

Welcome to the Grand Forks Signal Coordination Study Open House!

The Grand Forks – East Grand Forks Metropolitan Planning Organization (MPO), working together with the North Dakota Department of Transportation (NDDOT), Cities Area Transit (CAT) and City of Grand Forks, have been working towards improving the traffic signal timings along the arterial corridors of the community. By upgrading equipment and developing new traffic signal coordination plans, drivers using the corridors are expected to experience an improved drive.

Over the next year, we will be undertaking the development of new signal timing plans for five arterial roadways. This is our first public open house to engage the citizens of Grand Forks and invite folks to provide input on their driving experience.

Study Area

The Signal Coordination Study will include installing new traffic signal controller equipment and developing new signal timing plans for five major corridors:

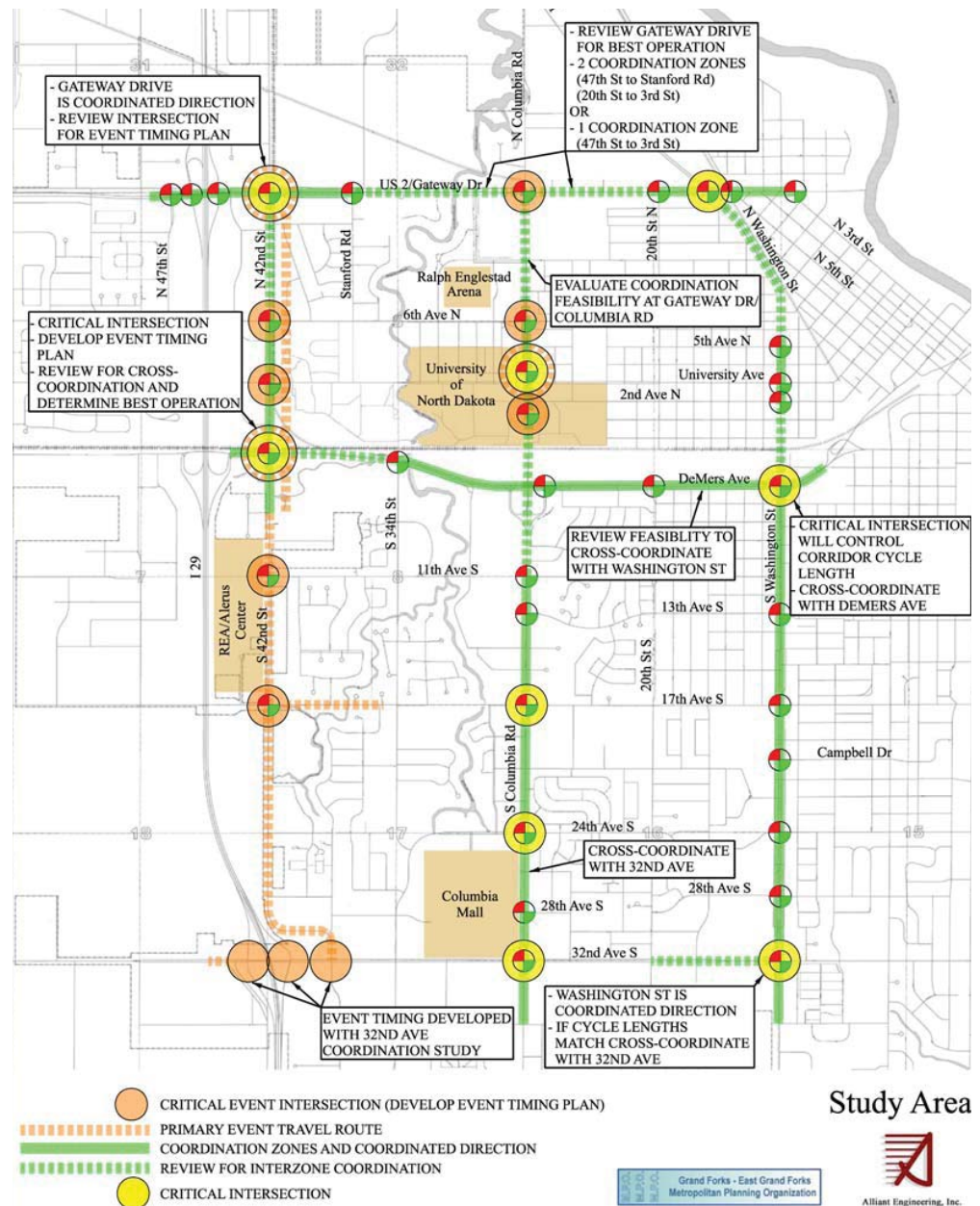
- Columbia Road – 32nd Avenue S to Gateway Drive
- Washington Street – 32nd Avenue S to Gateway Drive
- Gateway Drive – N 47th Street to N 3rd Street
- DeMers Avenue – N 42nd Street to Washington Street
- N 42nd Street – 17th Avenue S to Gateway Drive

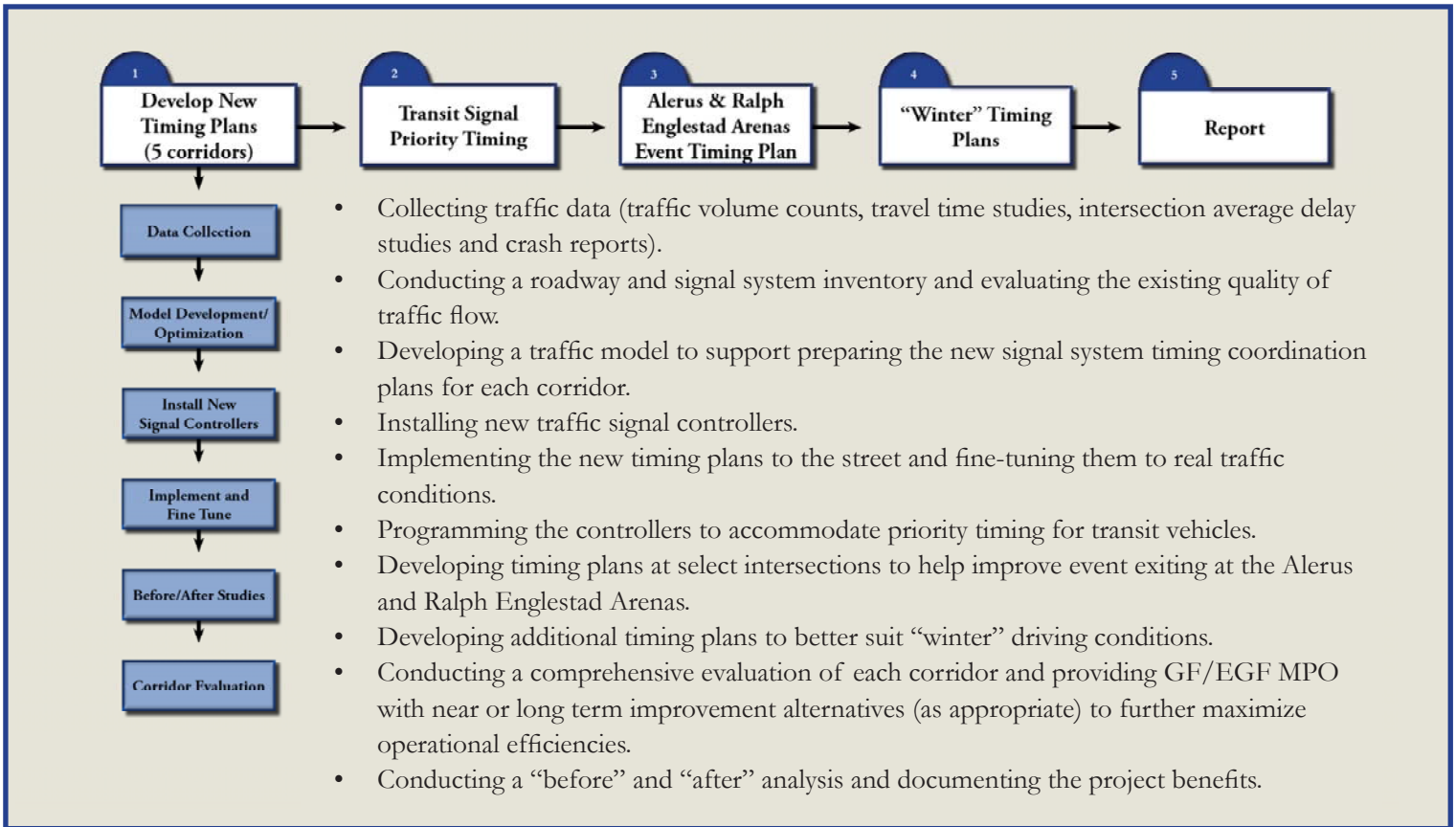
Study Goals

The primary goal of the Signal Coordination Study is to provide improved traffic flow along each of the arterial corridors, reduce vehicle delays, reduce vehicle stops and improve safety. This will be accomplished through installing “optimized” signal timing plans and upgrading traffic signal equipment.

Study Process

The Signal Coordination Study will consist of the following major components and will follow the process shown on the next page.





Tentative Project Milestone Dates

- Data CollectionSeptember 2009, February 2010, May 2010, October 2010, December 2010
- **Columbia Road (Interim Timing Plans)** **October 15-17, 2009**
- Washington Street (New Timing Plans)May 2010
- DeMers Avenue, 42nd Street and Gateway Drive (New Timing Plans)Fall 2010
- Event and Bus Priority Timing PlansFall 2010
- Final Project Report December 31, 2010

Project Contact

Visit the project website at <http://www.theforksmpo.org/Pages/Projects.htm> for more information. Or contact Earl Haugen of the Grand Forks-East Grand Forks MPO, at 701-746-2660.

What is Signal Timing?

Signal timing is a process to "optimize" the operation of signalized intersections. The objective is to respond to the demands of all types of motor vehicles, bicycles and pedestrians in an optimum or balanced manner. Signal timing is one of the most cost-effective ways to improve traffic flow and make our streets safer. Signal timing is performed to:

- Improve traffic flow through a group of signals.
- Reduce overall delay time at an intersection (Note: does not always equal to an individual motorist's wait time).
- Account for changes in traffic characteristics due to growth or new developments.
- Reduce motorist frustration by reducing stops and delay.
- Reduce response time for bus service and emergency vehicles.
- Postpone the need for costly road construction by improving traffic flow on the existing facility.

In addition to developing new coordination timing plans, there are several basic signal timing parameters that will be reviewed and updated at each intersection as part of the Signal Coordination Study. These include:

- The "Yellow" interval.
- The "Red" clearance interval.
- The pedestrian "Walk" symbol interval.
- The pedestrian "Don't Walk" hand interval.

- The minimum “Green” indication.
- Vehicle detection settings.

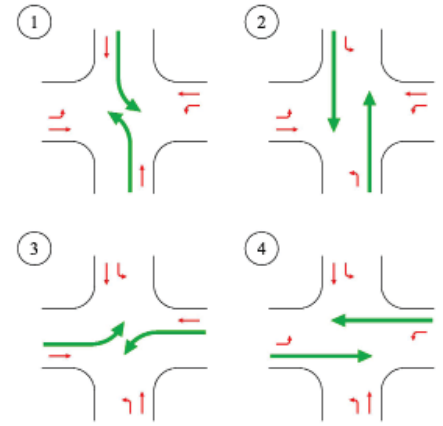
What is Signal Coordination?

Signal coordination is the process to synchronize the start of the “green light” along the major roadway (e.g., northbound and southbound Columbia Road traffic), so that vehicles can travel through a group of signals with minimal or no stopping. There are three key timing parameters to make signal coordination work and are noticeable to the driver. These include the “cycle length”, the individual traffic movement “green + yellow + red” phase (referred to as a movement “split”) and intersection “offset” or progression.

Cycle Length

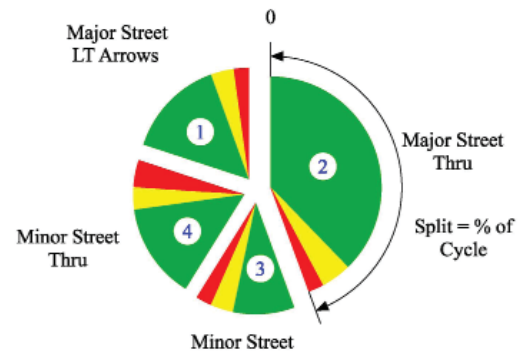
The cycle length is the total time to complete one sequence of all movements around an intersection. As shown in the illustration to the right, one cycle length is the total time required to complete Interval 1 through Interval 4.

The cycle length is the most important parameter. In order for signal coordination to work, all intersections along the arterial must have the same cycle length (or be a multiple of each other). Cycle lengths typically range between 80 seconds and 180 seconds depending upon the intersection design, spacing between intersections and traffic characteristics. Choosing the optimum cycle length for a system of several intersections is challenging and often requires the use of a traffic modeling software to help balance coordinated traffic flow on the major roadway and minimizing delay on the minor street. On Columbia Road we will be installing cycle lengths ranging between 80 and 120 seconds.



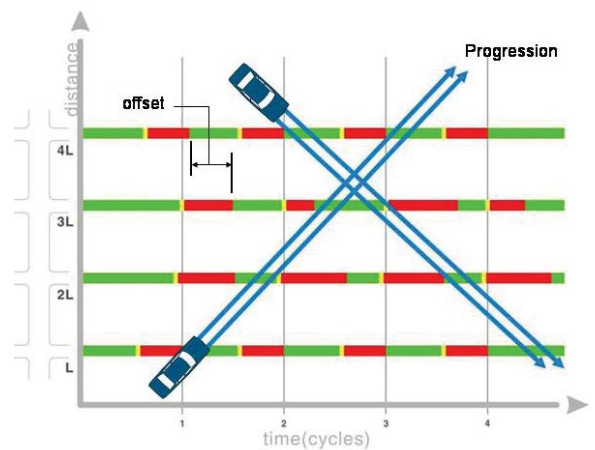
Split

The individual movement (e.g., northbound left turn arrow at Columbia Road/24th Avenue) split is the sum of the “green time + yellow interval + red clearance interval”. The movement split represents a percentage of the total cycle length. The movement splits are timed to clear all waiting motorists on a typical day. However, the total amount of split is constrained by the cycle length and other conflicting movements; therefore, need to be balanced. Because traffic demand varies from day to day, or events/functions or other reasons, sometimes not all motorists will always “make the green light.”



Offset

The offset, illustrated to the right, is the time between the start of the “green light” at one intersection and the start of “green light” at another intersection. The offset defines the movement of traffic along the arterial, also referred to as “progression.” The offset is very important to observe and fine-tune in the field to real traffic speeds and conditions to help reduce stops and slowing.



Signal Coordination Considerations

Signal timing and coordination on the surface seems very easy; and in the end, appears to the motorist as simple as green lights and red lights. However, the nuts and bolts of developing signal coordination timing plans for arterial corridor can be very complex and challenging. The following generally highlights a few key considerations that may influence the signal coordination:

- **The traffic signal controller and communication between intersections.** The traffic signal controller is the brain of the intersection and operates the signal system. However, the controller has its own set of capabilities, functions and limitations. Signal timing plans must fit with the capability of the signal controller.
- **Traffic volumes in multiple directions and for multiple movements must be considered.** These volumes may vary by time of day, day of week, and as overall travel in the area changes.

- **Spacing between intersections.** The ability to maximize traffic flow is directly related to the spacing of the signals and the motorist vehicle speeds. This is especially true when trying to move traffic continuously in both directions along an arterial.
- **Number of cars stopped at an intersection.** The impact of vehicle queues (or line of cars) must be considered when setting the intersection offsets. It is desirable to time the offsets to minimize slowing of traffic approaching the intersection and to contain vehicle queue lengths such that no lanes or intersections are blocked.
- **Pedestrians and Bikes.** Pedestrian crossing times may be a critical component of the timing and influences the corridor progression. This is especially true at Columbia Road and University Avenue. A signal may need to give more time than is required for the vehicles on an intersection approach in order to allow pedestrians to cross the street safely.
- **The location of high volume cross-streets.** Critical intersections (e.g., Columbia Road at 32nd Avenue, 24th Avenue, 17th Avenue and University Avenue) or those locations with high cross-street traffic volume and pedestrian demands greatly influences the progression. Vehicle platoons can be more difficult to serve at the critical intersections that must give more green time to cross-street movements.

What to Expect

Signal timing is one of the most cost-effective ways to improve traffic flow. However, signal coordination is also not perfect. Traffic flow and delays must be balanced throughout the system; therefore, trade-offs are always required. The biggest impact of signal coordination projects is the lower volume cross-street movements will often experience a slight increase in wait time. Why does this occur?

- **Signal coordination requires that each intersection have the same cycle length or be multiples of the same cycle length.** Typically, there are a few critical intersections that require a particular cycle length to accommodate the traffic and pedestrian demands, while others within the system must then be compatible to allow coordination. This can at times result in a longer wait at certain locations, than would be otherwise expected.
- **A primary goal of signal coordination is to efficiently move the majority of vehicles through the system with the fewest stops and reduced travel time.** It would be ideal if every vehicle entering the system could proceed through the system without stopping. This is not possible. Therefore, in traffic signal coordination, the majority rules and the busiest traffic movements are given precedence over the smaller traffic movements. This means that side street traffic often experiences a slightly longer wait time. However, once on the main street, motorists should generally experience better flowing traffic conditions.

Other items to expect or things you might see include:

- **Some intersections will have a lagging left turn arrow (32nd Avenue at Columbia Road).** This means the left turn arrow comes up at the end of the through lane green light. This is done to improve the progression at upstream and downstream intersections. It also typically lowers the wait time for left turning motorists.
- **Turning off left turn arrows.** During low volume time periods (mid-morning or late evening) the cross-street left turn arrows may be turned off. This will be done at Columbia Road/28th Avenue and Columbia Road/University Avenue). You can still turn left on the “green ball” indication. This is done to use a shorter cycle length, plus still provide adequate crossing time for pedestrians.
- **Planned stops.** Having a planned stop along the arterial is usually necessary because the signal spacing prohibits non-stop progression in both directions. Logical locations are chosen to group vehicles.
- **Heavier flow in one direction.** The higher volume direction is favored, which may cause more stops in the lower volume direction.

Although there are always some trade-offs, and there may be some individual cross-street movements experiencing a slight increase in wait time, significant performance improvements are generally made. Especially when considering the entire length of an arterial and all the intersections within the system. Maintaining efficient signal coordination improves the environment and always results in an overall reduction of user costs. These improvements include reducing air pollution (emission), reducing fuel consumption (improved gas mileage), reducing vehicles stops (wear and tear) and reduced delay (value of time). As an example, the benefits of the 32nd Avenue Signal Coordination Project found the following:

- The benefit to cost ratio was computed as 31:1 with an estimated annual user cost savings of 1.3 million dollars.
- The project resulted in a 25% reduction in vehicles stops, 9% reduction in fuel consumption (600 gallons daily) and a 6% reduction in vehicle delays.
- Travel times along 32nd Avenue were found reduced by 23% during the morning rush and 29% during the evening rush.