive	Richardson	Campbell	-
4287	Campbell Road & Collins Boulevard	Richardson	Campbell	-
4286	Collins Boulevard & Municipal Drive	Richardson	Campbell	-
4291	Campbell Road & US 75 SBFR	Richardson	Campbell	On-System
4292	Campbell Road & US 75 NBFR	Richardson	Campbell	On-System
4293	Campbell Road & Lakeside Boulevard	Richardson	Campbell	-



Regional Traffic Signal Retiming Program Phase V

Executive Summary

*RTSRP
Phase V*

COG#	Intersection	City	Corridor	TxDOT
4294	Campbell Road & Greenville Ave	Richardson	Campbell	-
4297	Campbell Road & Glenville Drive	Richardson	Campbell	-
4299	Campbell Road & Plano Road	Richardson	Campbell	-
4304	Plano Road & Greenville Ave	Richardson	Campbell	-
4305	Plano Road & Lookout Drive	Richardson	Campbell	-
5387	Campbell Road & Owens Boulevard	Richardson	Campbell	-
4334	Campbell Road & Yale Boulevard	Richardson	Campbell	-
4335	Campbell Road & Jupiter Road	Richardson	Campbell	-
4336	Jupiter Road & North Cliffe Drive	Richardson	Campbell	-
4337	Jupiter Road & Springpark Way	Richardson	Campbell	-
4338	Jupiter Road & Lookout Drive	Richardson	Campbell	-
4436	Renner Road & Murphy Road	Richardson	Renner	-
4435	Renner Road & Brand Road	Richardson	Renner	-
4433	Renner Road & North Star Road	Richardson	Renner	-
4426	Renner Road & Telecom Parkway	Richardson	Renner	-
4425	Renner Road & Shiloh Road	Richardson	Renner	-
4343	Renner Road & SH 190 NBFR	Richardson	Renner	On-System
4344	Renner Road & SH 190 SBFR	Richardson	Renner	On-System
4340	Renner Road & Jupiter Road	Richardson	Renner	-
4345	Jupiter Road & SH 190 EBFR	Richardson	Renner	On-System
4346	Jupiter Road & SH 190 WBFR	Richardson	Renner	On-System
4339	Renner Road & Wyndham Ln	Richardson	Renner	-
4306	Renner Road & Plano Road	Richardson	Renner	-
6089	Plano Road & CityLine Drive	Richardson	Renner	-
6088	Plano Road & State St	Richardson	Renner	-
4320	Plano Road & SH 190 EBFR	Richardson	Renner	On-System
4321	Plano Road & SH 190 WBFR	Richardson	Renner	On-System
5293	Renner Road & Routh Creek Parkway	Richardson	Renner	-
4303	Renner Road & US 75 NBFR	Richardson	Renner	On-System
4302	Renner Road & US 75 SBFR	Richardson	Renner	On-System
4316	Renner Road & Renner Parkway	Richardson	Renner	-
4308	Renner Road & Alma Road	Richardson	Renner	-
4309	Alma Road & SH 190 EBFR	Plano	Renner	On-System
4310	Alma Road & SH 190 WBFR	Plano	Renner	On-System
4307	Renner Road & Custer Parkway	Richardson	Renner	-
6642	Custer Parkway & Greenside Drive	Richardson	Renner	-
3901	Custer Parkway & SH 190 EBFR	Plano	Renner	On-System
3902	Custer Parkway & SH 190 WBFR	Plano	Renner	On-System
4897	Renner Road & Synergy Park Boulevard	Richardson	Renner	-
3892	Renner Road & Waterview Parkway	Richardson	Renner	-
6658	Waterview Parkway & Tatum St	Richardson	Renner	-
3887	Waterview Parkway & Franklyn Jenifer Drive	Richardson	Renner	-
6086	Waterview Parkway & Synergy Park Boulevard	Richardson	Renner	-
6085	Waterview Parkway & Frankford Road	Richardson	Renner	-
3893	Waterview Parkway/Independence Parkway & SH 190 EBFR	Plano	Renner	On-System
3894	Waterview Parkway/Independence Parkway & SH 190 WBFR	Plano	Renner	On-System
6693	Renner Road & Wyngate Boulevard	Richardson	Renner	-



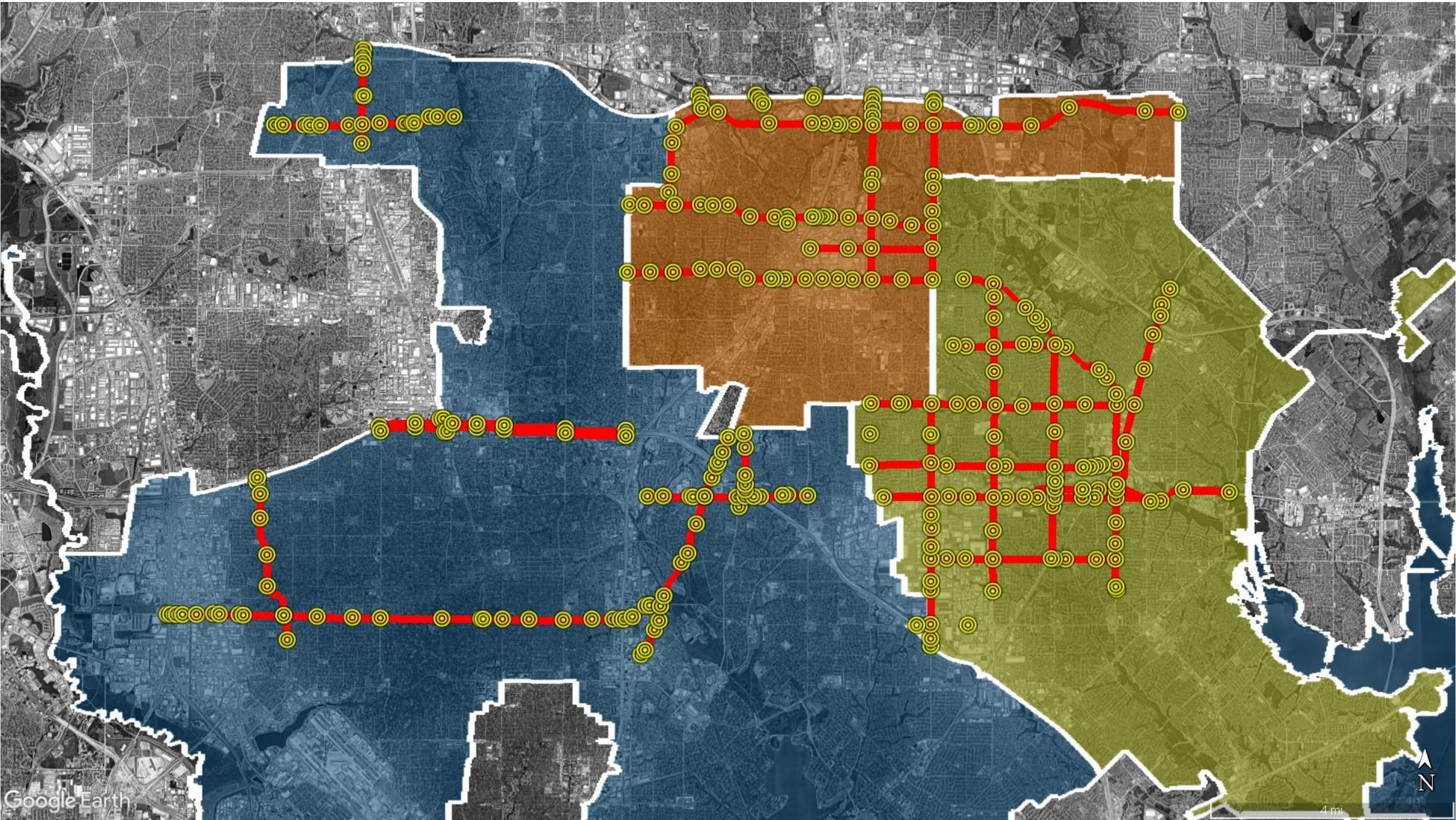


Figure 1. RTSRP Phase V Project Intersections
Source: Google Earth

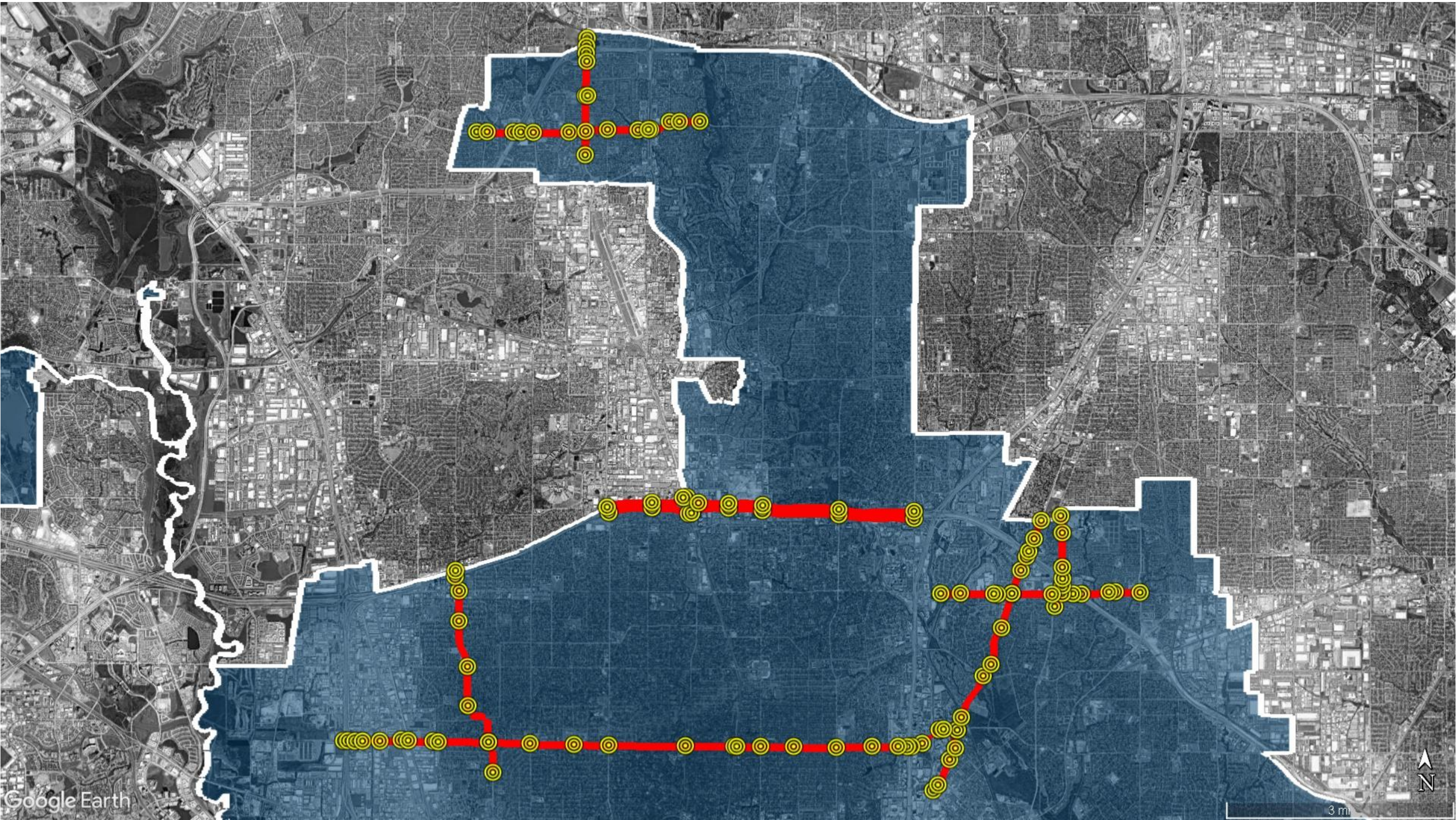


Figure 2. RTSRP Phase V Dallas Project Intersections
Source: Google Earth

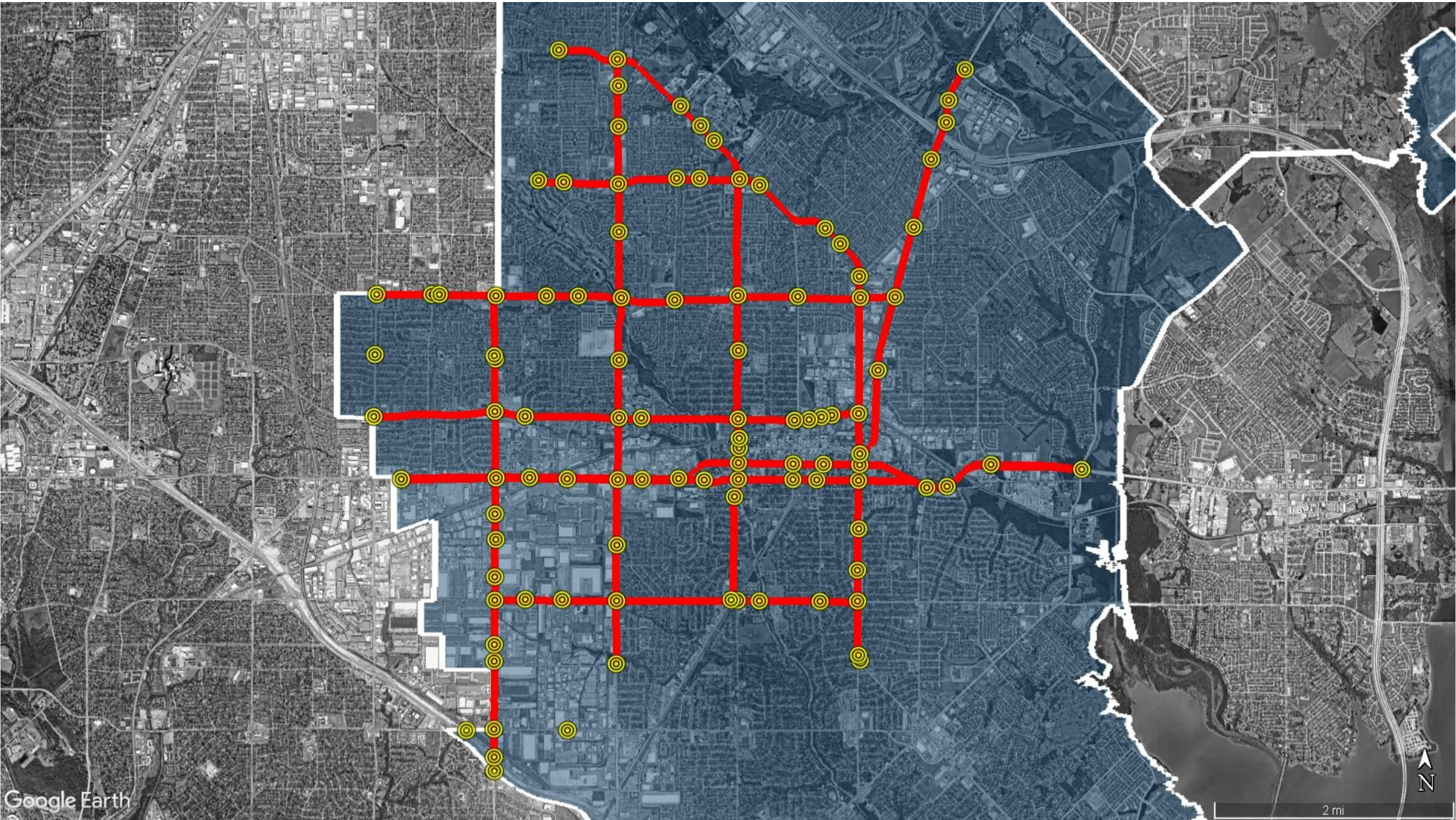


Figure 3. RTSRP Phase V Garland Project Intersections
Source: Google Earth

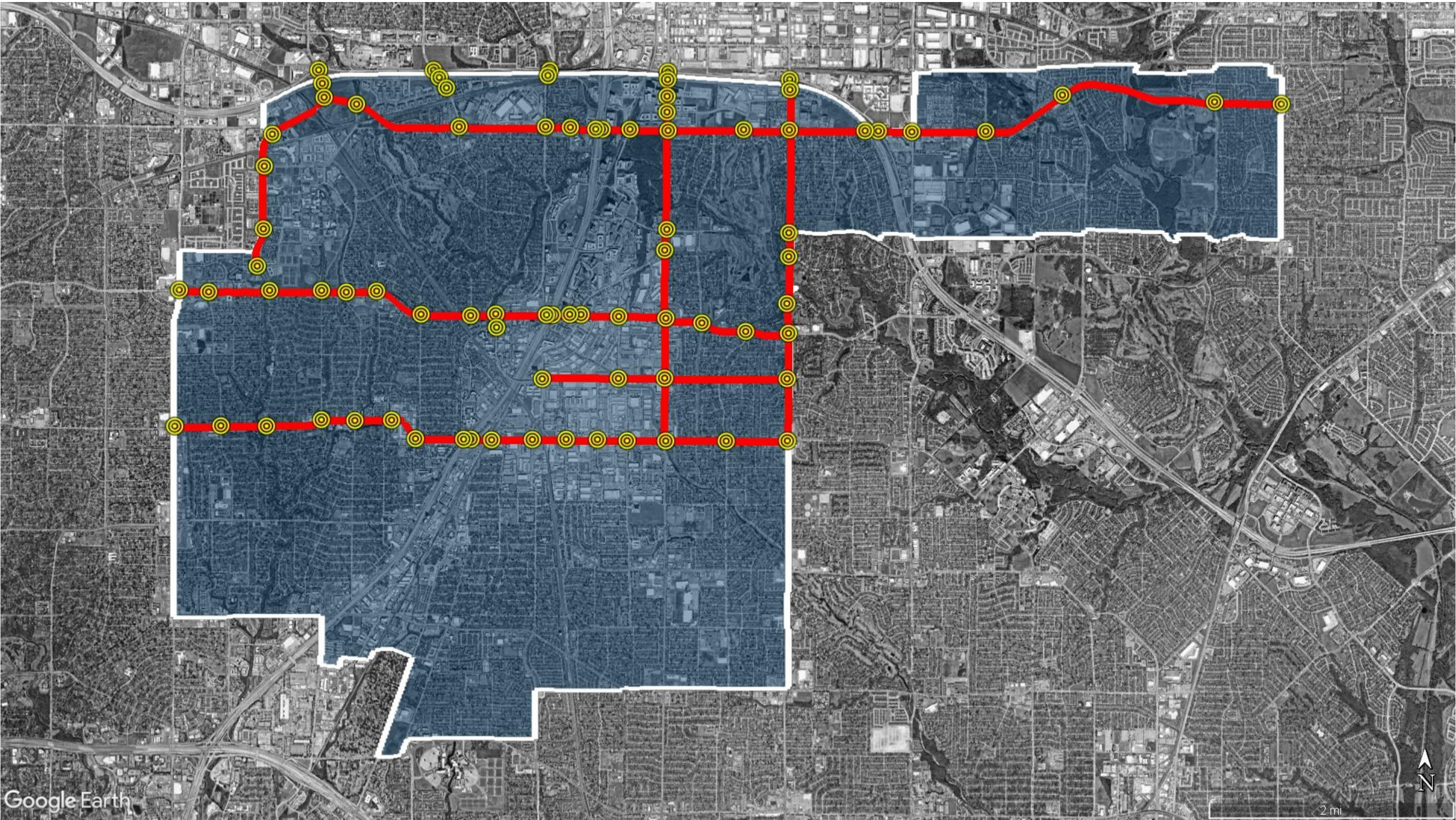


Figure 4. RTSRP Phase V Richardson Project Intersections
Source: Google Earth

1.2 Data Collection

The project included extensive data collection:

- For intersections, peak-hour turning movement counts were made, recording number of vehicles by approach direction and by movement (i.e., left turn, straight through, or right turn). Video data collection methods were used, with post-processing of count data.
- Approximately 36 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. Four supplemental counts were collected in April 2021 in Garland and Richardson to measure the impacts of COVID-19 shutdowns on traffic volumes.

1.3 Signal Timing Plans

For all corridors, new timing plans were developed for four time periods – the weekday AM, Midday and PM peaks plus the Saturday peak. In Richardson, the Midday plan was also implemented for weekends and an afternoon “pre-PM” plan was developed and deployed. In many cases, separate versions of the AM and midday plans were required for times when school speed zones are in operation. After new timing plans were operational, extensive “fine-tuning” was performed to improve actual on-street performance.

2. General COVID-19 Impacts

The COVID-19 pandemic and shutdowns in North Texas greatly affected this project. Initial traffic data was successfully collected in Garland and Richardson prior to the pandemic. Proposed timing plans were developed and planned for implementation circa April 2020. Dallas County issued a “Shelter In Place” order¹ effective Monday, March 23, 2020. This order restricted “non-essential” business and travel², creating an unprecedented effect on traffic volumes and patterns, as illustrated by the empty Woodall Rogers Freeway during the AM peak on Tuesday, March 24, 2020 in Figure 5.

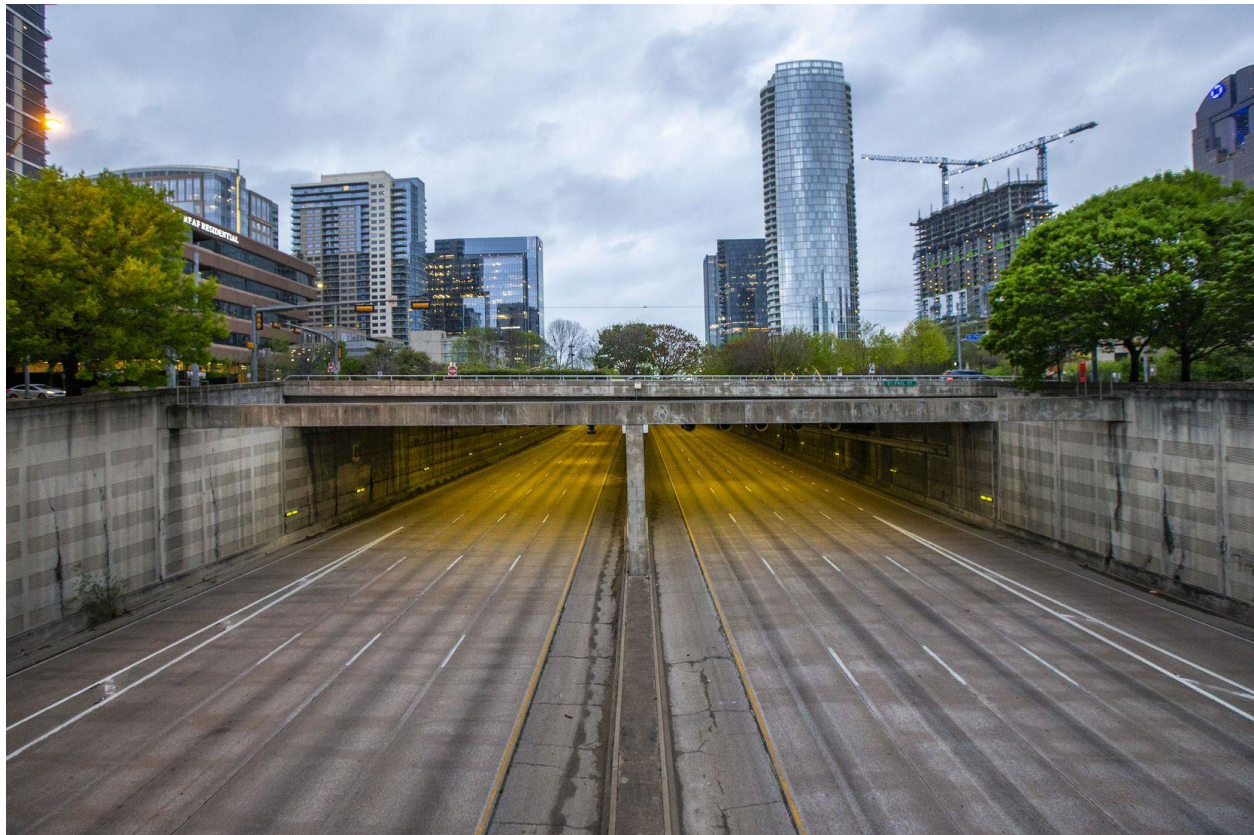


Figure 5. Woodall Rogers Freeway at 7:26 AM Tuesday, March 24, 2020

Source: Dallas Morning News www.dallasnews.com/photos/2020/03/25/photos-together-in-isolation/

¹ www.dallascounty.org/Assets/uploads/docs/judge-jenkins/covid-19/03232020-AmendedOrder.pdf

² www.dallasnews.com/news/public-health/2020/03/22/dallas-county-residents-ordered-to-stay-home-as-new-shelter-in-place-rules-are-put-in-place/

Similar to the national pattern shown in Figure 6, traffic volumes in North Texas were estimated to drop almost 50% overall. Rather than implement timings designed for traffic patterns that were no longer present, implementation was put on hold. Kimley-Horn, NCTCOG, the City of Dallas, the City of Garland, and the City of Richardson monitored traffic volumes throughout the pandemic as traffic patterns adjusted.

Based on volume trends, the midday and Pre-PM timing plans were implemented to run the entire day. These plans were determined to best fit the current conditions as of November 2020.

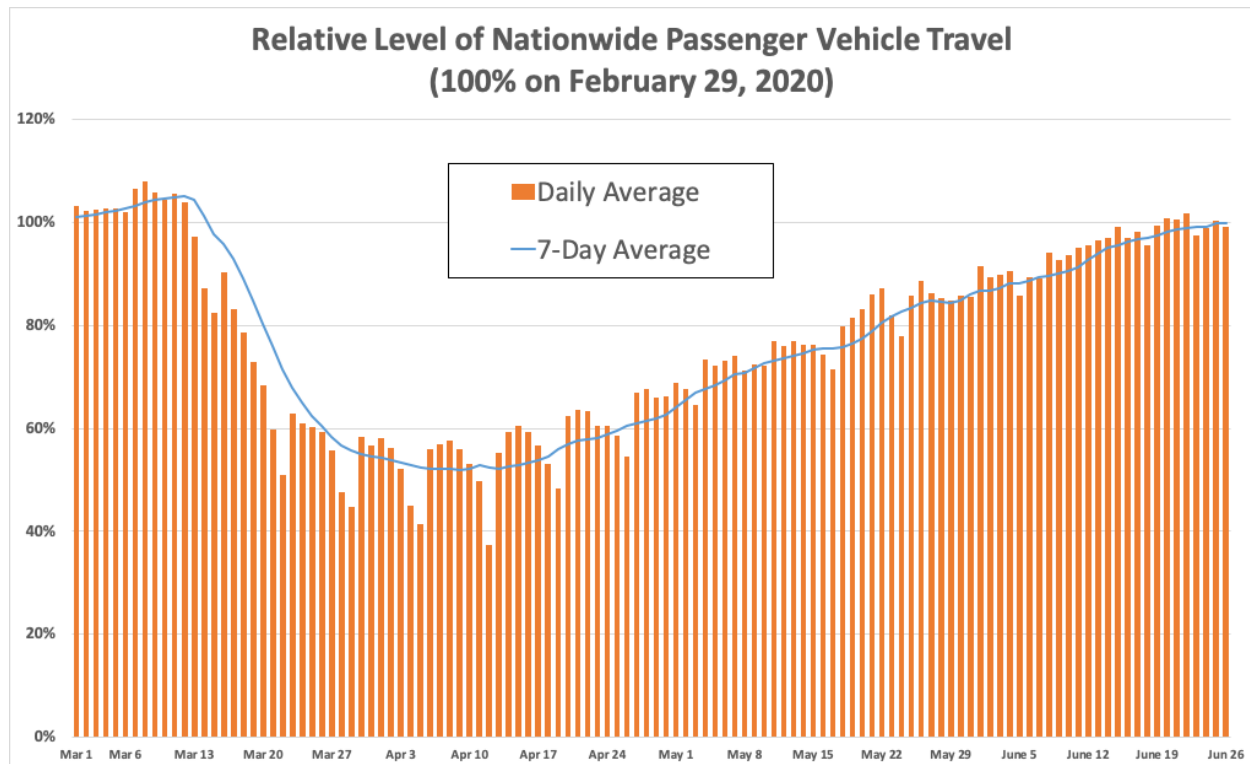


Figure 6. Nationwide Travel Demand as Measured by INRIX June 2020
Source: inrix.com/blog/2020/06/covid19-us-traffic-volume-synopsis-15/

3. Summary of Recommended Improvements

Dallas, Garland, and Richardson are essentially built-out within the project area; most typically recommended improvements have either already been installed or have been programmed as part of future projects. These typical improvements include:

- Dual left turn bays for heavy left turns,
- Right turns for heavy right turns,
- Flashing yellow arrows for protected-permitted left turns,
- Modern traffic signal controllers,
- Removing split-phased operations, and
- Advanced operational strategies (e.g., dual service of left turn phases, uneven double cycles).

For the most part, existing phasing and lane-use assignments at project intersections were appropriate for observed volumes and patterns.

The following signal control equipment improvements and signing, striping, or geometric modifications were recommended in the final reports for each project corridor or group of corridors. Some of the improvements have been implemented. Future timing plan updates should be scheduled at intervals of three to five years for all project corridors.

3.1 Dallas Corridors

The Frankford Road & PGBT diamond is recommended to run standard 3-phase operations, and the Midway Road & PGBT diamond should use standard or modified 3-phase operations by plan. The intersection of Midway Road & Timberglenn Road should be updated to include left-turn arrow heads rather than circular balls. The City of Dallas should integrate new timing on Marsh Lane into the new coordinated timing for Frankford Road, between Rosemeade Parkway and Trinity Mills Road.

At Coit & IH 635 Westbound Frontage Road, it is recommended that the lane assignments of the two left-most lanes be changed from left and left/thru to two left-only lanes. The left-most thru lane ends immediately after the intersection with Coit Road, and the merging creates a bottleneck that stacks into the intersection during peak periods.

At the Greenville Avenue and Meadow Road intersection, it was recommended that a flashing yellow arrow be implemented for the southbound left turn movement at this intersection to allow the northbound left turn to lag during certain timing plans.

3.2 Garland Corridors

In conjunction with this project, the City of Garland added cross-street left-turn phases at two intersections:

- Fifth Street & Miller Road – added flashing yellow arrow (FYA) protected-permitted left-turns for the northbound and southbound directions; both were previously permitted-only
- Plano Road & Lawler Road – added a FYA protected-permitted left-turn for the westbound direction, and a permitted-protected left turn for the eastbound directions, both of which



were previously permitted-only; the eastbound direction could not have a FYA because it has a shared left/thru lane

The right-most westbound lane on Miller Road at Jupiter Road was changed from a right-only lane to a shared thru/right lane. No other signing, striping, or geometric modifications were recommended in Garland as part of RTSRP V.

It should be noted that the City of Garland is currently in the process of implementing bond-funded “bottleneck” improvements at the ten of the RTSRP V intersections:

- Arapaho Road & Shiloh Road
- Belt Line Road & Garland Avenue
- Belt Line Road & Shiloh Road
- Buckingham Road & Plano Road
- Buckingham Road & Shiloh Road
- First Street & Lavon Drive/Main Street
- First Street & Avenue B
- First Street & Avenue D
- First Street & Miller Road
- Forest Avenue & Jupiter Road

Typical improvements will include conversion of single-lane left-turn bays to dual lefts, and addition of right-turn bays.

3.3 Richardson Corridors

At Jupiter & SH 190, it is recommended that existing YIELD signs (designated R1 -2 in the Texas *Manual on Uniform Traffic Control Devices*) be removed from the northbound and southbound right turns. The right turns are channelized with a free receiving lane, so YIELD signs are unnecessary. Removing these signs will create a free-right turn for both directions improving capacity and reducing delay.

4. Project Results

Final implemented timing plans were designed to integrate with the regional super-network. The implemented plans provide progression across a large swath of the Metroplex. For example, Arapaho Road is coordinated from its western terminus at Marsh Road in Carrollton through Addison, Dallas, Richardson, and Garland, where Arapaho Road turns south and becomes Garland Avenue. The overall distance which has a continuous progression scheme is a little over 16 miles.

4.1 Synchro Measures of Effectiveness

Among the many challenges caused by the COVID-19 pandemic, collecting representative *before* and *after* travel time data in a traditional manner with floating car travel time runs was not viable. Even using probe-based data, which provides many advantages over traditional data collection methods including readily available and continuous historical data, was not a useful source of measures of effectiveness (MOEs). As discussed in Section 2, traffic volumes and patterns were substantially impacted by COVID-19. Final signal timings were deployed as traffic patterns approached normalcy in each individual peak. Unlike the standard deployment strategy where all plans are implemented simultaneously, there was no clear line of demarcation between *before* and *after*, especially as traffic volumes recovered. With these limitations, quantifying benefits of RTSRP V through modeling was the most appropriate approach.

Project results were estimated from Synchro models used in the development of new traffic signal timing plans. For each corridor, the calibrated model of original timing was compared with the calibrated model of final timing. MOEs compared included total signal delay and fuel consumption along with three categories of emissions (CO, NOx, and VOC). The following annual improvement percentages were estimated by the Synchro comparison:

- Total travel time was reduced by **8 percent**
- Total signal delay was reduced by **17 percent (>1.5 million vehicle hours annually)**
- Total stops were reduced by **9 percent (>66 million annually)**
- Fuel consumption was reduced by **2.2 million gallons** annually
- Emissions were reduced by **7 percent**
 - CO reduction of nearly **152,000 kilograms** annually
 - NOx reduction of nearly **30,000 kilograms** annually
 - VOC reduction of more than **35,000 kilograms** annually

Table 2 provides total measures of effectiveness (MOEs) as calculated with Synchro models consisting of this project's signals. The tables listed below provide Synchro MOEs for the respective corridors listed:

- Table 3. Synchro MOEs – Webb Chapel Road Corridor
- Table 4. Synchro MOEs – Midway Road Corridor
- Table 5. Synchro MOEs – Frankford Road Corridor
- Table 6. Synchro MOEs – Greenville Avenue Corridor
- Table 7. Synchro MOEs – IH 635 (LBJ) Corridor
- Table 8. Synchro MOEs – Forest Lane and Abrams Road Corridors
- Table 9. Synchro MOEs – Walnut Hill Road Corridor
- Table 10. Synchro MOEs – Garland Corridors
- Table 11. Synchro MOEs – Arapaho Road Corridor
- Table 12. Synchro MOEs – Campbell Road Corridor
- Table 13. Synchro MOEs – Renner Road Corridor

It should be noted that Synchro calculates delay for all traffic movements at the included intersections. In many cases, benefits on the regional arterial approaches were greater than documented, but increased cycle lengths resulted in somewhat greater side-street delay factored into the overall benefits.

Regional Traffic Signal Retiming Program Phase V

Executive Summary

Table 2. Summary of Synchro MOEs

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	4,565	363,993	21	10,374	222,263	14,883	1,040	202	241
	After	4,121	343,660	22	10,010	221,480	14,261	997	194	231
	Δ	-444	-20,333	1	-364	-783	-622	-43	-8	-10
	$\Delta\%$	-10%	-6%	4%	-4%	0%	-4%	-4%	-4%	-4%
MD	Before	1,954	216,084	26	5,796	152,124	8,972	627	122	145
	After	1,732	205,969	26	5,629	153,131	8,735	611	119	142
	Δ	-222	-10,115	1	-167	1,007	-237	-16	-3	-4
	$\Delta\%$	-11%	-5%	2%	-3%	1%	-3%	-3%	-3%	-3%
PrePM	Before	2,669	209,076	24	6,338	145,059	9,253	647	126	150
	After	1,800	178,275	26	5,392	139,063	8,059	563	110	131
	Δ	-869	-30,801	2	-946	-5,996	-1,194	-84	-16	-19
	$\Delta\%$	-33%	-15%	8%	-15%	-4%	-13%	-13%	-13%	-13%
PM	Before	5,255	394,403	21	11,312	242,148	16,404	1,147	223	266
	After	4,754	378,634	22	10,909	242,120	15,861	1,109	216	257
	Δ	-501	-15,769	1	-403	-28	-543	-38	-7	-9
	$\Delta\%$	-10%	-4%	4%	-4%	0%	-3%	-3%	-3%	-3%
SAT	Before	2,157	233,150	26	6,391	167,952	9,862	689	134	160
	After	1,958	221,294	27	6,160	166,578	9,563	669	130	155
	Δ	-199	-11,856	1	-231	-1,374	-299	-21	-4	-5
	$\Delta\%$	-9%	-5%	3%	-4%	-1%	-3%	-3%	-3%	-3%
Annual Total ^A	Before	8,579,220	732,249,960	21	20,755,020	479,248,640	30,643,080	2,141,860	416,727	496,392
	After	7,411,040	686,488,140	21	19,673,940	476,137,220	29,153,800	2,037,940	396,514	472,291
	Δ	-1,168,180	-45,761,820	1	-1,081,080	-3,111,420	-1,489,280	-103,920	-20,214	-24,101
	$\Delta\%$	-14%	-6%	4%	-5%	-1%	-5%	-5%	-5%	-5%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday
- 5 weekdays and 1 Saturday per week
- 52 weeks per year
- 260 weekdays per year
- 52 Saturdays per year

Regional Traffic Signal Retiming Program Phase V

Executive Summary

RTSRP
Phase V

Table 3. Synchro MOEs – Webb Chapel Road Corridor

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	73	7,526	22	216	4,713	290	20	4	5
	After	64	6,510	23	206	4,671	275	19	4	4
	Δ	-9	-1,016	1	-10	-42	-15	-1	0	0
	$\Delta\%$	-12%	-13%	5%	-5%	-1%	-5%	-5%	-5%	-5%
MD	Before	41	5,123	25	141	3,501	202	14	3	3
	After	35	4,154	26	134	3,480	190	13	3	3
	Δ	-6	-969	1	-7	-21	-12	-1	0	0
	$\Delta\%$	-15%	-19%	4%	-5%	-1%	-6%	-6%	-6%	-6%
PM	Before	105	8,715	21	261	5,437	350	24	5	6
	After	84	7,267	23	240	5,437	324	23	4	5
	Δ	-21	-1,448	2	-21	0	-26	-2	0	0
	$\Delta\%$	-20%	-17%	10%	-8%	0%	-7%	-7%	-8%	-8%
SAT	Before	48	6,367	25	175	4,438	252	18	3	4
	After	43	5,147	26	169	4,408	238	17	3	4
	Δ	-5	-1,220	1	-6	-30	-14	-1	0	0
	$\Delta\%$	-10%	-19%	4%	-3%	-1%	-6%	-5%	-6%	-5%
Annual Total ^A	Before	137,020	14,096,680	19	403,520	9,162,660	555,880	38,831	7,553	8,999
	After	115,440	11,742,380	20	380,380	9,116,640	521,560	36,426	7,088	8,437
	Δ	-21,580	-2,354,300	1	-23,140	-46,020	-34,320	-2,405	-465	-562
	$\Delta\%$	-16%	-17%	5%	-6%	-1%	-6%	-6%	-6%	-6%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

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Regional Traffic Signal Retiming Program Phase V

Executive Summary

Table 4. Synchro MOEs - Midway Road Corridor

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	61	7,022	23	147	3,438	236	17	3	4
	After	68	7,694	22	154	3,438	248	17	3	4
	Δ	7	672	-1	7	0	12	1	0	0
	$\Delta\%$	11%	10%	-4%	5%	0%	5%	5%	5%	5%
MD	Before	31	4,592	28	99	2,729	165	12	2	3
	After	33	3,713	27	102	2,729	158	11	2	3
	Δ	2	-879	-1	3	0	-7	0	0	0
	$\Delta\%$	6%	-19%	-4%	3%	0%	-4%	-4%	-4%	-4%
PM	Before	100	9,480	21	212	4,427	325	23	4	5
	After	96	9,040	21	208	4,427	317	22	4	5
	Δ	-4	-440	0	-4	0	-8	-1	0	0
	$\Delta\%$	-4%	-5%	0%	-2%	0%	-2%	-2%	-2%	-2%
SAT	Before	39	5,689	27	120	3,230	200	14	3	3
	After	42	4,879	26	123	3,230	194	14	3	3
	Δ	3	-810	-1	3	0	-6	0	0	0
	$\Delta\%$	8%	-14%	-4%	3%	0%	-3%	-3%	-3%	-3%
Annual Total ^A	Before	118,040	13,641,940	20	295,100	7,058,220	472,420	33,025	6,427	7,652
	After	121,940	12,866,360	19	299,780	7,058,220	467,480	32,716	6,367	7,579
	Δ	3,900	-775,580	-1	4,680	0	-4,940	-309	-60	-73
	$\Delta\%$	3%	-6%	-5%	2%	0%	-1%	-1%	-1%	-1%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

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- 52 Saturdays per year



Regional Traffic Signal Retiming Program Phase V

Executive Summary

Table 5. Synchro MOEs – Frankford Road Corridor

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	149	11,379	18	276	5,088	403	28	5	7
	After	109	10,788	22	236	5,088	368	26	5	6
	Δ	-40	-591	4	-40	0	-35	-2	0	-1
	Δ%	-27%	-5%	22%	-14%	0%	-9%	-9%	-9%	-9%
MD	Before	66	8,964	27	209	5,721	341	24	5	6
	After	77	9,874	26	220	5,721	358	25	5	6
	Δ	11	910	-1	11	0	17	1	0	0
	Δ%	17%	10%	-4%	5%	0%	5%	5%	5%	5%
PM	Before	179	14,005	20	365	6,850	535	37	7	9
	After	243	17,421	17	428	6,850	615	43	8	10
	Δ	64	3,416	-3	63	0	80	6	1	1
	Δ%	36%	24%	-15%	17%	0%	15%	15%	15%	15%
SAT	Before	78	10,510	27	239	6,459	392	27	5	6
	After	91	11,091	26	252	6,459	407	28	6	7
	Δ	13	581	-1	13	0	15	1	0	0
	Δ%	17%	6%	-4%	5%	0%	4%	4%	4%	4%
Annual Total ^A	Before	242,320	22,924,200	18	558,480	12,349,480	855,660	59,808	11,640	13,863
	After	266,760	25,254,060	18	582,400	12,349,480	896,220	62,644	12,189	14,516
	Δ	24,440	2,329,860	0	23,920	0	40,560	2,836	549	653
	Δ%	10%	10%	0%	4%	0%	5%	5%	5%	5%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week
- 52 weeks per year
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- 52 Saturdays per year



Regional Traffic Signal Retiming Program Phase V

Executive Summary

RTSRP
Phase V

Table 6. Synchro MOEs – Greenville Avenue Corridor

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	99	10,297	25	277	6,922	420	29	6	7
	After	91	9,651	26	269	6,922	407	28	6	7
	Δ	-8	-646	1	-8	0	-13	-1	0	0
	Δ%	-8%	-6%	4%	-3%	0%	-3%	-3%	-3%	-3%
MD	Before	72	10,898	26	233	6,163	376	26	5	6
	After	77	10,505	26	238	6,163	375	26	5	6
	Δ	5	-393	0	5	0	-1	0	0	0
	Δ%	7%	-4%	0%	2%	0%	0%	0%	0%	0%
PM	Before	234	18,053	20	493	10,030	700	49	10	11
	After	190	16,645	22	449	10,030	656	46	9	11
	Δ	-44	-1,408	2	-44	0	-44	-3	-1	-1
	Δ%	-19%	-8%	10%	-9%	0%	-6%	-6%	-6%	-6%
SAT	Before	65	9,647	28	227	6,256	364	25	5	6
	After	73	9,595	27	235	6,256	368	26	5	6
	Δ	8	-52	-1	8	0	4	0	0	0
	Δ%	12%	-1%	-4%	4%	0%	1%	1%	1%	1%
Annual Total ^A	Before	246,220	25,750,660	20	641,160	15,248,740	970,320	67,811	13,192	15,717
	After	225,160	24,362,520	20	620,100	15,248,740	940,940	65,811	12,813	15,252
	Δ	-21,060	-1,388,140	0	-21,060	0	-29,380	-1,999	-380	-465
	Δ%	-9%	-5%	0%	-3%	0%	-3%	-3%	-3%	-3%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week
- 52 weeks per year
- 260 weekdays per year
- 52 Saturdays per year



Regional Traffic Signal Retiming Program Phase V

Executive Summary

Table 7. Synchro MOEs – IH 635 (LBJ) Corridor

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	376	29,040	20	759	14,882	1,075	75	15	17
	After	361	28,279	19	712	13,626	1,008	70	14	16
	Δ	-15	-761	-1	-47	-1,256	-67	-5	-1	-1
	$\Delta\%$	-4%	-3%	-5%	-6%	-8%	-6%	-6%	-6%	-6%
MD	Before	298	23,700	20	608	12,026	867	61	12	14
	After	239	22,027	22	549	12,026	810	57	11	13
	Δ	-59	-1,673	2	-59	0	-57	-4	-1	-1
	$\Delta\%$	-20%	-7%	10%	-10%	0%	-7%	-7%	-7%	-7%
PM	Before	631	34,257	16	1,075	17,265	1,394	97	19	23
	After	594	34,156	16	1,006	16,011	1,320	92	18	21
	Δ	-37	-101	0	-69	-1,254	-74	-5	-1	-1
	$\Delta\%$	-6%	0%	0%	-6%	-7%	-5%	-5%	-5%	-5%
SAT	Before	345	26,374	20	697	13,697	985	69	13	16
	After	328	25,218	20	681	13,697	965	67	13	16
	Δ	-17	-1,156	0	-16	0	-20	-1	0	0
	$\Delta\%$	-5%	-4%	0%	-2%	0%	-2%	-2%	-2%	-2%
Annual Total ^A	Before	845,780	58,257,680	15	1,609,140	29,657,940	2,216,240	154,887	30,134	35,898
	After	768,300	56,203,940	16	1,498,640	28,352,740	2,093,260	146,302	28,462	33,907
	Δ	-77,480	-2,053,740	1	-110,500	-1,305,200	-122,980	-8,585	-1,672	-1,991
	$\Delta\%$	-9%	-4%	7%	-7%	-4%	-6%	-6%	-6%	-6%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week
- 52 weeks per year
- 260 weekdays per year
- 52 Saturdays per year



Regional Traffic Signal Retiming Program Phase V

Executive Summary

RTSRP
Phase V

Table 8. Synchro MOEs – Forest Lane and Abrams Road Corridors

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	144	15,500	20	353	7,123	496	35	7	8
	After	118	12,947	22	327	7,123	457	32	6	7
	Δ	-26	-2,553	2	-26	0	-39	-3	-1	-1
	$\Delta\%$	-18%	-16%	10%	-7%	0%	-8%	-8%	-8%	-8%
MD	Before	99	12,216	25	281	7,137	448	31	6	7
	After	100	11,413	24	283	7,137	440	31	6	7
	Δ	1	-803	-1	2	0	-8	-1	0	0
	$\Delta\%$	1%	-7%	-4%	1%	0%	-2%	-2%	-2%	-2%
PM	Before	270	22,241	19	529	10,170	779	54	11	13
	After	170	17,729	23	428	10,170	661	46	9	11
	Δ	-100	-4,512	4	-101	0	-118	-8	-2	-2
	$\Delta\%$	-37%	-20%	21%	-19%	0%	-15%	-15%	-15%	-15%
SAT	Before	100	12,570	25	292	7,563	466	33	6	8
	After	102	11,630	25	295	7,563	459	32	6	7
	Δ	2	-940	0	3	0	-7	0	0	0
	$\Delta\%$	2%	-7%	0%	1%	0%	-2%	-1%	-1%	-2%
Annual Total ^A	Before	318,500	32,422,000	18	753,740	16,525,600	1,133,600	79,220	15,413	18,356
	After	254,280	27,877,460	19	690,040	16,525,600	1,043,900	72,998	14,206	16,923
	Δ	-64,220	-4,544,540	1	-63,700	0	-89,700	-6,223	-1,206	-1,433
	$\Delta\%$	-20%	-14%	6%	-8%	0%	-8%	-8%	-8%	-8%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week
- 52 weeks per year
- 260 weekdays per year
- 52 Saturdays per year



Regional Traffic Signal Retiming Program Phase V

Executive Summary

Table 9. Synchro MOEs – Walnut Hill Road Corridor

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	299	29,393	20	807	16,051	1,075	75	15	17
	After	243	24,974	21	751	16,050	996	70	14	16
	Δ	-56	-4,419	1	-56	-1	-79	-5	-1	-1
	$\Delta\%$	-19%	-15%	5%	-7%	0%	-7%	-7%	-7%	-7%
MD	Before	207	20,636	22	530	11,460	752	53	10	12
	After	144	17,595	24	468	11,460	680	48	9	11
	Δ	-63	-3,041	2	-62	0	-72	-5	-1	-1
	$\Delta\%$	-30%	-15%	9%	-12%	0%	-10%	-9%	-9%	-10%
PM	Before	501	35,631	19	1,053	19,489	1,387	97	19	22
	After	388	30,515	21	940	19,489	1,264	88	17	20
	Δ	-113	-5,116	2	-113	0	-123	-9	-2	-2
	$\Delta\%$	-23%	-14%	11%	-11%	0%	-9%	-9%	-9%	-9%
SAT	Before	168	20,180	23	478	10,992	702	49	10	11
	After	121	15,840	25	432	10,992	632	44	9	10
	Δ	-47	-4,340	2	-46	0	-70	-5	-1	-1
	$\Delta\%$	-28%	-22%	9%	-10%	0%	-10%	-10%	-10%	-10%
Annual Total ^A	Before	621,140	55,155,360	17	1,504,880	30,277,520	2,049,320	143,226	27,864	33,192
	After	471,900	46,696,780	18	1,356,680	30,277,000	1,869,920	130,749	25,436	30,290
	Δ	-149,240	-8,458,580	1	-148,200	-520	-179,400	-12,477	-2,428	-2,902
	$\Delta\%$	-24%	-15%	6%	-10%	0%	-9%	-9%	-9%	-9%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week
- 52 weeks per year
- 260 weekdays per year
- 52 Saturdays per year



Regional Traffic Signal Retiming Program Phase V

Executive Summary

RTSRP
Phase V

Table 10. Synchro MOEs – Garland Corridors

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	2,264	165,712	22	5,104	110,667	7,307	511	99	118
	After	2,105	165,357	22	5,052	110,884	7,115	497	97	115
	Δ	-159	-355	0	-52	217	-192	-13	-3	-3
	$\Delta\%$	-7%	0%	0%	-1%	0%	-3%	-3%	-3%	-3%
MD	Before	718	87,427	29	2,408	68,759	3,855	269	52	62
	After	691	86,060	29	2,430	69,636	3,834	268	52	62
	Δ	-27	-1,367	0	22	877	-21	-1	0	0
	$\Delta\%$	-4%	-2%	0%	1%	1%	-1%	-1%	-1%	-1%
Pre-PM	Before	1,853	132,987	22	4,355	97,072	6,180	432	84	100
	After	1,171	111,984	25	3,546	90,363	5,206	364	71	84
	Δ	-682	-21,003	3	-809	-6,709	-974	-68	-13	-16
	$\Delta\%$	-37%	-16%	14%	-19%	-7%	-16%	-16%	-16%	-16%
PM	Before	2,239	162,227	23	4,932	111,505	7,287	509	99	118
	After	2,069	159,368	23	4,852	112,239	7,126	498	97	115
	Δ	-170	-2,859	0	-80	734	-161	-11	-2	-3
	$\Delta\%$	-8%	-2%	0%	-2%	1%	-2%	-2%	-2%	-2%
SAT	Before	953	102,797	28	2,957	81,574	4,647	325	63	75
	After	905	104,816	28	2,909	81,574	4,631	324	63	75
	Δ	-48	2,019	0	-48	0	-16	-1	0	0
	$\Delta\%$	-5%	2%	0%	-2%	0%	0%	0%	0%	0%
Annual Total ^A	Before	4,112,940	334,601,800	25	10,130,380	240,848,140	15,017,600	1,049,727	204,238	243,285
	After	3,553,680	321,467,640	26	9,645,740	238,538,040	14,307,020	1,000,048	194,574	231,772
	Δ	-559,260	-13,134,160	1	-484,640	-2,310,100	-710,580	-49,679	-9,664	-11,513
	$\Delta\%$	-14%	-4%	4%	-5%	-1%	-5%	-5%	-5%	-5%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week
- 52 weeks per year
- 260 weekdays per year
- 52 Saturdays per year

Regional Traffic Signal Retiming Program Phase V

Executive Summary

RTSRP
Phase V

Table 11. Synchro MOEs – Arapaho Road Corridor

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	313	27,070	22	704	15,525	1,051	73	14	17
	After	279	23,213	23	677	15,865	1,000	70	14	16
	Δ	-34	-3,857	1	-27	340	-51	-4	-1	-1
	Δ%	-11%	-14%	5%	-4%	2%	-5%	-5%	-5%	-5%
MD	Before	85	12,096	30	345	10,368	552	39	8	9
	After	85	11,259	30	350	10,526	550	38	7	9
	Δ	0	-837	0	5	158	-2	0	0	0
	Δ%	0%	-7%	0%	1%	2%	0%	0%	0%	0%
PrePM	Before	184	21,111	26	520	13,416	823	58	11	13
	After	185	19,061	26	534	13,864	818	57	11	13
	Δ	1	-2,050	0	14	448	-5	0	0	0
	Δ%	1%	-10%	0%	3%	3%	-1%	-1%	-1%	-1%
PM	Before	299	27,488	23	709	16,308	1,070	75	15	17
	After	288	25,623	24	712	16,807	1,063	74	14	17
	Δ	-11	-1,865	1	3	499	-7	0	0	0
	Δ%	-4%	-7%	4%	0%	3%	-1%	-1%	-1%	-1%
SAT	Before	139	12,891	26	408	10,690	610	43	8	10
	After	82	10,720	31	357	10,917	556	39	8	9
	Δ	-57	-2,171	5	-51	227	-54	-4	-1	-1
	Δ%	-41%	-17%	19%	-13%	2%	-9%	-9%	-9%	-9%
Annual Total ^A	Before	516,360	52,134,420	26	1,380,340	34,395,920	2,120,040	148,192	28,834	34,349
	After	478,660	46,875,660	27	1,365,780	35,247,420	2,071,680	144,807	28,174	33,556
	Δ	-37,700	-5,258,760	1	-14,560	851,500	-48,360	-3,385	-660	-793
	Δ%	-7%	-10%	4%	-1%	2%	-2%	-2%	-2%	-2%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week
- 52 weeks per year
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- 52 Saturdays per year



Regional Traffic Signal Retiming Program Phase V

Executive Summary

RTSRP
Phase V

Table 12. Synchro MOEs - Campbell Road Corridor

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	314	26,853	22	702	15,506	1,047	73	14	17
	After	283	23,820	23	670	15,474	994	69	14	16
	Δ	-31	-3,033	1	-32	-32	-53	-4	-1	-1
	$\Delta\%$	-10%	-11%	5%	-5%	0%	-5%	-5%	-5%	-5%
MD	Before	234	17,808	23	547	12,526	794	56	11	13
	After	164	17,989	26	477	12,522	744	52	10	12
	Δ	-70	181	3	-70	-4	-50	-3	-1	-1
	$\Delta\%$	-30%	1%	13%	-13%	0%	-6%	-6%	-6%	-6%
PrePM	Before	357	31,100	21	737	15,174	1,111	78	15	18
	After	209	24,587	26	594	15,416	945	66	13	15
	Δ	-148	-6,513	5	-143	242	-166	-12	-2	-3
	$\Delta\%$	-41%	-21%	24%	-19%	2%	-15%	-15%	-15%	-15%
PM	Before	366	32,391	22	821	18,144	1,234	86	17	20
	After	367	33,181	22	821	18,138	1,242	87	17	20
	Δ	1	790	0	0	-6	8	1	0	0
	$\Delta\%$	0%	2%	0%	0%	0%	1%	1%	1%	1%
SAT	Before	129	13,573	27	409	11,173	627	44	9	10
	After	109	13,749	29	389	11,173	614	43	8	10
	Δ	-20	176	2	-20	0	-13	-1	0	0
	$\Delta\%$	-16%	1%	7%	-5%	0%	-2%	-2%	-2%	-2%
Annual Total ^A	Before	755,300	64,398,100	23	1,708,200	38,063,740	2,546,180	177,996	34,632	41,249
	After	602,940	60,031,920	25	1,557,400	38,166,700	2,394,080	167,365	32,565	38,792
	Δ	-152,360	-4,366,180	2	-150,800	102,960	-152,100	-10,631	-2,067	-2,457
	$\Delta\%$	-20%	-7%	9%	-9%	0%	-6%	-6%	-6%	-6%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week
- 52 weeks per year
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Regional Traffic Signal Retiming Program Phase V

Executive Summary

Table 13. Synchro MOEs - Renner Road Corridor

Scenario		Total Delay (hr)	Stops (#)	Average Speed (mph)	Total Travel Time (hr)	Distance Traveled (mi)	Fuel Consumed (gal)	CO Emissions (kg)	NOx Emissions (kg)	VOC Emissions (kg)
AM	Before	473	34,201	22	1,029	22,348	1,483	104	20	24
	After	400	30,427	23	956	22,339	1,393	97	19	23
	Δ	-73	-3,774	1	-73	-9	-90	-6	-1	-1
	$\Delta\%$	-15%	-11%	5%	-7%	0%	-6%	-6%	-6%	-6%
MD	Before	103	12,624	30	395	11,734	620	43	8	10
	After	87	11,380	31	378	11,731	596	42	8	10
	Δ	-16	-1,244	1	-17	-3	-24	-2	0	0
	$\Delta\%$	-16%	-10%	3%	-4%	0%	-4%	-4%	-4%	-4%
PrePM	Before	275	23,878	27	726	19,397	1,139	80	16	18
	After	235	22,643	27	718	19,420	1,090	76	15	18
	Δ	-40	-1,235	0	-8	23	-49	-3	-1	-1
	$\Delta\%$	-15%	-5%	0%	-1%	0%	-4%	-4%	-4%	-4%
PM	Before	331	29,915	25	862	22,523	1,343	94	18	22
	After	265	27,689	27	825	22,522	1,273	89	17	21
	Δ	-66	-2,226	2	-37	-1	-70	-5	-1	-1
	$\Delta\%$	-20%	-7%	8%	-4%	0%	-5%	-5%	-5%	-5%
SAT	Before	93	12,552	31	389	11,880	617	43	8	10
	After	62	8,609	32	318	10,309	499	35	7	8
	Δ	-31	-3,943	1	-71	-1,571	-118	-8	-2	-2
	$\Delta\%$	-33%	-31%	3%	-18%	-13%	-19%	-19%	-19%	-19%
Annual Total ^A	Before	665,600	58,867,120	27	1,770,080	45,660,680	2,705,820	189,137	36,800	43,833
	After	551,980	53,109,420	28	1,677,000	45,256,640	2,547,740	178,074	34,640	41,267
	Δ	-113,620	-5,757,700	1	-93,080	-404,040	-158,080	-11,063	-2,160	-2,566
	$\Delta\%$	-17%	-10%	4%	-5%	-1%	-6%	-6%	-6%	-6%

Note A: Based on the following:

- 2 hours per AM peak period per weekday
- 3 hours per MD peak period per weekday
- 2 hours per PM peak period per weekday
- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week
- 52 weeks per year
- 260 weekdays per year
- 52 Saturdays per year



4.2 Annual Delay Reductions

Table 14 summarizes the annual benefits calculated from Synchro, specifically Annual Reduction in Delay (veh-hrs) and Peak Hour Annual Delay Savings. The following rationale was used to estimate the annual reduction in delay from the new timing plans, based on Synchro MOEs:

- Calculations are based on total reduction in delay.
- On each weekday there will be:
 - Two hours of benefit per AM peak period per weekday
 - Three hours of benefit per MD peak period per weekday
 - Two hours of benefit per PrePM peak period per weekday (if applicable)
 - Two hours of benefit per PM peak period per weekday
- On each Saturday, there will be five hours of benefit from the Saturday timing plan.
- To be conservative, no benefit is assumed from other hours of the day even though most of the corridors operate the new timing plans for at least 12 hours per day.
- For calculations, 5 weekdays and 1 Saturday per week were used, with 52 weeks per year, resulting in 260 weekdays per year and 52 Saturdays per year.
- For the purpose of economic analysis of transportation improvements, the cost of delay was assumed to be \$21.71 per vehicle-hour (as reflected in NCTCOG's Mobility 2045 Update value of time³).

Based on modeled travel time results and assumptions listed above, RTSRP Phase V has resulted in delay savings of nearly **1.2 million vehicle hours per year** (or **more than 133 years** of vehicle delay annually) on the project corridors. In terms of delay savings, this translates to more than **\$25.3 million annually** in driver delay savings (at NCTCOG's Mobility 2045 Update value of time).

³ <https://www.nctcog.org/trans/plan/mtp/mobility-2045-2022-update>



Table 14. Summary of Annual Benefits

Corridor Information						Annual Benefits	
City	Corridor	From	To	Signals	Length (mi)	From Synchro Modeling	
						Annual Reduction in Delay (veh-hr) ^A	Peak Hour Annual Delay Savings ^B
Dallas	Webb Chapel	IH 635 (LBJ)	Park Lane	8	2.9	-21,580	-\$468,502
	Midway Road	Horizon North Parkway	Briargrove Lane	8	7.4	3,900	\$84,669
	Frankford Road	Appleridge Drive	Stonehollow Way	13	3.0	24,440	\$530,592
	Greenville Avenue	Restland Road/Walnut Street	Park Lane	15	3.9	-21,060	-\$457,213
	IH 635 (LBJ)	Midway Road	Coit Road	17	4.1	-77,480	-\$1,682,091
	Forest Lane	Schroeder Road	Audelia Street	11	2.6	-64,220	-\$1,394,216
	Abrams Road	Walnut Street	Meadowknoll Drive	7	1.3		
	Walnut Hill Road	IH 35E (Stemmons)	Greenville Avenue	27	8.2	-149,240	-\$3,240,000
	Total			106	33.4	-305,240	-\$6,626,760
Garland	Arapaho Road/Garland Avenue	Galaxie Road	Miller Road	15	6.3	-559,260	-\$12,141,535
	Belt Line Road/First Street	East Park Drive/ Laurel Oaks Drive	Broadway Boulevard	20	6.3		
	Jupiter Road	Buckingham Road	IH 635 (LBJ)	14	4.0		
	Miller Road	Jupter Road	First Street	9	3.2		
	Shiloh Road	Arapaho Road	Wood Drive/English Drive	12	5.0		
	Buckingham Road	Plano Road	Lavon Drive	12	4.3		
	Forest Lane/Avenue B/Avenue D	Shepherd Drive	Centerville Road	20	5.8		
	Lavon Drive	First Street	Firewheel Parkway	8	3.4		
	Walnut Street	Plano Road	First Street	11	4.1		
	Total			103 ^c	18.5	-559,260	-\$12,141,535
Richardson	Arapaho Road	Coit Road	Jupiter Road	17	5.1	-37,700	-\$818,467
	Campbell Road	Coit Road	Jupiter Road	18	5.1	-152,360	-\$3,307,736
	Renner Road	Waterview Parkway	Brand Road	19	8.0	-113,620	-\$2,466,690
	Misc	N/A	N/A	27	-	-	-
	Total			81	18.2	-303,680	-\$6,592,893
RTSRP V Total				290	70.1	-1,168,180	-\$25,361,188

Note A: Based on the following:

- 2 hours per AM peak period per weekday

- 3 hours per MD peak period per weekday

- 2 hours per PrePM peak period per weekday (if applicable)

- 2 hours per PM peak period per weekday

- 5 hours per SAT peak period per Saturday

- 5 weekdays and 1 Saturday per week

- 52 weeks per year

- 260 weekdays per year

- 52 Saturdays per year

Note B: Based on NCTCOG's Mobility 2045 value of time of \$21.71 per passenger car hour

Note C: Due to crossing arterial progression some intersections are counted twice above'

5. Conclusions and Recommendations

New timing plans implemented in Dallas, Garland, and Richardson have successfully achieved the Regional Traffic Signal Retiming Program goals: to maximize capacity of the existing roadway system by improving traffic operations through signal retiming along selected corridors, in addition to reducing mobile source emissions, improving mobility, and enhancing safety. Through the RTSRP program, North Texas residents benefit from improved air quality, reduced delay, higher reliability, reduced fuel consumption and vehicle emissions, reduced congestion, and improved efficiency throughout the region.

To further improve operations, adjacent signals in the area should be retimed to integrate with the RTSRP V corridors and the regional super-network.

Typically, future timing plan updates are recommended at intervals of three to five years. Due to on-going and evolving traffic patterns, these timing plans should be continuously monitored and updated to reflect current traffic patterns.

