IOWA'S REAL-TIME DATA INTEGRATION OF SNOWPLOW INFORMATION AND ROADWAY SAFETY

STRATEGIES FOR USING GIS TO ADVANCE HIGHWAY SAFETY

CASE STUDY

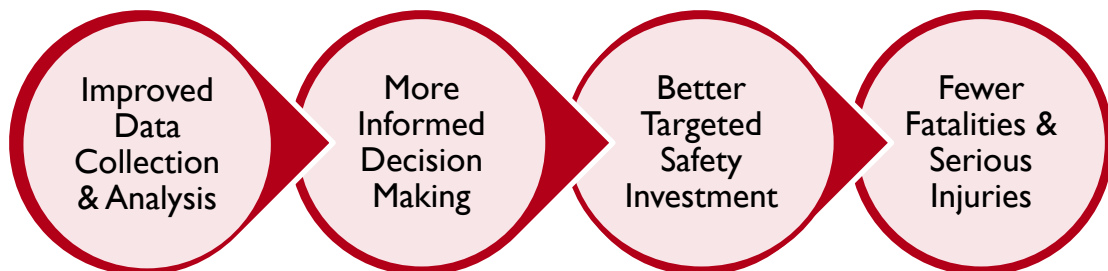**FHWA-SA-16-030**

Prepared for
Federal Highway Administration
Office of Safety
Roadway Safety Data Program
http://safety.fhwa.dot.gov/rsdp/

Improved Data Collection & Analysis → More Informed Decision Making → Better Targeted Safety Investment → Fewer Fatalities & Serious Injuries

CASE STUDY OVERVIEW

OBJECTIVE

The objective of this case study is to illustrate how Iowa has successfully used GIS to implement a snowplow project that provides real-time weather/road information and creates a database of consistent information.

BACKGROUND

The Iowa Department of Transportation (DOT) deploys about 900 snowplows each winter to plow 9,479 centerline miles of road and 25, 215 lane miles of roadway. The Iowa DOT continuously seeks ways to improve winter operations and provide information to the traveling public. A current effort involves the Iowa DOT deploying the Plow Cam Project—a statewide real-time integration system. The project, started in winter 2013–2014, involves collecting up-to-date photos that create a database of road conditions.[1]

To gather this information, the Iowa DOT used its existing communications infrastructure and the snowplows deployed on a regular basis in the winter. The process also required an iPhone (with camera and GPS), an Iowa DOT-developed app, phone charger, cigarette lighter socket and fuse, and a suction cup phone mount. The iPhone is mounted inside the front windshield of the snowplow; once activated, it automatically takes photos and accumulates data.[2]

The information collected from the snowplow cameras is available for internal and public use. The public accesses the information through its *Track A Plow* Web site, which provides snowplow locations, as well as up-to-date Plow Cam photos.[2]

KEY ACCOMPLISHMENT

The project's accomplishments are the following:

- Combines the Plow Cams and the Track A Plow Web site to show garage supervisors real-time road conditions and helps them manage their resources.

- Provides real-time information on road conditions to assist the public in making safe, informed travel choices when weather is bad.

- Helps control cost while eliminating the need for laborious record keeping.[2]

TARGET AUDIENCE

Highway safety professionals, transportation planners, and transportation engineers can use the Plow Cams and Track A Plow technology through the Internet. While Iowa is currently the only program user, three States (Ohio, Idaho, and Missouri) have been able to imitate it. The Iowa DOT encourages its use and will provide the base framework of the program at no cost to any government entity that might want it. Once obtained, the program is fairly intuitive and self-explanatory.[1] The results from the program, including pictures and data collected, are available both internally and to the general public.[2]

PROGRAM AND PROCESSES

THE IOWA DOT SNOWPLOW COORDINATION PROJECT

The Iowa DOT has equipped 435 of its 900 snow-removal trucks with Plow Cams.[2] The iPhone is mounted on the windshield; the app is set up on the phone and drivers must simply activate the phone when they start the trucks.[3] The DOT developed an app specifically for this purpose. To avoid processing photos when a truck is parked, the DOT uses the app to track where a truck is and verifies that it is on a road. The truck must also be traveling at least 8 mph for the app to process the photo. Once it verifies that it should be collecting data, it can be set up to take photos every 5–10 minutes. Garage supervisors can determine what timing increment they think will be most effective.[1]

The photos are automatically uploaded to the Internet where they are available to the Iowa DOT as well as the public through the Track A Plow Web site, which is located on the Iowa DOT page.[2] The Web site advises users about which roads are safest to travel and when might be the best time to travel. Figure 1 shows an example of what users see. The image presents the current state of the roads, current temperature, where snowplows are at the moment, and if they are applying deicing material to the roadway. One extra click on the Web site information shows photos taken from the snowplows and special weather statements (see Figure 2).[2, 3]
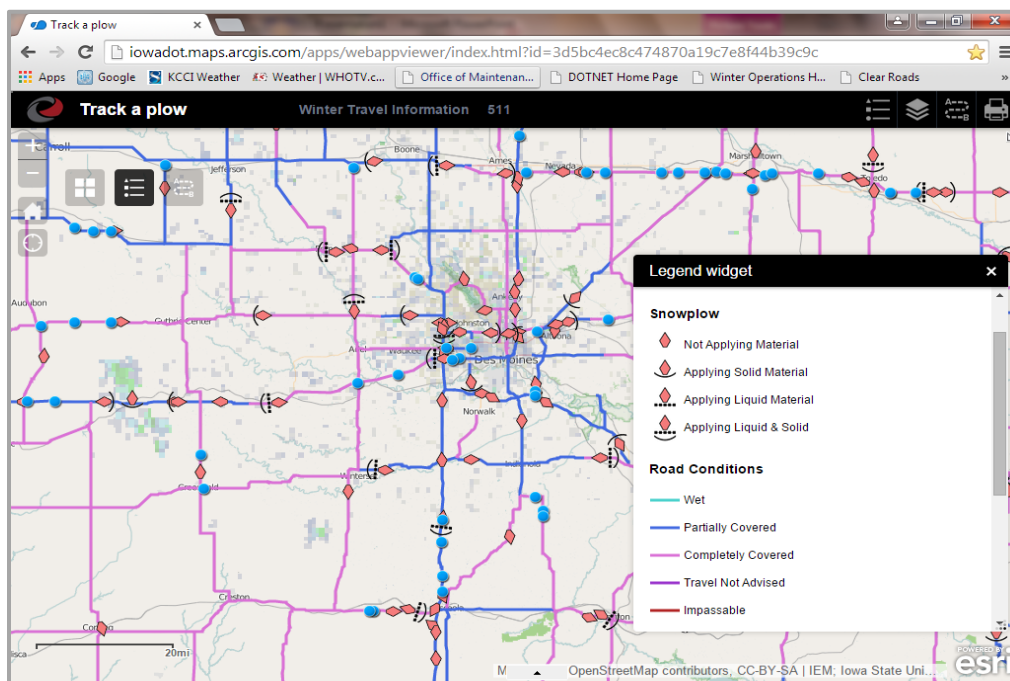

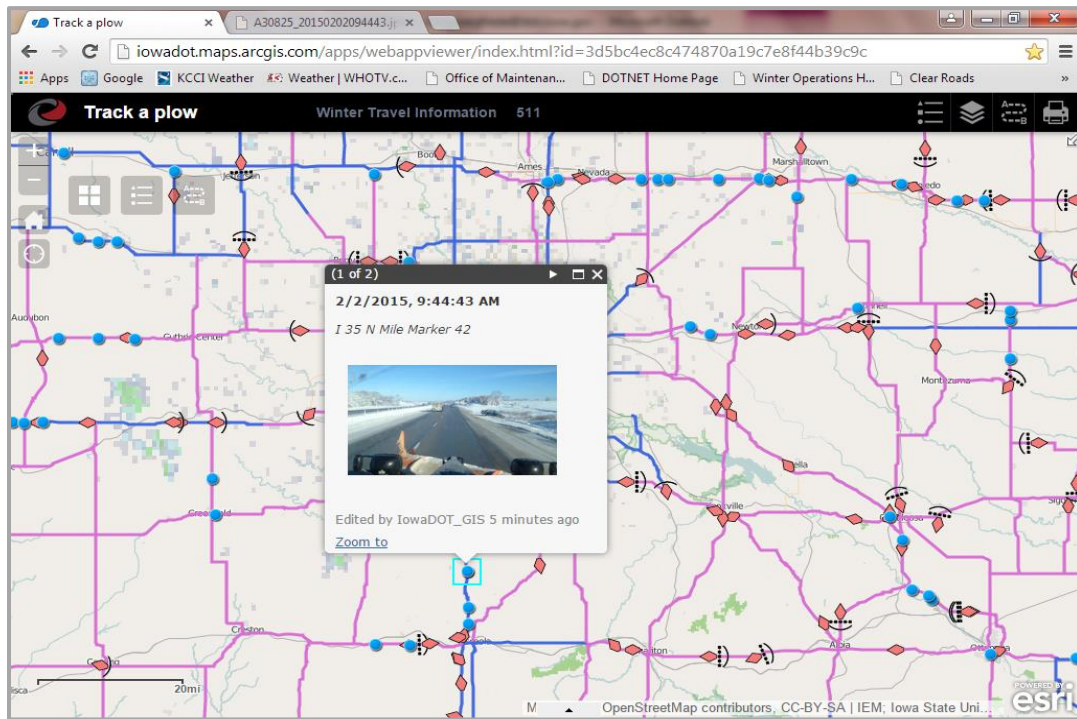**Figure 1: Screenshot of the Track a Plow Web Site**

Figure 2: Track A Plow Web site Snowplow Photo

SUMMARY

BENEFITS/RESULTS

Using real-time integration in the Plow Cams and Track a Plow projects benefits government entities, garage supervisors, snowplow operators, and the general public. It allows the DOT to share valuable, timely information, in the form of both data and photos.[2] In addition, because the roadway information is available to drivers, DOTs and other government agencies hope to see a reduction in crash rates during inclement weather. The snowplow cams and associated Web site involve minimal work to set up and the process of collecting data is relatively self-sufficient as it requires limited control from the snowplow operators.[1]

IMPLEMENTATION CHALLENGES

Agencies must account for several factors when choosing the equipment, specifically the quality of photo it can take, availability of hardware, availability of software/application, functionality and simplicity, connectivity and data transfer, and cost.[4] Although the app is currently only for iPhones, the Iowa DOT believes it could probably be easily transferred to other phones.[1]

FUNDING/COST

The Track A Plow program cost about $75,000 to launch[1] and included the cost of the initial hardware, wiring, power cords, and labor. The cost also included the nominal cost to develop the app and the Web site, which was created internally by the Information Technology Division of the Office of Maintenance.[5] Iowa DOT obtained the phones at no cost from Verizon. The only charge was a $35/month data fee for the Iowa DOT. This data cost covers all phones.[1]

With this framework already set up, cost for future endeavors will likely be lower. The Iowa DOT will provide the base framework at no cost to any government entity wanting to replicate this program. The base framework includes the app and website template. No training or instruction is needed; setting up the program is a quick, self-explanatory process.[1]

TIME FRAME

The DOT began to develop this program in August 2013, and implemented it during winter 2013–2014. It would be a quick process for any State that might wish to use it in the future.[1]

LESSONS LEARNED

- Real-time information can be integrated into various projects with multiple uses.[4]

- There is a public need for information regarding road conditions in winter.[5]

- Although this program could be modified and used to monitor driving conditions (when it is raining, for example) in non-winter months, there is no demand for it.[1]

- Despite initial costs and getting everything completely set up, users will pay a nominal fee each month for data plans.[1]

REFERENCES

1) Bargfrede, C. Iowa Department of Transportation. Phone interview, September 3, 2015.

2) Iowa Department of Transportation. Plow Cam Project and Track A Plow Website, PowerPoint presentation, 2015.

3) McCart, M. Snowplow Tracking, PowerPoint presentation, GIS-T 2015 Workshop, Des Moines, Iowa, Iowa Department of Transportation, 2015.

4) Burkheimer, D. "Iowa's Winter Maintenance Technologies Research," *Research News*, Federal Highway Administration, Bureau of Research and Technology, 2009.

5) Iowa Department of Transportation. Do You See What I See? Iowa DOT's Track A Plow Website A Hit With Travelers, Iowa DOT Web site, http://www.transportationmatters.iowadot.gov/2015/01/do-you-see-what-i-see-iowa-dots-track-a-plow-website-a-hit-with-travelers.html, Accessed September 1, 2015.

EXPLANATION OF TERMS

DOT   –   Department of Transportation

GIS   –   Geographic Information System

GPS   –   Global Positioning System

AGENCY CONTACT INFORMATION

Craig Bargfrede
Winter Operations Administrator, Iowa DOT
Craig.Bargfrede@dot.iowa.gov
(515) 239-1355

Jan Laaser-Webb
Transportation Safety Supervisor, Iowa DOT
Jan.Laaser-Webb@dot.iowa.gov
(515) 239-1349