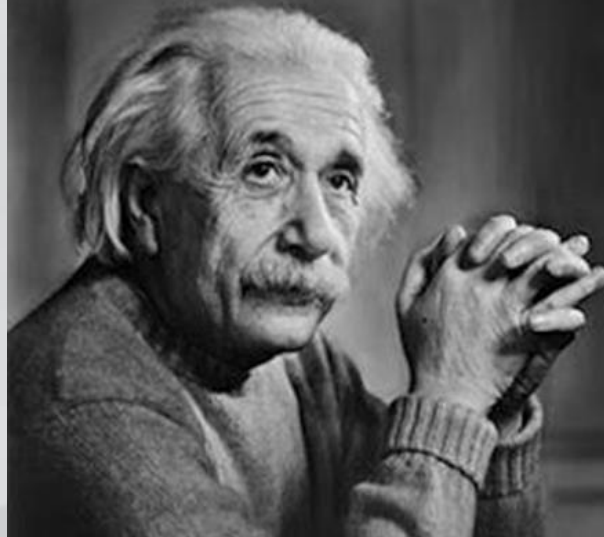


If you can't explain it **simply**, you
don't understand it well enough.

– Albert Einstein



Or you might be an engineer





Office of Construction and Materials Updates

ACEC Conference | August 2017

Wes Musgrove, PE

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Presentation Topics

- ❑ Drivers and advantages of e-construction
- ❑ Legislative authority for e-business
- ❑ Digital vs. electronic signatures
- ❑ Use of GIS to streamline and enhance data
- ❑ E-ticketing for PCC, HMA, Aggregates



Staffing and Program Dynamics

3,100 FTEs

\$3.5B

Program +30%

45% Difference!

Positions -15%

\$2.7B

2,632 FTEs

2011

2016





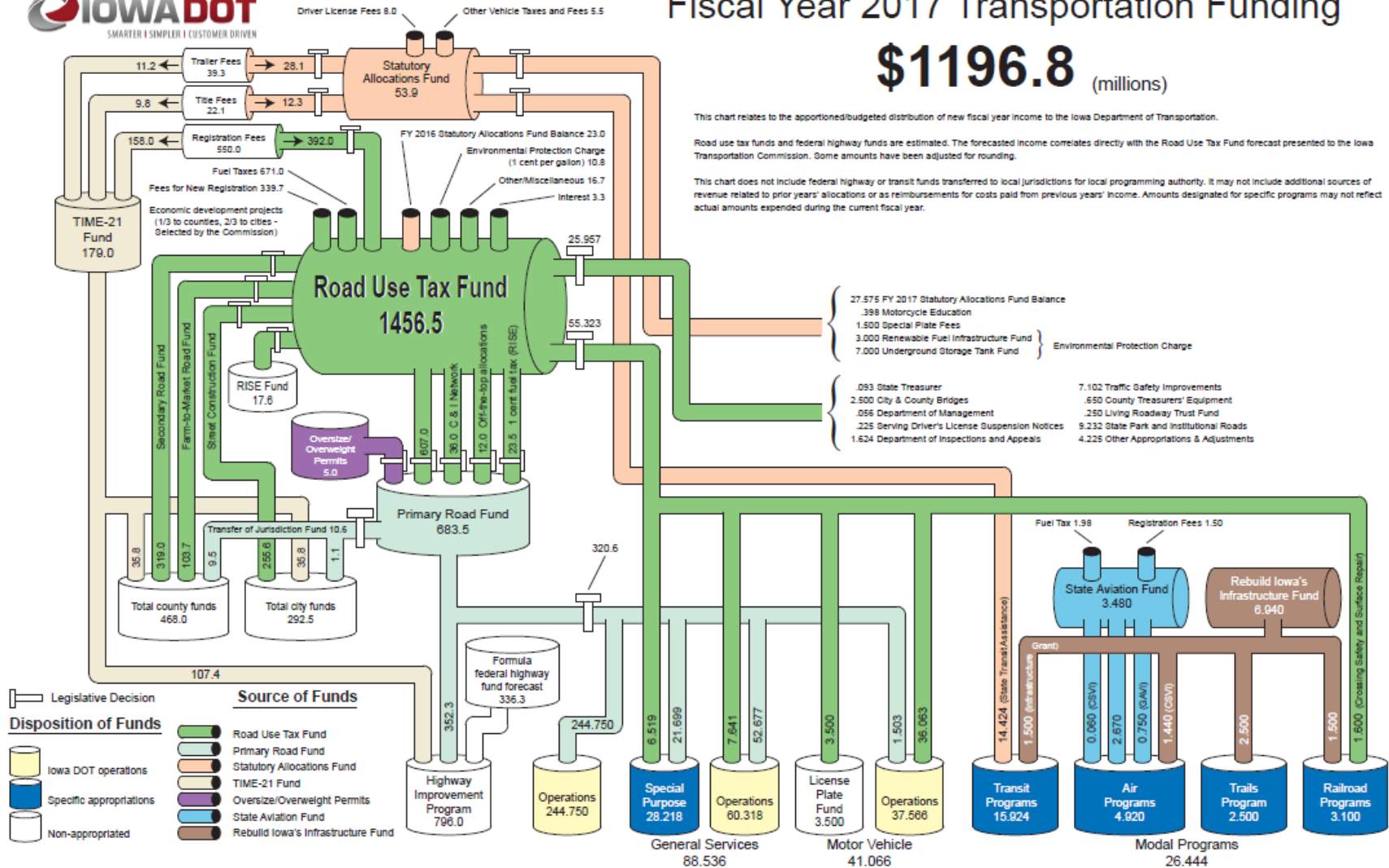
Fiscal Year 2017 Transportation Funding

\$1196.8 (millions)

This chart relates to the apportioned/budgeted distribution of new fiscal year income to the Iowa Department of Transportation.

Road use tax funds and federal highway funds are estimated. The forecasted income correlates directly with the Road Use Tax Fund forecast presented to the Iowa Transportation Commission. Some amounts have been adjusted for rounding.

This chart does not include federal highway or transit funds transferred to local jurisdictions for local programming authority. It may not include additional sources of revenue related to prior years' allocations or as reimbursements for costs paid from previous years' income. Amounts designated for specific programs may not reflect actual amounts expended during the current fiscal year.



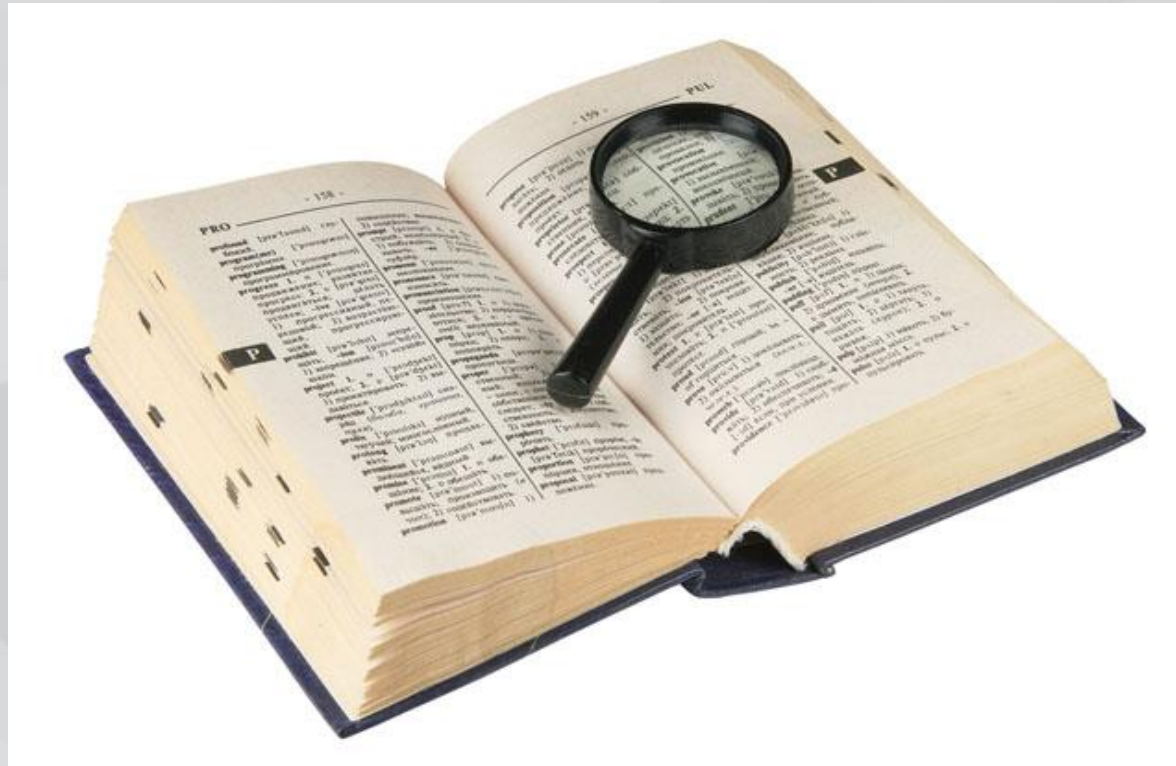
Why e-construction?

- Limited resources
- Availability and acceptance of new technology
- Better manage an increasing workload
- Cost effective, efficient, streamlined processes
- Increased transparency and accountability
- Enhanced customer service
- Safer construction environment
- Existing Legislative authority



Legislative Authority

- ❑ Iowa Code Chapter 554D “*Uniform Electronic Transactions Act*” (2000, 2004, 2005)



Chapter 554D Definitions

- ❑ Defines an “**automated transaction**” as one conducted or performed, in whole or in part, by *electronic* means or *electronic* records
- ❑ Further defines “**electronic**” as relating to technology having electrical, digital, magnetic, wireless, optical, electromagnetic, or similar capabilities



Chapter 554D Definitions

- ❑ Defines “**Governmental agency**” as an executive, legislative, or judicial agency, **department**, board, commission, authority, institution, or instrumentality of the federal government or of a state or of a **county**, **municipality**, or other political subdivision of a state.



Chapter 554D Provisions

- ❑ A record or signature shall not be denied legal effect or enforceability solely because it is in *electronic* form
- ❑ A contract shall not be denied legal effect or enforceability solely because an *electronic* record was used in its formation
- ❑ If a law requires a record to be in writing, an *electronic* record satisfies the law
- ❑ If a law requires a signature, an *electronic* signature satisfies the law.



Chapter 554D Provisions

- ❑ Legal recognition of electronic signatures, contracts, and records



Electronic vs. Digital Signatures

Electronic

- Numerous types, less secure
- Can be created anonymously
- Can be copied, or used w/o authorization
- Examples include handwritten stylus signature on mobile device, pdf, Adobe



Electronic vs. Digital Signatures

Digital

- Mathematical algorithm
- Requires verification of identity (**authentication**)
- User ID and password protected (**security**)
- Cannot be tampered with or altered (**integrity**)
- Signer cannot later deny (**non-repudiation**)



E-construction: where are we?



99%
Paperless!

□ 100% by 2019



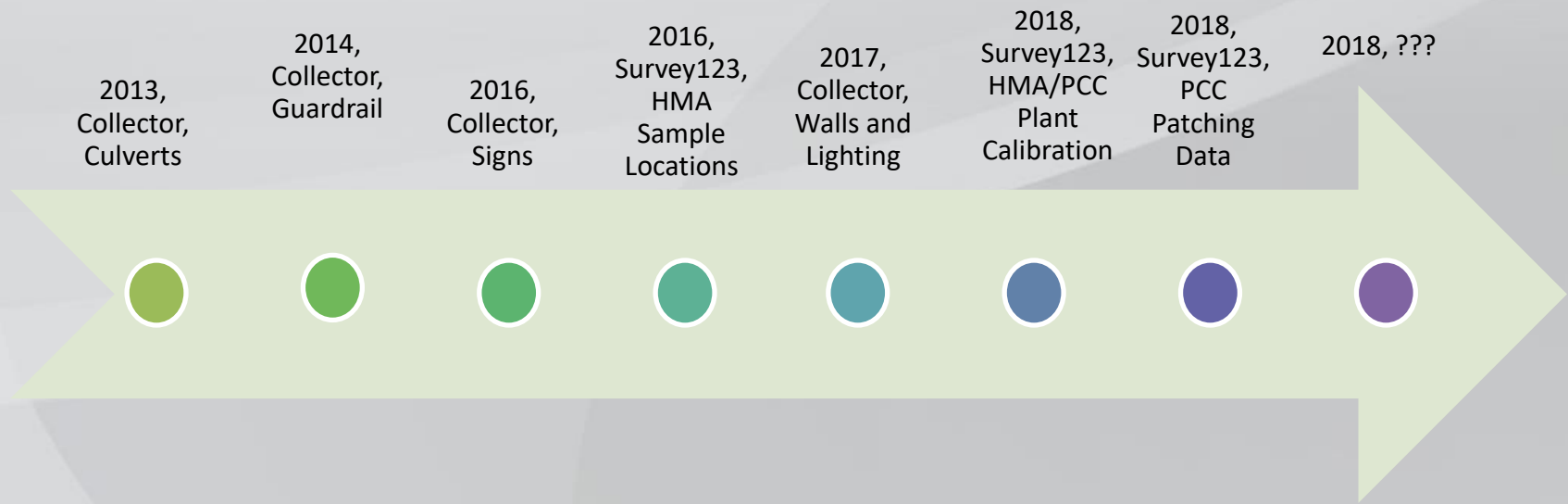
ESRI and ArcGIS

- ❑ ESRI is a company that produces most of the GIS products that we use.

“ArcGIS combines mapping and analytics to reveal deeper insight into data. ArcGIS provides contextual tools for mapping and spatial reasoning so you can explore data and share location-based insights.” -Esri



GIS App and Data Collection Timeline



Advantages

- Minimizes Human Error
- Contributes to Our Paperless Goal (Including As-Builts)
- More Consistent Workflows, Processes, and Document Submittals Between Contractors, Consultants, and the DOT
- Smarter Surveys = Time Efficiency
- Increased Transparency

Disadvantages

- Must Use a Mobile Device
- Training on Current Workflows and Processes
- Current Practices Need to be Reevaluated/Updated
- Cellular Data/Internet

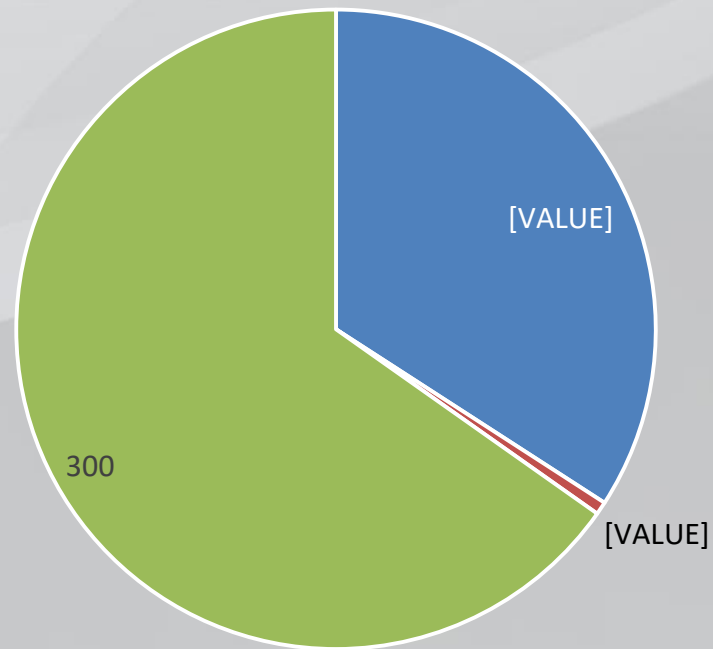


Current GIS App Usage

Current Construction/Maintenance GIS App User Breakdown

6 Districts
14 Resident Construction Engineer offices
157 full time inspectors
150 cross trained inspectors
320 iPads in Construction
3 consultants

102 maintenance garages
300 users in the office of Maintenance



■ Full Time Inspectors ■ Consultants ■ Maintenance Users



Apps We Utilize

Survey123 (Data Collection)

- Material Sample Submittals to District Materials Offices
- Hot Mix Asphalt Sample
- Soil Boring Locations
- Submitting Design Information

HMA Field Sample Locations

Location on Mat *

Mainline NB Mainline SB Mainline EB Mainline WB Shoulder

Detour Pavement Other*

Sample information

Date & Time Sampled *
8/16/17 7:33 PM

Sampled By: *

Sampler Email: *

Station Location *
No decimals, ie 251+00

Sample Type: *

HMA Loose Mix
 HMA Cores

Additional Comments

Additional Comments:

Sample Location *

42°11'N 93°39'W ± 65 m

Identification of Sample Test

Sampler Information

Date & Time Sampled *
8/16/17 7:33 PM

Sampled By: *

Sampler Email *

Sender's Sample #: *

Project Information

Project #: *

County: *

Contract ID #:

Contractor:

Contractor Address:

Sample Information

Material: *

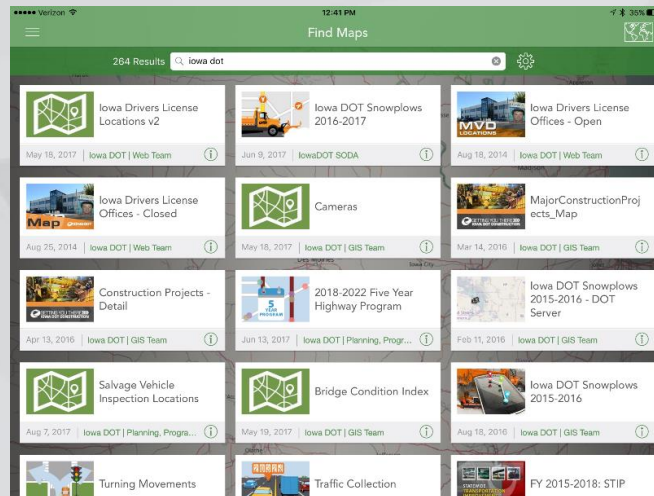
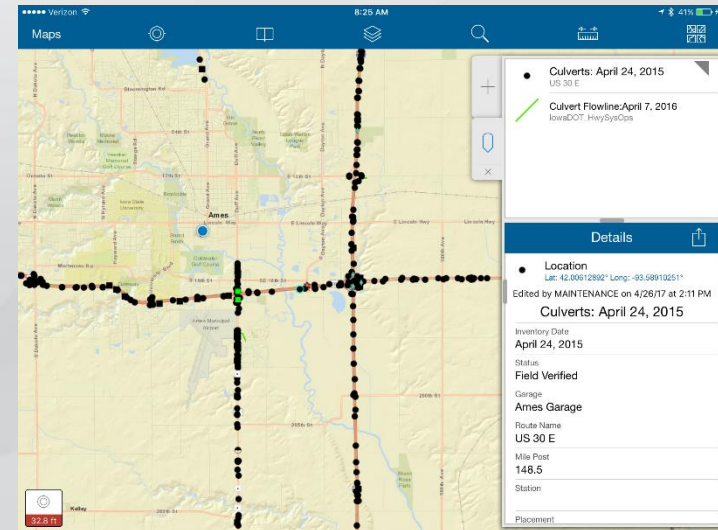
Intended Use: *



Apps Cont'd

Collector (Data Collection and Inventory)

- Guardrails
- Culverts
- Lighting
- Signing



Explorer (Viewer Only)

- Access Different Maps from ArcGIS Online
- Over 200 Maps Shared by Multiple Offices



Scope of Services Updated

Revision Date 5/12/2017

Material Sampling and Testing

- | | |
|--|---|
| <input type="checkbox"/> Air, slump & beams | <input type="checkbox"/> Sampling and testing per Materials IM 204 |
| <input type="checkbox"/> Witness cutting, collect and deliver PCC cores to field lab for testing | <input type="checkbox"/> Layout HMA core locations, witness cutting, collect and deliver to field lab for testing |
| <input type="checkbox"/> Soil density and moisture content | <input type="checkbox"/> Nuclear gauge testing |
| <input type="checkbox"/> Collect HMA samples | <input type="checkbox"/> Record HMA field sample locations using a tablet/smartphone with ArcGIS apps |

Inspection Requirements

- | | |
|---|---|
| <input type="checkbox"/> HMA plant monitoring | <input type="checkbox"/> Force account work |
| <input type="checkbox"/> PCC plant monitoring | <input type="checkbox"/> Traffic safety inspections |
| <input type="checkbox"/> Inspection of work | <input type="checkbox"/> Storm water site inspections |
| <input type="checkbox"/> Use of Fieldbook program | <input type="checkbox"/> Confirm certified welders |
| <input type="checkbox"/> Daily diary | <input type="checkbox"/> Confirm trained flaggers |
| <input type="checkbox"/> Working days | <input type="checkbox"/> Confirm traffic control technician |
| <input type="checkbox"/> Measurement and payment | <input type="checkbox"/> Wage rate interviews |
| <input type="checkbox"/> Punch list | <input type="checkbox"/> Update field assets using a tablet/smartphone with ArcGIS apps |
| <input type="checkbox"/> Unacceptable work - noncompliance notices | |
| <input type="checkbox"/> Review contractor bulletin boards – EEO Project Site Inspection/Wage Rate Report | |
| <input type="checkbox"/> Evaluation of pavement and bridge deck smoothness | |

Submittals



What We Use Our Data For



- Inventory of Current Assets
- Historical Data for Informational Purposes
- Data Analytics
- Construction Progress
- Project Documentation



GIS Resources: Data & More

[REST Services](#)

The screenshot shows the ArcGIS REST Services Directory interface. At the top, there is a search bar and navigation links for 'Home > Services' and 'Help | API Reference'. Below this, the 'Folder: /' is indicated, along with 'Current Versions: 10.41' and 'View Footprints In: ArcGIS Online map viewer'. A 'Folders:' section lists various categories such as Aviation, Basemap, Boundaries, Bridges/Structures, Cadastre, Construction, CSB, Environmental, Exeision, Facilities, Imagery, LRS, Maintenance, Pavement Management, Program Management, Project Scheduling, Rail, RAMS, Right of Way, Survey, Systems Planning, Topography, Traffic, Traffic Safety, Transit, Utilities, and Winter Operations. A 'Services:' section at the bottom shows 'None'.

[Iowa DOT's GIS Training Portal](#)

The screenshot displays the Iowa DOT's GIS Training Portal. The header features the text 'GIS Training Portal' and 'Iowa Department of Transportation' over a background image of a highway interchange. A central graphic shows a white graduation cap above a globe. The main text reads: 'Welcome to the GIS Training Portal. The Iowa Department of Transportation maintains a wide array of geographic information system, or GIS, services and tools to collect, manage, leverage, and implement geospatial data. In addition to supporting the data and services we offer, The Office of Organizational Improvement also creates training guides, videos, and documents that cover everything from the fundamentals to advanced skills. This GIS Training Portal was created in an effort to provide a centralized location for all types of geospatial learning.' A search bar at the bottom is labeled 'Search for training...'

[Iowa DOT's GIS Homepage](#)

The screenshot shows the Iowa DOT's GIS Homepage. The top navigation bar includes links for 'HOME', 'ONLINE SERVICES', 'TRAVEL', 'DRIVERS / VEHICLES', 'BUSINESS', 'FORMS', and 'ABOUT'. The main content area is titled 'GEOSPATIAL TECHNOLOGIES' and features a 'GIS UPDATE' section with a link to 'Check out our newly updated Open Data site'. Below this is a 'GEOSPATIAL DATA NEWS' section with a link to 'Iowa DOT's REST Services Upgraded to 10.4.1'. A 'REST SERVICES' sidebar lists links for 'Iowa DOT REST Director' and 'DNR REST Directory'. Another sidebar titled 'GIS RESOURCES' lists links for 'Iowa DOT Interactive Web Portal', 'Iowa DOT Open Data Portal', 'Iowa Geospatial Map Server', and 'Iowa Open Data'. The footer contains social media icons and contact information.

Coming Soon: Construction Portal



E-ticketing pilot projects...

HMA

PCC

Aggregates



Questions



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