COVER PAGE

Advanced Transportation and Congestion Management Technologies Deployment Initiative

Project Name	SMART Arterial Management
Previously Incurred Project Cost	$234,500
Future Eligible Project Cost	$4.76 million
Total Project Cost	$4.99 million
ATCMTD Request	$ 2.25 million
Total Federal Funding (including ATCMTD)	$ 2.25 million
Are matching funds restricted to a specific project component? If so, which one?	Commuteride Match is restricted to GPS only
State(s) in which the project is located	Idaho
Is the project currently programmed in the: • Transportation Improvement Program (TIP) • Statewide Transportation Improvement Program (STIP) • MPO Long Range Transportation Plan • State Long Range Transportation Plan	Yes – This project is currently part of the MPO Long Range Transportation Plan and will be placed in the TIP upon notification of award of funds.

Treasure Valley

SMART Arterial Management

Advanced Transportation & Congestion Management Technologies Deployment Initiative

USDOT Funding # 693JJ317NF0001

June 9, 2017

Table of Contents

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Project Narrative

Project Description

1. Introduction – Summary

The Ada County Highway District (ACHD), Boise, ID, has been a Northwest leader in ITS technology and implementation for the past fifteen years. In today's ITS driven environment, ACHD needs the dynamic tools to help identify factors impacting traffic to detect problems easier by enabling enhanced signal coordination and timing adjustments on a corridor wide basis to enhance traffic flow.

With this grant, ACHD plans to replace traffic signal controllers and detection systems at 82 intersections to implement the traffic Signal Performance Measures (SPM) developed by Purdue University and Indiana Department of Transportation, and implemented by Utah Department of Transportation (UDOT). The majority of traffic signal vendors in the US have now integrated the SPM software into their new Advanced Traffic Controllers (ATC). ACHD also plans to implement vehicle to infrastructure (V2I) technology at 20 intersections as part of the FHWA's SPAT challenge. This V2I interface will be part of a Freight Mobility project lead by the University of Idaho to get critical traffic signal information to commercial drivers on a major freight corridor within Ada County.

Signal timing in Ada County has been a continuous challenge in the past 20 years. The average population of just the three communities where this project is located has quintupled during that time, while the capital funds for road expansion increased at a nominal rate. In the past, signal timing on arterials was updated on an as-needed basis as situations arose. ACHD staff demonstrated to the ACHD Commissioners the value of signal timing and coordination, and developed an aggressive signal timing plan to retime all arterials at least every five years. In support, the ACHD commission recommended $150,000 per year be allocated to transportation consulting firms to help ACHD signal engineering staff develop signal timing plans.

In 2014, ACHD implemented Idaho's first adaptive signal system at 22 intersections in Ada County, but following less than expected performance, that system was removed. After much additional research and consideration, ACHD selected the advanced signal technology described in this application.

The SPM technology to be implemented with the new ATC controllers included in this project will improve traffic flow on arterials by increasing the percentage of vehicles arriving on the green light. Changes in the signal timing parameters will be made by ACHD engineers without relying on consultants or adaptive signal systems to enhance signal timing, particularly since ACHD's signal timing engineers are some of the best in the country and have extensive experience to perform the work successfully. With the right tools, which are included in this grant proposal, these engineers will have the ability to make ongoing improvements to traffic flow along these arterials that will positively impact the region.

2. Entities/Partnerships

Primary Applicant and Management of Program/Funding

Ada County Highway District (ACHD) is the primary applicant and will manage this program, from selection and purchase of the equipment through installation, operation, and maintenance. ACHD has extensive experience with operating and managing various traffic signal equipment, including a state-of-the-art Traffic Management Center that monitors 165 CCTV cameras throughout Ada County and provides real-time information on its web site.

ACHD has successfully received and managed federal grants, both competitive and formula funds, to maintain roadways, construct capacity and safety improvements, operate a van pool system, develop green storm water infrastructure standards, provide traffic control, and support public safety for many years. The Federal Highways Administration and Federal Transit Administration have been the primary sources of federal grants, but ACHD has also received funds from the U.S. Department of Homeland Security and Housing and Urban Development. In the last five years ACHD has received $32,000,000 in federal grant funding, with the majority of funding going towards capacity expansion and maintenance projects. All projects were successfully completed, or are in the process of being completed, and all projects met federal requirements.

ACHD has staff in all capacities that have expertise working with federal projects. This includes project and construction managers, inspectors, accounting, payroll, and federal funding coordination staff.

Partnership

Ada County Highway District, Idaho Transportation Department (ITD) and the University of Idaho have partnered with COMPASS, the Community Planning Association of Southwest Idaho, to submit this application for ATCMTD funding. COMPASS members include all of the cities in Ada County, both large and small, as well as adjacent Canyon County, highway districts (including ACHD), and special purpose organizations. Ada and Canyon Counties combined are known as the Treasure Valley.

Established in 1972 as an independent government entity, the Ada County Highway District is responsible for all short and long-range planning, construction, maintenance, operation, rehabilitation and improvements to Ada County's urban streets, rural roadways and bridges and stormwater monitoring. ACHD also operates a regional van pool system with 86 vans currently in operation. Geographically, the District's jurisdiction includes Boise (#1 most populated city in Idaho), Eagle, Garden City, Kuna, Meridian (#2 most populated city in Idaho), Star, and the unincorporated areas of Ada County. It is the largest highway district and the only consolidated countywide highway district in the State of Idaho and the nation.

ACHD maintains and operates over 4,866 lane miles of roadway and 766 bridges in Ada County with an estimated value of $3 billion. Elements of ACHD's infrastructure include multi-lane arterials, collector and local roadways, farm-to-market roadways, along with a state-of-the-art computerized signal system to improve traffic flow. The District also purchases rights-of-way necessary for future infrastructure improvements. ACHD, Ada County, and the six cities work

together monitoring growth and ensuring infrastructure and transportation improvements meet the needs of the county.

The relationship between ACHD and ITD was born out of a need to remedy roads that were potholed, cracking, and generally falling apart in the cities, while rural roads with much less traffic were wonderful, primarily due to inequity in road funding. A special election was held in 1971 where residents decided they wanted to move all city and county road functions under a new agency – ACHD. "We were going nowhere with regard to street planning and improvements," said Charles Hummel, an architect and founder of Idaho Smart Growth, a planning advocacy group. "Putting the entire county and all its towns into one street and highway district was the solution – and still is today." "You don't hear about potholes very much anymore," said Hummel, who also served on Boise's Planning & Zoning Commission. "I'm very pleased with the way the district is being operated now." This relationship is very unique, as this is the only place in the country that has one entity that manages all roads within an entire county (except for the state highways).

Idaho Transportation Department (ITD) maintains all state and federal routes in Ada County, with the exception of the traffic signals, which are managed and maintained by ACHD through a cooperative agreement (see Appendix A). As a direct recipient of federal funds, ITD also oversees federal transportation funds, for which ACHD is a subrecipient. ACHD and ITD have an approved Stewardship Agreement, which allows ITD to appoint ACHD as the contract administrator for federal funded projects.

With a portion of this funding, ACHD's van pool system, Commuteride, will install GPS units in vehicles to track and monitor various information, including travel time. This information will be used for signal timing along the project corridors, as well as assistance with incident management. Commuteride is providing more than the 50% of the match funding required for the purchase, installation, and operation of the GPS units. ACHD will also include several vans in the V2I test corridor installing on-board units (OBU) in some vehicles.

3. Geographic Area or Jurisdiction

This project will be carried out in Ada County, Idaho which, along with Canyon County, are known as the Treasure Valley (See Figures 1 and 4). ITD holds responsibility for the state highways and interstates, and ACHD oversees the remainder of the various roadways in Ada County. Signal improvements will be completed at 82 intersections along three east-west corridors that parallel the interstate, and two north-south corridors that bisect the interstate, all facing increasing congestion day after day. 63 of those intersections are fully under ACHD jurisdiction, 3 intersections are under ITD jurisdiction, and the remaining are shared (with costs divided proportionately by the number of lanes each is responsible for at each of those shared intersections).

Figure 1. ADA COUNTY-IDAHO-USA

The traffic signal improvements to the corridors included in this project are in alignment with the Treasure Valley Annual Congestion Management System Report. Its recent 2015 update identifies several stretches of road within the project corridors that have experienced significant increases in traffic in the past year. In addition, ACHD's 2017-2021 Integrated Five-Year Work Plan specifies planned signal upgrades along these project corridors. And the Treasure Valley Transportation System: Operations, Management, and ITS report, completed in 2014 with participation from a dozen area transportation-related agencies, dedicated an entire section to Traffic Signal and Central Control Systems. Links to all these documents are embedded within their titles listed in this paragraph.

A majority of these signals will be placed on corridors throughout the Cities of Meridian and Boise, with one corridor extending into the City of Eagle (See Figure 2). East-West corridors included in this project include Overland Road, Franklin Road, and Fairview Avenue. North-South corridors include Ten Mile Road and Eagle Road.

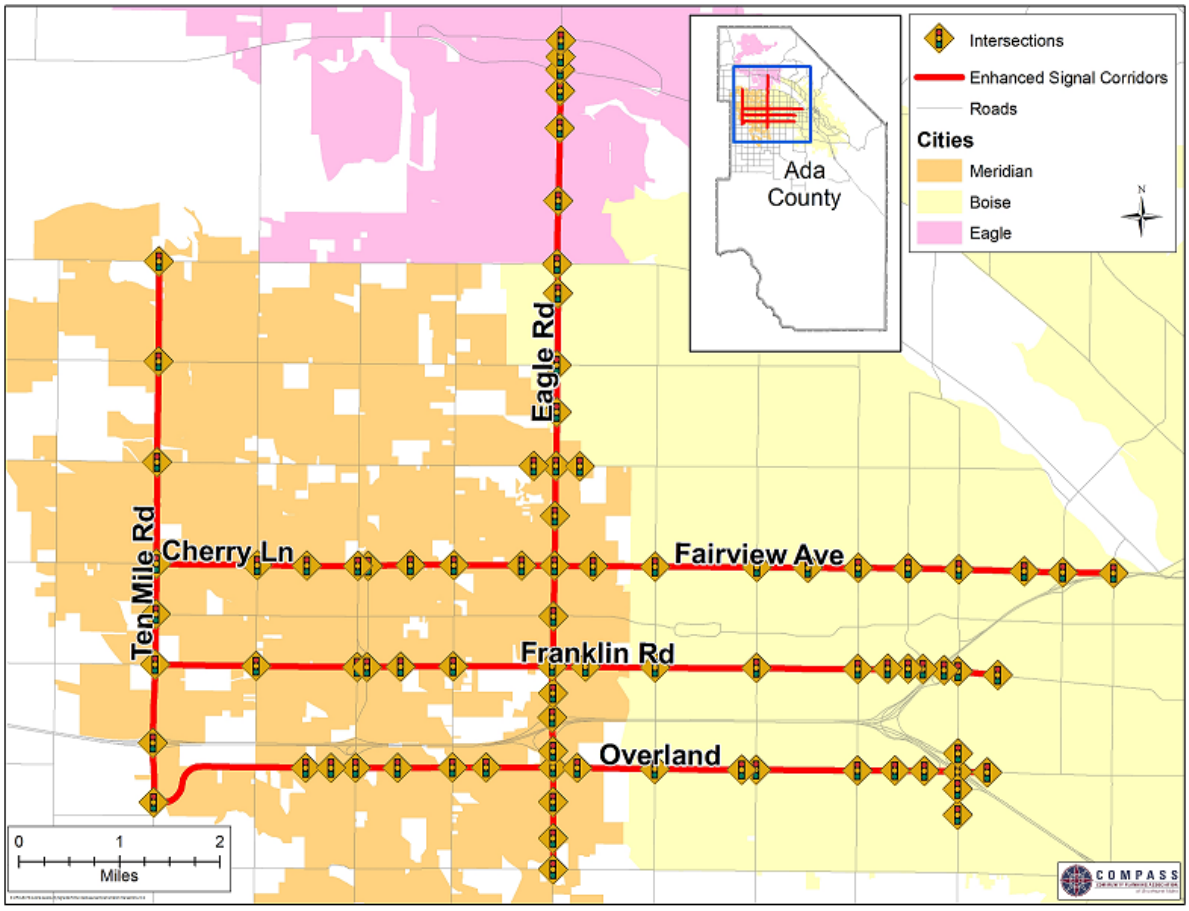


Figure 2. Project corridors – cities of Meridian, Boise, and Eagle signal locations

4. Issues and Challenges Addressed

According to USDOT's Beyond Traffic 2045 initiative, each American spends over 40 hours stuck in traffic each year, costing the nation $121 billion. The Treasure Valley in Idaho is no exception. Fortunately, the increasing congestion can be reduced with improvements such as these proposed traffic signal upgrades, which will provide enhanced travel experiences and make moving people and goods safer, more efficient, and more secure.

The Treasure Valley Annual Congestion Management System Report, updated in November 2015, identifies several segments within the designated project corridors that have experienced significant increases in traffic in the past year. This was to be expected based on the rapid population growth experienced in both the immediate and surrounding areas since 1990, as well as the continual commercial and housing development along the project corridors. As shown in Figure 3, Boise's population grew 80% since 1990, which has exacerbated congestion problems. While this is significant growth, Eagle grew 667% and Meridian's population grew an astonishing 853% in that same time period.

Year	City of Boise	% Increase	City of Eagle	% Increase	City of Meridian	% Increase
1990 Census	125,738		3,327		9,596	
2000 Census	185,787	48	11,085	233	34,919	264
2010 Census	205,671	11	19,908	80	75,092	115
2016 Estimate	226,900	10	25,510	28	91,420	22
1990-2016		80%		667%		853%

The majority of the intersections included in this project are located in Meridian, which experienced the most significant growth, and is most in need of the decreased travel times these signal improvements will provide. Other congestion-related factors positively affected will be vehicle operating costs, reliability, safety, logistics/freight costs, productivity from access/connectivity, and environmental concerns.

Expected users of this project come from every aspect of life – from those who use these corridors to commute to college and work, to those accessing medical and other services. The corridors are home to a significant number of the markets where residents can access healthy food, as well as a very high proportion of the medical and dental professional offices located within the community of Meridian (see Figure 6). These corridors also play a significant role in the movement of freight through these communities.

Ladders of Opportunity – These corridors are a critical area for connecting disadvantaged populations and others to essential services available both in the immediate area and throughout the Treasure Valley. The current congestion, which is significant at peak hours, delays the potential for these Ladders of Opportunity to be reliable for those who most need them, particularly for the significant

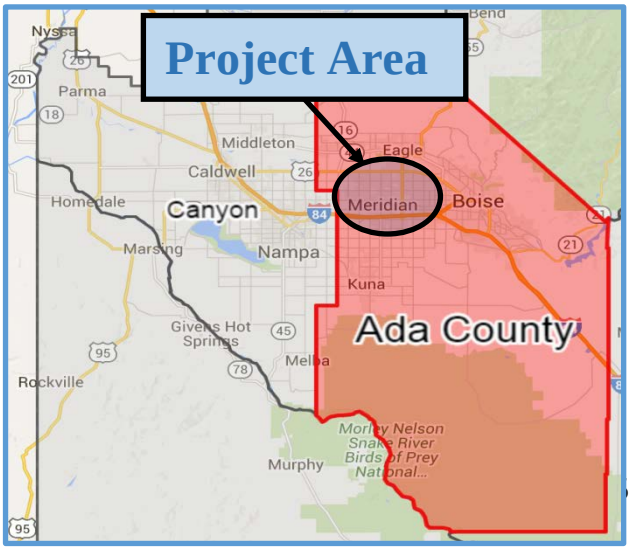


Figure 4. Treasure Valley project area (in Ada County) with adjacent Canyon

number of Hispanics at the eastern end of these corridors, as well as in adjacent Canyon County (West of Ada County - See Figure 4) who routinely travel within and through this area and whose incomes average 23% less than the County as a whole. Canyon County's population is made up of 19.2% Hispanics; Nampa, its largest city and closest to the project area, has a Hispanic population of 23.4%. More than 25% of Canyon County residents commute, many along these corridors, to the Treasure Valley's employment centers in Ada County.

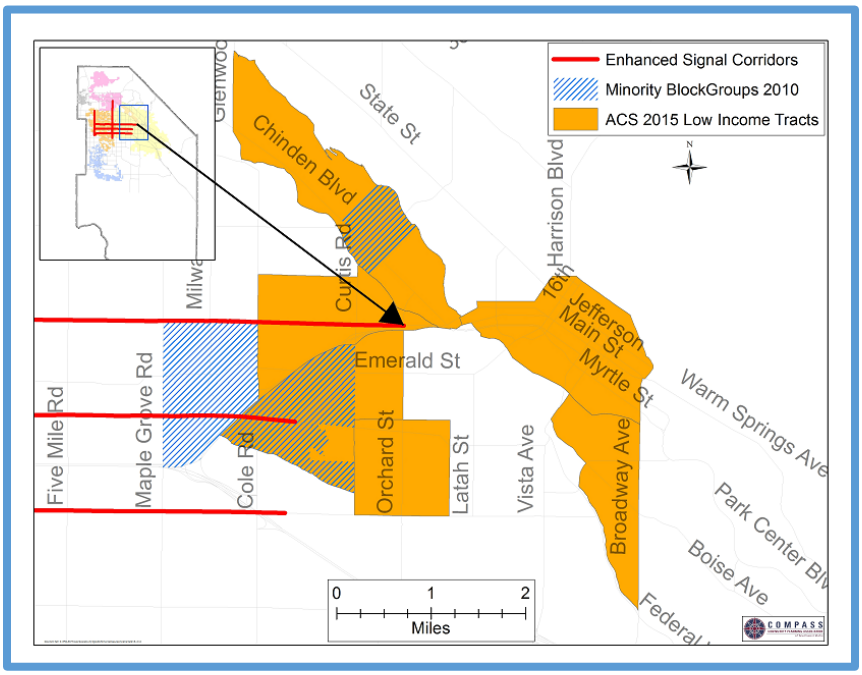


Figure 5. Environmental justice areas in project corridors

The jobs to be created during project implementation, and those resulting from the increased efficiencies within the project area and surrounding areas, will help lift up neighborhoods and provide residents new opportunities for both jobs and housing. Almost 90,000 workers are employed within a half mile of the intersections included in this project at 4,292 employer locations, a number that continues to grow rapidly.

The eastern end of the Franklin and Fairview corridors included in this project are home to both Low-Income and Minority Environmental Justice Consideration Areas (See Figure 5). The low-income residents in these areas earn 60 percent of the median household income of Ada County as a whole, while the minority areas contain a population that is 30 percent non-white or Hispanic. These signal improvements will enhance access to essential services for low-income groups, persons with visible and hidden disabilities, elderly individuals, and minority persons and populations, as well as the population as a whole. In addition to jobs, these corridors are home to a significant number of destinations for healthy food, recreation, healthcare, and education these residents routinely access either by automobile, bicycle, and/or on foot; upgraded signals will improve the livability for these residents. It will also increase the likelihood that even more services will become available along these corridors.

Four intersections on Fairview Avenue, which are included in this project, have been identified by ACHD's ADA Advisory Committee as high-priority locations in need of Accessible Pedestrian Signals (APS), with three more along that corridor identified as secondary priorities. These APS's communicate information about the WALK and DON'T WALK intervals at signalized intersections in non-visual formats to pedestrians who are blind or who have low vision, increasing the safety of people with these special needs. Figure 6 demonstrates the significance of improving signal responsiveness due to the high number of essential services

located within one-half mile of the project corridors. The signal features needed at each location will be individually identified, then designed to solve the specific need at each intersection,

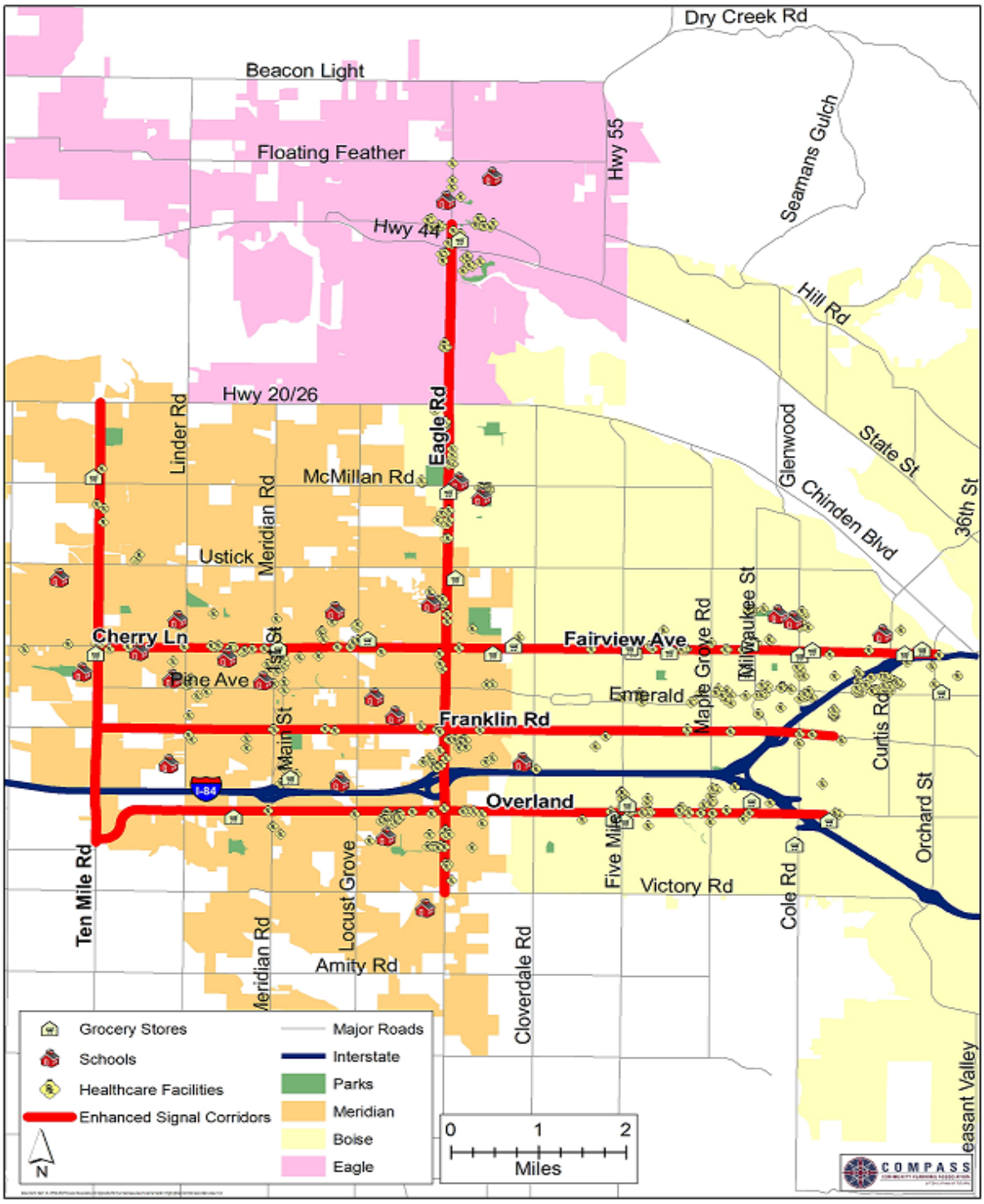


Figure 6. Essential services within ½ mile of project corridors

particularly in the environmental justice areas.

The safety of these corridors continues to deteriorate due to the increased use from the rising population and the resulting frequent congestion. Crash information is included in Section 8. Crashes will continue to climb unless improvements can be made to this segment in the very near future.

More discussion about reduced costs and environmental benefits experienced due to congestion management is located in Section 9.

5. Transportation Systems and Services

Project Description

Traffic Signal Performance Measures (SPM)

ACHD has been very interested in gathering automated signal performance measure (SPM) data on arterials for several years now, but the lack of an accurate and dependable detection infrastructure and substandard traffic signal controllers has made this difficult to achieve. ACHD staff have met with Purdue University and Indiana DOT several times in Boise to discuss their work on the SPM technology, and feel this is the direction ACHD needs to shift to enhance arterial signal operations. ACHD recently attended a two day workshop hosted by UDOT in Salt Lake City; the interest in the SPM technology was high considering 175 attended from 29 states. ACHD has a good relationship with UDOT staff, and UDOT is willing to share their SPM software with ACHD on this upcoming project. UDOT believes this technology is "*game changing for traffic signal operations*", and ACHD agrees. ACHD is planning to have an SPM corridor in place at eight intersections in late June, 2017 for initial testing.

ACHD plans to work with the selected traffic signal vendor and UDOT to incorporate the following performance metrics at 82 intersections along five major corridors included in this project:

- Purdue Phase Termination
- Split Monitor Report
- Pedestrian Delay
- Preemption Details
- Purdue Coordination Diagram
- Arrivals on Red
- Yellow and Red Activations (Vehicles running Yellow and Red)
- Purdue Split Failure
- Turning Movement Counts
- Approach Volume
- Approach Delay
- Approach Speed
- Detection Failure Report

Advanced Traffic Signal Controller (ATC)

ACHD has 432 signalized intersections within Ada County. All of the intersections use NEMA based TS 2, Type 1 controllers and cabinets. These controllers run on a central software; 380 of

the intersections are tied into the ACHD Traffic Management Center (TMC) via a direct fiber link to the intersection. This project will replace the existing TS2, Type 1 controller at 82 intersections with a new ATC controller. The ATC controller will allow advanced functionality for more complex phasing, enhanced detector processing required for SPM, and incorporate Signal Phase and Timing (SPaT) software that will allow Connected Vehicle (CV) interface and testing at 20 intersections on Eagle Road with this project.

The SpaT interface in the controller will allow the current movement state of each active phase in the system to be relayed to CV's in the future. This will enhance safety applications such as warnings and alerts for crash avoidance and will improve mobility and help preserve the environment. ACHD will work with the University of Idaho's National Institute for Advanced Transportation Technology (NIATT) and Boise State University to test the Vehicle to Intersection (VI) technology on the Eagle Road corridor within Ada County as part of the universities Freight Mobility and Safety project. The V2I project will install DSRC radios at 20 intersections and install on-board units in 40 vehicles. Congestion and traffic signal information will then be relayed in real-time to drivers.

Upgraded Vehicle Detection System

With this project ACHD plans to replace the existing video detection at 82 intersections with radar technology. ACHD started installing video detection at intersections 20 years ago to replace in-ground loops. After years of working with video detection, ACHD has faced several inherent problems with video. The video tends to have problems during sunset and sunrise, and major problems occur when the area has dense fog or inversions. Ada County can typically have an inversion that lasts 4-5 weeks in the winter which has been very problematic for signal operations.

Another problem with video detection is that for SPM to have good data, an advanced detection zone is needed 350-450 feet prior to the stop bar. It is very difficult, if not impossible, to have a video detection zone placed that far from a stop bar. Our typical video detection camera can only see 250-300 feet past the stop bar if mounted on a 35' luminaire arm.

With the proposed radar technology (see Figure 7), a vehicle can be seen up to 900 feet from the stop bar if the radar detector is placed on the signal mast arm. The radar technology can see the majority of advanced vehicles and will tell you their speed, distance from the stop bar and estimated time to reach the stop bar. This is all valuable information that will enhance the SPM and V2I data. The advanced radar units will also provide better dilemma zone protection and can extend the green light for larger commercial vehicles if their speed is determined to be too fast to safely stop at an intersection. The radar units also work in all weather conditions, so sunrise/sunset and fog will present no

Figure 7. Radar unit being tested by ACHD

problems.

ACHD plans to install radar for vehicles at the stop bar on all legs of the 82 intersections, and advanced radar detectors on critical legs of intersections where the speed limit is 40 mph or greater. This is the criteria that UDOT uses and has been recommended to ACHD.

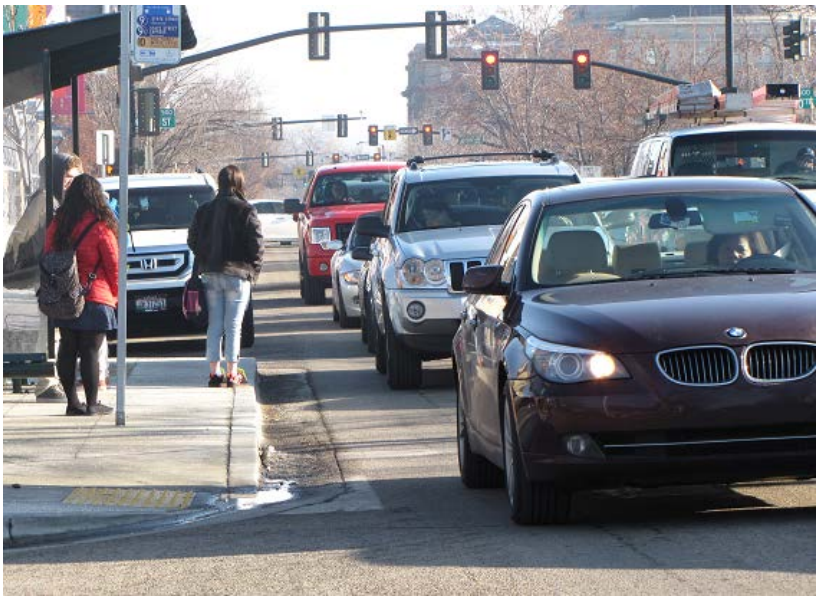
Another benefit of shifting to a radar-based system is the proven savings in yearly maintenance and operating costs compared to other systems. The radar units require no yearly maintenance. With the current video detection system, ACHD staff have to clean the camera lens on each camera at least once a year, and at some problem locations 2-3 times per year.

In addition, the radar system will improve the detection of bikes at the intersections. ACHD has been installing bike lanes on most major corridors in the county and have been very aggressive in improving bike lanes by painting green bike boxes at the stop bar at high bike use intersections. The current video detection system has problems detecting bikes, as the bikes need to be in the proper location in the lane to be detected. Radar can detect a bike in any lane, thus improving biker safety.

Enhanced Pedestrian Protection

As part of the new traffic signal controller and SPM implementation, ACHD will evaluate the SPM pedestrian reports from the 82 intersections and install audible Accessible Pedestrian Signals (APS) at intersections with high pedestrian traffic and delay. These APS will communicate information about the WALK and DON'T WALK intervals at signalized intersections in non-visual formats to pedestrians who are blind or who have low vision. With advisement from ACHD's ADA Advisory Committee, ACHD currently has been actively upgrading pedestrian pushbuttons and relocating poles to meet the current ADA standards in downtown Boise and at other prioritized intersections. This funding will allow APS to be extended into the arterials included in this project.

Pedestrian utilization information at intersections where this project is located has been hard to evaluate with the current traffic signal controller. The upgraded ATC controller, in concert with the SPM data, will allow ACHD staff to prioritize high pedestrian use intersections and establish a priority list of intersections to upgrade. This project will implement APS technology at approximately ten intersections based on the SPM data. The project team will also solicit further advice from its Advisory Committees on best places to install APS at intersections within the low- income environmental justice areas where residents typically rely more on walking and biking.



Some features of the APS systems include:

- Selectable push-button activation force (a longer push will give an extended walk time to blind pedestrians)
- 360 degree sound output; instant ambient sound response
- Crosswalk synchronization with Bluetooth technology

Figure 8. Boise Pedestrians and Traffic

- Vandal proof (less maintenance for ACHD crews)
- Flexible programming options.

Travel Time Information Systems

Bluetooth

ACHD, in partnership with the Idaho Transportation Department, has been testing various Bluetooth systems the past year to see what type of match rate could be achieved on Ada County freeways and arterials, and to evaluate the accuracy of various vendors' travel time information. Using the match rate criteria developed by a University of Maryland, ACHD has found several Bluetooth systems that do meet the minimum match rate criteria suggested by the University of Maryland study, and has talked with many agencies using various bluetooth systems. With this project, ACHD would use a "Best Value" selection criteria to install bluetooth units on these five proposed project corridors to assist in the evaluation of the SPM technology. This travel time information from the bluetooth units will also be linked to the ACHD Advanced Traffic Information System (ATIS) web page, http://achd.ada.id.us/atis

ACHD has fiber communication to all 82 proposed project intersections, and a dedicated bluetooth server will be installed to handle the data requirements. ACHD will eventually use the bluetooth data to post travel times on existing and future arterial dynamic message signs.

GPS Tracking System

ACHD Commuteride operates a vanpool program, Club Red, which provides a smart commute option for Treasure Valley employees whose commute begins, ends, or passes through Ada County. A vanpool includes a group of 10-14 commuters (regular vans) or 5-7 commuters (rural mini-vans) with similar commute trips and work schedules that share a van. ACHD Commuteride covers all costs associated with operating the van in exchange for a monthly fare paid by the vanpoolers, which is up to 80% less than a commuter driving alone. The current service area includes seven Idaho counties and one in Oregon. The number of routes operating each month is entirely dependent on demand; in fact, a new vanpool can start any time ten paying persons (seven for rural commutes) are able to share a route. The number of vanpools currently on route is 86. A Club Red van is shown in Figure 9.

Figure 9. Commuteride *Club Red* van

Along with the responsibility of all operating costs and complying with federal performance reporting requirements, ACHD Commuteride monitors the van condition, mileage, and number of riders through a hard copy monthly reporting system that is less than adequate. The data provided in these reports is at least one month old, making it difficult to accurately assess diagnostic needs. Currently, maintenance tracking is based off monthly mileage estimation, often resulting in service intervals that are overdue or too frequent. Further, the monthly reporting itself is a tedious time-consuming process that usually falls on the shoulders of the driver. This often makes it difficult to create vanpools simply because no one is willing to take responsibility for the required data entry.

ACHD would like to install GPS units on all of its Commuteride vans with this project. These GPS units with diagnostic capabilities will provide the following: driver activity tracking, vehicle utilization, fuel usage, idle time, emissions and smog check, vehicle and driver management, diagnostic reporting, streamlined preventive maintenance, driver accountability, and asset management. Most important to this project, though, is its ability to provide **travel time estimates**, which will include information for signal timing studies and future travel time information posting on the ACHD ATIS web page.

ACHD Transportation Management Center

ACHD established a Transportation Management Center (TMC) in 2000 after doing a scanning tour of TMC's across the US. The TMC is currently open from 5:30 am to 7:00 pm Monday

Figure 10. ACHD Transportation Management Center

through Friday and is also manned for 50 to 70 special events a year such as Boise State University sporting events, concerts, marathons, and community events. President Obama's visit in 2015 was monitored by the TMC to ensure smooth traffic flow and to notify officials of any traffic issues. The TMC has one full-time operator and one part-time operator who monitor the 169 CCTV cameras within Ada County. The TMC is jointly funded by the Idaho Transportation

Department and ACHD. The recently remodeled state-of-the-art TMC can be seen in Figure 10 above.

Approximately 390 of the county's 432 traffic signals are tied into the TMC by over 250 miles of fiber optic cable that runs throughout the county. All of the 82 signals in this proposed project are currently tied into the TMC. The TMC monitors both freeway and arterial cameras, and real-time incident information is posted on the ACHD ATIS webpage. In 2016, over 3,700 incidents were posted on the ACHD webpage, which gets over 100,000 hits per month. In 2017 ACHD will be looking to partner with companies such as WAZE to share incident information to Treasure Valley drivers.

The TMC has been toured by a variety of parties interested in transportation technology, from local and state officials to out of state and foreign visitors. Most have heard of our state-of-the-art system and want to see it in operation. Those who have come to learn about its capabilities and see it in action include: Idaho State Police, Idaho Transportation Department, Indiana DOT, Nevada DOT, various city and county staff from Oregon and Washington, local and national Federal Highway Administration staff, and transportation professionals from Australia, China, and Taiwan. It should be noted that both Purdue University and Indiana DOT, who helped develop the system included in this project, also visited the TMC while ACHD was gathering information on technology options for the planned signal upgrade.

6. Plan for Long-Term Operation and Maintenance

The enhanced signals will be a high priority for ACHD to ensure the equipment will be used to its fullest extent. The full-time signal engineer assigned to this project, along with the project manager and the congestion management supervisor, will work together to ensure the project's success. Operations and maintenance will be paid from current ACHD yearly Traffic Operations budget, as it is anticipated that those costs will decrease with the new technology due to a decreased need to tend to the video cameras in the field regularly and the ability to make adjustments remotely.

The GPS tracking system is expected to result in cost savings for Commuteride, from driver incentives and reduced repairs to improved van performance. Those cost savings will be used to pay for continuing wireless services after the initial three year period.

ACHD has a very aggressive signal timing program, as all major corridors in Ada County are currently retimed every three to four years. With the new upgraded signal system, continuous fine-tuning of corridor signal timing will occur. The ACHD Commissioners have dedicated $150,000 per year toward hiring consultants to help in retiming signals, as ACHD staff have shown that benefits of retiming corridors can often achieve a 30:1 benefit. ACHD plans to assign an existing traffic signal engineer to work full-time on this SPM project during the deployment and after the project is completed to continue monitoring and optimizing the system.

7. Regulatory, Legislative, Institutional or Other Challenges

In 2011, the Idaho legislature issued updated guidance on traffic control devices, stating *"Thus, while this Manual provides Standards, Guidance, and Options for design and application of traffic control devices, this Manual should not be considered a substitute for engineering judgement. Engineering judgement should be exercised in the selection and application of traffic control devices, as well as in the location and design of the roads and streets that the devices complement."* After extensive and ongoing research, and evaluating the evidence, ACHD's engineers and congestion management personnel have concluded that the proposed project as described is the best option for the Treasure Valley. No regulatory, legislative, institutional, or other challenges are anticipated, so this project is expected to proceed without delay.

8. System Performance Improvements

This project is expected to significantly improve system efficiency and reduce congestion. In the first nine months of UDOT's SPM implementation, they saved taxpayers an estimated $3.7 million dollars in delay reduction and achieved a benefit cost ratio of 15:1. ACHD is hoping to have the same type of results in the implementation in Ada County, including an overall 10% reduction in travel time on the five corridors. Eagle Road, the most heavily traveled and congested corridor included in this project, requires 25 minutes to drive 9 miles, despite being posted at 55 mph. This improved signal technology is expected to decrease congestion through reduced intersection delay, reducing idling and travel times, and increasing environmental benefits.

ACHD is committed to continuously evaluating the effectiveness of these signal upgrades to ensure system efficiency, as these five corridors are significant arterials which severely impact overall travel time. They facilitate almost 15% of Ada County's total vehicle miles traveled. 20% of all Ada County residents live near these corridors, which experienced a population increase of 13% between 2010 and 2015. Job growth in that area during that same time period was around 23%; nearly 30% of all of Ada County's jobs are near these five corridors. The corridors are critical to the efficiency of traffic movement throughout western Ada County for all users, including those most in need of Ladders of Opportunity.

These signal improvements are expected to also reduce traffic-related crashes. In 2014 in Ada County (2015 data not available), over 50% of all crashes (6,282) occurred at intersections (3,196). These 82 intersections experienced 25% (788) of all intersection crashes (3,196) despite representing only 20% of all intersections in Ada County, with Eagle Road intersections alone being the site of 285 of those crashes (See Figure 11). The 788 total crashes along these five corridors resulted in 1,665 injuries valued at over $44 million. Even a 5% reduction in injuries in one year due to a reduction in crashes resulting from improved signal performance would save $2.2 million dollars.

The north-south corridors included in this project (Eagle and Ten Mile Roads) also have an impact on regional and interstate travel, as they accommodate a huge majority of the traffic entering and exiting Interstate 84 in the project area. These signal upgrades also have far-

reaching benefits for not only drivers, but others who are affected by traffic flow on these arterials, such as businesses and bicycle/pedestrian users.

For instance, the Accessible Pedestrian Signals to be included in this project provide both a visual and audible notification that the signal has been activated and that their request for a WALK cycle has been received. This feedback eliminates wondering whether the push-button works and reduces the tendency to press the button repeatedly. Receiving confirmation that the signal has been engaged encourages pedestrians and bicyclists to wait for the WALK cycle rather than darting across an intersection at the first opportunity. Research shows that blind or visually impaired pedestrians begin crossing sooner once the WALK cycle is activated when there is an APS than they do without it, which allows them more time to make the street crossing and thus increases safety.

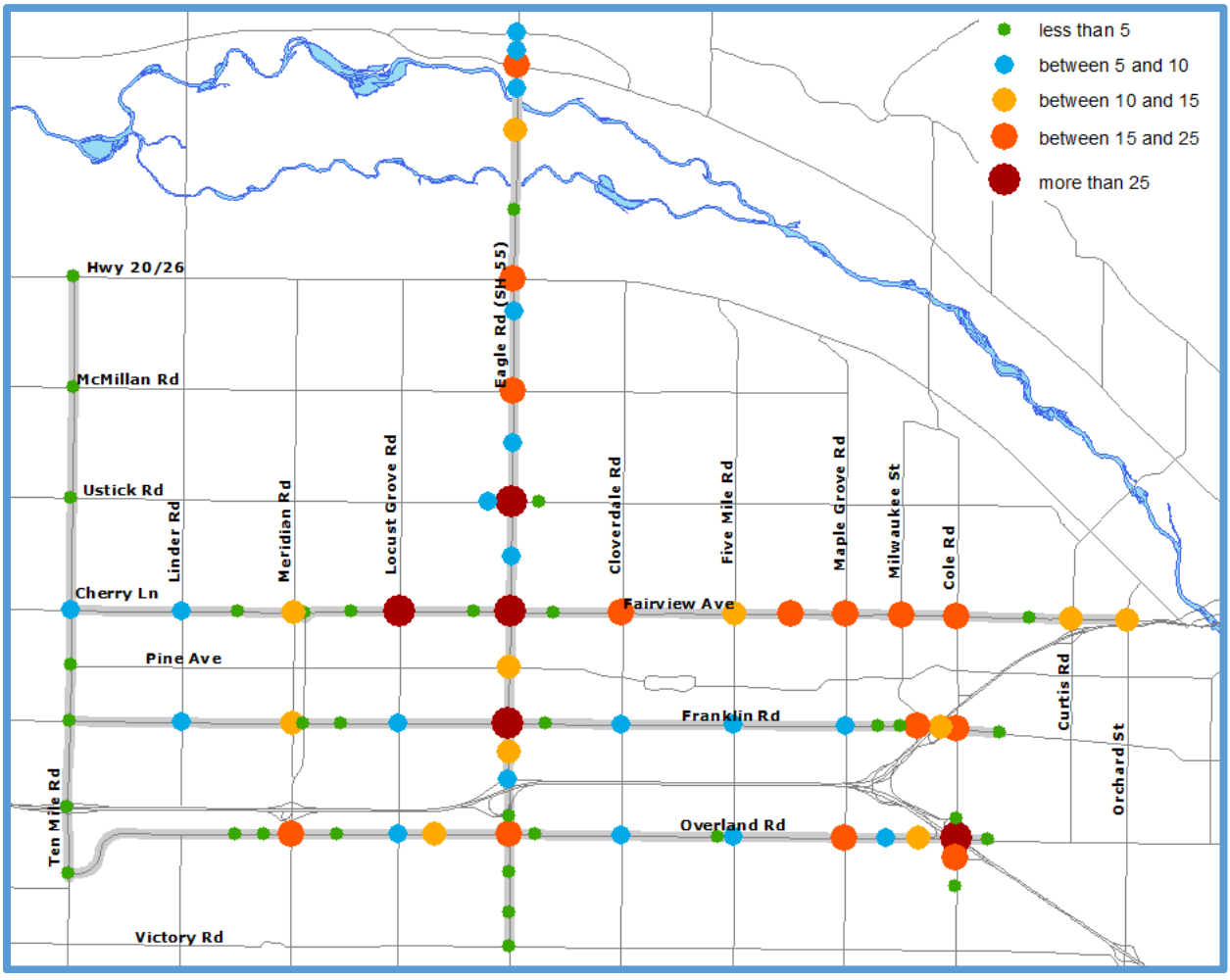


Figure 11. Crash events at project corridor intersections, 2014

9. Safety, Mobility, and Environmental Benefits

The many benefits described previously, particularly in Section 8, will be measured through traffic signal performance measure reporting and are expected to reduce delay, incidents, and emissions, and improve travel time on the corridors.

ACHD commits to evaluating the effectiveness of this project through measuring the benefits received. ACHD will analyze each individual intersection during all time periods and on weekends, reviewing the existing time-of-day plans using the SPM data. Each intersection will be evaluated to improve synchronization/ coordination during all time periods in order to achieve the maximum "arrivals on green" percentage. After each intersection is fine-tuned, all of the remaining intersections along that corridor will be evaluated to achieve improved synchronization/coordination during all time periods. New time-of-day plans may be developed based on the SPM data.

Radar is known to do an excellent job of providing accurate and reliable dilemma zone protection for both vehicles and trucks based off of their individual speed, and does so dynamically. The existing video technology being used along these corridors doesn't work well in dilemma zones, as zooming in on those areas by positioning the camera more horizontally causes more glare problems with the sun and more sensitivity to even slight bouncing. This bouncing causes the system to lose performance in adverse weather such as wind and rain, and they don't do well in the fog either. Radar is also safer for field technicians to maintain because of the elimination of the need to wipe the lens of the video cameras once or twice each year. The upgraded system also requires less junction box maintenance, and allows upgrades and adjustments to be made remotely, saving lots of field time.

ACHD will hire a consulting firm knowledgeable of SPM and V2I implementation and evaluation to help perform before and after studies and to help set up the SPM reporting parameters. Analysis of corridor operating conditions, using Measures of Effectiveness (MOE) output from the software package Synchro, will be conducted to measure the benefits of the new coordinated timing plans. ACHD has developed a Synchro model for all 432 signalized intersections within the County. In addition to measuring impacts to the main corridors, the software analysis considers impacts for side streets that the travel time surveys do not measure. Components of the software analysis include two measures: 1 - total delay (vehicle hours) and 2 - fuel consumption (gallons).

The benefit-cost analysis compares the monetary benefits accrued from the MOEs listed above (for one year), to the cost of developing and implementing the new signal timing project (i.e., the cost to ACHD, including the consultant). The MOEs reported in Synchro are based on the peak hour volumes used to develop the coordinated signal timing plans. However, each timing plan operates during lower volume hours before and after the peak hour, so the results cannot be multiplied by the number of hours the plan is in operation because this would overstate the benefits. A time-of-day factor is calculated based on the 24-hour volumes to correct the benefits for the difference in volumes.

ACHD purchased and installed Bluetooth devices on the five corridors as a first step in this project to collect travel time information several months prior to the implementation of the SPM technology. ACHD feels, with the new SPM technology, that ACHD staff can evaluate signal timing using in-house signal engineers and thus will reduce the need for consultants in the future. The installation of a radar-based detection system that can count vehicles will also eliminate the

need for ACHD staff to do manual and tube counts at the intersections, saving additional time and money.

Evaluation will be an ongoing process in an effort to keep up with traffic increases along all five corridors as housing and businesses continue to flock to this rapidly-growing area. COMPASS has experience calculating safety, mobility, and environmental benefits using USDOT's TIGER Benefit-Cost Analysis Resource Guide, and will assist ACHD as needed in quantifying signal

Ada County Highway District
VISION:

performance measures. In addition, and as stated in Section 5, ACHD is committed to sharing its expertise and these results with other entities interested in replicating a similar project.

10. Vision, Goals, and Objectives of Deployment

The following shows the Vision, Mission, Priorities, and Bottom Line stance of ACHD.

Leading transportation innovation – investing in communities
MISSION:
Drive quality transportation for all of Ada County – Anytime, Anywhere!
PRIORITIES:
Serve as the criteria for judging every choice we make going forward:
1. Our People – our competitive edge in the workplace is the source of our strength.
2. Effective and efficient execution
3. Leaders in technology, design, and innovation
4. Safety throughout the District for our employees and citizens
BOTTOM LINE:
Every choice we make must help us to effectively and efficiently accomplish ACHD's Vision and Mission through the development of ACHD's operations, prepare Ada County for tomorrow's opportunities, develop and reward people, assure accountability, and innovate our support structures.

Figure 12. About ACHD

This project will be aligned with the above vision and agency's direction and with area plans for mitigating transportation congestion.

Overall goals for this program are reduced costs and improved return on investments, environmental benefits from congestion management and streamlined traffic flow, measurement and improvement of transportation network operations, reduction of traffic crashes and increased personal safety, and real-time information to improve mobility, reduce congestion, and provide for more efficient and accessible transportation. These goals will provide access to safe, reliable, and affordable connections to employment, education, healthcare, freight facilities, and other services.

Another goal is the economic benefits resulting from reduced delays, improved system performance and throughput, and the efficient and reliable movement of people, goods, and services. These advanced technologies will be integrated into transportation system management and operations, and provide a means to evaluate the impact as related to safety, efficiency, and sustainable movement of people and goods. The final goal of this project is to develop a reproducible system for knowledge transfer not only to other Ada County and nearby Canyon County traffic professionals, but to others wishing to improve performance of signalized intersections throughout the state of Idaho, including out of state locations facing similar challenges.

11. Plan for Public/Private Partnership

As a public agency, ACHD actively pursues partnerships and regularly requests input from local jurisdictions, community groups, and members of the public. ACHD also is a member of

COMPASS (The Community Planning Association of Southwest Idaho), which is the Metropolitan Planning Organization for the region. The COMPASS Board has fifteen general members who represent cities and highway districts in Ada and Canyon counties; ACHD routinely coordinates transportation concerns with many of these entities.

To effectively execute this project, ACHD will continue to work closely with its project partners, ITD, the University of Idaho, Boise State University and representatives of the three cities that encompass the five corridors targeted for signal upgrades. COMPASS will also provide assistance during this process by having its board review and approve the inclusion of the project in the short-range regional budget, or Transportation Improvement Program.

ACHD has a long and positive history of working with its partners, and the coordinated application process for this grant is evidence that these partners are committed to working together effectively to improve transportation in the Treasure Valley. In addition, ACHD and the City of Nampa in neighboring Canyon County are discussing partnering in a future phase II of the traffic signal project that would extend the Franklin corridor signal upgrades further west.

ACHD has two standing public involvement committees, the ADA Advisory Group and the Bicycle Advisory Group. Members of these committees will support this project by providing feedback to ACHD staff on issues impacting bicyclists, pedestrians, seniors, and persons with disabilities. The University of Idaho's National Institute for Advanced Transportation Technology (NIATT) and ACHD have a twenty year relationship working together on joint research and education projects. NIATT researchers will be involved in the development and deployment of this traffic signal performance upgrade, and plan to assist ACHD in testing Vehicle to Intersection technology along the Eagle Road corridor.

Utilizing GPS on Commuteride vans will provide an opportunity to evaluate the effectiveness of tracking travel time and using the data to improve traffic flow. Valley Regional Transit (VRT), the public transportation provider for the region, will likely become an active partner in this project once the data the GPS system will provide is successfully incorporated into this project via Commuteride.

Figure 13. Bike/Ped Users

Scalability and Portability

This project provides a perfect opportunity for future Integrated Corridor Management between Ada County and Canyon County. ACHD has already entered discussions with the City of Nampa and Canyon County Highway District to replicate these upgrades on the west end of Franklin Road in phase II, which will connect with the signals being upgraded in this project. ACHD will assist in every step of the process, including identification of potential vendors, equipment purchase and installation, signal timing, and ongoing evaluation. The method used to quantify the extent of the benefits realized from the equipment upgrade will also be shared with Canyon County and any other entity wishing to replicate this or a similar project.

12. Leverage and Optimization of Existing Technology Investments

This project will increase the effectiveness of ACHD's existing state-of-the-art traffic management system by replacing old technology with new and more powerful technology using an existing traffic management infrastructure. The new technology will help eliminate data gaps and provide more detailed data that will allow Traffic Signal engineers to make necessary system changes in a timely and more cost effective manner. Besides improved data for signal timing, the Transportation Management Center will benefit from improved travel time information.

13. Schedule of Deployment

ACHD anticipates completing this work in a maximum three year timeframe. The five project corridors will be upgraded according to the following timeframe:

Roadway	Year	Number of Signals
Overland Road	2018	19
Ten Mile Road	2018	8
Eagle Road	2018	24
Fairview Avenue	2019	18
Franklin Road	2019	16

Figure 14. Signal installation timeframe

Project Task Schedule

The task schedule below will be used for this project on all five corridors and will be repeated each year for three years until the project is complete. ACHD staff have extensive experience in project management and plans, specifications, and estimates (Plans Specifications &Estimates) document development and advertising.

ACHD will utilize a Transportation Consulting firm experienced in SPM deployment and signal timing development and implementation to assist ACHD staff as needed. In addition, ACHD has a yearly on-call consultant roster that has several transportation firms with experience in SPM implementation that are available for assistance with this project.

Yearly Tasks	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Kick-off Meeting	X			
Advertise Bluetooth Devices & Implementation	X			
Travel Time – Floating Car	X			
Advertise for Radar, DSRC radios, OBU and	X			

Yearly Tasks	Quarter 1	Quarter 2	Quarter 3	Quarter 4
ATC controllers				
Install Radar Detection			X	
Install ATC Signal Controllers, DSRC radios and OBU		X		
Implement SPM			X	
Fine Tune Signal Timing Plans via Field Reviews				X
"After" Travel Time – Floating Car/Bluetooth				X
Final Report				X
Project Management	X	X	X	X

Figure 15. Scope of Work/Project Schedule

14. Support or Leveraging of ITS/Innovative Technology Initiatives

This signal technology advances several strategic themes included in DOT's ITS Strategic Plan. It enables safer roadways by altering the dilemma zone and improving signal timing to reduce crashes, and enhances mobility by increasing system efficiency, improving individual mobility. Further, it limits environmental impacts by improving traffic flow, reducing idling time and decreasing emissions.

The project demonstrates technological advancement and innovation, as it incorporates state-of-the-art signal technology designed to meet future transportation needs. This technology leverages and complements the well-respected Transportation Management Center already operated by ACHD. The radar and wireless technology included in this project will support transportation connectivity so that real-time information can be provided to users.

Staffing Description

[redacted]

[redacted]

Funding Description

PROJECT BUDGET			
Item	**Quantity**	**Unit Cost**	**Total Cost**
Signal Project Costs			
CONSTRUCTION COSTS			
Rent Construction Signs, Class A	210	$ 8	$ 1,680
Rent Construction Signs, Class B	250	7	1,750
Rent Tubular Markers	50	5	250
Rent Advanced Warning Arrow Panel, Type C	400	10	4,000
Rent Incidental Traffic Control Items	1	3,500	3,500
Traffic Control Maintenance	400	35	14,000
Flagging	400	35	14,000
Install GPS Units and Harnesses	120	85	10,200
Install Radar Detector Units	460	1,000	460,000
Install Accessible Pedestrian Signals (in-kind)	100	625	62,500
Install DSRC Radio equipment (in-kind)	20	500	10,000
Install V2I On-Board Units	40	2,000	80,000
Install Bluetooth Units (in-kind)	40	250	10,000
Mobilization	1	20,000	20,000
Construction Engineering (15%)	.15	691,880	103,782
TOTAL Construction Costs			**795,662**
EQUIPMENT COSTS			
Commuteride GPS Units with Harness	120	113	13,560
Bluetooth Detectors	40	4,500	180,000
Radar Detector Control Units	82	2,600	213,200
Radar Detectors	460	5,400	2,484,000
DSRC Radio Equipment for V2I Interface	20	5,000	100,000
Advanced Traffic Controllers w/ V2I Software	82	5,000	410,000
Audible Pedestrian Signal Buttons	100	425	42,500
Testing Equipment (Controller, Radar, etc.)*	1	234,500	234,500
Server Upgrade	1	24,000	24,000
TOTAL Equipment Costs			**3,701,760**
OTHER COSTS			
Signal Preliminary Engineering (Consultant)	1	175,000	175,000
Signal Installation and Programming (Staff) (in-kind)	1	200,000	200,000
GPS Purchasing/Tracking/Reporting/Oversight (in-kind)	1	28,900	28,900
DSRC V2I Installation and Testing (Univ of Idaho, BSU, in-kind)	1	15,000	15,000
Annual GPS Wireless Service	3	27,300	81,900
TOTAL Other Costs			**500,800**
TOTAL PROJECT COSTS			**$4,998,222**

* Previously Expended

Figure 16. Project Budget

The following table (Figure 17) shows the sources of funding for this project:

SOURCES OF FUNDING		
Source	**Amount**	**Percent of Total**
Cash Match		
Ada County Highway District (ACHD)	$ 1,564,572	32.84
Idaho Transportation Department (ITD)	570,000	11.97
ACHD Commuteride	52,750	1.11
In-Kind Match		
ACHD	282,500	5.93
University of Idaho & Boise State University	15,000	.31
ACHD Commuteride	28,900	.61
Funds Request		
Federal ATCMTD Funds	2,250,000	47.23
TOTAL FUTURE PROJECT COST	**$4,763,722**	**100%**

Figure 17. Project Sources of Funding

ACHD previously incurred $234,500 in project costs, but that amount is not included in Figure 16 as it is not eligible as match.

Both ACHD and ITD funds are non-federal funds from state and local sources. The Cooperative Agreement (see Appendix A) between these two agencies outlines the formula used to calculate the appropriate share of project costs assigned to each agency, which is based on how many lanes the agency owns at each intersection. Also included is documentation from the various agencies committing match for this project (see Appendix C)

The only restriction on match is from Commuteride, as those funds are only for the GPS portion of this project.

Organizational Information

Exceptions to Award Terms and Conditions

No issues with preexisting intellectual property or data rights are anticipated either during or after the award period of performance.

Organization DUNS Number

The DUNS number for the Ada County Highway District is 099312712.

Audits

Ada County Highway District has A-133 Single Audits annually. The latest was completed on 09-30-2016 and is attached as Appendix D.

Conflicts of Interest

There are no actual or potential personal or organizational conflicts of interest in this application; the proposed project will be performed in an impartial and objective manner.

Accounting, Purchasing, and Property Control System Review

ACHD's accounting system, purchasing system, and property control systems were reviewed on 09-30-2016. The point of contact for this review is Eide Bailly LLP (www.eidebailly.com).

Terminated Contracts

No contracts have been terminated for convenience of the Government within the past three years, and no contract/agreement has been terminated for default within the past five years.

Title 2 CFR Reporting Requirements

ACHD understands and acknowledges the requirements, and has the necessary processes, systems, and personnel in place to fully comply with the reporting required upon receipt of this funding.

Violations of Federal Law

ACHD has no violations of Federal criminal law, including those involving fraud, bribery, or gratuity violations.

Appendix A: ACHD/ITD Signal Maintenance Cooperative Agreement

Appendix C: Matching Funds Commitment and Letters of Support

Appendix D: ACHD 09-30-2016 Audit