GOVERNOR’S MESSAGE

Aloha,

As Governor of the State of Hawaii, I am committed to ensuring our administration works toward efficiency through the development of vanguard solutions that allow us to adapt to our rapidly changing environment. Collaborating with partners to institute effective, advanced traffic management protocols is key in preserving the natural beauty of the islands while minimizing commute times to enhance the quality of life for our citizens. In addition, the state’s economic growth depends on the efficient transportation of goods.

My administration’s Action Plan pledges to address the issues facing our state in a direct and forthright manner, and transportation is a top priority. Now more than ever, we must find viable ways to use technology to facilitate easier access, and to foster expansion of programs that will protect our islands from infrastructure pitfalls.

Hawaii’s statewide transportation system must be regularly upgraded to counter traffic challenges and to become a reliable network our drivers can depend upon. As Hawaii progresses and new technology enhances communication potential, our transportation department is tapping into advanced resources that will enable them to operate for the full benefit of travelers. Improved communication through innovative traffic management features and response procedures will help our roadway system reach its full potential.

With the increased demand of growing island communities comes the responsibility to provide businesses, residents and visitors with practical methods that foster safe and sensible commutes. As the glaring need for change becomes impossible to ignore, I am pleased to present the Hawaii Intelligent Transportation Systems (ITS) Strategic Plan, designed to guide HDOT with the tools needed to optimize the transportation experience. I invite you to familiarize yourself with ITS and envision a transportation network that caters to the needs of Hawaii’s people.

Mahalo,

David Y. Ige
Governor of the State of Hawaii

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Aloha,

In the midst of a growing population juxtaposed with shrinking budgets, the State of Hawaii is searching for innovative ways to effectively manage its transportation systems for the benefit of all. The evident worsening congestion demands creative solutions now, as building our way out of traffic problems has proven ineffectual. Vital traffic management along with dependable and safe transportation options will improve the quality of life for Hawaii residents, contribute to environmental sustainability, and foster economic stability.

In keeping with these objectives, the Hawaii Department of Transportation (HDOT) is up for the challenge of giving our people the resources and results they need. I’m pleased to announce that HDOT is initiating a new plan for actively managing our transportation system—the Hawaii Intelligent Transportation Systems (ITS) Strategic Plan. I am confident that this dynamic proposal will successfully guide HDOT in controlling congestion on our roadways through the various resources, technologies, and tools outlined herein.

The comprehensive ITS plan maps out a ten-year program of investment in state-of-the-art equipment, operations, and staffing with the purpose of:

- Facilitating faster incident resolution to minimize risk of backups and secondary crashes.
- Offering real-time traffic condition information to all commuters, enabling them to make informed decisions regarding where, when, and whether to travel.
- Improving cooperation and collaboration between HDOT and partner agencies—including the City and County of Honolulu—and eventually expanding ITS statewide.

You are invited to review the ITS Strategic Plan and participate in the ongoing discussion about how to continually better our transportation network and cultivate a system that effectively responds to the needs of our island travelers.

Mahalo,

Ford N. Fuchigami
Director, Hawaii Department of Transportation
INTRODUCTION

Hawaii’s surface transportation system is under multiple pressures from aging roads and bridges, growing traffic congestion, and the high cost of construction. The resulting traffic congestion and safety issues are of increasing concern, and the Hawaii Department of Transportation (HDOT) has committed to “saving lives, saving time, and saving money” through construction projects for system preservation, restoration, capacity and safety improvements; multi-modal programs; and intelligent transportation systems (ITS).

ITS uses advanced technologies and communications to improve the operations of new and existing infrastructure. Typical ITS deployments include:

- Closed circuit television cameras (CCTV) to monitor operations and improve incident response.
- Electronic variable message signs (VMS) to inform drivers of incidents, travel times, and other information to help them make driving decisions en-route.
- Traffic sensors to monitor traffic flow, calculate travel time, and provide data that can be used for planning and performance monitoring.
- Traveler information systems – these systems fuse data from multiple sources to provide real-time traffic congestion, incident, and event information to travelers. The public receives the information via accessible means such as the Internet, hand-held devices (e.g. smart phones or other personal digital devices) and are informed of conditions and mode choices to make decisions before the start of their trip.
- Traffic operations centers (TOC), where traffic data is processed and managed, and where trained operators monitor conditions and respond to incidents by supplying important information to the public and coordinating with incident responders.

ITS provides a relatively new and evolving set of tools, enabling DOTs to get the most out of their built infrastructure through pro-active system operations and management, in particular by providing incident management and traveler information. The AASHTO 2006 publication “The 21st Century Operations-Oriented State DOT” states:

> Obtaining the best possible performance from the existing system is surely the number one priority of all state DOTs. Current realities indicate that a major source of loss of performance—urban and rural—is the result of operational problems, from both a mobility and safety perspective.

As state DOTs increasingly focus on customers and performance, they must consider how best to maintain their commitment to highway service by incorporating operations as well as capacity expansion into their mission plan.

As the Federal Highway Administration (FHWA) has documented (see Figure 1), over half of all congestion can be attributed to operational issues. Thus, finding ways to address these issues is vital.
HDOT's ITS program began with the construction of the H-3 Harano Tunnels, which opened in 1997. The H-3 system includes a tunnel and freeway management system, variable message signs at key approaches to the tunnels and to alternative routes, CCTV cameras to monitor conditions, and a traffic operations center at the H-3 Tunnel where all the systems are brought together to support HDOT's management of the H-3. Since startup of the H-3 systems, VMS and CCTVs have been deployed beyond the H-3 tunnel approaches on Oahu. Additional HDOT efforts include installing traffic detection on the H-1, H-201 and H-2 roadways, initiation of the Go Akamai traveler information system, and the launch of a Freeway Service Patrol (FSP) on Oahu.

This ITS Strategic Plan (“Plan”) provides a framework for implementing ITS in a coordinated and comprehensive fashion in Hawaii to meet today’s transportation challenges and to plan for the future. The Plan is dynamic in nature, with its goals focused primarily on providing tools to support incident management and to provide advanced traveler information (via the web and phone) for Hawaii. Updates of the Plan may look toward expanding these goals to other ITS functional areas and providing more specifics for statewide ITS deployments.

Benefits of ITS

ITS supports several key HDOT transportation objectives:

- **ITS improves safety.** Incident management systems have been shown to reduce crashes. One good example amongst many is the St. Louis, Missouri Freeway Management Program. St. Louis has implemented an ITS freeway management program that includes traffic cameras, communications, electronic message signs, traffic detection, and a freeway service patrol to reduce delay and improved safety on its freeway system. An analysis of the St. Louis program’s incident data for the period between 2000-2008 found that secondary crashes due to incidents were dramatically reduced by over 1,000 secondary crashes annually, resulting in an annual social benefit of over $78 million and a reduction of annual congestion costs of $1.1 millionii.

  The likelihood of a secondary crash increases by 2.8 percent for each minute the primary incident continues to be a hazard. Causes include the dramatic change in traffic conditions, including the rapid spreading of queue length, the substantial drop in traffic speed, and rubbernecking. Secondary crashes due to congestion resulting from a previous crash are estimated to represent
ITS provides reliable information about congestion. Travelers who have real-time information about traffic conditions, emergencies, incidents, and planned events may decide that they need to leave earlier or later, or change travel modes and, in cases when travel is not absolutely necessary, may choose to skip the trip entirely. Evaluation of traveler information services has shown benefits in improved on-time reliability, better trip planning, and reduced early and late arrivals. Studies show that drivers who use route-specific travel time information instead of area-wide traffic advisories can improve on-time performance by 5 to 13 percent. Hawaii’s infrastructure is unable to handle the demands of vehicle traffic during many hours of the day. In the 2014 INRIX National Traffic Scorecard Annual Report, Honolulu ranked highest in the US when it comes to travel times motorists spend on the roadways during peak traffic hours. On Maui, Highway 30 (Honoapiilani Highway) is frequently backed up from the tunnel to Kaanapali. Traveler information can result in small but significant changes in travel behavior, bringing noticeable changes to drive times in Hawaii.

ITS is a tool for incorporating sustainable principles in the transportation system. ITS is not about building new highways or widening existing ones. Rather, ITS focuses on the transportation network as it exists today and uses technology to allow agencies to get the most out of their investments in transportation infrastructure. A benefit-cost analysis of the Hawaii Freeway Service Patrol demonstration project (2009-2011) resulted in an 8:1 ratio, meaning that, for every $1 the Hawaii DOT spent on its FSP program, $8 in benefits were realized. And notably, the congestion-reducing aspects of ITS are important tools towards reducing greenhouse gas emissions.

ITS promotes economic growth. Incident management programs and policies have been shown to reduce crashes and clear roadways quickly, allowing for efficient movement of goods and people. Efficient movement provides direct economic benefits including direct savings to transportation users through reduced operating costs. Based on data from the Texas Transportation Institute, every ten minutes of traffic delay on highways costs each driver $600 per year, and $3300 per year for commercial vehicles.

ITS is a high technology solution for Hawaii, promoting the creation of high-tech jobs in managing, operating, and maintaining ITS systems and equipment. In 2009, the London School of Economics Information Technology and Innovation Foundation found that investment in ITS creates a “network effect” throughout the economy and directly benefits economic growth by stimulating job creation across multiple sectors, including green jobs, high-tech, and related industries. In addition, the US DOT has determined that an average of 50 percent of ITS spending goes directly to wages and salaries.

ITS promotes enhanced quality of life. ITS helps reduce congestion and provides real-time traveler information using VMS, the web, and phone systems—giving travelers the opportunity to be better informed. A study of travelers in Seattle found benefits from traveler information include avoiding congestion, reducing uncertainty and stress, saving time, and improving travel safety. Where they have options—such as taking other routes, using other modes, or delaying their trip—traveler information allows them to save time and be more productive. Even when they do not have options, traveler information provides a valuable service to drivers.
GOALS OF THE ITS STRATEGIC PLAN

HDOT has established three goals for its ITS program:

- Implement an interagency incident management program
- Provide advanced traveler information
- Expand ITS statewide

These goals directly support HDOT Highways Division’s mission to provide safe, efficient, and accessible land transportation facilities, and are framed by planning and policy work accomplished to date.

Goal #1: Implement an interagency incident management program
Incident management consists of surveillance and detection, mobilization and response, and information dissemination. HDOT’s role is a supporting one, providing assistance to first responders (police, fire, and emergency medical services) in all three areas of incident management.

HDOT will implement an interagency incident management program through Freeway Service Patrol, video coverage, variable message signs, incident management information systems, and interagency coordination. HDOT will focus initially on the freeway system and expand to other National Highway System roads.

Studies from around the world show that incident management programs consistently produce significant benefits.

- San Antonio, Texas experienced a 41% reduction in crash frequency.
- In Georgia, incident duration was reduced from 67 minutes to 21 minutes, and incident-related delay was reduced by 7.25 million vehicle hours in one year.
- In Japan, there was a 50% reduction in secondary crashes after real-time incident detection and warning systems were installed.
- In Los Angeles, the benefits of the Los Angeles Metro FSP outweighed costs 8:1.

Goal #2: Provide advanced traveler information
Advanced traveler information systems (ATIS) take real-time and static data on transportation conditions, incidents, and events; fuse the data in a database; and disseminate it to the public via the web (and personal web-enabled devices), twitter feeds, phone, and other means. It is a key component of an effective traffic and congestion management program. By providing information on traffic conditions, construction, special events, incidents, and advisories, travelers can make informed travel choices. Thus, individual travelers...
These goals directly support HDOT Highways Division’s mission to provide safe, efficient, and accessible land transportation facilities...

become active participants in congestion management as they are empowered with the information and may choose to change their individual travel behaviors.

In coordination and cooperation with the City and County of Honolulu, advanced traveler information for HDOT begins with collection of data on real-time traffic conditions on its freeways. Deployment of detection devices enables HDOT to provide information about travel times, congestion, and incidents to the traveling public for both pre-trip and en-route planning and information. Additional data and advisories about special events and construction are also being provided through web-based services and a 511 telephone system.

Traveler information benefits have been quantified in the US:

- In Houston, 85% of motorists surveyed changed their route after viewing real-time information on freeway VMS.
- In Virginia, 90% of 511 phone users found the service useful; 49% indicated they had changed their travel plans due to information obtained through the 511 system.
- In Missouri, 85% of tourists surveyed were aware of at least one ATIS component and 48% of the travelers had used the system; 50% of those who were aware of at least one ATIS component said that they saved time.

Goal #3: Expand ITS statewide

The area of coverage for the Plan is the State of Hawaii. Because of the number of residents, visitors, and vehicles on Oahu, a conscious decision was made to focus ITS deployment on Oahu’s freeway system first. While this Plan includes detailed deployment of ITS devices and systems for Oahu only, it calls for additional planning work to be done before HDOT is able to comprehensively expand ITS to the islands of Hawaii, Maui, and Kauai.

To start, in 2014 HDOT began work to create the Hawaii Statewide ITS Architecture. Development of an architecture consistent with the National ITS Architecture is a FHWA requirement to warrant that ITS projects are eligible for federal funds. The County of Hawaii developed its Architecture in 2012, and Oahu’s Regional ITS Architecture was completed in 2003. The Hawaii ITS Architecture will include regional architectures for the islands of Maui and Kauai, ensuring funding eligibility of ITS projects when completed in 2016.
HDOT’s ITS Strategic Plan is built on two primary principles: first, implement functions and systems that are cost-effective and can be readily leveraged and expanded in the future; and second, build off of these investments to create sustainable, effective ITS systems. By doing so, HDOT will be able to build a viable ITS infrastructure and operations program that will provide traveler information and enhanced incident management for the foreseeable future.

**Investments in a rich traveler information program will yield:**

- A robust website that presents speed data, travel times, and event information as well as offers personalized services and alerts to users.
- A fully functional 511 telephone system with interactive voice response will provide the same information that is available on the website.

**Investments in incident management will produce:**

- An expanded Freeway Service Patrol program.
- A coordinated incident management program with the City & County of Honolulu’s Department of Transportation Services (DTS) and first responder agencies.
- Developed and implemented diversion plans based on consensus with DTS and first responder agencies.
- A joint traffic management center (JTMC), where traffic is actively managed and operationally integrated with Hawai’i’s emergency and transportation management agencies.

As the program grows, traveler information and incident management will help HDOT save time, save lives, and save money.

**The ITS Program has a 10-year timeframe and is divided into the following periods:**

- **Current Program: Today-Year 3**
  - FY 2016 – FY 2018
  - FY 2017
- **Near-Term Plan: Years 4-6**
  - FY 2019 – FY 2021
  - FY 2020
- **Long-Term Plan: Years 7-10**
  - FY 2022 – FY 2024
  - FY 2023 – FY 2025

Full implementation of the ITS Program in Hawaii—which includes additional staff to support design, programming, operations, and maintenance as well as field equipment—will provide outcomes and benefits to achieve HDOT’s goals.
HDOT’s ten-year program includes investments in telecommunications, field devices, computer systems, operations, maintenance, and staffing. This section describes existing infrastructure and the planned ITS through 2025.

Over the next 10 years, HDOT will:

1. Complete a Robust Communications Network

Telecommunications to transmit data between devices in the field to a data processing or traffic operations center is an integral part of any ITS program. HDOT uses three types of telecommunications—fiber optic cable, traditional telephone service, and various wireless communications—between its existing field devices and its TOC at the H-3 Harano Tunnels. The ITS Plan will improve the communications network functionality, capacity, and reliability to provide the ITS services outlined in this Plan.

Consistent with the strategy of leveraging available resources, HDOT’s communication system is planned to enhance and be enhanced by the City’s communication system. An HDOT-owned fiber optic network, augmented by the City’s fiber optic network, will provide the most reliable communications and have sufficient bandwidth to support snapshot images and streaming video from the CCTV network. It will also provide much-needed redundancy for the majority of telecommunications infrastructure (comprised of both State and City resources). As part of its network communications plan, HDOT will continue to look at wireless options to enhance and cost effectively deliver its overall communications system.

2. Install ITS Equipment on HDOT Facilities

A number of ITS devices have been or will soon be implemented to support incident management and traveler information needs on Oahu. These include spot speed (Figure 2) and travel time detection (Figure 3), closed circuit television cameras (Figure 4 and Figure 5), and variable message signs (Figure 6). These devices have been deployed using current funding with placement prioritized for locations where the most immediate benefit will be recognized. Future funding will be directed to expand deployment on Oahu.

Spot Speed Detection
Spot speed detection enables HDOT to assess traffic conditions in real time. Detection is placed at several locations along a facility, and the data is monitored for changes from free-flow speed. Data from these devices will be used for incident management, performance measurement data collection, and traveler information. Spot speed detection was installed on the H-1, H-2, and H-201 Freeways in 2010. Similar spot speed detection devices are included in the ITS Program for H-3, Pali, and Likelike Highways.
The ITS Plan proposes to improve the communications network functionality, capacity, and reliability...

**Figure 2:** Existing and Future Spot Speed Locations

**Figure 3:** Existing and Future Travel Time Detection Locations

**Travel Time Detection**

Travel time detection was installed along H-1 and H-201, between the Waiawa Interchange and Punahou Street in 2011. Expansion of the travel time system will include the remainder of H-1, along H-2 and H-3, as well as select locations on the Pali, Likelike, and Farrington Highways. Using data collected from these devices, estimated travel time will be calculated and will be provided in traveler information systems including variable message signs on key roadways, web, phone, and other information dissemination media as the technology evolves. In addition, this data will also be used to measure freeway system performance.
Closed Circuit Television Cameras

HDOT CCTV camera coverage is currently provided along the H-3 and H-201 Freeways. CCTV coverage is supplemented by City-owned CCTV deployed along sections of H-1. Both have agreed to share CCTV images at their respective centers. The Plan includes expansion of the CCTV system to provide full coverage on all of H-1 and H-2, as well as along the Farrington, Pali, and Likelike Highways and replacement/upgrades of cameras on H-3.

CCTV images aid operators at traffic management and operations centers in confirming and responding to incidents and managing traffic, and are provided to the public through traveler information systems.

**Figure 4:** Existing CCTV Cameras Located on HDOT Facilities

**Figure 5:** Future HDOT CCTV Camera Locations
Variable Message Signs
As part of the initial H-3 program deployment, VMS were installed along its length, including installations on approaches to H-3 from the H-1 corridor and Windward Oahu. These signs have exceeded their life cycle, are no longer supported by the manufacturer, and must be replaced.

Replacement of existing VMS is phased based on operational priority and available funding. The first three years of the Plan include replacing four existing VMS and installing six new VMS in the H-1 corridor. Two of the existing VMS were replaced in 2012 and are currently planned for demonstration of travel time messaging. New VMS on H-2, Pali, and Likelike Highways are planned, and the eventual replacement of all existing VMS and CMS on H-3 and in the Harano Tunnels are included in the 10-year Plan timeframe.

Figure 6: Existing and Future VMS Locations

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3. Provide a Traveler Information Website and Telephone System

There are two elements of the traveler information system: a traveler information website and mobile-ready applications, and an integrated, interactive telephone system. Both systems have been deployed, and enhancements will be implemented in the first three years of the program with additional enhancements planned in the Near- and Long-Term plans as needed. Each is described below.

Website
The traveler information website, available at www.goakamai.org, is the aggregation point for all traveler information from HDOT’s ITS systems and includes travel time and congestion information, event information (incident, construction, and public events that impact travel), a portal for other transportation services, and personalized services.

Summer 2010 marked the first public release of the joint State-City ATIS website. Under the name “Go Akamai”, the website includes a congestion map based on data collected from the spot speed devices and provides the user with access to State and City CCTV images. Enhancements since the initial release include integration with traffic incident information, select City and County of Honolulu arterial information (currently all special events), and mobile applications for smart phones.
About the ATIS program name, tagline, and logo:

- The ATIS program is named “Go Akamai” or “go smart”.
- The tagline is “Get it. Got it. Go.” It was chosen because it conveys a sense of speed in obtaining valuable travel planning information. It also implies that the system is easy to navigate and helps travelers get to where they need to go faster.

**Telephone**

The development of the infrastructure to support dissemination of traveler information through a website also supports other dissemination media including an interactive voice response phone system. The system is accessed by dialing 511, a federally designated number for traveler information use. Launched in the fall of 2013, the telephone system provides a full range of traveler information including current speed conditions, projected travel times, event details, and access to information on alternate travel modes.

**4. Expand Freeway Service Patrol Coverage**

HDOT’s incident management program was implemented in 2009 with roving freeway service patrols. FSP operates between 5 a.m. and 7 p.m., Monday through Friday, on H-201 and H-1 between the Kunia Interchange and Ainakoa Interchange and on H-2 from the Waiawa Interchange to Ka Uka Boulevard (see Figure 7). The program has provided over 60,000 assists and averages close to 1,000 assists per month. In surveys received from motorists who have been assisted by FSP, 97 percent rate the program as “excellent”. The ITS Plan assumes expansion of the FSP over the 10-year program beyond its current 29 freeway miles of service on H-1 to more than 40 miles of service.

**Figure 7: Freeway Service Patrol Area of Service**
5. Improve Incident Management Through Traffic Operations

Tunnel and freeway operations are provided at the H-3 TOC by operators who support traffic operations and incident management on the H-3 facility and some select sections of other Oahu roadways. These operators rely on software and technology systems to do their jobs. First opened in 1997, the systems equipment and software at the TOC has or will reach its life cycle end during the 10-year window of this strategic plan. Since inception of HDOT’s ITS program, the H-3 video wall, the field device communications system, and hardware supporting the tunnel management software system have been replaced. Replacement of other obsolete ITS-related systems at the H-3 TOC and along the H-3 freeway is included in the Near- and Long-Term Plans.

Joint Traffic Management Center

The City and County of Honolulu, in conjunction with HDOT, is moving forward with a Joint Traffic Management Center (JTMC) project. As currently planned, the JTMC will house HDOT’s ITS operations as well as portions of the City’s Police (HPD), Fire (HFD), Emergency Medical Services (EMS), Department of Transportation Services (DTS), and other organizations with functions related to active traffic management. Co-location of key staff within the JTMC will allow for better incident management and coordination between these agencies.

The Plan assumes that the JTMC will be operational in Year 3 (2018). Benefits to and requirements from the ITS Program resulting from JTMC development and implementation are:

- The JTMC will improve HDOT’s ability to meet the two ITS program goals—improved incident management and traveler information.
- Systems staff will be needed to plan and operate the hardware, software, and communications systems in the JTMC.
- HDOT will incur ongoing costs to occupy and operate the JTMC.

If the JTMC project does not move forward, HDOT will expand the existing systems and facilities at the H-3 TOC to manage the expanded incident management and traveler information functions. Additionally, interagency coordination to support incident management and interconnected computer systems will also be required. The Plan addresses systems needs independent of the location of the systems.

6. Provide Ongoing Support to Implement and Maintain the Program

ITS is more than systems and devices. It also needs ongoing support functions, including field maintenance, HDOT’s System Manager Contract, and ITS public outreach. Operations for traveler information, FSP, and the JTMC were previously discussed.
Field Maintenance
Field maintenance encompasses the ongoing preventative and responsive maintenance needed to keep ITS equipment functioning. Today, limited preventative maintenance is done on a regular basis, with most work due to outages or breakdowns. HDOT has limited maintenance staff and has contracted some of these services to third parties.

In the Plan, costs associated with maintenance are designated for staff needed to perform preventative and responsive maintenance work, as well as for replacement equipment.

System Manager
HDOT currently contracts with a System Manager to provide support for various ITS activities that cannot be accomplished with its current staffing levels. To date, this support has included development of procurement materials for ITS projects, development of the traveler information website and phone system, ITS strategic planning efforts, support to initiate and monitor the Freeway Service Patrol, and other ITS activities as required.

The Plan assumes continued staff support via the System Manager in the Current and Near-Term phases of the ITS Program. Staff support through the System Manager will be maintained at current levels, then reduced in Years 4 and 5 after an ITS organization within HDOT has been established. It is expected that the majority of new staff positions will be created by Year 4 and filled by Year 6. At that point, HDOT will either have sufficient ITS staff to perform the functions or will need to secure funding to continue the System Manager contract. Should there be neither new staff nor a System Manager, continued implementation of the ITS Program Plan elements will be delayed and some of the implemented systems will be at risk due to lack of maintenance.

Public Outreach
As HDOT rolls out new ITS projects, a public outreach program will be developed that will be proactive in terms of providing information about the ITS Plan elements and its benefits. Also, as part of monitoring performance of the ITS Program, an annual public opinion telephone survey will be conducted that addresses general attitudes about traffic congestion on Oahu roads and implementation of ITS devices and systems.

7. Implement ITS on the Neighbor Islands
The ITS Program focuses planning, design, and construction dollars primarily on Oahu, where the greatest level of congestion and incidents are found. Today, ITS on the neighbor islands is almost nonexistent with the exception of about 25 CCTV cameras on Hawaii Island and a single, permanent VMS on Maui.

HDOT recognizes that the neighbor islands will benefit from traveler information and incident management functions as well as other potential ITS applications. Development of the Hawaii Statewide ITS Architecture is included as part of the Current Program. Future projects that are identified will be programmed for annual funding starting in Year 4 (2019).
8. Increase Staff to Operate, Maintain, and Expand the Program

In order to continue to develop, implement, and expand the ITS program, HDOT must address the associated staffing needs and a projected gap in available resources. To offset staffing shortfalls under the Current phase of the program, this Plan proposes supplementing maintenance of some devices and systems by requiring the vendor or installer to provide extended warranty service. As addressed previously, the System Manager is supplementing other staffing needs for the Current and Near-Term programs.

Unlike more traditional DOT operations and maintenance staff skills, ITS requires specialized skills in systems and software engineering processes, roadway operations, incident management, computer and software systems, and communications networks and field technologies such as VMS, CCTV, and traffic detectors. Managing the implementation, maintenance, and operations of ITS in Hawaii is a complex task for several reasons:

1. Lack of nationally-accepted design manuals and standards – There are no manuals or national standards for ITS that provide design standards or parameters. Each Hawaii ITS project is a tailored solution based on a federally guided decision-making process.

2. Statewide span of ITS responsibility – The approach for planning, deploying, operating, and maintaining ITS beyond Oahu has yet to be developed. This will require close coordination with District Engineers and branch leadership within HDOT to prioritize and implement ITS projects, operate and maintain the infrastructure, and, where appropriate, train local staff.

3. Policy recommendation and interpretation authority – The impacts that ITS planning, design, construction, maintenance, and operation have in the HDOT organization are far-reaching and require coordination with multiple branches and districts; within them, numerous sections; and between them, many federal and county agencies. The ability to recommend and interpret HDOT-adopted ITS policies is needed to move these interagency discussions forward with minimal delay.

4. Stakeholder involvement – FHWA requires that ITS project planning and design involve potential stakeholders. The process typically involves a large group of stakeholders, and consensus-building is key to the ITS project planning and design. In addition to transit, transportation services, and public works departments, the stakeholders can include affected agencies such as Police, Fire, EMS, Emergency Management, Information Technology, and others that may share the systems themselves or have input to how the systems should operate. HDOT will need to lead these consensus efforts.
5. Continuous changes in technology – Further adding to the complexity of ITS project design, operation, and ongoing maintenance, technology is continually and rapidly changing. The design solution developed for an ITS application today will likely not be the same solution selected next year. Plus, this continuous change makes maintenance and replacement of ITS components more complex. Each replacement decision must be made considering the state of the market in terms of the technology being addressed, including whether the technology remains current and available, whether new technologies meet functional needs, whether new technologies require changes to operations or maintenance practices, and other complicating factors.

New HDOT staff positions are needed to meet the growth and supporting skill sets required to implement the ITS Strategic Plan. These are tied to the addition of specific functions and other key milestones in the plan. The staffing approach developed to support implementation of the ITS Strategic Plan is based on three primary principles:

- **Additional Staff, Additional Skills.** The incorporation of the new systems with the legacy systems, as well as the geographic expansion of and development of wholly new systems, requires new and innovative problem solving, new skill sets, and new staff. While existing staff may be trained to run and manage some of these systems, additional staff are required for the ongoing design, construction, operations, and maintenance of the ITS Program. New positions are also required to provide leadership in interagency coordination, management, and administration of the ITS Program.

- **Consolidation.** ITS functions united within a single organization responsible for the complete ITS Program, including statewide functions, will enable direct coordination and facilitate cohesive planning, programming, construction, operation, and maintenance of the ITS Program. Plus, a united ITS group will readily leverage skills across functional areas, resulting in efficiencies in staffing resources. The Plan calls for moving existing staff from various sections in the Highways Division to an ITS organization.

- **Elevation.** The ITS functions are currently housed between the Traffic Branch and the Oahu District. The ITS Program proposes a new ITS organization where the elevation of ITS functions within HDOT reflects a focus on managing the investment in the transportation infrastructure to get the most out of those dollars. In addition, the ITS Program will be a statewide function so that the skills developed from the program investment in Oahu are leveraged across the state.
To achieve HDOT’s ITS goals, the ITS Strategic Plan is broken into the Current (0-3 years), Near-Term (Years 4-6), and Long-Term (7+ years) Programs. The Current Program concentrates on what can be constructed and implemented within the first three years of the program with existing resources and programmed funds. The Near- and Long-Term strategies assume a significant expansion of resources and funding for implementation of ITS infrastructure and systems to support comprehensive incident management and advanced traveler information systems.

Current Program

The Current Program is very opportunistic in that it focuses on field devices that are relatively quick to install with mostly solar power, rely on wireless communication, and require limited design. In addition to the already launched traveler information website and the FSP, these are the functions and systems that will be implemented in the first three years of the Plan:

- Travel condition information for Trans-Koolau routes and travel time display on VMS.
- JTMC construction, systems/staff migration, and start-up.

Near- and Long-Term Strategies

Where the focus of the Current Program is to get information about roadway conditions to the traveling public by deploying data collection devices and information systems as quickly and easily as possible, the focus of the Near- and Long-Term Plans is to expand and strengthen the traveler information and incident management functions and services by leveraging the early investments to create workable and effective ITS systems. These are planned for completion over the life of the Plan:

- Ongoing traveler information web and phone systems.
- ITS devices and communications on major roadways.
- Expanded FSP.
- JTMC operations and maintenance.
- Expanded ITS on neighbor islands.

The implementation of the Near- and Long-Term Plans is highly dependent on the availability of additional staff resources and funding.
### TABLE 1: Deployment Summary of the ITS Plan

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<th><strong>Infrastructure</strong></th>
<th><strong>Current Program (0-3 Years)</strong></th>
<th><strong>Near-Term Plan (4-6 Years)</strong></th>
<th><strong>Long-Term Plan (7-10 Years)</strong></th>
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<tbody>
<tr>
<td><strong>Construction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Affected Roadways)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Oahu: H-1 Core, H-1 Outer Core, H-3, Pali Hwy, Likelike Hwy</td>
<td>Oahu: H-2 South, H-1 Core (Telecommunications), H-201, Pali Hwy, Neighbor Islands: To be determined, based on Statewide ITS Plan.</td>
<td>Oahu: H-2 North, Farrington Hwy, H-1 Outer Core, Likelike Hwy, Neighbor Islands: To be determined, based on Statewide ITS Plan.</td>
</tr>
<tr>
<td><strong>Equipment to be Installed</strong></td>
<td>Telecommunications: Wireless CCTV: 25 new (augment City camera network to provide complete coverage) VMS: 7 new and 2 replacement for posting travel times Speed Detection: 34 new on Trans-Koolau routes</td>
<td>Telecommunications: Fiber-optic (25.5 miles) CCTV: 24 new VMS: 10 new; 2 replacement Travel Time Detection: 3 nodes</td>
<td>Telecommunications: Fiber-optic (60 miles) CCTV: 36 new; 15 replacement VMS: 7 new (plus 80 in H-3 tunnel/corridor) Travel Time Detection: 15 nodes (Farrington, Pali &amp; Likelike) Replacement of Priority H-3 Legacy Systems</td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td>Pali Hwy, H-1 Core Telecommunications Neighbor Islands (TBD)</td>
<td>H-2 South, Likelike Hwy Neighbor Islands (TBD)</td>
<td>H-2 North, Neighbor Islands (TBD)</td>
</tr>
</tbody>
</table>

### Program Initiatives & Support

| **Traveler Information** | Website, mobile and 511 phone enhancements | Ongoing maintenance of website and phone systems | Ongoing maintenance of website and phone systems |
| **Staff and System Manager** | Staff support and specialty needs through System Manager contract HDOT organizational changes with addition of 11 new positions, including one Branch Manager, 2 section heads; administrative support; 2 operations engineers; 2 systems engineers; 2 maintenance technicians | System Manager contract services transition in Year 4 HDOT staff increases: 2 staff to support engineering, design and systems; 1 staff to support systems | No System Manager contract services |
| **Freeway Service Patrol** | Maintain current service (geographic coverage, times, and days to be determined), evaluate and expand | Continued service, limited expansion based on previous evaluation. | Continued service |
| **Public Relations** | Create and initiate program to promote the ITS Program; begin implementation of annual public opinion telephone survey | Continued promotion of the ITS Program and its elements, but at a lower rate than in the first 3 years of the program; continue annual telephone survey | Continued promotion of the ITS Program at same rate as near-term; and annual telephone survey |
| **JTMC** | Facility construction, systems migration, and staff occupancy | Occupy the JTMC; begin to provide joint incident mgmt and traveler info | Continue to provide joint incident management and traveler information |

### Cost

| **Years 1–3 Total:** | $37.5 Million | $56.8 Million | $61.7 Million |
| **Years 4–6 Total:** | $69.3 Million | $9.0 Million | $17.7 Million |
| **Years 7–10 Total:** | $121.7 Million | | |

This table provides additional detail about the infrastructure elements and summarizes the program initiatives and staff support that are part of the Current Program, Near- and Long-Term Plans.
HDOT’s Highways Division’s annual budget is about $400 million per year. These dollars fund highway projects and operations for the department and include between $140 and $150 million in federal funding. Over 10 years, assuming no increases or decreases to this amount, HDOT’s Highways Division budget is $4 billion.

The total cost of the 10-year ITS Program is roughly $229 million. As shown in Figure 8, almost 49% ($112.3 million) of the program costs are for new ITS infrastructure and 10% ($23.5 million) are for maintenance of that infrastructure. Just over 17% ($38.8 million) is earmarked to support new and existing staff. Program initiatives, which include FSP, System Manager, Public Relations, and traveler information, comprise 23% of the total cost ($51.6 million), with the remainder (just over $2.4 million) of the program supporting JTMC operations.

FIGURE 8: Overall ITS Strategic Plan Cost Summary

Funding Opportunities

Funding for the elements in the ITS Plan is anticipated to continue to come from the following sources:

- FHWA
- State of Hawaii Highway Fund
The Plan’s goals, programmatic elements, approach, and funding are considered essential in systematically implementing ITS in Hawaii. To this end, measuring the success of the ITS Program is vital to guide expansion of ITS, ensure sufficient funding, and validate best use of the funds that are applied. In short, performance metrics are quantified to confirm that Hawaii is getting the expected return on its investment in ITS and, when needed, the program is adjusted to make sure that it is. The evaluation metrics that will be used are summarized in the following table. These metrics will measure the progress in meeting the Plan’s goals over the next 10 years. Annual reports will be published showing the ITS Plan’s growth and its performance against these metrics.

### MEASURING AND REPORTING OUTCOMES

<table>
<thead>
<tr>
<th>Metric Category</th>
<th>Description</th>
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<tbody>
<tr>
<td>Detection, VMS, and CCTV Coverage</td>
<td>Detection refers to traffic sensors that measure vehicle speeds or travel times. This measure considers the total coverage proposed in the ITS Plan for detection, VMS, and CCTV deployment, and compares it with the actual coverage to date.</td>
</tr>
<tr>
<td>Travel Time</td>
<td>Travel time is the average time it takes for vehicles to travel from one point to another and is one of the fundamental measures of freeway performance. Using travel time detection devices, travel time will be measured and historical trends will be developed to understand the actual travel times and assess overall system performance. Additionally, percent variation will be reported. The variation shows the fluctuation in travel time on a specific roadway during a certain period (e.g., AM or PM peak). Minimizing the variation in travel time is expected to be a key benefit of ITS as travelers can readily recognize the variation in their commute.</td>
</tr>
<tr>
<td>Website and 511 Telephone System</td>
<td>The GoAkamai website and 511 telephone system provide real-time traffic information so that travelers are better able to plan their trips using information posted. This metric includes tracking the number of website hits and phone calls.</td>
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<tr>
<td>FSP Service</td>
<td>This metric considers the actual number of service hours and days of service provided, miles of freeway coverage, and the number of motorists assisted by the FSP. Motorists being assisted by FSP are given a survey which they can fill out and mail back to HDOT. This metric considers the rating given to the FSP program (e.g., excellent, good, fair, poor) and the perceived response time (the time it took the FSP vehicle to arrive on scene, from the motorists’ perspective).</td>
</tr>
<tr>
<td>Customer Satisfaction</td>
<td>A public opinion telephone survey will be administered periodically. The survey will include general questions to gauge opinions about how HDOT is dealing with congestion through ITS applications and specific questions about the Plan elements.</td>
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</tbody>
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For more information, contact:
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www.goakamai.org

2 http://www.benefitcost.its.dot.gov/; includes inset box statistics