Traffic insights

ATSPM Flashcards

Traffic Insights

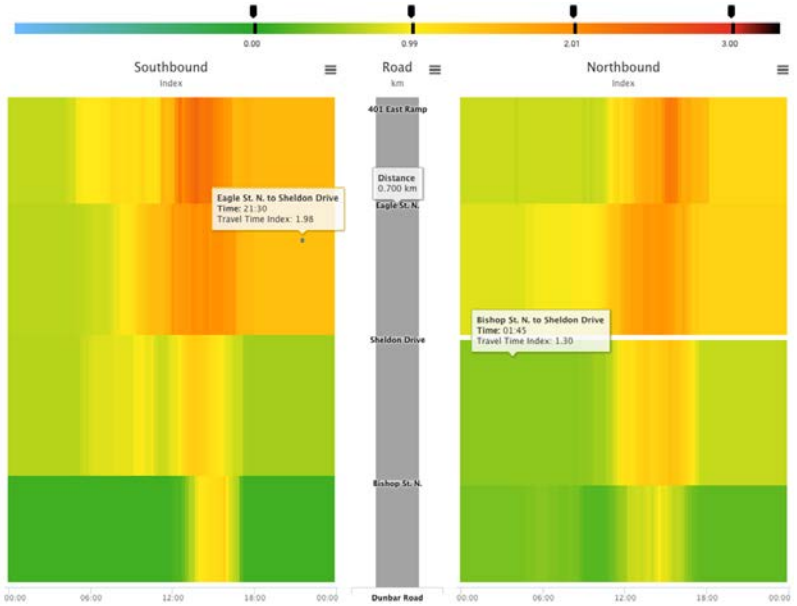
Optimize your traffic network. Measure the impact.

Traffic Insights are a suite of signal performance analytics and tools that help improve traffic safety and efficiency, while cutting congestion and cost. High-resolution traffic intersection data provided by Miovision TrafficLink helps support objectives and performance-based traffic signal maintenance and operations strategies.

The following are a list of Miovision Automated Traffic Signal Performance Measures (ATSPMs) you can use to measure your traffic network.

Corridor Heatmap

AKA: Corridor Travel Time / Speed



Requirements: More than two Smartlink units
Data freshness: Same day (15 minutes)

Definition:

Corridor Heatmap is an industry-standard visualization for reporting travel time at different times of day in relation to distance along a corridor. You can also switch between Travel Time and Speed, giving users additional context.

Corridor Heatmap offers a number of visualization options, including Travel Time Index, Planning Index, Historical Space-Mean-Speed, Historical Travel Time, Speed Exception (Single Day), and Travel Time Exception (Single Day).

Interpretation:

In general, areas of green indicate free flow speeds. Areas of orange indicate periods of time through a day that exceed free-flow speeds moderately (20-30%). Areas of red indicate travel times exceeding free-flow inordinately (40%+).

Use cases:

Identify bottlenecks along a corridor where travel time or speeds decrease most regularly at various time of the day.

Evaluate the performance of coordination/timing plans from a corridor perspective in both directions.

Determine whether there's a need to increase or decrease the duration of coordinated timing plans, including introducing mid-day coordinated timing plans (if not already in place).

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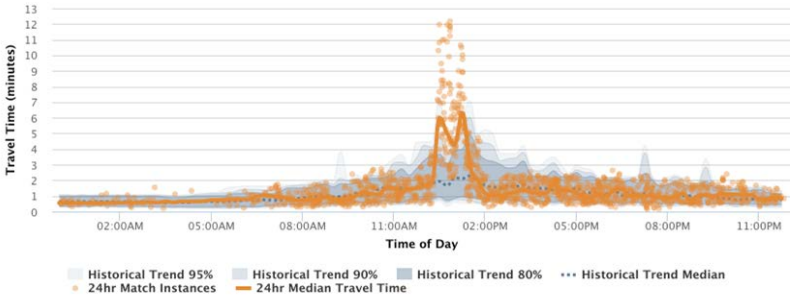
Travel Time

AKA: Point-to-Point Travel Time



Requirements: More than one Smartlink
Data freshness: Same day (15 minutes)

Definition:

Travel Time displays the amount of time it takes vehicles to travel along a segment of roadway between intersections, at different times of day. Travel time is overlaid with 95th, 90th, and 80th percentile trends.

Interpretation:

Big spikes in 24-hour data (orange line) above the average or 95% historical trend (blue bands) indicate a period of major congestion or an incident. Increasing trends (blue bands) over time indicate longer travel times (less efficient travel). Wider blue bands indicate higher travel time variability (less reliable travel).

Use cases:

Use single-day data to measure the impact of anomalies (for example, traffic incident).

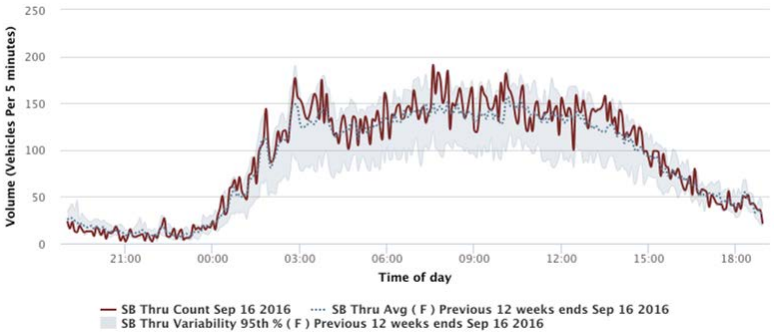
Compare historical trend data to measure changes in travel times over time.

Perform before-and-after comparisons of travel time along a corridor (such as after a signal retiming project).

Evaluate the variability and reliability of travel time between intersections and identify sections with highest unreliability for further evaluation.

Approach Volumes

AKA: Approach Counts, Arrival Volumes



Requirements: Advance/upstream pulse detection
Data freshness: Next day

Definition:

Approach volumes are a measure that uses upstream detection to count the number of vehicles arriving at each approach of an intersection over a 24-hour period.

Interpretation:

Sudden spikes in volume (high or low) typically indicate that an incident has occurred either at the intersection or nearby. Increasing volume trends over time have the potential to affect signal performance and increase congestion levels.

Use cases:

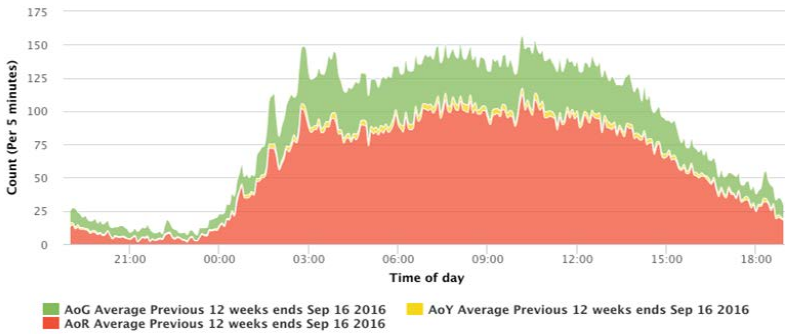
Compare the traffic demand on different approaches at the intersection to prioritize coordination directionality during the AM and PM peak.

Watch volume trends over time to help identify and create more efficient time of day (TOD) plan durations based on historical weekday and weekend trends.

Differentiate between volume anomalies (such as incidents) and volume trends (such as increasing traffic).

Arrivals on Red

AKA: Arrivals on Green, AoR vs. AoG



Requirements: Advance/upstream count detection
Data freshness: Next day

Definition:

Arrivals on Red reports the number of vehicles arriving at an intersection during a given phase interval (Red / Yellow / Green), providing an indication of progression through the intersection.

Interpretation:

The more Red visible on the graph; the more vehicles are arriving on Red; the worse the progression is for that specific approach. Good progression would have 60-80% Arrivals on Green (that is, 20%-40% Arrivals on Red). The acceptable level depends on the agency strategy for the intersection (for example, coordination or fully actuated free-mode).

Use cases:

Identify progression bottlenecks by comparing arrivals for different intersections along a coordinated signal corridor.

Perform before-and-after comparisons on progression at intersections (such as after a signal retiming project).

Watch trends over time to help differentiate anomalies from the need for timing plan or coordination adjustments.

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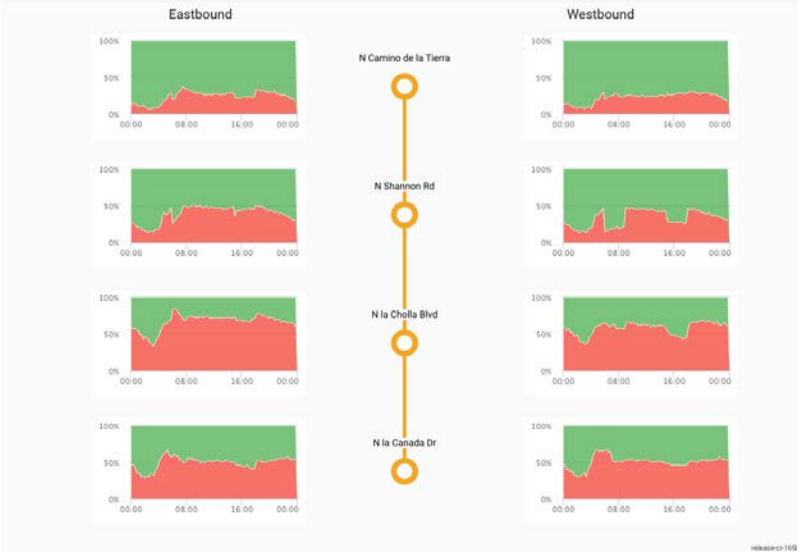
Arterial Analysis

AKA: Arrival-on-Red Corridor Scan



Definition:

Arterial Analysis provides a visual representation of Arrivals-on-Red along the length of a corridor. This context and analysis allows for easy identification of problem intersections.

Interpretation:

The more Red visible on the graph; the more vehicles are arriving on Red; the worse the progression is for a specific approach. Good progression has 60-80% Arrivals on Green (that is, 20%-40% Arrivals on Red).

Use cases:

Easily identify progression bottlenecks by comparing arrivals for different intersections along a coordinated signal corridor.

Perform before-and-after comparisons on progression along the entire corridor after making changes at particular intersections (for example, after a signal retiming project).

Watch trends over time to help differentiate anomalies from the need for timing plan or coordination adjustments.

Requirements: Advance/upstream count detection
Data freshness: Next day

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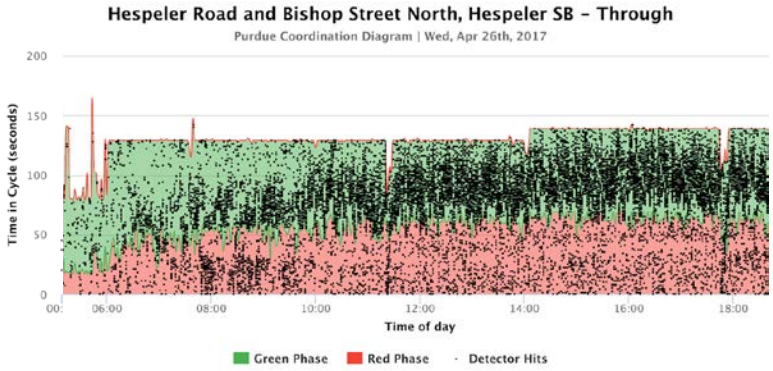
Purdue Coordination Diagram (PCD)

AKA: Approach Counts, Arrival Volumes



Requirements: Advance/upstream count detection
Data freshness: Next day

Definition:

The Purdue Coordination Diagram (PCD) uses dots to depict the arrival of each vehicle through each phase (Green, Yellow, and Red) and during each movement of the cycle. This depicts vehicle arrivals in a spatial manner to allow for platoon analysis.

Interpretation:

Large clusters of dots within the green-shaded area illustrates good progression and platooning.

Clusters of dots within the red area of the chart indicate a high volume of vehicles arriving on Red. This could be caused by sub-optimal offsets or signals out of time sync.

Scattered dots with no clear pattern indicates random arrivals and no effective platooning.

Use cases:

Troubleshoot coordination-related issues more accurately by characterizing arrivals on Red and Green in more detail.

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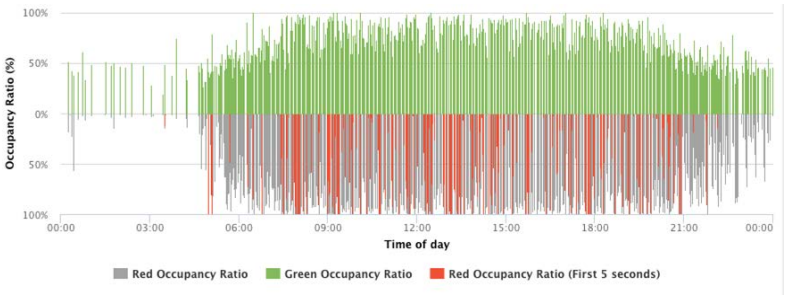
Occupancy Ratio

AKA: Green Occupancy, Red Occupancy



Requirements: Stop bar presence detection
Data freshness: Next day

Definition:

Occupancy Ratio provides the percentage of phase cycle time a stop bar detector is actuated during the Red and Green intervals. Red Occupancy Ratio on the first 5 seconds of Red (RoR5) helps identify residual demand after Green.

Interpretation:

Areas on the graph with consecutive tall red lines (RoR5) are areas of concern as these indicate consecutive cycles with residual vehicle demand or oversaturation. High GoR (green lines) and low RoR5 (red lines) indicate effective green-time utilization.

Use cases:

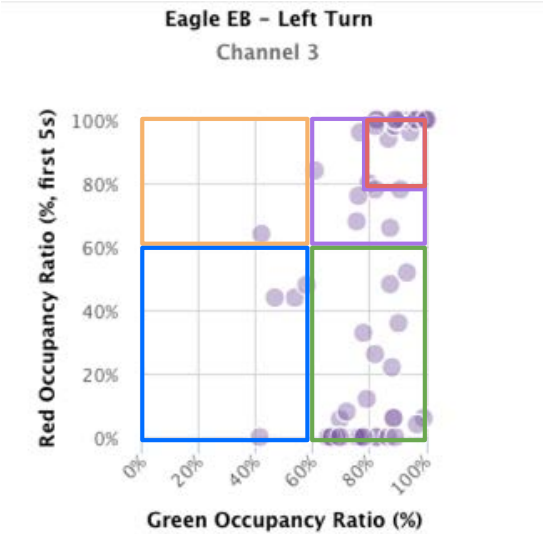
Quantify phase utilization to make informed decisions about reallocating green time.

Identify opportunities to improve Level-of-Service (LOS) at an intersection level (that is, local optimization).

Respond to citizen complaints regarding service at a specific intersection. For example, a citizen call stating “I waited three cycles to get through the left-turn”. Validate the problem by time of day and make changes where appropriate.

Split Failures

AKA: Purdue Split Failure



Requirements: Stop bar presence detection
Data freshness: Next day

Definition:

Split Failure charts every cycle as points comparing the Green Occupancy Ratio (GoR) along the x-axis and the first 5 seconds of Red Occupancy Ratio (RoR5). Values over 80% for both GoR and RoR5 indicate a Split Failure.

Interpretation:

Look for clusters in the sections of the chart indicated in the example on the left.

Split Failures (GoR and RoR5 > 80%): Indicates Split Failures.
Heavy Traffic (60% < GOR and ROR5 <80%): Highly saturated but not failing. Indicates a potential but not imminent problem.
OK (Good) (GoR > 80%, low RoR5): Indicates excellent Green Utilization.
Random Arrivals (low GoR, RoR5 > 60%): Random Arrivals of vehicles.
Spare Capacity (both GoR and RoR5 are low): Indicates excess capacity.

Use cases:

Quickly identify how effectively an intersection movement is being serviced (that is, is it getting enough green time or serving the available queue effectively?).

Evaluate the performance of the intersection from a local split allocation point of view to potentially identify opportunities (that is, phases with excess capacity) to allocate green time to phases in need.

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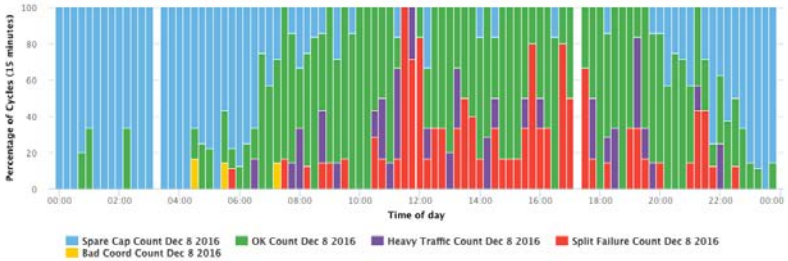
Split Trend

AKA: Historical Split Failures



Requirements: Stop bar presence detection
Data freshness: Next day

Definition:

Split Trend decodes the Split Failure chart into a 24-hour chart that can be examined for trends over weeks and months (instead of single days). This allows deeper analysis into trends than single days. This data is binned into 15 minute intervals.

Interpretation:

Split Failures (GoR and RoR5 > 80%): Indicates Split Failures.
Heavy Traffic (60% < GOR and ROR5 <80%): Highly saturated but not failing. Indicates a potential but not imminent problem.
OK (Good) (GoR > 80%, low RoR5): Indicates excellent Green Utilization.
Random Arrivals (low GoR, RoR5 > 60%): Random Arrivals of vehicles.
Spare Capacity (both GoR and RoR5 are low): Indicates excess capacity.

Use cases:

Make higher-confidence timing plan decisions based on weeks of data and validated patterns, instead of single-day data that can be prone to showing anomalies.

Provides a more accessible version of the Split Failure chart by characterizing ratios into human-readable explanations.

Validate the sufficiency of the intersection cycle time.

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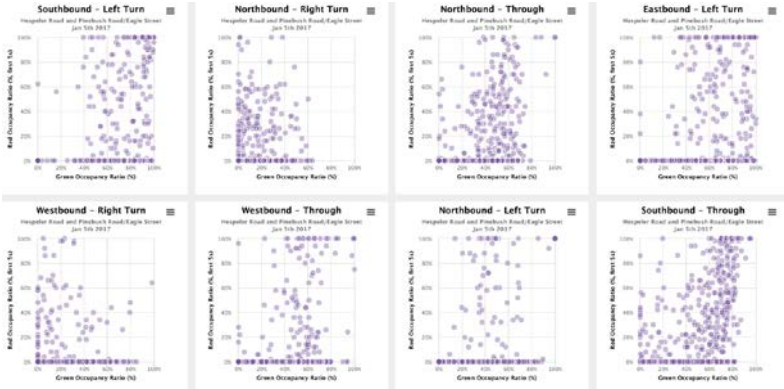
Split Analysis

AKA: Purdue Split Failure



Requirements: Stop bar presence detection
Data freshness: Next day

Definition:

Split Analysis plots the Split Failure charts for every movement/phase of an intersection on the same page, allowing users to spatially compare and identify which phases are receiving enough green time and which phases are not.

Interpretation:

Phases that are not receiving enough green time (that is, Split Failures are occurring), contain clusters of dots toward the top-right corner of individual charts. Charts with clusters in the bottom-left have spare capacity. Viewing all movements together provides an overall view of which movements are performing well and which are not.

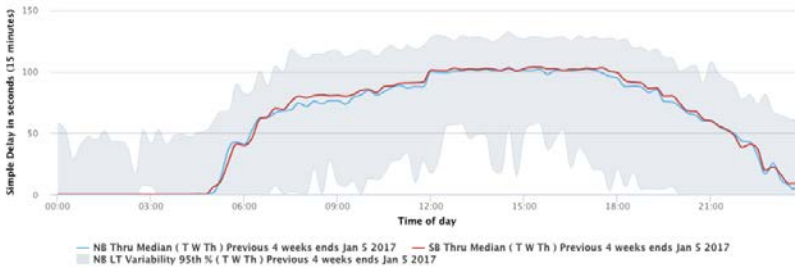
Use cases:

Identify opportunities to take spare capacity from under-utilized movements and allocate it to over-saturated movements.

Primary use case is local optimization of an intersection's splits (that is, movement green time).

Simple Approach Delay

AKA: Simple Delay, Delay



Requirements: Stop bar detection
Data freshness: Next day

Definition:

Simple Delay displays the time between detector actuation during the red phase and when the phase turns green. Called ‘simple’ because it does not account for startup delay, deceleration or queue length outside of the detection zone. This data is binned into 15-minute intervals.

Interpretation:

Quite simply, more delay is bad. That being said, delay on the minor-streets of a coordinated arterial may have higher, but acceptable, levels of simple delay. This depends heavily on the agency’s signal operations strategy.

Use cases:

Measure the approximate wait times drivers experience for specific intersection movements.

Compare levels of delay before and after a signal timing plan change.

Phase Interval

Requirements: Signal telemetry
Data freshness: Next day

Definition:

Phase Interval displays cycle by cycle Red / Green / Yellow durations over a 24-hour period. Each phase has its own chart.

Interpretation:

This tool is not intended to indicate good or bad performance, but to provide visibility into the length of green times for individual phases. It also helps infer how a phase is terminating (for example, Max Out or Gap Out).

Use cases:

Identify phases that are constantly maxing out.

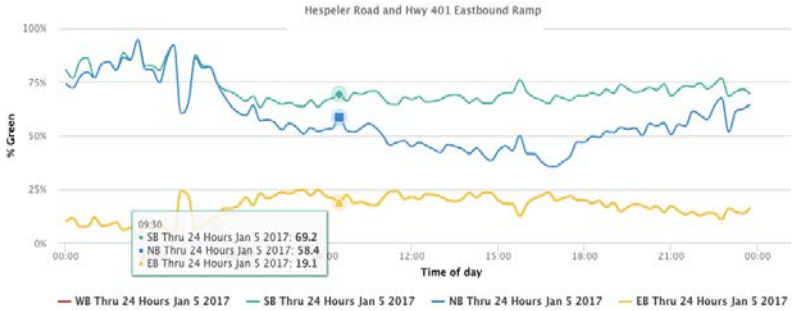
Identify/verify coordinated movements and durations of coordination.

Verify the controller operation in keeping the cycle length constant during coordinated timing plans.

Debug controller configurations that may not have been set properly and that may be creating unwanted anomalous timing behavior.

Green Allocation

AKA: Green %



Requirements: Signal telemetry
Data freshness: Next day

Definition:

Green Allocation is a simple visualization that illustrates the relative allocation of green time between all of the phases at an intersection. It provides a high-level view of how much green is allocated to each phase at an intersection.

Interpretation:

How to interpret green allocation depends on the goals of the traffic department for a particular intersection. This metric helps verify that timing plans are set up according to established goals. For example, if the objective is to achieve progression on the main street, green allocation should be fairly high for the main street movements.

Use cases:

Confirm that green time allocation for phases at an intersection aligns with the operational goals for that intersection.

Compare before and after phase usage in actuated control when the maximum green times are increased.

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Pedestrian Delay

AKA: Pedestrian wait times

Requirements: Pedestrian detection
Data freshness: Next day

Definition:

Pedestrian Delay displays the time between pedestrian detector actuation (push button or detector) during the Don't Walk phase and when the phase turns to Walk. This data is binned into 15-minute intervals.

Interpretation:

Different agencies have different goals when it comes to pedestrians. However, if pedestrians are waiting longer than the length of one cycle for a Walk sign, their needs are not being served, and this may cause pedestrians to cross the street illegally and when it is potentially unsafe to do so.

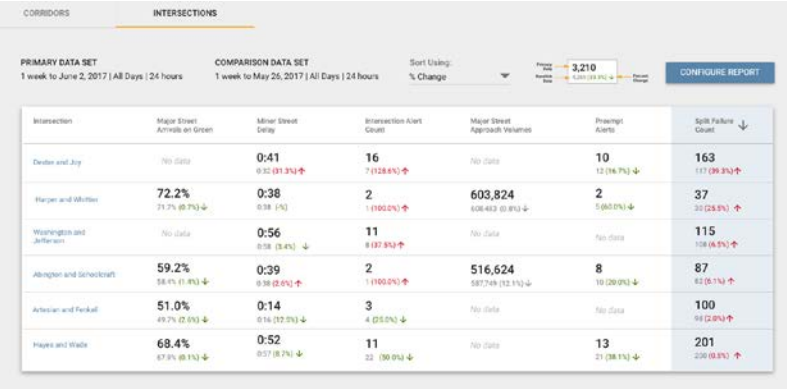
Use cases:

Minimize Pedestrian Delay if the area is geared toward pedestrian foot traffic.

Determine whether to reduce the max green times on vehicle phases to shorten pedestrian wait times.

Check pedestrian demand and if pedestrians may be disrupting traffic.

Intersection Report Card



Requirements: Report Card is a rolled-up view of signal performance metrics, including Arrivals on Green, Simple Delay, Approach Volumes, Split Failures and Preempt Alerts. Intersections without required detection for a particular metric will say *No Data*.
Data freshness: Next day

Definition:

Intersection Report Cards let you filter and sort traffic signal performance measures at the intersection level to compare traffic performance over a period of time, or after a change has been made to the signal network. Report Card is a rolled-up view of signal performance metrics, including Arrivals on Green, Simple Delay, Approach Volumes, Split Failures and Preempt Alerts.

Interpretation:

Intersection Report Cards help agencies identify trends in traffic and intersection performance at a glance in order to quickly identify priorities. Agencies can easily measure the impact of their work, report the results of changes made to an intersection, and quantify the benefits of changes to the city and its citizens.

Use cases:

Quickly identify top offending intersections based on a variety of metrics.

Compare traffic performance trends over time.

Easily prepare accessible, relevant, and timely reports to support grant applications or meet executive reporting requirements.

Monitor traffic trends over time to help identify need for signal retiming or coordination adjustments.

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