IOWA DOT Research

FACT SHEET

Remote Controlled Hydrographic Survey System

PROJECT TITLE
Remote Controlled Hydrographic Survey System

STUDY TIMELINE
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Introduction

The purpose of this project was to investigate the potential for collecting and using engineering survey accurate data from a remote controlled (unmanned) platform equipped with a system of advanced survey technologies for hydrographic and bridge scour evaluations. The primary interests in investigating this hydrographic scanning technology is to obtain; a significantly improved representation of the underwater surface as compared to traditional methods, the presence of scour at bridge elements and to minimize the exposure of field surveyors and bridge inspectors to the dangers of working in water, from boats and gathering data from bridges. Additional benefits to explore were cost savings and reducing the time required to gather and produce the subsurface information.

Methodology

The Survey Section of the Iowa DOT's Office of Design has over the years performed many surveys on ponds, partial lakes, streams and rivers bottoms in support of transportation improvement projects. These efforts have typically been conducted by staff wading into the water or using a small boat to collect the data. This method is slow, does not capture many data points on the bottom of the body of water and has some risk to the safety of the survey staff conducting the work. In 2013 and 2014, an internet search was conducted to see how hydrographic surveys are being addresses by other organizations. That search indicated that there are several large boat systems in operation for significant bodies of water, but that only one fully integrated hydrographic system for addressing bodies of water typically encountered on highway system. Teledyne Oceanscience produces such a system called a Z-Boat which integrates a remote-controlled boat and motors with an RTK GNSS receiver, a GPS antenna, an echo sounder and radio communications. The purpose of this study was to determine if this system can provide hydrographic data in a quick, data dense and safe manner. This system produces electronic data for use in various reports and to create MicroStation/GEOPAK (civil design platform and software) triangular irregular

network (TIN) files representing the 3-dimensional surface of the bottom of the body of water.

Conclusions

Survey Time Comparison:
It was estimated that if the 4 test site survey projects had been conducted by a 2-person survey crew using traditional survey methods and a boat that it would have taken approximately 15 hours to complete. The same area was surveyed by the same 2-person survey crew using the hydrographic survey system took approximately 2 to 3 hours to complete.

Survey Data Density:
The challenges associated with tradition survey methods in gathering lake/river bottom data have resulted in sparse data points representing the bottom surface. This lack of data can lead to an inaccurate representation of the actual conditions. The hydrographic survey system investigated allows for extensive data collection for use by a designer in analyzing site conditions. It is not unrealistic to assume that sites like the four test projects could readily be represented by approximately 2000 unique points collected on average as compared to approximately 50 to 200 points that could be realistically collected using traditional survey methods.

Potential Impacts and Benefits

The hydrographic survey system can collect 3-dimensional under water surface data significantly faster, at a greater density, at an accuracy that meets the needs on the Iowa DOT and in way that is safer than traditional survey methods used to collect data within a body of water. The four survey test site surveys were accomplished in a small fraction of the time as compared to traditional methods. The safety benefits of having personnel on dry land rather than in or on the water are significant. All future bathymetric survey needs at the Iowa DOT will be conducted using the hydrographic system. The system will be used approximately 40 to 50 applications that require an underwater surface per year including the emergency response projects that arise due to flooding conditions that require immediate action.