CONNECTICUT TRAFFIC SIGNAL PROGRAM INITIATIVE

Phase 3

Computerized Traffic Signal System Timing Plan Evaluation - CRCOG

JUNE 2023

Connecticut Department of Transportation Partnering with

CRCOG CAPITOL REGION COUNCIL OF GOVERNMENTS
Working together for a better region.

COMPUTERIZED TRAFFC SIGNAL SYSTEM EVALUATION
Prepared for Connecticut Department of Transportation
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List of Acronyms

Acronym	Definition
@	At
a.m.	ante meridiem or “before midday”
AVE.	Avenue
CCTV	Closed Circuit Television
CRCOG	Capital Region Council of Governments
CTDOT	Connecticut Department of Transportation
CTSS	Coordinated Traffic Signal System
EB	Eastbound
FHWA	Federal Highway Administration
GPS	Global Positioning System
INDOT	Indiana Department of Transportation
INT	Intersection
LOS	Level of Service
MOE	Measures of Effectiveness
MPH	Miles Per Hour
N/A	Not Available
NB	Northbound
NCHRP	National Cooperative Highway Research Program
OST	Objectives, Strategies, Tactics
p.m.	post meridiem or “after midday”
SB	Southbound
ST.	Street
TSDWIN	Time Space Diagram Windows Program
Rd.	Road
RTE.	Route
UCONN	University of Connecticut
V	Version
WB	Westbound

Glossary of Terms

Capacity

The maximum rate at which vehicles can pass through an intersection under prevailing conditions.

Congestion

An excess of vehicles on a portion of roadway at a particular time resulting in speeds that are slower — sometimes much slower — than normal or "free flow" speeds.

Coordination

The ability to synchronize multiple intersections to enhance the operation of one or more directional movements in a system.

Cycle Length

The duration of a complete sequence of phases in the absence of priority calls. In an actuated controller unit, a complete cycle is dependent on the presence of calls for all non-priority phases. Some indications may be served more than once in a cycle. Occasionally, an indication may not be part of a normal cycle (e.g., a left-turn arrow may only be displayed during railroad preemption).

Offset

The time relationship between the coordinated phase(s) based on the offset reference point and a defined master reference (i.e., master clock or sync pulse).

Operating Environment

An area with similar characteristics that would have similar signal timing objectives.

Phase Splits

The time assigned to a phase (green and the greater of the yellow change plus red clearance or the pedestrian walk plus clearance times) during coordinated operations. May be expressed in seconds or as a percentage

Time-Space Diagram

A chart that plots the location of signalized intersections along the vertical axis and the signal timing along the horizontal axis. This is a visual tool that illustrates coordination relationships between intersections.

Traffic Signal Operations

The prioritization of objectives and active collection of information to efficiently manage traffic signal infrastructure and control devices to maximize safety and throughput while minimizing delays.

User Priority

A user may be assigned a relative or absolute priority based on operating environment and locally desired outcomes. These priorities may vary by movement.

Executive Summary

This document is meant to report the "before" and "after" results of the timing plan evaluation for the CTSS completed in Phase 3 of the evaluation project. The Connecticut Department of Transportation (CTDOT) proposed the project to approximately forty (40) corridors in the north central portion of the State of Connecticut known as Capital Region Council of Governments (CRCOG) crcog.org. See Figure 3 and 4 for CRCOG location maps. These corridors were analyzed and refined to improve traffic flow and the safety of roadway users and pedestrians. Below is a list of eight (8) corridors out of the approximately forty (40) included in Phase 3 of the project:

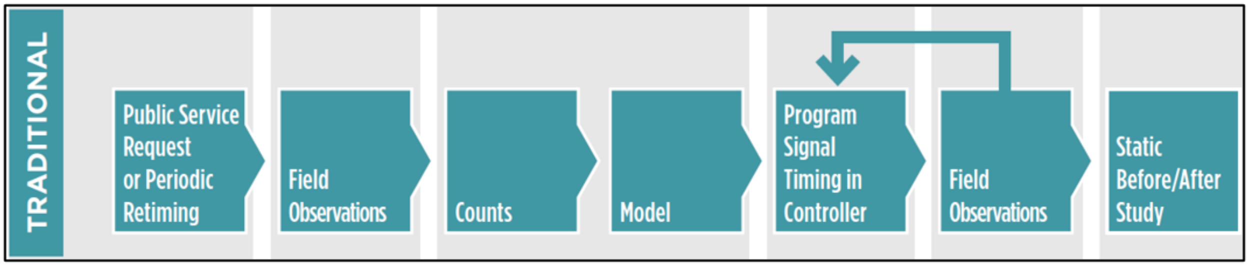
- Canton - Route 44 & Route 202 (Albany Turnpike) from East Hill Road to Secret Lake Road
- East Hartford - Route 517 & Route 5 (Main Street/High Street) from Route 2 Off Ramp to Garvan Street
- East Hartford - Route 5 & Route 44 (Main Street) from Connecticut Boulevard/Locust Street to Burnside Avenue
- East Hartford - Route 44 (Connecticut Boulevard) from Blacksmith Lane to Prospect Street
- East Hartford/South Windsor - Route 5 (Main Street/Ellington Road/John Fitch Boulevard) from Prospect Street to Scantic Road
- East Windsor - Route 140 (Bridge Street) from I-91 Southbound Ramp to Route 5 (Prospect Hill Road)
- West Hartford - Route 71 & Route 73 (New Britain Avenue/South Main Street) from South Road to South Main Street/New Britain Avenue to Beechwood Road
- West Hartford/Hartford - Route 173 & Route 529 (New Britain Avenue) from Mayflower Street to Newington Avenue

The purpose of the project was to prepare and implement traffic signal coordination timing plans along the study corridors and to measure the resulting changes in traffic signal operations. These timing plans were developed based on a data collection effort, field observations, operational / safety review, FHWA guidance and recommendations, and detailed traffic signal timing analysis which included utilizing a computerized software model (Such as Synchro/SimTraffic 11[i] and Tru-Traffic[ii]).

Each corridor was evaluated from 6 a.m. to 6 p.m. Monday through Friday to improve CTSS operations by following the step-by-step signal system timing plan evaluation process as shown in Figure 1 below. CTDOT Bureau of Highway Operations - Traffic Management Unit updated the timing plans from 6 p.m. to 10 p.m. Monday through Friday and Saturday/Sundays. The added weekday evening, Saturday, and Sunday hours timing plans by CTDOT did not include evaluation measures.

The signalized intersections coordination timings were adjusted based on operating environment, volume demand during congestion and uncongested conditions, signal phasing, and proximity of intersections. Cycle lengths were balanced to move motor vehicles through the closely spaced signalized intersections while limiting wait times for side streets.

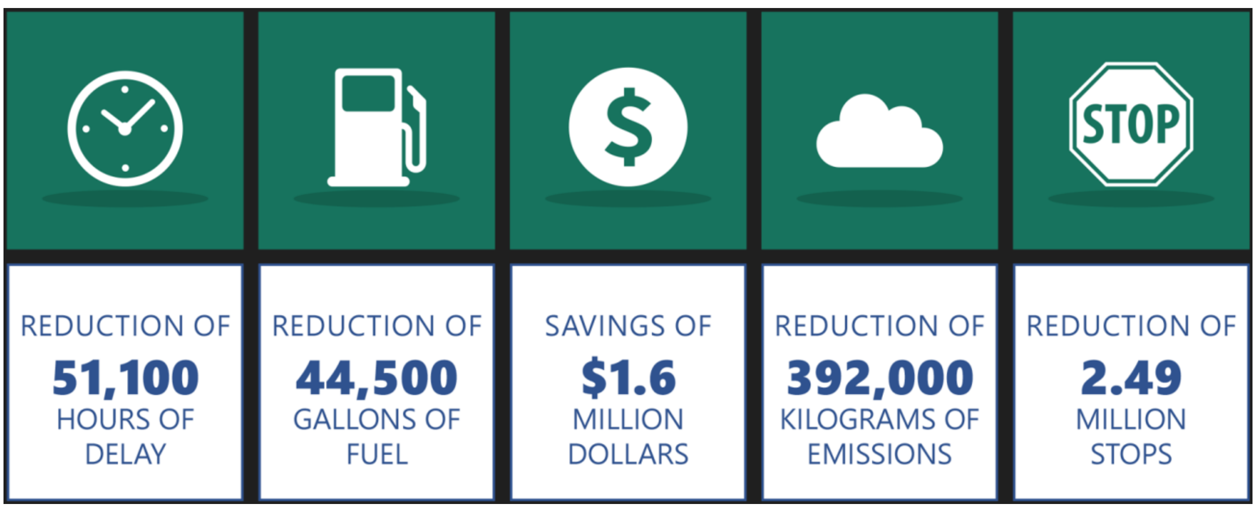
Figure 1: Timing Plan Evaluation Process



Source: NCHRP 954[iii]

The new traffic signal timing plans were implemented by the CTDOT Bureau of Engineering and Construction - Division of Traffic Engineering's Traffic Signal Lab and Bureau of Highway Operations - Traffic Management Unit. The timing plans were fine-tuned based on field observations to achieve the best results possible. To confirm and quantify these results, performance measures were documented in the form of travel time studies, which occurred both before and after the signal timing implementation and field fine-tuning tasks. Based on the "Before" and "After" data of the corridors studied in Phase 3, we saw reduction in the following: delays, fuel consumption, road user costs, emissions, and number of stops. This resulted in reducing travel times and improving travel speed. See results of the Benefit Cost calculations provided below for Phase 3 corridors in Figure 2.

Figure 2: Phase 3 Corridors Performance Measures



It is determined that significant cost savings were achieved in all eight (8) study corridors. On average, travel speeds were increased from an average of 24 mph to 27.4 mph, an increase of 14%. The number of stops were reduced by 2.49 million per year and travel times were reduced by an average of 12%. The Phase 3 reductions to delay and fuel are estimated to save Connecticut motorists over 51,100 hours of delay and $1.6 million in user (time and fuel) costs per year.

A benefit-to-cost analysis was completed for each phase study area to understand the return benefit based on the State's investment. The Consultant's cost of Phase 3 is $400,000 or $100,000 per year for 4 years. The benefit –to-cost ratio for Phase 3 is calculated to be 16:1.

This shows a significant return on investment through delay and fuel savings to Connecticut motorists. The reduction to stops and emissions, provide a benefit to the air quality in Connecticut and is expected to provide added safety benefits by reducing crashes. Moreover, these savings are only inclusive for the portion of the day for which travel time data was collected.

Phase 3 included systems that showed increase in travel time with the “After” timings. The evaluation and analysis determined a negative improvement resulting in a reverting to the “Before” timings.

Introduction

Timing plan evaluation of CTSS is a cost-effective method of improving traffic flow, reducing congestion, improving mobility and safety for all users. Federal Highway Administration (FHWA) guidance indicates that traffic signal systems need to be retimed every three (3) to five (5) years. The needs are based on changes in land use, population, demographics, and travel patterns. CTDOT's mission and goals emphasizes a commitment to improving safety and mobility for all transportation users. This document identifies the results of the timing plan evaluation for approximately forty (40) corridors within the limits of the CRCOG area. This will help improve mobility and safety for all CTSS users and achieve CTDOT's mission and goals.

Phase 3 report documents the results of the eight (8) corridors out of the approximate forty (40) studied in the CRCOG area. Figure 4 below shows the approximate CTDOT's CTSS locations for all four phases of the Region.

Figure 3: CTDOT Statewide Map – CRCOG Region

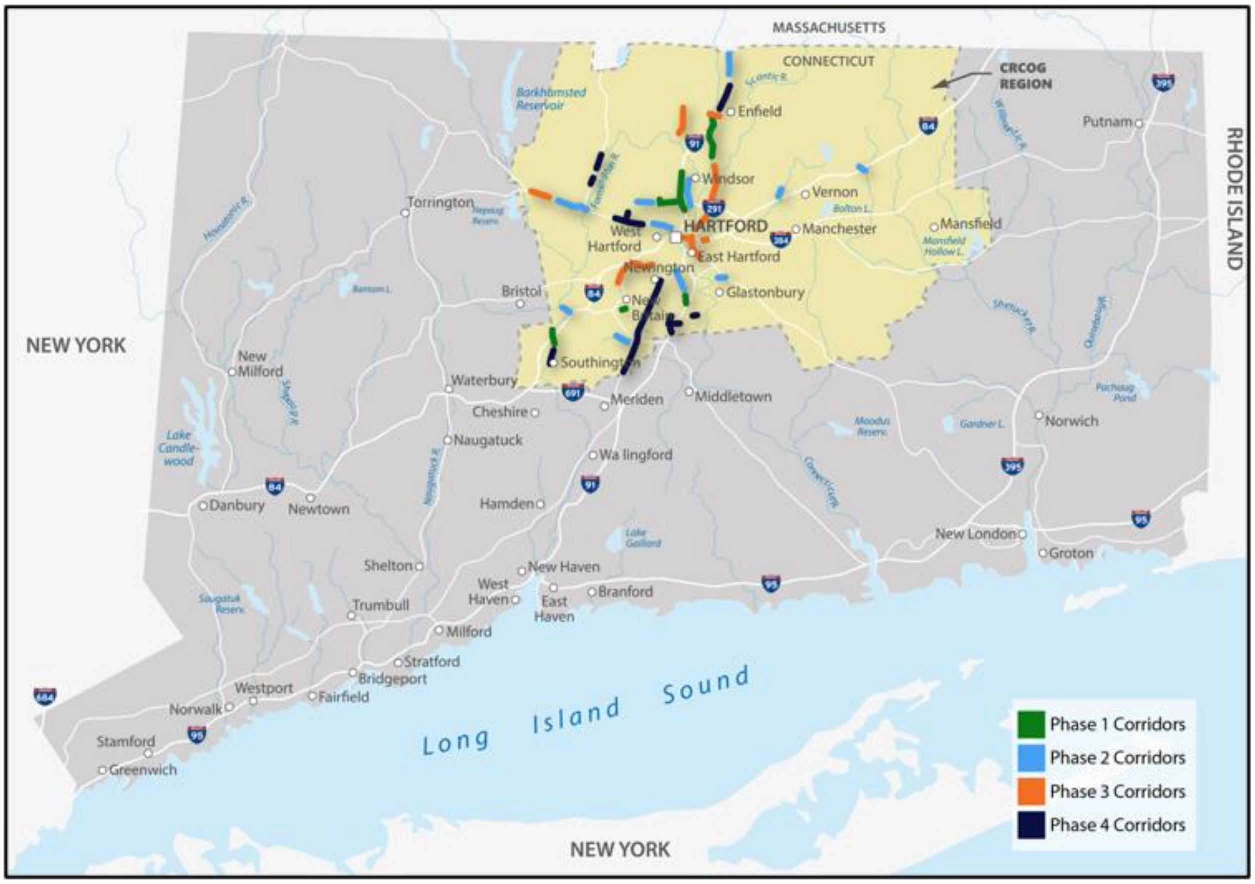
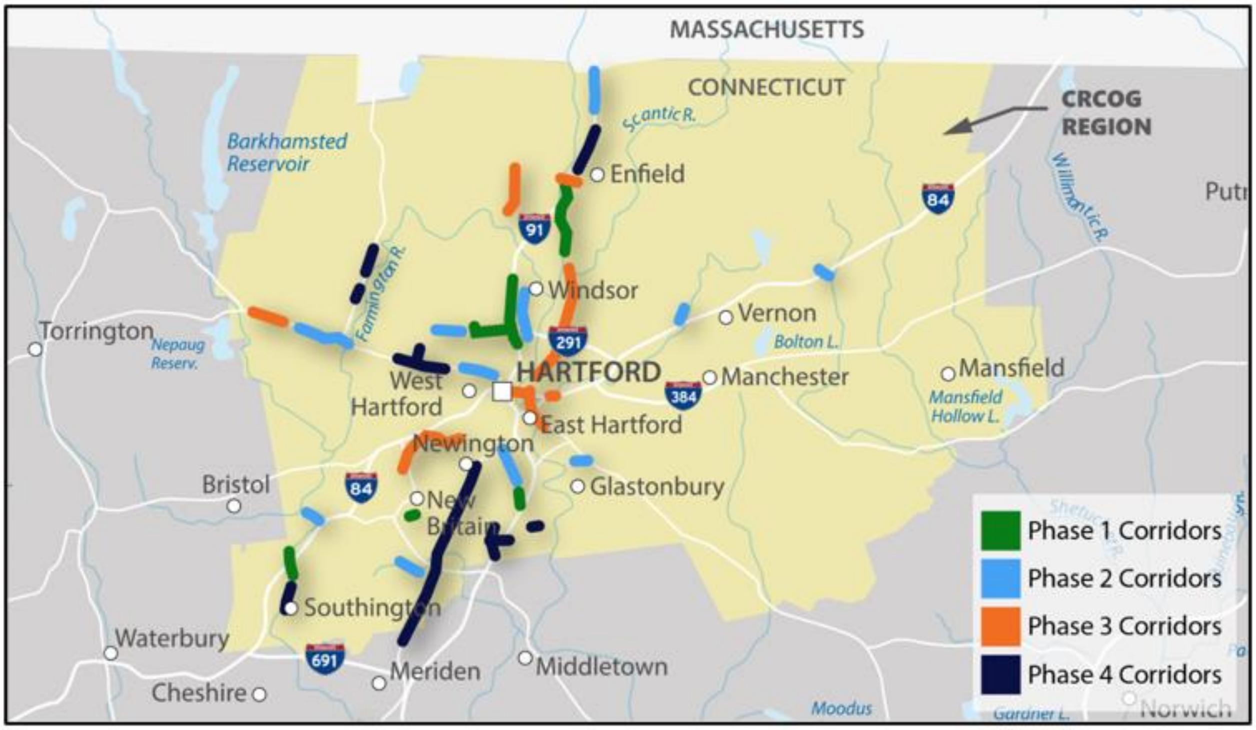
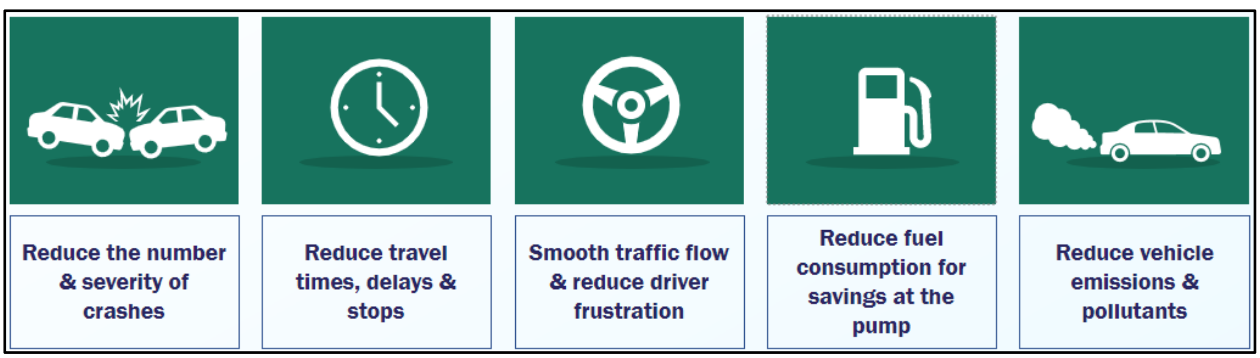


Figure 4: CTDOT CTSS Locations – CRCOG Region



CTDOT Green Light effort includes meeting key objectives and strategies shown below in Figure 5 that contribute to supporting CTDOT's mission and goals. The tactics are described in the timing plan development process below.

Figure 5: Project Objectives and Strategies



CTDOT and its Consultant team worked together to review the context of the corridors, perform traffic counts, travel time runs and perform analysis to optimize each corridor using Synchro V11/SimTraffic, Tru-Traffic and field observations. Upon completion of the data collection tasks and optimization, new timing plans were implemented. CTDOT and the Consultant team then performed "after" travel time runs to quantify the benefits of the timing changes using the performance measures established by the project. The following is a list of the corridors, location and system numbers included in Phase 3. A detailed list of intersections within each corridor is provided in Appendix A.

- Canton - Route 44 & Route 202 (Albany Turnpike) from East Hill Road to Secret Lake

Road

- East Hartford - Route 517 & Route 5 (Main Street/High Street) from Route 2 Off Ramp to Garvan Street
- East Hartford - Route 5 & Route 44 (Main Street) from Connecticut Boulevard/Locust Street to Burnside Avenue
- East Hartford - Route 44 (Connecticut Boulevard) from Blacksmith Lane to Prospect Street
- East Hartford/South Windsor - Route 5 (Main Street/Ellington Road/John Fitch Boulevard) from Prospect Street to Scantic Road
- East Windsor - Route 140 (Bridge Street) from I-91 Southbound Ramp to Route 5 (Prospect Hill Road)
- West Hartford - Route 71 & Route 173 (New Britain Avenue/South Main Street) from South Road to South Main Street/New Britain Avenue to Beechwood Road
- West Hartford/Hartford - Route 173 & Route 529 (New Britain Avenue) from Mayflower Street to Newington Avenue

The timing adjustments for the CRCOG area included travel time runs to calculate travel time measurement. Travel time runs include driving a vehicle through the study limits during weekday peak morning and afternoon hours to gather speed, stops, delay, and travel time measurements for both directions of travel. To learn more about the concept of how travel time runs are taken, watch the side-by-side video on the CTDOT Green Light website (CTDOT Green Light Main Page). The video demonstrates the before and after travel time runs for corridor Route 218 (Cottage Grove Road/Putnam Highway). See Appendix B for before and after travel times.

Figure 6: Route 218 (Cottage Grove Road/Putnam Highway)

Data Collection

Data collection and information review efforts were dual-purposed. First, it yielded the corridor characteristics, operating environment, and technical traffic signal information to perform calculations and support the development of new timing plans. Second, it provided the means to compare traffic signal operations from updated conditions to baseline conditions. See data sources used below:

State Provided Information

CTDOT provided the following:

- GRIDSMART or Miovision traffic volumes where available
- CTDOT Planning Unit volume counts
- Speed profiles from Google Maps
- Existing traffic signal plans
- Existing timing plans coversheets
- Existing time space diagrams
- Context of the corridors
- Travel time runs for assigned corridors

Consultant Collected Information

The Consultant team collected/created the following for each corridor

- Collected turning movement counts by classification from 6 a.m. to 6 p.m. Monday – Friday for specific intersections
- Collected crash data
- Collected distance between intersections
- Created travel time run data for assigned corridors
- Collected timing plan coversheets for assigned corridors
- Collected time space diagrams for assigned corridors
- Collected existing and created optimized Synchro V11 models for assigned corridors
- Collected field observations of traffic operations

Phase 3 Corridors Descriptions

The characteristic of each corridor was provided through CTDOT data sources, desktop reviews, and field observations as well as detailed discussion with CTDOT staff regarding the context of each intersection and corridor. Each corridor is described within this section including a map of locations and detailed technical table.

Canton, Route 44 & Route 202 (Albany Turnpike)

Route 44 and Route 202 (Albany Turnpike) corridor is an east/west principal corridor through the town of Canton. The arterial functional classifications for the project can be found on CTDOT's website at CTDOT Functional Classification. It includes eight (8) signalized intersections beginning at East Hill Road (Int. 023-203) and ending at Secret Lake Road (Int. 023-209). See Figure 7 below for location map. This corridor is approximately 1.7 miles long, has two travel lanes in each direction with median divider from east of Route 177 & Lawton (Int. 023-204) to Secret Lake Road. The corridor has existing sidewalk on the south side of Route 44 & 202 from East Hill Road to the Shops at Farmington Valley Site Drive (Int. 023-211), partial sidewalk on the north side in front of CVS Commercial Drive (Int. 023-213), and from Dowd Avenue (Int. 023-207) to Canton Village (Int. 023-210). There are no bike lanes throughout the corridor. The intersections at Canton Village, Dowd Avenue, Route 177, and CVS Commercial Drive include crosswalks with walk/don't walk indications. The intersections at East Hill Road, Turnpike Shops (Int. 023-212), and Secret Lake Road include crosswalks and operate as a side street green where pedestrians cross the road with the side street traffic. A typical pedestrian head for side street green is red, yellow, and green indications. The intersection at Farmington Valley Site Drive does not include pedestrian crosswalks or indications. There are two transit bus stops along the corridor. One transit stop is on the westbound side of Route 44 & Route 202 at 191 Albany Turnpike and the second bus stop is located on the eastbound side of Route 44 & Route 202 at Secret Lake Road. The average two-way peak hour volumes are approximately 1,900, 1,600, and 2,500 vehicles for a.m., midday, and p.m. peak hours, respectively. The posted speed limit is 40 mph.

The corridor area is mostly commercial with mix of residential dwellings to the west end of the corridor. The users are predominantly motor vehicles. The pedestrian and transit activity are considered light for this corridor. The corridor's functional use has a moderate variation by time of day, day of week. The number of commercial properties and driveways combined with the adjacent residential homes and commuters contribute to the motorist activity. Table 1 below shows further details of each signalized intersection throughout this corridor.

The corridor has two Subsystems A and B to meet the user needs and movement priorities. The subsystems are divided by the intersection at Route 177. Route 177 always operates non-coordinated to meet the user movement priorities. Each of the subsystems have common operating environments including roadway functionality, geographic surroundings, traffic signal phasing, motor vehicle volumes, buses, and pedestrian activity. Subsystem A includes widely spaced intersections with higher average speeds than Subsystem B. Subsystem B includes closely spaced intersections with dense commercial activity and slower average speeds than Subsystem A. Cycle lengths need to balance the need to move motor vehicles through the closely spaced signalized intersections in Subsystem B while limiting wait times for side streets. The corridor's subsystems signalized intersections coordination timing will be adjusted based on operating environment, operational objectives, volume demand, signal phasing, minimize wait times, and proximity of intersections.

The corridor experiences higher volumes during a.m. and p.m. peak hours. The a.m. volume flow favors eastbound where p.m. volumes favor westbound. Midday volumes are moderate with a balance by direction. Late evening/night is uncongested with lower volume that is better suited for equitable green to reduce side street wait times by not providing preferential time for arterial coordination.

Figure 7: Canton Route 44 & Route 202 Location Map

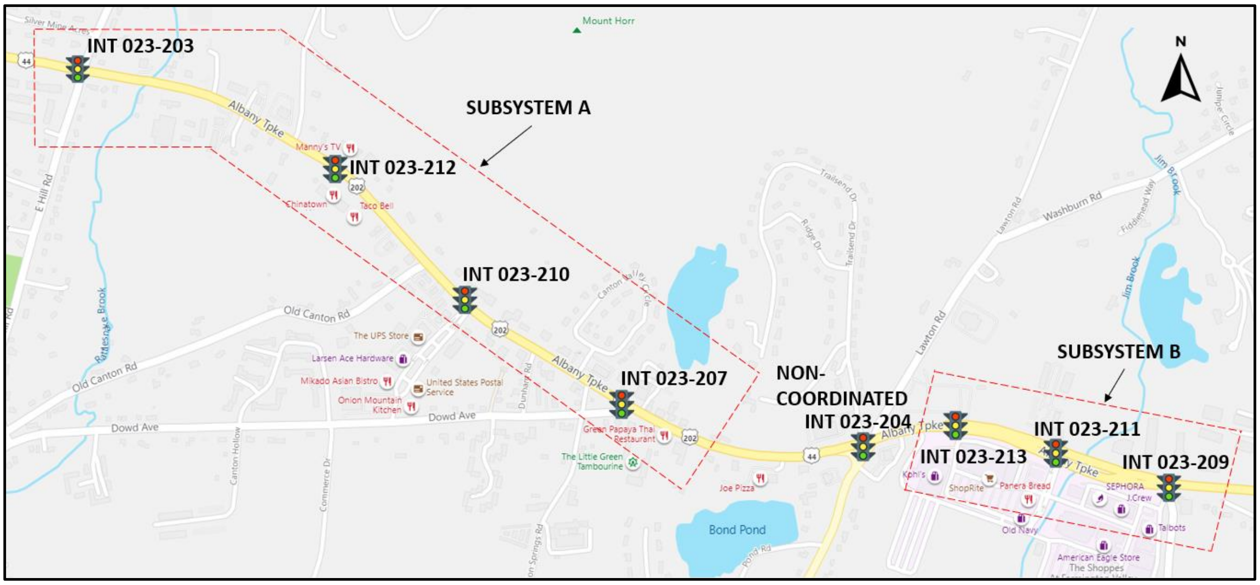


Table 1. Canton Details, Route 44 & Route 202 (Albany Turnpike)

Canton Route 44 & Route 202						
Intersection #	Subsystem	Location	Detection	Artery Detection	Field Communications	Controller
023-203	A	RTE 44 & 202 AT EAST HILL ROAD	L	L	Aerial	Naztec V41
023-212	A	RTE 44 & 202 AT TURNPIKE	L	NONE	Aerial	Naztec V41
023-210	A	RTE 44 & 202 AT CANTON VILLAGE	L, M	NONE	Aerial	Naztec V41
023-207	A	RTE 44 & 202 AT DOWD AVENUE	L	NONE	Aerial	Naztec V41
023-204	NONE	RTE 44 & 202 AT 177 (LOVELY STREET)	L	L	Aerial	Naztec V41
023-213	B	RTE 44 & 202 AT COMMERCIAL	L, V	L	Aerial	Naztec V41
023-211	B	RTE 44 & 202 AT SITE DRIVE	L, V	L	Aerial	Naztec V41
023-209	B	RTE 44 & 202 AT SECRET LAKE ROAD	V	V	Aerial	Naztec V41
L = Loop, V = Video (Non recording), M = Microwave						

East Hartford, Route 517 & Route 5 (Main Street/High Street)

Route 517 and Route 5 (Main/High Street) corridor is a north/south principal corridor through the town of East Hartford. This corridor includes 12 signalized intersections beginning at Route 2 Westbound Off Ramp (Int. 042-271) and ending at Garvan/Central Ave (Int. 042-212). See Figure 8 below for location map. This corridor is two miles long with two travel lanes in each direction with median divider, sidewalks exist on both side of the roadway, and no bike lanes throughout the corridor. The average two-way peak hour volumes are approximately 650, 1,000, and 1,050 vehicles for a.m., midday, and p.m. peak hours, respectively. From Route 2 Westbound Off Ramp to Town Hall (Int. 042-266) the posted speed limit is 35 mph and drops down to 30 mph through Garvan Avenue. Route 517/5 is considered a diversion route for Route 2 when the highway experiences significant delays and queues.

The corridor is a mix of multimodal users with predominantly motor vehicles. Pedestrian crosswalks/indications are provided at all signalized intersections except at Route 2 Westbound Off Ramp and West Brewer at High Street (Int. 042-244) where red, yellow, and green indication is provided for pedestrian crossings. There are transit bus stops located along both sides of the corridor. The pedestrian and transit activity are considered moderate for this corridor.

The corridor's functional use varies from time of day, day of week, leading to multiple subsystems of intersections for coordination. The corridor serves as a commuter route during the weekday mornings and again later in the afternoon. The vast number of commercial properties and driveways combined with adjacent residential neighborhoods contribute to the motorist, pedestrian, and bus activities. The corridor has a major industrial facility between Brewer Street (Int. 042-226) and Willow Street (Int. 042-227) that had significant changes due to Covid-19 where a considerable number of employees are working remotely. The remote working has significantly changed the traffic volumes and patterns for this corridor. Table 2 below shows further details of each signalized intersection throughout this corridor.

The corridor is divided into three Subsystems A, B, and C to meet the user needs and movement priorities. Each of the subsystems have common operating environments including roadway functionality, geographic surroundings, traffic signal phasing, motor vehicle volumes, buses, and pedestrian activity. Subsystem A prioritizes coordination to manage congestion between the intersections and improve flow. Cycle lengths are restricted for this subsystem since storage bays are limited in length for the Route 2 Westbound Off Ramp and between Brewer Street and West Brewer (Int. 042-244). Priority coordination is given between these two intersections to avoid bottle necks at Brewer Street and Main Street.

Subsystem B is an uncongested corridor that meets the users need for two-way progression during peak hours and commercial operational environment. Subsystem C is a break away from Subsystem B to improve flow and meet the user movement priorities for pedestrian activity. The corridor experiences congestion during peak hours, closely spaced intersections, and two-way progression for non-peak hours to improve traffic flow. Late evening/night is uncongested with lower volume that is better suited for equitable green to reduce side street wait times by not providing preferential time for arterial coordination. In optimizing the traffic signal system timings, Route 517 & Route 5 corridor in East Hartford achieved better traffic flow in both directions that improved timing for local operational movements to meet all the user needs.

Figure 8: East Hartford Route 517 & Route 5 Location Map

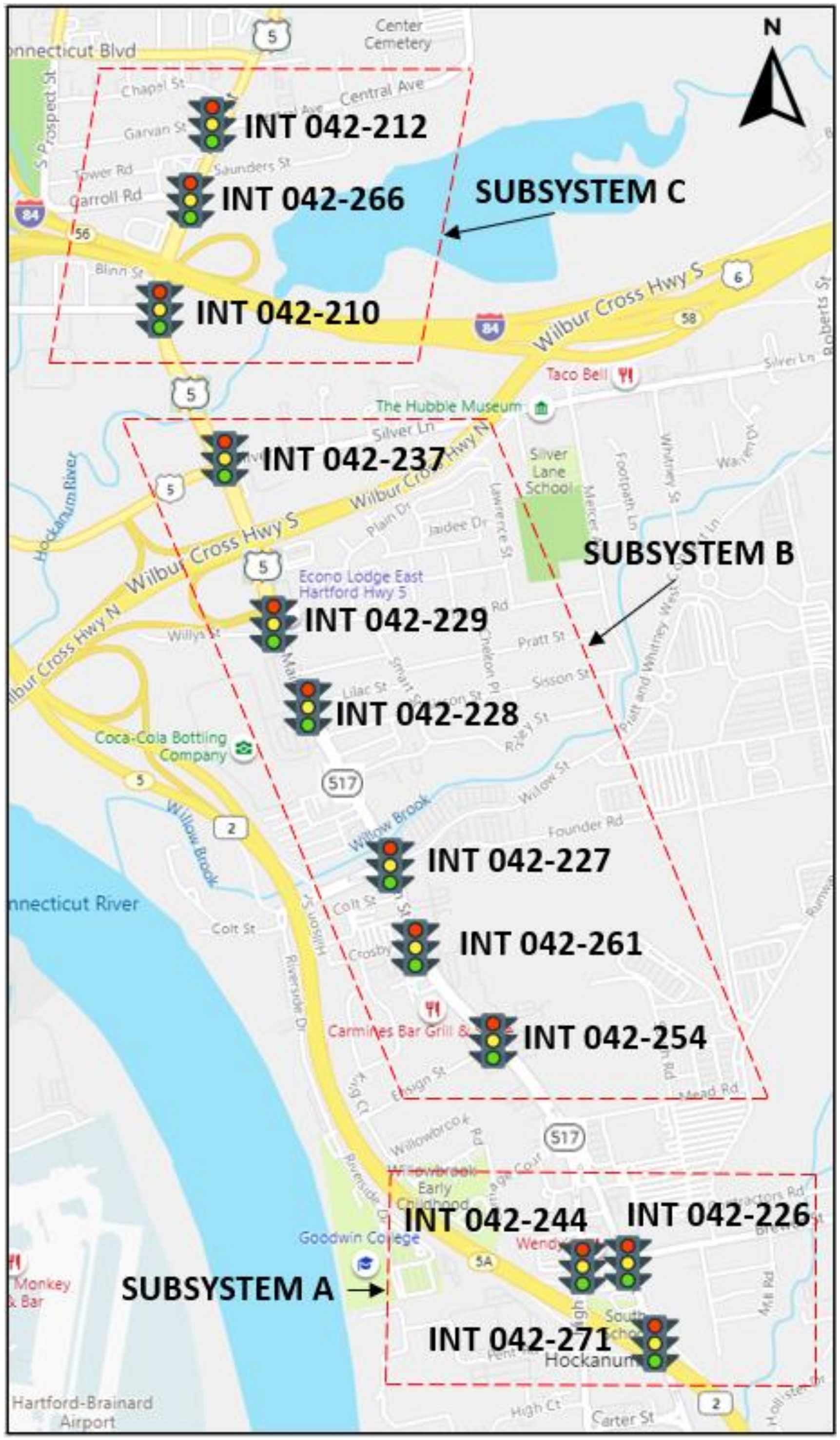


Table 2. East Hartford Details, Route 517 & Route 5 (Main Street/High Street)

East Hartford Route 517 & Route 5						
Intersection #	Subsystem	Location	Detection	Artery Detection	Field Communications	Controller
042-271	A	RTE 517 AT RTE 2 WB OFF RAMP	L	L	Aerial	Naztec V41
042-226	A	RTE 517 AT BREWER/W BREWER STREET	L	L	Aerial	Naztec V41
042-244	A	RTE 517 AT W BREWER	L	L	Underground	Naztec V41
042-254	B	RTE 517 AT ENSIGN ST	L	L	Aerial	Naztec V41
042-261	B	RTE 517 AT CROSBY ST	L	L	Aerial	Naztec V41
042-227	B	RTE 517 AT WILLOW ST	L	L	Aerial	Naztec V61
042-228	B	RTE 517 AT LILAC STREET	L	L	Aerial	Naztec V41
042-229	B	RTE 5 & ROUTE 517 AT BROWN & WILLYS ST	V	V	Aerial	Naztec V41
042-237	B	RTE 5 AT EAST RIVER DRIVE & SILVER LANE	V	V	Aerial	Naztec V41
042-210	C	RTE 5 AT PITKIN STREET	V	NONE	Aerial/Underground	Naztec V41
042-266	C	RTE 5 AT TOWN HALL	L	NONE	Underground	Naztec V41
042-212	C	RTE 5 AT CENTRAL AVE & GARVAN STREET	L	NONE	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

East Hartford, Route 5 & Route 44 (Main Street)

Route 5 and Route 44 (Main Street) corridor is a north/south principal corridor through the town of East Hartford. It includes five signalized intersections beginning at Connecticut Boulevard (Int. 042-202) and ending at Burnside Avenue (Int. 042-203). See Figure 9 below for location map. This corridor is 0.37 miles long, has two lanes traveling northbound and three lanes traveling southbound with on-street parking, sidewalks exist on both side of the roadway, and no bike lanes throughout the corridor. Pedestrian crosswalks/indications are provided at all signalized intersections and there are transit bus stops along both sides of the corridor. The pedestrian and transit activity are considered moderate for this corridor. The average two-way peak hour volumes are approximately 1,750, 1,300, and 1,800 vehicles for a.m., midday, and p.m. peak hours, respectively. The posted speed limit is 30 mph. Route 5 & Route 44 are considered a diversion route for I-91/I-291 when the highway experiences significant delays and queues.

The corridor is a mix of multimodal users with predominantly motor vehicles. The corridor's functional use varies from time of day, day of week. The corridor serves as a commuter route during the weekday mornings and again later in the afternoon. The number of commercial properties and driveways combined with adjacent residential neighborhoods contribute to the motorist, pedestrian, and busing activity. Table 3 below shows further details of each signalized intersection throughout this corridor.

The corridor has one subsystem to meet the user needs and movement priorities. The corridor signalized intersections coordination timing was adjusted based on operating environment, operational objectives, volume demand, signal phasing, minimize wait times, and proximity of intersections. The Subsystem prioritizes coordination to manage congestion between the intersections and improve flow. Cycle lengths needs to balance the need to move motor vehicles through the closely spaced signalized intersections while limiting wait times for side streets and pedestrian crossings. The volumes at Connecticut Boulevard and Burnside Avenue approaches require significant split times. All the signalized intersections have significant pedestrian timing intervals for safe pedestrian passage across Main Street.

The corridor experiences congestion during peak hours, closely spaced intersections, and two-way progression for non-peak hours to improve flow. Late evening/night is uncongested with lower volume that is better suited for equitable green to reduce side street wait times by not providing preferential time for arterial coordination. The three middle signalized intersections at Phelps Place (Int. 042-213), Bissel Street (Int. 042-214), and Wells Avenue (Int. 042-215) need to remain coordinated during late evening/night hours due to intersection proximity and safe flow. In optimizing the traffic signal system timings, Route 5 East Hartford achieved better traffic flow in both directions that improved timing for local operational movements to meet all the user needs.

Figure 9: East Hartford Route 5 & Route 44 Location Map

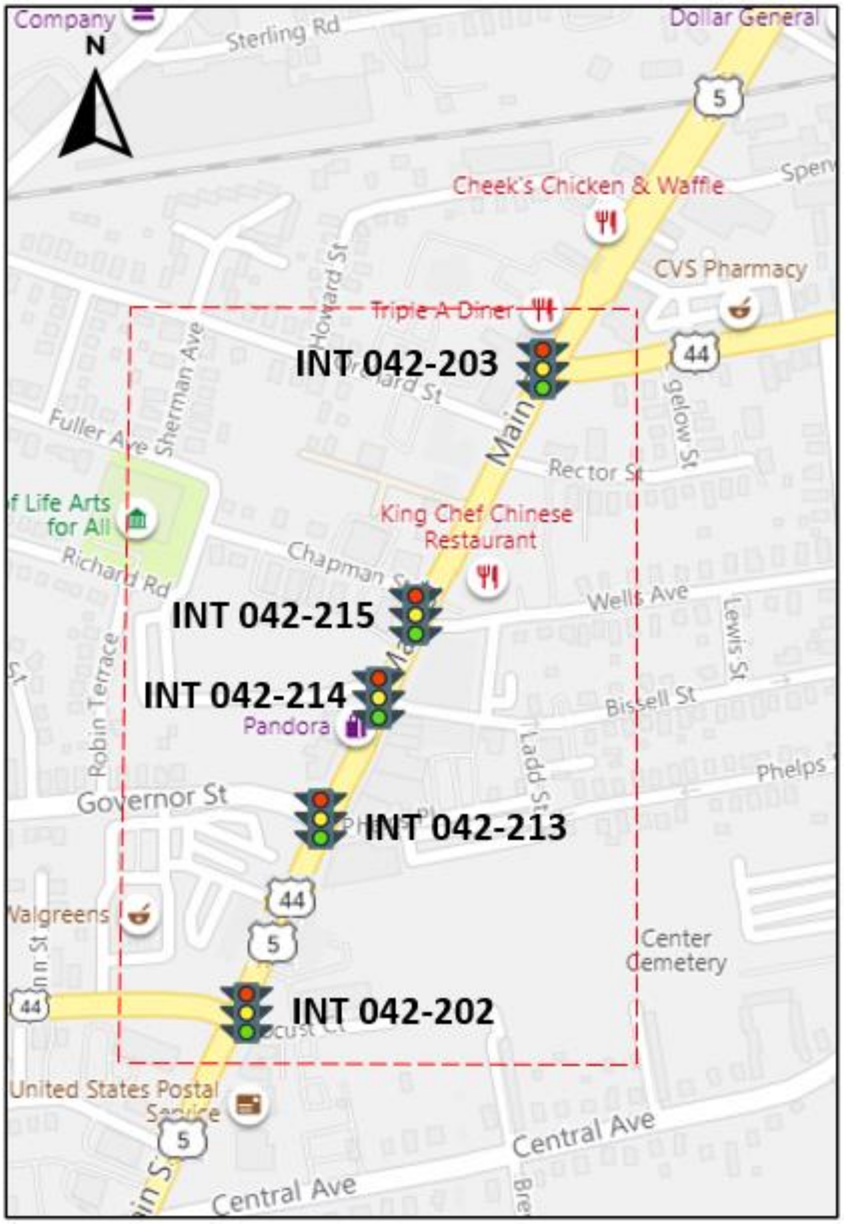


Table 3. East Hartford Details, Route 5 & Route 44 (Main Street)

East Hartford Route 5 & Route 44						
Intersection #	**Subsystem**	**Location**	**Detection**	**Artery Detection**	**Field Communications**	**Controller**
042-202	A	RTE 5 AT RTE 44 (CT BLVD) & LOCUST STREET	V	NONE	Underground	Naztec V41
042-213	A	RTE 5 & RTE 44 AT PHELPS PLACE	L	NONE	Underground	Naztec V41
042-214	A	RTE 5 & RTE 44 AT BISSEL STREET & ALUMNI	L	NONE	Underground	Naztec V41
042-215	A	RTE 5 & RTE 44 AT WELLS AVENUE	L	NONE	Underground	Naztec V41
042-203	A	RTE 5 AT RTE 44 (BURNSIDE AVENUE)	L	NONE	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

East Hartford, Route 44 (Connecticut Boulevard)

Route 44 (Connecticut Boulevard) corridor is an east/west other principal corridor through the town of East Hartford. It includes three signalized intersections at Blacksmith Lane (Int. 042-243), Thomas Street (Int. 042-238), and Prospect Street (Int. 042-201). See Figure 10 below for location map. This corridor is 0.37 miles long, has two travel lanes in each direction with median divider between Blacksmith Lane and Thomas Street. The corridor has sidewalks on both side of the roadway, no bike lanes, and no pedestrian crosswalks or indications are provided. There are transit bus stops along both sides of the corridor. The average two-way peak hour volumes are approximately 800, 600 and 800 vehicles for a.m., midday, and p.m. peak hours, respectively. The posted speed limit is 30 mph. Route 44 is considered a diversion route for I-84 & I-91 when the highways experiences significant delays and queues.

The corridor area is mostly commercial with a mix of commercial and residential dwellings to the east. The users are predominantly motor vehicles. The pedestrian and transit activity are considered light for this corridor. The corridor’s functional use has a low variation by time of day, day of week. The number of commercial properties and driveways combined with adjacent residential neighborhoods contribute to the motorist, pedestrian, and bus activities. Table 4 below shows further details of each signalized intersection throughout this corridor. The corridor has one subsystem to meet the user needs and movement priorities.

The corridor experiences congestion during peak hours, closely spaced intersections, and two-way progression for non-peak hours to improve flow. Late evening/night is uncongested with lower volume that is better suited for equitable green to reduce side street wait times by not providing preferential time for arterial coordination. In optimizing the traffic signal system timings, Route 44 East Hartford achieved better traffic flow in both directions that improved timing for local operational movements to meet all the user needs.

Figure 10: East Hartford Route 44 Location Map

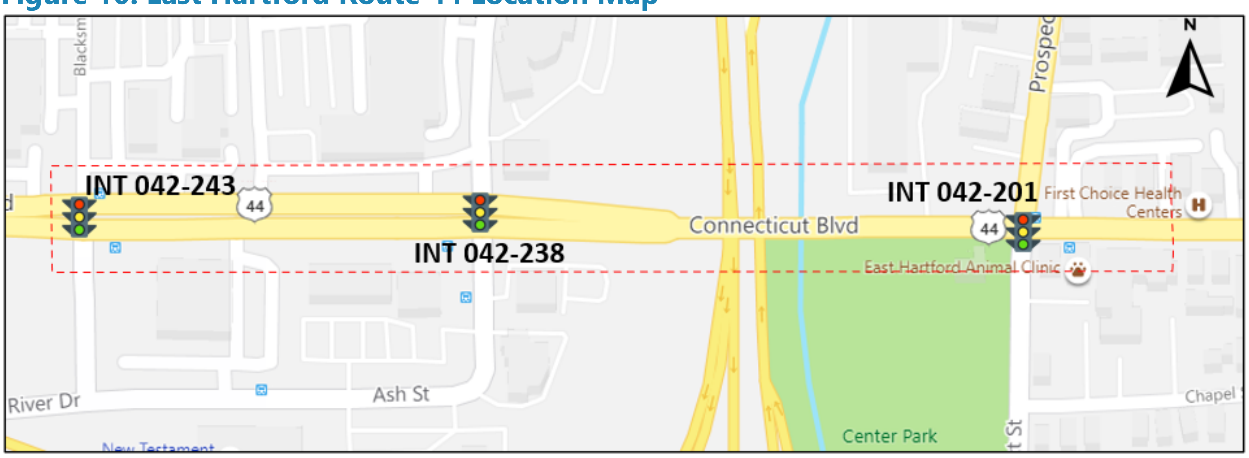


Table 4. East Hartford Details, Route 44 (Connecticut Boulevard)

East Hartford Route 44						
Intersection #	**Subsystem**	**Location**	**Detection**	**Artery Detection**	**Field Communications**	**Controller**
042-201	A	RTE 44 AT PROSPECT ST.	V	NONE	Aerial	Naztec V41
042-238	A	RTE 44 AT THOMAS ST.	V	NONE	Aerial/Underground	Naztec V41
042-243	A	RTE 44 AT BLACKSMITH LANE	V	NONE	Underground	Naztec V41

V = Video (Non recording)

East Hartford/South Windsor, Route 5 (Main Street, Ellington Road, John Fitch Boulevard)

Route 5 (Main Street/Ellington Road/John Fitch Boulevard) corridor is a north/south other principal corridor through the towns of East Hartford and South Windsor. It includes 15 signalized intersections beginning at Prospect Street (Int. 042-217) and ending at Scantic Road (Int. 132-211). See Figure 11 below for location map. This corridor is 6.6 miles long, has two travel lanes in each direction with median divider, no sidewalks, and no bike lanes throughout the corridor. The average two-way peak hour volumes are approximately 1,700, 1,200, and 1,800 vehicles for a.m., midday, and p.m. peak hours, respectively. The posted speed limit is 35 mph from Prospect Street to McKee Street (Int. 042-218) and increases to 50 mph from Goodwin Street (Int. 042-219) to Scantic Road. Route 5 is considered a diversion route for I-91 & I-291 when the highways experiences significant delays and queues.

The corridor is predominantly occupied by motor vehicles. Pedestrian crosswalks/indications are provided for Prospect Street and McKee Street All other signalized intersections have crosswalks with no pedestrian indications. There are transit bus stops located along both sides of the corridor. The pedestrian and transit activity are considered light for this corridor. Prospect Street best meets all the user needs operating without coordination with the other signalized intersections in the corridor. To provide access equity for all movements at this intersection, the signalized intersection will serve all movements and not provide preferential treatment for coordinated movements to the extent that delays and stops for all other movements are significantly increased.

The corridor's functional use is divided into two Subsystems A and B for signalized intersection coordination. Each of the subsystems have common operating environments including roadway functionality, geographic surroundings, traffic signal phasing, motor vehicle volumes, buses, and pedestrian activity. The southern portion of the corridor in East Hartford is a mix of commercial business and residential homes while the northern portion of the corridor in South Windsor is commercial/industrial properties and driveways. The corridor serves as a commuter route during the weekday mornings and afternoons while serving the schools. The corridor is split at the midpoint by I-291 ramps that link I-84 and I-91. Table 5 below shows further details of each signalized intersection throughout this corridor.

The corridor is uncongested that best meets the users need for two-way progression during peak hours. Late evening/night is uncongested with lower volume that is better suited for equitable green to reduce side street wait times by not providing preferential time for arterial coordination. In optimizing the traffic signal system timings, Route 5 East Hartford/South Windsor achieved better traffic flow in both directions that improved timing for local operational movements to meet all the user needs.

Figure 11: East Hartford/South Windsor Route 5 Location Map

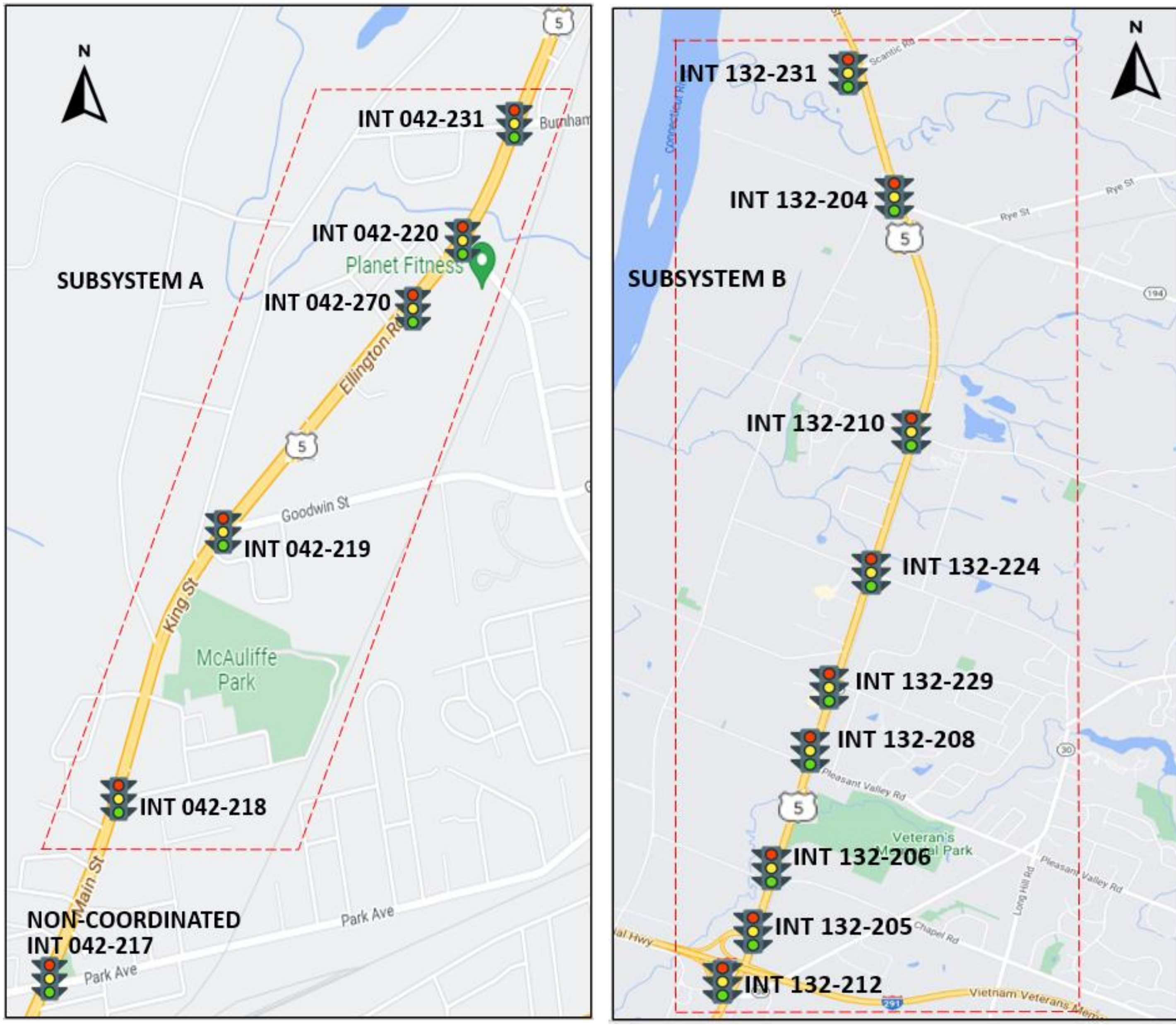


Table 5. East Hartford/South Windsor Details, Route 5 (Main Street, Ellington Road/John Fitch Boulevard)

East Hartford/South Windsor Route 5						
Intersection #	**Subsystem**	**Location**	**Detection**	**Artery Detection**	**Field Communications**	**Controller**
042-217	N/A	RTE 5 AT PROSPECT STREET	L,M	L	Underground	Naztec V41
042-218	A	RTE 5 AT MCKEE STREET	L	NONE	Underground/Aerial	Naztec V41
042-219	A	RTE 5 AT GOODWIN STREET	L	NONE	Aerial	Naztec V41
042-270	A	RTE 5 AT DR TO SCHOOL STREET SQUARE CENTER	L	NONE	Aerial	Naztec V41
042-220	A	RTE 5 AT SCHOOL STREET	L	NONE	Aerial	Naztec V41
042-231	A	RTE 5 AT BURNHAM ST	L	NONE	Aerial	Naztec V41
132-212	B	RTE 5 AT RTE 30 & I-291 EB RAMP	L	NONE	Aerial	Naztec V41
132-205	B	RTE 5 AT I-291 WB RAMP	L	NONE	Aerial	Naztec V41
132-206	B	RTE 5 AT CHAPEL ROAD	L	NONE	Aerial	Naztec V41
132-208	B	RTE 5 AT PLEASANT VALLEY ROAD	L	L	Aerial	Naztec V41
132-229	B	RTE 5 AT S. SATELLITE RD	L	NONE	Aerial	Naztec V41
132-224	B	RTE 5 AT GOVERNORS HIGHWAY	L	NONE	Aerial	Naztec V41
132-210	B	RTE 5 AT STRONG ROAD	L	NONE	Aerial	Naztec V41
132-204	B	RTE 5 AT RTE 194 (SULLIVAN AVENUE)	L	NONE	Aerial/Underground	Naztec V41
132-211	B	RTE 5 AT SCANTIC ROAD	L	NONE	Underground/Aerial	Naztec V41
L = Loop, M = Microwave						

East Windsor, Route 140 (Bridge Street)

Route 140 (Bridge Street) corridor is an east/west minor corridor in the town of East Windsor. It includes three signalized intersections at I-91 Southbound Ramps (Int. 046-219), I-91 Northbound Ramps (Int. 046-220), and Route 5 (Int. 046-210). See Figure 12 below for location map. This corridor is 0.22 miles long, has two travel lanes in each direction with no median divider. The corridor does not have any sidewalks, bike lanes, bus stops, and pedestrian crosswalks. Route 5 at Route 140 is the only intersection in this corridor that has a side street green pedestrian phase, which is represented by a red, yellow, green pedestrian indication, for crossing Route 140 on the east side of the intersection. The average two-way peak hour volumes are approximately 1,100, 1,050, and 1,200 vehicles for a.m., midday, and p.m. peak hours, respectively. The posted speed limit is 35 mph. Route 140 is considered a diversion route for I-91 when the highway experiences significant delays and queues.

The corridor area has commercial businesses between I-91 Northbound Ramps and Route 5 as well surrounding the Route 5 at Route 140 signalized intersection. The corridor users are predominantly motor vehicles. The pedestrian and transit activity are considered light for this corridor. The corridor's functional purpose varies with commuter activity during weekday morning, evening peak and lower volumes for off-peak time periods. Route 140 to the west provides for crossing the Connecticut River. The I-91 Ramps are a major generator of traffic for this corridor. Table 6 below shows further details of each signalized intersection throughout this corridor.

The corridor has one subsystem to meet the user needs and movement priorities. Route 5 best meets all the user needs operating without coordination with the other signalized intersections in the corridor. To provide access equity for all movements at this intersection, the signalized intersection will serve all movements and not provide preferential treatment for coordinated movements to the extent that delays and stops for all other movements are significantly increased. The corridor signalized intersections coordination timing will be adjusted based on operating environment, operational objectives, volume demand, signal phasing, minimize wait times, and proximity of intersections. The subsystem prioritizes coordination between the intersections and improve flow. Cycle lengths needs to balance motor vehicles through the closely spaced signalized intersections with limiting wait times for Ramps.

Late evening/night is uncongested with lower volume that is better suited for equitable green to reduce side street wait times by not providing preferential time for arterial coordination.

Figure 12: East Windsor Route 140 Location Map

Table 6. East Windsor Details, Route 140 (Bridge Street)

East Windsor Route 140						
Intersection #	**Subsystem**	**Location**	**Detection**	**Artery Detection**	**Field Communications**	**Controller**
046-210	N/A	RTE 140 AT RTE 5	V	V	Underground	Naztec V41
046-220	A	RTE 140 AT I-91 NB RAMPS	L	NONE	Underground	Naztec V41
046-219	A	RTE 140 AT I-91 SB RAMPS	L	NONE	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

West Hartford, Route 71 & Route 173 (New Britain Avenue/South Main Street)

Route 71 and Route 173 (New Britain Avenue/South Main Street) corridor has two sections where Route 71 is an east/west minor corridor and Route 173 is a north/south minor corridor. Both corridor sections are in the town of West Hartford. The corridor includes 10 signalized intersections. Route 71 at South Road (Int. 155-239) and Route 71 at Ridgewood Road (Int. 155-215) operate non-coordinated to better meet all the user needs. Subsystem A begins at I-84 Eastbound Ramps (Int. 155-216) and ends at Wolcott Road (Int. 155-218). Subsystem B begins at Route 173 and Corporate Place (Int. 155-251) and ends at Beechwood Road (Int. 155-232). See Figure 13 below for location map. The combined sections are approximately 1.26 miles long, they have two travel lanes in each direction with median divider between South Road and Chatfield Drive (Int. 155-217), and again between Corporate Place and Beechwood Road. Sidewalks exist throughout the corridor except at South Road and there are no bike lanes. The average two-way peak hour volumes are approximately 1,100, 1,050, and 1,200 vehicles for a.m., midday, and p.m. peak hours, respectively. The posted speed limit is 35 mph. Route 71 & Route 173 are considered diversion routes for I-84 & Route 9 when the highway experiences significant delays and queues.

The corridor predominantly serves motor vehicles. There are transit bus stops located along both sides of the corridor. The pedestrian and transit activity are considered light for this corridor. Pedestrian crosswalks/indications are provided at Ridgewood Road (Int. 155-215), Chatfield Drive, Wolcott Road, New Britain Avenue at South Main Street (Int. 155-219), I-84 EB Ramps, and Beechwood Road. South Road, Corporate Place, and I-84 WB Ramps (Int. 155-230) provide red, yellow, green indications for pedestrian crossings. New Britain Avenue at South Main Street best meets all the user needs operating without coordination with the other signalized intersections in the corridor. To provide access equity for all movements at this intersection, the signalized intersection should serve all movements and not provide preferential treatment for coordinated movements to the extent that delays and stops for all other movements are significantly increased.

The corridor's functional use is divided into two Subsystems A and B for signalized intersection coordination. The Route 71 section is broken into one subsystem to meet the user needs and movement priorities. Each of the subsystems have common operating environments including roadway functionality, geographic surroundings, traffic signal phasing, motor vehicle volumes, buses, and pedestrian activity. Subsystem A signalized intersections service a residential area with I-84 Eastbound Ramp. Subsystem B serves I-84 Eastbound and Westbound ramps along with an office building complex and residential area.

The corridor is uncongested that best meets the users need for two-way progression during peak hours. Late evening/night is uncongested with lower volume that is better suited for equitable green to reduce side street wait times by not providing preferential time for arterial coordination. In optimizing the traffic signal system timings, Route 71 & Route 173 West Hartford achieved better traffic flow in both directions that improved timing for local operational movements to meet all the user needs.

Figure 13: West Hartford Route 71 & Route 173 Location Map

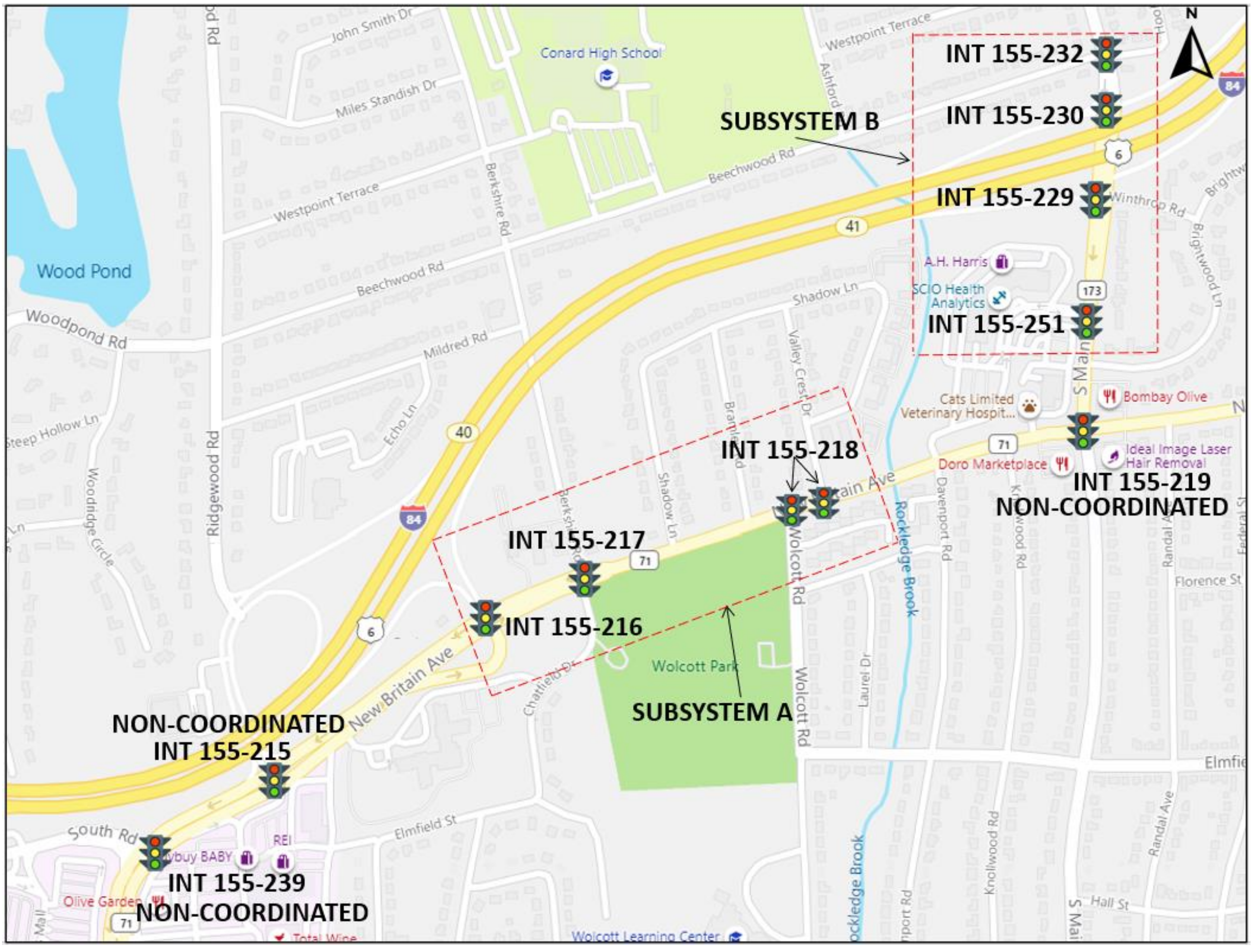


Table 7. West Hartford Details, Route 71 & Route 173 (New Britain Avenue)

West Hartford Route 71 & Route 173						
Intersection #	**Subsystem**	**Location**	**Detection**	**Artery Detection**	**Field Communications**	**Controller**
155-239	N/A	RTE 71 AT SOUTH ROAD	L	L	Underground	Naztec V41
155-215	N/A	RTE 71 AT RIDGEWOOD ROAD	V	V	Underground/Aerial	Naztec V41
155-216	A	RTE 71 AT I-84 EB RAMPS	L	L	Aerial	Naztec V41
155-217	A	RTE 71 AT CHATFIELD DR	V	V	Aerial	Naztec V41
155-218	A	RTE 71 AT WOLCOTT RD	V	NONE	Aerial	Naztec V41
155-219	N/A	RTE 71 AT RTE 173 (S. MAIN)	V	V	Aerial	Naztec V61
155-251	B	RTE 173 AT CORPORATE	V	NONE	Aerial/Underground	Naztec V41
155-229	B	RTE 173 AT I-84 EB RAMPS	V	NONE	Underground	Naztec V41
155-230	B	RTE 173 AT I-84 WB RAMPS	V	NONE	Underground	Naztec V41
155-232	B	RTE 173 AT BEECHWOOD	V	NONE	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

West Hartford/Hartford, Route 173 & Route 529 (New Britain Avenue)

Route 173 and Route 529 (New Britain Avenue) corridor is an east/west minor corridor in the town of West Hartford and city of Hartford. The corridor includes nine signalized intersections beginning at Mayflower Street (Int. 155-221) and ending at Newington Avenue (Int. 063-232). See Figure 14 below for location map. The corridor is 1.6 miles long, two travel lanes in each direction, sidewalks exist on both sides of the roadway, and no bike lanes throughout the corridor. The average two-way peak hour volumes are approximately 800, 900, and 1,100 vehicles for a.m., midday, and p.m. peak hours, respectively. The corridor posted speed limit is 30 mph. Routes 173 & Route 529 are considered diversion routes for I-84 when the highway experiences significant delays and queues.

The corridor is a mix of multimodal users. There are transit bus stops located along both sides of the corridor. The bus activity is considered moderate for the corridor. The pedestrian activity varies for this corridor. The pedestrian activity from Mayflower Street, South Quaker Lane (Int. 155-222), Cambridge Street (Int. 155-224), and New Park Avenue (Int. 155-225) is heavy, where pedestrian activity at other locations such as South Street (Int. 155-226) and Shield Street (Int. 155-227) is light. Pedestrian activity is heavy at Newington Road during school hours (Monday-Friday 8:00 a.m. to 8:45 a.m. and again at 2:45 p.m. to 3:30 p.m.)

Pedestrian crosswalks/indications are provided for signalized intersections in the corridor. Route 529 at Newington Road and Stone Street (Int. 063-232) meets all the user needs operating without coordination with the other signalized intersections in the corridor. The corridor's functional use is divided into two Subsystems A and B for signalized intersection coordination to meet the user needs and movement priorities. Each of the subsystems have common operating environments including roadway functionality, geographic surroundings, traffic signal phasing, motor vehicle volumes, buses, and pedestrian activity. Subsystem A prioritizes coordination to manage congestion between the intersections and improve flow. Subsystem A signalized intersections service a heavy commercial/pedestrian area in the western portion of the corridor. Subsystem B signalized intersections service a mostly commercial/residential area.

The intersection at South Quaker Lane and Newington Road (Int. 155-222) along with Mayflower Street and Cambridge Street is the most congested area in the corridor from a.m. peak through p.m. peak. The system timing is best served by managing queues, accounting for the walk and don't walk timing at South Quaker Lane and providing appropriate through put for all movements at the intersection. The need to coordinate these intersections is due to the proximity between each location combined with heavy volume otherwise the queues on New Britain Avenue at South Quaker would spillback into the adjacent intersections. The frequency of the pedestrian activity at South Quaker Lane adds to the queue lengths. Late evening/night is uncongested with lower volume that is better suited for equitable green to reduce side street wait times by not providing preferential time for arterial coordination. In optimizing the traffic signal system timings, Route 173 & Route 529 West Hartford achieves better traffic flow in both directions with improved timing for local operational movements to meet all the user needs.

Figure 14: West Hartford/Hartford Route 173 & Route 529 Location Map

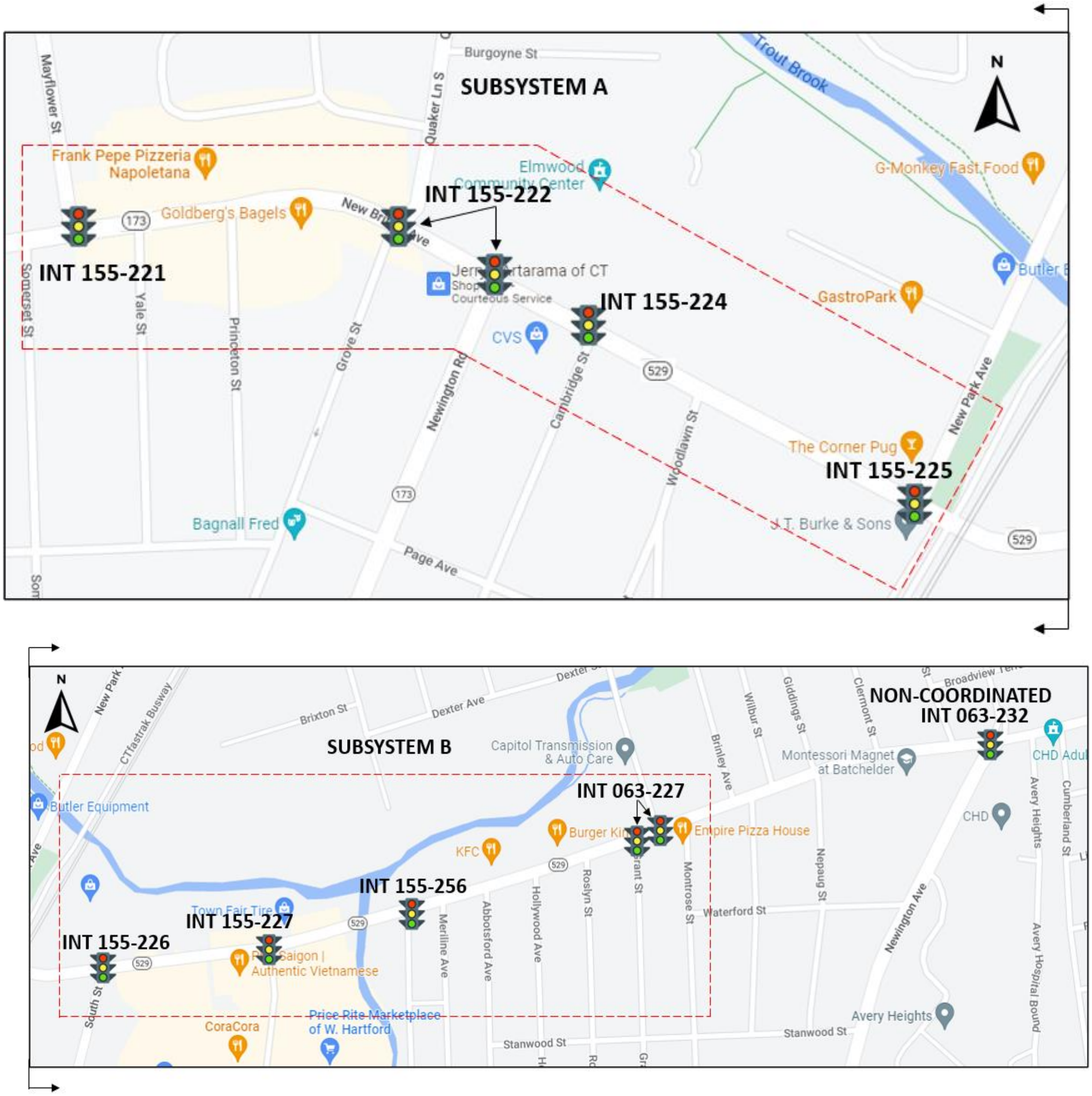


Table 8. West Hartford/Hartford Details, Route 173 & Route 529 (New Britain Avenue)

West Hartford/Hartford Route 173 & Route 529						
Intersection #	Subsystem	Location	Detection	Artery Detection	Field Communications	Controller
155-221	A	RT 173 AT MAYFLOWER STREET	L	NONE	Aerial	Naztec V41
155-222	A	RT 173 AT SOUTH QUAKER LANE	L	L	Aerial	Naztec V41
155-224	A	RT 529 AT CAMBRIDGE STREET	L	NONE	Aerial	Naztec V41
155-225	A	RT 529 AT NEW PARK AVENUE	L	L	Aerial	Naztec V41
155-226	B	RT 529 AT SOUTH STREET	L	L	Aerial	Naztec V41
155-227	B	RT 529 AT SHIELD STREET	L	NONE	Aerial	Naztec V41
155-256	B	RT 529 AT HILLCREST AVENUE	L	NONE	Aerial	Naztec V41
063-227	B	RT 529 AT NEWFIELD AVENUE	L	NONE	Aerial	Naztec V41
063-232	N/A	RT 529 AT NEWINGTON AVE	V	V	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

Traffic Signal Optimization

Synchro Network Development

A base network was created for each corridor by using computer analysis software (Synchro V11/SimTraffic). Existing intersection geometry, posted speed limits, traffic volumes (Appendix C), and signal timings were used in the creation of these models. The models were then calibrated using the "before" travel time run data from Tru-Traffic and SimTraffic to make sure that Synchro/SimTraffic V11 was reflecting existing conditions as closely as possible.

Operational Analysis

Building upon the base networks developed and calibrated as described in the previous section, an analysis was performed to optimize cycle lengths and phase splits. The operational analysis focused on improving mobility in the corridor based on the objectives and strategies established for each corridor. Context discussions were held to identify characteristics of each corridor to be considered in the analysis. For example, the user needs, and priorities are to improve traffic flow for uncongested conditions. In other corridors, the user needs, and priorities are to manage queues for congested conditions. Most corridors included user needs and priorities to address both uncongested and congested conditions for various hours of day and day of week time periods.

The operational analysis imbeds NCHRP Report 812 *Signal Timing Manual 2nd Ed*[iv] guidance to include an outcome-based approach utilizing traffic signal system timing objectives and performance measures that ensures all the user needs and priorities are met. The outcome-based approach to signal timing allows the analyst to develop signal timing based on the operating environment, users, user priorities by movement, and local operational objectives. Performance measures are then used to assess how well the objectives are being met. Once the objectives and performance measures are established, timing strategies and timing values can be chosen. The final steps of the process involve implementation and observation (i.e., determining if the timing strategies and values are working), as well as sustaining operations that meet the operational objectives through monitoring and maintenance.

Crash Data

Crash data was downloaded from the UCONN Connecticut Crash Data Repository Website[v] ctcrash.uconn.edu for each corridor studied in Phase 3 of the project. The crash data period is from 1/1/2017 to 12/31/2019. The data was reviewed for crash patterns that may be reduced or be eliminated by changes to signal coordination timings. For example, rear-end and same direction side swipe type crashes are related to quality of traffic flow and queue management. If these types of conditions were identified, then the crash data was used in developing the timing plans and are noted in the corridor descriptions if applicable. Detailed crash reports for each corridor can be found in Appendix D. It is planned that the crash data provided in Appendix D will be used in a comparative analysis three to five years from the date of timing plan implementation. The comparison of future crash data with the crash data in Appendix D can be used to determine if any crashes related to timing plan changes have been reduced or corrected.

Traffic Signal Timing Development

Development of traffic signal timings were completed through a multi-step process which included the calculation of each intersection's coordination timing parameters (cycle lengths, splits, and offsets) from Monday through Friday during 6 a.m. to 6 p.m. Timings were then refined in the field based on observations and/or complaints. The following sections detail how these calculations were developed and modified for each corridor.

Cycle Length

An optimal cycle length provides sufficient green time to effectively serve all movements at an intersection while providing efficient flow of traffic through a corridor from one intersection into the next. Longer cycle lengths can typically accommodate higher mainline volumes, however, they may cause greater delays for the minor approaches to the intersections. Short cycle lengths can help to reduce the delay for minor approaches but will cause disruption to the flow of traffic. An optimal cycle length balances these two considerations of delay and flow. Additionally, it is important to consider how the selection of a cycle length at an intersection affects operations at adjacent intersections. System-wide coordination can be accomplished by using a similar cycle length throughout the system or grouping of intersections into subsystems. The optimal cycle length is the merging of the following factors:

- System-wide coordination
- Intersection vehicular demand (user through and turning movements priorities)
- Minimum cycle length
- Pedestrian and bicycle user phase activation and volumes
- Overall intersection delay and level of service (LOS)
- Intersection approach/movement delays
- Flow of traffic

A critical movement analysis was performed following the guidance from NCHRP Report 812 *Signal Timing Manual 2nd Ed*[vi]. Using the peak hour volumes, lane configuration and existing phasing at the intersections, the critical volume was calculated by time of day for each intersection to identify a system cycle length by time of day. Exhibit 5-30 of the *Signal Timing Manual 2nd Ed*[vii] recommends cycle length and effective green time per cycle based on a maximum peak hour volume.

Cycle lengths were considered and evaluated against the items listed above, with consideration given to the performance of existing cycle lengths. Up to five (5) cycle lengths were considered for a 24-hour period including the existing cycle length, the cycle length identified through the critical movement analysis and cycle lengths within 5 to 10 second increments of the existing and critical cycle lengths. Resulting MOEs such as travel time and delay were evaluated in the selection of the cycle length to be implemented.

Splits and Offsets

Splits were calculated based on the minimum and maximum green times plus the clearances (total time of red and yellow) from the traffic signal plans. The existing splits were considered in optimizing green times in Synchro V11/SimTraffic. Offsets were initially calculated by using the Tru-Traffic and SimTraffic programs.

Time of Day Schedule

A schedule was developed to operate the proposed timing plans based on patterns for Monday through Friday 6 a.m. to 10 p.m. Traffic volumes throughout the day were used as the basis for developing the time-of-day schedule. The spikes in the a.m., midday, and p.m. periods of the traffic volumes guided the core hours of operation. The graphical representation of volumes developed in the critical movement analysis were used to identify variations in volumes by time of day and develop the time-of-day schedule for a corridor. The time of day, day of week schedules include coordinating with the programmed hours of flash and determination of time periods for non-coordinated operation. The flash and non-coordination operation aid in meeting the needs of the users for uncongested time periods to reduced wait times for green, improved flow, and provide users' equitable green time. The time-of-day schedules were selected to minimize transition time between changes in cycle lengths.

CTDOT Review and Adjustments

Upon completion of the proposed traffic signal timing changes, CTDOT performed a review of the timing plans using pertinent operational objectives and performance measures as well as various technical and engineering tools. CTDOT's review included data collection with field reviews before implementation. CTDOT recognizes the importance of visual observations to gain an understanding of the arterial functionality and the surrounding environment (Context of the corridor). Combining field observations with technology such as data from the controllers, 360-degree video detectors and CCTV, the CTDOT engineers evaluated the timing plans and adjusted as appropriate. Additionally, prior to implementing new timing plans, the engineers use a visual software tool called TSDWIN[viii] to analyze coordination strategies to refine the time space diagrams and confirm the proposed offsets.

Implementation and Field Fine-Tuning

Recommended changes to the existing timing plans were developed by the Consultant and submitted to CTDOT for review. Upon discussion and completion of the recommended changes, new optimized signal timings were downloaded through the remote system communications from central control or implemented by the Traffic Signal Lab. The new timing plans were observed through split monitoring field observations, and travel time data collection by CTDOT staff after implementation. Fine tuning continued in the weeks following the initial implementation in each corridor to address operational deficiencies that were noted during monitoring of the new timing's operation and address citizen's complaints.

Fine-tuning included adjusting splits and offsets. Movements found needing more split time were addressed based on the tradeoff between improving the movement operations and the impact to the overall coordination along the corridor. Offsets were adjusted along the corridor to improve progression based on the field observations and travel time runs. Any revision made during the fine-tuning process was recorded and revised on the excel coversheets.

Final Data Collection

Upon completion of the field fine tuning, the Consultant collected travel time data using Tru-Traffic and the travel time surveys. The travel time surveys are used to calculate travel time measurement. Travel time runs include driving a vehicle through the study limits during weekday peak morning and afternoon hours to gather speed, stops, delay, and travel time measurements for both directions of travel. To learn more about the concept of how travel time runs are taken, watch the side-by-side video on the CTDOT Green Light website (CTDOT Green Light Main Page). The video demonstrates the before and after travel time runs for corridor Route 218 (Cottage Grove Road/Putnam Highway)

Delay and travel time collected for each corridor "after" field fine tuning was compared to the "before" travel runs performed prior to optimization to determine operational improvements for the timing evaluation.

Changes by Corridors in Phase 3

This section describes the signal timing changes implemented for each corridor by comparing the "before" evaluation timing plans to the "after" evaluation timing plans.

CTDOT used equitable distribution of time for the hours 10 p.m. to 6 a.m. and minimum cycle lengths to reduce wait times. Coordination between intersections is provided where intersection proximity, or other user needs could be addressed by the coordination. Otherwise, the intersections are programmed non-coordinated or flashing operation for late night early morning time periods as needed.

Each corridor has tables to show the before and after coordination schedules applicable to Monday through Friday operations from 6:00 a.m. to 10:00 p.m. These schedules contain a separate block for each pattern. Each block shows the coordinated cycle length followed by the offset (in seconds) for each of the corresponding intersections.

Each traffic signal in a system or subsystem may be required to operate differently after 10 p.m. Therefore, the cycle lengths are listed as "variable" to represent the several types of operation. For example, some signals may remain coordinated while other signals operate flash or non-coordinated.

Canton, Route 44 & Route 202

Route 44 & Route 202 is an east/west principal corridor in Canton. The travel times conducted after the new signal timings were implemented showed no appreciable benefits between the "Before" to "After" conditions resulting in a return to the "Before" timings. It should be noted that most of the travel time comparisons that showed an increase in travel time with the new timings are minor increases.

Some reasons for an increased travel time include but are not limited to:

- A change in signal progression to improve flow and reduce travel time in one direction resulted in an increase to travel time in the opposing direction
- Progression needs of a crossing arterial with higher traffic volumes result in added delay of a study corridor at the crossing intersection
- Consistent time of day plans along a corridor that reduce the likelihood of random progression through signals
- Day-to-day variation in traffic demand
- Increase in pedestrian and vehicle clearance timings
- Faulty detection, resulting in a constant call on the cross-street, which was not yet fixed during the after runs but was functioning properly during the before runs

The following table shows the coordination schedules applicable to Monday through Friday operations from 6:00 a.m. to 10:00 p.m. These schedules contain a separate block for each pattern. Each block shows the coordinated cycle length followed by the offset (in seconds) for each of the corresponding intersections. The cycle length is listed as "variable" for the intersections that run "non-coordinated."

Figure 15: Canton Route 44 & Route 202 Location Map

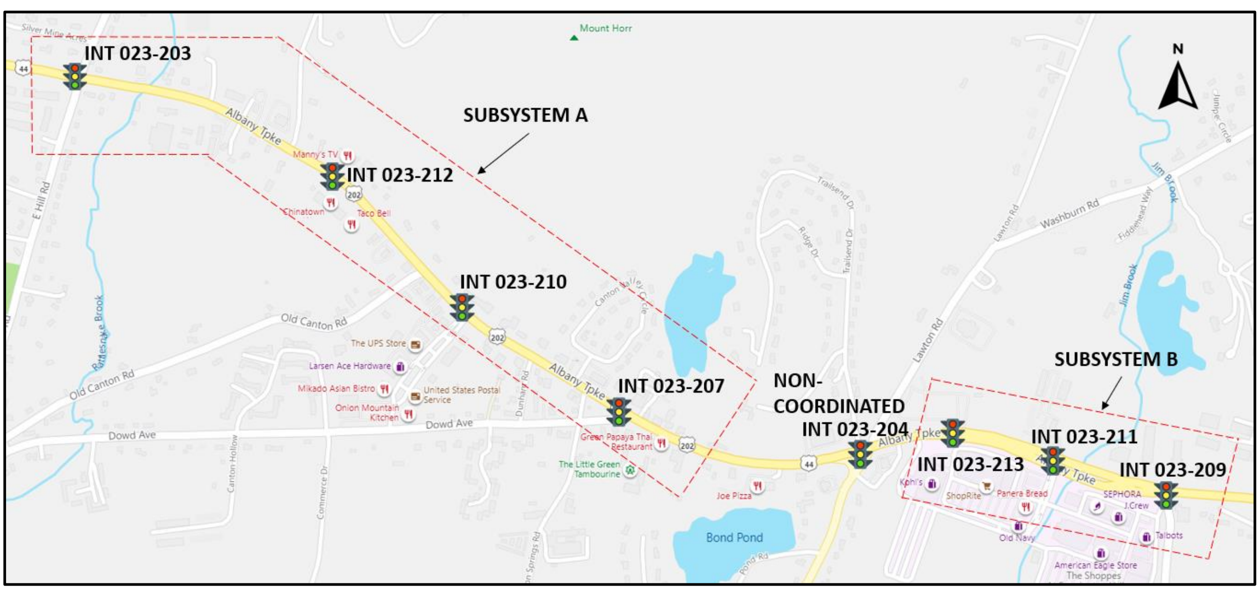


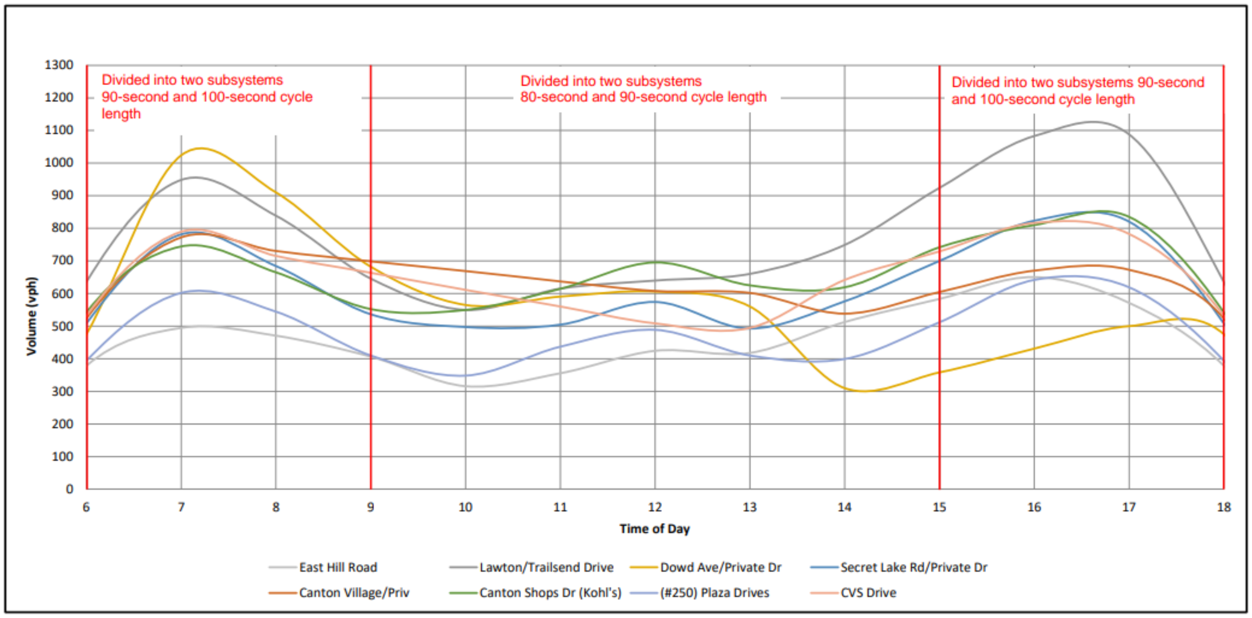
Table 9. Canton Route 44 & Route 202 Changes to Cycle Lengths and Offsets

Monday – Friday 6 a.m. – 10 p.m.

Before Evaluation Timings (Cycle - Offset)						
Intersection		**Time of Day**				
No.	**Description**	6 7 8 9	10 11 12 13 14 15	16 17 18	19 20 21 22	
023-203	East Hill Road	90 - 17	80 - 25	90 - 30	65 - 18	Variable
023-212	Turnpike	90 - 38	80 - 00	90 - 33	65 - 15	Variable
023-210	Canton Village	90 - 76	80 - 74	90 - 75	65 - 25	Variable
023-207	Dowd Avenue	90 - 16	80 - 36	90 - 21	65 - 51	Variable
023-204	Route 177 (Lovely St)	Variable				Variable
023-213	Commercial Drive	100 - 40	90 - 51	100 - 20	70 - 13	Variable
023-211	Site Drive	100 - 85	90 - 87	100 - 16	70 - 17	Variable
023-209	Secret Lake Road	100 - 89	90 - 03	100 - 16	70 - 31	Variable

After Evaluation (Reverted to Before Timings) Timings (Cycle - Offset)						
Intersection		**Time of Day**				
No.	**Description**	6 7 8 9	10 11 12 13 14 15	16 17 18	19 20 21 22	
023-203	East Hill Road	90 - 17	80 - 25	90 - 30	65 - 18	Variable
023-212	Turnpike	90 - 38	80 - 00	90 - 33	65 - 15	Variable
023-210	Canton Village	90 - 76	80 - 74	90 - 75	65 - 25	Variable
023-207	Dowd Avenue	90 - 16	80 - 36	90 - 21	65 - 51	Variable
023-204	Route 177 (Lovely St)	Variable				Variable
023-213	Commercial Drive	100 - 40	90 - 51	100 - 20	70 - 13	Variable
023-211	Site Drive	100 - 85	90 - 87	100 - 16	70 - 17	Variable
023-209	Secret Lake Road	100 - 89	90 - 03	100 - 16	70 - 31	Variable

Figure 16. Canton, Route 44 & Route 202 Critical Volume Chart



East Hartford, Route 517 & Route 5

Route 517 & Route 5 is a north/south minor corridor in East Hartford and provides access to Route 2, Route 15, and Interstate I-84. The changes implemented to improve traffic flow include an increase in cycle length to increase overall capacity. East River Drive will remain non-coordinated after the p.m. peak to better meet the needs of the motorist movement priorities over traffic flow between adjacent intersections. To improve Route 517 & Route 5 flow for both directions, the increase in cycle length was combined with maintaining the number of cycle changes. The midday volume continued to increase, and the p.m. peak was accommodated by increasing the cycle by 5 seconds. These changes simplified operations, increased capacity, and eliminated multiple shifts between cycle lengths to increase the effectiveness of coordination. The following table shows the before and after coordination schedules applicable to Monday through Friday operations from 6:00 a.m. to 10:00 p.m. These schedules contain a separate block for each pattern. Each block shows the coordinated cycle length followed by the offset (in seconds) for each of the corresponding intersections. The cycle length is listed as “variable” for the intersections that run “non-coordinated.”

Figure 17: East Hartford Route 517 & Route 5 Location Map

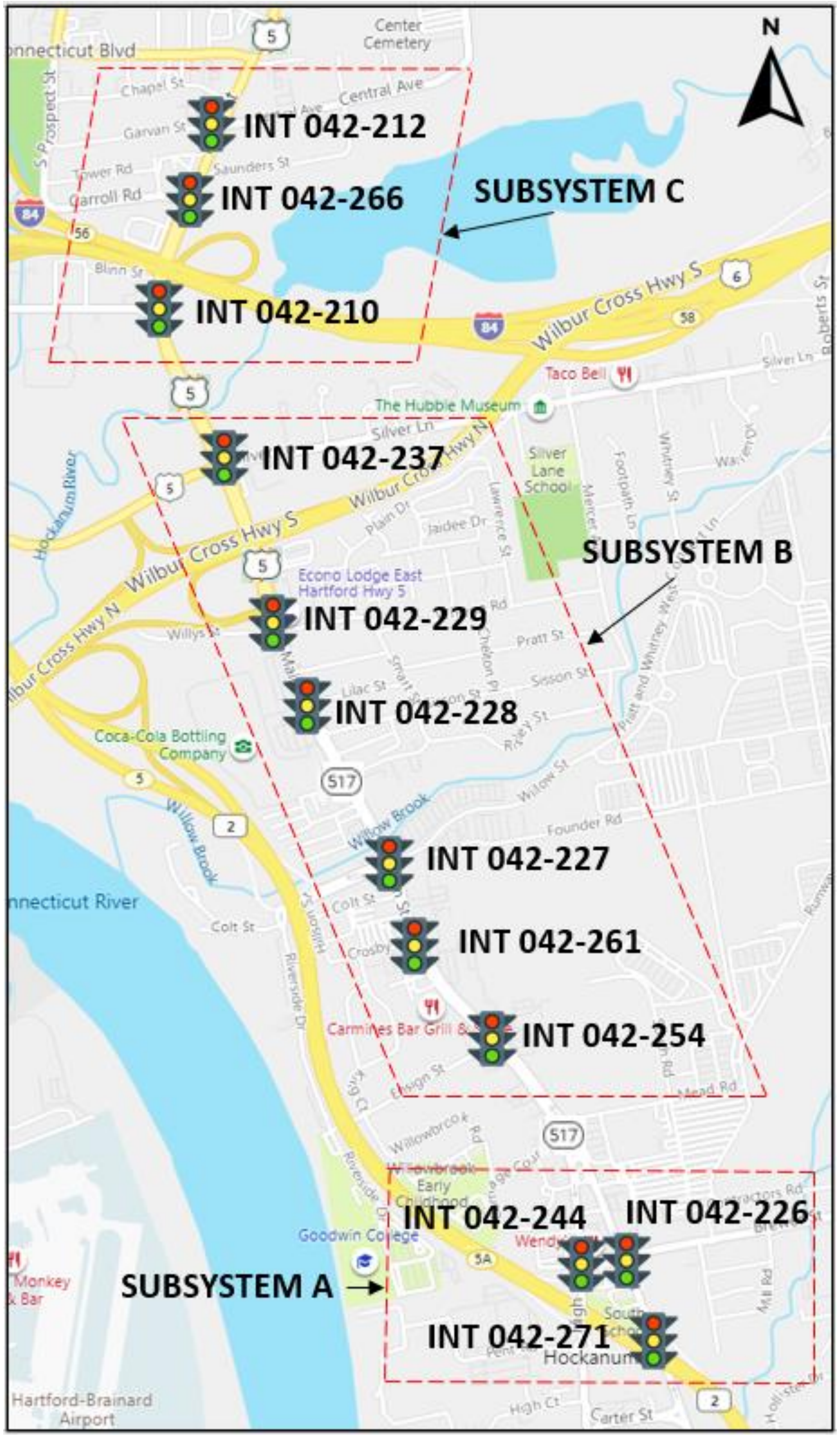


Table 10. East Hartford Route 517 & Route 5 Changes to Cycle Lengths and Offsets

Monday – Friday 6 a.m. – 10 p.m.

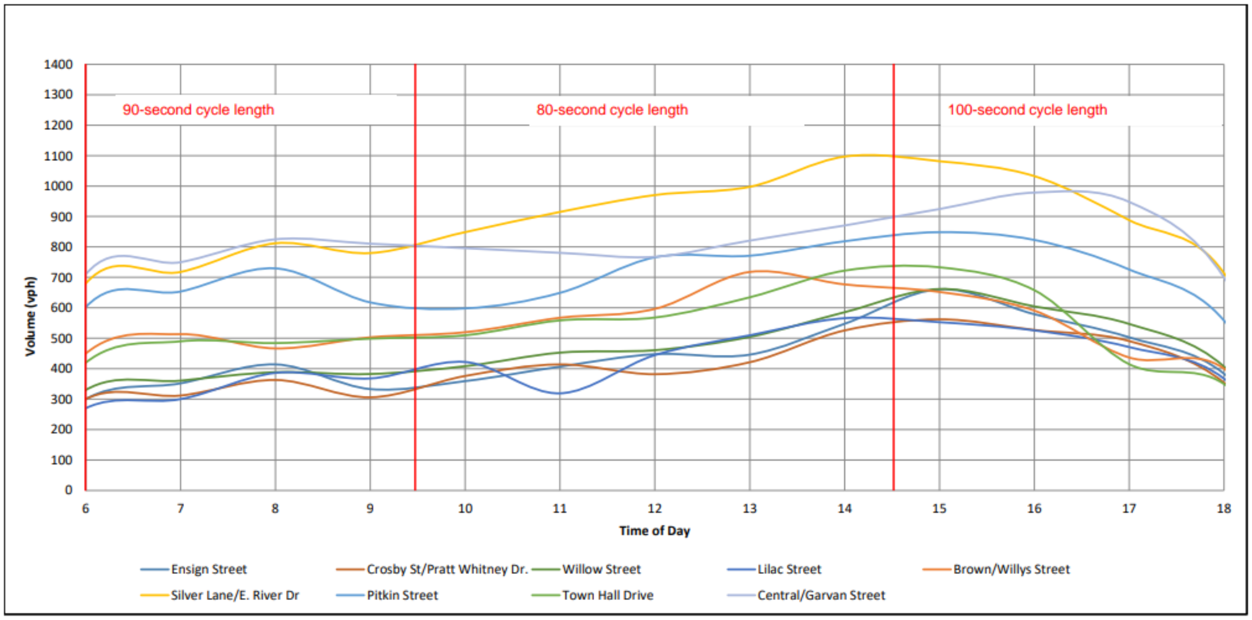
Before Evaluation Timings (Cycle - Offset)

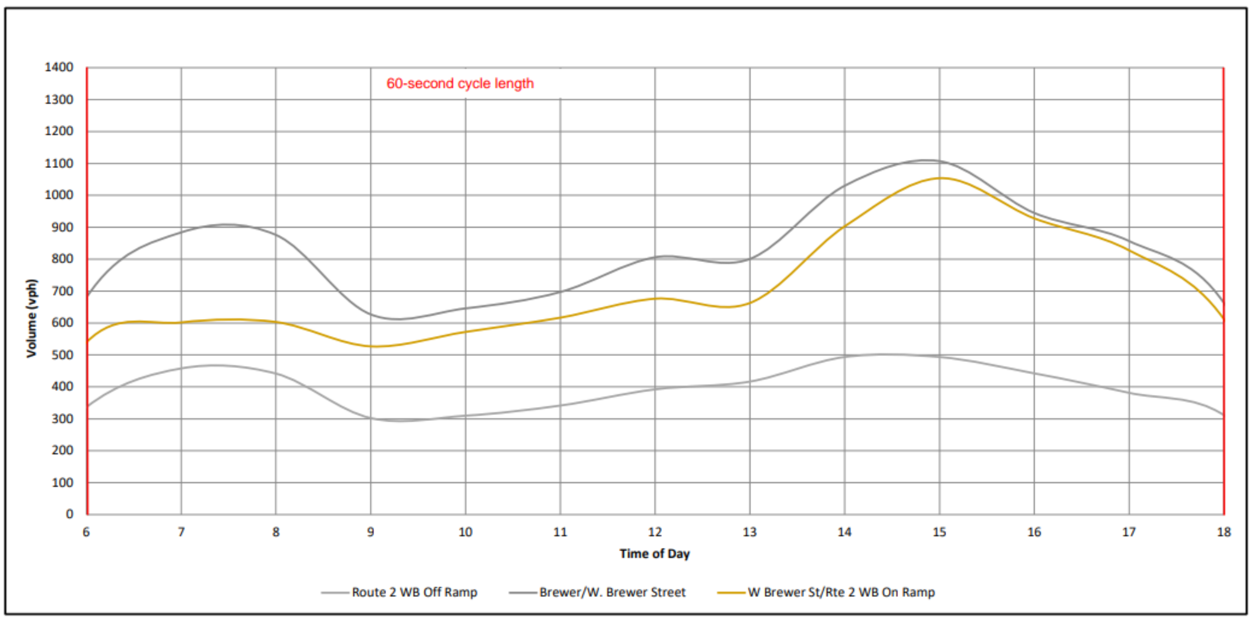
Intersection No.	Intersection Description	Time of Day (6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22)				
042-271	Rte 2 WB Off Ramp	60 - 00	60 - 00	60 - 00	Variable	Variable
042-226	Brewer & W. Brewer St	60 - 00	60 - 00	60 - 00		
042-244	W. Brewer St.	60 - 10	60 - 10	60 - 10		
042-254	Ensign Street	90 - 05	75 - 00	90 - 05	60 - 00	
042-261	Crosby Street	90 - 53	75 - 75	90 - 53	60 - 42	
042-227	Willow Street	90 - 41	75 - 42	90 - 41	Variable	
042-228	Lilac Street	90 - 05	75 - 05	90 - 05	60 - 05	
042-229	Brown & Willys Street	90 - 85	75 - 10	90 - 85	60 - 10	
042-237	East River Dr & Silver La	90 - 46	Variable	90 - 46	Variable	
042-210	Pitkin Street	90 - 13	75 - 15	90 - 13	60 - 15	
042-266	Town Hall	90 - 07	75 - 15	90 - 07	60 - 53	
042-212	Central Ave & Garvan St	90 - 09	75 - 10	90 - 09	60 - 50	

After Evaluation Timings (Cycle - Offset)

Intersection No.	Intersection Description	Time of Day (6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22)				
042-271	Rte 2 WB Off Ramp	60 - 00				Variable
042-226	Brewer & W. Brewer St	60 - 00				
042-244	W. Brewer St.	60 - 10				
042-254	Ensign Street	90 - 81	80 - 00	100 - 93	70 - 00	
042-261	Crosby Street	90 - 73	80 - 00	100 - 81	70 - 00	
042-227	Willow Street	90 - 70	80 - 00	100 - 81	70 - 14	
042-228	Lilac Street	90 - 44	80 - 34	100 - 99	70 - 51	
042-229	Brown & Willys Street	90 - 30	80 - 18	100 - 75	70 - 55	
042-237	East River Dr & Silver La	90 - 02	80 - 00	100 - 99	Variable	
042-210	Pitkin Street	90 - 72	80 - 15	100 - 00	70 - 50	
042-266	Town Hall	90 - 83	80 - 13	100 - 13	70 - 53	
042-212	Central Ave & Garvan St	90 - 79	80 - 20	100 - 00	70 - 50	

Figure 18. East Hartford, Route 517 & Route 5 Critical Volume Chart





East Hartford, Route 5 & Route 44

Route 5 & Route 44 is a north/south minor corridor in East Hartford and provides access to I-84, Route 15, and Interstate I-84. The changes implemented to improve user needs include a decrease in cycle length for the a.m. and midday time periods to reduce wait times and reduction in the number of patterns throughout the day. Connecticut Boulevard was added to the existing coordination system to improve traffic flow between adjacent intersections. The a.m. and p.m. volumes are the same except for a slight increase during the p.m. peak resulting in a minor increase in cycle length. The slight volume drop after the a.m. peak did not warrant a change in the cycle length. These changes simplified operations, reduced wait times, and eliminated multiple shifts between cycle lengths to increase the effectiveness of coordination. The following table shows the before and after coordination schedules applicable to Monday through Friday operations from 6:00 a.m. to 10:00 p.m. These schedules contain a separate block for each pattern. Each block shows the coordinated cycle length followed by the offset (in seconds) for each of the corresponding intersections. The cycle length is listed as “variable” for the intersections that run “non-coordinated.”

Figure 19. East Hartford, Route 5 & Route 44 Location Map

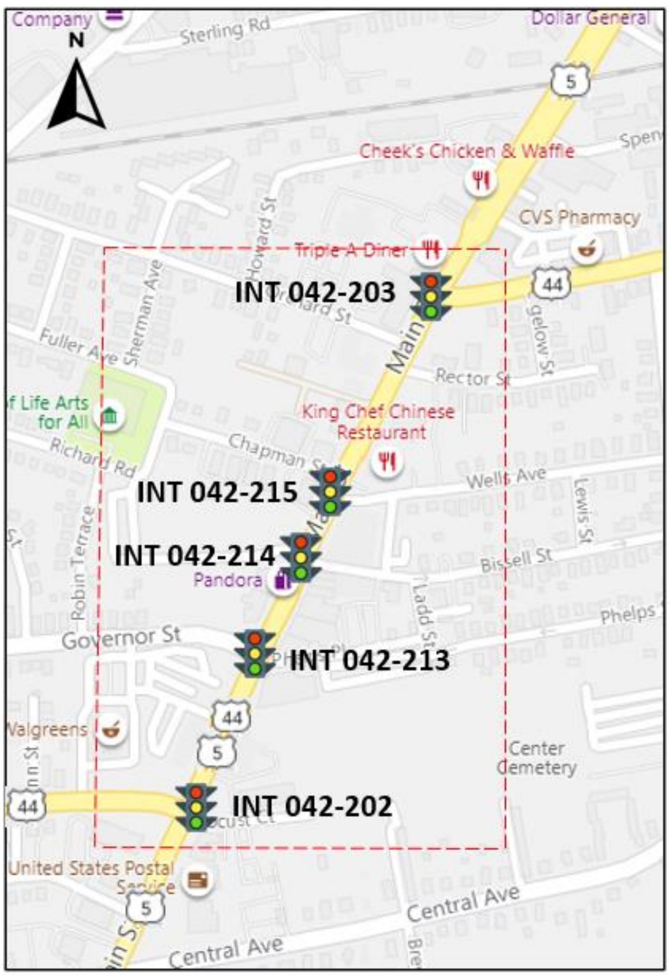


Table 11. East Hartford Route 5 & Route 44 Changes to Cycle Lengths and Offsets

Monday – Friday 6 a.m. – 10 p.m.

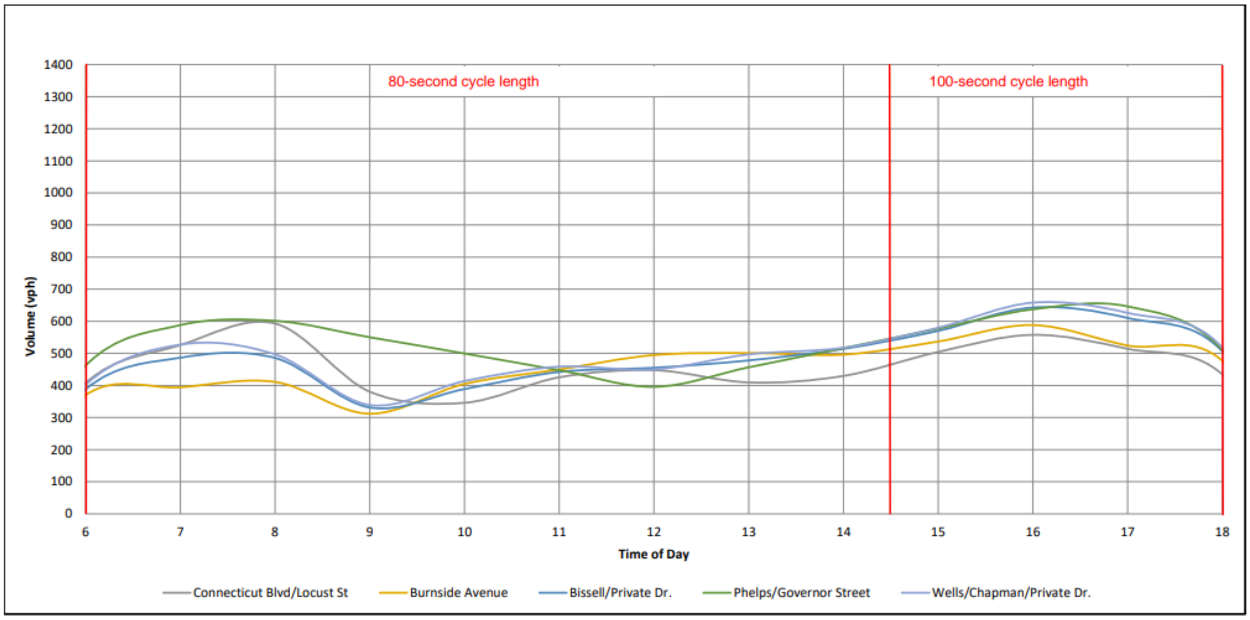
Before Evaluation Timings (Cycle - Offset)

Intersection		Time of Day (6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22)					
No.	**Description**						
042-202	CT Blvd. & Locust St.	Variable					Variable
042-213	Phelps Place	100 - 05	95 - 12	100 - 96	95-12	75-16	Variable
042-214	Bissel & Alumni	100 - 05	95 - 12	100 - 96	95-12	75-19	Variable
042-215	Wells Avenue	100 - 05	95 - 12	100 - 96	95-12	75-19	Variable
042-203	Burnside Avenue	100 - 07	Variable	100 - 02	Variable		Variable

After Evaluation Timings (Cycle - Offset)

Intersection		Time of Day (6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22)			
No.	**Description**				
042-202	CT Blvd. & Locust St.	80 - 44	100 - 72	70 - 58	Variable
042-213	Phelps Place	80 - 38	100 - 58	70 - 58	Variable
042-214	Bissel & Alumni	80 - 78	100 - 00	70 - 00	Variable
042-215	Wells Avenue	80 - 32	100 - 60	70 - 25	Variable
042-203	Burnside Avenue	80 - 36	100 - 56	70 - 45	Variable

Figure 20. East Hartford, Route 5 & Route 44 Critical Volume Chart



East Hartford, Route 44

Route 44 is an east/west minor corridor in East Hartford and provides access to I-84 and Route 5. The changes implemented to improve traffic flow include an increase of 10 seconds to the cycle length during the midday, p.m., and off peak to increase overall capacity and reduce the number of patterns throughout the day. The a.m. and p.m. volumes are the same. The slight volume drop after the a.m. peak did not warrant a change in the cycle length. These changes simplified operations, increased capacity, and eliminated multiple shifts between cycle lengths to increase the effectiveness of coordination. The following table shows the before and after coordination schedules applicable to Monday through Friday operations from 6:00 a.m. to 10:00 p.m. These schedules contain a separate block for each pattern. Each block shows the coordinated cycle length followed by the offset (in seconds) for each of the corresponding intersections. The cycle length is listed as “Variable” for the intersections that run “non-coordinated.”

Figure 21. East Hartford Route 44 Location Map

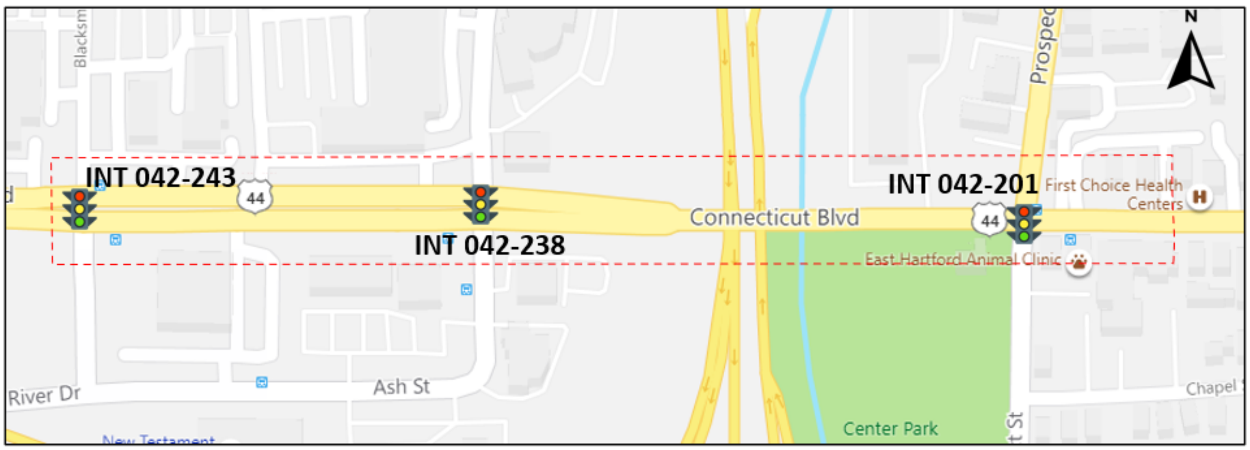


Table 12. East Hartford Route 44 Changes to Cycle Lengths and Offsets

Monday – Friday 6 a.m. – 10 p.m.

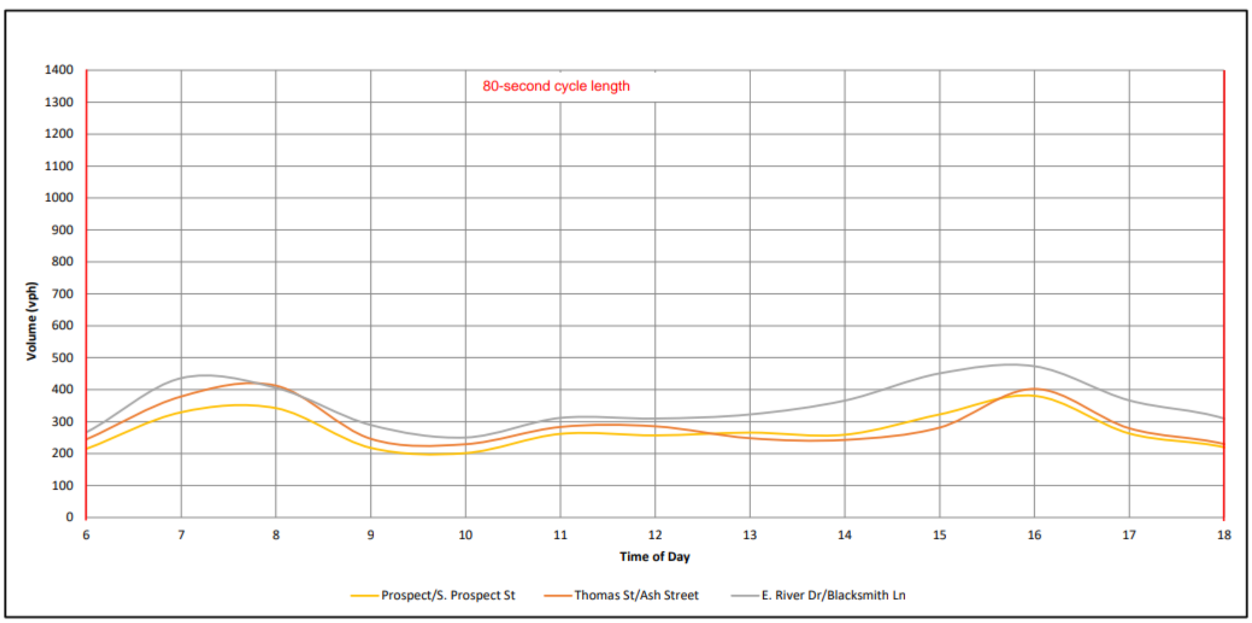
Before Evaluation Timings (Cycle - Offset)

Intersection No.	Intersection Description	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
042-201	Prospect & S. Prospect	80 - 00			70 - 00									60 - 00			Variable
042-238	Ash & Thomas	80 - 26			70 - 24									60 - 28			Variable
042-243	Blacksmith & East River	80 - 42			70 - 60									60 - 58			Variable

After Evaluation Timings (Cycle - Offset)

Intersection No.	Intersection Description	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
042-201	Prospect & S. Prospect	80 - 53												70 - 39			Variable
042-238	Ash & Thomas	80 - 05												70 - 00			Variable
042-243	Blacksmith & East River	80 - 00												70 - 69			Variable

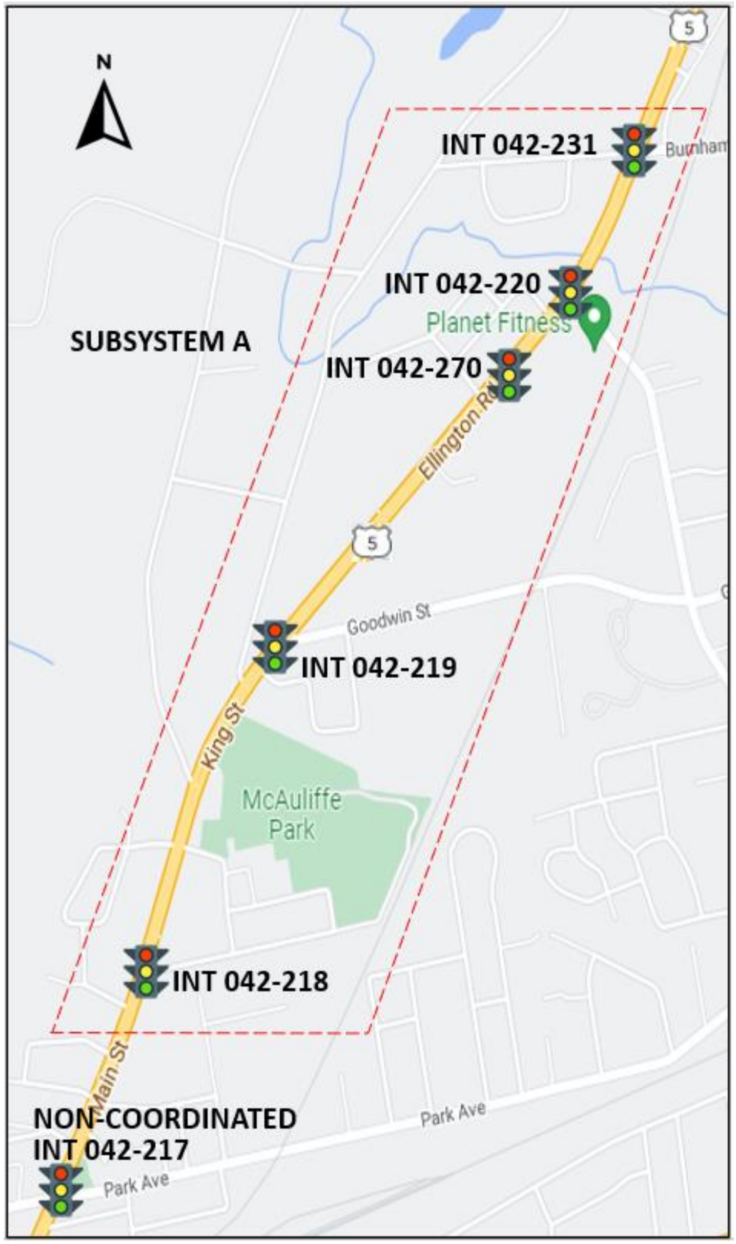
Figure 22. East Hartford, Route 44 Critical Volume Chart



East Hartford/South Windsor, Route 5

Route 5 is a north/south corridor in East Hartford and provides access to I-84 and I-291. The changes implemented to improve traffic flow include an increase in cycle length for the midday and p.m. time periods to increase overall capacity and a reduction in the number of patterns throughout the day. Prospect Street (Int. 042-217), Route 194 (Int. 132-204), and Scantic Road (Int. 132-211) will remain non-coordinated to better meet the needs of the motorist movement priorities over traffic flow between adjacent intersections. The a.m. and midday volumes did not warrant a change in the cycle length, however, at the 12 p.m. hour and near the p.m. peak hours the volumes did warrant an increase in the cycle length. These changes simplified operations, increased capacity, and eliminated multiple shifts between cycle lengths to increase the effectiveness of coordination. The following table shows the before and after coordination schedules applicable to Monday through Friday operations from 6:00 a.m. to 10:00 p.m. These schedules contain a separate block for each pattern. Each block shows the coordinated cycle length followed by the offset (in seconds) for each of the corresponding intersections. The cycle length is listed as “variable” for the intersections that run “non-coordinated.”

Figure 23. East Hartford/South Windsor Route 5 Location Map



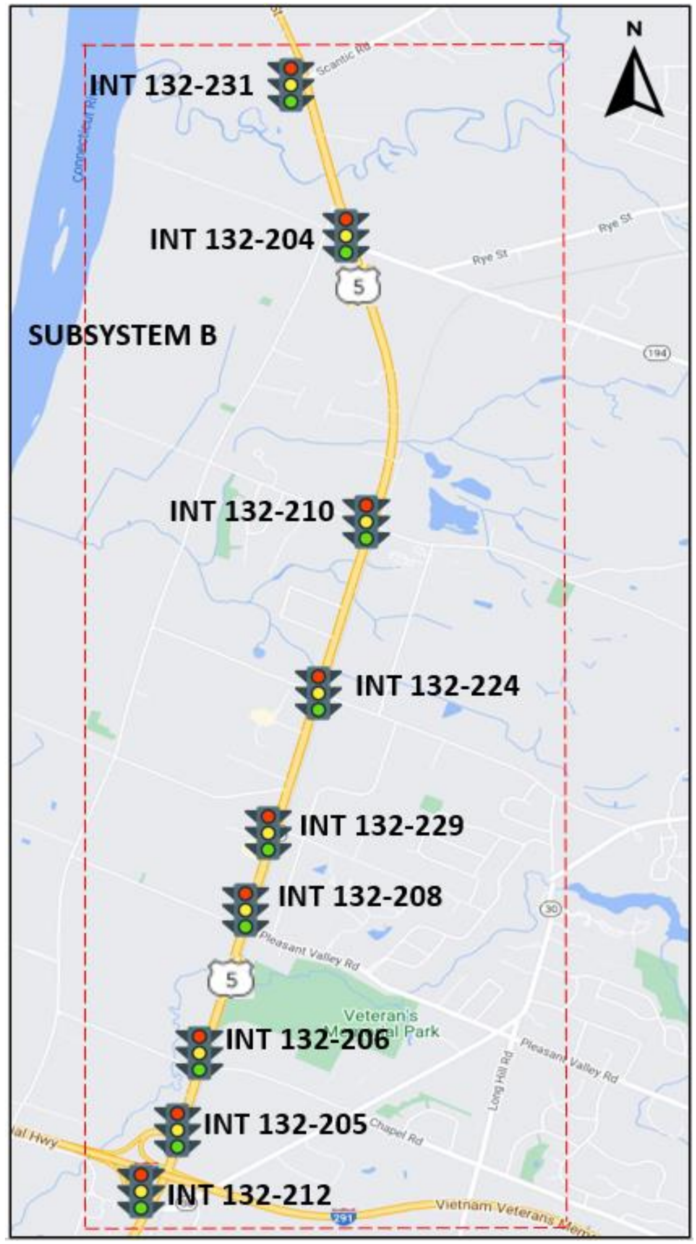


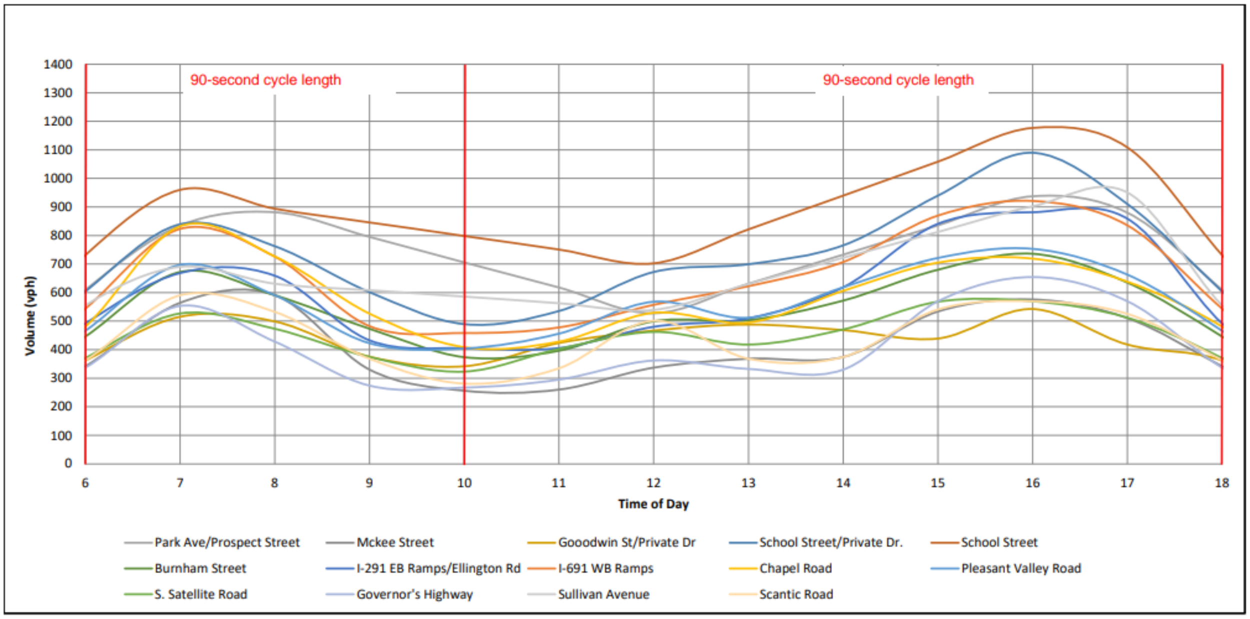
Table 13. East Hartford/South Windsor Route 5 Changes to Cycle Lengths and Offsets

Monday – Friday 6 a.m. – 10 p.m.

Before Evaluation Timings (Cycle - Offset)						
Intersection		**Time of Day** (6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22)				
No.	**Description**					
042-217	Prospect Street & Park Ave.	Variable				Variable
042-218	McKee Street	90 - 33	80 - 59	85 - 78	80 - 59	
042-219	Goodwin Street	90 - 71	80 - 78	85 - 24	80 - 78	
042-270	Drive to School St Square	90 - 34	80 - 13	85 - 28	80 - 13	
042-220	School Street	90 - 35	80 - 40	85 - 48	80 - 40	
042-231	Burnham Street	90 - 59	80 - 43	85 - 60	80 - 43	
132-212	Route 30 & I-291 EB Ramp	90 - 77	80 - 76	85 - 84	80 - 76	
132-205	I-291 WB Ramp	90 - 54	80 - 41	85 - 47	80 - 41	
132-206	Chapel Road	90 - 35	80 - 35	85 - 43	80 - 35	
132-208	Pleasant Valley Road	90 - 86	80 - 09	85 - 10	80 - 09	
132-229	South Satellite Road	90 - 45	80 - 50	85 - 53	80 - 50	
132-224	Governor's Highway	90 - 00	80 - 08	85 - 80	80 - 08	
132-210	Strong Road	90 - 45	80 - 50	85 - 56	80 - 50	
132-204	Rte 194 (Sullivan Avenue)	Variable				
132-211	Scantic Road	Variable				

After Evaluation Timings (Cycle - Offset)					
Intersection		**Time of Day** (6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22)			
No.	**Description**				
042-217	Prospect Street & Park Ave.	Variable			Variable
042-218	McKee Street	90 - 26	90 - 42	70 - 36	
042-219	Goodwin Street	90 - 79	90 - 13	70 - 16	
042-270	Drive to School St Square	90 - 42	90 - 35	70 - 49	
042-220	School Street	90 - 33	90 - 43	70 - 61	
042-231	Burnham Street	90 - 22	90 - 54	70 - 04	
132-212	Route 30 & I-291 EB Ramp	90 - 73	90 - 42	70 - 34	
132-205	I-291 WB Ramp	90 - 56	90 - 27	70 - 37	
132-206	Chapel Road	90 - 38	90 - 11	70 - 27	
132-208	Pleasant Valley Road	90 - 01	90 - 47	70 - 58	
132-229	South Satellite Road	90 - 62	90 - 26	70 - 27	
132-224	Governor's Highway	90 - 18	90 - 73	70 - 57	
132-210	Strong Road	90 - 49	90 - 45	70 - 40	
132-204	Rte 194 (Sullivan Avenue)	Variable			
132-211	Scantic Road	Variable			

Figure 24. East Hartford/South Windsor, Route 5 Critical Volume Chart



East Windsor, Route 140

Route 140 is an east/west corridor in East Windsor and provides access to I-91 and Route 5. The travel times conducted after the new signal timings were implemented showed no appreciable benefits between the “Before” to “After” conditions resulting in a return to the “Before” timings. It should be noted that most of the travel time comparisons that showed an increase in travel time with the new timings are minor increases.

Some reasons for an increased travel time include but are not limited to:

- A change in signal progression to improve flow and reduce travel time in one direction resulted in an increase to travel time in the opposing direction
- Progression needs of a crossing arterial with higher traffic volumes result in added delay of a study corridor at the crossing intersection
- Consistent time of day plans along a corridor that reduce the likelihood of random progression through signals
- Day-to-day variation in traffic demand
- Increase in pedestrian and vehicle clearance timings
- Faulty detection, resulting in a constant call on the cross-street, which was not yet fixed during the after runs but was functioning properly during the before runs

The following table shows the coordination schedules applicable to Monday through Friday operations from 6:00 a.m. to 10:00 p.m. These schedules contain a separate block for each pattern. Each block shows the coordinated cycle length followed by the offset (in seconds) for each of the corresponding intersections. The cycle length is listed as “variable” for the intersections that run “non-coordinated.”

Figure 25. East Windsor Route 140 Location Map

Table 14. East Windsor Route 140 Changes to Cycle Lengths and Offsets

Monday – Friday 6 a.m. – 10 p.m.

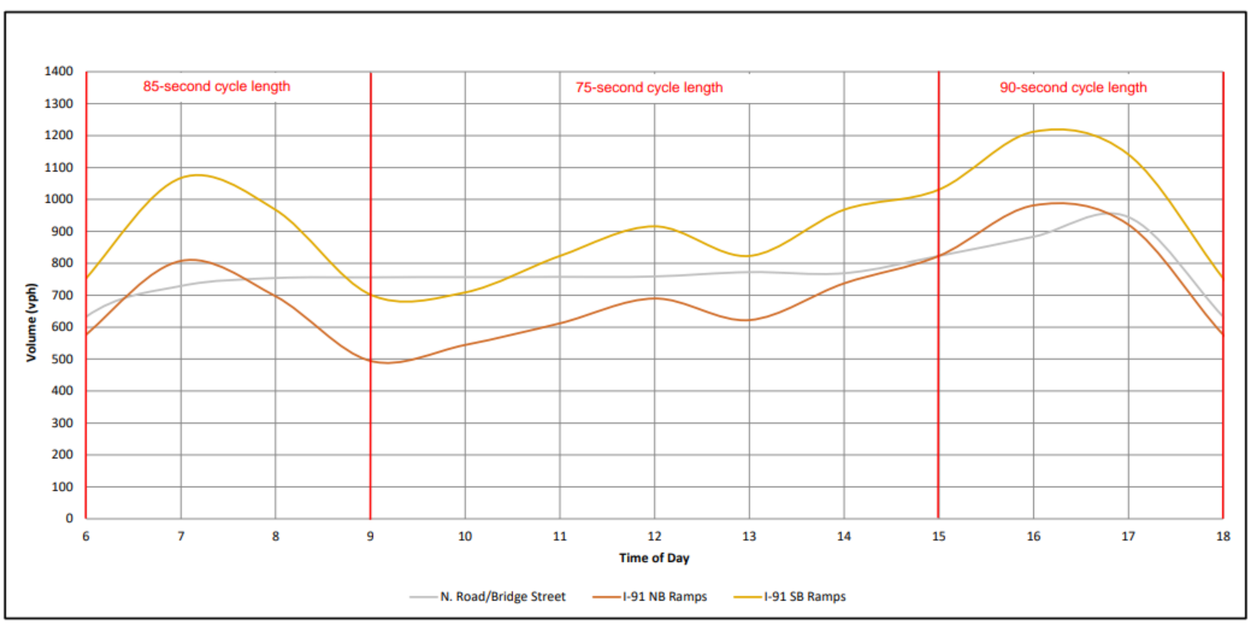
Before Evaluation Timings (Cycle - Offset)

Intersection		Time of Day																
No.	**Description**	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
046-210	Rte 5	75 - 00			Variable													Variable
046-220	I-91 NB Ramps	75 - 04			75 - 12						90 - 89			75 - 12				Variable
046-219	I-91 SB Ramps	75 - 00			75 - 00						90 - 00			75 - 00				Variable

After Evaluation (Reverted to Before Timings) Timings (Cycle - Offset)

Intersection		Time of Day																
No.	**Description**	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
046-210	Rte 5	Variable																Variable
046-220	I-91 NB Ramps	75 - 04			75 - 12						90 - 89			75 - 12				Variable
046-219	I-91 SB Ramps	75 - 00			75 - 00						90 - 00			75 - 00				Variable

Figure 26. East Windsor, Route 140 Critical Volume Chart



West Hartford, Route 71 & Route 173

Route 71 is an east/west corridor while Route 173 is a north/south corridor in West Hartford that provides access to I-84. The CTDOT made cycle length and schedule changes to both subsystems prior to the evaluation phase of this project. The revised system coordination timing provided in Table 15 is the result of CTDOT addressing concerns by the public in West Hartford to reduce wait times and improve flow for both subsystems. South Road (Int. 155-239) and Ridgewood Road (Int. 155-215) were removed from the system due to the reconstruction of Ridgewood Road. These two locations will be evaluated by CTDOT when field communications are restored. The intersection of Route 71 (New Britain Avenue) at Route 173 (South Main St(Int. 155-219)) will remain non-coordinated to better meet the needs of the motorist movement priorities over traffic flow between adjacent intersections. The following table shows the before and after coordination schedules applicable to Monday through Friday operations from 6:00 a.m. to 10:00 p.m. These schedules contain a separate block for each pattern. Each block shows the coordinated cycle length followed by the offset (in seconds) for each of the corresponding intersections. The cycle length is listed as “variable” for the intersections that run “non-coordinated.”

Figure 27. West Hartford Route 71 & Route 173 Location Map

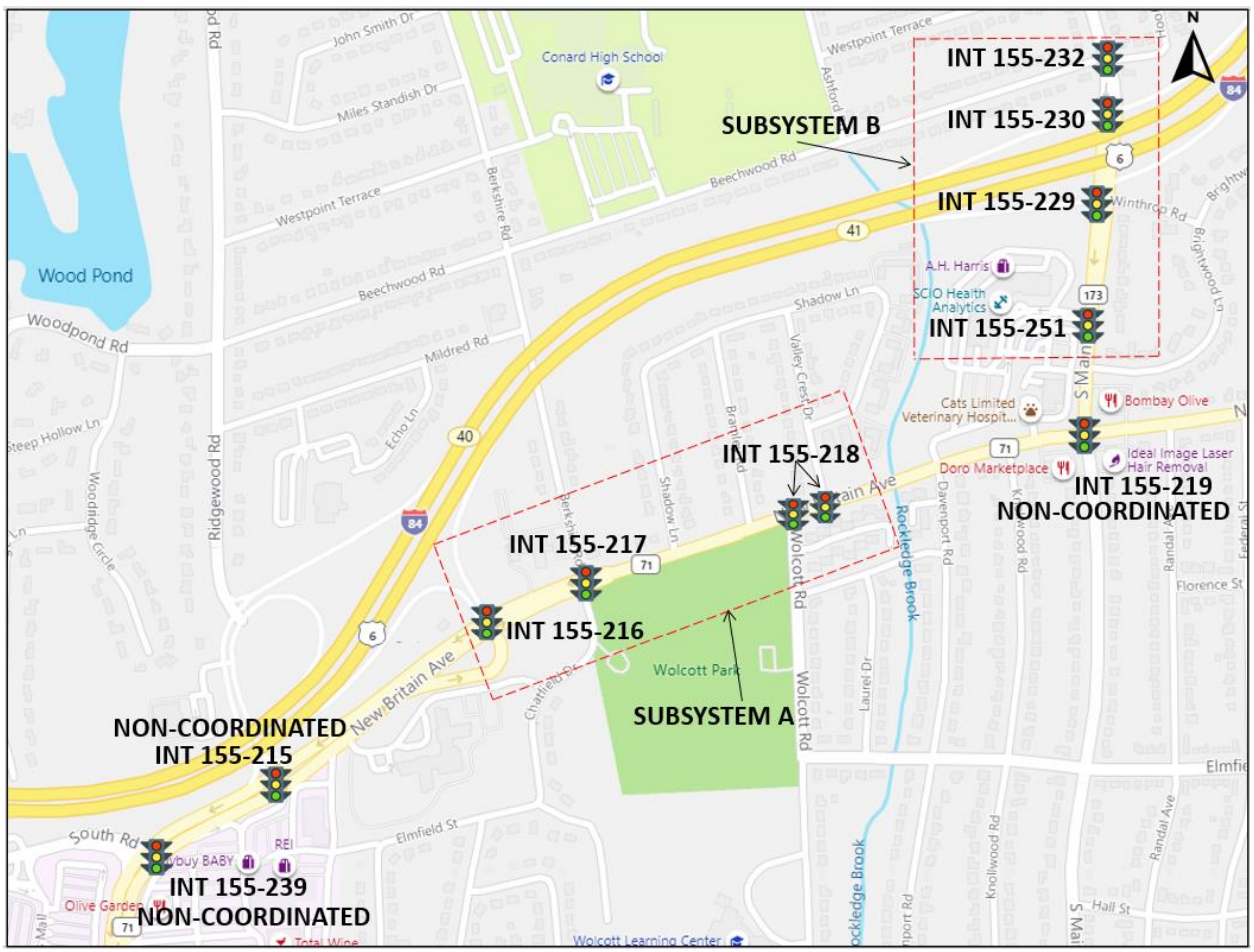


Table 15. West Hartford Route 71 & Route 173 Changes to Cycle Lengths and Offsets

Monday – Friday 6 am – 10 pm

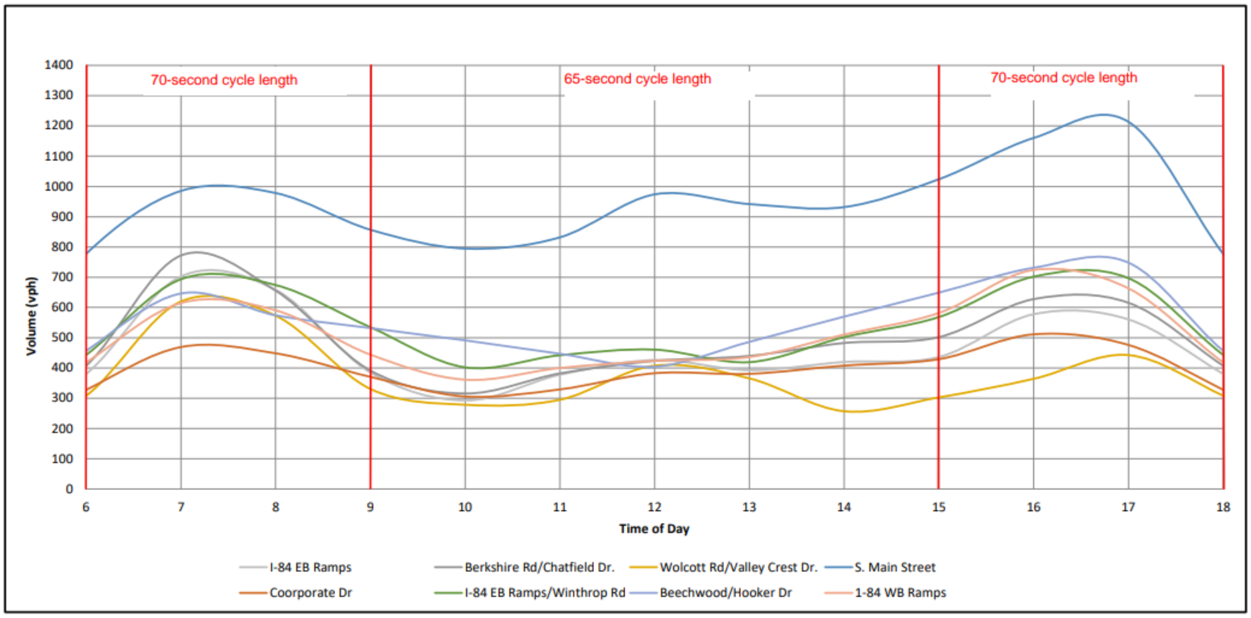
Before Evaluation Timings (Cycle - Offset)

Intersection No.	Intersection Description	Time of Day 6 – 9	9 – 11	11 – 15	15 – 19	19 – 22	22
155-239	South Road	85 - 78	100 - 28		100 - 29	Variable	Variable
155-215	Ridgewood Road	85 - 00	100 - 40		100 - 00	80 - 40	
155-216	I-84 EB Ramps	85 - 35	80-00	85 - 00	100 - 00	80 - 00	
155-217	Chatfield Drive	85 - 35	80-00	85 - 00	100 - 95	80 - 00	
155-218	Wolcott Road	85 - 50	80-27	85 - 20	100 - 95	80 - 27	
155-219	Rte 173 (South Main St.)	Variable					
155-251	Corporate Drive	70 - 05	65 - 64		70 - 01	60 - 00	
155-229	I-84 EB Ramps & Winthrop	70 - 35	65 - 30		70 - 30	60 - 19	
155-230	I-84 WB Ramps	70 - 24	65 - 28		70 - 23	60 - 22	
155-232	Beechwood & Hooker	70 - 46	65 - 38		70 - 39	60 - 20	

After Evaluation Timings (Cycle - Offset)

Intersection No.	Intersection Description	Time of Day 6 – 9	9 – 11	11 – 15	15 – 19	19 – 22	22
155-239	South Road	Variable					
155-215	Ridgewood Road	Variable					
155-216	I-84 EB Ramps	70 - 05	Variable	65 - 00	70 - 00	65 - 00	Variable
155-217	Chatfield Drive	70 - 05	Variable	65 - 01	70 - 00	65 - 01	
155-218	Wolcott Road	70 - 24	Variable	65 - 20	70 - 55	65 - 20	
155-219	Rte 173 (South Main St.)	Variable					
155-251	Corporate Drive	70 - 00	65 - 00		70 - 00	60 - 00	
155-229	I-84 EB Ramps & Winthrop	70 - 00	65 - 00		70 - 00	60 - 00	
155-230	I-84 WB Ramps	70 - 00	65 - 00		70 - 00	60 - 00	
155-232	Beechwood & Hooker	70 - 00	65 - 00		70 - 00	60 - 00	

Figure 28. West Hartford, Route 71 & Route 173 Critical Volume Chart



West Hartford/Hartford, Route 173 & Route 529

Route 173 and Route 529 are an east/west corridor in West Hartford/Hartford and provides access to I-84. The changes implemented to improve traffic flow include an increase in cycle length to increase overall capacity and a reduction in the number of patterns throughout the day. Newington Avenue and Stone Street (Int. 063-232) will remain non-coordinated to better meet the needs of the motorist movement priorities over traffic flow between adjacent intersections. The a.m. volumes are slightly lower than midday and p.m. peak. The 5 second increase in cycle length for Subsystem B is included to improve flow between intersections. However, the increasing pedestrian activity from just after a.m. peak through the p.m. peak requires an increase in cycle length to maintain sufficient green time for all movements. The cycle lengths are reduced after the p.m. peak to meet the lower volumes and reduce wait times. These changes simplified operations, increased capacity, and eliminated multiple shifts between cycle lengths to increase the effectiveness of coordination. The following table shows the before and after coordination schedules applicable to Monday through Friday operations from 6:00 a.m. to 10:00 p.m. These schedules contain a separate block for each pattern. Each block shows the coordinated cycle length followed by the offset (in seconds) for each of the corresponding intersections. The cycle length is listed as “variable” for the intersections that run “non-coordinated.”

Figure 29. West Hartford/Hartford Route 173 & Route 529 Location Map

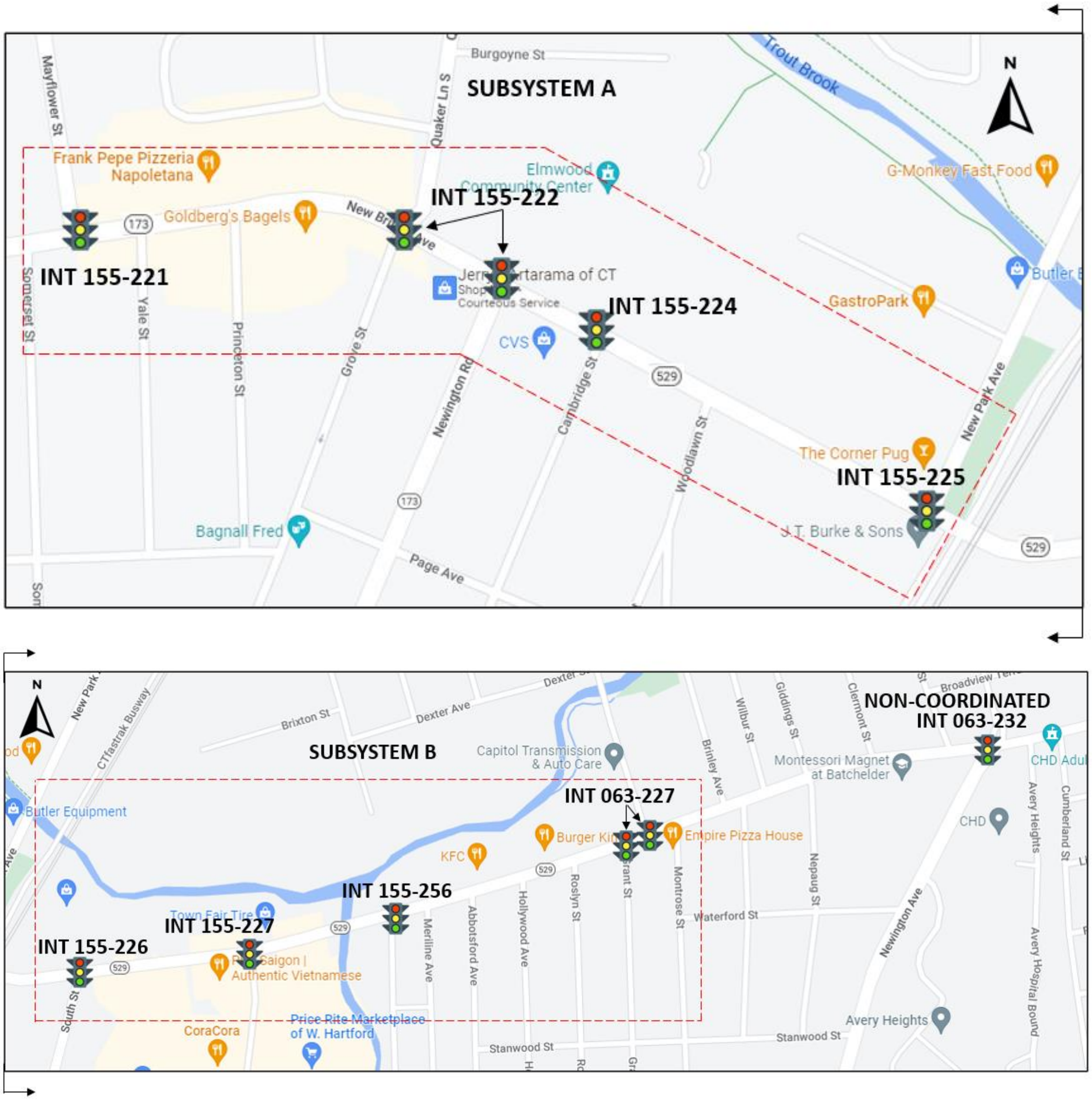


Table 16. West Hartford/Hartford Route 173 & Route 529 Changes to Cycle Lengths and Offsets

Monday – Friday 6 am – 10 pm

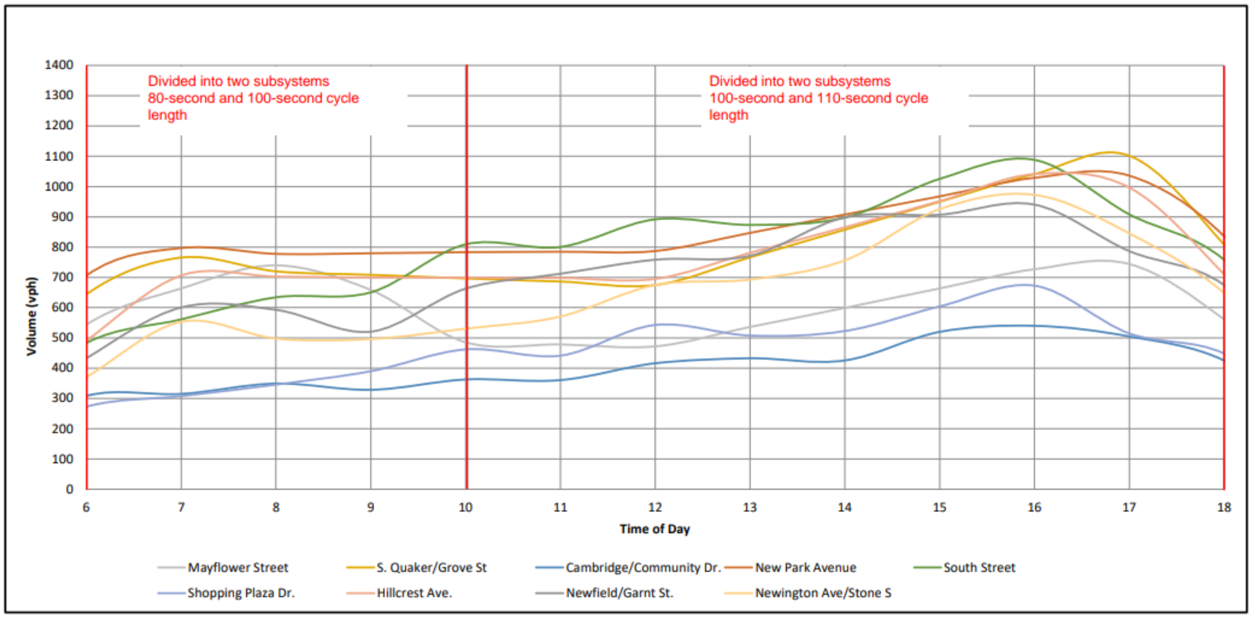
Before Evaluation Timings (Cycle - Offset)

No.	Description	Time of Day: 6 – 9	9 – 15	15 –	– 22	22
155-221	Mayflower Street	100 - 00	100 - 05	100 - 99	100 - 05	Variable
155-222	South Quaker Lane	100 - 85	100 - 85	100 - 40	100 - 85	
155-224	Cambridge Street	100 - 15	100 - 85	100 - 40	100 - 20	
155-225	New Park & Rail Road	100 - 20	100 - 20	100 - 85	100 - 20	
155-226	South Street	75 - 25	85 - 40	90 - 55	100 - 30	
155-227	Shield & Shop Cntr	75 - 50	85 - 60	90 - 45	100 - 50	
155-256	Hillcrest Avenue	75 - 55	85 - 70	90 - 50	100 - 55	
063-227	Grant & Newfield	75 - 15	85 - 31	90 - 80	100 - 10	
063-232	Newington & Stone	Variable				

After Evaluation Timings (Cycle - Offset)

No.	Description	Time of Day: 6 – 10	10 – 19	19 – 22	22
155-221	Mayflower Street	100 - 14	110 - 14	100 - 14	Variable
155-222	South Quaker Lane	100 - 57	110 - 57	100 - 57	
155-224	Cambridge Street	100 - 78	110 - 78	100 - 78	
155-225	New Park & Rail Road	80 - 70	100 - 83	80 - 70	
155-226	South Street	80 - 70	100 - 83	80 - 70	
155-227	Shield & Shop Cntr	80 - 11	100 - 08	80 - 11	
155-256	Hillcrest Avenue	80 - 22	100 - 57	80 - 22	
063-227	Grant & Newfield	80 - 49	100 - 00	80 - 49	
063-232	Newington & Stone	Variable			

Figure 30. West Hartford/Hartford Route 173 & Route 529 Critical Volume Chart



Post Implementation Assessment

Upon complete of field fine-tuning, the Consultant conducted travel time runs using Tru-traffic to report the results of the timing changes. Videos of the travel runs were also collected to view any specific issues that were encountered. The post-implementation travel times were then compared to the initial travel time runs to calculate the improvements. Results are presented by corridor in the following sections of this report.

Corridor Performance Evaluation

The study corridors were evaluated to determine the effectiveness of the timing changes. The corridor evaluations consisted of comparing performance measures from "Before" and "After" studies conducted prior to and post implementation of new signal timings. This chapter provides details on the methodology used to evaluate corridor performance and the results of those evaluations.

Performance Evaluation Data

Travel time study data were used to calculate a variety of performance measures. Corridor performance results were based on data from "Before" and "After" travel time studies conducted for each study corridor. The corridor travel time studies occurred during multiple periods throughout the weekdays (Monday through Friday) for "Before" and "After" conditions of implementing the new signal timing plans. The periods for the travel time studies were:

- a.m. peak period – 7:00 a.m. – 8:30 a.m. (Weekday) – All study corridors
- midday peak period – 11:30 a.m. – 1:00 p.m. (Weekday) – All study corridors
- p.m. peak period – 4:00 p.m. – 6:00 p.m. (Weekday) – All study corridors
- Saturday midday period – 11:00 a.m. – 3:00 p.m. -Varied by corridor

The "Before" travel time studies were conducted in February 2020 prior to implementation of new signal timings. The "After" travel time studies were conducted in Septe[ix]mber/October 2021 after implementation and fine-tuning of new signal timings. The travel time studies were conducted with a pilot vehicle traveling each study corridor for a minimum of three travel time runs for each period "Before" and "After" conditions. During these studies, travel time data was collected with Tru-Traffic software. Tru-Traffic, accompanied with a GPS device, is used to track a vehicle's position while it travels along a corridor. It records the position of the vehicle every second and uses that information, along with inputs on the locations of intersections, to calculate performance measures along the corridor such as number of stops and travel time.

Performance Measures

The following performance measures were identified to be reported for this project *See Appendix:

- **Travel Time** – The time to travel from one end of a study corridor to the other
- **Corridor Performance**
    - Delay – The amount of time corridor through traffic is slowed or stopped by traffic signals on a trip from one end of a study corridor to the other.
    - Fuel Consumption – The estimated amount of fuel consumed by through traffic on a trip from one end of a study corridor to the other.
    - Emissions – The estimated emissions produced by through traffic on a trip from one end of a study corridor to the other.
    - Stops – The number stops experienced by through traffic on a study corridor on a trip from one end of a study corridor to the other.

User Savings Analysis

This travel time performance measure was reported as the change in travel time between "Before" and "After" conditions by comparing the average time to travel from one end of a study corridor to the other end during the study periods. Travel time was extracted from the travel time run data in Tru-

Traffic for each period of "Before" and "After" conditions. "Time" is of value to all people. A reduction in travel time, delay, and fuel consumption lower costs to motorists. These direct savings were tracked and quantified to determine community savings. Corridor performance measures of delay, stops, fuel consumption, and emissions were calculated using output from Tru-Traffic travel time runs, year 2019 local demographics, and formulas developed by Indiana Department of Transportation (INDOT) & Purdue University[x]. Each of the corridor performance measures was reported as the change between "Before" and "After" conditions.

Summary of Performance Measures and User Savings

Travel Time Results

Phase 3 included systems that showed increase in travel time with the "After" timings. The evaluation and analysis determined a negative improvement resulting in a reverting to the "Before" timings.

Table 17. Travel Time Comparison from "Before" to "After" Conditions

Corridor	Time Period	Travel Time Change (Min:Sec)		
		NB/EB	SB/WB	Total
*Canton, Route 44 & Route 202	a.m.	-	-	-
	midday	-	-	-
	p.m.	-	-	-
East Hartford, Route 517 & Route 5	a.m.	0:42	-0:37	0:05
	midday	-0:12	-0:20	-0:32
	p.m.	-0:26	-0:05	-0:31
East Hartford, Route 5	a.m.	0:18	-0:25	-0:07
	midday	-0:38	-0:43	-1:21
	p.m.	-1:00	-1:18	-2:18
East Hartford, Route 44	a.m.	-0:01	0:09	0:08
	midday	-0:04	0:02	-0:02
	p.m.	-0:21	-0:08	-0:29
East Hartford/South Windsor, Route 5	a.m.	-0:48	-1:37	-2:25
	midday	0:08	-1:01	-0:53
	p.m.	-1:32	-1:10	-2:42
*East Windsor, Route 140	a.m.	-	-	-
	midday	-	-	-
	p.m.	-	-	-
**West Hartford, Route 71 & Route 173	a.m.	-	-	-
	midday	-	-	-
	p.m.	-	-	-
West Hartford/Hartford, Route 173 & Route 529	a.m.	-0:26	-2:12	-2:38
	midday	-0:53	-1:22	-2:15
	p.m.	0:17	0:12	0:29

Note: It should be noted in Table 17, negative time values represent a decrease in travel time during the "After" condition as compared to the "Before" condition; Positive time values represent an increase in travel time during the "After" condition.

*Corridor evaluation determined showed no appreciable benefits between the "Before" to "After" conditions resulting in a return to the "Before" timings, subsequent performance measures are not necessitated.

**CTDOT made cycle length and schedule changes to both subsystems prior to the evaluation phase of this project. The changes before evaluation were necessitated by CTDOT to addressing concerns by the public in West Hartford. Performance measures are not available.

Corridor Performance Results

The total benefits to corridor performance from "Before" to "After" conditions are summarized in Table 18 below. The corridor performance results show sizable reductions for motorist delay, fuel consumption, stops, and emissions. The reductions to delay and fuel for the optimization of the five (5) of eight (8) corridors are estimated to save Connecticut motorists over 51,100 hours of delay and $1.6 million in user (time and fuel) costs per year. More detailed corridor performance measures, including a breakdown by study period, are provided in Appendix E.

Table 18. Corridor Performance Results

Corridor	Annual Savings (From "Before" to "After" Conditions)				
	Delay (Veh-hours)	Fuel (Gallons)	Stops (Veh-stops)	Emissions (kg)	User Savings ($)
*Canton Route 44 & 202	-	-	-	-	-
East Hartford Route 517 & 5	2,000	1,700	470,000	15,000	$63,000
East Hartford Route 5	14,300	12,500	1,120,000	110,000	$448,000
East Hartford Route 44	500	400	60,000	4,000	$16,000
East Hartford/South Windsor Route 5	23,000	20,000	890,000	176,000	$718,000
East Windsor Route 140	-	-	-	-	-
**West Hartford Route 71 & 173	-	-	-	-	-
West Hartford/Hartford Route 173 & 529	11,300	9,900	(50,000)	87,000	$354,000
Total	**51,100**	**44,500**	**2,490,000**	**392,000**	**$1,599,000**

Note: User savings in Table 18 are based on reductions in delay, fuel, and local demographic information.

* Corridor evaluation determined showed no appreciable benefits between the "Before" to "After" conditions resulting in a return to the "Before" timings, subsequent performance measures are not necessitated.

** CTDOT made cycle length and schedule changes to both subsystems prior to the evaluation phase of this project. The changes before evaluation were necessitated by CTDOT to addressing concerns by the public in West Hartford. Performance measures are not available.

Table 19. Corridor Average Travel Speed Increase

Corridor	Avg. Speed Before (mph)	Avg. Speed After (mph)	Increase in Travel Speed %
*Canton Route 44 & 202	-	-	-
East Hartford Route 517 & 5	27.5	28.3	4%
East Hartford Route 5	15.9	22.7	43%
East Hartford Route 44	24.0	26.2	9%
East Hartford/South Windsor Route 5	34.4	37.6	9%
*East Windsor Route 140	-	-	-
**West Hartford Route 71 & 173	-	-	-
West Hartford/Hartford Route 173 & 529	18.9	22.3	19%

* Corridor evaluation determined showed no appreciable benefits between the "Before" to "After" conditions resulting in a return to the "Before" timings, subsequent performance measures are not necessitated.

** CTDOT made cycle length and schedule changes to both subsystems prior to the evaluation phase of this project. The changes before evaluation were necessitated by CTDOT to addressing concerns by the public in West Hartford. Performance measures are not available.

Study Benefit-to-Cost Comparison

The total user savings cost for Phase 3 is $1,600,000 annually. The costs of the timing plan evaluation Phase 3 corridors are estimated to be $100,000 per year. This yields benefit-to-cost ratio of 16:1.

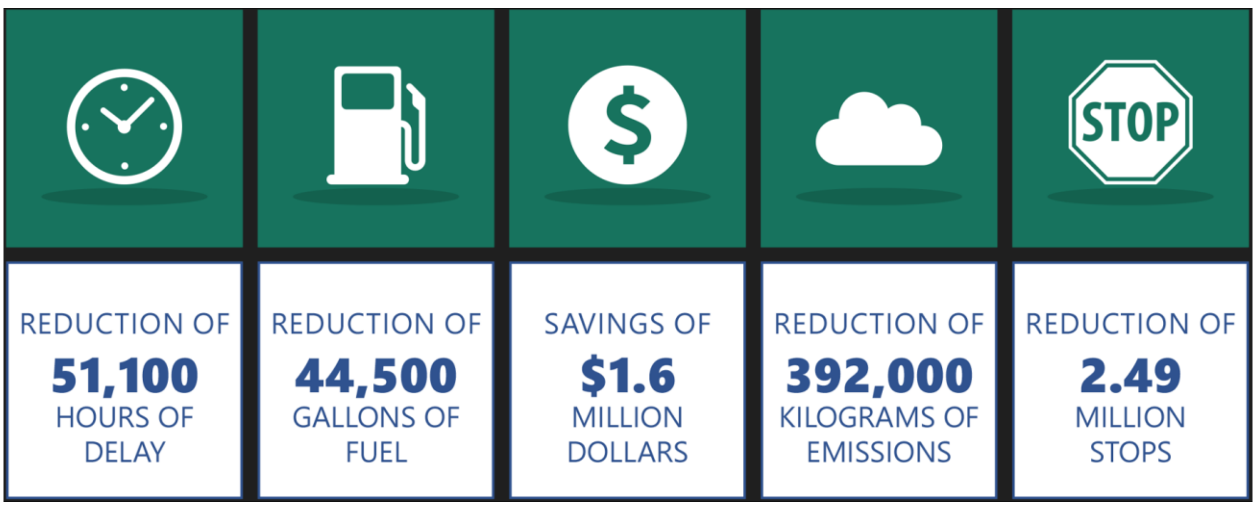
These benefits are measured and published on CTDOT Green Light Web Page.

Summary/Conclusion

The evaluation of the CTSS coordination timing resulted in a wide range of transportation, economic, and environmental improvements that increase user quality of life. The project offers better flow to improve safety, a reduction in congestion, fuel savings and improved air quality for the CRCOG corridors.

It is determined that significant cost savings are achieved in five (5) of the eight (8) study corridors. On average, travel speeds were increased from an average of 24 mph to 27.4 mph, an increase of 14%. The number of stops were reduced by 2.49 million per year and travel times were reduced by an average of 12%. The Phase 3 reductions to delay and fuel are estimated to save Connecticut motorists over 51,100 hours of delay and $1.6 million in user (time and fuel) costs per year. More detailed corridor performance measures, including a breakdown by study period, are provided in the appendices. Figure 31 below summarizes Phase 3 performance measures improvements.

Figure 31: Phase 3 Corridors Performance Measures Results Summary



Note: Performance measures were summarized for times of the day when travel time studies were completed. This means that benefits derived from the timing plan evaluation effort are only reported for those hours during the day in which travel time studies were conducted. For the remaining hours of the day and weekends, it is expected that additional benefits are realized that are not reported in this study since travel studies were not collected during those times of day.

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[x] Day, C.M., T.M. Brennan, A.M. Hainen, S.M. Remias, H. Premachandra, J.R. Sturdevant, G. Richards, J.S. Wasson, and D.M. Bullock. “Quantifying Benefits of Traffic Signal Retiming.” Joint Transportation Research Program Project No. C-36-661 File No. 8-7-10 SPR-3208. Conducted in cooperation with the Indiana Department of Transportation and the U.S. Department of Transportation Federal Highway Administration. Purdue University West Lafayette, IN 47905. October 2010.

Appendix A

Phase 3 Intersection List

Canton Route 44 & Route 202						
Intersection #	Subsystem	Location	Detection	Artery Detection	Field Communications	Controller
023-203	A	RTE 44 & 202 AT EAST HILL ROAD	L	L	Aerial	Naztec V41
023-212	A	RTE 44 & 202 AT TURNPIKE	L	NONE	Aerial	Naztec V41
023-210	A	RTE 44 & 202 AT CANTON VILLAGE	L, M	NONE	Aerial	Naztec V41
023-207	A	RTE 44 & 202 AT DOWD AVENUE	L	NONE	Aerial	Naztec V41
023-204	NONE	RTE 44 & 202 AT 177 (LOVELY STREET)	L	L	Aerial	Naztec V41
023-213	B	RTE 44 & 202 AT COMMERCIAL	L, V	L	Aerial	Naztec V41
023-211	B	RTE 44 & 202 AT SITE DRIVE	L, V	L	Aerial	Naztec V41
023-209	B	RTE 44 & 202 AT SECRET LAKE ROAD	V	V	Aerial	Naztec V41
L = Loop, V = Video, M = Microwave						

East Hartford Route 517 & Route 5						
Intersection #	Subsystem	Location	Detection	Artery Detection	Field Communications	Controller
042-271	A	RTE 517 AT RTE 2 WB OFF RAMP	L	L	Aerial	Naztec V41
042-226	A	RTE 517 AT BREWER/W BREWER STREET	L	L	Aerial	Naztec V41
042-244	A	RTE 517 AT W BREWER	L	L	Underground	Naztec V41
042-254	B	RTE 517 AT ENSIGN ST	L	L	Aerial	Naztec V41
042-261	B	RTE 517 AT CROSBY ST	L	L	Aerial	Naztec V41
042-227	B	RTE 517 AT WILLOW ST	L	L	Aerial	Naztec V61
042-228	B	RTE 517 AT LILAC STREET	L	L	Aerial	Naztec V41
042-229	B	RTE 5 & ROUTE 517 AT BROWN & WILLYS ST	V	V	Aerial	Naztec V41
042-237	B	RTE 5 AT EAST RIVER DRIVE & SILVER LANE	V	V	Aerial	Naztec V41
042-210	C	RTE 5 AT PITKIN STREET	V	NONE	Aerial/Underground	Naztec V41
042-266	C	RTE 5 AT TOWN HALL	L	NONE	Underground	Naztec V41
042-212	C	RTE 5 AT CENTRAL AVE & GARVAN STREET	L	NONE	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

East Hartford Route 5 & Route 44						
Intersection #	**Subsystem**	**Location**	**Detection**	**Artery Detection**	**Field Communications**	**Controller**
042-202	A	RTE 5 AT RTE 44 (CT BLVD) & LOCUST STREET	V	NONE	Underground	Naztec V41
042-213	A	RTE 5 & RTE 44 AT PHELPS PLACE	L	NONE	Underground	Naztec V41
042-214	A	RTE 5 & RTE 44 AT BISSEL STREET & ALUMNI	L	NONE	Underground	Naztec V41
042-215	A	RTE 5 & RTE 44 AT WELLS AVENUE	L	NONE	Underground	Naztec V41
042-203	A	RTE 5 AT RTE 44 (BURNSIDE AVENUE)	L	NONE	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

East Hartford Route 44						
Intersection #	**Subsystem**	**Location**	**Detection**	**Artery Detection**	**Field Communications**	**Controller**
042-201	A	RTE 44 AT PROSPECT ST.	V	NONE	Aerial	Naztec V41
042-238	A	RTE 44 AT THOMAS ST.	V	NONE	Aerial/Underground	Naztec V41
042-243	A	RTE 44 AT BLACKSMITH LANE	V	NONE	Underground	Naztec V41
V = Video (Non recording)						

East Hartford/South Windsor Route 5						
Intersection #	Subsystem	Location	Detection	Artery Detection	Field Communications	Controller
042-217	N/A	RTE 5 AT PROSPECT STREET	L,M	L	Underground	Naztec V41
042-218	A	RTE 5 AT MCKEE STREET	L	NONE	Underground/Aerial	Naztec V41
042-219	A	RTE 5 AT GOODWIN STREET	L	NONE	Aerial	Naztec V41
042-270	A	RTE 5 AT DR TO SCHOOL STREET SQUARE CENTER	L	NONE	Aerial	Naztec V41
042-220	A	RTE 5 AT SCHOOL STREET	L	NONE	Aerial	Naztec V41
042-231	A	RTE 5 AT BURNHAM ST	L	NONE	Aerial	Naztec V41
132-212	B	RTE 5 AT RTE 30 & I-291 EB RAMP	L	NONE	Aerial	Naztec V41
132-205	B	RTE 5 AT I-291 WB RAMP	L	NONE	Aerial	Naztec V41
132-206	B	RTE 5 AT CHAPEL ROAD	L	NONE	Aerial	Naztec V41
132-208	B	RTE 5 AT PLEASANT VALLEY ROAD	L	L	Aerial	Naztec V41
132-229	B	RTE 5 AT S. SATELLITE RD	L	NONE	Aerial	Naztec V41
132-224	B	RTE 5 AT GOVERNORS HIGHWAY	L	NONE	Aerial	Naztec V41
132-210	B	RTE 5 AT STRONG ROAD	L	NONE	Aerial	Naztec V41
132-204	B	RTE 5 AT RTE 194 (SULLIVAN AVENUE)	L	NONE	Aerial/Underground	Naztec V41
132-211	B	RTE 5 AT SCANTIC ROAD	L	NONE	Underground/Aerial	Naztec V41
L = Loop, M = Microwave						

East Windsor Route 140						
Intersection #	Subsystem	Location	Detection	Artery Detection	Field Communications	Controller
046-210	N/A	RTE 140 AT RTE 5	V	V	Underground	Naztec V41
046-220	A	RTE 140 AT I-91 NB RAMPS	L	NONE	Underground	Naztec V41
046-219	A	RTE 140 AT I-91 SB RAMPS	L	NONE	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

West Hartford Route 71 & Route 173						
Intersection #	**Subsystem**	**Location**	**Detection**	**Artery Detection**	**Field Communications**	**Controller**
155-239	N/A	RTE 71 AT SOUTH ROAD	L	L	Underground	Naztec V41
155-215	N/A	RTE 71 AT RIDGEWOOD ROAD	V	V	Underground/Aerial	Naztec V41
155-216	A	RTE 71 AT I-84 EB RAMPS	L	L	Aerial	Naztec V41
155-217	A	RTE 71 AT CHATFIELD DR	V	V	Aerial	Naztec V41
155-218	A	RTE 71 AT WOLCOTT RD	V	NONE	Aerial	Naztec V41
155-219	N/A	RTE 71 AT RTE 173 (S. MAIN)	V	V	Aerial	Naztec V61
155-251	B	RTE 173 AT CORPORATE	V	NONE	Aerial/Underground	Naztec V41
155-229	B	RTE 173 AT I-84 EB RAMPS	V	NONE	Underground	Naztec V41
155-230	B	RTE 173 AT I-84 WB RAMPS	V	NONE	Underground	Naztec V41
155-232	B	RTE 173 AT BEECHWOOD	V	NONE	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

West Hartford/Hartford Route 173 & Route 529						
Intersection #	**Subsystem**	**Location**	**Detection**	**Artery Detection**	**Field Communications**	**Controller**
155-221	A	RT 173 AT MAYFLOWER STREET	L	NONE	Aerial	Naztec V41
155-222	A	RT 173 AT SOUTH QUAKER LANE	L	L	Aerial	Naztec V41
155-224	A	RT 529 AT CAMBRIDGE STREET	L	NONE	Aerial	Naztec V41
155-225	A	RT 529 AT NEW PARK AVENUE	L	L	Aerial	Naztec V41
155-226	B	RT 529 AT SOUTH STREET	L	L	Aerial	Naztec V41
155-227	B	RT 529 AT SHIELD STREET	L	NONE	Aerial	Naztec V41
155-256	B	RT 529 AT HILLCREST AVENUE	L	NONE	Aerial	Naztec V41
063-227	B	RT 529 AT NEWFIELD AVENUE	L	NONE	Aerial	Naztec V41
063-232	N/A	RT 529 AT NEWINGTON AVE	V	V	Underground	Naztec V41
L = Loop, V = Video (Non recording)						

Appendix B Phase 3 Travel Time Runs Comparison

Route 517 & Route 5 (Main Street/High Street) East Hartford, from Route 2 Off Ramp to Garvan Street										
Period	Direction	Avg Speed Before (mph)	Avg Speed After (mph)	Δ Avg Speed (mph)	% change in Avg Speed	Travel Time (TT) Before (sec)	Travel Time (TT) After (sec)	**Total ΔTT (sec)**	Avg # of Stops Before	Avg # of Stops After
AM	NB	32.2	25.0	-7.2	-22%	146	188	42	1.3	1.7
	SB	27.8	31.7	3.9	14%	186	149	-37	1.6	0.7
MID	NB	23.0	24.4	1.5	6%	206	194	-12	3.0	2.0
	SB	26.7	29.7	3.0	11%	179	159	-20	2.0	0.7
PM	NB	25.3	28.3	3.0	12%	192	166	-26	2.3	1.3
	SB	30.1	30.6	0.4	1%	157	152	-5	1.0	1.0
Average:		**27.5**	**28.3**	**0.8**	**4%**	**178**	**168**	**-58**	**1.9**	**1.2**

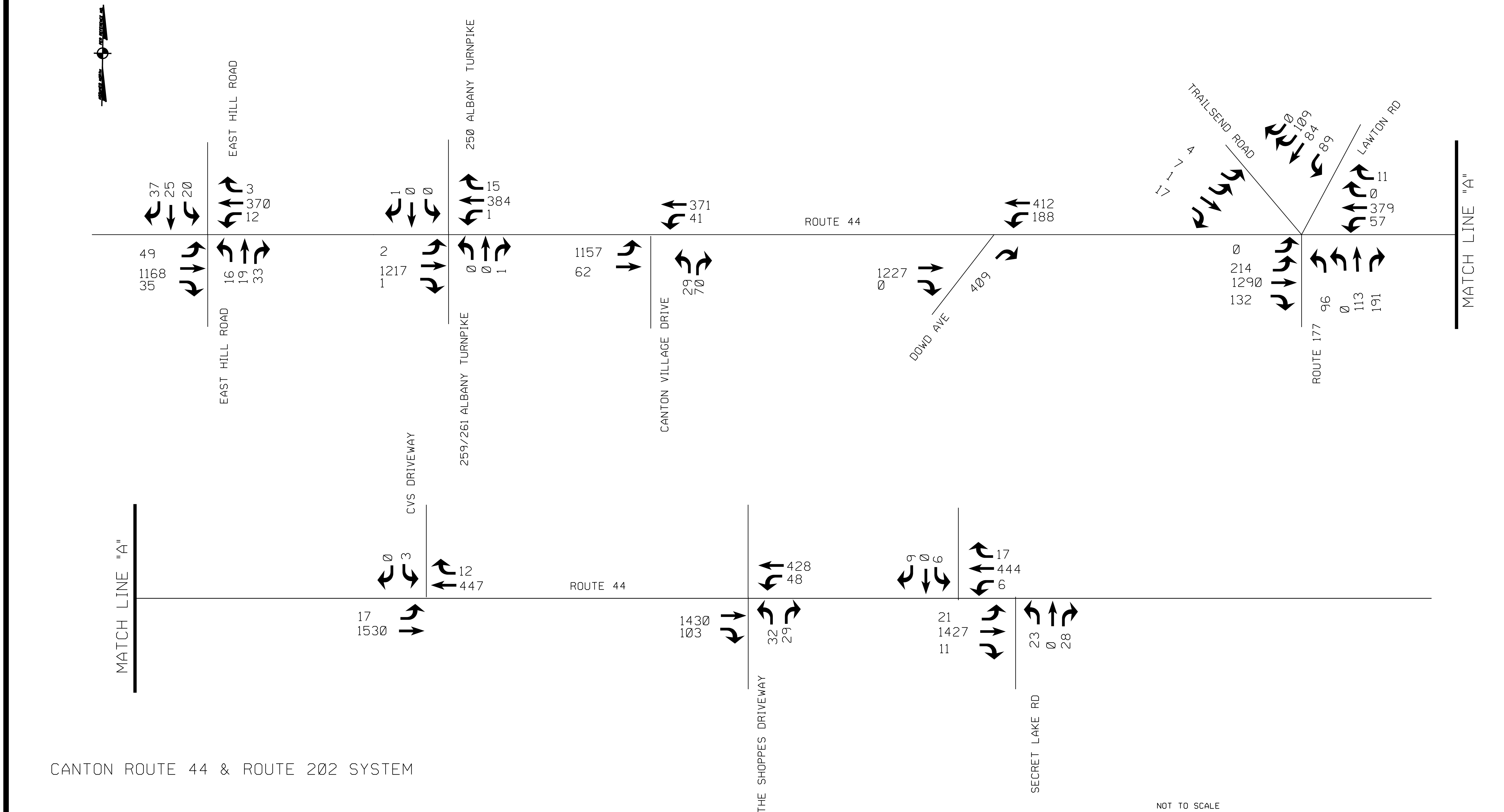
Route 5 (Main Street), East Hartford, from Ct Boulevard to Burnside Avenue										
Period	Direction	Avg Speed Before (mph)	Avg Speed After (mph)	Δ Avg Speed (mph)	% change in Avg Speed	Travel Time (TT) Before (sec)	Travel Time (TT) After (sec)	**Total ΔTT (sec)**	Avg # of Stops Before	Avg # of Stops After
AM	NB	25.1	18.1	-7.0	-28%	55	73	18	0.3	1.0
	SB	21.9	29.2	7.3	33%	71	46	-25	0.8	0.0
MID	NB	13.7	20.5	6.8	50%	103	65	-38	1.3	1.0
	SB	14.1	23.9	9.8	70%	104	61	-43	1.7	0.7
PM	NB	11.0	22.9	11.9	108%	122	62	-60	2.3	0.7
	SB	9.5	21.5	12.0	126%	146	68	-78	2.3	0.7
Average:		**15.9**	**22.7**	**6.8**	**43%**	**100**	**63**	**-226**	**1.5**	**0.7**

Route 44 (Connecticut Boulevard), East Hartford, from Blacksmith Lane to Prospect Street										
Period	Direction	Avg Speed Before (mph)	Avg Speed After (mph)	Δ Avg Speed (mph)	% change in Avg Speed	Travel Time (TT) Before (sec)	Travel Time (TT) After (sec)	**Total ΔTT (sec)**	Avg # of Stops Before	Avg # of Stops After
AM	EB	24.5	23.2	-1.3	-5%	61	60	-1	0.3	0.7
	WB	30.1	26.6	-3.5	-12%	44	53	9	0.0	0.3
MID	EB	20.4	23.6	3.2	16%	66	62	-4	1.0	0.7
	WB	24.1	25.8	1.7	7%	55	57	2	0.3	0.3
PM	EB	21.2	30.9	9.7	46%	63	42	-21	0.7	0.0
	WB	23.6	27.2	3.6	15%	58	50	-8	0.7	0.3
Average:		**24.0**	**26.2**	**2.2**	**11%**	**58**	**54**	**-23**	**0.5**	**0.4**

Route 5 (Main Street/Ellington Road/John Fitch Boulevard) East Hartford/South Windsor, from Prospect Street to Scantic Road										
Period	Direction	Avg Speed Before (mph)	Avg Speed After (mph)	Δ Avg Speed (mph)	% change in Avg Speed	Travel Time (TT) Before (sec)	Travel Time (TT) After (sec)	**Total ΔTT (sec)**	Avg # of Stops Before	Avg # of Stops After
AM	NB	35.1	37.9	2.8	8%	678	630	-48	3.3	2.7
	SB	32.8	38.5	5.8	18%	722	625	-97	3.7	2.3
MID	NB	38.9	38.4	-0.6	-1%	611	619	8	1.3	3.7
	SB	33.7	36.7	3.0	9%	708	647	-61	4.0	4.0
PM	NB	34.0	39.1	5.1	15%	699	607	-92	4.0	2.3
	SB	31.9	35.2	3.3	10%	746	676	-70	5.7	4.3
Average:		**34.4**	**37.6**	**3.2**	**10%**	**694**	**634**	**-360**	**3.7**	**3.2**

Route 173 & Route 529 (New Britain Avenue) West Hartford/Hartford from Mayflower Street to Newington Avenue										
Period	Direction	Avg Speed Before (mph)	Avg Speed After (mph)	Δ Avg Speed (mph)	% change in Avg Speed	Travel Time (TT) Before (sec)	Travel Time (TT) After (sec)	**Total** ΔTT (sec)	Avg # of Stops Before	Avg # of Stops After
AM	EB	22.4	25.0	2.6	11%	256	230	-26	2.3	2.0
	WB	16.2	25.6	9.4	58%	356	224	-132	4.3	2.0
MID	EB	17.7	20.8	3.1	17%	328	275	-53	4.0	4.0
	WB	19.3	26.4	7.1	37%	301	219	-82	3.3	1.7
PM	EB	19.7	18.6	-1.1	-6%	299	316	17	3.0	4.7
	WB	17.7	17.5	-0.2	-1%	327	339	12	3.0	4.3
Average:		**18.9**	**22.3**	**3.5**	**19%**	**311**	**267**	**-264**	**3.3**	**3.1**

Appendix C
Phase 3 Traffic Volumes



PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date: $DATE$

DESIGNER/DRAFTER: G. HOWELL
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILEA$

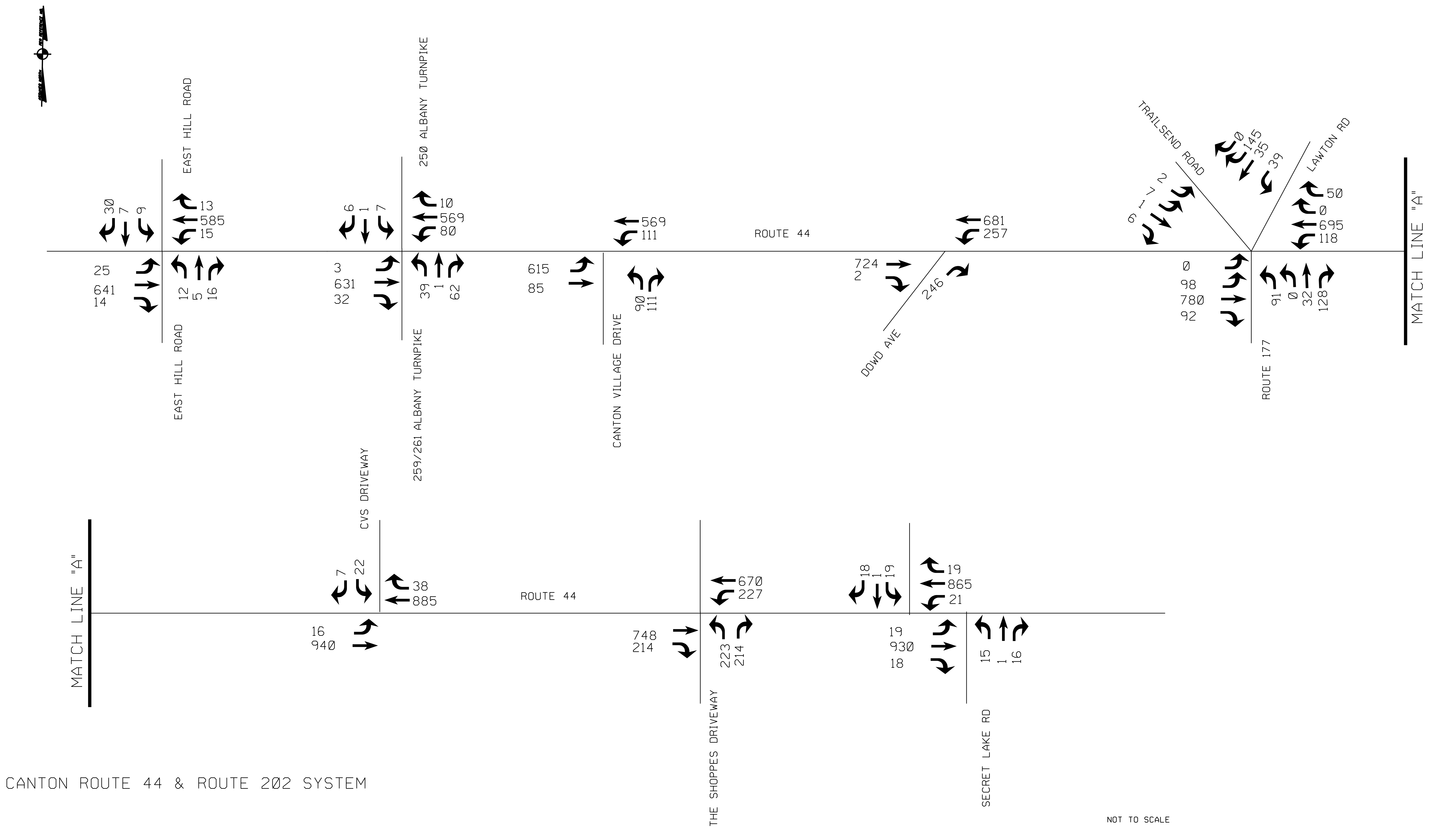
SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

TOWN: CANTON

DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES AM PEAK HOUR

PROJECT NO. 0171-0421
DRAWING NO. TMC-04
SHEET NO.



CANTON ROUTE 44 & ROUTE 202 SYSTEM

PRELIMINARY ENGINEERING

REV. / DATE / REVISION DESCRIPTION / SHEET NO.	Plotted Date@DATE$
DESIGNER/DRAFTER:	G. HOWELL
CHECKED BY:	J. KEISER
STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	Filename: $FILE$
SIGNATURE/ BLOCK:	OFFICE OF ENGINEERING
APPROVED BY:	
PROJECT TITLE:	CRCOG REGION SIGNAL COORDINATION
TOWN:	CANTON
DRAWING TITLE:	2018 - 2020 TRAFFIC VOLUMES MIDDAY PEAK HOUR
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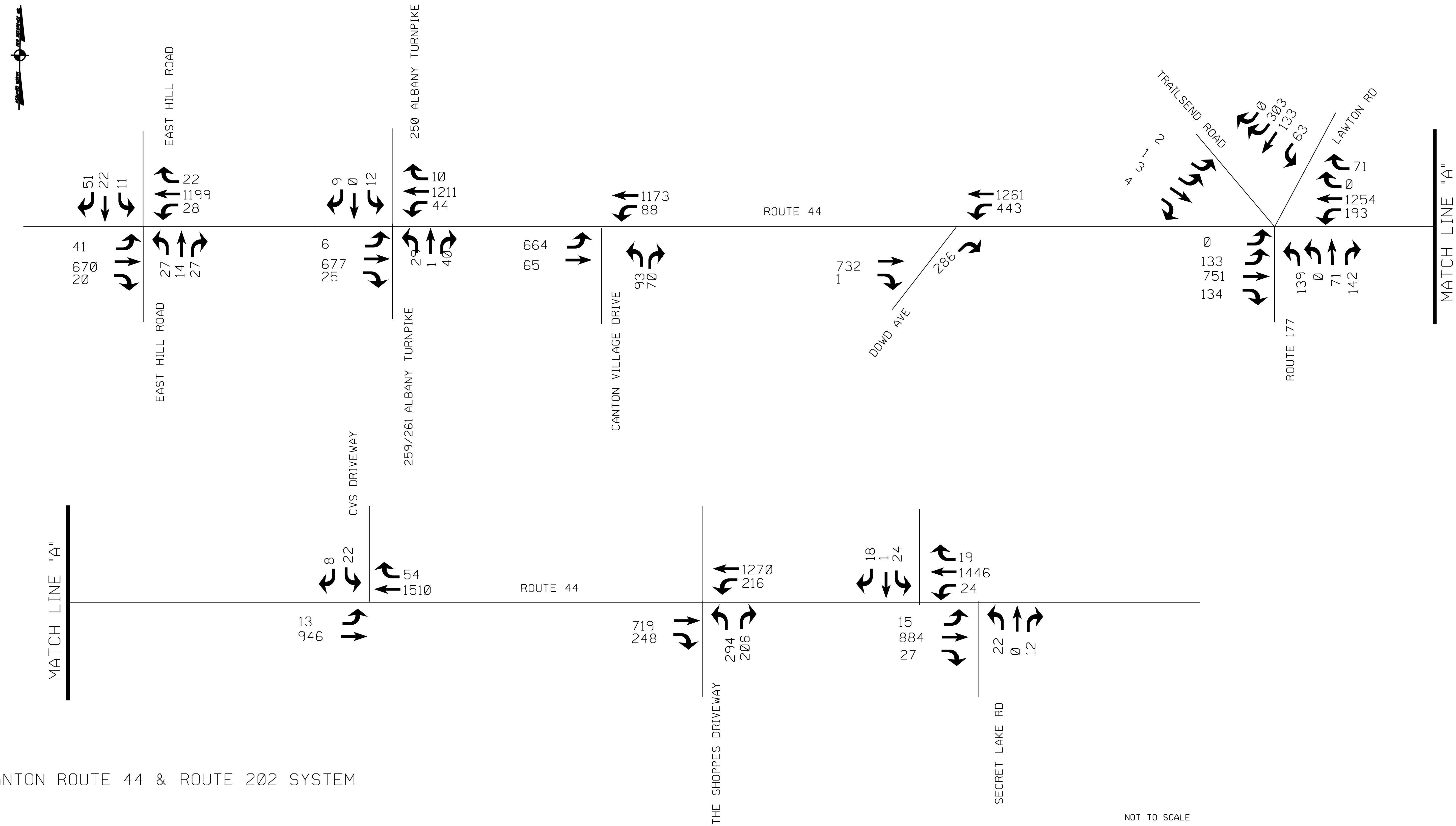
SHEET NO.	



CANTON ROUTE 44 & ROUTE 202 SYSTEM

PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date: $DATE$

DESIGNER/DRAFTER: G. HOWELL
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

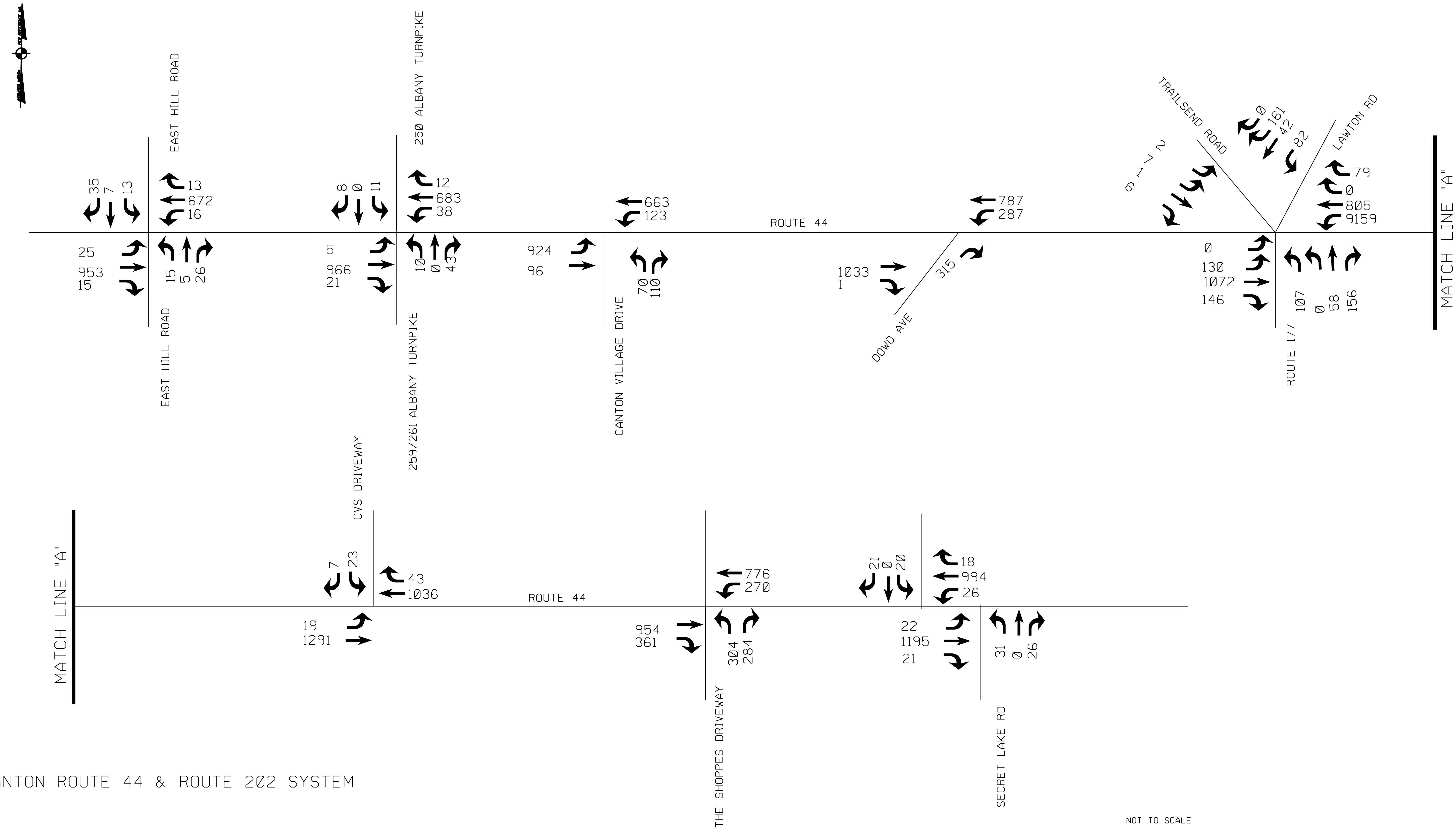
SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

TOWN: CANTON

DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES PM PEAK HOUR

PROJECT NO. 0171-0421
DRAWING NO. TMC-04
SHEET NO.

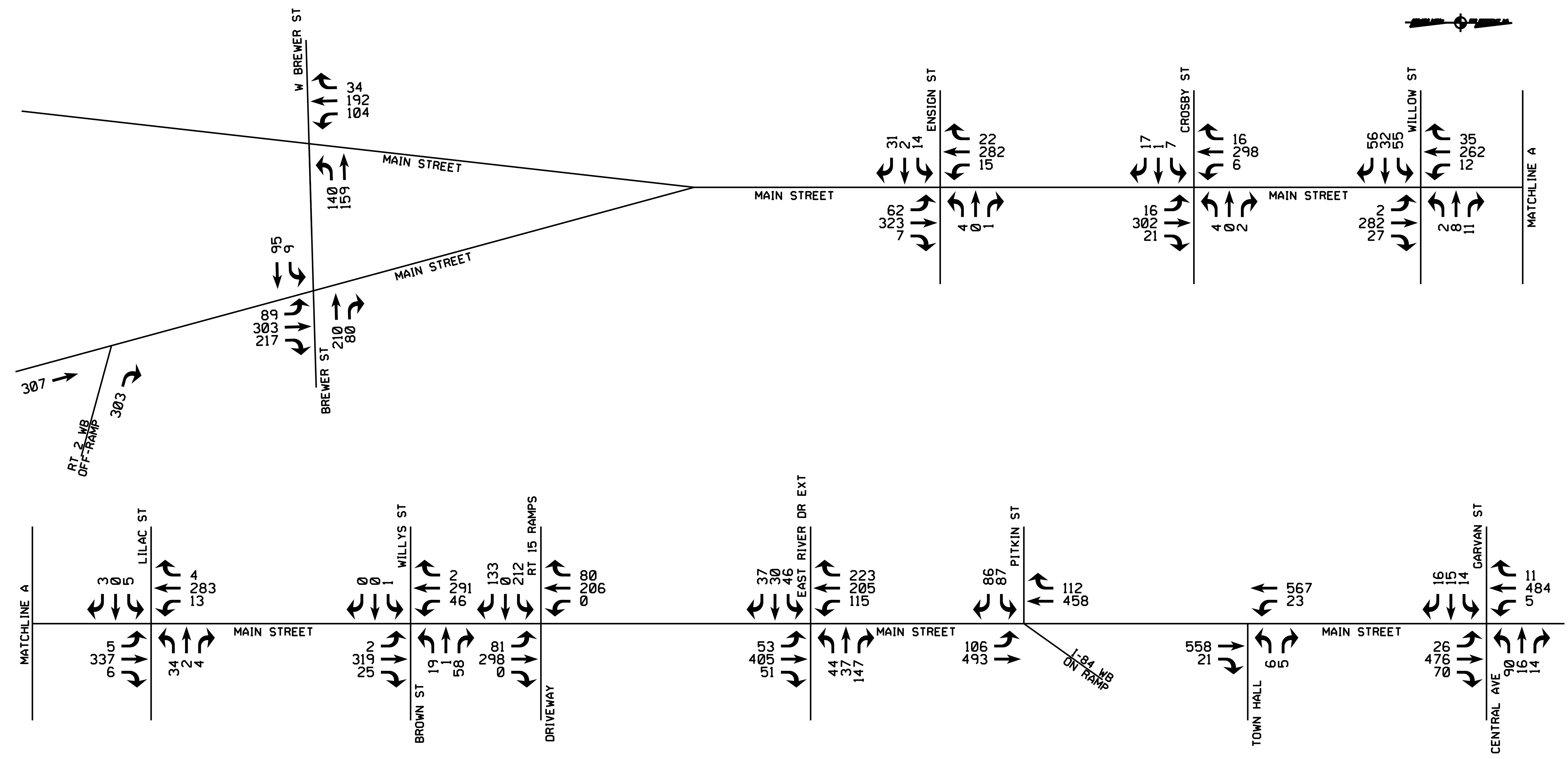


CANTON ROUTE 44 & ROUTE 202 SYSTEM

PRELIMINARY ENGINEERING

DESIGNER/DRAFTER: G. HOWELL CHECKED BY: J. KEISER	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/BLOCK: OFFICE OF ENGINEERING APPROVED BY:	PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION	TOWN: CANTON DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES SATURDAY PEAK HOUR	PROJECT NO. 0171-0421 DRAWING NO. TMC-04 SHEET NO.

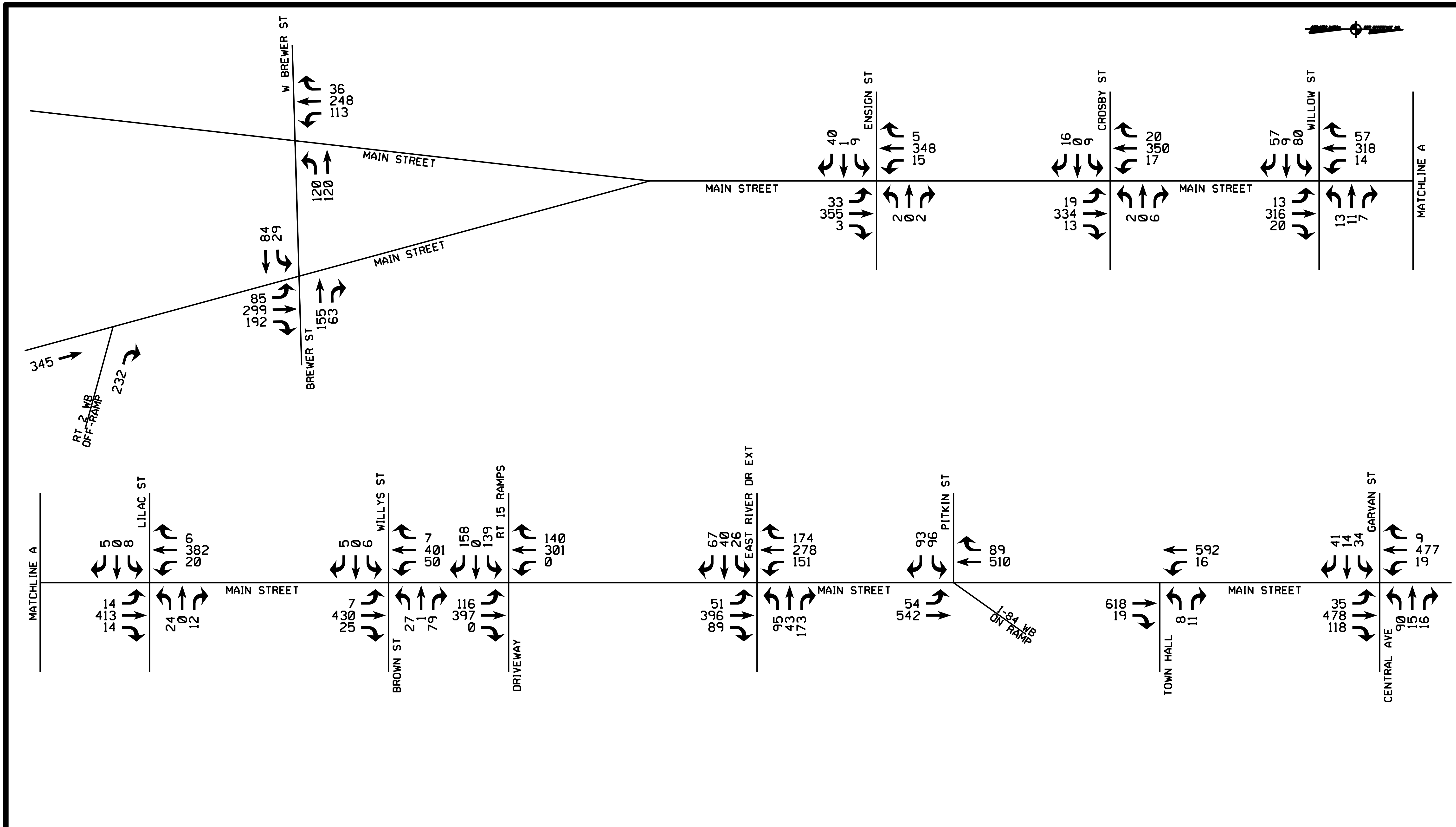
REV. | DATE | REVISION DESCRIPTION | SHEET NO. | Plotted Date:$DATE$ | Filename: $FILE$



EAST HARTFORD SYSTEM
ROUTE 517 & ROUTE 5
NOT TO SCALE

DESIGNER/DRAFTER: E. KLEPADLO	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/BLOCK: OFFICE OF ENGINEERING	PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION
CHECKED BY: J. KEISER		APPROVED BY:	
TOWN: EAST HARTFORD	DRAWING TITLE: 2018-2020 TRAFFIC VOLUMES AM PEAK HOUR	PROJECT NO. 0171-0421	DRAWING NO. TMC-43
SHEET NO. 1			

REV. | DATE | REVISION DESCRIPTION | SHEET NO. | Plotted Date: $DATE$ | Filename: $FILE$



EAST HARTFORD SYSTEM
ROUTE 517 & ROUTE 5
NOT TO SCALE

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date:$DATE$

DESIGNER/DRAFTER: E. KLEPADLO
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

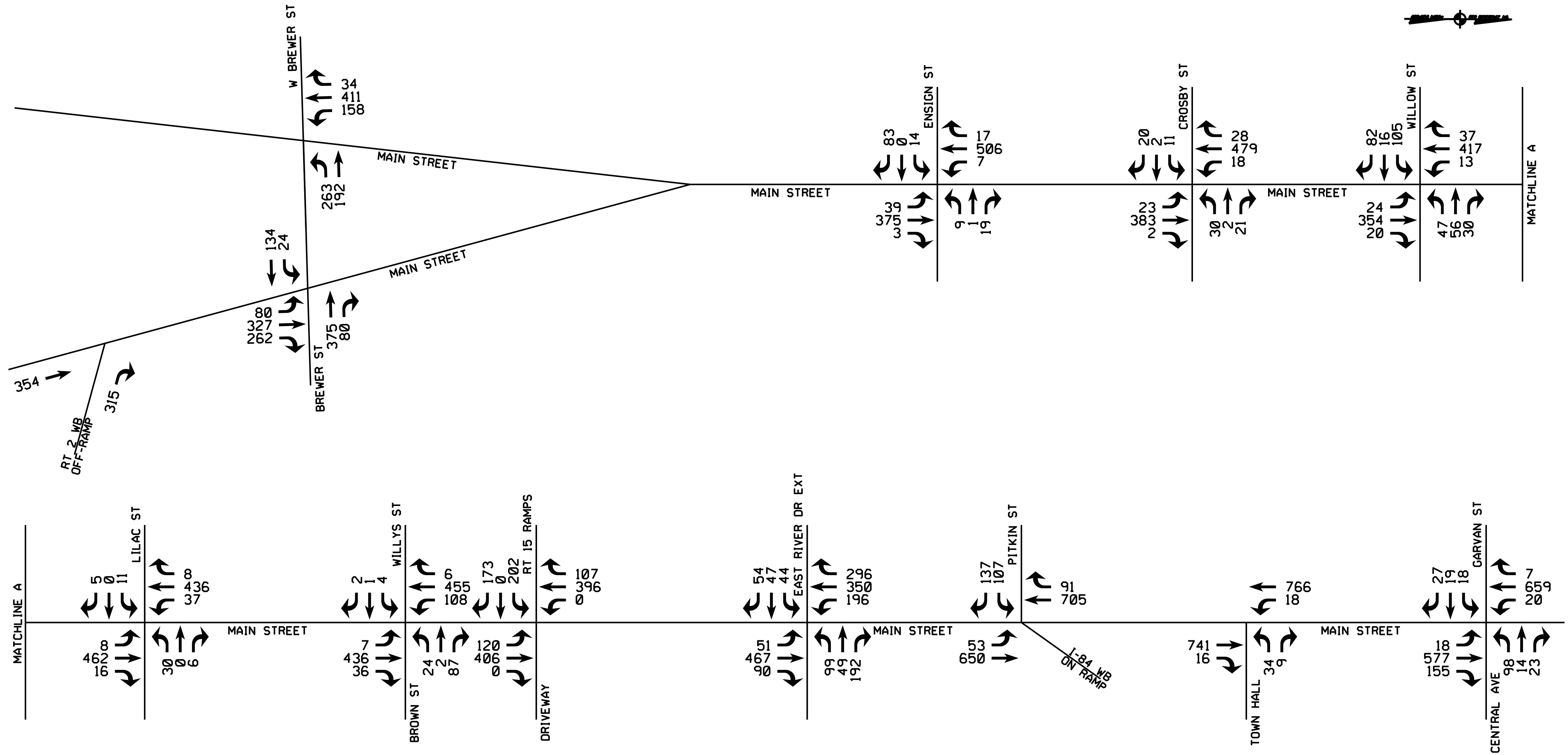
SIGNATURE/BLOCK:
OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE:
CRCOG REGION SIGNAL COORDINATION

TOWN:
EAST HARTFORD

DRAWING TITLE:
2018-2020 TRAFFIC VOLUMES
MIDDAY PEAK HOUR

PROJECT NO. 0171-0421
DRAWING NO. TMC-43
SHEET NO. 2



EAST HARTFORD SYSTEM
ROUTE 517 & ROUTE 5

NOT TO SCALE

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date: $DATE$

DESIGNER/DRAFTER: E. KLEPADLO
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

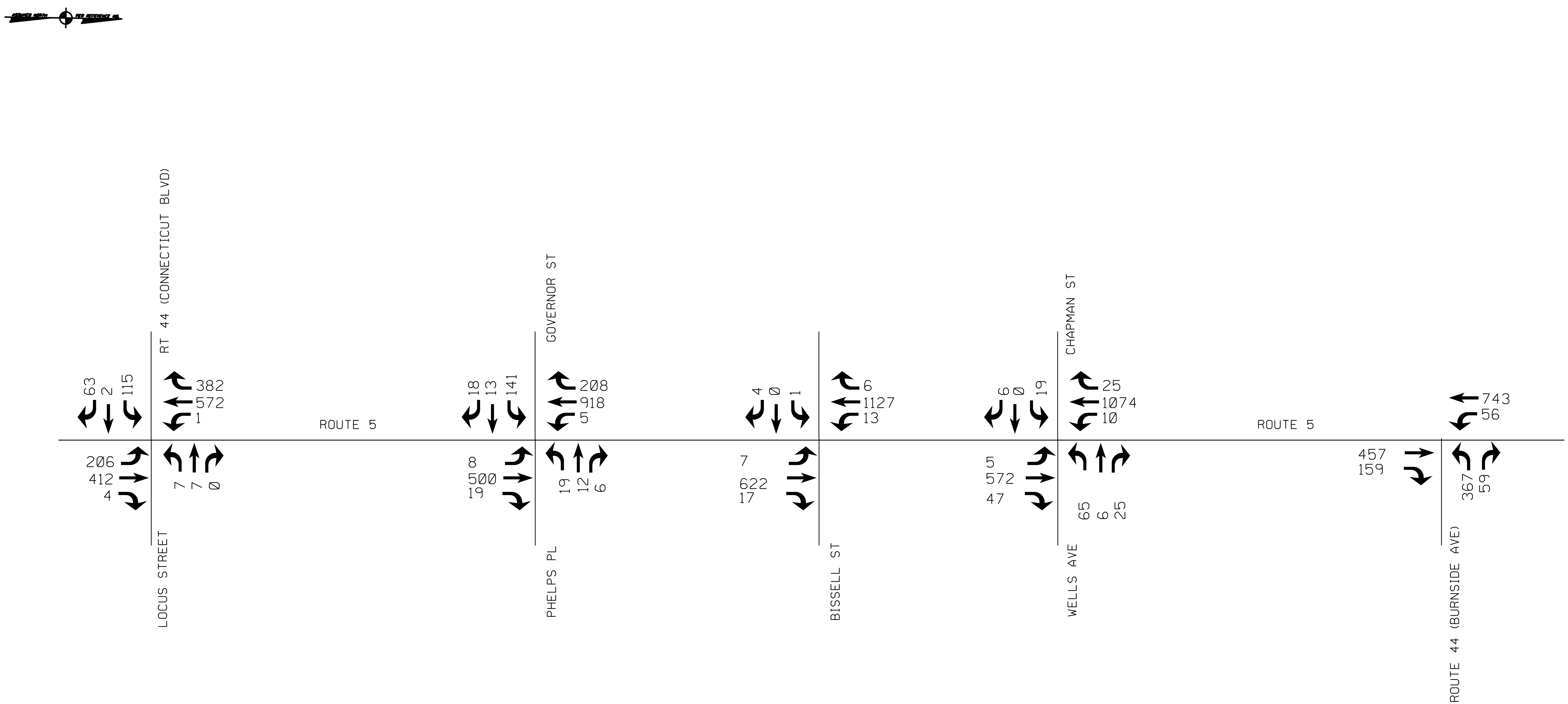
SIGNATURE/BLOCK:
OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE:
CRCOG REGION SIGNAL COORDINATION

TOWN:
EAST HARTFORD

DRAWING TITLE:
2018-2020 TRAFFIC VOLUMES
PM PEAK HOUR

PROJECT NO. 0171-0421
DRAWING NO. TMC-43
SHEET NO. 3



EAST HARTFORD
ROUTE 5 & ROUTE 44 SYSTEM

NOT TO SCALE

PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date:$DATE$

DESIGNER/DRAFTER: G. HOWELL
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILEA$

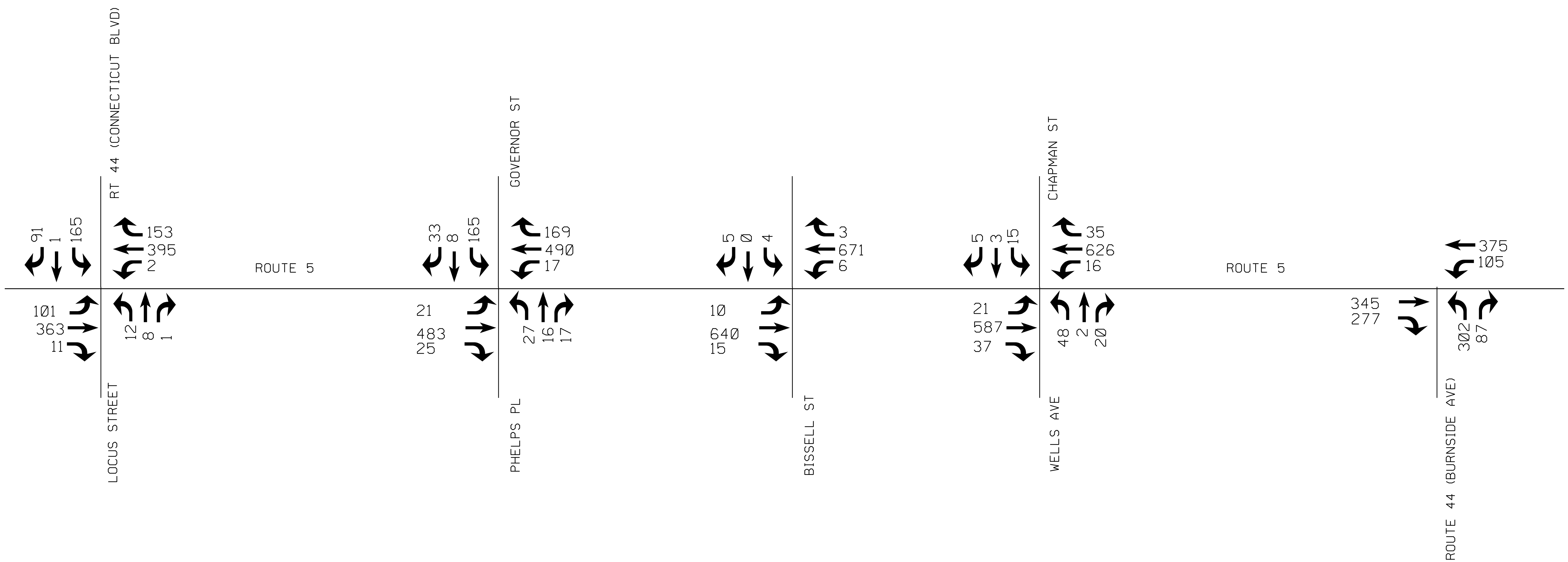
SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

TOWN: EAST HARTFORD

DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES AM PEAK HOUR

PROJECT NO. 0171-0421
DRAWING NO. TMC-04
SHEET NO.



EAST HARTFORD
ROUTE 5 & ROUTE 44 SYSTEM

NOT TO SCALE

PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date: $DATE$

DESIGNER/DRAFTER: G. HOWELL
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

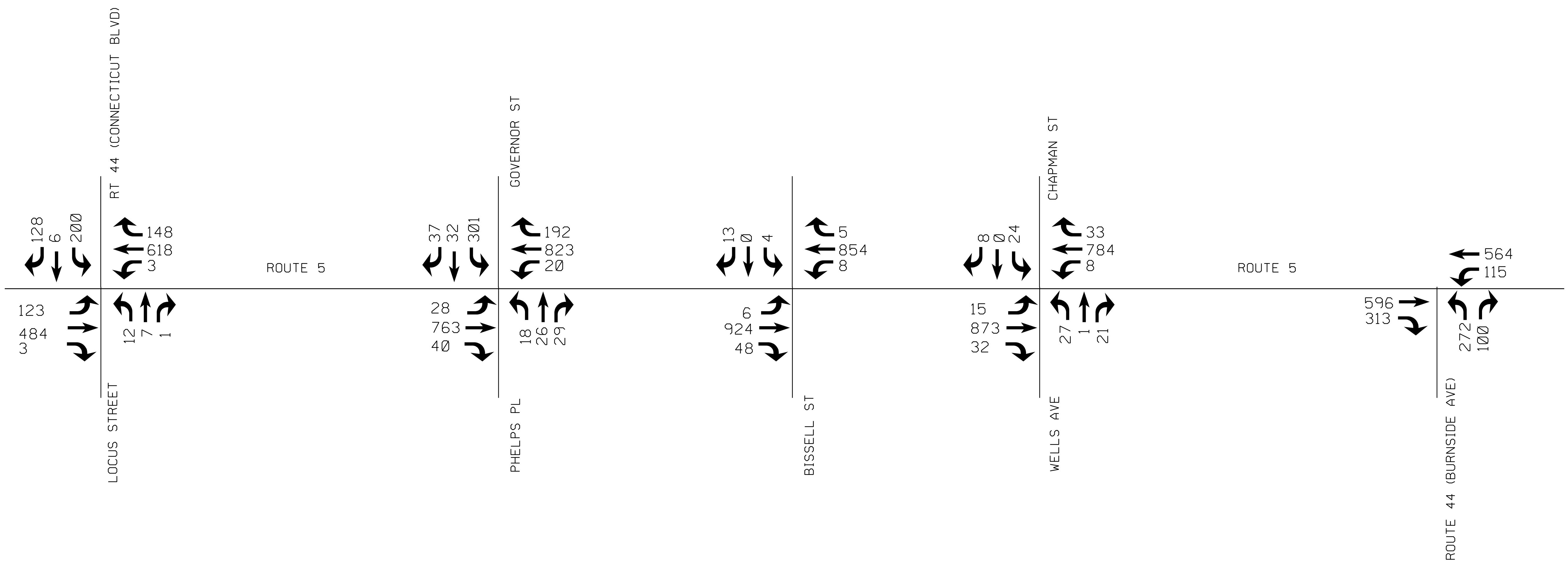
SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

TOWN: EAST HARTFORD

DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES MIDDAY PEAK HOUR

PROJECT NO. 0171-0421
DRAWING NO. TMC-04
SHEET NO.

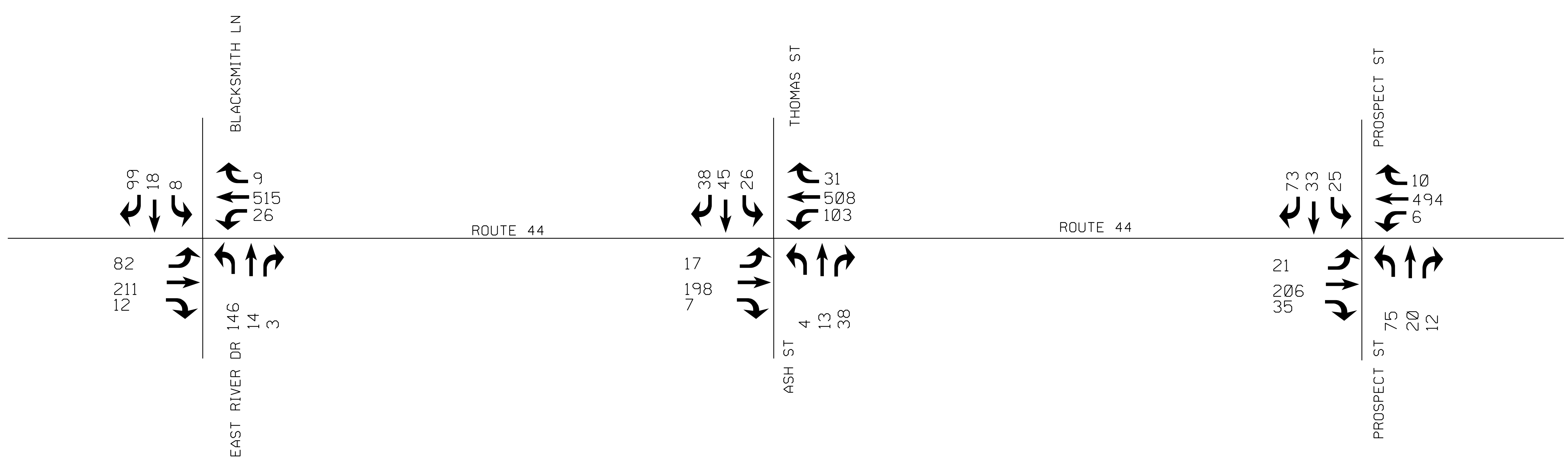


EAST HARTFORD
ROUTE 5 & ROUTE 44 SYSTEM

NOT TO SCALE

PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.	Plotted Date:$DATE$	DESIGNER/DRAFTER: G. HOWELL CHECKED BY: J. KEISER	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION Filename: $FILE$	SIGNATURE/BLOCK: OFFICE OF ENGINEERING APPROVED BY:	PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION	TOWN: EAST HARTFORD DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES PM PEAK HOUR	PROJECT NO. 0171-0421 DRAWING NO. TMC-04 SHEET NO.



EAST HARTFORD ROUTE 44 SYSTEM

NOT TO SCALE

PRELIMINARY ENGINEERING

REV. | DATE | REVISION DESCRIPTION | SHEET NO. | Plotted Date$DATE$

DESIGNER/DRAFTER: G. HOWELL
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

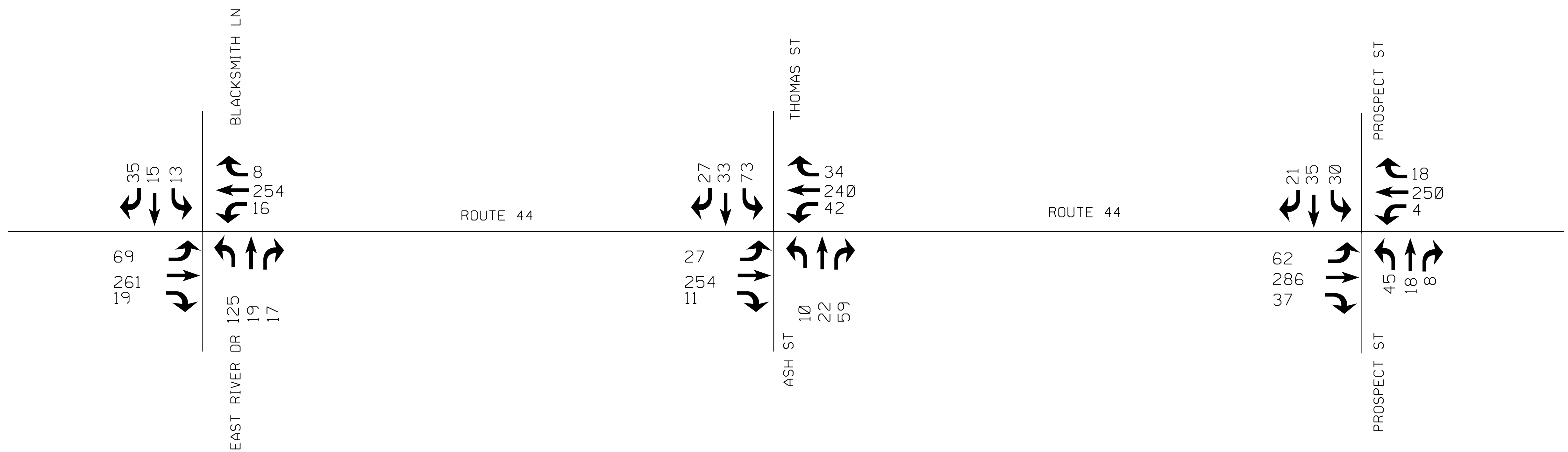
SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

TOWN: EAST HARTFORD

DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES AM PEAK HOUR

PROJECT NO. 0171-0421
DRAWING NO. TMC-04
SHEET NO.



EAST HARTFORD ROUTE 44 SYSTEM

NOT TO SCALE

PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date$DATE$

DESIGNER/DRAFTER: G. HOWELL

CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILEA$

SIGNATURE/BLOCK: OFFICE OF ENGINEERING

APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

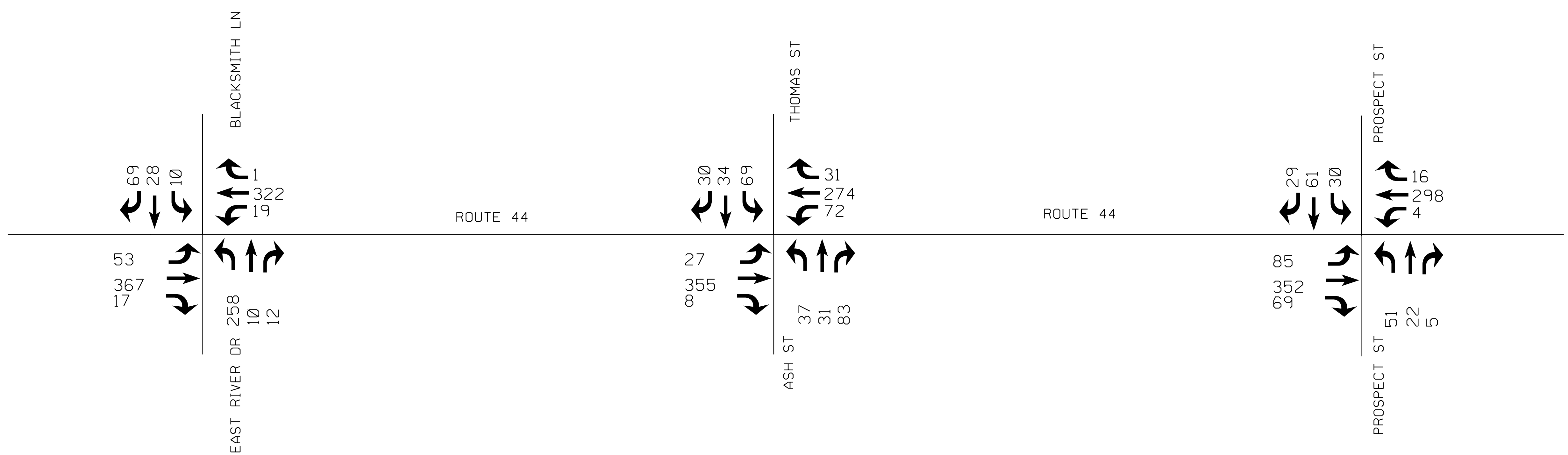
TOWN: EAST HARTFORD

DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES MIDDAY PEAK HOUR

PROJECT NO. 0171-0421

DRAWING NO. TMC-04

SHEET NO.



EAST HARTFORD ROUTE 44 SYSTEM

NOT TO SCALE

PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date:$DATE$

DESIGNER/DRAFTER: G. HOWELL

CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

SIGNATURE/BLOCK: OFFICE OF ENGINEERING

APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

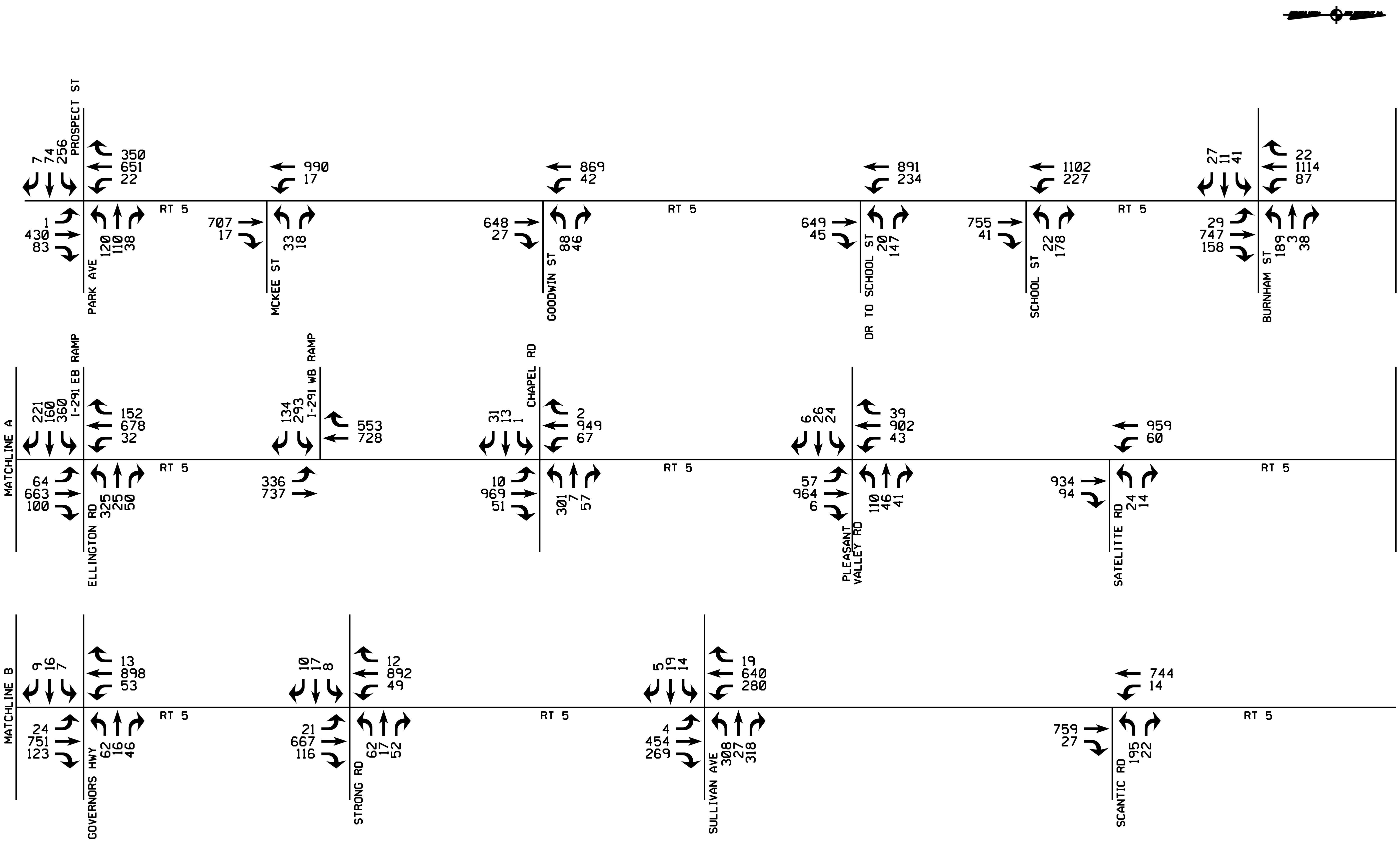
TOWN: EAST HARTFORD

DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES PM PEAK HOUR

PROJECT NO. 0171-0421

DRAWING NO. TMC-04

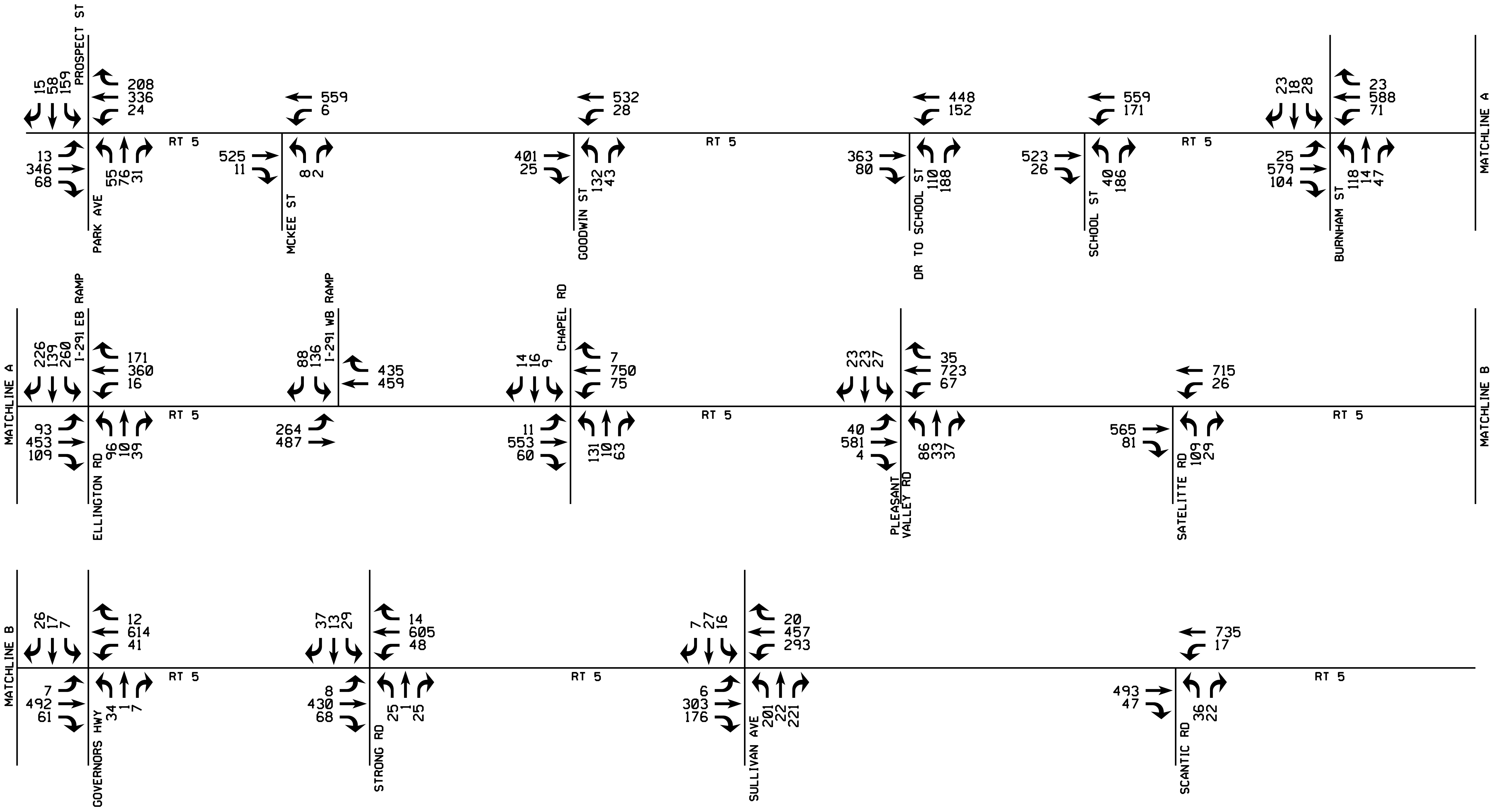
SHEET NO.



EAST HARTFORD/SOUTH WINDSOR ROUTE 5 SYSTEM

NOT TO SCALE

REV. / DATE / REVISION DESCRIPTION / SHEET NO.	Plotted Date: $DATE$	DESIGNER/DRAFTER: E. KLEPADLO CHECKED BY: J. KEISER	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION Filename: $FILE$	SIGNATURE/BLOCK: OFFICE OF ENGINEERING APPROVED BY:	PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION	TOWN: EAST HARTFORD - SOUTH WINDSOR DRAWING TITLE: 2018-2020 TRAFFIC VOLUMES AM PEAK HOUR	PROJECT NO. 0171-0421 DRAWING NO. TMC-43 SHEET NO. 1



EAST HARTFORD/SOUTH WINDSOR ROUTE 5 SYSTEM

NOT TO SCALE

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date: $DATE$

DESIGNER/DRAFTER: E. KLEPADLO

CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

SIGNATURE/BLOCK:

OFFICE OF ENGINEERING

APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

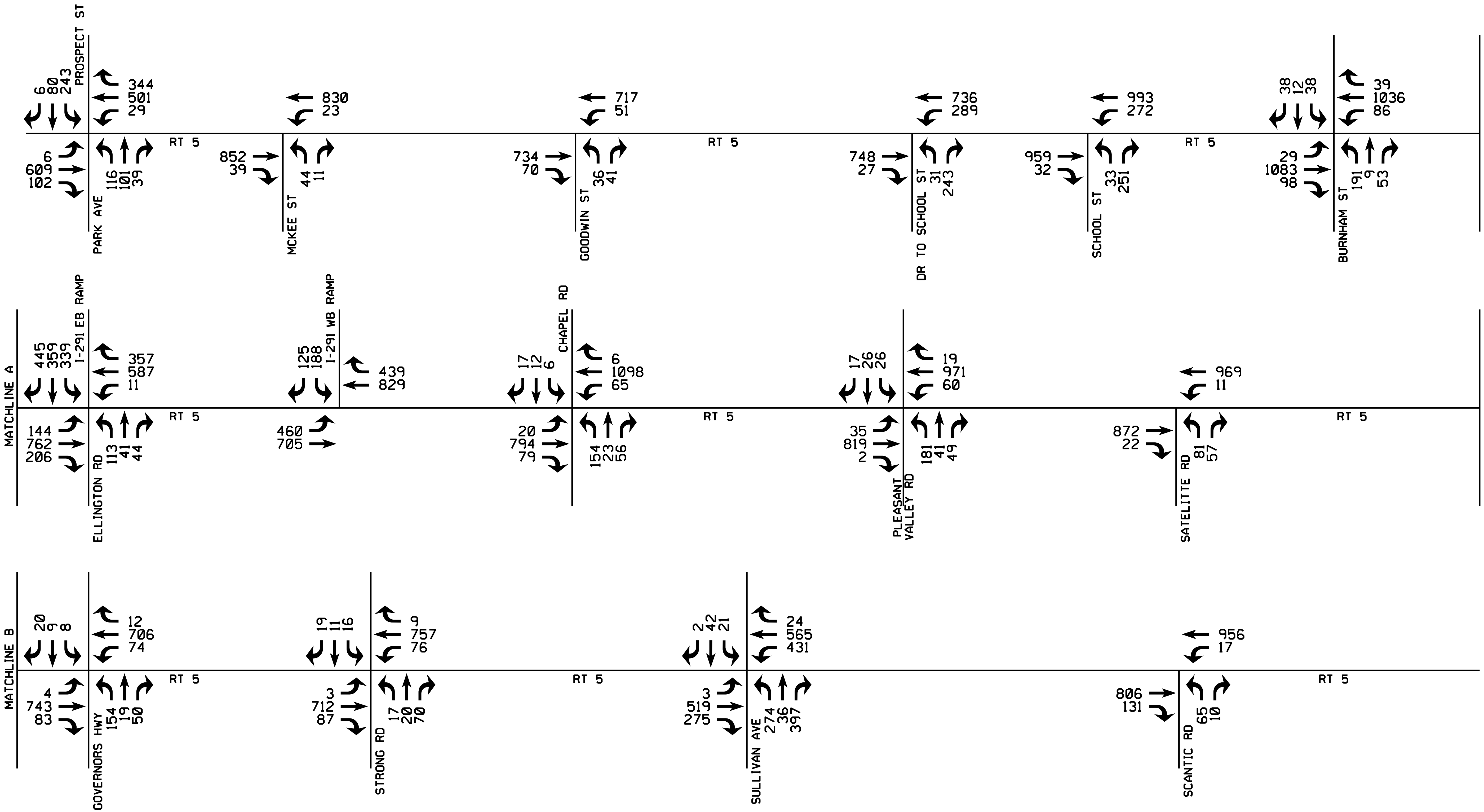
TOWN: EAST HARTFORD - SOUTH WINDSOR

DRAWING TITLE: 2018-2020 TRAFFIC VOLUMES MIDDAY PEAK HOUR

PROJECT NO. 0171-0421

DRAWING NO. TMC-43

SHEET NO. 2



EAST HARTFORD/SOUTH WINDSOR ROUTE 5 SYSTEM

NOT TO SCALE

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date: $DATE$

DESIGNER/DRAFTER: E. KLEPADLO
CHECKED BY: J. KEISER

Filename: $FILE$

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

SIGNATURE/BLOCK:
OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE:
CRCOG REGION SIGNAL COORDINATION

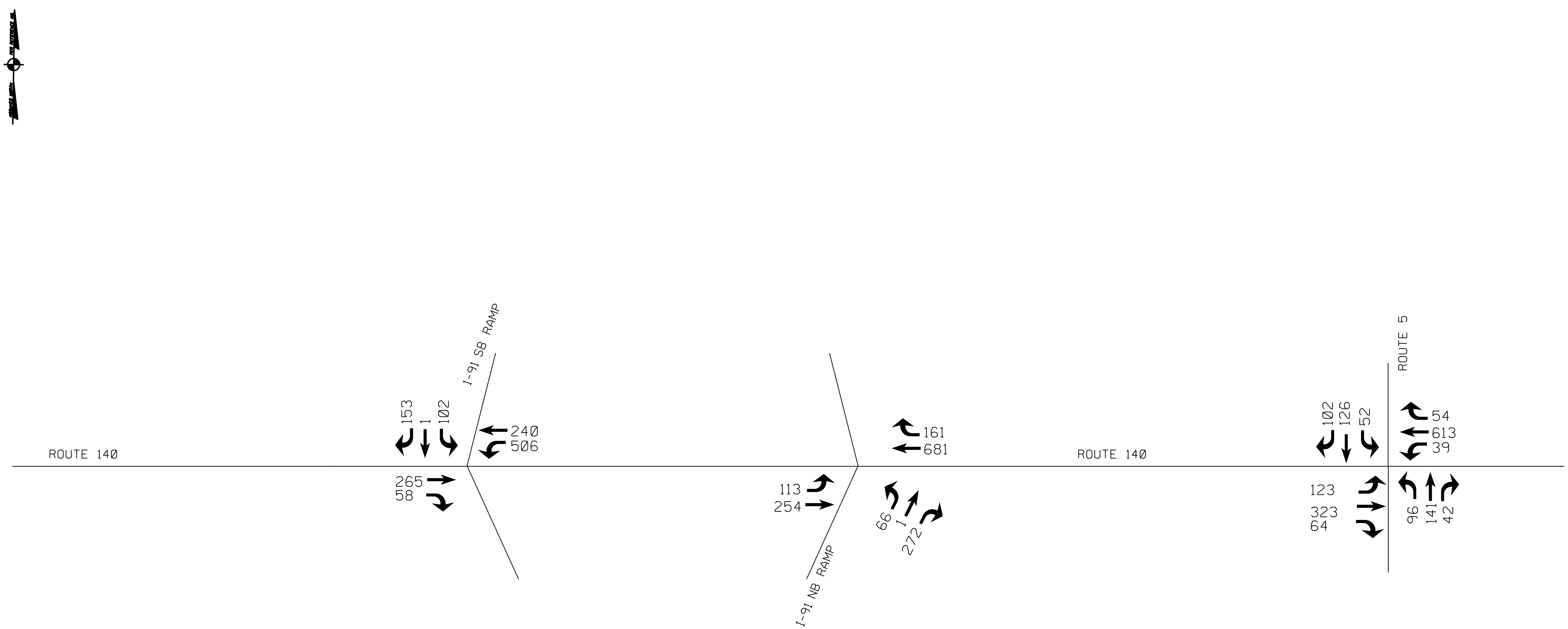
TOWN: EAST HARTFORD - SOUTH WINDSOR

DRAWING TITLE: 2018-2020 TRAFFIC VOLUMES PM PEAK HOUR

PROJECT NO. 0171-0421

DRAWING NO. TMC-43

SHEET NO. 3



NOT TO SCALE

EAST WINDSOR
ROUTE 140 SYSTEM

PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date$DATE$

DESIGNER/DRAFTER: G. HOWELL
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

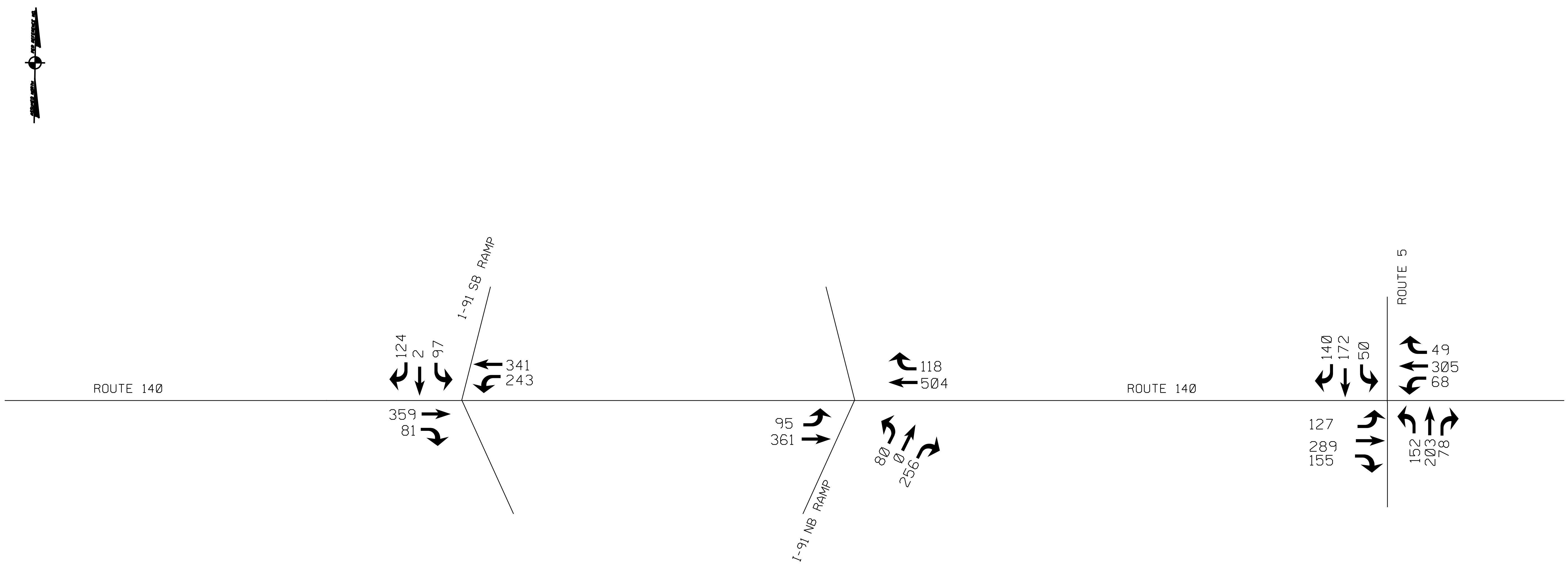
SIGNATURE/BLOCK: OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

TOWN: EAST WINDSOR

DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES AM PEAK HOUR

PROJECT NO. 0171-0421
DRAWING NO. TMC-04
SHEET NO.



NOT TO SCALE

EAST WINDSOR
ROUTE 140 SYSTEM

PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date $DATE$

DESIGNER/DRAFTER: G. HOWELL
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

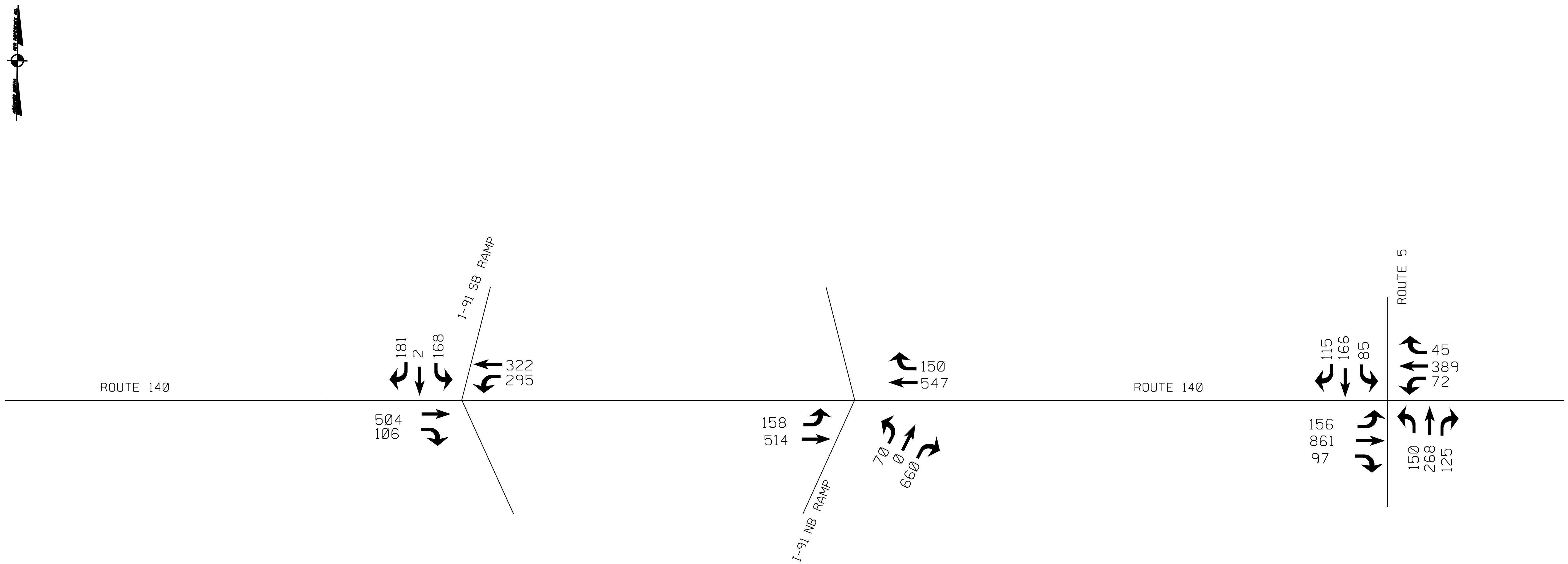
SIGNATURE/BLOCK:
OFFICE OF ENGINEERING
APPROVED BY:

PROJECT TITLE:
CRCOG REGION SIGNAL COORDINATION

TOWN:
EAST WINDSOR

DRAWING TITLE:
2018 - 2020 TRAFFIC VOLUMES
MIDDAY PEAK HOUR

PROJECT NO.
0171-0421
DRAWING NO.
TMC-04
SHEET NO.



NOT TO SCALE

EAST WINDSOR
ROUTE 140 SYSTEM

PRELIMINARY ENGINEERING

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date$DATE$

DESIGNER/DRAFTER: G. HOWELL

CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

SIGNATURE/BLOCK: OFFICE OF ENGINEERING

APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

TOWN: EAST WINDSOR

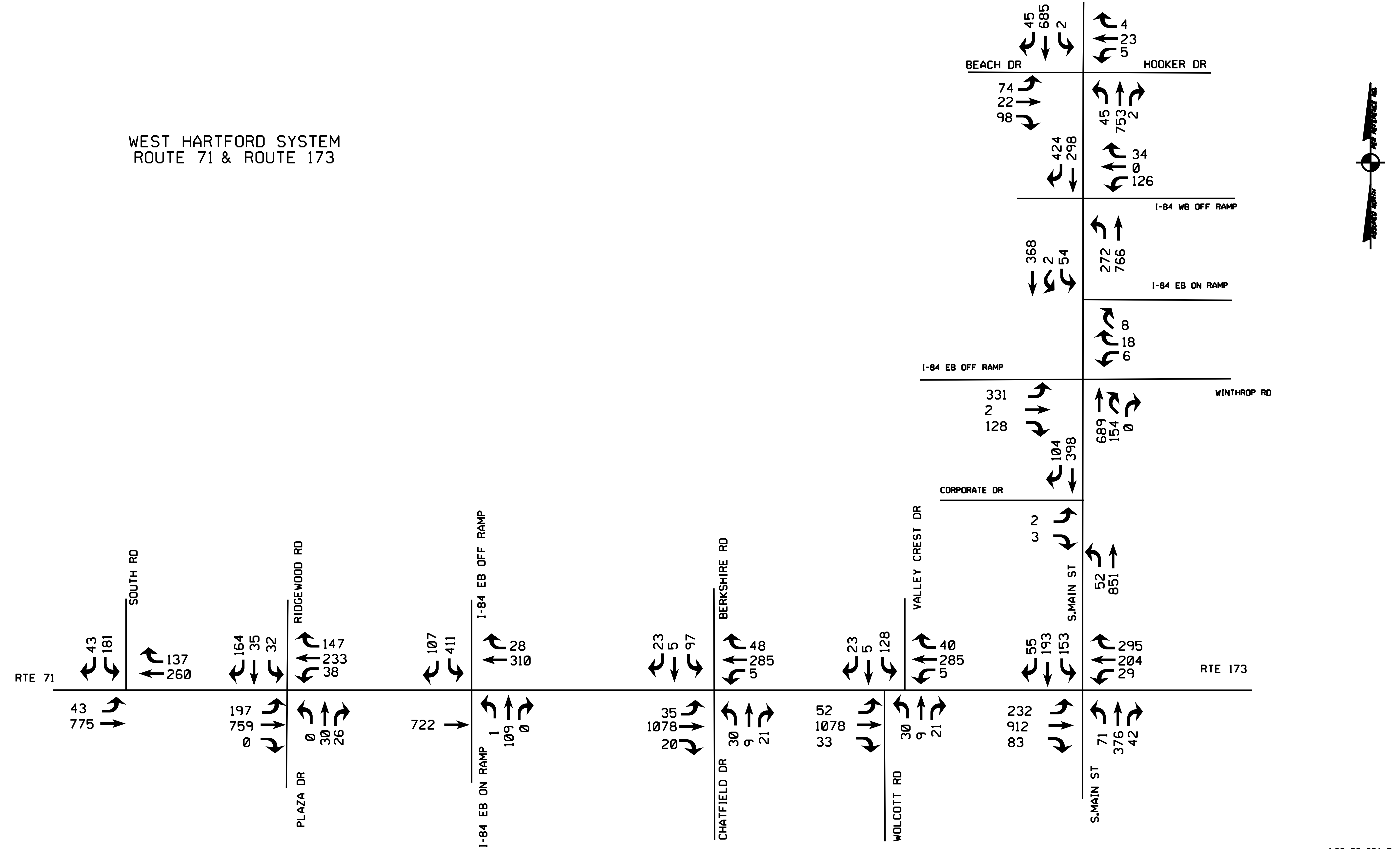
DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES PM PEAK HOUR

PROJECT NO. 0171-0421

DRAWING NO. TMC-04

SHEET NO.

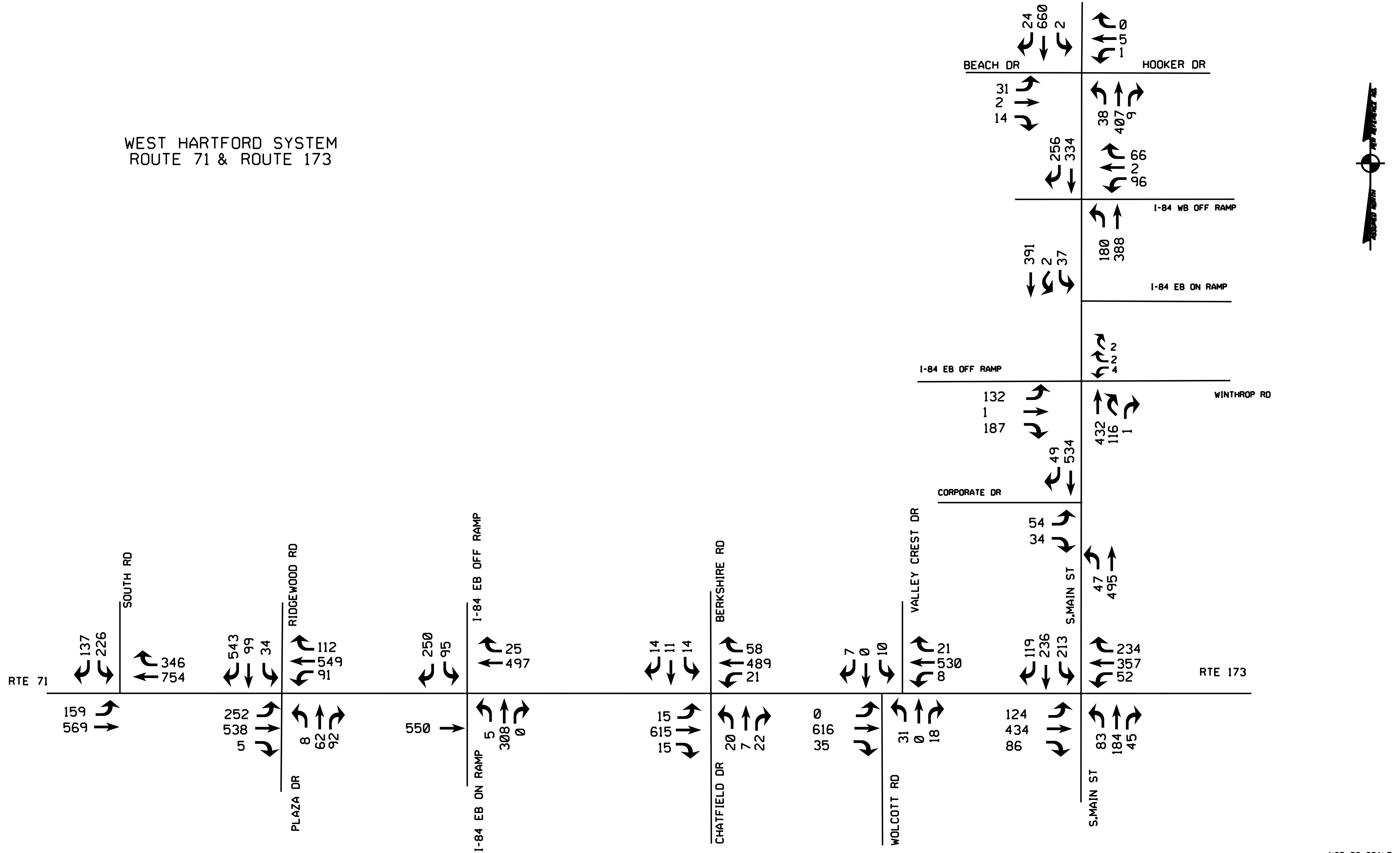
WEST HARTFORD SYSTEM
ROUTE 71 & ROUTE 173



DESIGNER/DRAFTER: A. AHUJA	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/BLOCK: OFFICE OF ENGINEERING	PROJECT TITLE: CRCOG REGIONAL SIGNAL COORDINATION	TOWN: WEST HARTFORD	PROJECT NO. 0171-0421
CHECKED BY: J. KEISER		APPROVED BY:		DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES AM PEAK HOUR	DRAWING NO. TMC-34
					SHEET NO. 1

REV. | DATE | REVISION DESCRIPTION | SHEET NO. | Plotted Date:$DATE$ | Filename: $FILE$

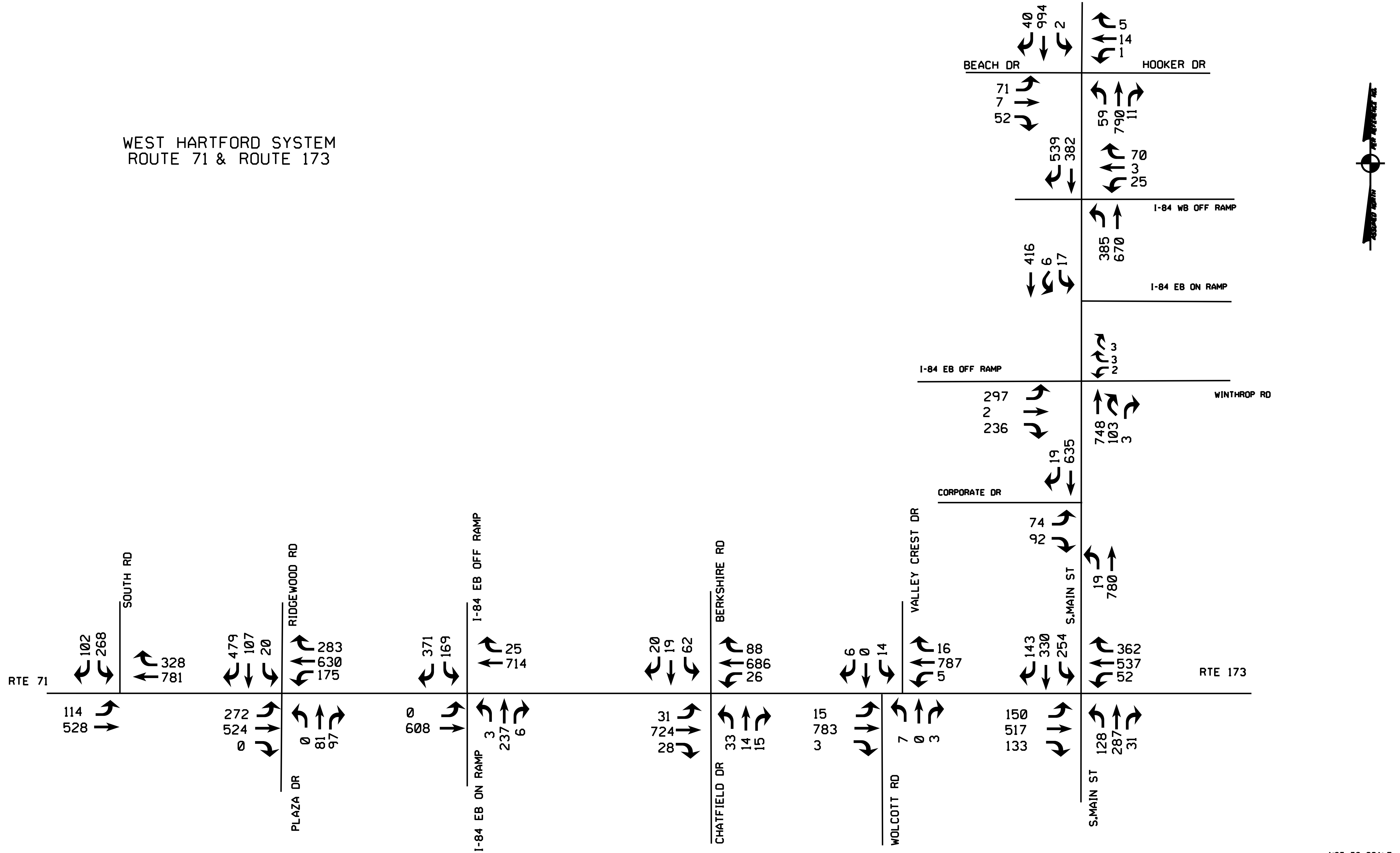
WEST HARTFORD SYSTEM
ROUTE 71 & ROUTE 173



NOT TO SCALE

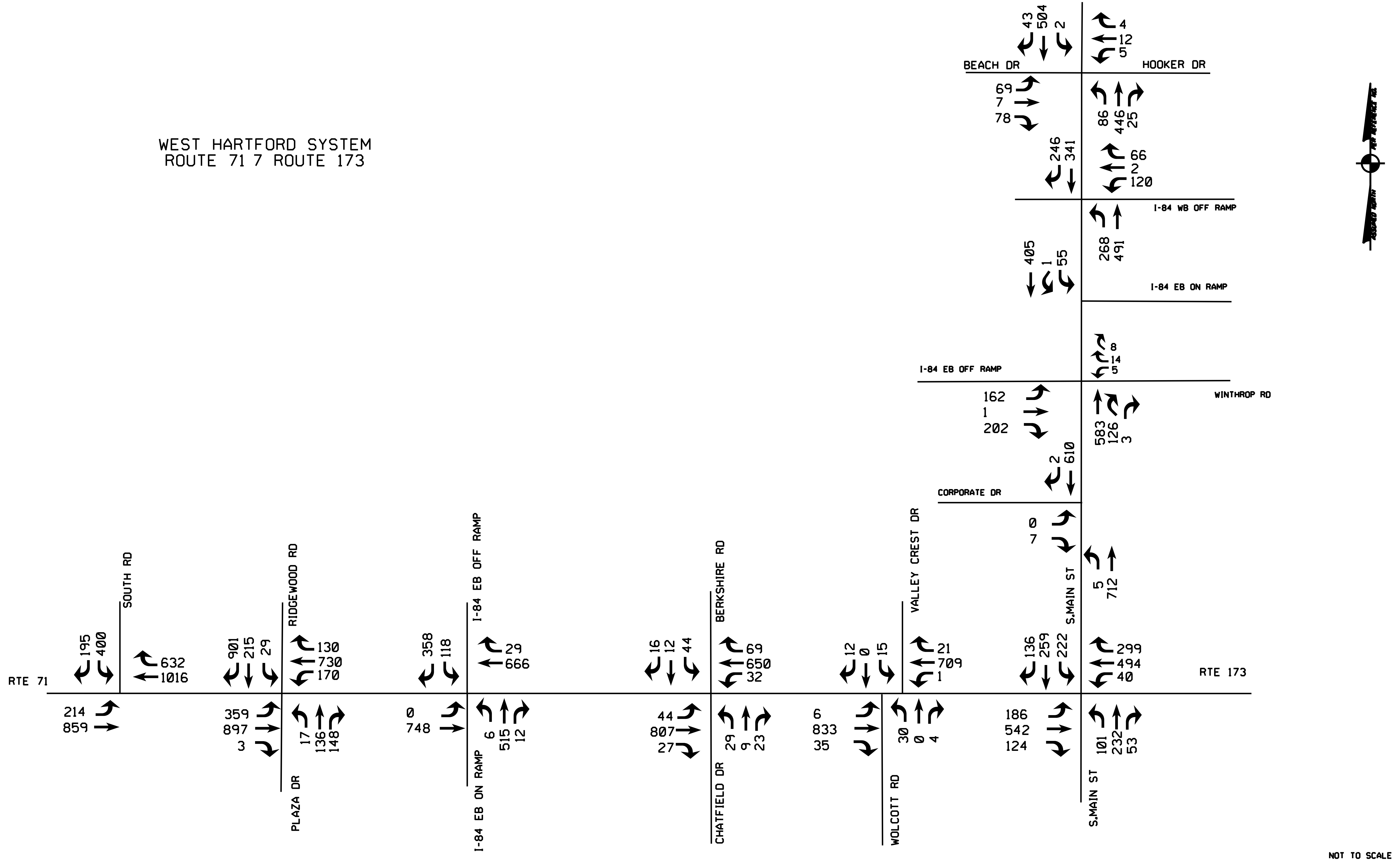
DESIGNER/DRAFTER:	A. AHUJA
CHECKED BY:	J. KEISER
STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	
SIGNATURE/BLOCK:	OFFICE OF ENGINEERING
APPROVED BY:	
PROJECT TITLE:	CRCOG REGIONAL SIGNAL COORDINATION
TOWN:	WEST HARTFORD
DRAWING TITLE:	2018 - 2020 TRAFFIC VOLUMES MIDDAY PEAK HOUR
PROJECT NO.	0171-0421
DRAWING NO.	TMC-34
SHEET NO.	2

REV. | DATE | REVISION DESCRIPTION | SHEET NO. | Plotted Date: $DATE$ | Filename: $FILE$



DESIGNER/DRAFTER: A. AHUJA CHECKED BY: J. KEISER	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/BLOCK: OFFICE OF ENGINEERING APPROVED BY:	PROJECT TITLE: CRCOG REGIONAL SIGNAL COORDINATION	TOWN: WEST HARTFORD DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES PM PEAK HOUR	PROJECT NO. 0171-0421 DRAWING NO. TMC-34 SHEET NO. 3

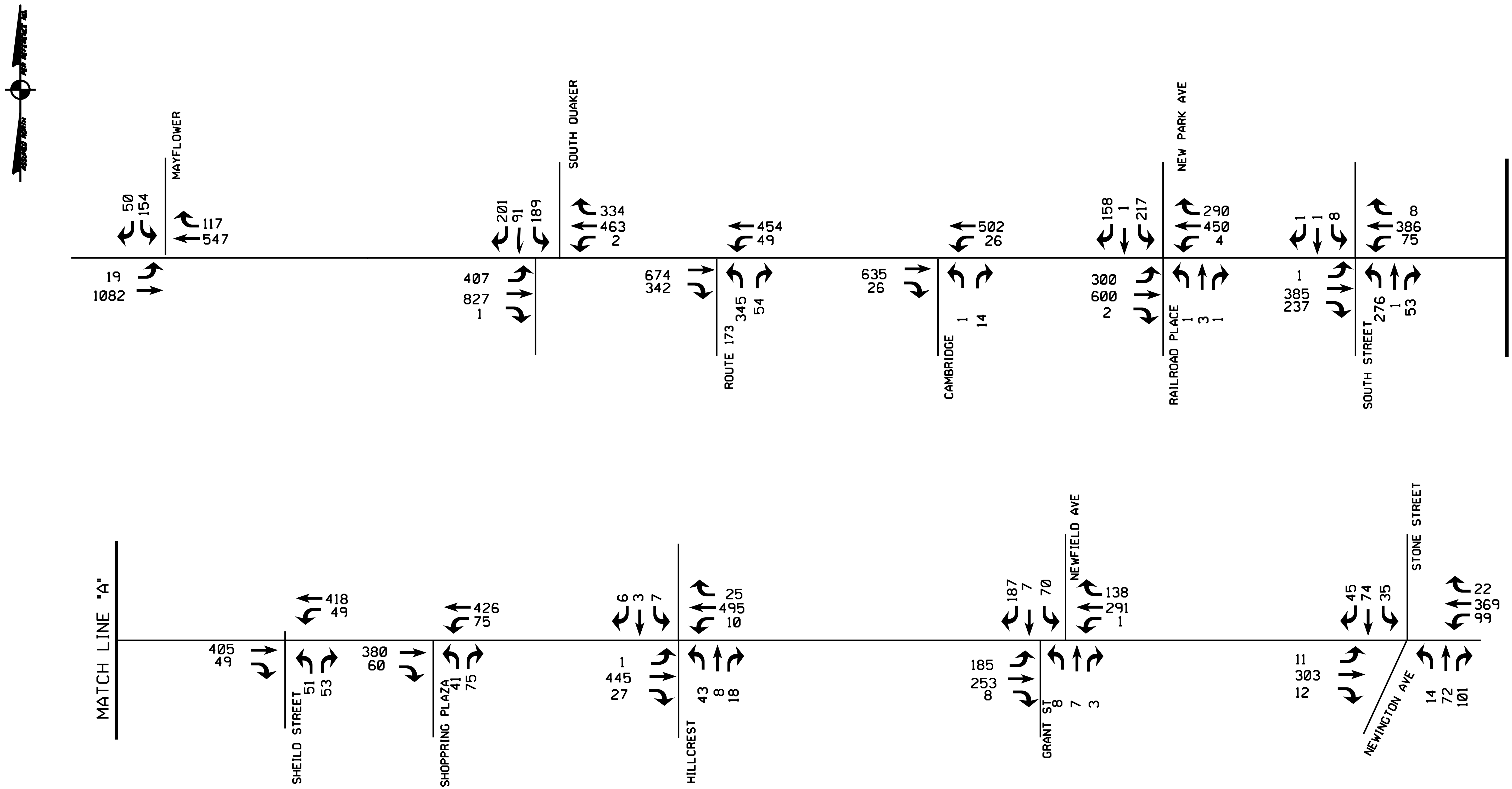
REV. | DATE | REVISION DESCRIPTION | SHEET NO. | Plotted Date: $DATE$ | Filename: $FILE$



DESIGNER/DRAFTER: A. AHUJA	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/BLOCK: OFFICE OF ENGINEERING	PROJECT TITLE: CRCOG REGIONAL SIGNAL COORDINATION
CHECKED BY: J. KEISER		APPROVED BY:	

TOWN:	WEST HARTFORD
DRAWING TITLE:	2018 - 2020 TRAFFIC VOLUMES WEEKEND PEAK HOUR
PROJECT NO.	0171-0421
DRAWING NO.	TMC-34
SHEET NO.	4

REV. | DATE | REVISION DESCRIPTION | SHEET NO. | Plotted Date: $DATE$ | Filename: $FILE$



WEST HARTFORD/ HARTFORD SYSTEM
ROUTE 173 & ROUTE 529

NOT TO SCALE

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date: $DATE$

DESIGNER/DRAFTER: N. JONES

CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILE$

SIGNATURE/BLOCK: OFFICE OF ENGINEERING

APPROVED BY:

PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

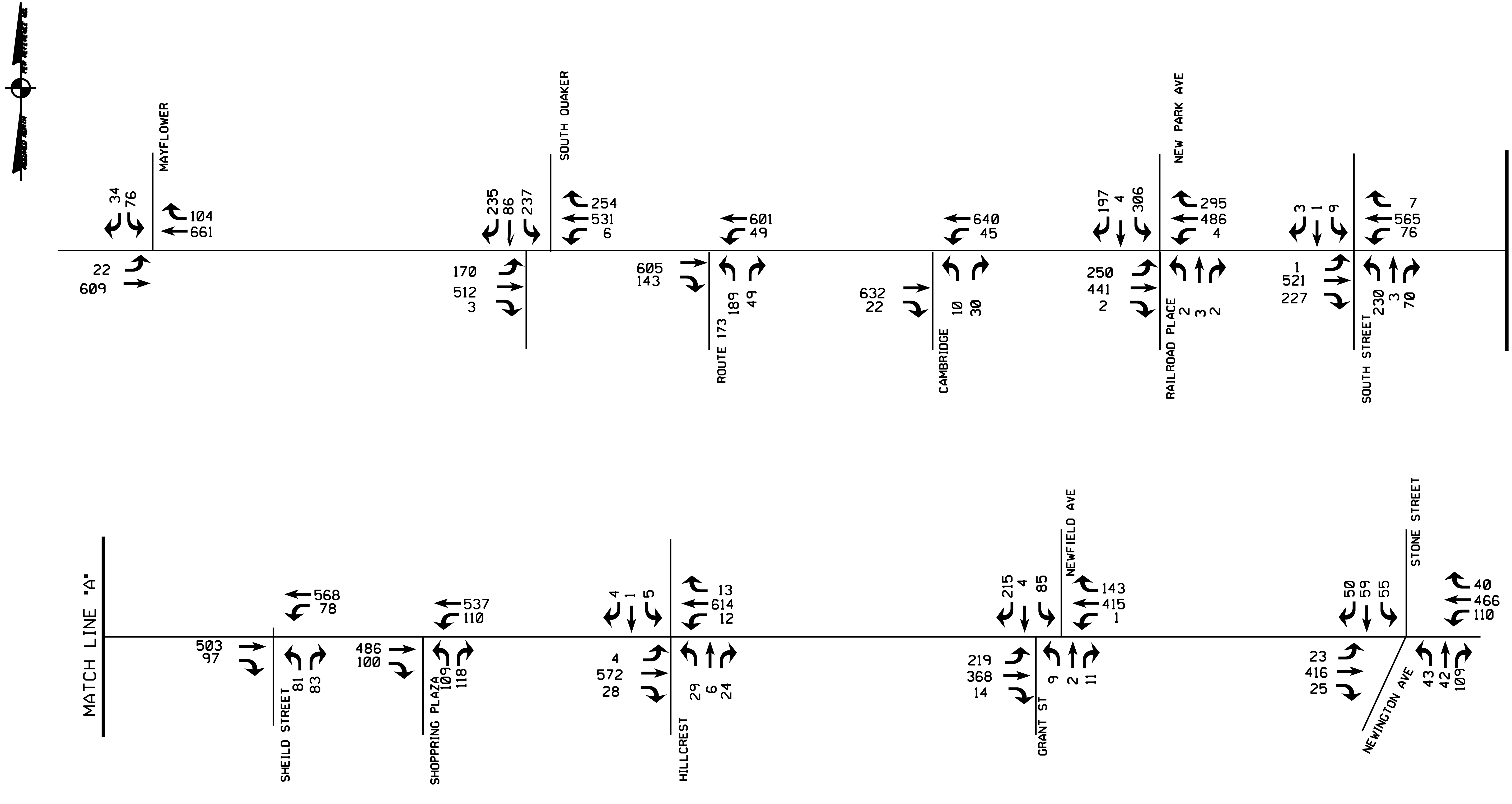
TOWN: WEST HARTFORD HARTFORD

DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES AM PEAK HOUR

PROJECT NO. 0171-0421

DRAWING NO. TMC-XX

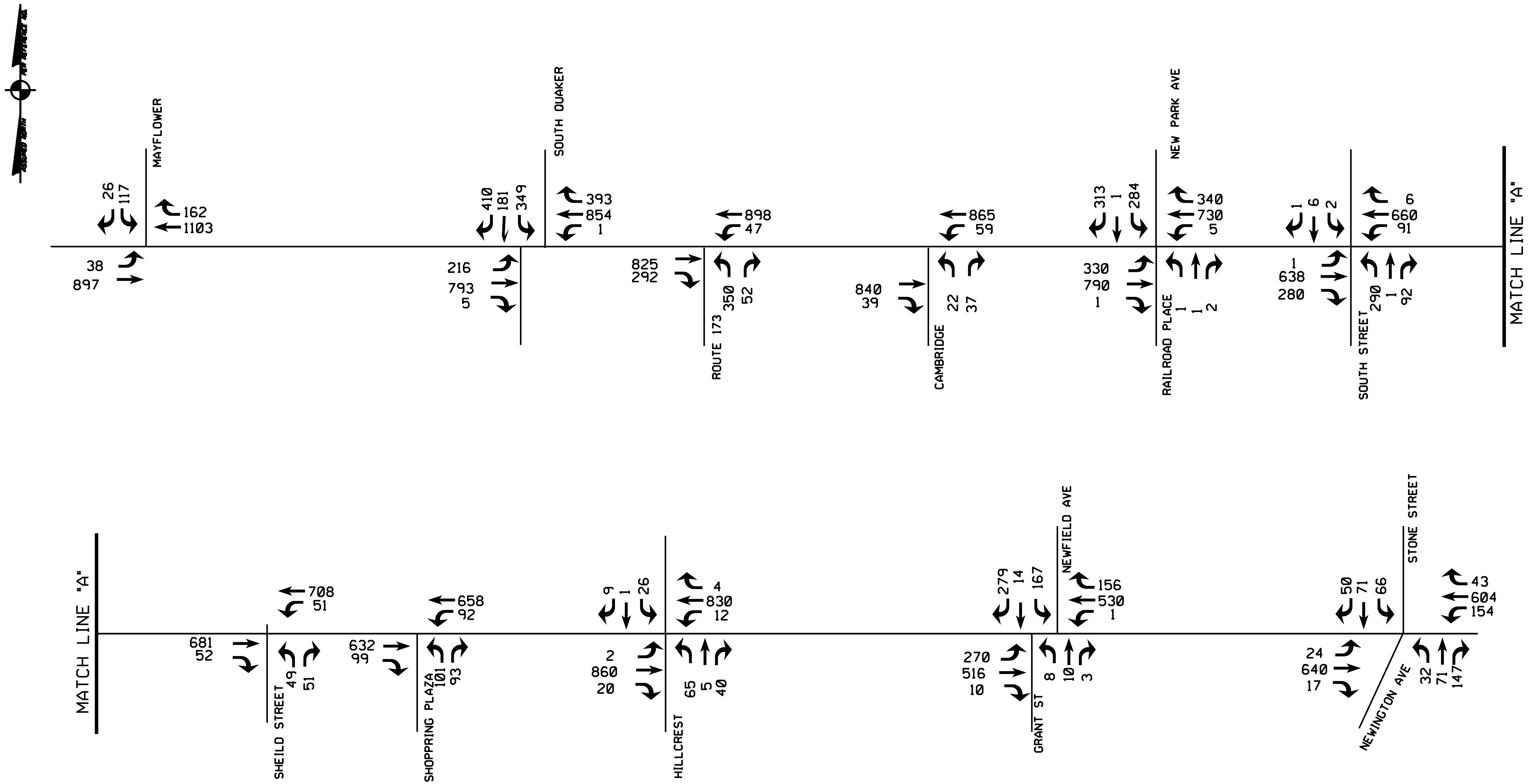
SHEET NO.



WEST HARTFORD/ HARTFORD SYSTEM
ROUTE 173 & ROUTE 529

NOT TO SCALE

DESIGNER/DRAFTER: D. Tompkins CHECKED BY: J. KEISER	STATE OF CONNECTICUT DEPARTMENT OF TRANSPORTATION	SIGNATURE/BLOCK: OFFICE OF ENGINEERING APPROVED BY:	PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION	TOWN: WEST HARTFORD HARTFORD DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES MIDDAY PEAK HOUR
REV. DATE REVISION DESCRIPTION SHEET NO.	Plotted Date:$DATE$ Filename: $FILE$			PROJECT NO. 0171-0421 DRAWING NO. TMC-XX SHEET NO.



WEST HARTFORD/ HARTFORD SYSTEM
ROUTE 173 & ROUTE 529

NOT TO SCALE

REV.	DATE	REVISION DESCRIPTION	SHEET NO.

Plotted Date: $DATE$

DESIGNER/DRAFTER: D. Tompkins
CHECKED BY: J. KEISER

STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Filename: $FILEA$

SIGNATURE/BLOCK:
OFFICE OF ENGINEERING
APPROVED BY:

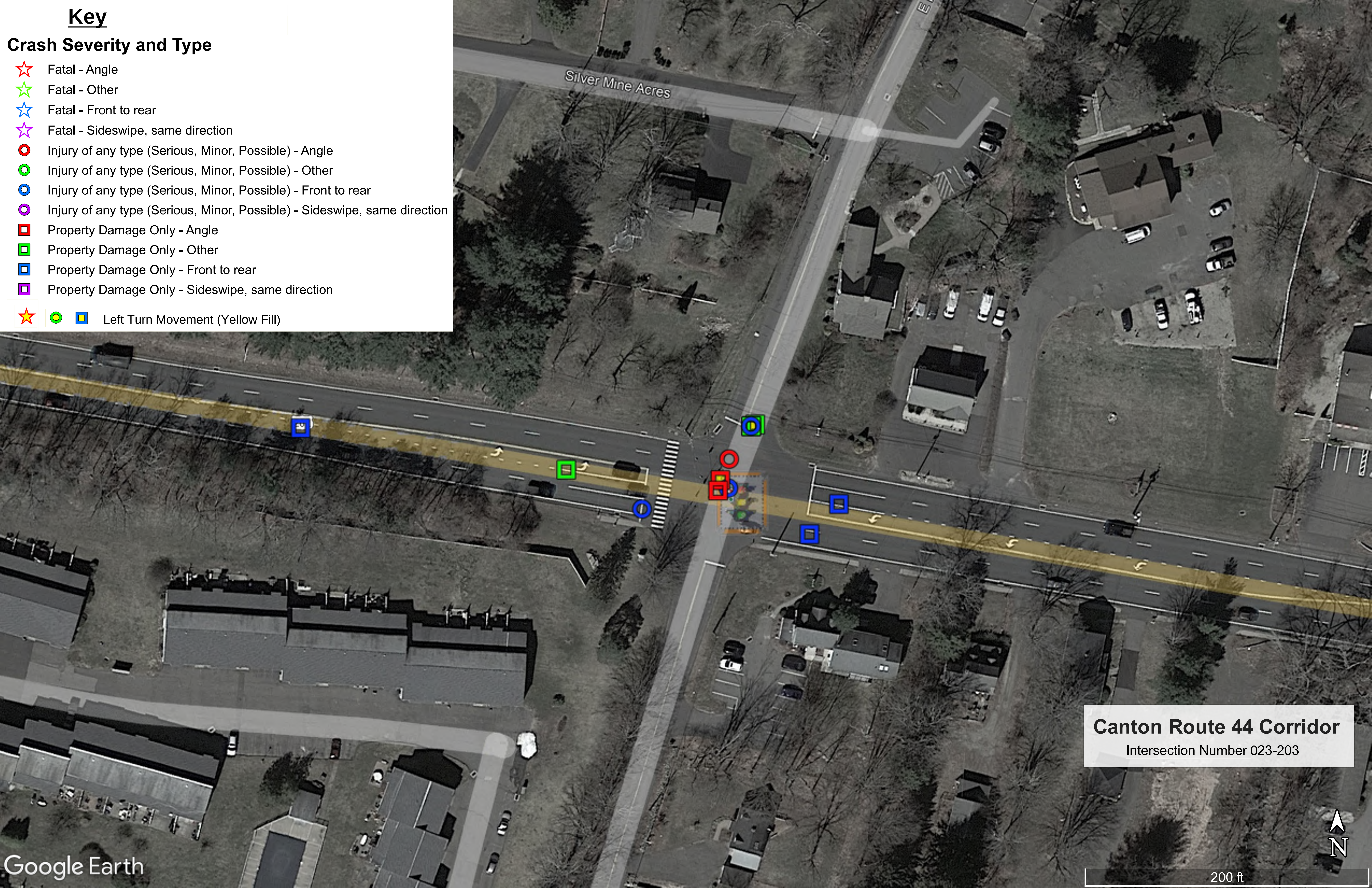
PROJECT TITLE: CRCOG REGION SIGNAL COORDINATION

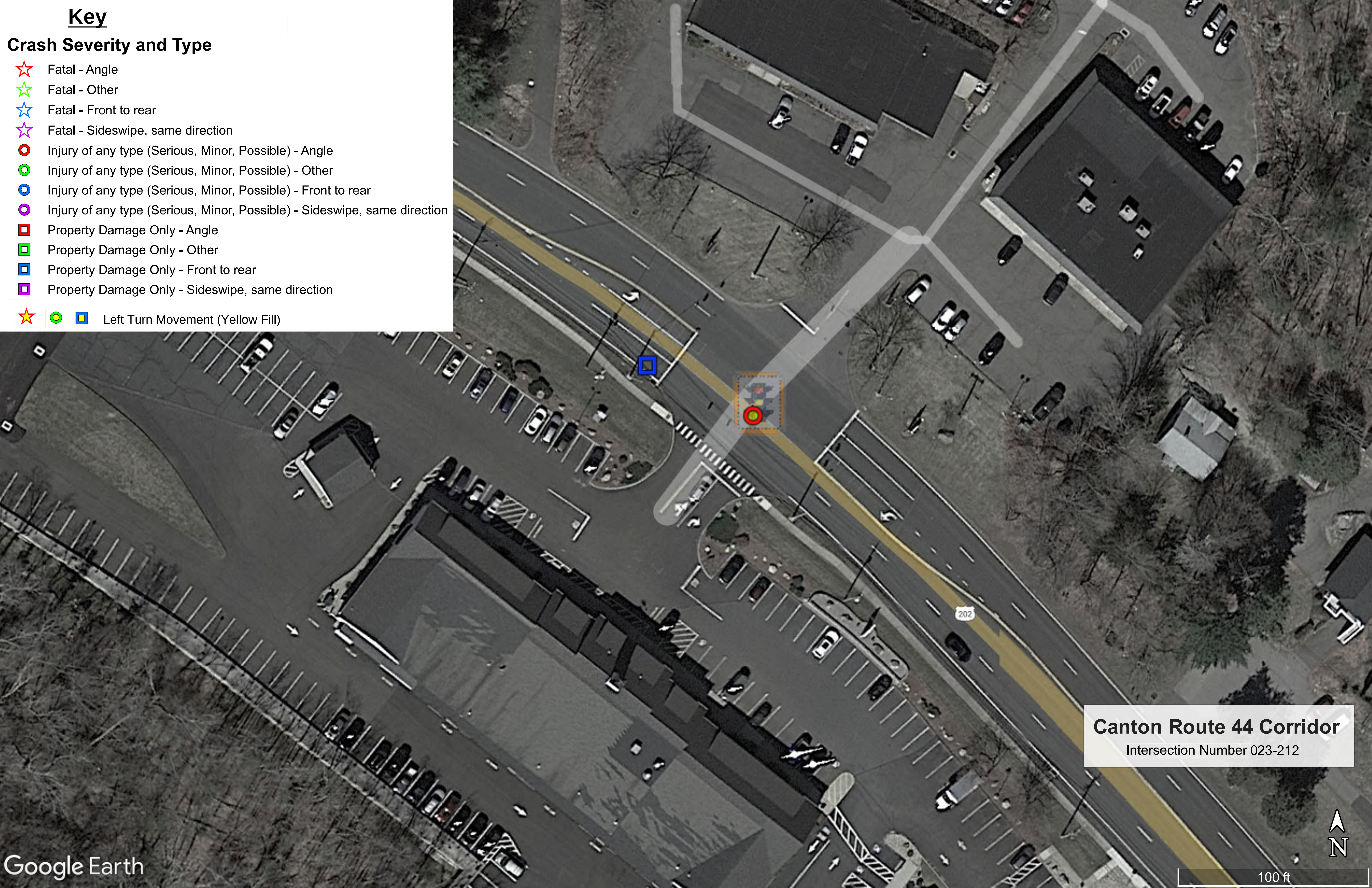
TOWN: WEST HARTFORD HARTFORD

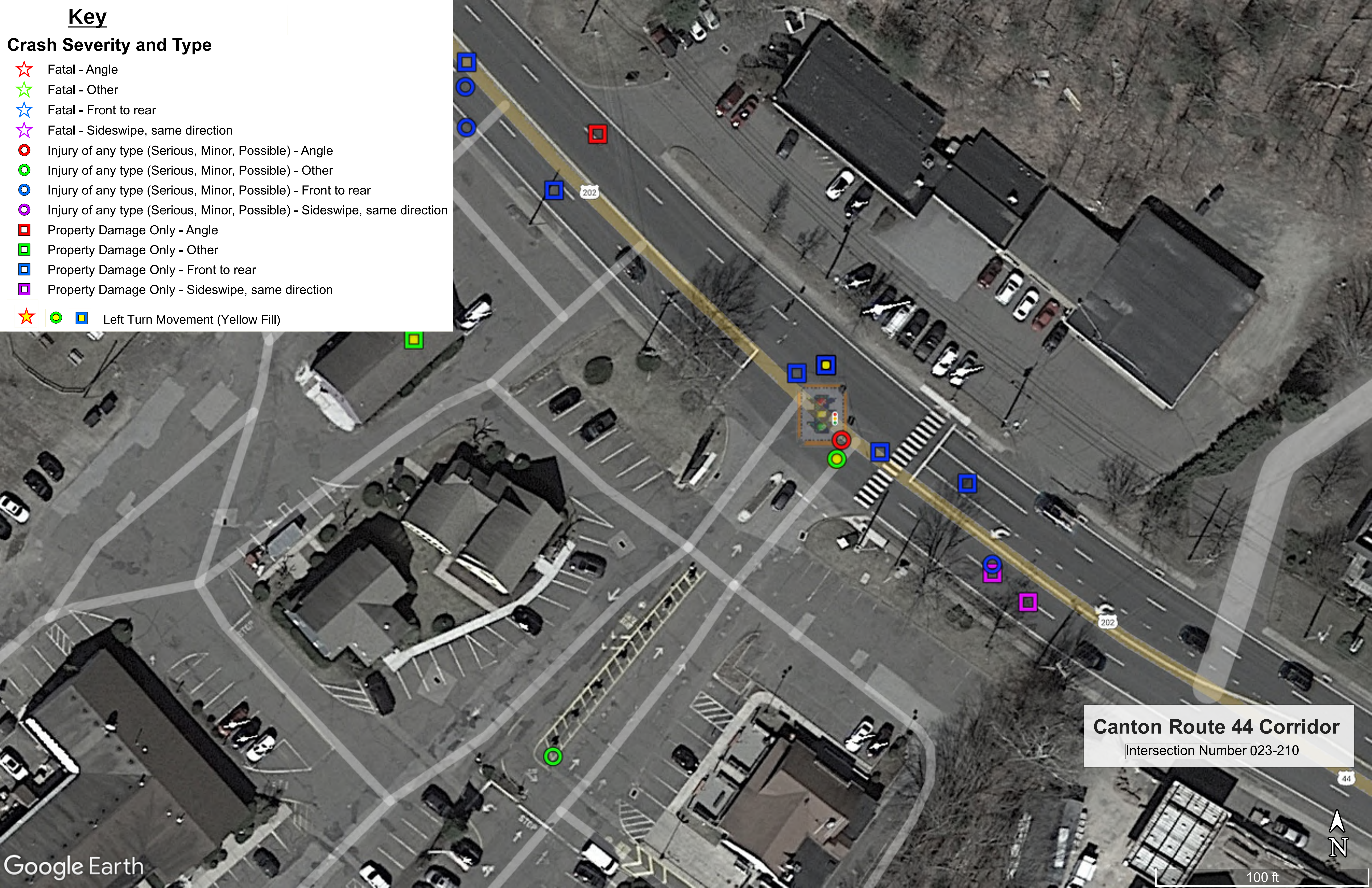
DRAWING TITLE: 2018 - 2020 TRAFFIC VOLUMES PM PEAK HOUR

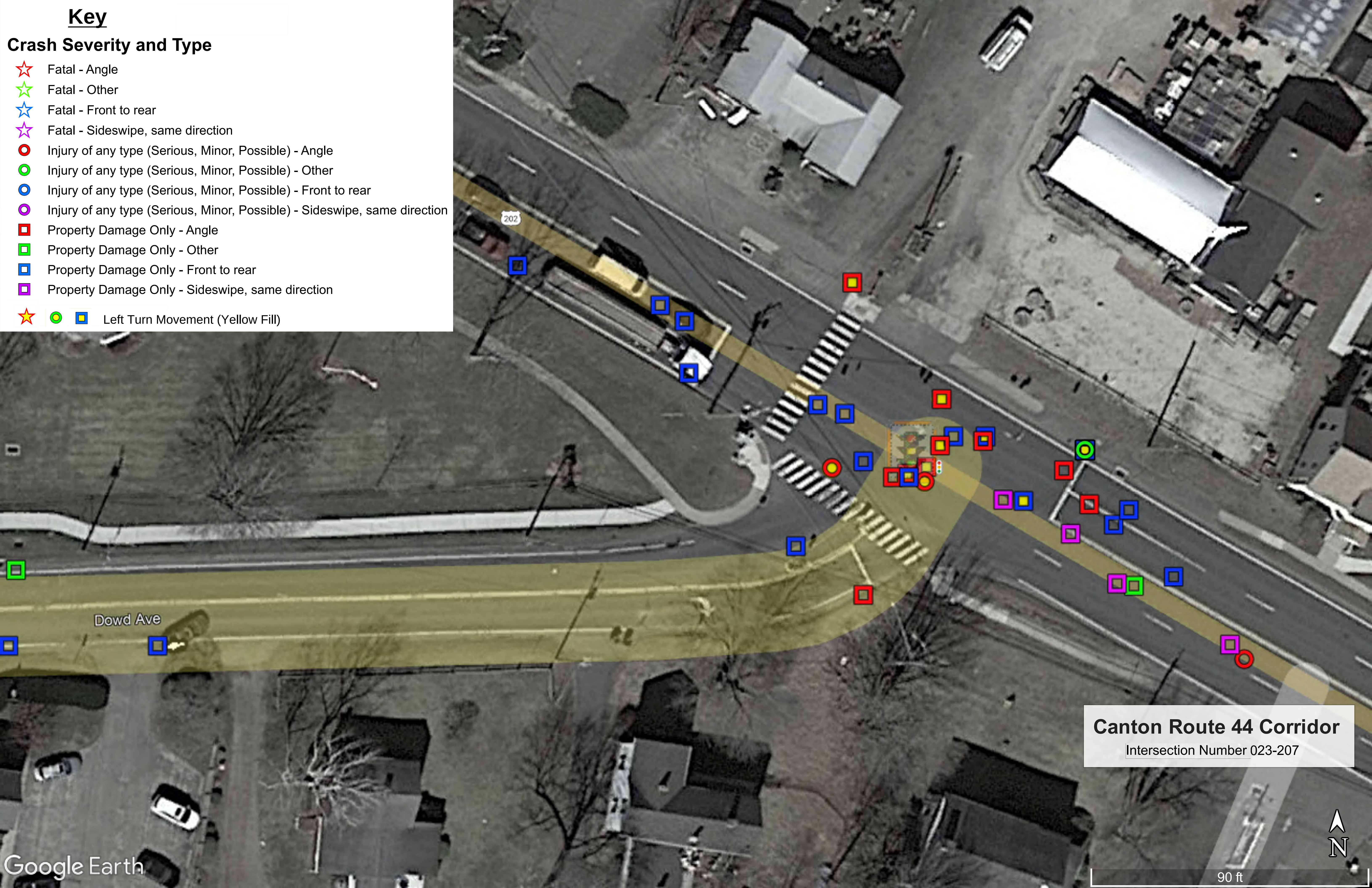
PROJECT NO. 0171-0421
DRAWING NO. TMC-XX
SHEET NO.

Appendix D
Phase 3 Crash Diagrams

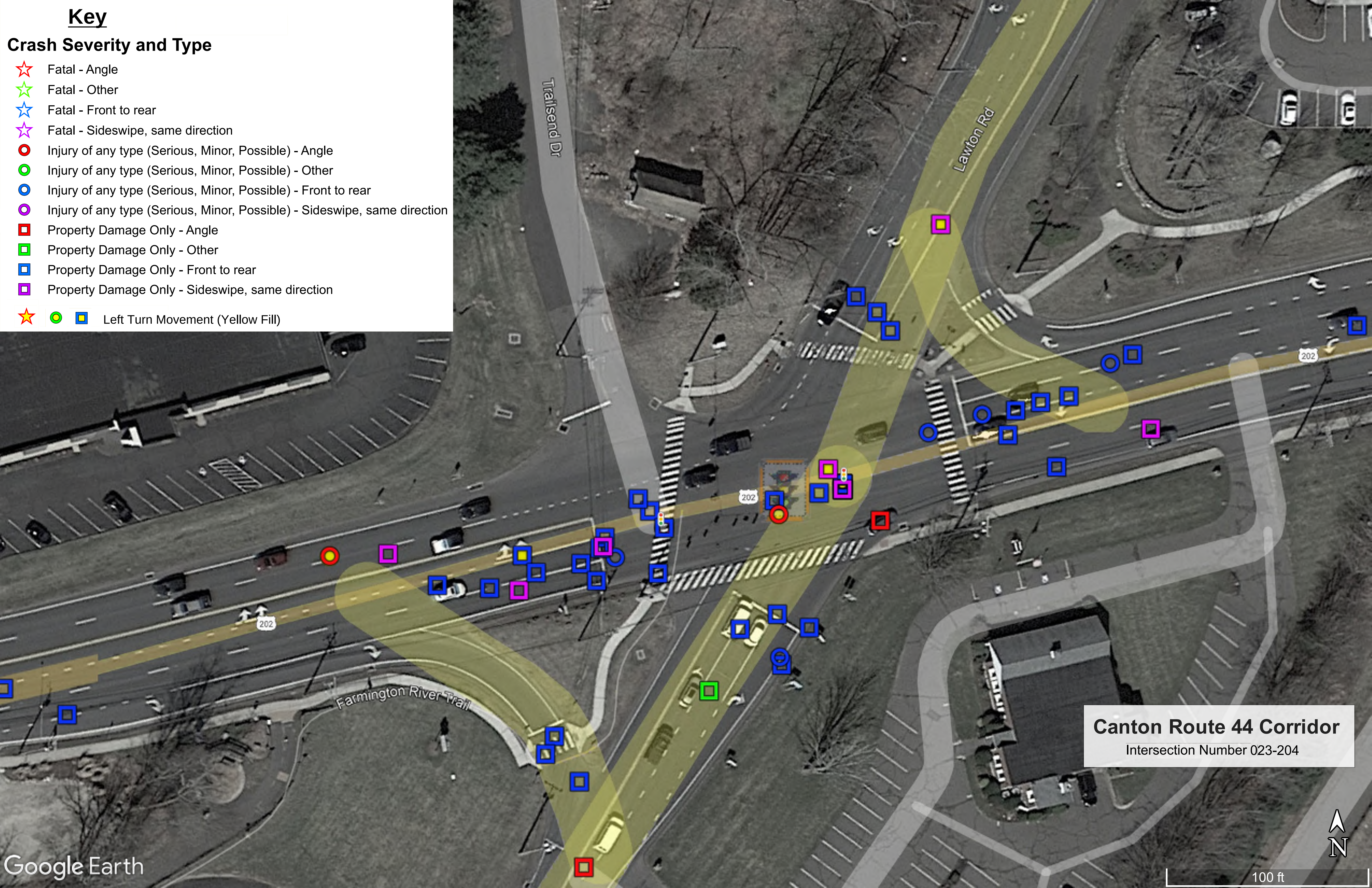

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Silver Mine Acres
Canton Route 44 Corridor
Intersection Number 023-203
N
200 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
202
Canton Route 44 Corridor
Intersection Number 023-212
N
100 ft
Google Earth

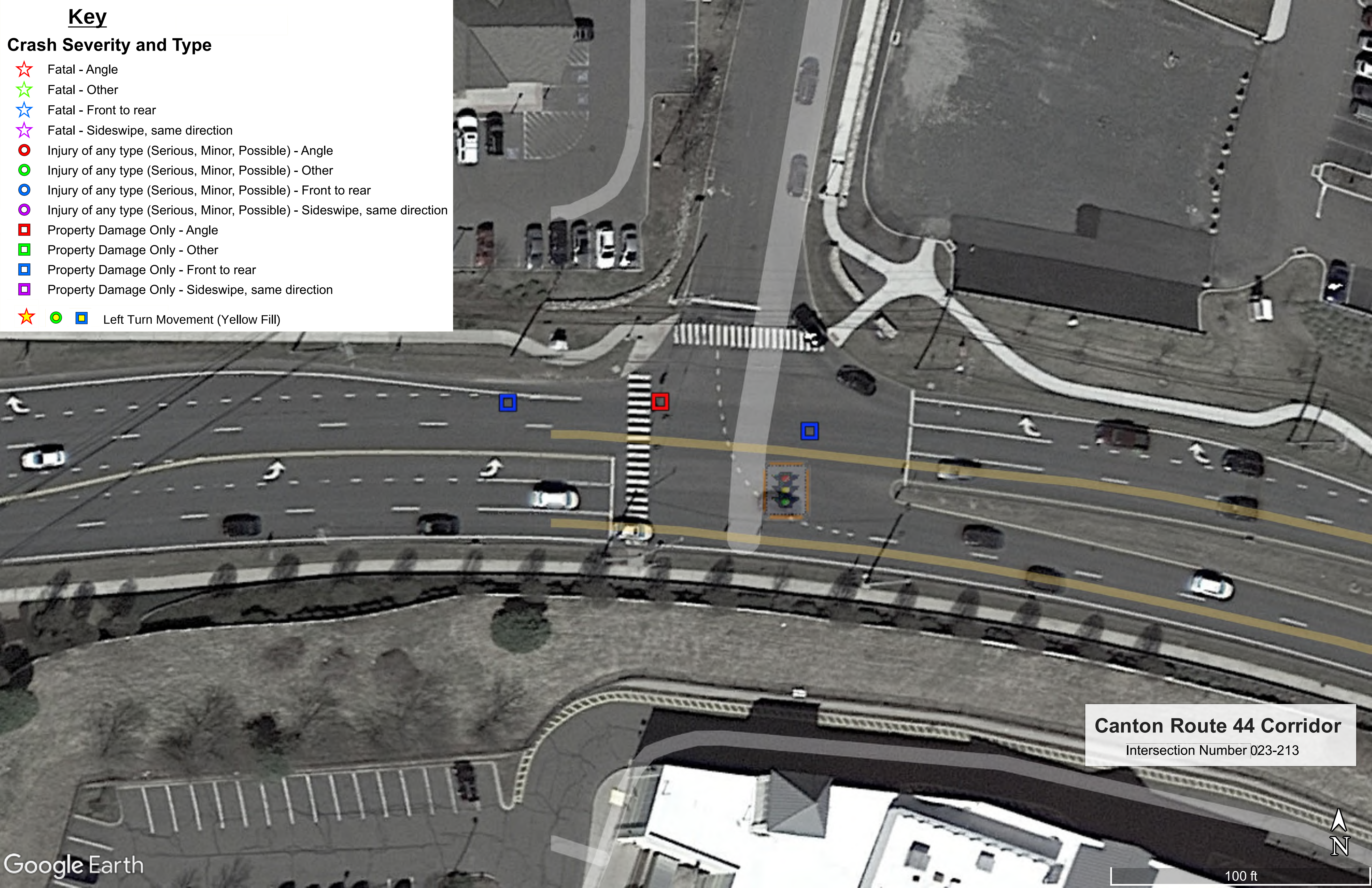

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
202
202
44
Canton Route 44 Corridor
Intersection Number 023-210
N
100 ft
Google Earth

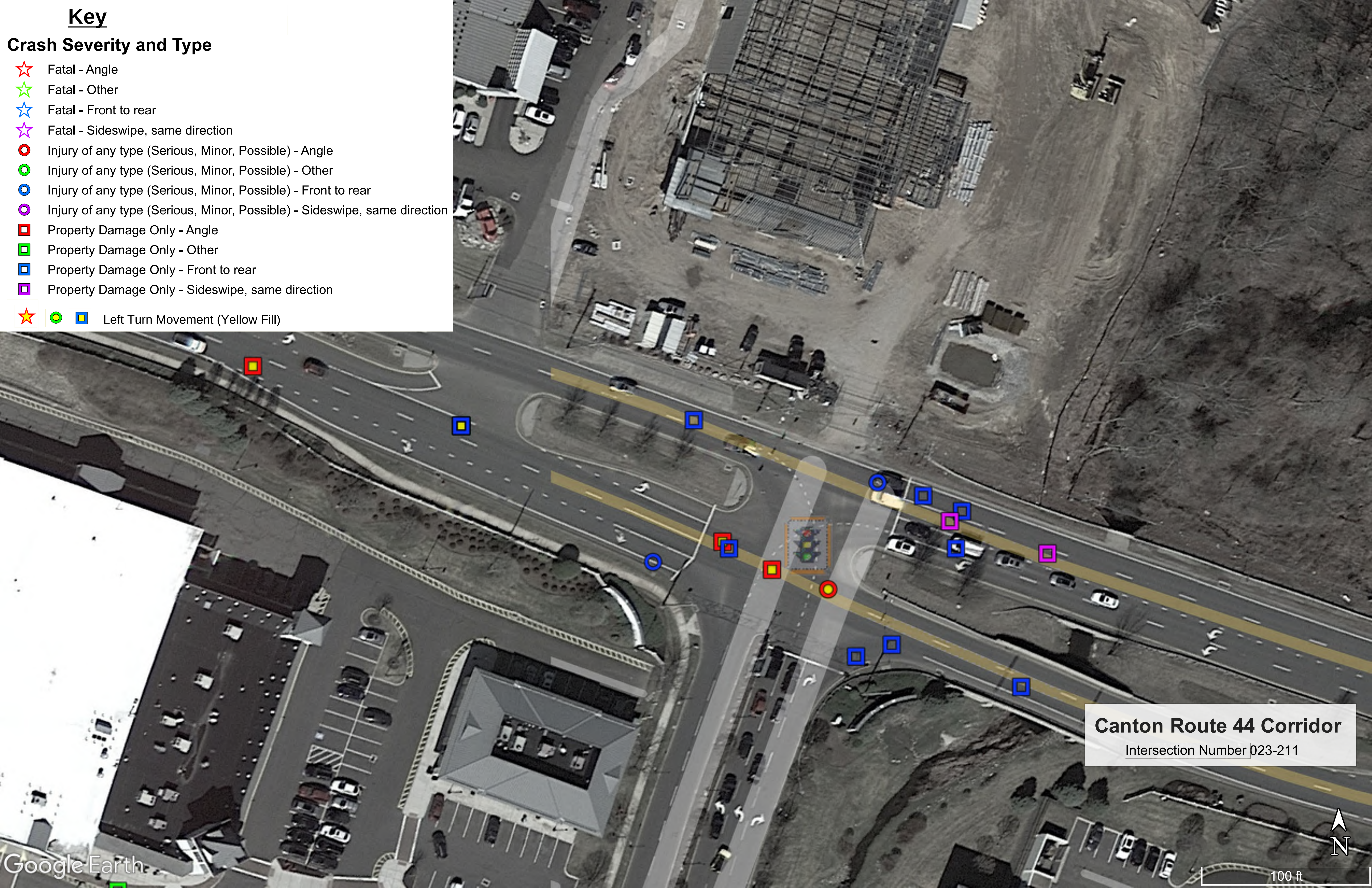


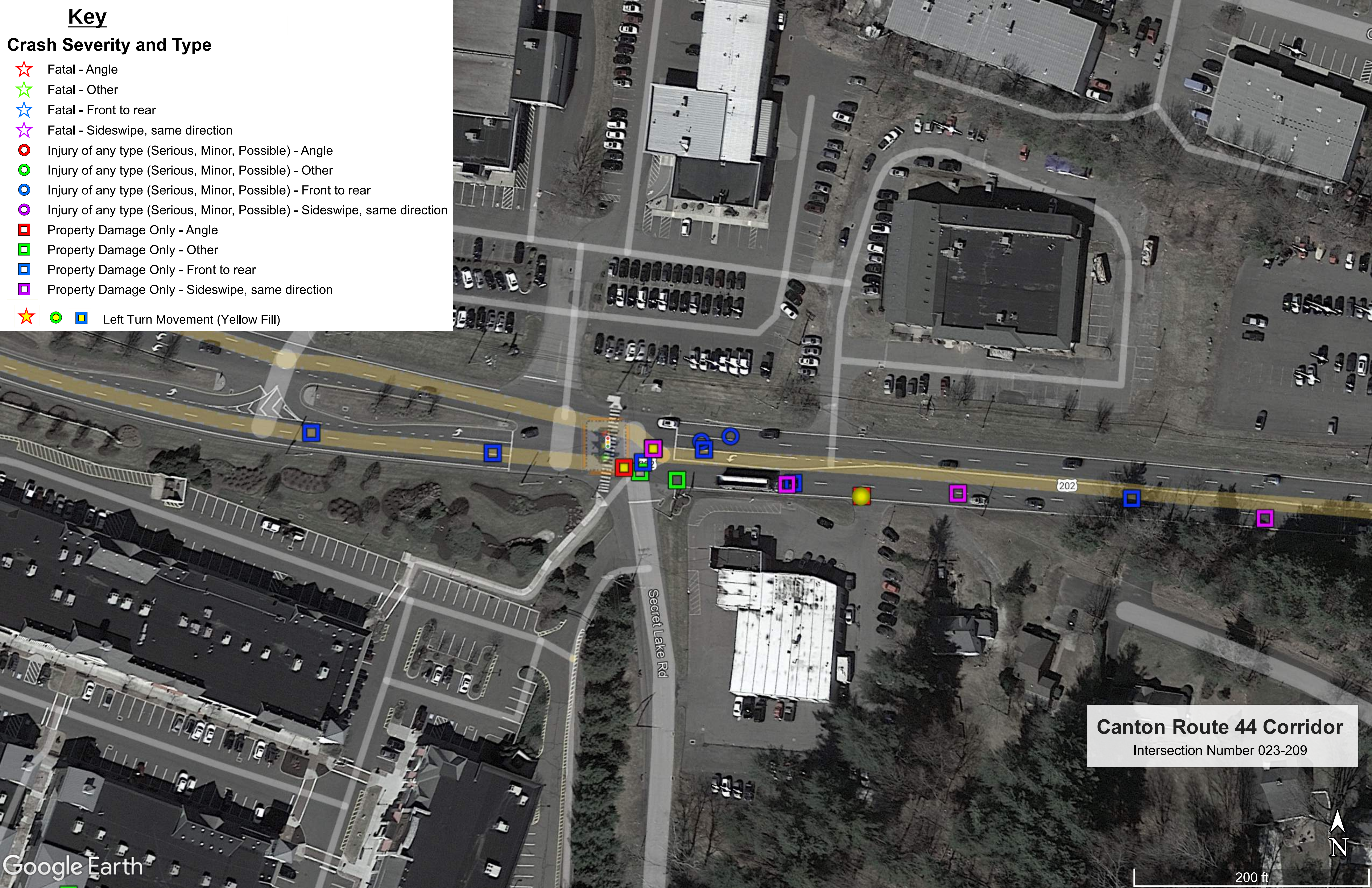
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
202
Dowd Ave
Canton Route 44 Corridor
Intersection Number 023-207
N
90 ft
Google Earth

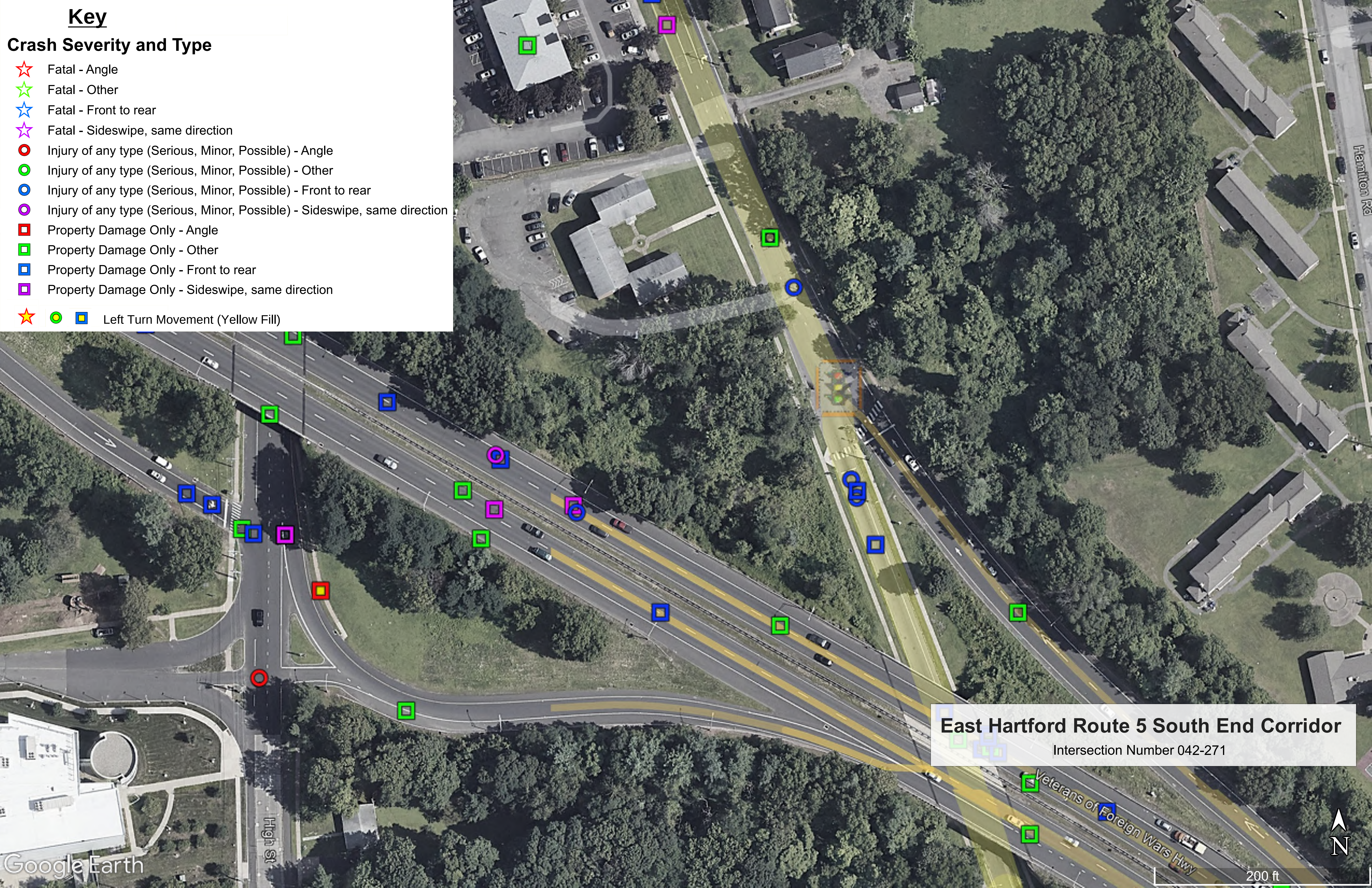


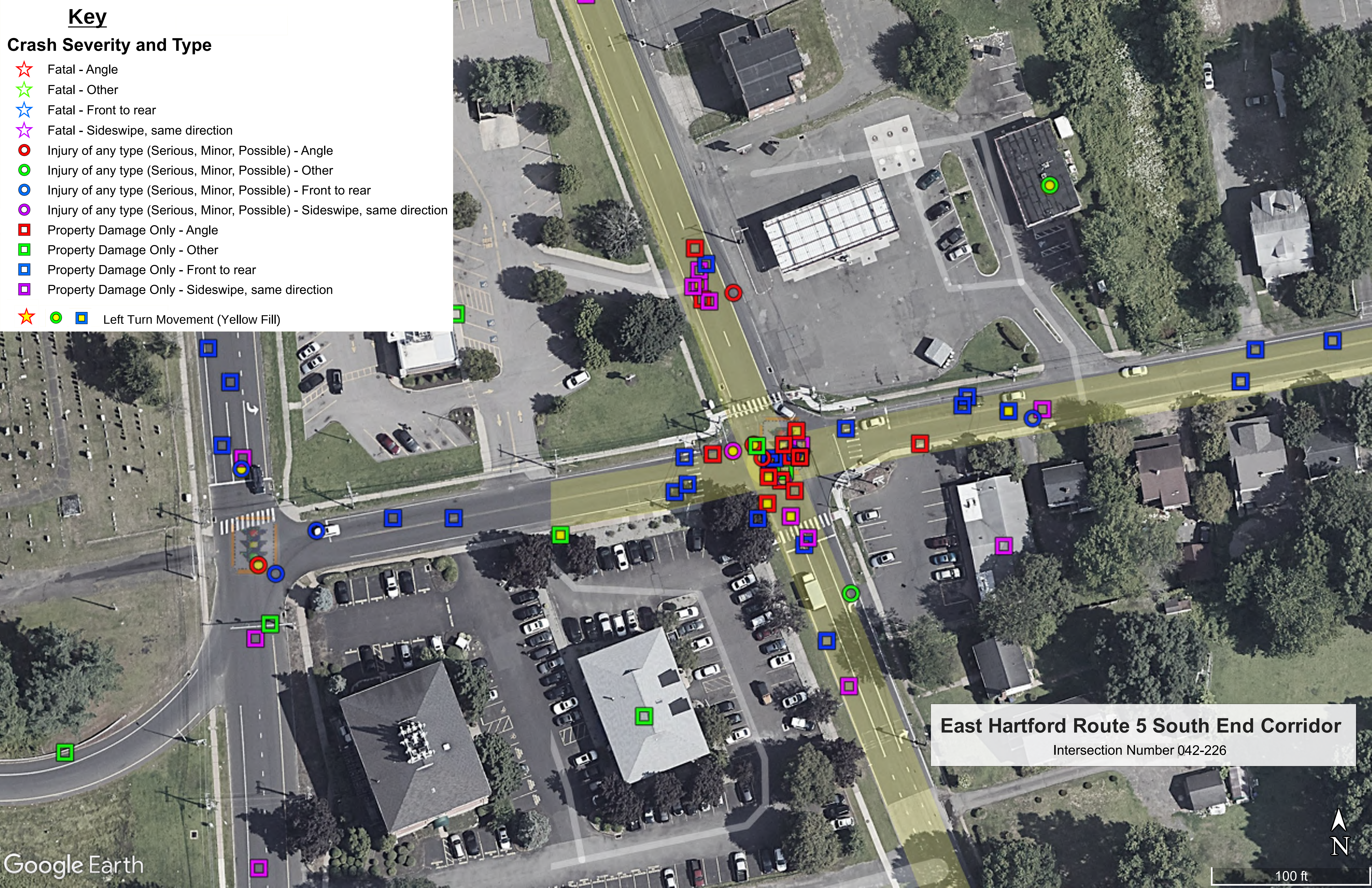
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Trailsend Dr
Lawton Rd
202
Farmington River Trail
Canton Route 44 Corridor
Intersection Number 023-204
N
100 ft
Google Earth

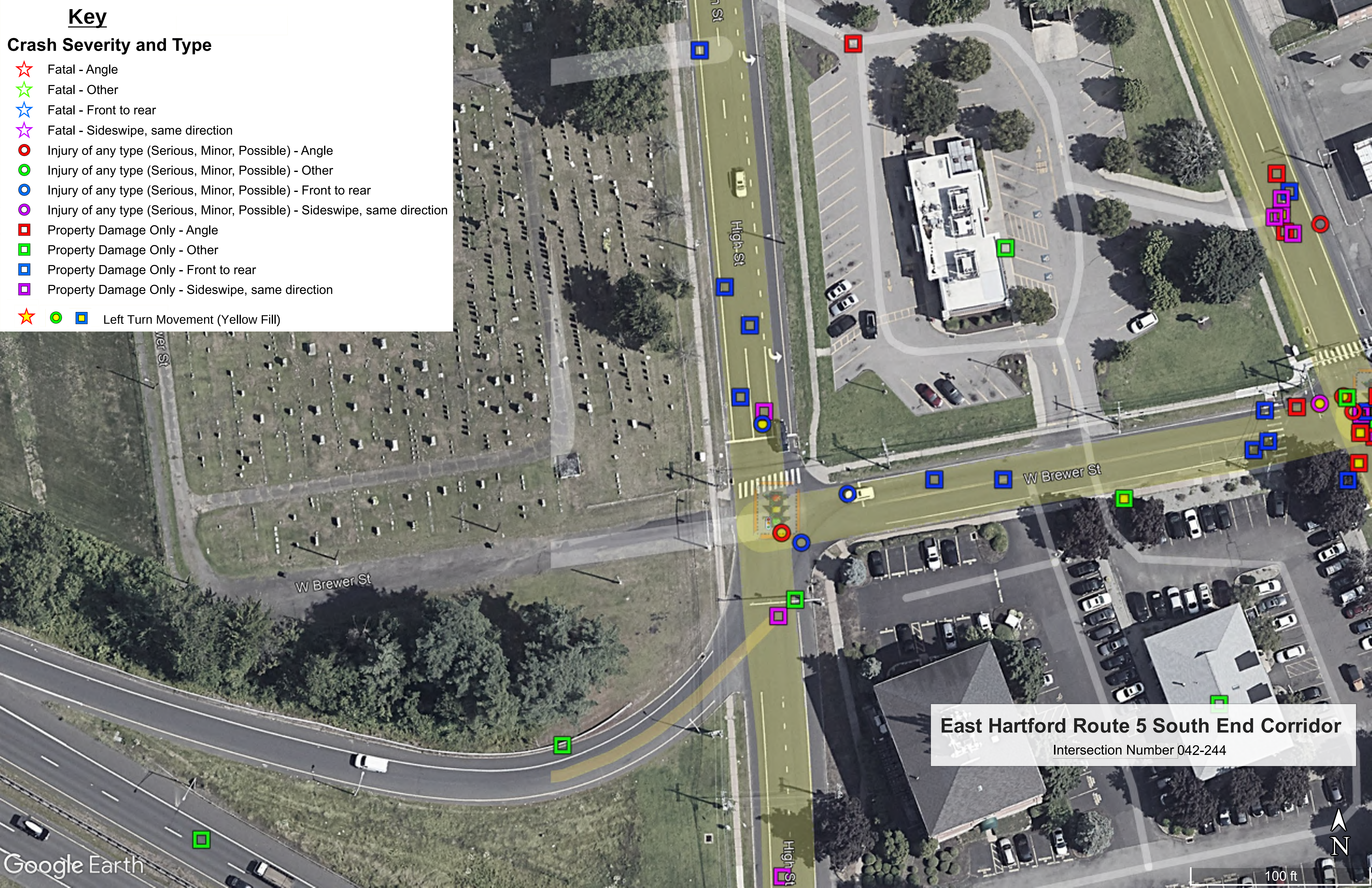

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Canton Route 44 Corridor
Intersection Number 023-213
Google Earth
N
100 ft

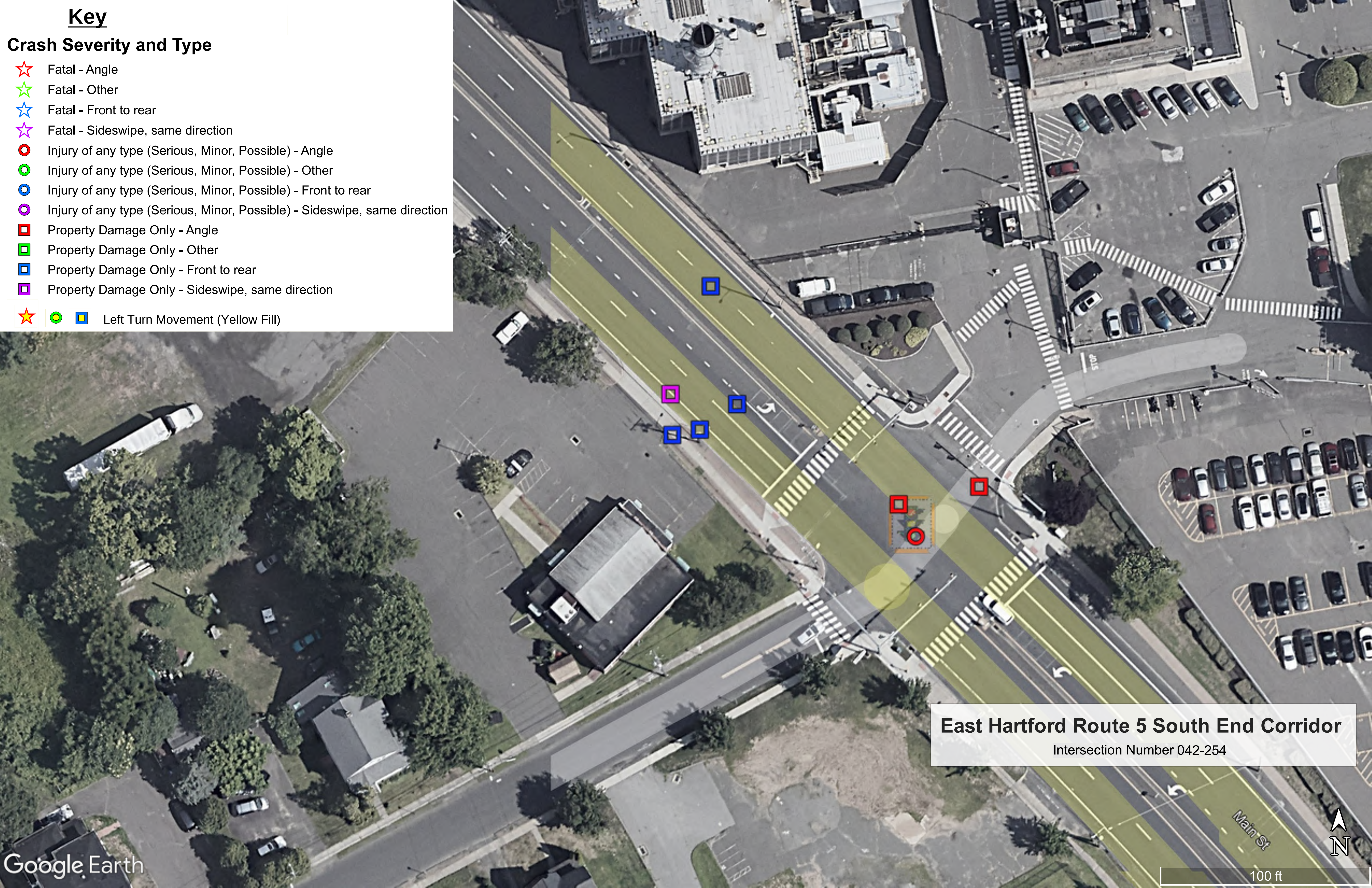

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Canton Route 44 Corridor
Intersection Number 023-211
N
100 ft
Google Earth

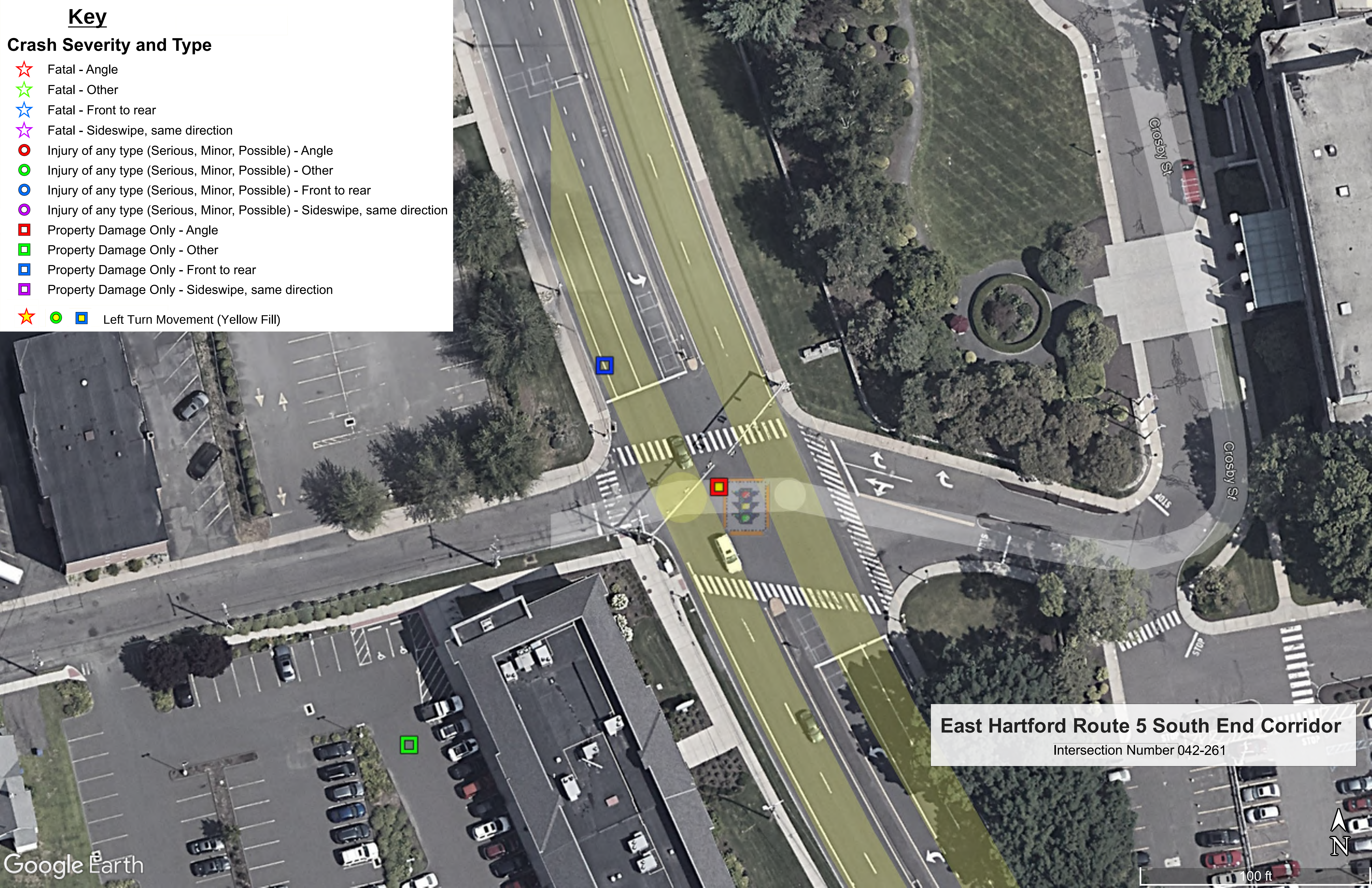

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Secret Lake Rd
202
Canton Route 44 Corridor
Intersection Number 023-209
N
200 ft
Google Earth

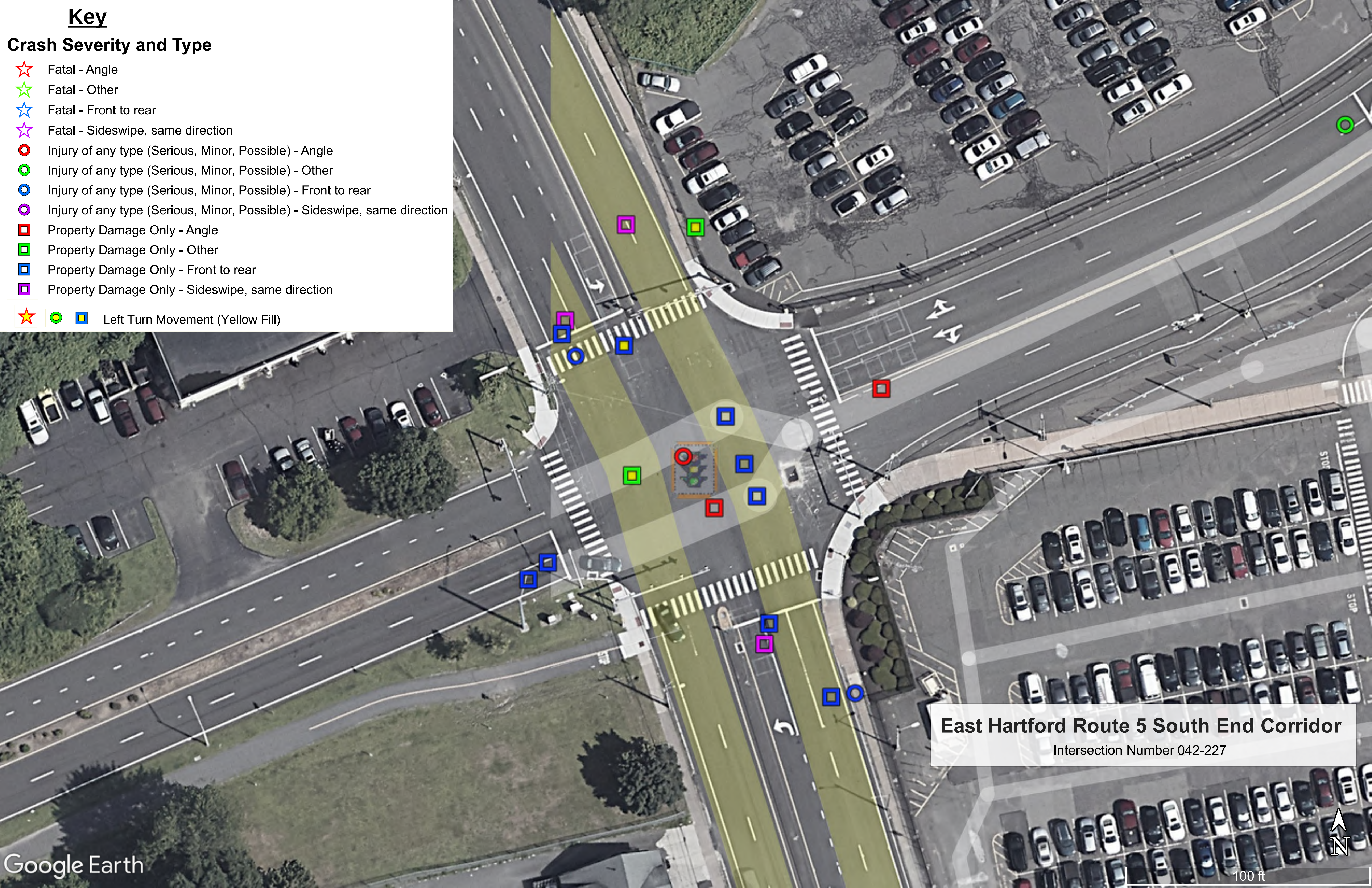

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 South End Corridor
Intersection Number 042-271
Hamilton Rd
High St
Veterans of Foreign Wars Hwy
Google Earth
N
200 ft

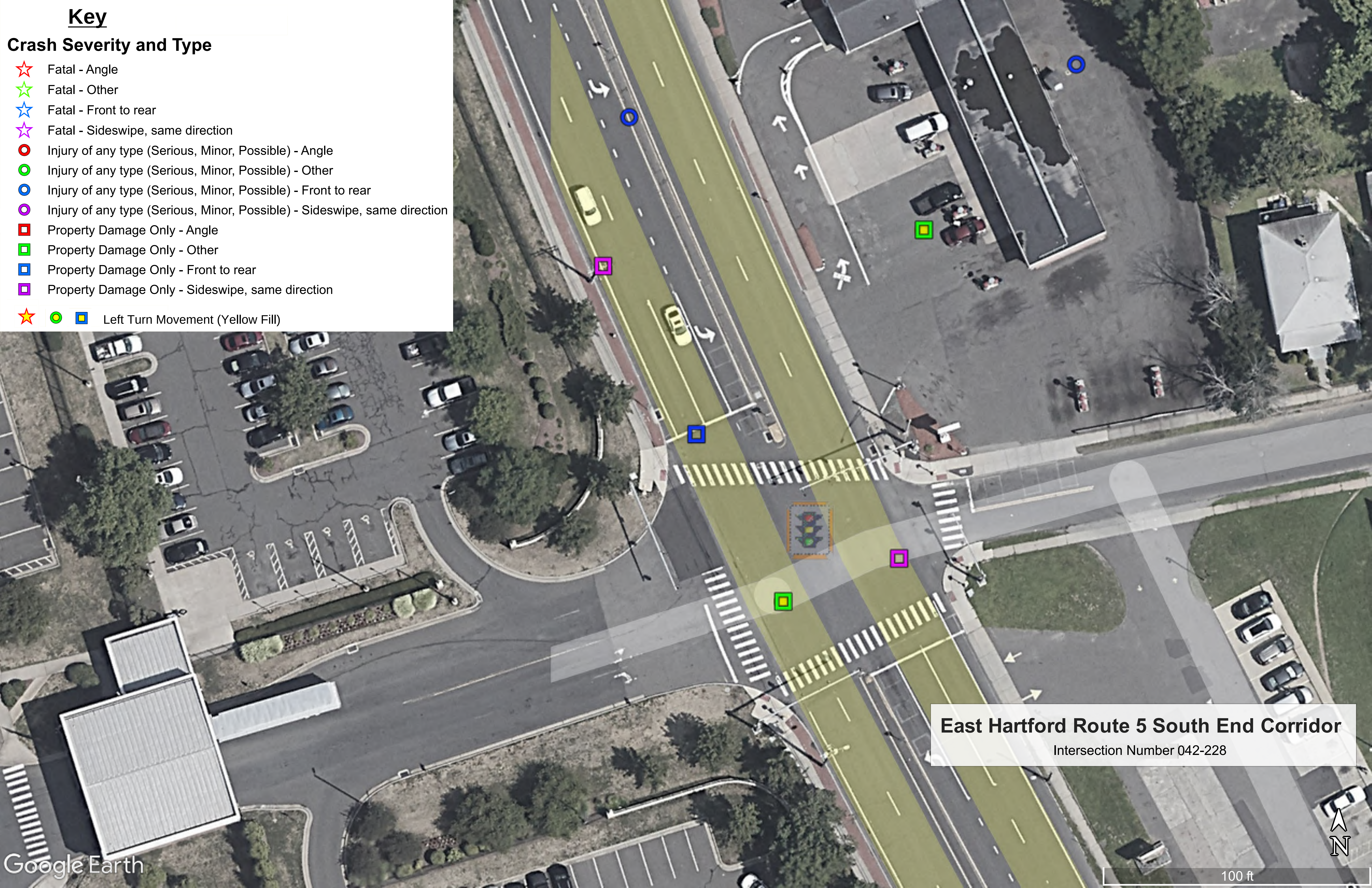

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 South End Corridor
Intersection Number 042-226
Google Earth
N
100 ft


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
High St
W Brewer St
W Brewer St
High St
East Hartford Route 5 South End Corridor
Intersection Number 042-244
100 ft
N
Google Earth

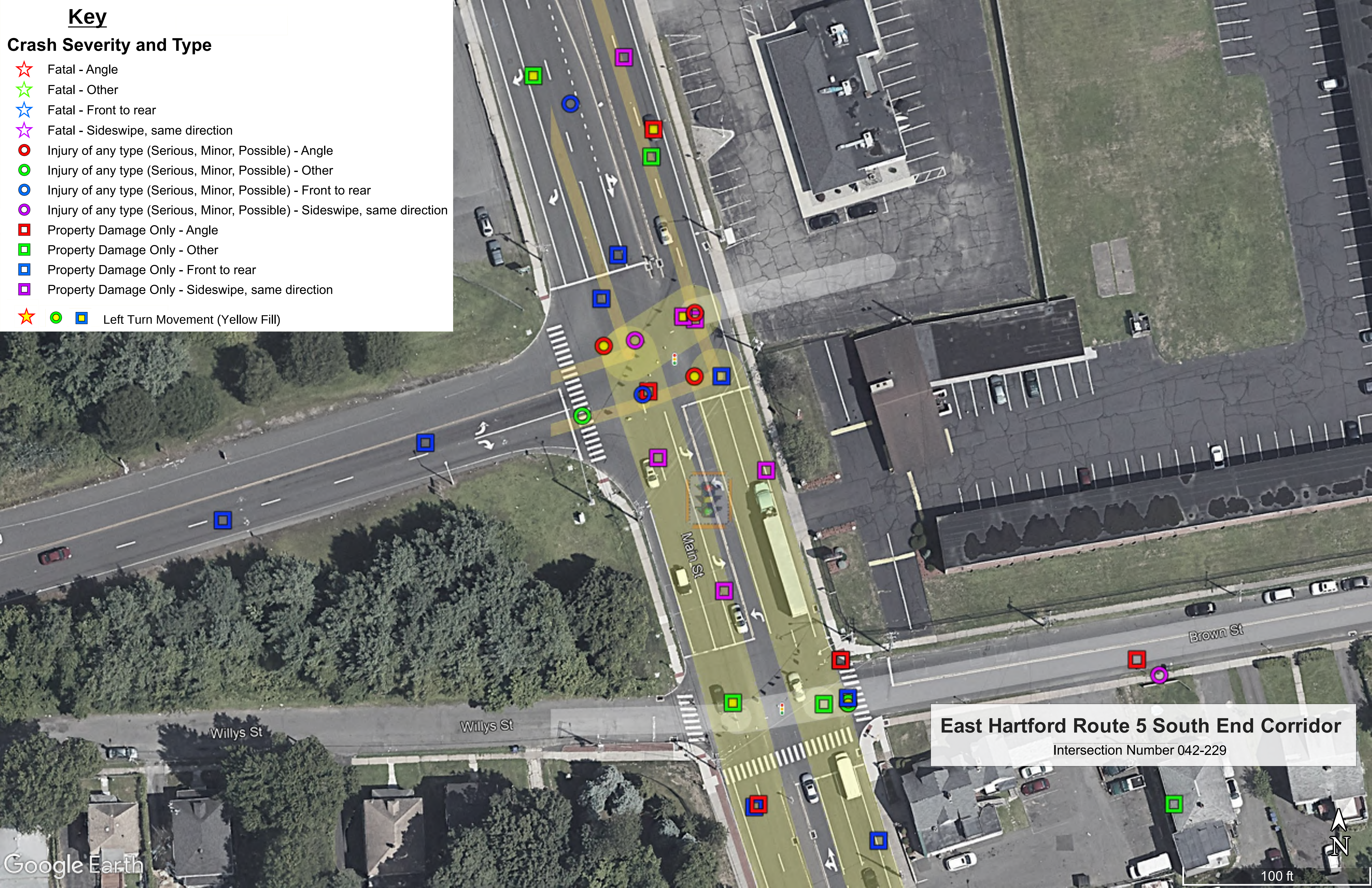

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 South End Corridor
Intersection Number 042-254
Main St
N
100 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Crosby St
Crosby St
East Hartford Route 5 South End Corridor
Intersection Number 042-261
N
100 ft
Google Earth

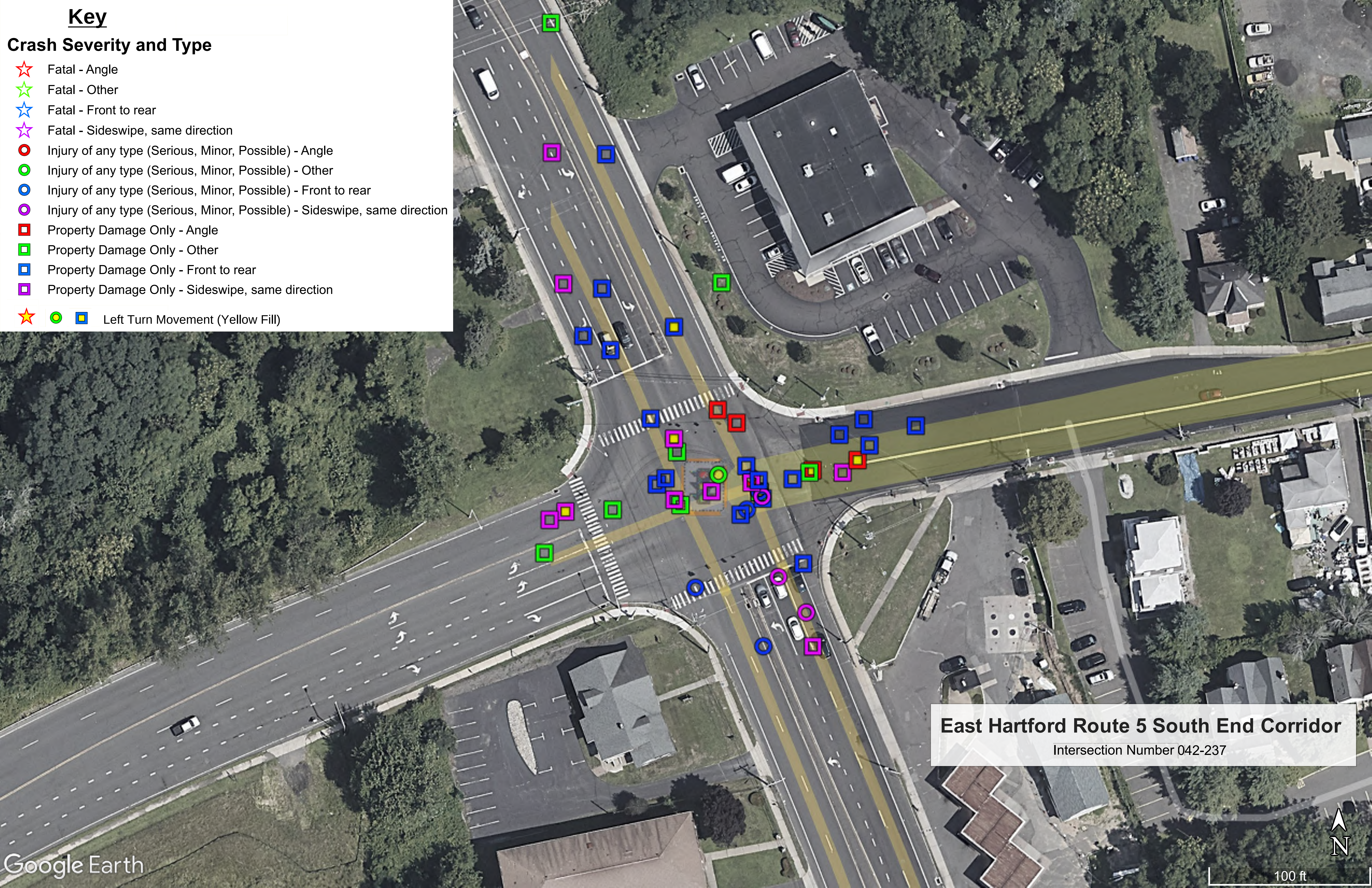

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 South End Corridor
Intersection Number 042-227
N
100 ft
Google Earth

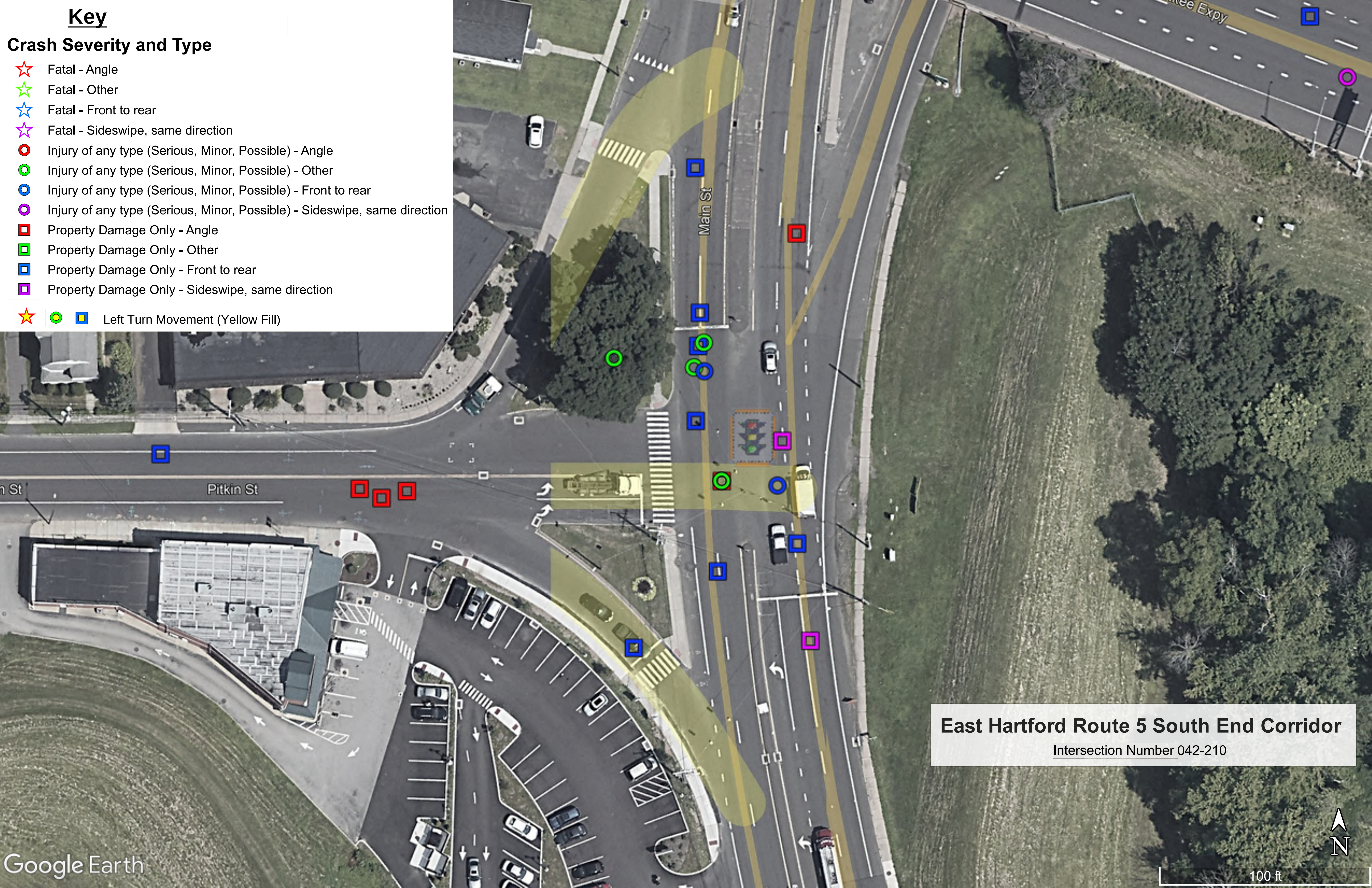


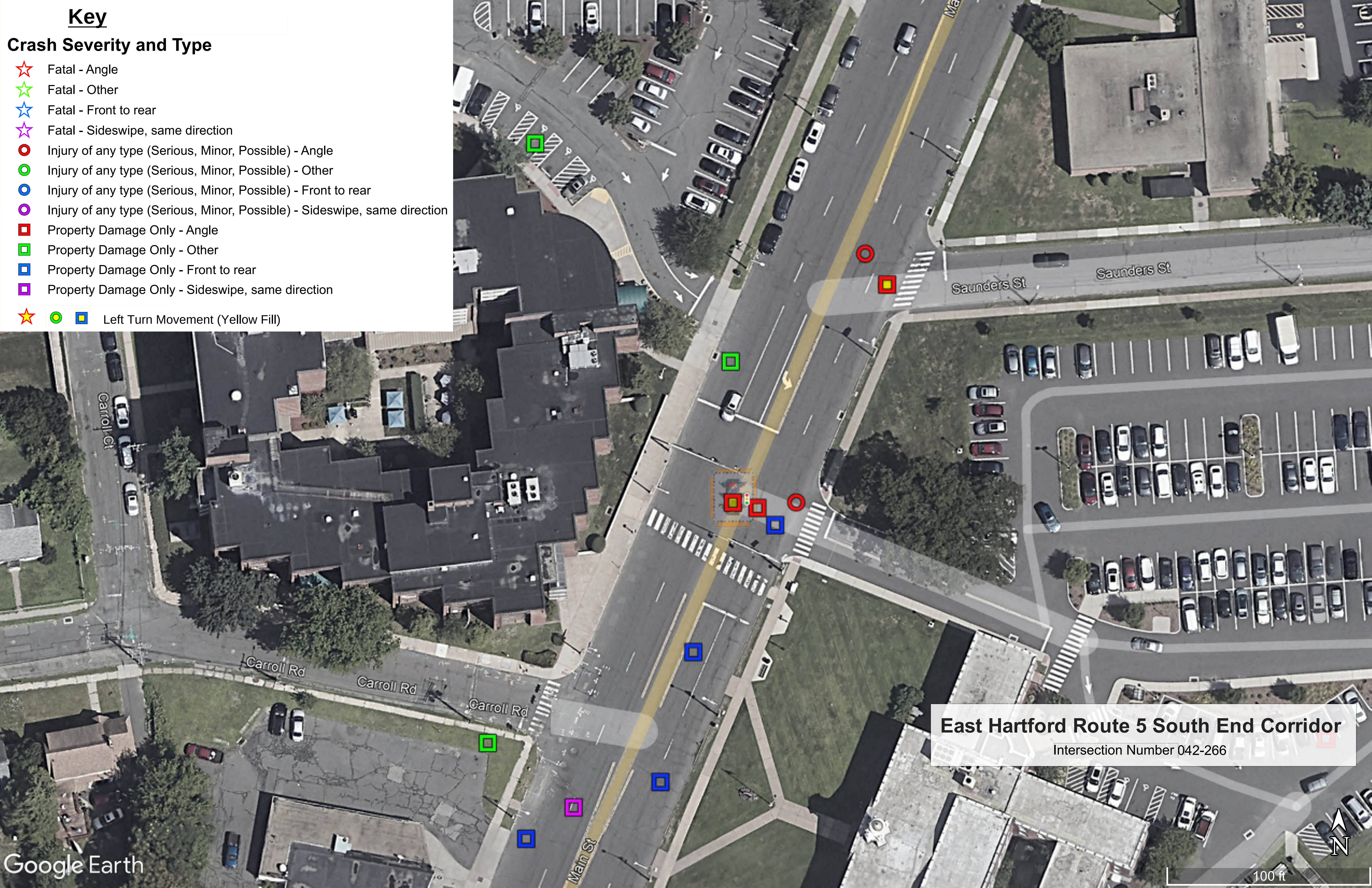
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 South End Corridor
Intersection Number 042-228
Google Earth
100 ft
N

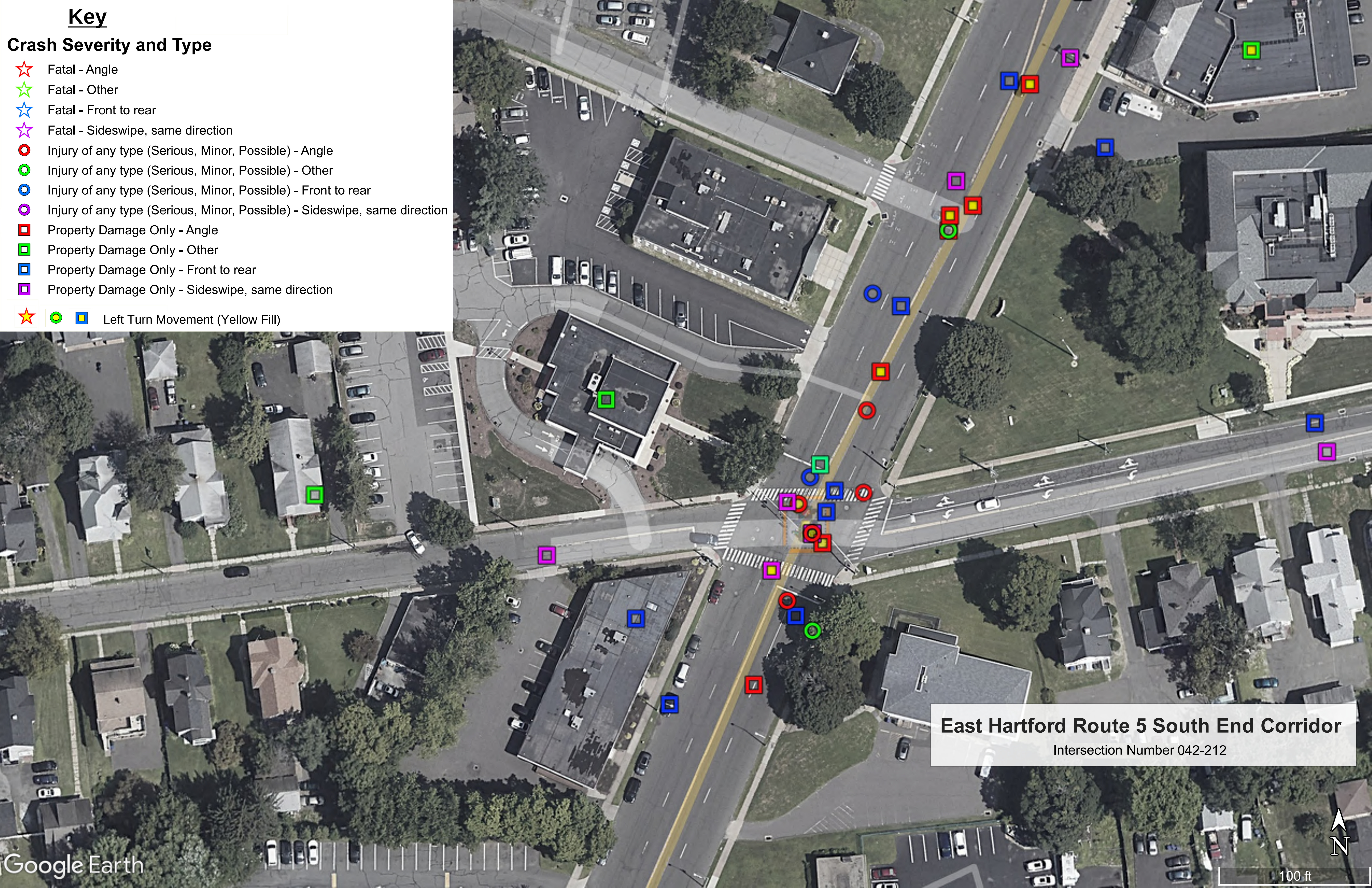


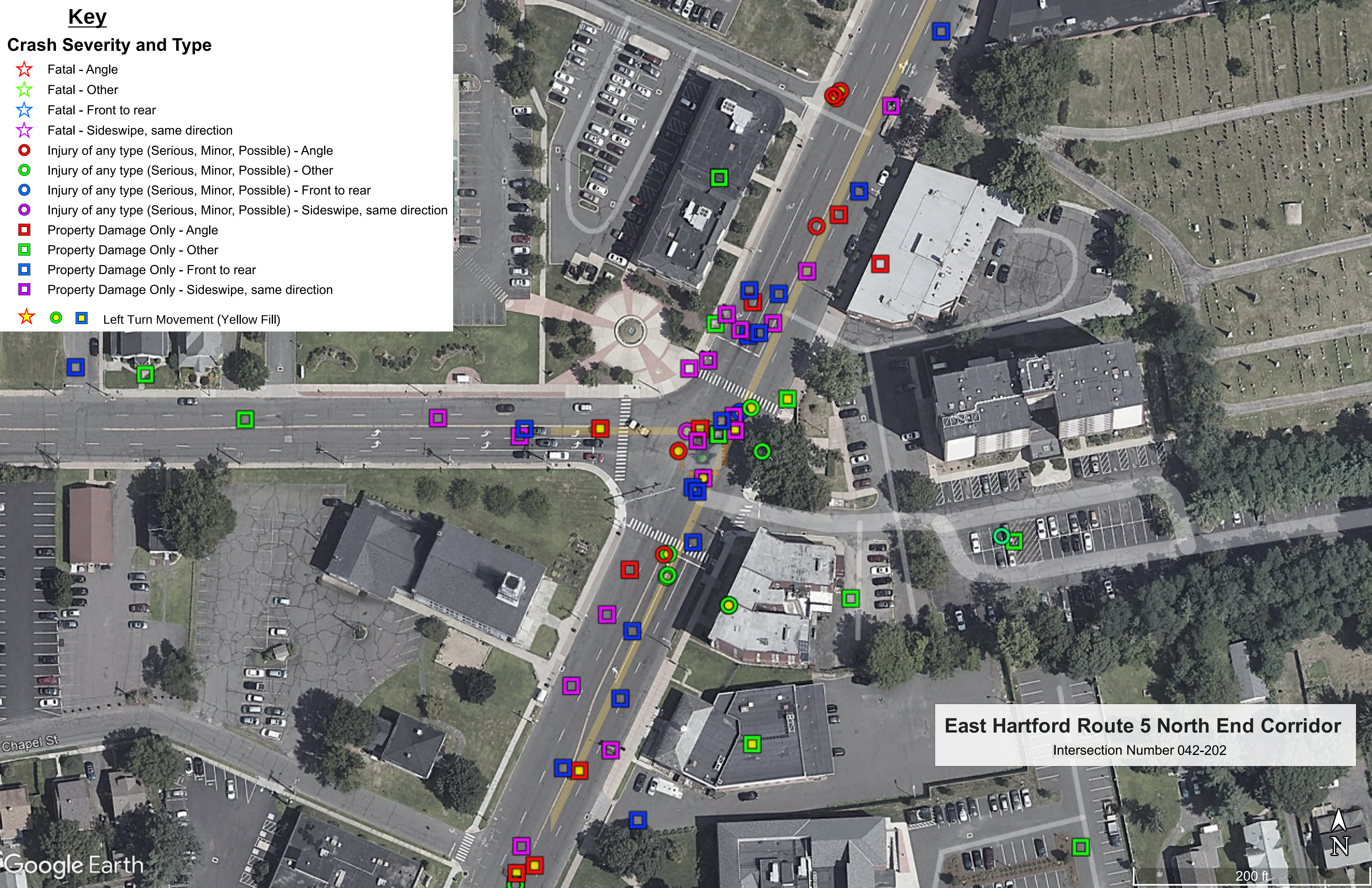
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Main St
Brown St
Willys St
East Hartford Route 5 South End Corridor
Intersection Number 042-229
N
100 ft
Google Earth

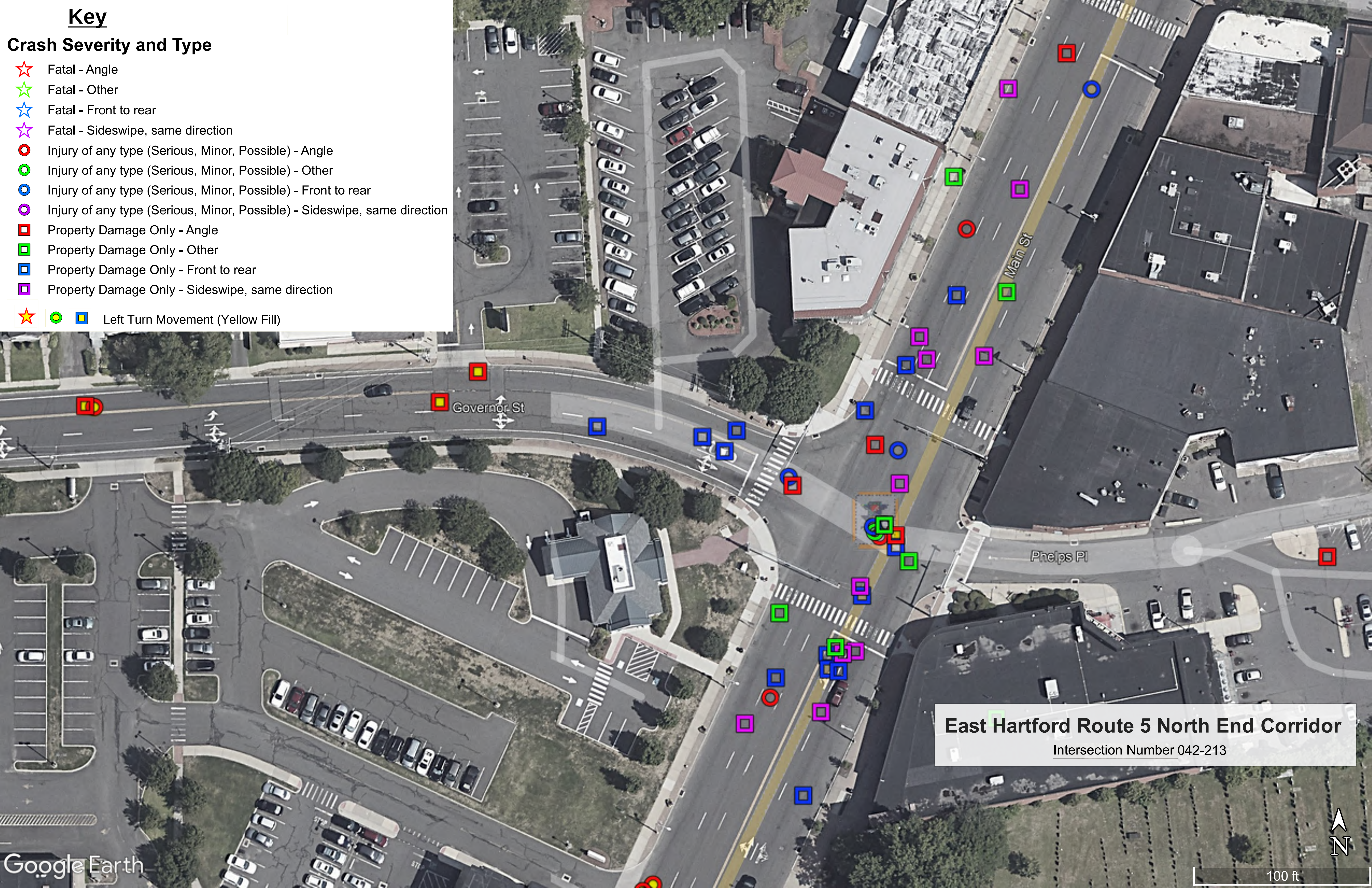

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 South End Corridor
Intersection Number 042-237
N
100 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Main St
Pitkin St
East Hartford Route 5 South End Corridor
Intersection Number 042-210
N
100 ft
Google Earth

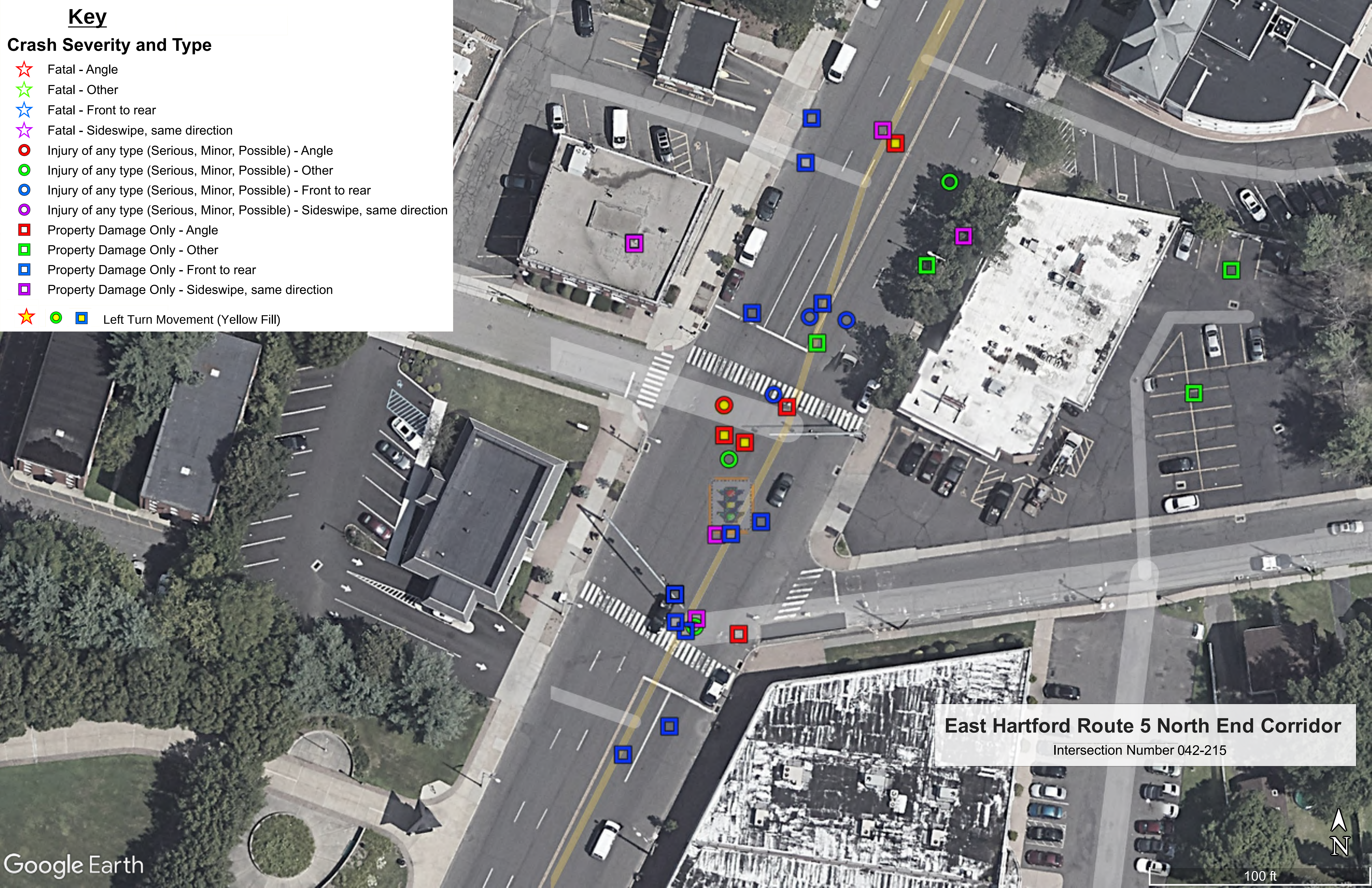

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Saunders St
Saunders St
Carroll Ct
Carroll Rd
Carroll Rd
Carroll Rd
Main St
East Hartford Route 5 South End Corridor
Intersection Number 042-266
Google Earth
N
100 ft

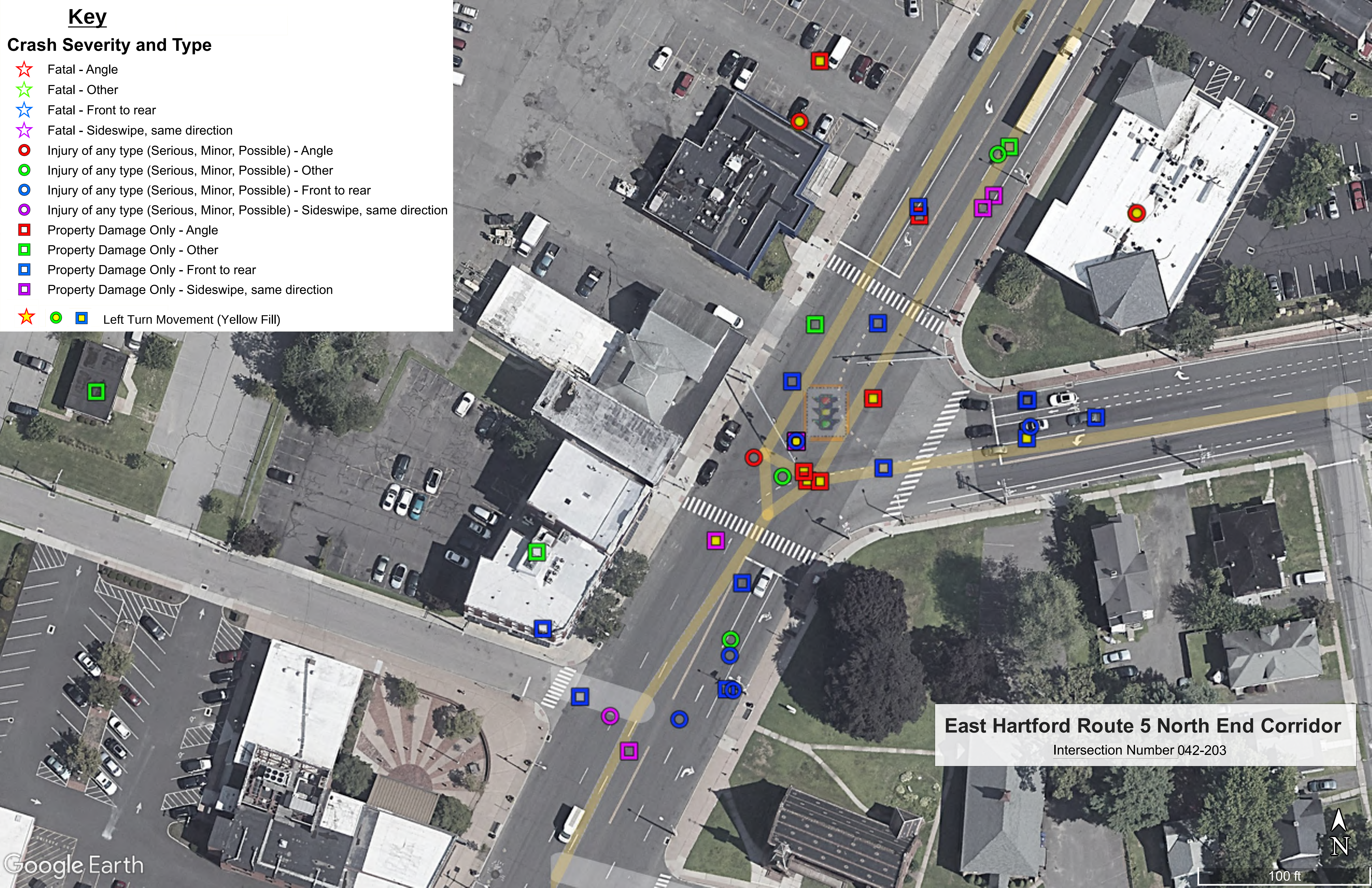

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 South End Corridor
Intersection Number 042-212
Google Earth
N
100 ft


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Chapel St
East Hartford Route 5 North End Corridor
Intersection Number 042-202
N
200 ft
Google Earth

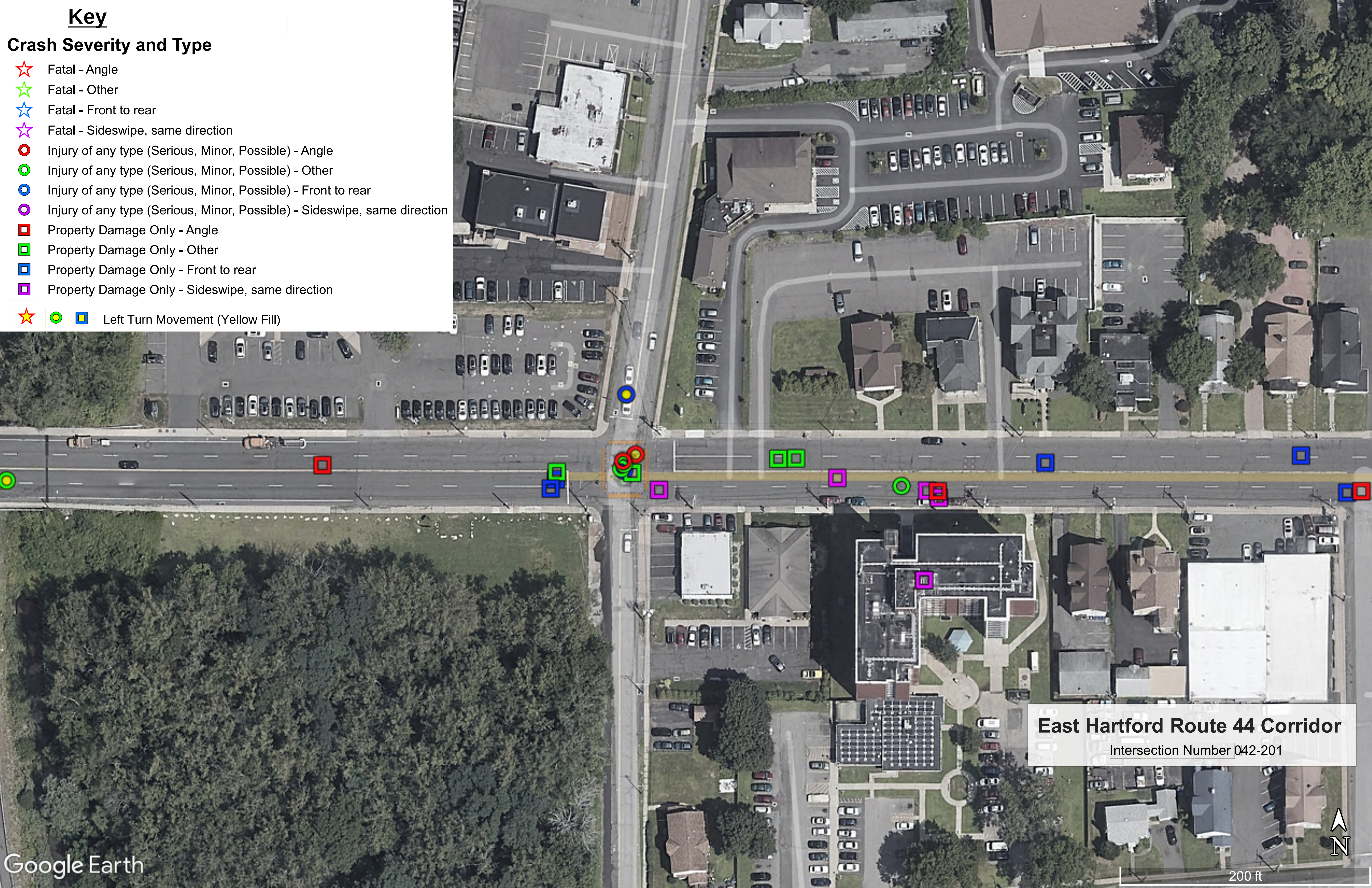

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Main St
Governor St
Phelps Pl
East Hartford Route 5 North End Corridor
Intersection Number 042-213
N
100 ft
Google Earth

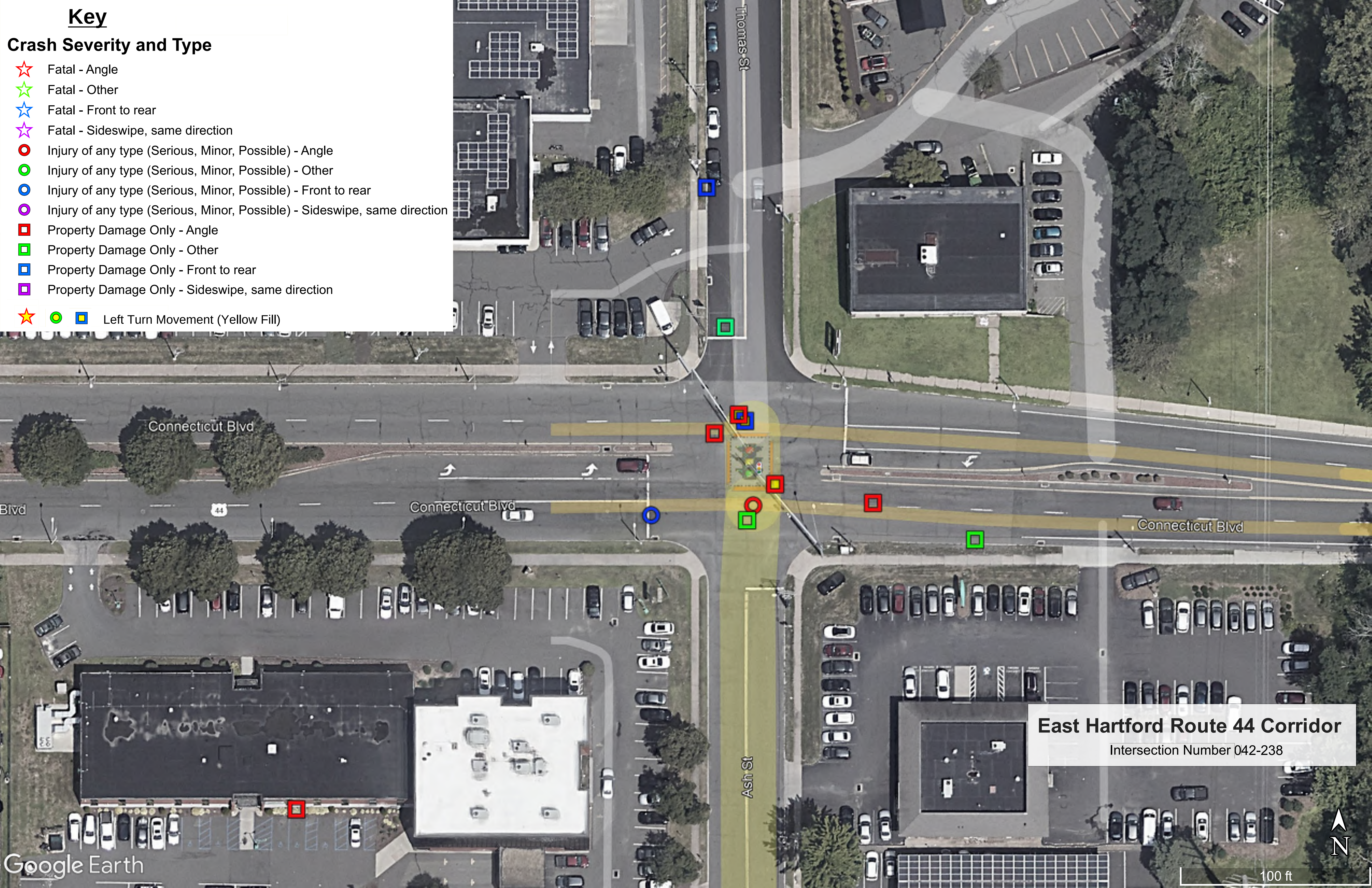

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 North End Corridor
Intersection Number 042-214
Google Earth
100 ft
N

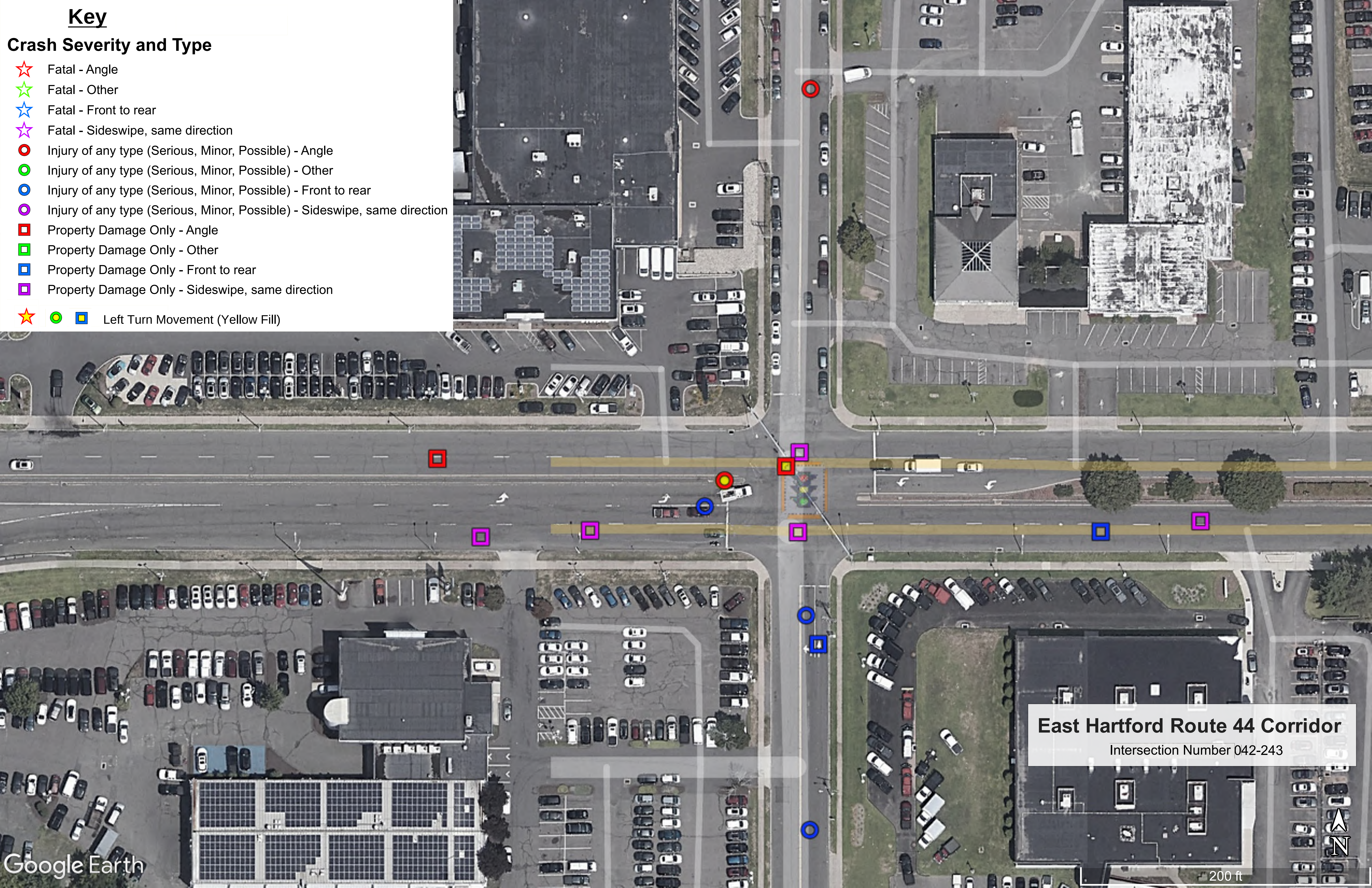

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 North End Corridor
Intersection Number 042-215
Google Earth
100 ft
N

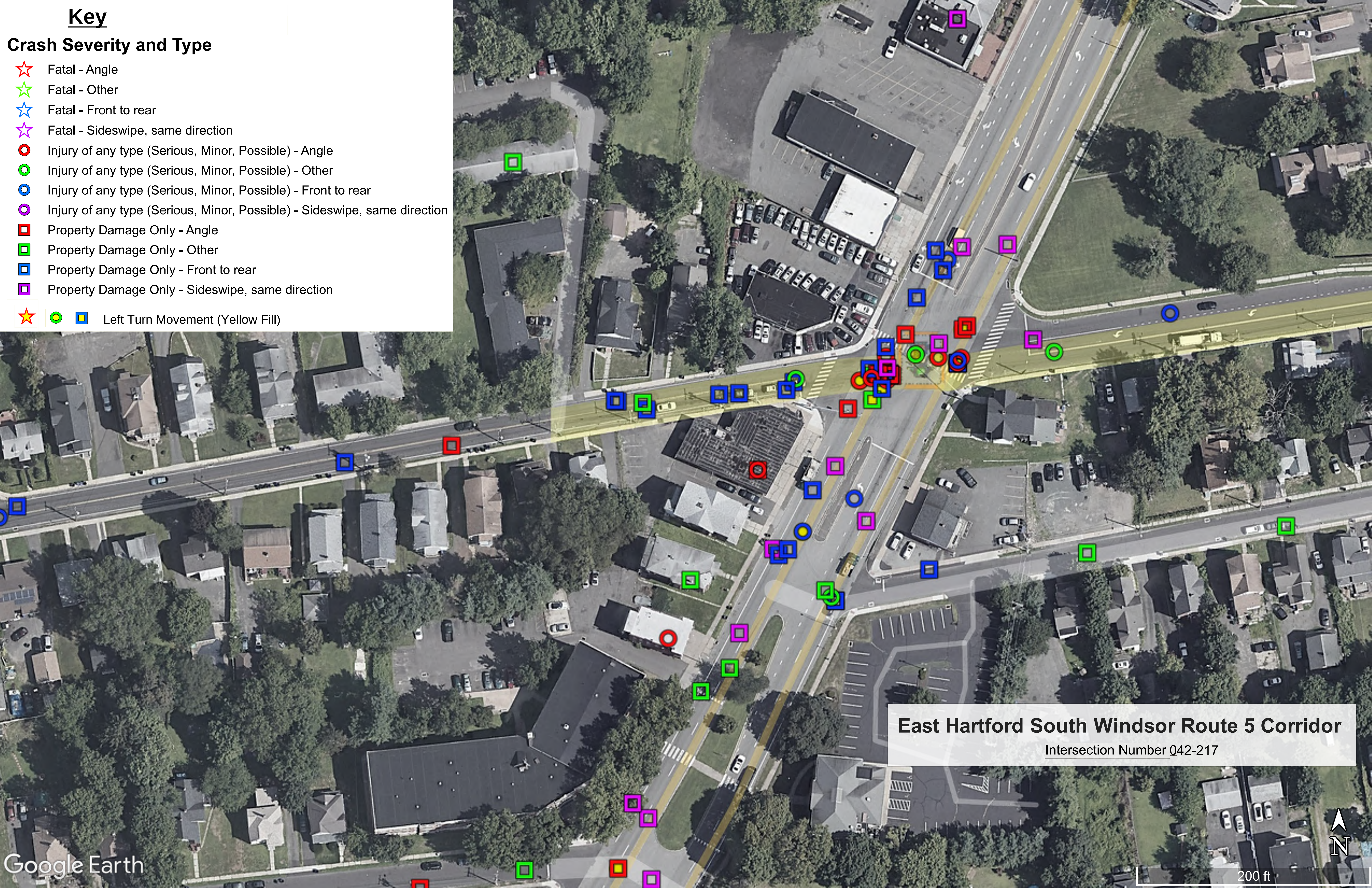


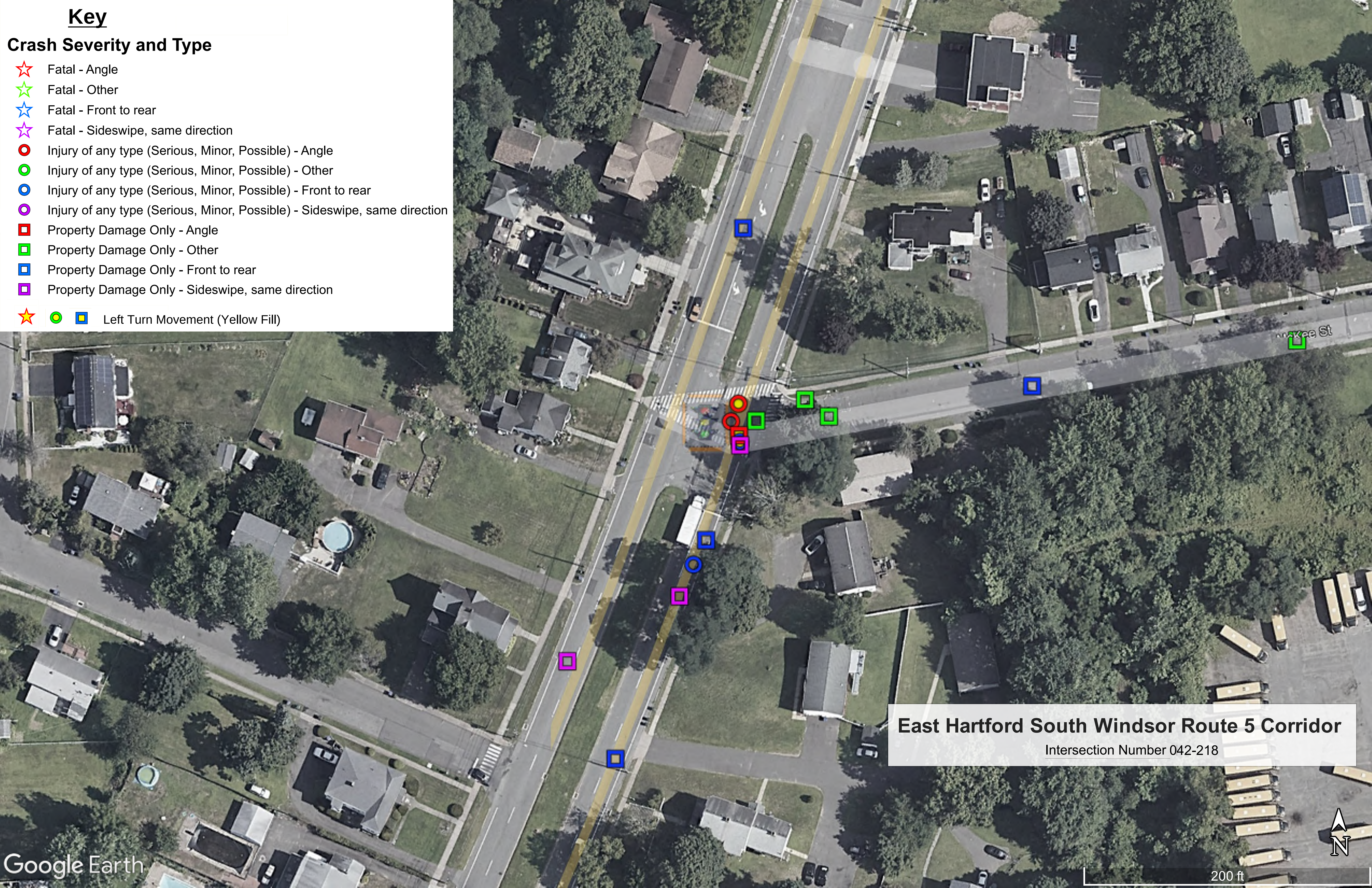
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 5 North End Corridor
Intersection Number 042-203
Google Earth
N
100 ft

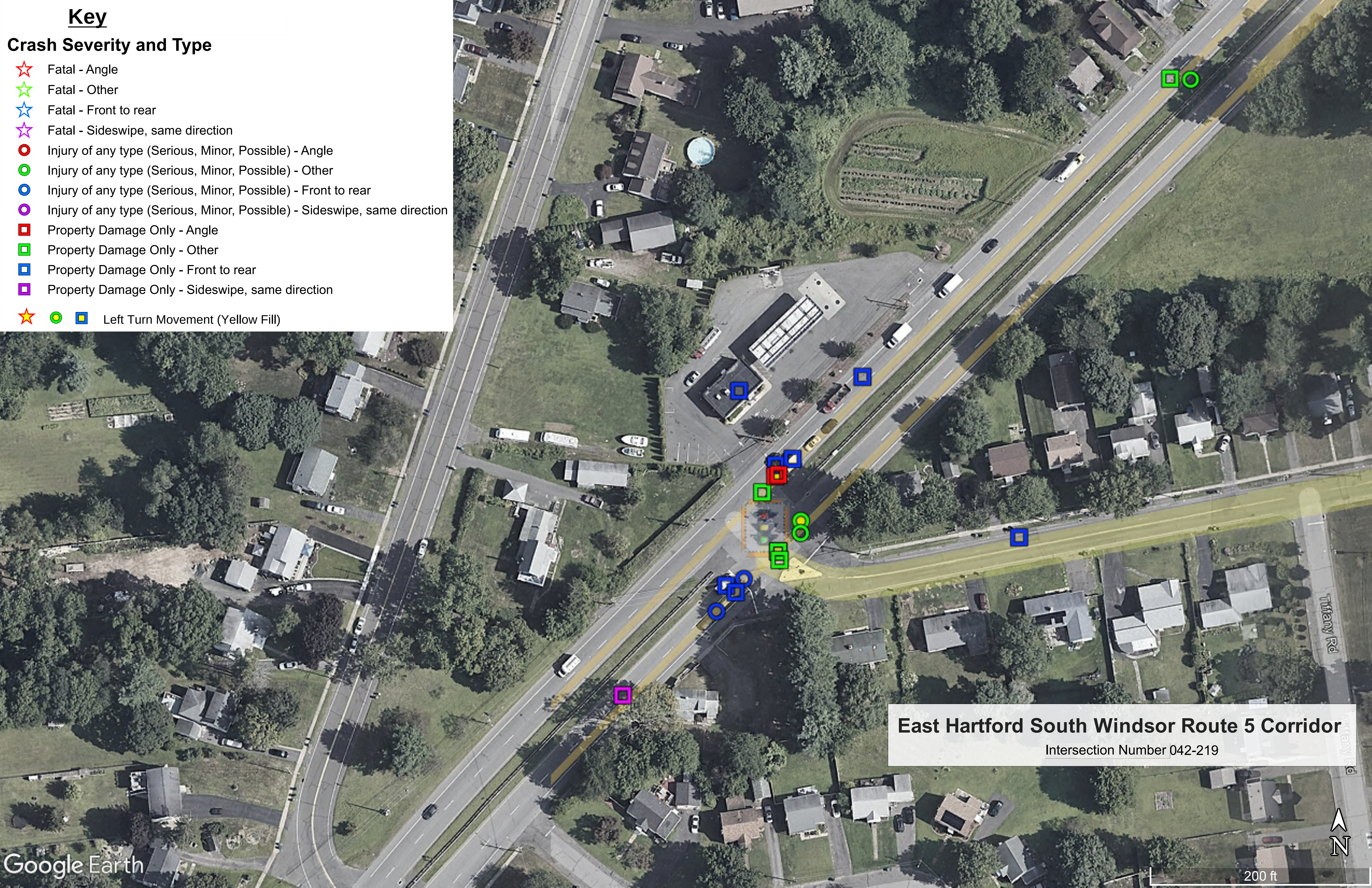

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 44 Corridor
Intersection Number 042-201
Google Earth
N
200 ft

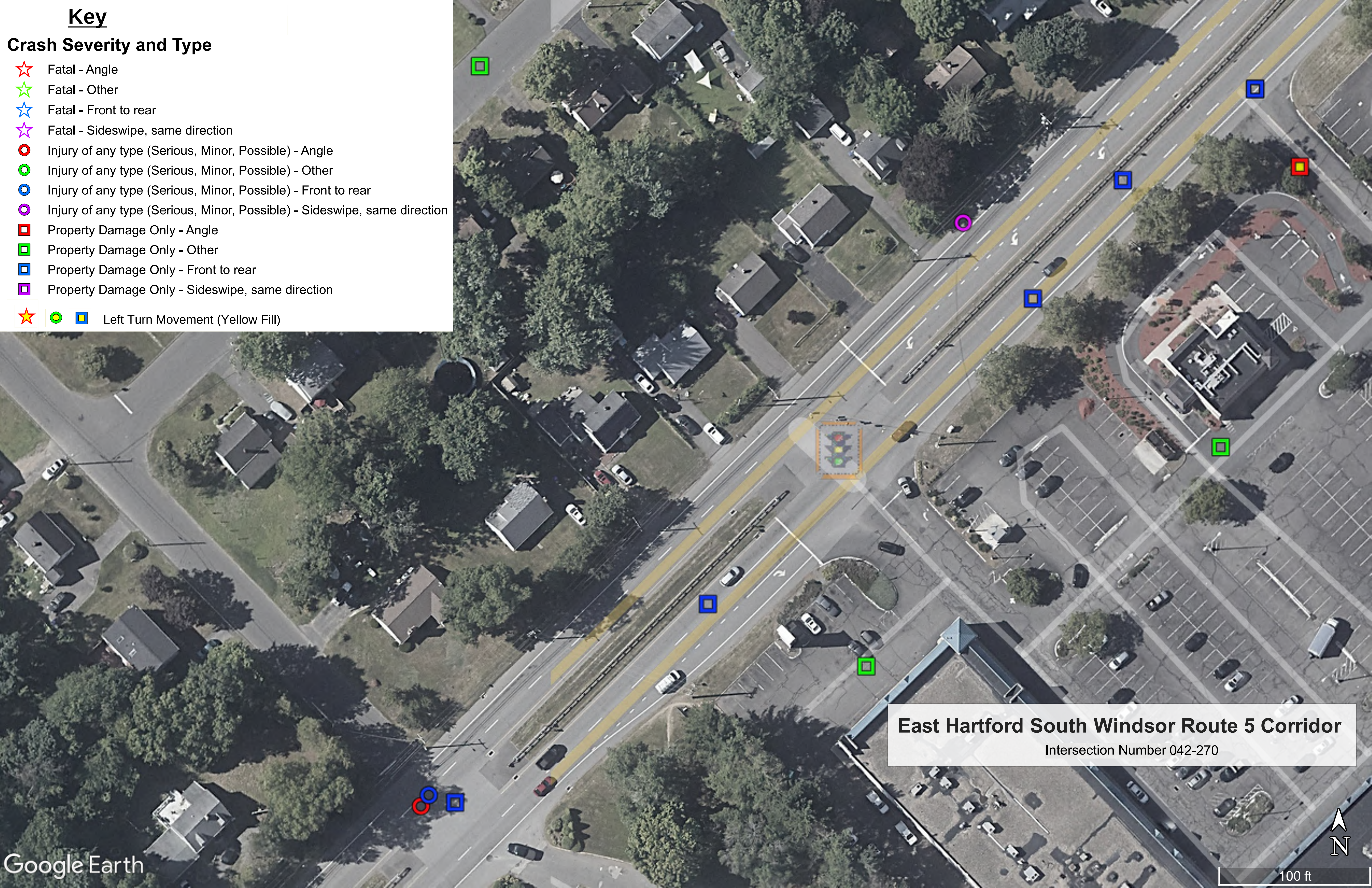

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Thomas St
Connecticut Blvd
Connecticut Blvd
Connecticut Blvd
Blvd
44
Ash St
East Hartford Route 44 Corridor
Intersection Number 042-238
Google Earth
N
100 ft

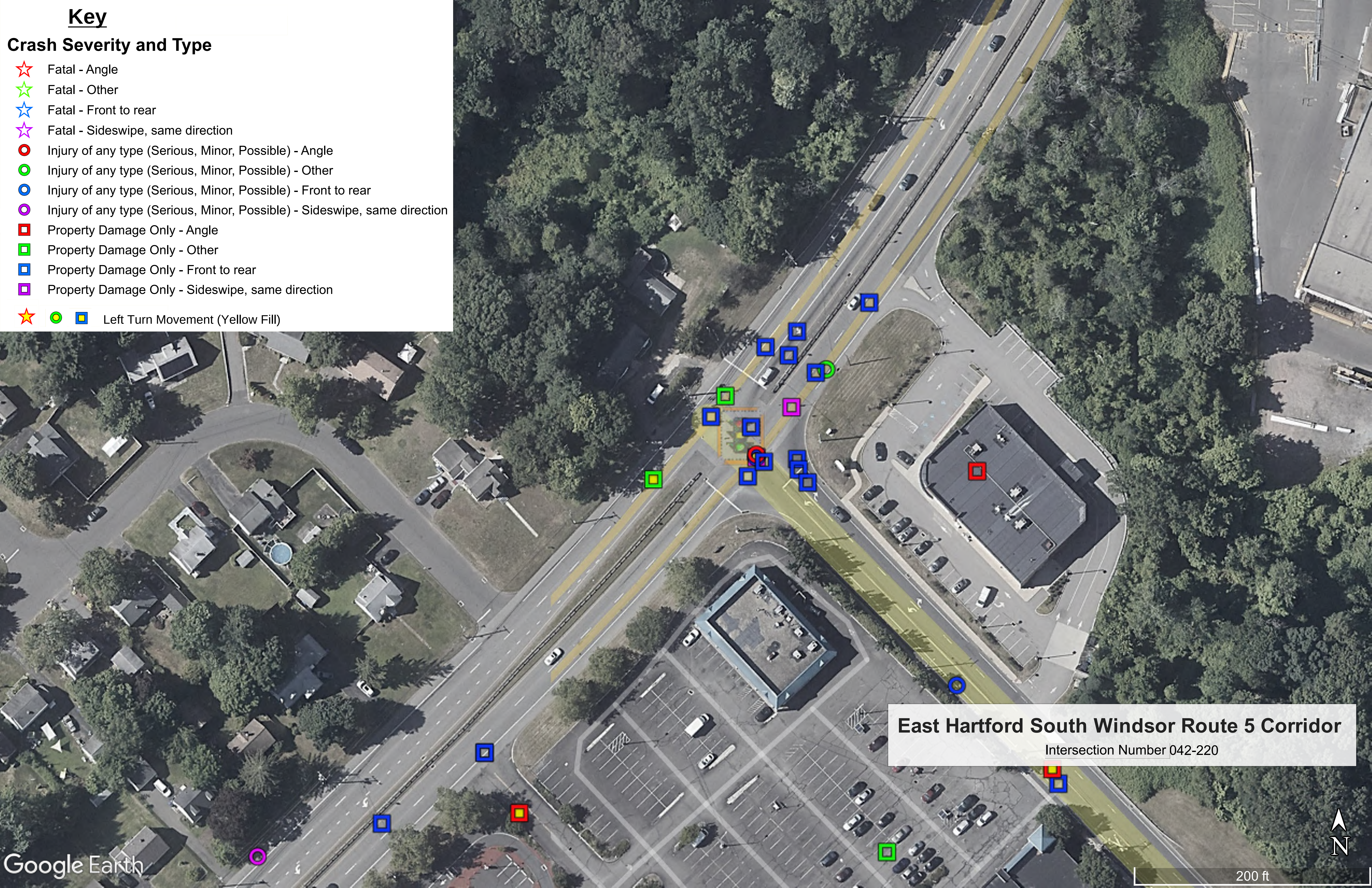

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford Route 44 Corridor
Intersection Number 042-243
N
200 ft
Google Earth

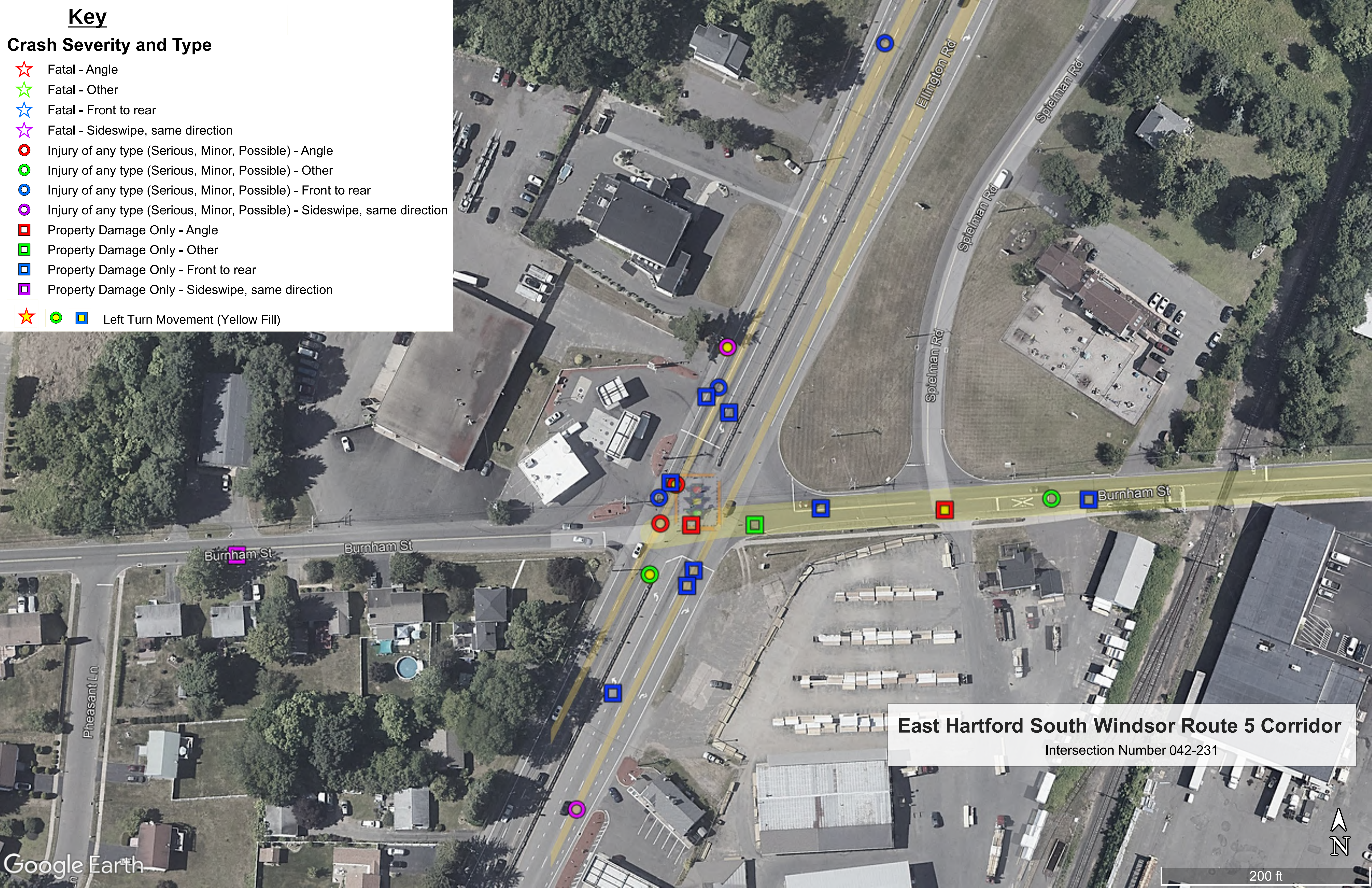

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 042-217
Google Earth
N
200 ft

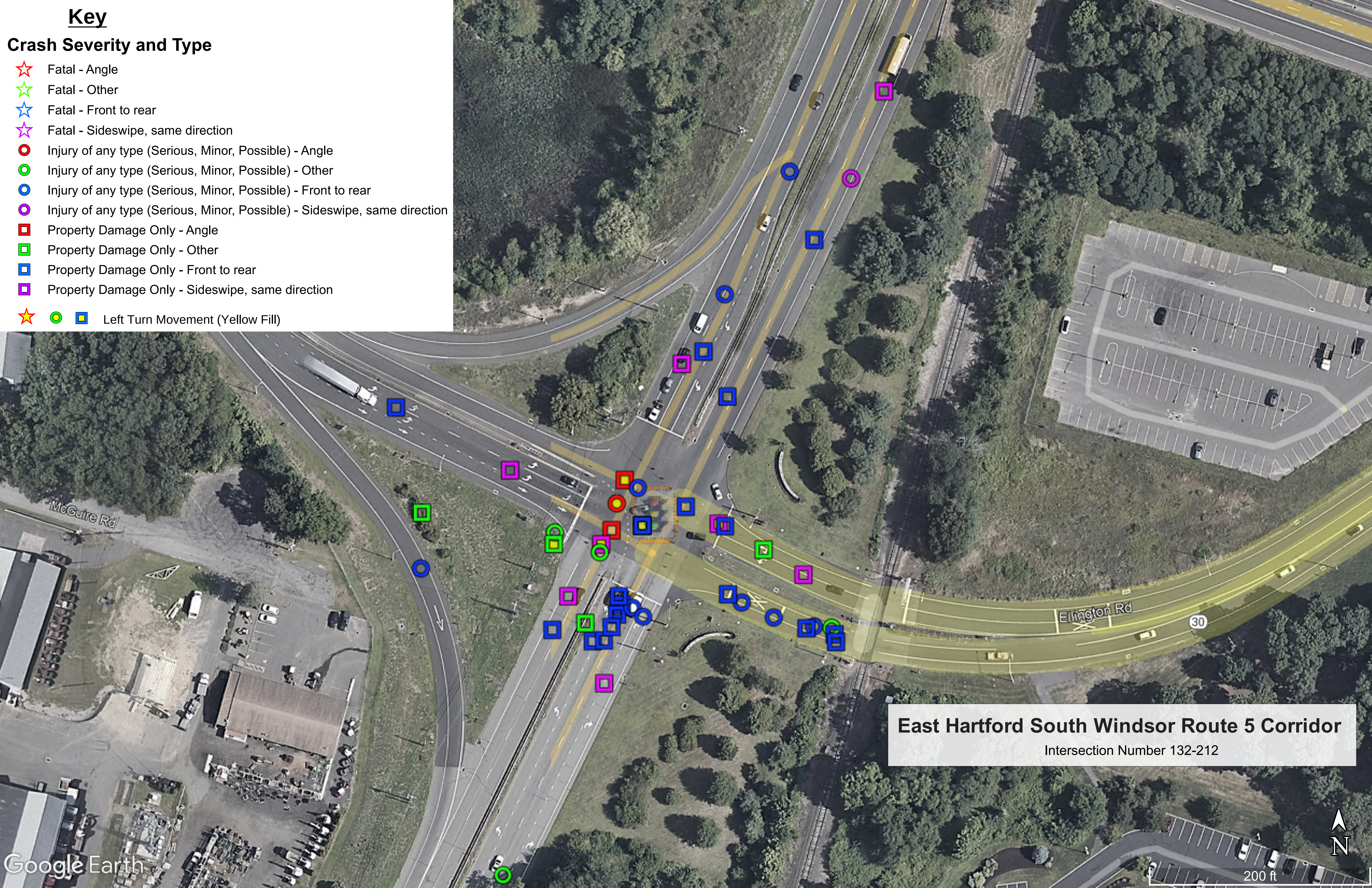

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 042-218
Google Earth
200 ft
N

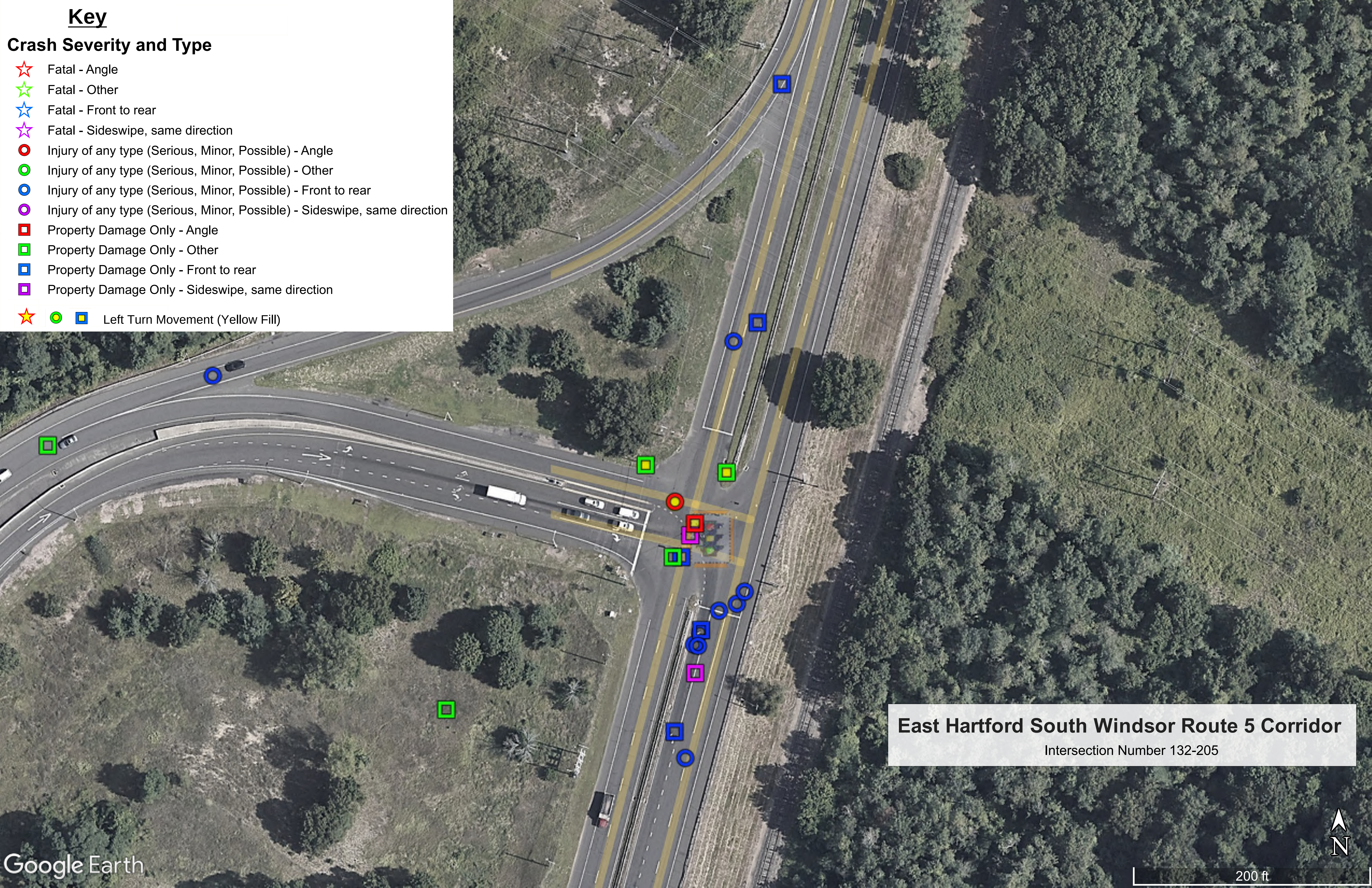

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 042-219
Tiffany Rd
Google Earth
N
200 ft


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 042-270
Google Earth
N
100 ft

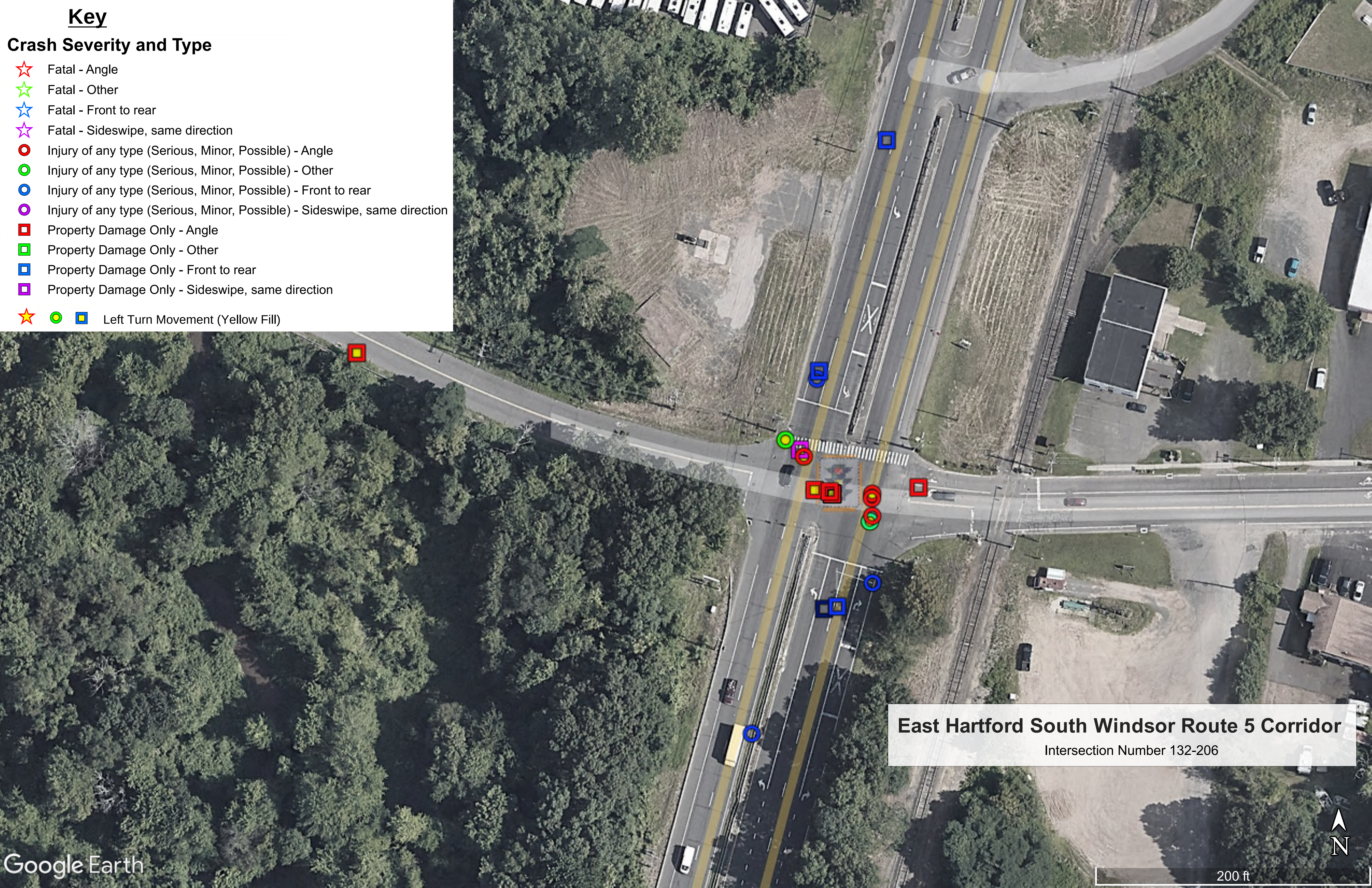

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 042-220
Google Earth
N
200 ft

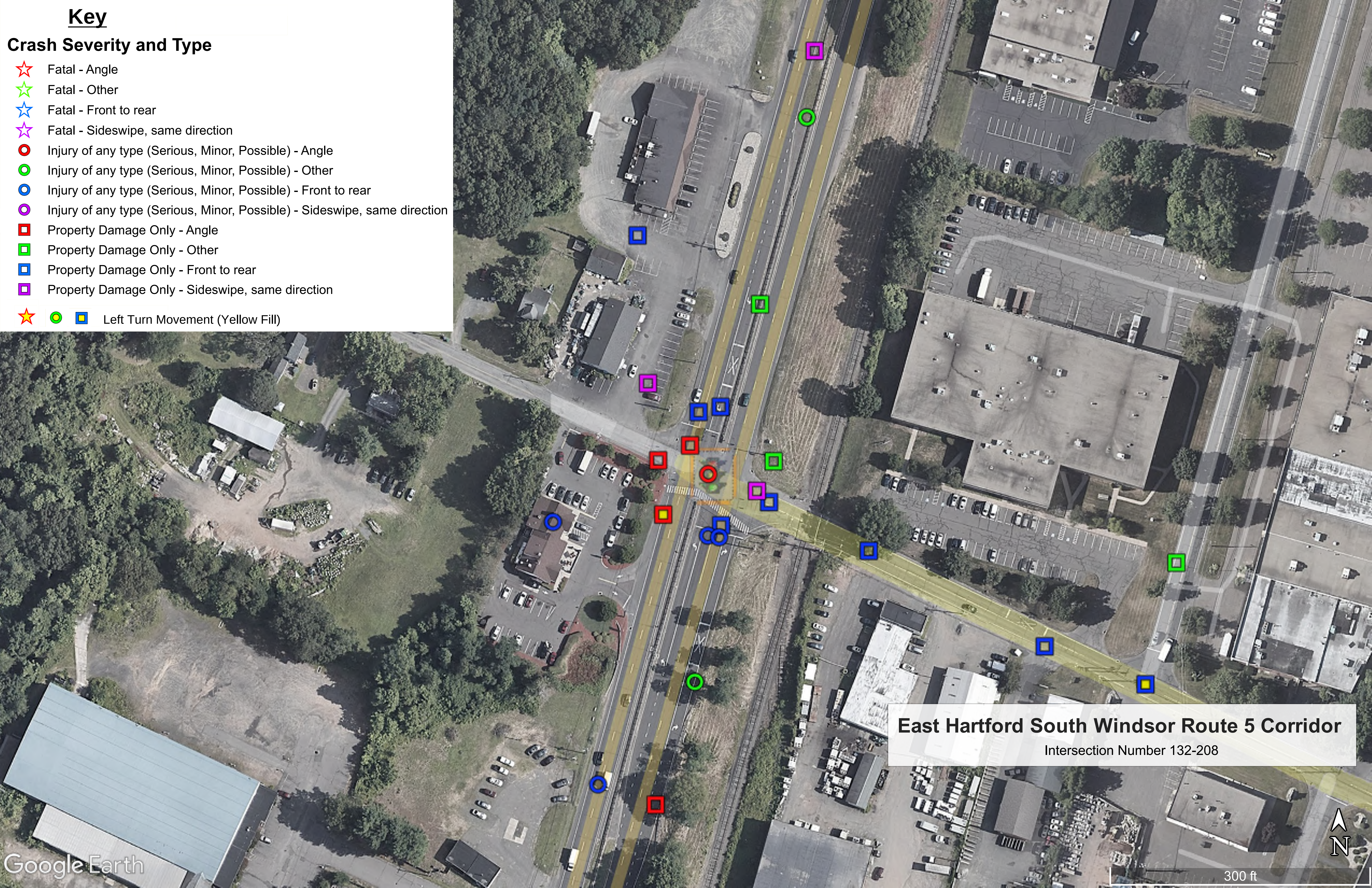

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Ellington Rd
Spielman Rd
Spielman Rd
Spielman Rd
Burnham St
Burnham St
Burnham St
Pheasant Ln
East Hartford South Windsor Route 5 Corridor
Intersection Number 042-231
N
200 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
McGuire Rd
Ellington Rd
30
East Hartford South Windsor Route 5 Corridor
Intersection Number 132-212
N
200 ft
Google Earth

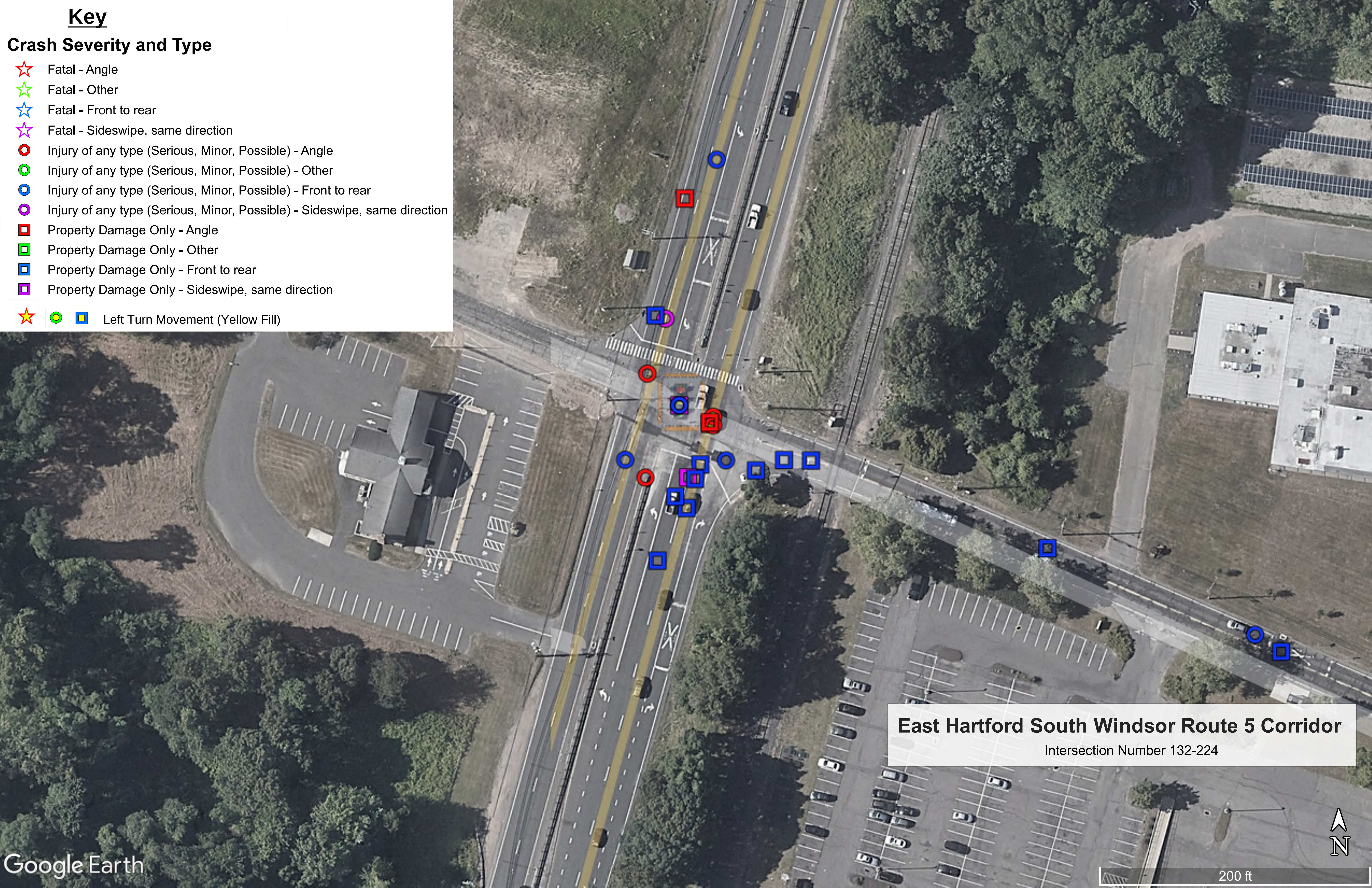


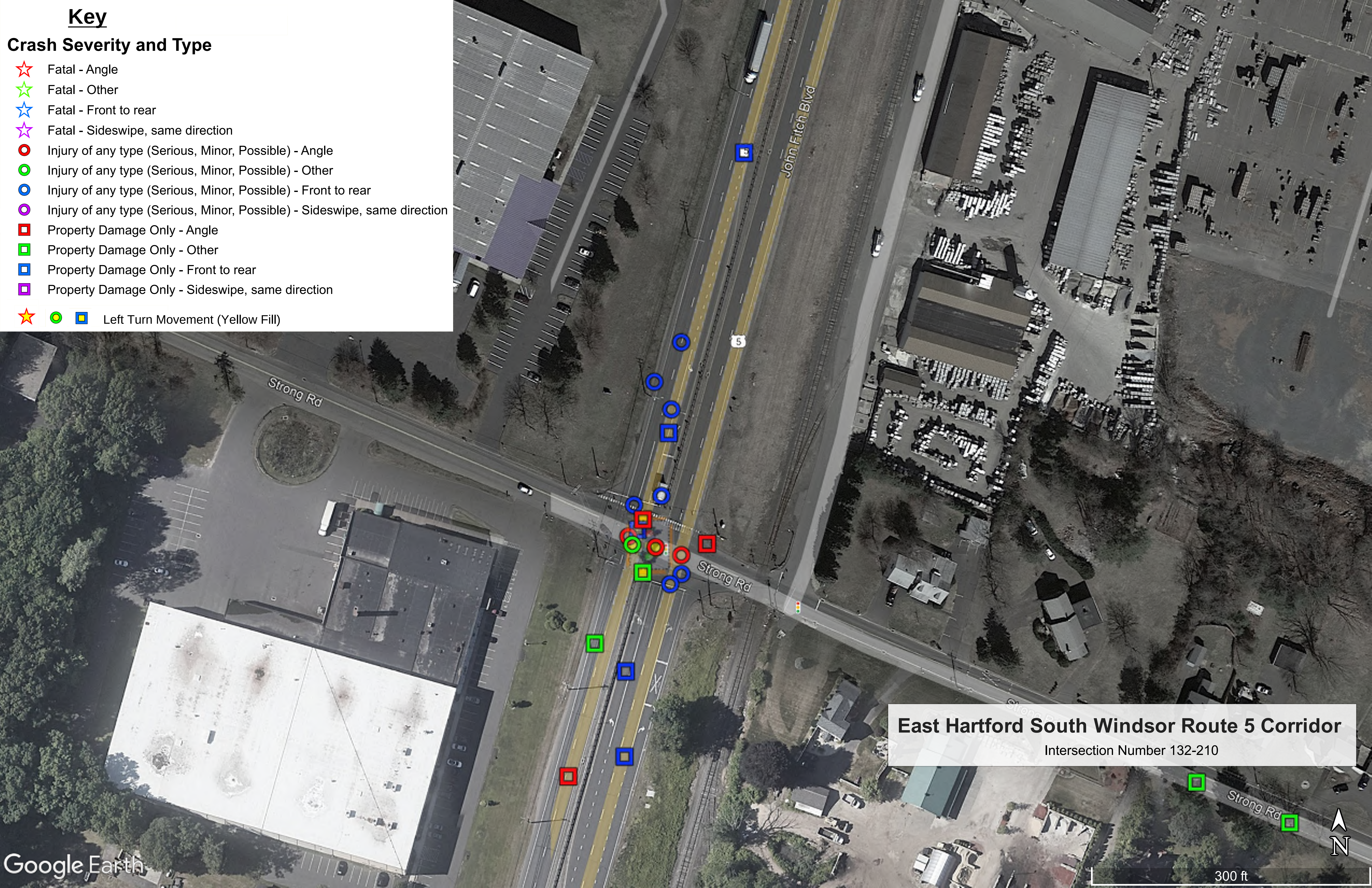
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 132-205
Google Earth
N
200 ft


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 132-206
N
200 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 132-208
Google Earth
N
300 ft

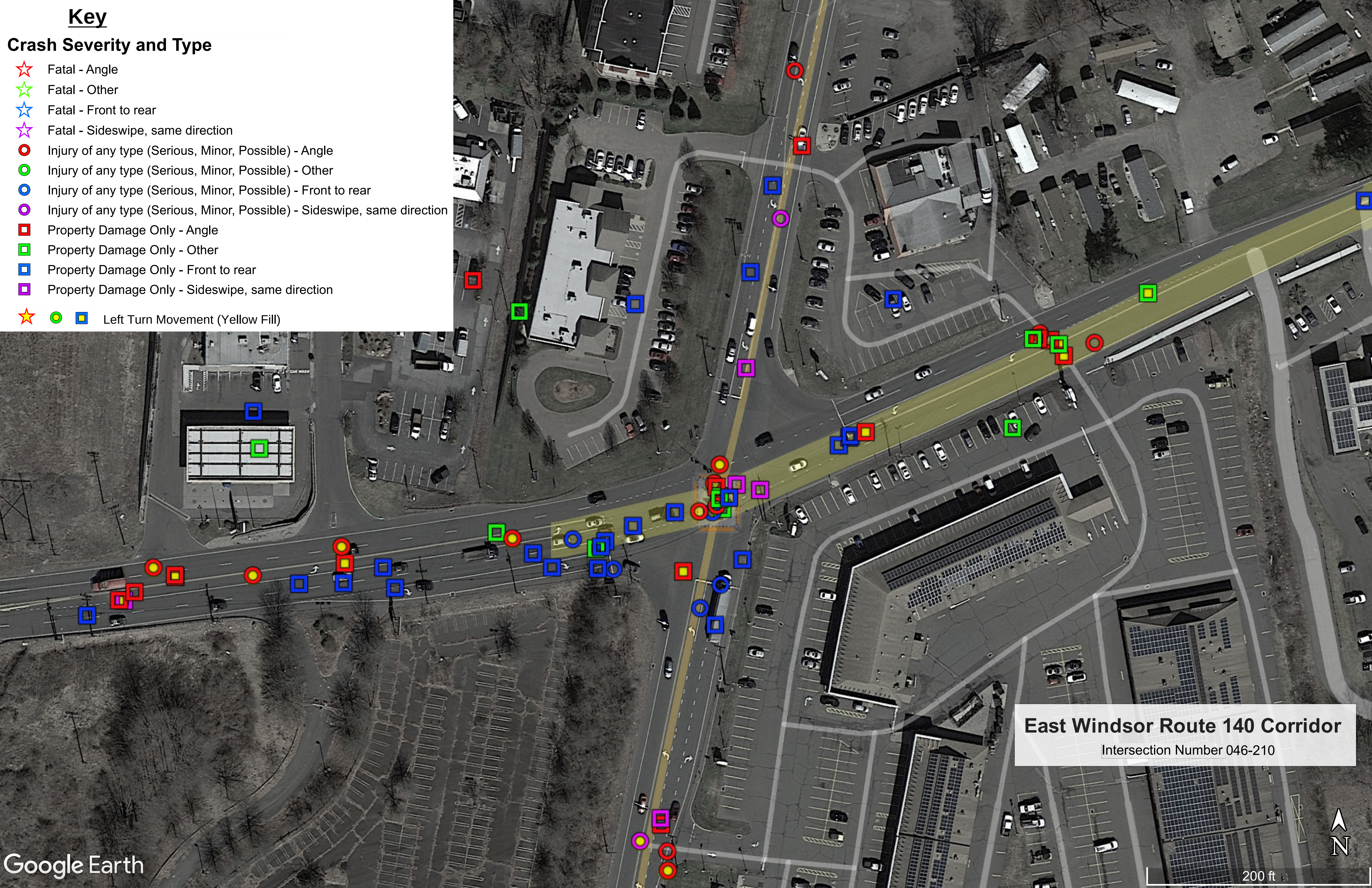

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 132-229
N
200 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Hartford South Windsor Route 5 Corridor
Intersection Number 132-224
Google Earth
N
200 ft

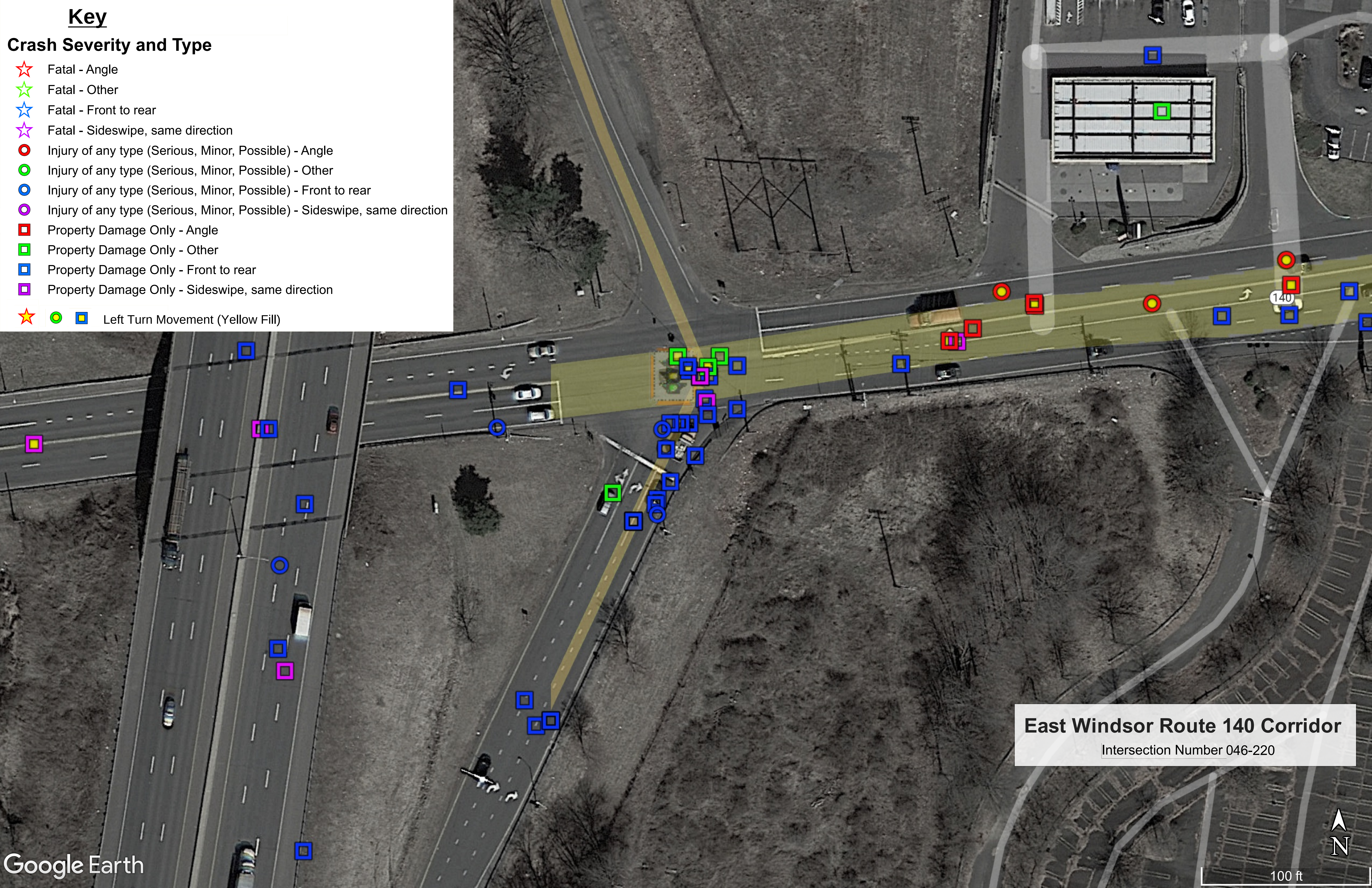

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
John Fitch Blvd
5
Strong Rd
Strong Rd
Strong Rd
East Hartford South Windsor Route 5 Corridor
Intersection Number 132-210
N
300 ft
Google Earth

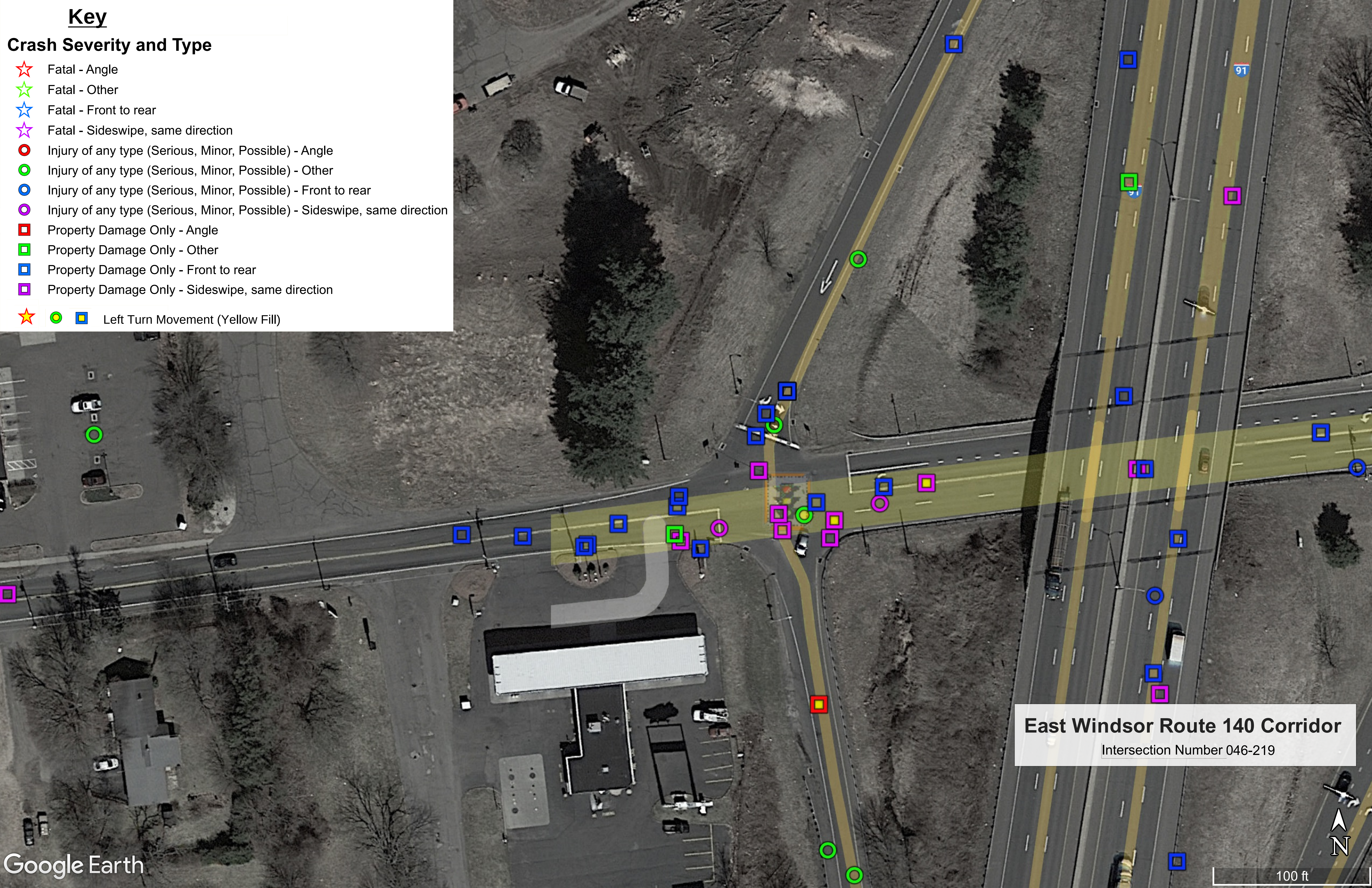
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Sullivan Ave
194
Sullivan Ave
Commerce Way
Commerce Way
Main St
5
East Hartford South Windsor Route 5 Corridor
Intersection Number 132-204
N
200 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Scantic Rd
Scantic Rd
Scantic Rd
East Hartford South Windsor Route 5 Corridor
Intersection Number 132-211
N
200 ft
Google Earth

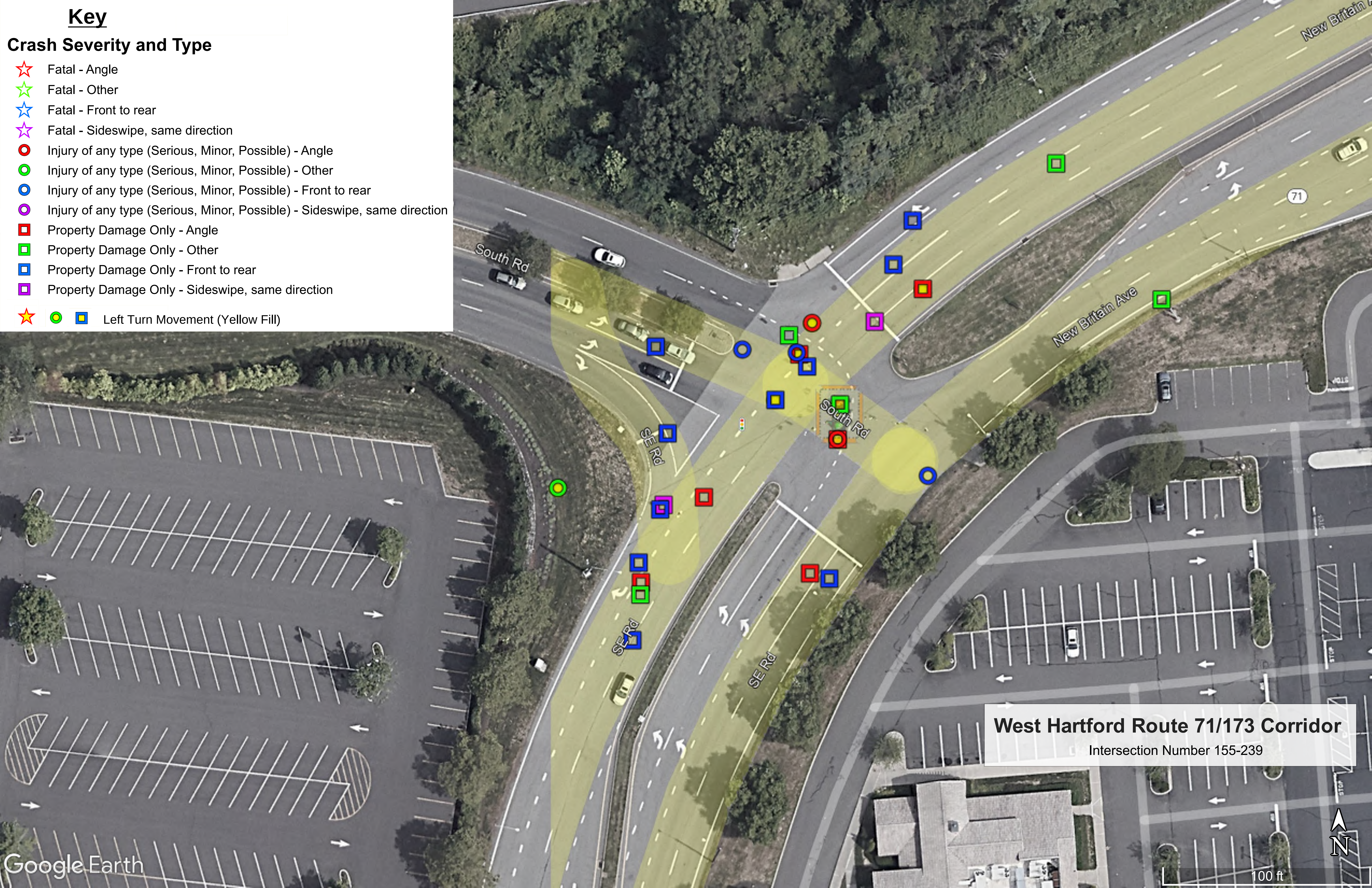


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Windsor Route 140 Corridor
Intersection Number 046-210
Google Earth
N
200 ft

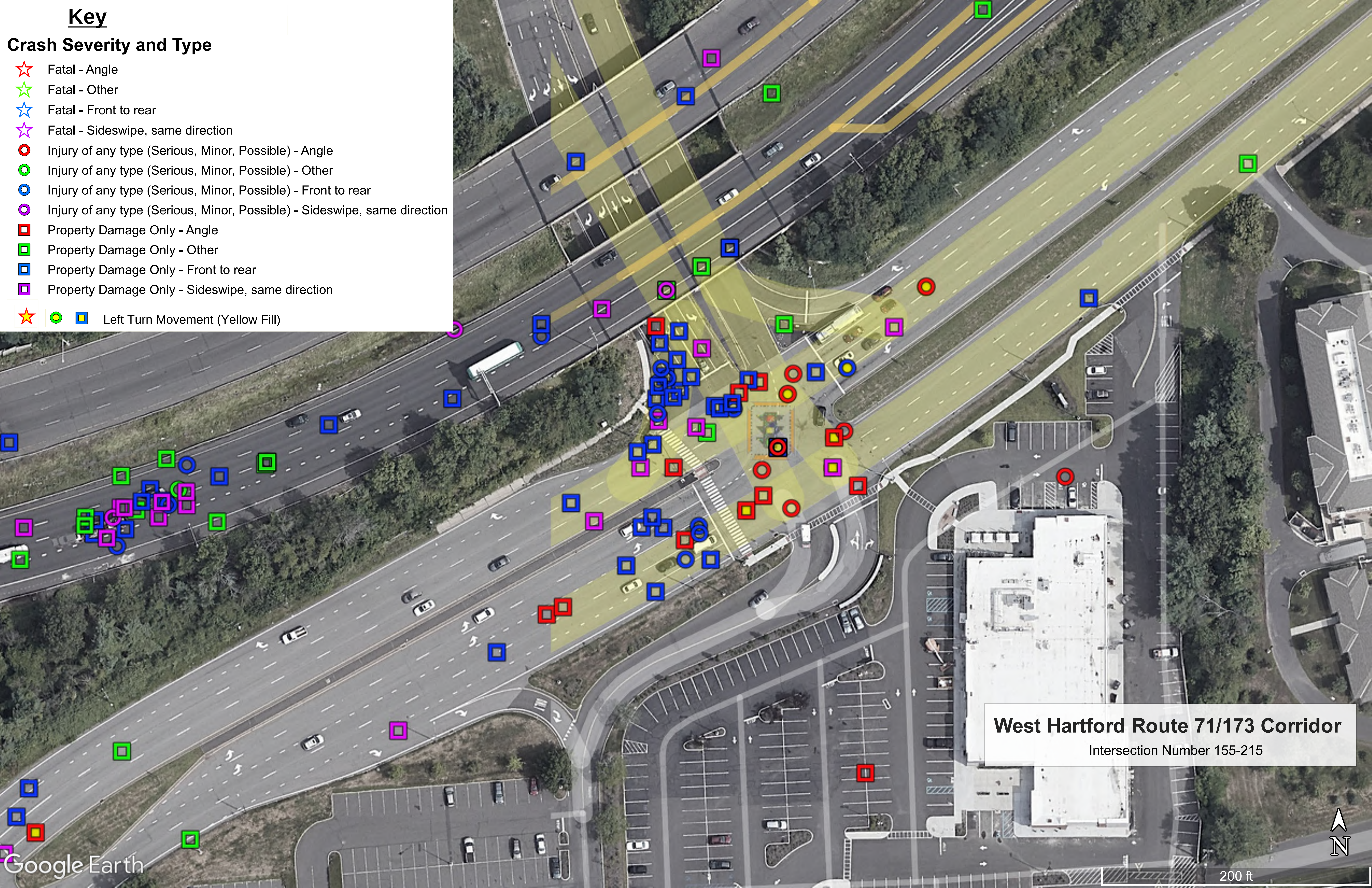

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
140
East Windsor Route 140 Corridor
Intersection Number 046-220
N
100 ft
Google Earth

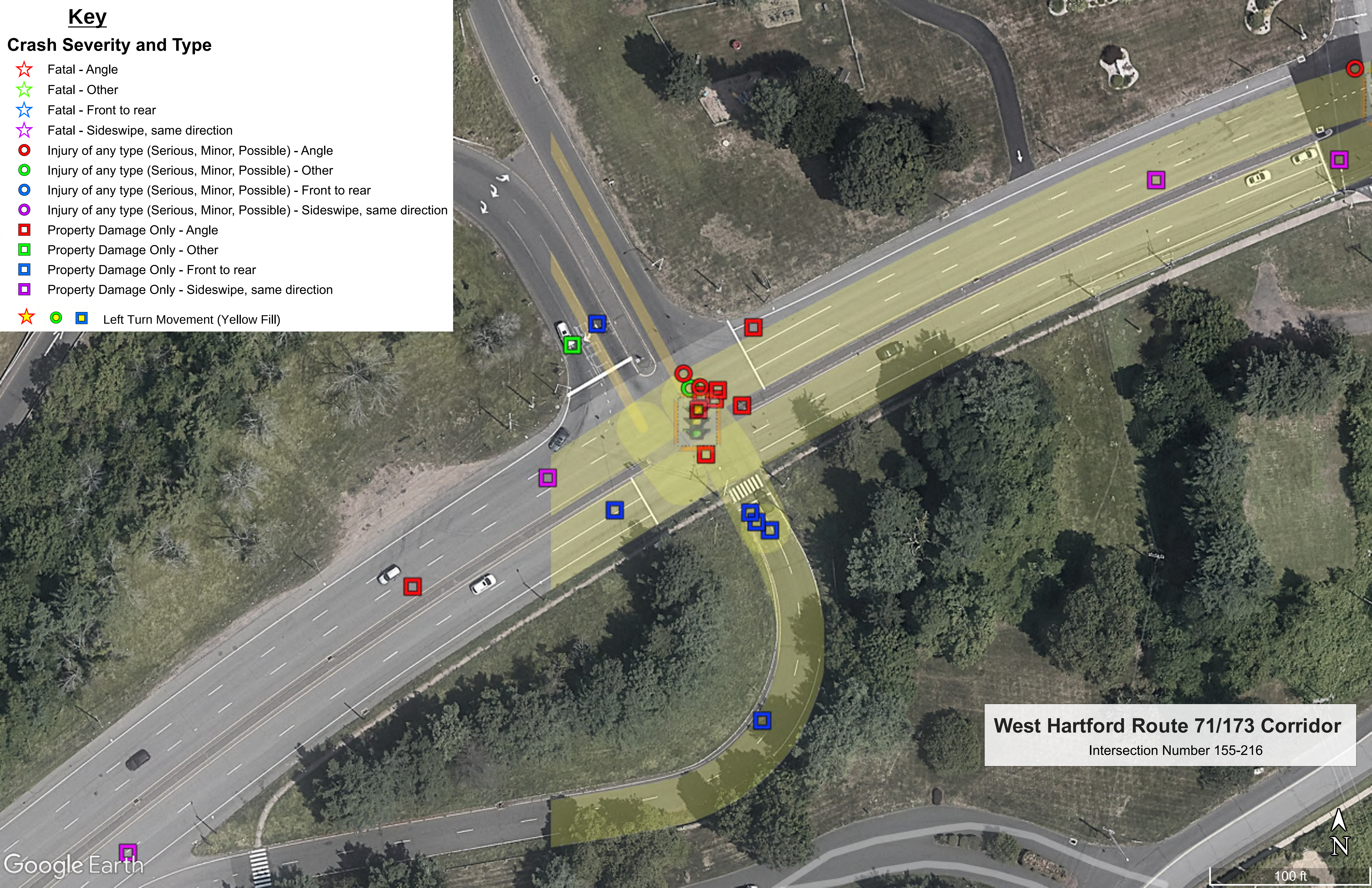


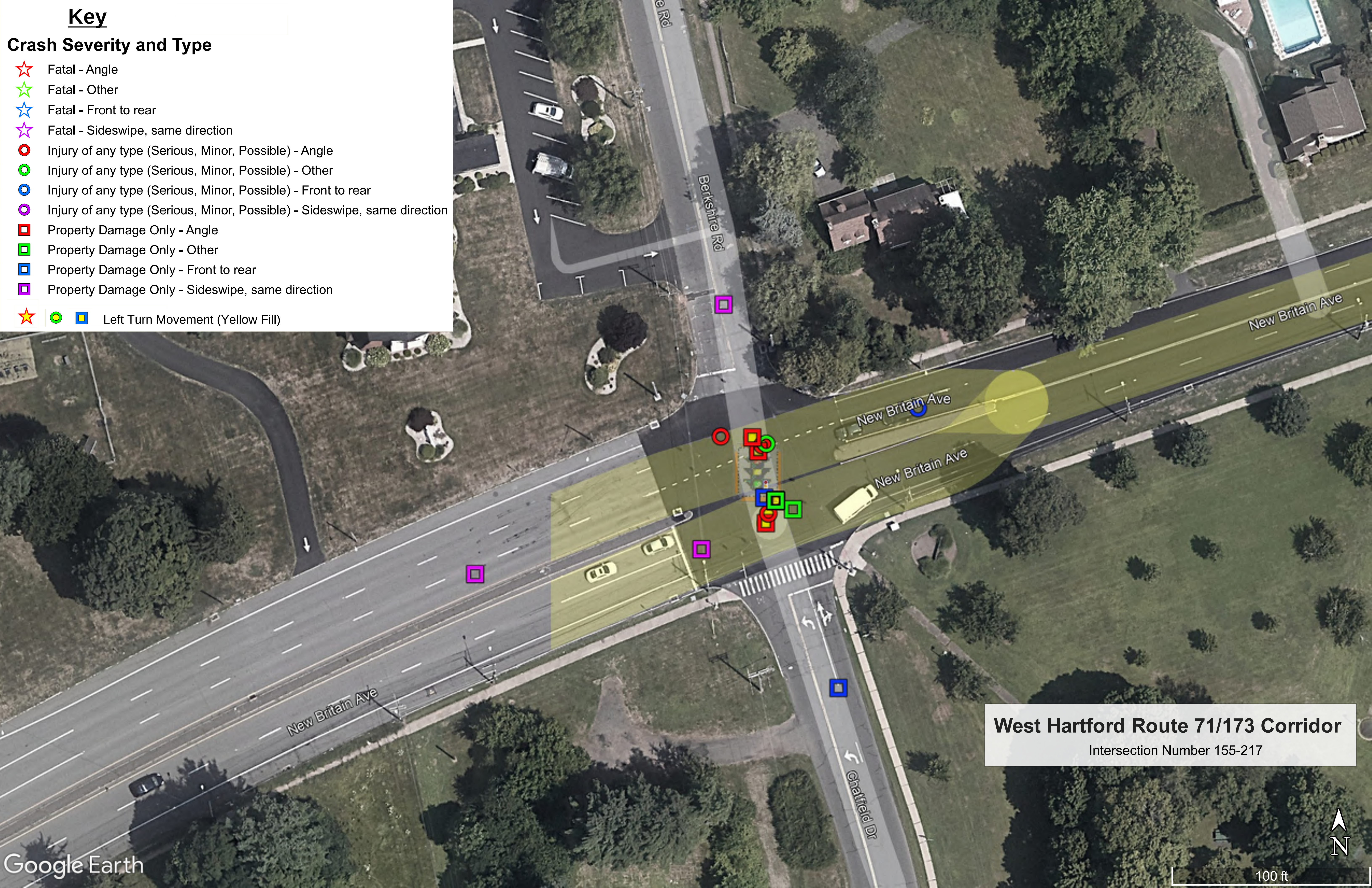
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
East Windsor Route 140 Corridor
Intersection Number 046-219
91
N
100 ft
Google Earth



Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
South Rd
New Britain Ave
SE Rd
71
West Hartford Route 71/173 Corridor
Intersection Number 155-239
Google Earth
N
100 ft

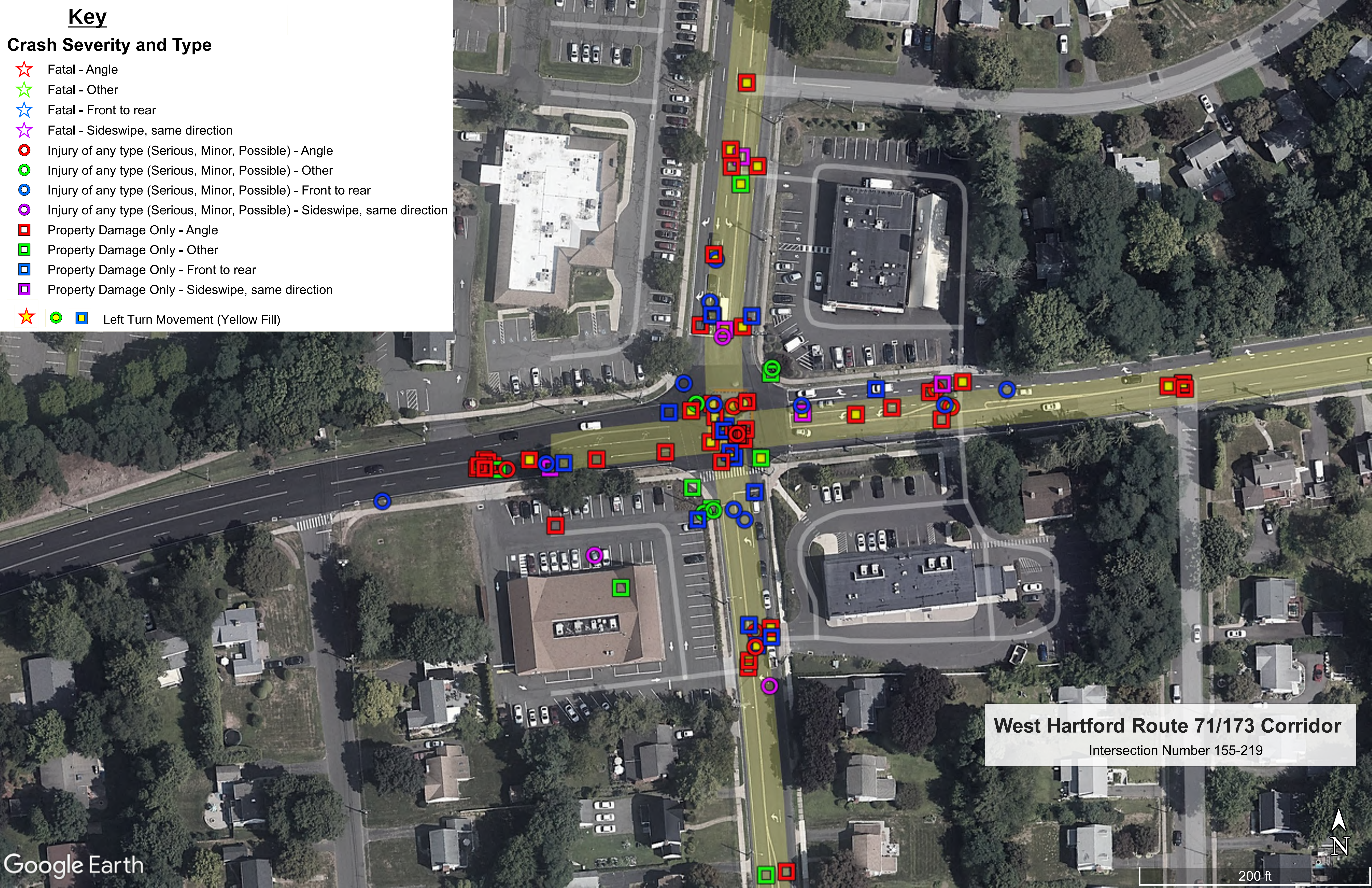

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
West Hartford Route 71/173 Corridor
Intersection Number 155-215
N
200 ft
Google Earth

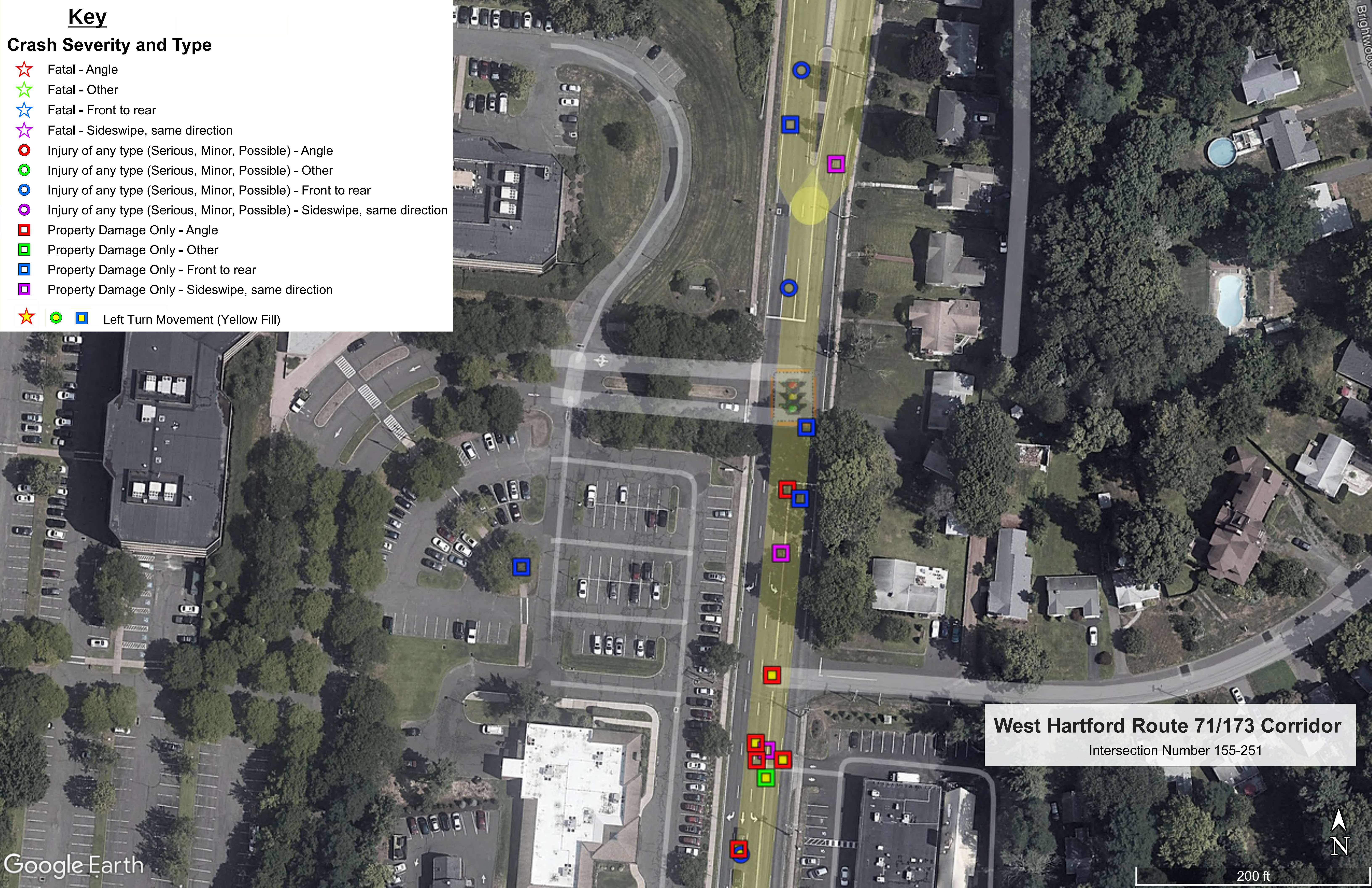

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
West Hartford Route 71/173 Corridor
Intersection Number 155-216
Google Earth
N
100 ft



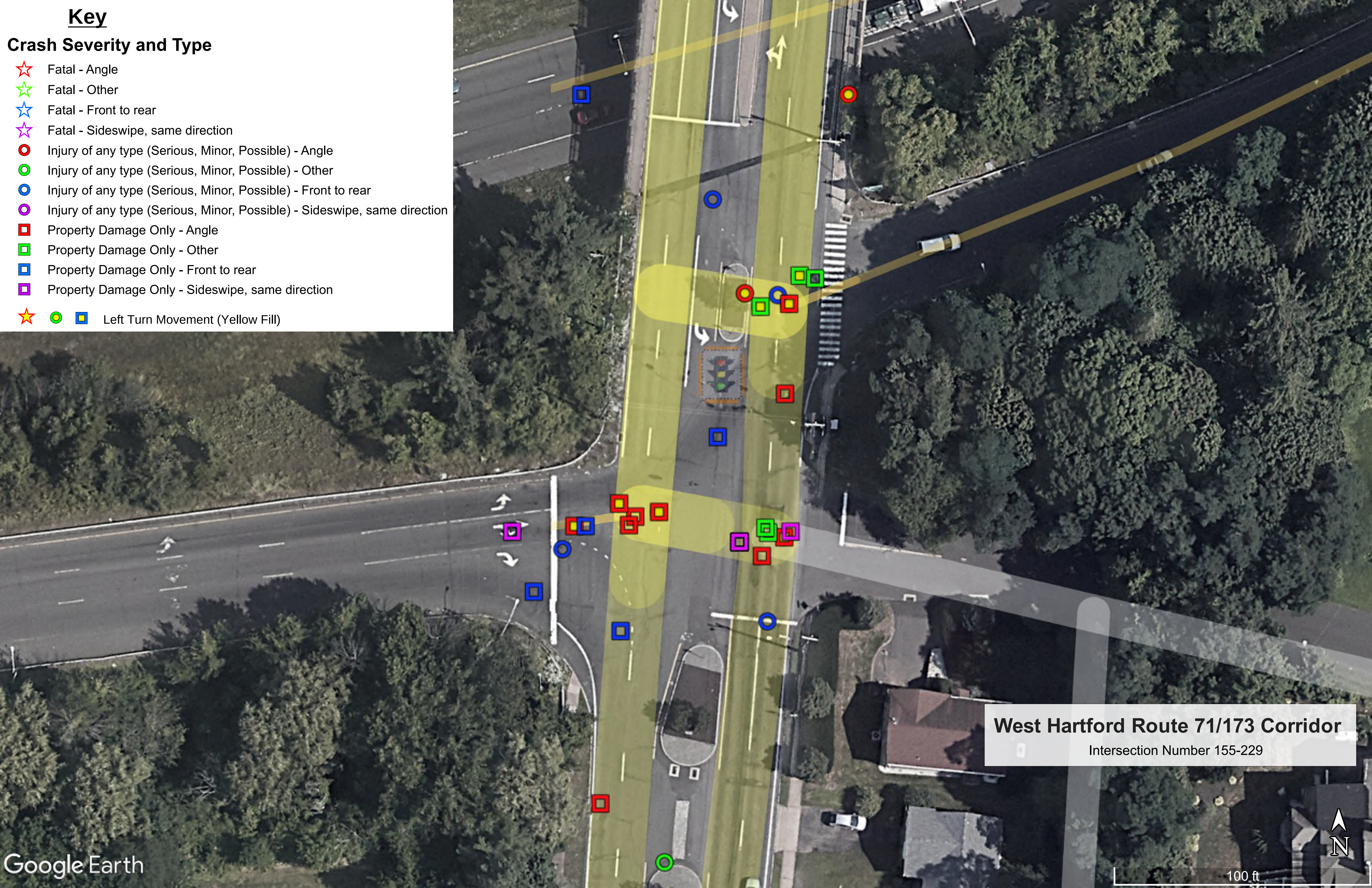
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Berkshire Rd
New Britain Ave
New Britain Ave
New Britain Ave
New Britain Ave
Chatfield Dr
West Hartford Route 71/173 Corridor
Intersection Number 155-217
Google Earth
N
100 ft

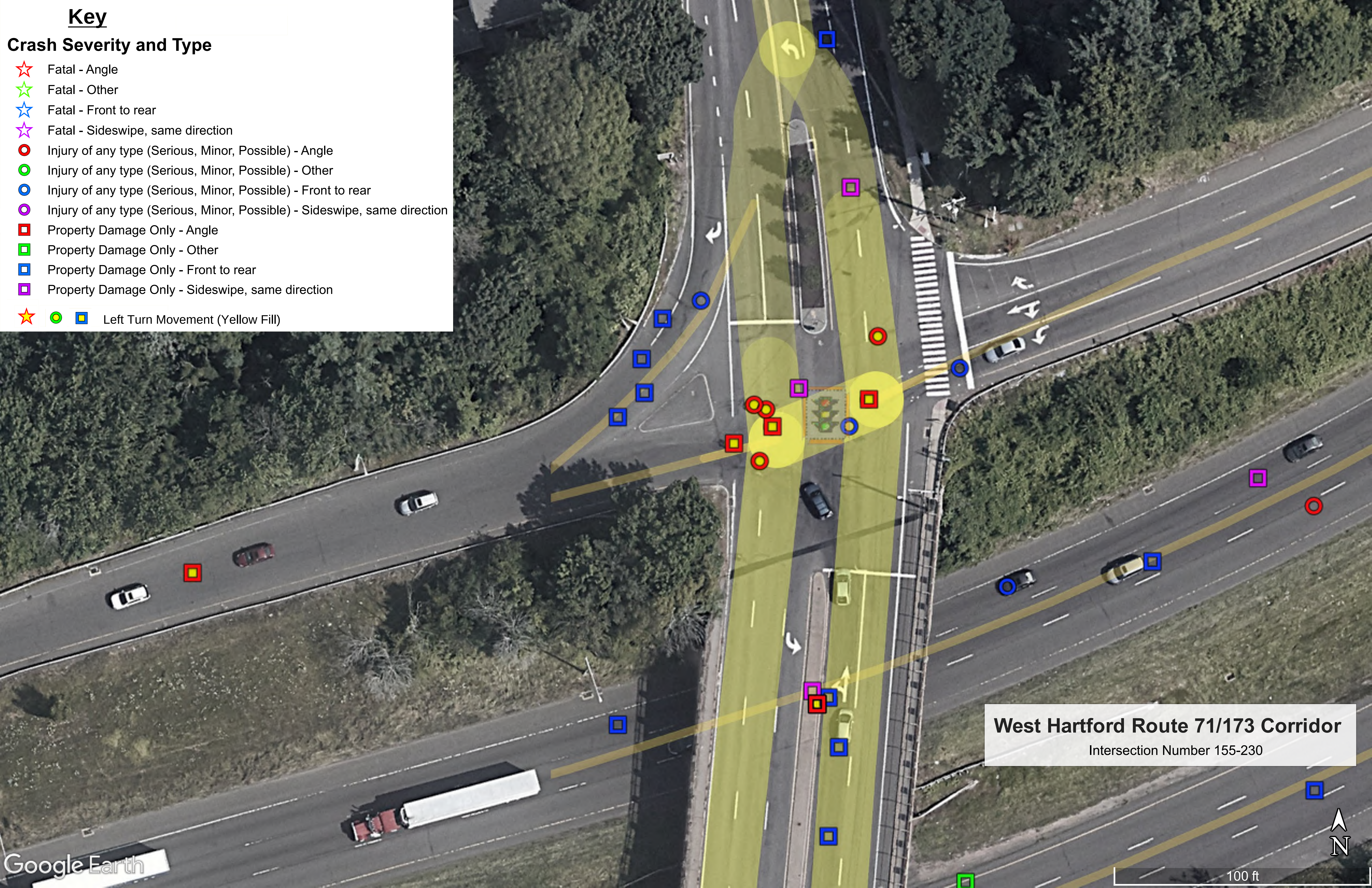

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
West Hartford Route 71/173 Corridor
Intersection Number 155-218
Google Earth
N
100 ft


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
West Hartford Route 71/173 Corridor
Intersection Number 155-219
Google Earth
N
200 ft

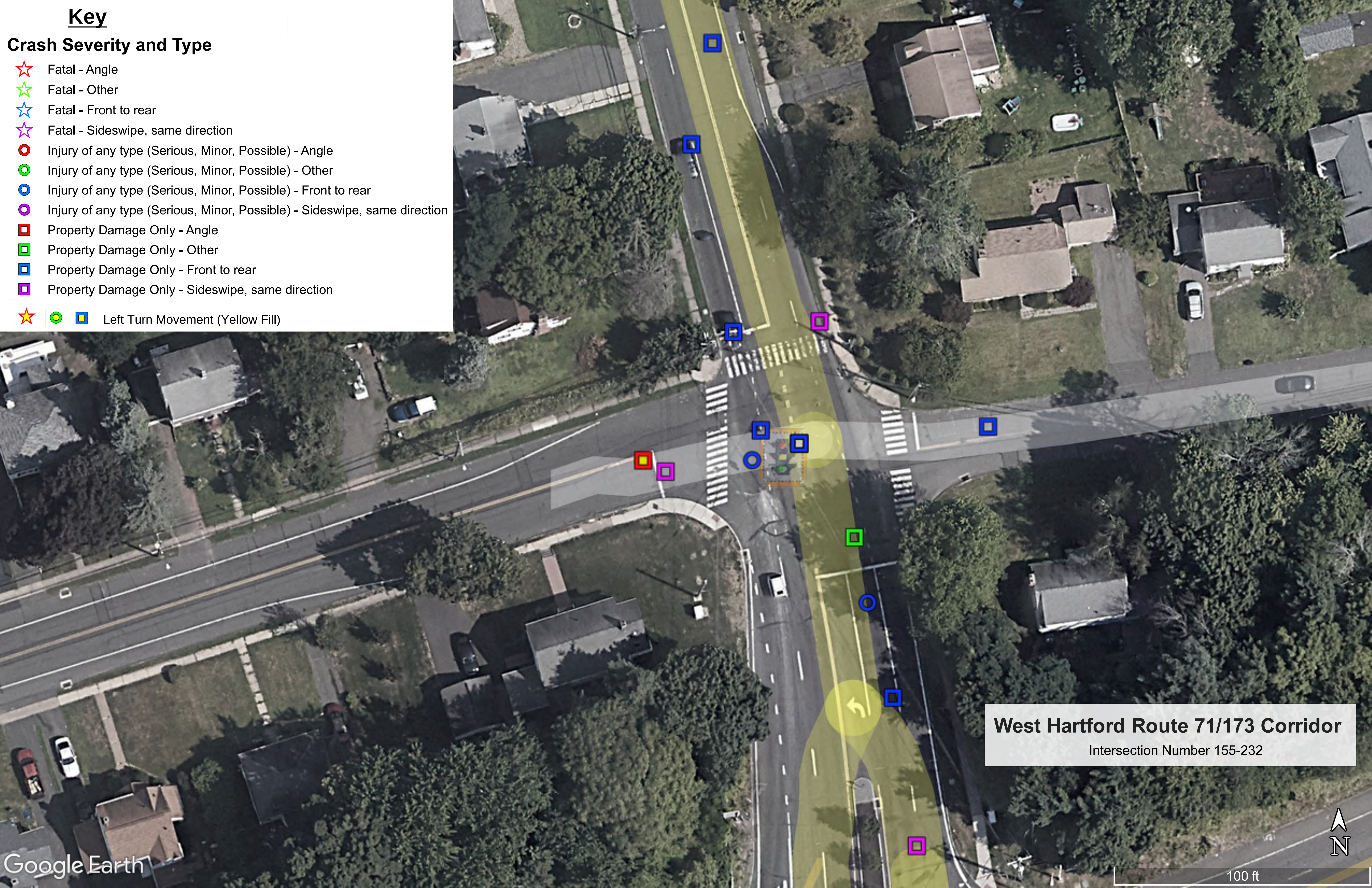


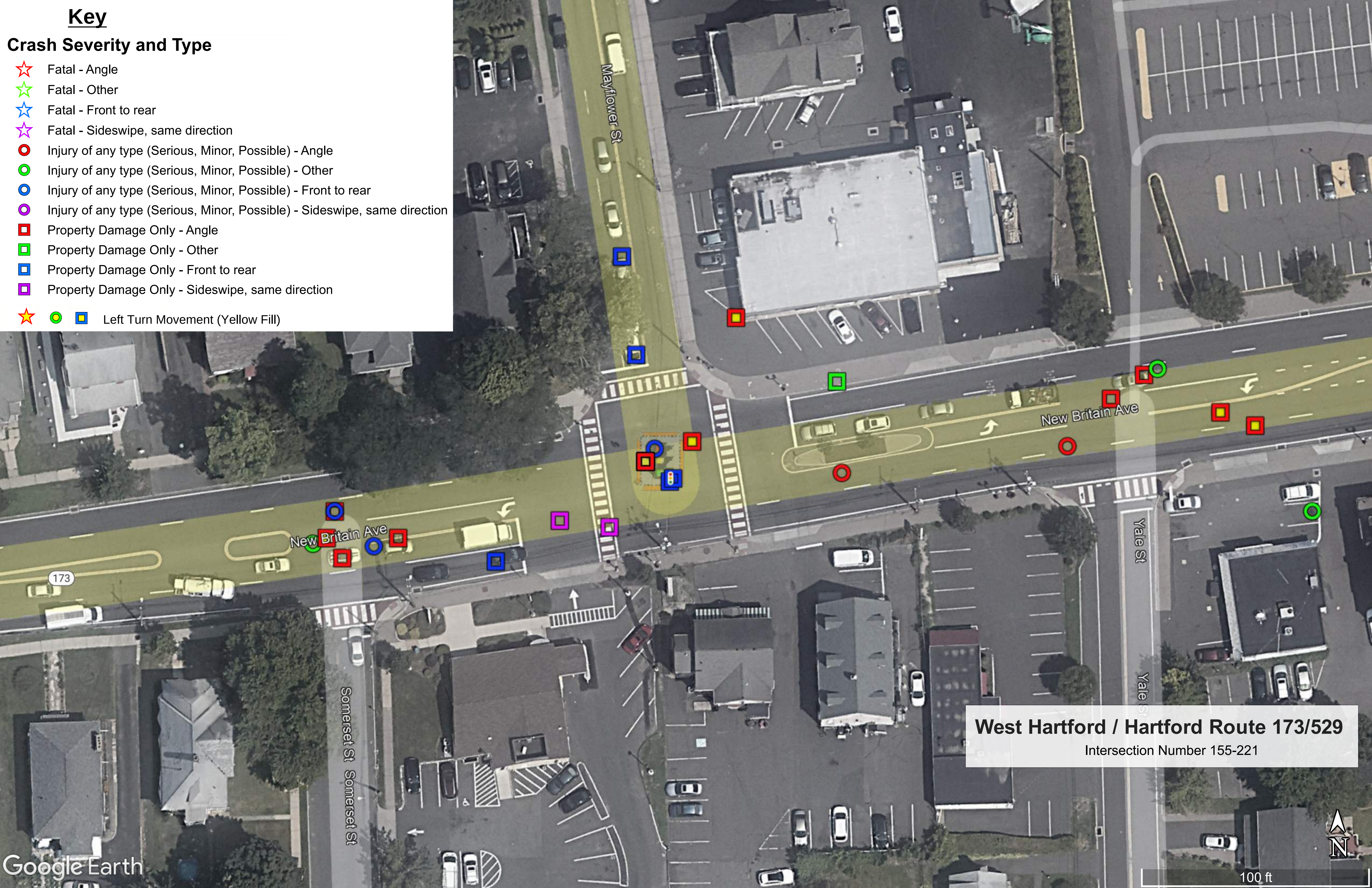
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
West Hartford Route 71/173 Corridor
Intersection Number 155-251
Google Earth
200 ft
N

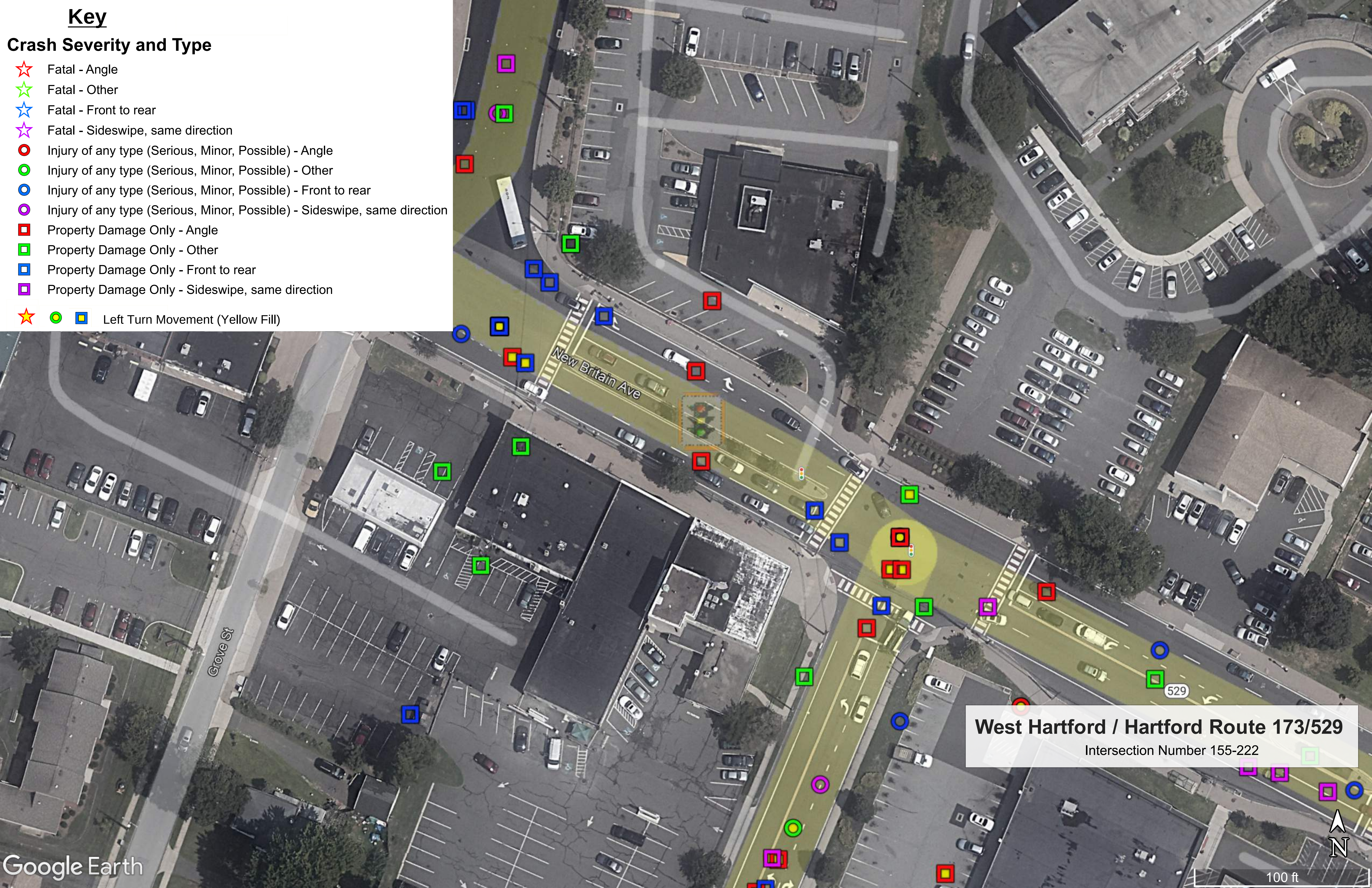

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
West Hartford Route 71/173 Corridor
Intersection Number 155-229
Google Earth
N
100 ft



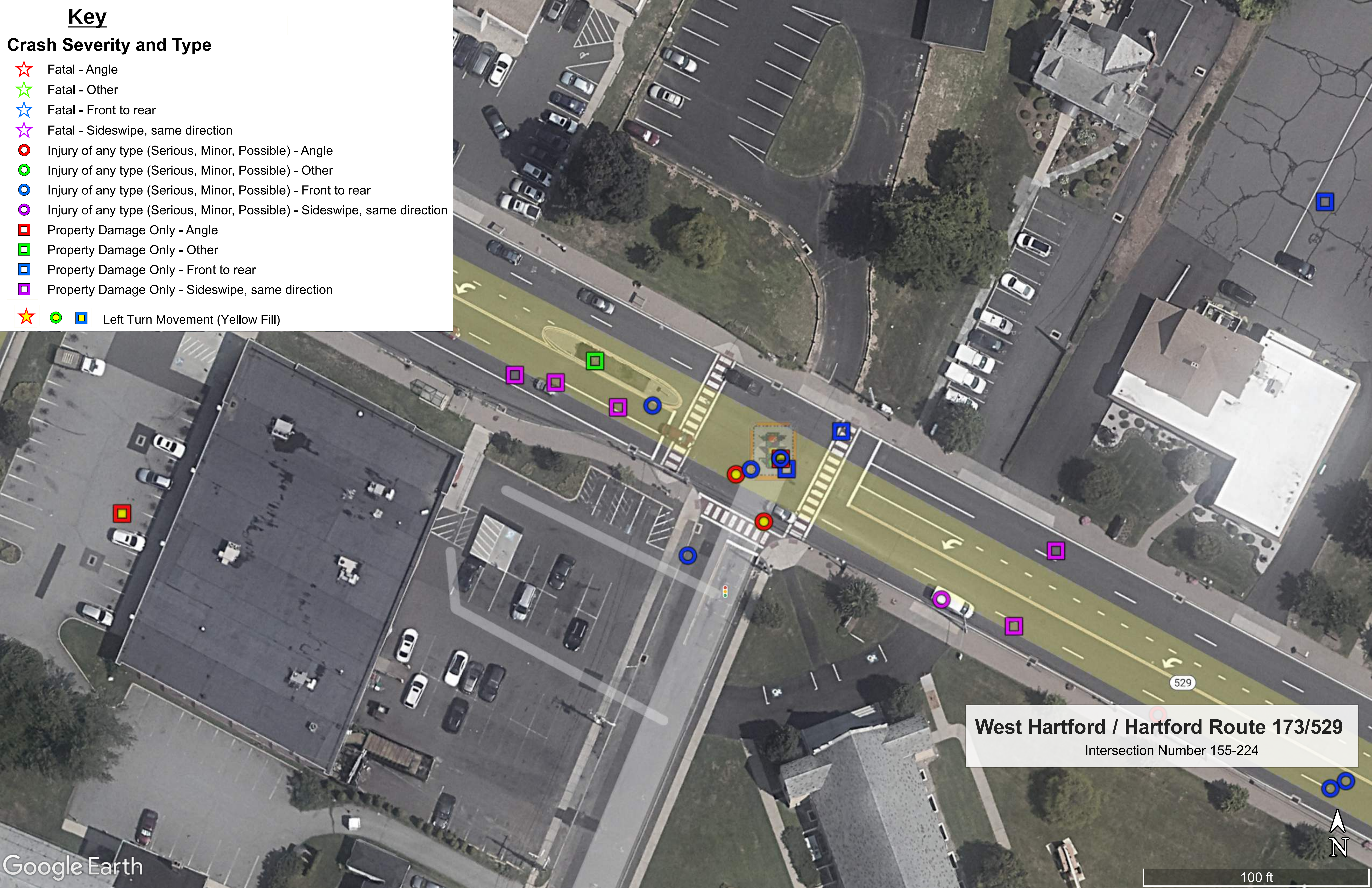
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
West Hartford Route 71/173 Corridor
Intersection Number 155-230
N
100 ft
Google Earth

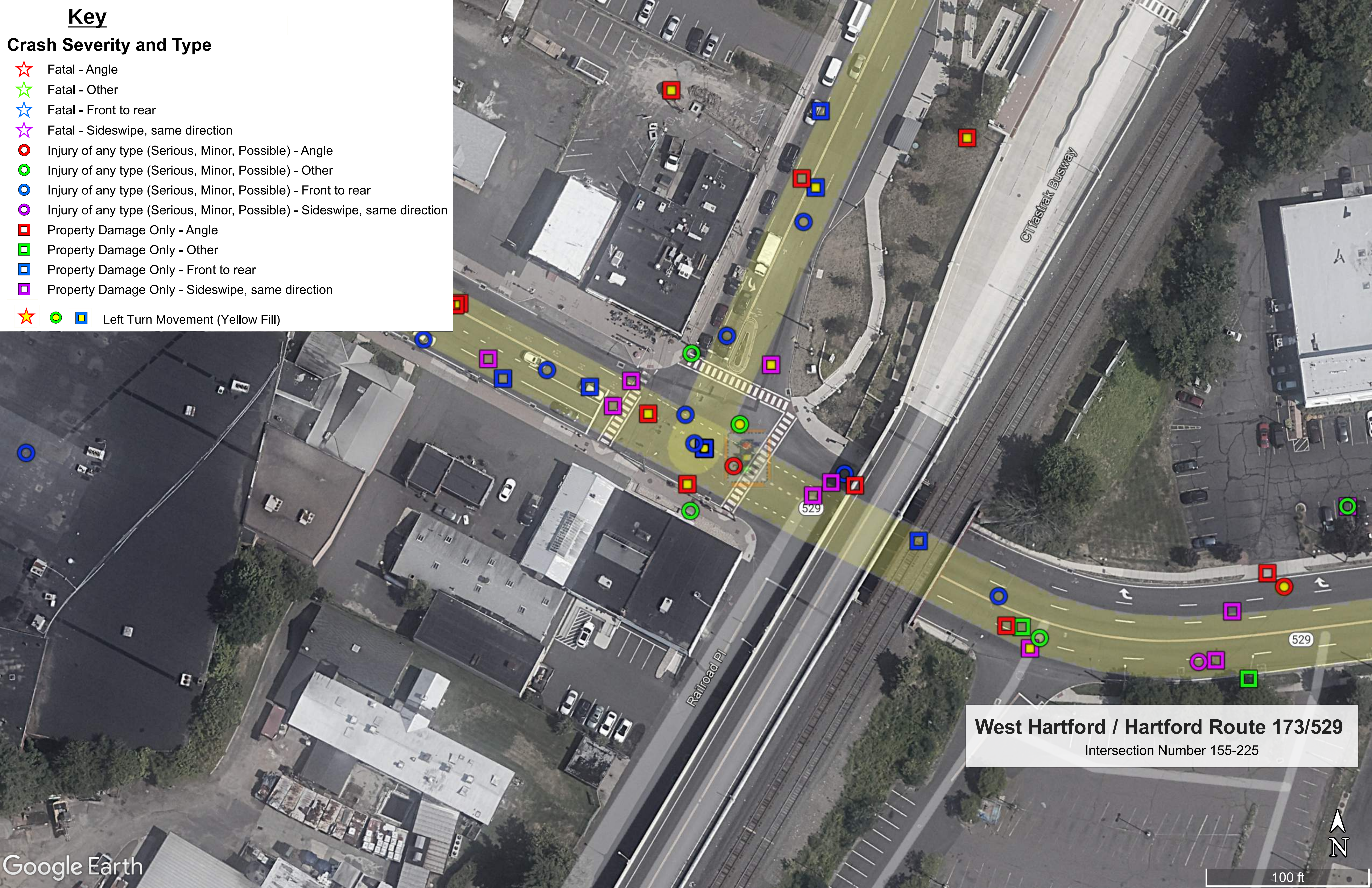

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
West Hartford Route 71/173 Corridor
Intersection Number 155-232
N
100 ft
Google Earth

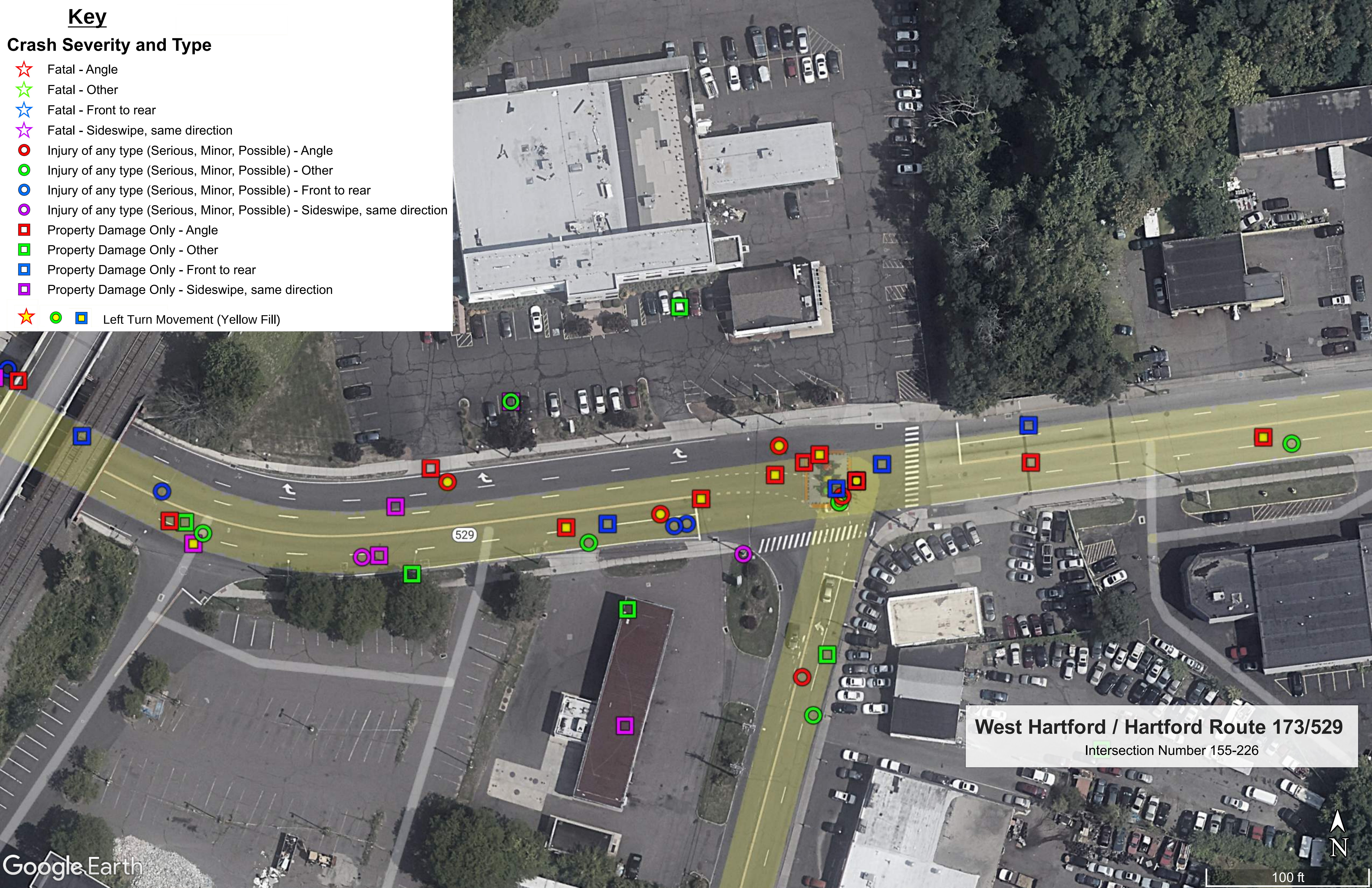

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Mayflower St
New Britain Ave
New Britain Ave
173
Yale St
Yale St
Somerset St
Somerset St
West Hartford / Hartford Route 173/529
Intersection Number 155-221
Google Earth
N
100 ft

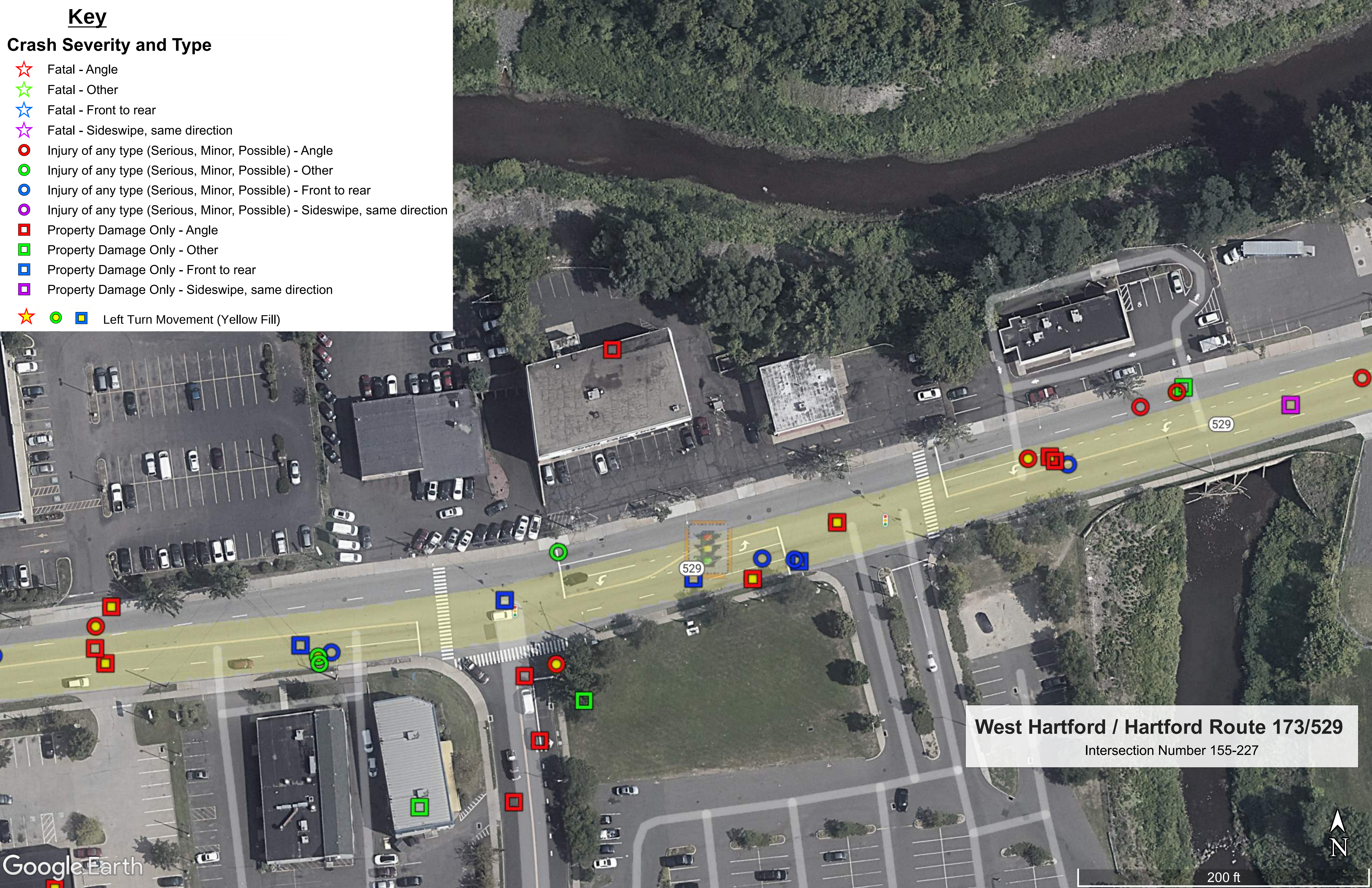


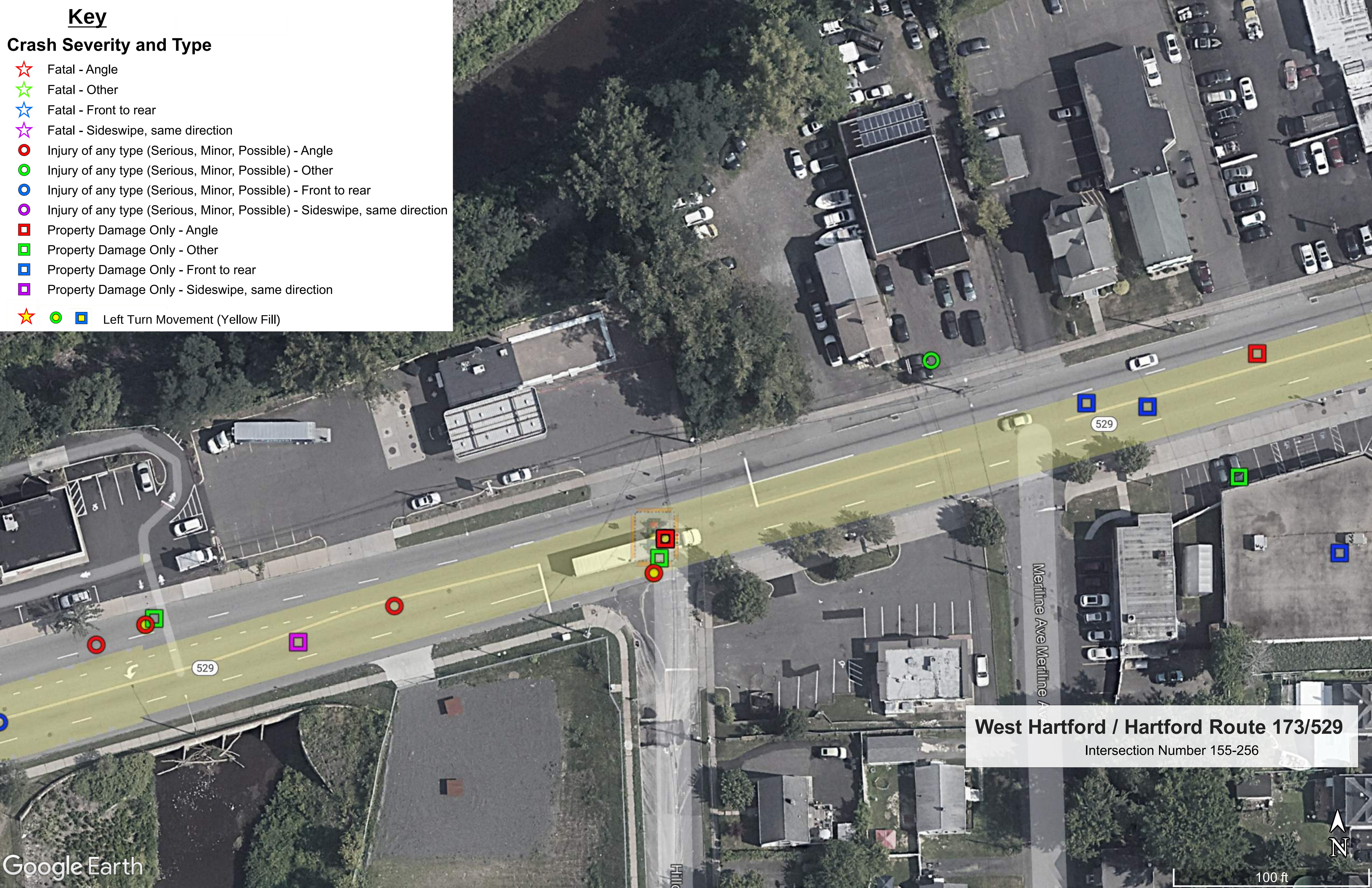
Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
New Britain Ave
Grove St
529
West Hartford / Hartford Route 173/529
Intersection Number 155-222
N
100 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
529
West Hartford / Hartford Route 173/529
Intersection Number 155-224
N
100 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
CTfastrak Busway
529
529
Railroad Pl
West Hartford / Hartford Route 173/529
Intersection Number 155-225
Google Earth
N
100 ft


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
529
West Hartford / Hartford Route 173/529
Intersection Number 155-226
Google Earth
N
100 ft


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
529
529
West Hartford / Hartford Route 173/529
Intersection Number 155-227
N
200 ft
Google Earth


Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
529
529
Merline Ave
Merline Ave
West Hartford / Hartford Route 173/529
Intersection Number 155-256
Google Earth
N
100 ft

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Newfield Ave
Newfield Ave
529
529
Montrose St
Montrose St
West Hartford / Hartford Route 173/529
Intersection Number 063-227
N
100 ft
Google Earth

Key
Crash Severity and Type
Fatal - Angle
Fatal - Other
Fatal - Front to rear
Fatal - Sideswipe, same direction
Injury of any type (Serious, Minor, Possible) - Angle
Injury of any type (Serious, Minor, Possible) - Other
Injury of any type (Serious, Minor, Possible) - Front to rear
Injury of any type (Serious, Minor, Possible) - Sideswipe, same direction
Property Damage Only - Angle
Property Damage Only - Other
Property Damage Only - Front to rear
Property Damage Only - Sideswipe, same direction
Left Turn Movement (Yellow Fill)
Stone St
Stone St
Natick St
New Britain Ave
New Britain Ave
529
Newington Ave
Newington Ave
Avery Heights
Avery Heights
West Hartford / Hartford Route 173/529
Intersection Number 063-232
N
100 ft
Google Earth

Appendix E
Phase 3 User Costs Analysis

Route 517 & Route 5 (Main Street/High Street) East Hartford
Travel Time Run System Evaluation - Comparison of Before and After Travel Time Run

Period	Direction	ΔTT (sec)	Δ Stops per vehicle	Total Traffic Volumes (veh/hour)	% Trucks	% Passenger Vehicles	PPVt	PPVc	Daily Δ Delay (veh/hours)	Daily Truck Travel Time Savings	Daily Car Travel Time Savings	Daily Fuel Consumption Savings (gallons)	Daily Reduced CO_2 Emission (kg)	Daily Reduced # Stops
AM	EB	42	0.37	355	3%	97%	1.14	1.5	4.14	$ (3.99)	$ (112.67)	-3.603	-31.7	-131
	WB	-37	-0.93	307	3%	97%	1.14	1.5	-3.16	$ 3.04	$ 85.83	2.745	24.2	286
MID	EB	-12	-1.00	522	3%	97%	1.14	1.5	-1.74	$ 1.68	$ 47.33	1.514	13.3	522
	WB	-20	-1.33	510	3%	97%	1.14	1.5	-2.83	$ 2.73	$ 77.08	2.465	21.7	678
PM	EB	-26	-0.97	460	3%	97%	1.14	1.5	-3.32	$ 3.20	$ 90.38	2.890	25.4	446
	WB	-5	0.00	588	3%	97%	1.14	1.5	-0.82	$ 0.79	$ 22.22	0.711	6.3	0
								TOTALS PER DAY:	**-7.73**	**$ 7.45**	**$ 210.17**	**6.722**	**59.2**	**1801**

ΔTT= Change in Travel Time

		Yearly Totals		
	2,010	Delay Savings (Vehicle Hours)	(say 2000)
$	1,937	Travel Time Savings (Truck)	
$	54,644	Travel Time Savings (Car)	
+ $	6,134	Fuel Savings	
$	62,716	Combined Savings	(say 63000)
	1,748	Reduction in Fuel Use (Gallons)	(say 1700)
	15,392	Reduction in CO_2 Emission (kg)	(say 15000)
	468,260	Savings Number of Stops	(say 470000)

$$\Delta TT = TT_{Base(section)} - TT_{Objective(section)}$$

$$USER_c = \Delta TT * Vol * \%C * PPV_c * \frac{\$18.71}{\text{hr}}$$

$$USER_t = \Delta TT * Vol * \%T * PPV_t * \frac{\$27.51}{\text{hr}}$$

$$FUEL = \Delta TT * Vol * \frac{0.87\ \text{gal}}{\text{hr}}$$

$$CO_2 = FUEL * \frac{19.4\ \text{lbs}}{\text{gal}}$$

Notes and References:
*Formulas from : https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2598&context=jtrp
*Cost Reference: https://ftp.dot.state.tx.us/pub/txdot-info/cst/ruc-methodology-memo.pdf
Table 1 on Page 2 (2018)
*Vehicle percentages from : https://tminfo-dot.ct.gov/TMINFO/top?year=2015,town=131,station=216,dataset=0
*Total savings represent annual savings during the periods of travel time run data collection only. Savings outside these times are not reported.
*Annual Calculations based on 260 commuter days per year.
*Average price per gallon for gasoline in CT = $3.51 (December 2021) https://gasprices.aaa.com/?state=CT

Route 5 & Route 44, East Hartford
Travel Time Run System Evaluation - Comparison of Before and After Travel Time Run

Period	Direction	ΔTT (sec)	Δ Stops per vehicle	Total Traffic Volumes (veh/hour)	% Trucks	% Passenger Vehicles	PPVt	PPVc	Daily Δ Delay (veh/hours)	Daily Truck Travel Time Savings	Daily Car Travel Time Savings	Daily Fuel Consumption Savings (gallons)	Daily Reduced CO_2 Emission (kg)	Daily Reduced # Stops
AM	EB	18	0.70	591	3%	97%	1.14	1.5	2.96	$ (2.85)	$ (80.39)	-2.571	-22.6	-414
	WB	-25	-0.80	1155	3%	97%	1.14	1.5	-8.02	$ 7.72	$ 218.19	6.978	61.4	924
MID	EB	-38	-0.30	585	3%	97%	1.14	1.5	-6.18	$ 5.95	$ 167.98	5.372	47.3	176
	WB	-43	-1.00	720	3%	97%	1.14	1.5	-8.60	$ 8.28	$ 233.95	7.482	65.8	720
PM	EB	-60	-1.60	810	3%	97%	1.14	1.5	-13.50	$ 13.00	$ 367.25	11.745	103.4	1296
	WB	-78	-1.60	1007	3%	97%	1.14	1.5	-21.82	$ 21.01	$ 593.53	18.982	167.0	1611
								TOTALS PER DAY:	-55.16	$ 53.11	$ 1,500.51	47.988	422.3	4313

ΔTT= Change in Travel Time

Yearly Totals		
14,342	Delay Savings (Vehicle Hours)	(say 14300)
$ 13,809	Travel Time Savings (Truck)	
$ 390,133	Travel Time Savings (Car)	
+ $ 43,794	Fuel Savings	
$ 447,735	Combined Savings	(say 448000)
12,477	Reduction in Fuel Use (Gallons)	(say 12500)
109,798	Reduction in CO_2 Emission (kg)	(say 110000)
1,121,380	Savings Number of Stops	(say 1120000)

$$\Delta TT = TT_{Base(section)} - TT_{Objective(section)}$$

$$USER_c = \Delta TT * Vol * \%C * PPV_c * \frac{\$18.71}{\text{hr}}$$

$$USER_t = \Delta TT * Vol * \%T * PPV_t * \frac{\$27.51}{\text{hr}}$$

$$FUEL = \Delta TT * Vol * \frac{0.87 \text{ gal}}{\text{hr}}$$

$$CO_2 = FUEL * \frac{19.4 \text{ lbs}}{\text{gal}}$$

Notes and References:
*Formulas from : https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2598&context=jtrp
*Cost Reference: https://ftp.dot.state.tx.us/pub/txdot-info/cst/ruc-methodology-memo.pdf
Table 1 on Page 2 (2018)
*Vehicle percentages from : https://tminfo-dot.ct.gov/TMINFO/top?year=2015,town=131,station=216,dataset=0
*Total savings represent annual savings during the periods of travel time run data collection only. Savings outside these times are not reported.
*Annual Calculations based on 260 commuter days per year.
*Average price per gallon for gasoline in CT = $3.51 (December 2021) https://gasprices.aaa.com/?state=CT

Route 44, East Hartford
Travel Time Run System Evaluation - Comparison of Before and After Travel Time Run

Period	Direction	ΔTT (sec)	Δ Stops per vehicle	Total Traffic Volumes (veh/hour)	% Trucks	% Passenger Vehicles	PPVt	PPVc	Daily Δ Delay (veh/hours)	Daily Truck Travel Time Savings	Daily Car Travel Time Savings	Daily Fuel Consumption Savings (gallons)	Daily CO_2 Emission (kg)	Daily Reduced # Stops
AM	EB	-1	0.37	265	3%	97%	1.14	1.5	-0.07	$ 0.07	$ 2.00	0.064	0.6	-98
	WB	9	0.33	558	3%	97%	1.14	1.5	1.40	$ (1.34)	$ (37.95)	-1.214	-10.7	-184
MID	EB	-4	-0.33	279	3%	97%	1.14	1.5	-0.31	$ 0.30	$ 8.43	0.270	2.4	92
	WB	2	0.03	333	3%	97%	1.14	1.5	0.19	$ (0.18)	$ (5.03)	-0.161	-1.4	-10
PM	EB	-21	-0.7	393	3%	97%	1.14	1.5	-2.29	$ 2.21	$ 62.36	1.994	17.5	275
	WB	-8	-0.37	387	3%	97%	1.14	1.5	-0.86	$ 0.83	$ 23.39	0.748	6.6	143
								TOTALS PER DAY:	**-1.94**	**$ 1.89**	**$ 53.20**	**1.701**	**15.0**	**218**

ΔTT= Change in Travel Time

Yearly Totals			
	504	Delay Savings (Vehicle Hours)	(say 500)
$	**491**	Travel Time Savings (Truck)	
$	**13,832**	Travel Time Savings (Car)	
$	**1,552**	Fuel Savings	
$	**15,876**	Combined Savings	(say 16000)
	442	Reduction in Fuel Use (Gallons)	(say 400)
	3,900	Reduction in CO_2 Emission (kg)	(say 4000)
	56,680	Savings Number of Stops	(say 60000)

$$\Delta TT = TT_{Base(section)} - TT_{Objective(section)}$$

$$USER_c = \Delta TT * Vol * \%C * PPV_c * \frac{\$18.71}{\text{hr}}$$

$$USER_t = \Delta TT * Vol * \%T * PPV_t * \frac{\$27.51}{\text{hr}}$$

$$FUEL = \Delta TT * Vol * \frac{0.87 \text{ gal}}{\text{hr}}$$

$$CO_2 = FUEL * \frac{19.4 \text{ lbs}}{\text{gal}}$$

Notes and References:

*Formulas from : https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2598&context=jtrp

*Cost Reference: https://ftp.dot.state.tx.us/pub/txdot-info/cst/ruc-methodology-memo.pdf Table 1 on Page 2 (2018)

*Vehicle percentages from : https://tminfo-dot.ct.gov/TMINFO/top?year=2015,town=131,station=216,dataset=0

*Total savings represent annual savings during the periods of travel time run data collection only. Savings outside these times are not reported.

*Annual Calculations based on 260 commuter days per year.

*Average price per gallon for gasoline in CT = $3.51 (December 2021) https://gasprices.aaa.com/?state=CT

Route 5, East Hartford/South Windsor
Travel Time Run System Evaluation - Comparison of Before and After Travel Time Run

Period	Direction	ΔTT (sec)	Δ Stops per vehicle	Total Traffic Volumes (veh/hour)	% Trucks	% Passenger Vehicles	PPVt	PPVc	Daily Δ Delay (veh/hours)	Daily Truck Travel Time Savings	Daily Car Travel Time Savings	Daily Fuel Consumption Savings (gallons)	Daily Reduced CO_2 Emission (kg)	Daily Reduced # Stops
AM	NB	-48	-0.67	557	3%	97%	1.14	1.5	-7.43	$ 7.15	$ 202.03	6.461	56.9	373
	SB	-97	-1.33	1167	3%	97%	1.14	1.5	-31.44	$ 30.27	$ 855.39	27.356	240.7	1552
MID	NB	8	2.33	474	3%	97%	1.14	1.5	1.05	$ (1.01)	$ (28.65)	-0.916	-8.1	-1104
	SB	-61	0	694	3%	97%	1.14	1.5	-11.76	$ 11.32	$ 319.90	10.231	90.0	0
PM	NB	-92	-1.67	647	3%	97%	1.14	1.5	-16.53	$ 15.92	$ 449.79	14.385	126.6	1080
	SB	-70	-1.33	1151	3%	97%	1.14	1.5	-22.38	$ 21.55	$ 608.83	19.471	171.3	1531
								TOTALS PER DAY:	**-88.49**	**$ 85.20**	**$ 2,407.29**	**76.988**	**677.4**	**3432**

ΔTT= Change in Travel Time

Yearly Totals		
23,007	Delay Savings (Vehicle Hours)	(say 23000)
$ 22,152	Travel Time Savings (Truck)	
$ 625,895	Travel Time Savings (Car)	
+ $ 70,259	Fuel Savings	
$ 718,307	Combined Savings	(say 718000)
20,017	Reduction in Fuel Use (Gallons)	(say 20000)
176,124	Reduction in CO_2 Emission (kg)	(say 176000)
892,320	Savings Number of Stops	(say 890000)

$$\Delta TT = TT_{Base(section)} - TT_{Objective(section)}$$

$$USER_c = \Delta TT * Vol * \%C * PPV_c * \frac{\$18.71}{\text{hr}}$$

$$USER_t = \Delta TT * Vol * \%T * PPV_t * \frac{\$27.51}{\text{hr}}$$

$$FUEL = \Delta TT * Vol * \frac{0.87\text{ gal}}{\text{hr}}$$

$$CO_2 = FUEL * \frac{19.4\text{ lbs}}{\text{gal}}$$

Notes and References:

*Formulas from : https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2598&context=jtrp

*Cost Reference: https://ftp.dot.state.tx.us/pub/txdot-info/cst/ruc-methodology-memo.pdf
Table 1 on Page 2 (2018)

*Vehicle percentages from : https://tminfo-dot.ct.gov/TMINFO/top?year=2015,town=131,station=216,dataset=0

*Total savings represent annual savings during the periods of travel time run data collection only. Savings outside these times are not reported.

*Annual Calculations based on 260 commuter days per year.

*Average price per gallon for gasoline in CT = $3.51 (December 2021) https://gasprices.aaa.com/?state=CT

Route 173 & Route 529, West Hartford & Hartford
Travel Time Run System Evaluation - Comparison of Before and After Travel Time Run

Period	Direction	ΔTT (sec)	Δ Stops per vehicle	Total Traffic Volumes (veh/hour)	% Trucks	% Passenger Vehicles	PPVt	PPVc	Daily Δ Delay (veh/hours)	Daily Truck Travel Time Savings	Daily Car Travel Time Savings	Daily Fuel Consumption Savings (gallons)	Daily Reduced CO_2 Emission (kg)	Daily Reduced # Stops
AM	EB	-26	-0.33	687	3%	97%	1.14	1.5	-4.96	$ 4.78	$ 134.97	4.317	38.0	227
	WB	-132	-2.33	585	3%	97%	1.14	1.5	-21.45	$ 20.65	$ 583.51	18.662	164.2	1363
MID	EB	-53	0	709	3%	97%	1.14	1.5	-10.44	$ 10.05	$ 283.95	9.081	79.9	0
	WB	-82	-1.67	630	3%	97%	1.14	1.5	-14.35	$ 13.82	$ 390.37	12.485	109.9	1052
PM	EB	17	1.67	970	3%	97%	1.14	1.5	4.58	$ (4.41)	$ (124.61)	-3.985	-35.1	-1620
	WB	12	1.33	915	3%	97%	1.14	1.5	3.05	$ (2.94)	$ (82.97)	-2.654	-23.4	-1217
								TOTALS PER DAY:	-43.57	$ 41.95	$ 1,185.22	37.906	333.5	-195

ΔTT= Change in Travel Time

Yearly Totals		
11,328	Delay Savings (Vehicle Hours)	(say 11300)
$ 10,907	Travel Time Savings (Truck)	
$ 308,157	Travel Time Savings (Car)	
+ $ 34,593	Fuel Savings	
$ 353,657	Combined Savings	(say 354000)
9,856	Reduction in Fuel Use (Gallons)	(say 9900)
86,710	Reduction in CO_2 Emission (kg)	(say 87000)
(50,700)	Savings Number of Stops	(say -50000)

$$\Delta TT = TT_{Base(section)} - TT_{Objective(section)}$$

$$USER_c = \Delta TT * Vol * \%C * PPV_c * \frac{\$18.71}{\mathrm{hr}}$$

$$USER_t = \Delta TT * Vol * \%T * PPV_t * \frac{\$27.51}{\mathrm{hr}}$$

$$FUEL = \Delta TT * Vol * \frac{0.87\ \mathrm{gal}}{\mathrm{hr}}$$

$$CO_2 = FUEL * \frac{19.4\ \mathrm{lbs}}{\mathrm{gal}}$$

Notes and References:
*Formulas from : https://docs.lib.purdue.edu/cgi/viewcontent.cgi?article=2598&context=jtrp
*Cost Reference: https://ftp.dot.state.tx.us/pub/txdot-info/cst/ruc-methodology-memo.pdf
Table 1 on Page 2 (2018)
*Vehicle percentages from : https://tminfo-dot.ct.gov/TMINFO/top?year=2015,town=131,station=216,dataset=0
*Total savings represent annual savings during the periods of travel time run data collection only. Savings outside these times are not reported.
*Annual Calculations based on 260 commuter days per year.
*Average price per gallon for gasoline in CT = $3.51 (December 2021) https://gasprices.aaa.com/?state=CT