



# DIGITAL TRANSFORMATION OF MATERIALS MANAGEMENT

A Guide for DOTs







# INTRODUCTION

Materials management is a vital part of building and maintaining our nation's infrastructure. This crucial process ensures that our roads are safe for all travelers and those that live near highways. As 2020 will be the fifth and final year of the Fixing America's Surface Transportation Act (FAST), the president requested \$47.4 billion for the federal-aid highway program. Greater efficiencies in materials management will allow that investment to provide even greater returns on improving the safety and mobility of our national transportation network.

Whenever a roadway is paved, a bridge built, or an underpass reconstructed, materials engineering labs need to collect numerous samples and test them so that quality and safety standards are

maintained. Throughout all phases of a project's development, inspectors and field and lab technicians diligently check construction materials to verify that they meet the state standards. Their efforts ensure that road materials are safe, sustainable, and efficient.

Some departments of transportation (DOTs) still rely on older, paper-based systems for collecting and testing samples. The lack of communication between the field and office is problematic and causes inefficient workflows and delays. Field staff often don't have access to all the information they need. Consequently, materials management takes longer than it should.

# MANAGE THE WORKFLOW

The Esri Materials Management solution fast-tracks sample collection and lab process workflows and improves communication between the office, lab, and field. With it, materials managers can

- Create a work order system that makes sampling, testing, and reporting more efficient.
- Instantly share data between the field, lab, and office.
- Uphold compliance with regulations, standards, and project specifications with built-in calculations.
- Digitize, automate, and standardize materials management workflows while promoting transparency.
- Provide mobile tools for field personnel.

“In the first year that we had our ArcGIS Online based portal stood up, I can quantify that it was approximately a million dollars in savings in that first year.”

– Jeremy Planteen,  
GIS Manager, Oklahoma  
Department of Transportation



# AN END TO END TOOL FOR DOTs

From senior management to field staff, the entire team will be empowered with an end-to-end solution that promotes transparency and efficiency.

## ESRI MATERIALS MANAGEMENT SOLUTION

### 01 ASSIGN COLLECTION

Project manager assigns sample collection task to field team who is notified on their mobile app

### 05 TEST AND REPORT

Lab technician conducts sample test, records results. Automatic notifications of pass or fail results.

### 02 NAVIGATE TO SITE

Field team uses Esri navigation find the shortest routes to all their sample sites

### 04 ASSIGN LAB TEST

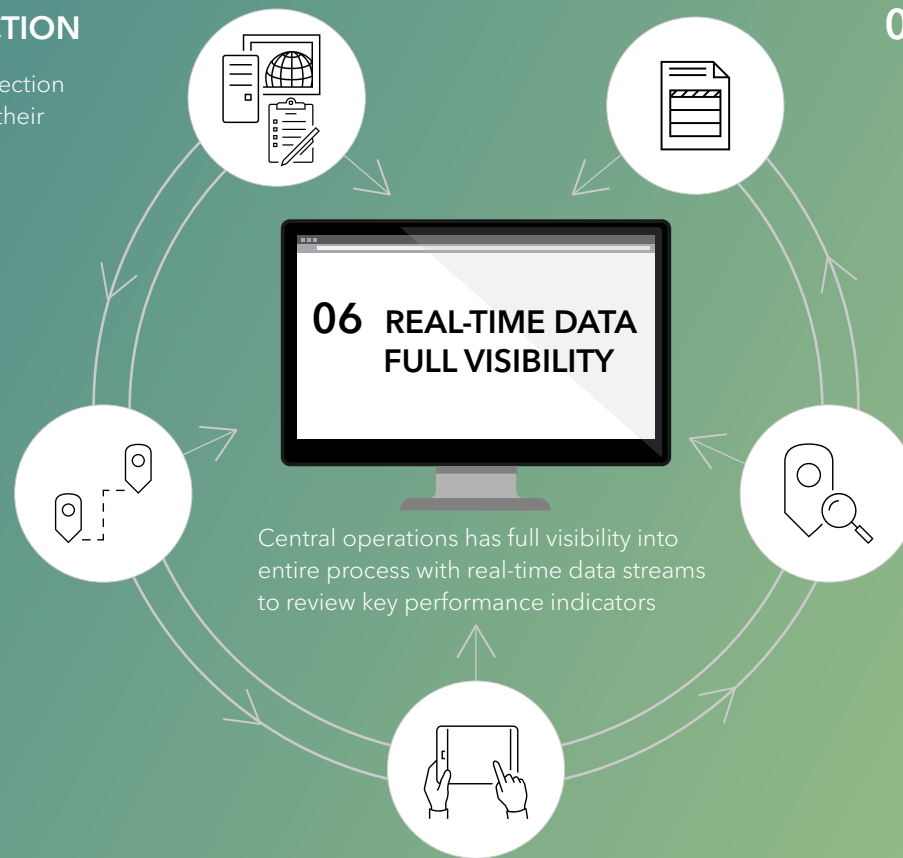
Lab technician is assigned test of sample

### 06 REAL-TIME DATA FULL VISIBILITY

Central operations has full visibility into entire process with real-time data streams to review key performance indicators

### 03 COLLECT

Field team collects sample and Inputs sample data into app

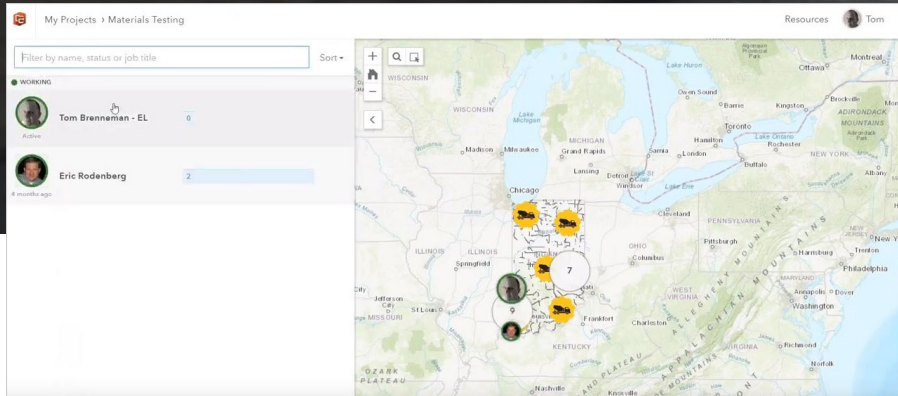




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## ASSIGNING SAMPLE COLLECTION

Communicating with office staff, field staff, and the management team isn't always easy. The solution begins when a manager uses an assignment tool to initiate a work order and instantly sends it to the field technician. The manager can add the time and date the sample is due or any additional, useful information on the work order request.

Field personnel receive notification of the order on their mobile device, which is also empowered with location tracking. Knowing where workers are in the field empowers dispatchers to monitor progress and make key deployment decisions. Using a customized dispatch map in ArcGIS Online, the materials office manager sees each field tech's GPS location in real time.



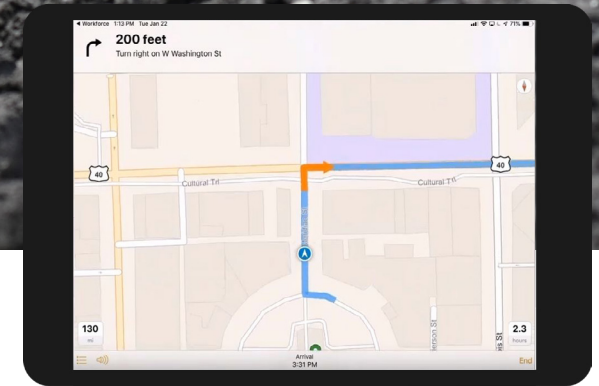
The manager is able to monitor all work in progress from a central dashboard.





## GETTING TO THE SITE

The tech collecting samples in the field uses the Workforce for ArcGIS app and sees the new assignment added to the app's work list, which includes other ticket assignments. To best schedule the day, the tech can sort the work list by distance, priority, or due date. Next, the tech selects the task and accepts it. Immediately, the app sends the status update back to the office dispatch map. The work order shows the assignment location and any additional sample information such as, "This is a number 43 sample type." Knowing this before heading to the field, the tech can grab the appropriate tools for the job.



The Workforce app seamlessly opens a navigation app that generates a route based on the tech's sorted work list. Intelligent navigation helps fieldworkers complete their tasks faster. Less time on the road ultimately leads to more samples tested.

Navigator for ArcGIS provides a full routing system using data from Esri, which DOTs can augment with their own data. This adds agency specificity that Google Maps lacks. What's more, the navigation app can be used and modified completely offline, keeping field teams on task even when the conditions are remote.





## COLLECT SAMPLE DATA IN THE FIELD

Once at the site, the tech uses Survey123 for ArcGIS to collect sample-specific information. These digital forms can include the same questions that were on the previous paper forms. But now, field data can be immediately used by the home office without any data entry of information on paper forms.

Using Survey123, the technician captures required field data quicker and more accurately. They can also easily add photos, notes, and auto-fill answers and include a signature to accompany the sample. Metadata, such as location and time, are automatically attached to the sample. A key feature many DOTs deploy is the ability to associate a QR Code with each sample that links it to its digital record.



Field Sample Collection

SFN 9987  
(Rev. 7.2018)

Sample Collection Date/Time  
January 22, 2019 1:14 PM

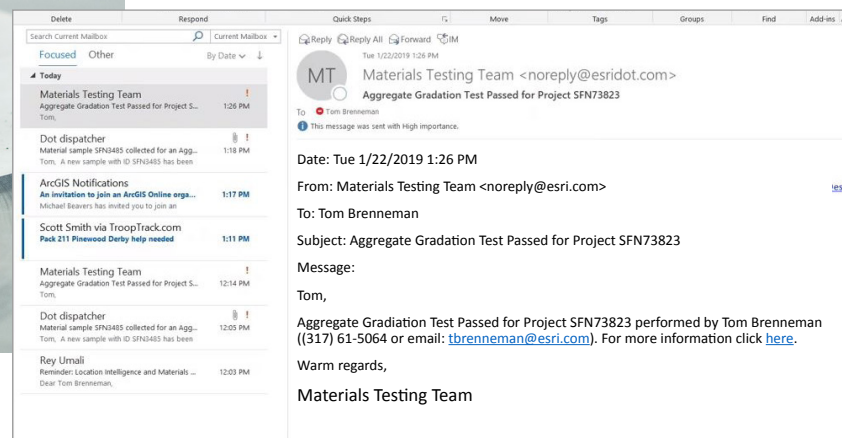
**Technician Personnel Information:**  
► This is the information about the technician who performed the sample collection and test and is captured from the logged in user.

**Sample Information:**  
► Only one location per Field Sheet. Sample location and weather conditions at the time of field testing.

Collected by:

Distribution:

Date and Time Shipped:  
Date Time

## SEAMLESS INTEGRATION OF ONLINE, FIELD, AND LAB DATA

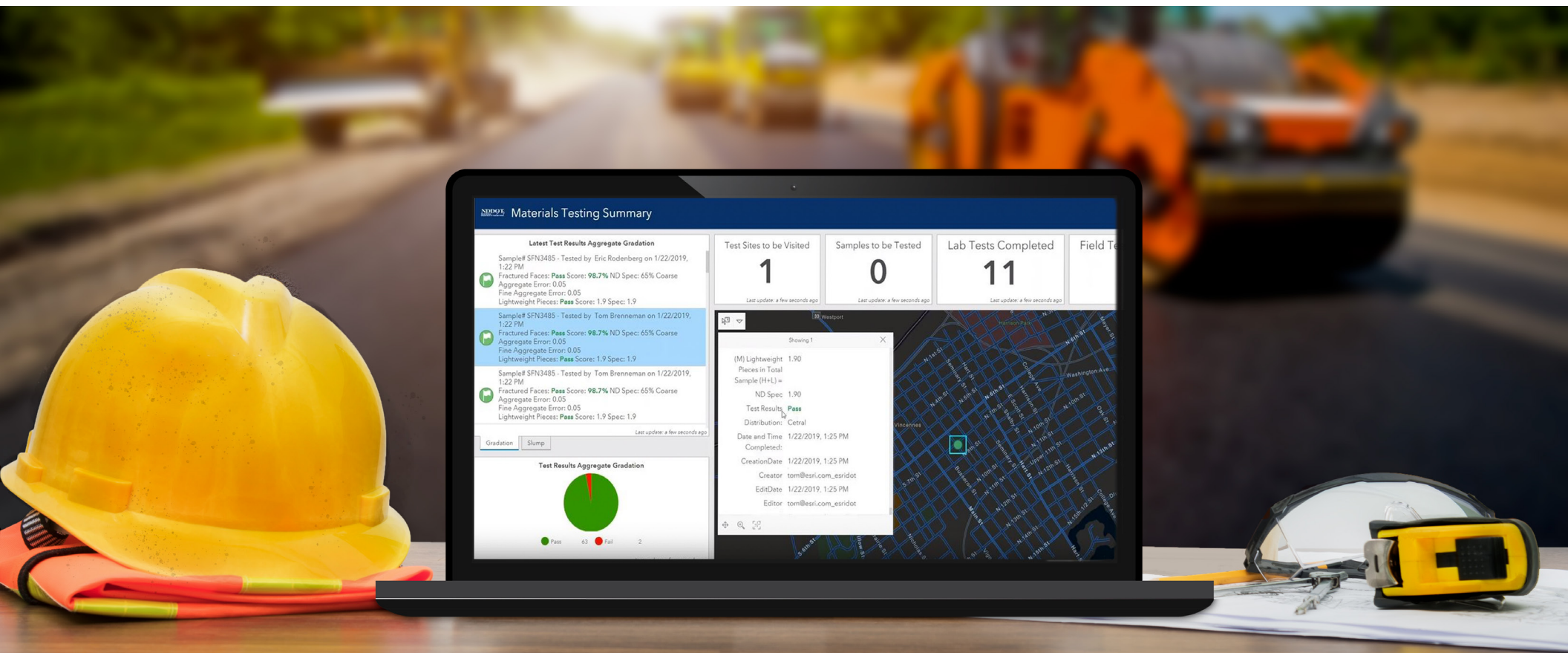
Once the sample arrives at the lab, lab testing can be assigned in a similar way that field tests are assigned. Once assigned, the lab tech scans the sample's QR Code and the field notes are instantly visible. When the test is completed, the digital lab report is attached to the sample's record and streams it to the ArcGIS Online database. Every step of the workflow

is connected and trackable from a central dashboard. All information can then be easily accessed and shared with project managers.

A winning feature of using Survey123 to record lab test data is the ability to build calculated ranges into the survey, which will automatically denote whether the test passed or failed.

After the test is completed and data captured, an email is automatically sent to the project manager, notifying that the test was conducted and providing the result.





## A CENTRAL DASHBOARD

Using information in strategic ways makes a difference in how DOTs operate. Operations Dashboard for ArcGIS shows test results and project progress on a dashboard of charts and graphs. Supervisors and managers can now see the overall health of their project in relation to their materials management processes. There is full visibility into which tasks have been completed and at what time, along with the final test results.

Each dashboard can be configured to show the information most needed by the stakeholder using it. Such key performance indicators may include what percentage of tests are passing, how tests are performing by supplier, how many sites have yet to be visited, and which kinds of tests are being performed.



Esri Materials Management solution is a robust system of record that manages authoritative data and provides transparency. GIS empowers more efficient materials management operations by

- Digitizing, automating, and standardizing materials management workflows while promoting transparency.
- Increasing field productivity and accountability.
- Automatically reporting work order status to supervisors and managers.
- Summarizing performance to managers and board members on a customizable dashboard with livestream data.
- Upholding compliance with regulations, standards, and project specifications with built-in calculations.
- Promoting a timeliness of projects that translates into reduced fines and keeping projects within budget.





## TOM BRENNEMAN

Executive Solution Engineer,  
Transportation Team, Esri

Tom has worked at Esri since 1996 as Instructor, Product Manager, Senior Consultant, and Solution Engineer. Tom currently leads the solution engineers for the transportation team whose sole purpose is to meet tomorrow's transportation needs with Esri technology and know-how.



## TERRY BILLS

Global Transportation  
Industry Director at ESRI

He is responsible for all transportation segments worldwide. He has over 25 years experience in transportation planning and policy, information technology and GIS.

Mr. Bills has been a Principal Planner for a large regional transportation planning agency, as well as the President of a GIS and transportation consulting firm during his career. He was a Doctoral Candidate at UCLA, where he was also awarded two Masters' degrees.

# Learn More

Esri solutions are used by 90 of the Fortune 100 companies, all 50 state governments, more than half of all counties (large and small), and 87 of the Forbes top 100 colleges in the US, as well as all 15 executive departments of the US government and dozens of independent agencies.

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