Florida Department of Transportation Research

# Sunshine Skyway Bridge Monitoring Phase 1: System Assessment and Integration Recommendations

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## Current Situation

At over five miles long, the Sunshine Skyway Bridge, crossing Tampa Bay where it meets the Gulf of Mexico, is one of the world's longest cable-stayed bridges. The pier-supported approaches rise to meet the center section where cables radiating from two central pylons suspend the bridge segments, allowing for an under-clearance of 181 feet above the water, permitting large vessels to pass underneath. The cables are encased in steel pipe painted bright yellow – a symbol of the Sunshine State.

Like all tall structures, the Sunshine Skyway Bridge was designed to tolerate structural movements, which are monitored by weather equipment, GPS, and other sensors that have been added to the bridge over many years by a number of agencies. And of course, technology has advanced considerably during the 30 years that the bridge has been in operation.

*The Sunshine Skyway Bridge is one of Florida's most iconic views and a remarkable work of engineering.*

## Research Objectives

In this initial project, University of Florida researchers developed a plan for a fully integrated and highly flexible monitoring system, including a user-friendly Web interface and full data archiving.

The system proposed in this project combines data from existing sensors into a single monitoring system with an interface for data visualization and alerts. This will allow bridge managers to establish normal bridge response limits, as data from the system will be collected and analyzed over a period of time that is adequate to capture diurnal and seasonal variations in response to a range of weather and traffic-load conditions. Data from the integrated monitoring system will inform an updated and calibrated computer model of the bridge, which will be useful for setting loading and response thresholds and for bridge management decisions.

## Project Activities

The researchers inventoried and assessed the existing monitoring equipment and power and data connections. The researchers then worked with FDOT District 7, which has primary responsibility for the bridge, as well as the Intelligent Traffic Systems Office, the Surveying and Mapping Office, and the State Materials Office, which all maintain bridge monitoring equipment, to determine their data needs and expectations. Together, the inventory, assessment, and stakeholder interviews led to a design brief for an upgraded system. The researchers then reviewed methods for collecting, processing, storing, and visualizing bridge data, including the integration of advanced data management and bridge modeling.

Comprehensive recommendations were made for upgrading the Sunshine Skyway Bridge monitoring system, including consolidation of existing sensor subsystems, connection of all data acquisition systems to the Skyway fiber network, development of data processing methods and event alert thresholds to provide bridge management decision support, and the development of an integrated Web-based data visualization interface for the Skyway monitoring system.

## Project Benefits

The Sunshine Skyway's new monitoring system will help ensure that the bridge serves its 70-year lifespan with a minimum of unanticipated maintenance or service interruptions.

*For more information, please see www.fdot.gov/research/.*