

# PRESENTING

## A SUCCESS STORY OF STAKEHOLDER ENGAGEMENT & DATA UNIFICATION FOR TRANSPORTATION ASSET MANAGEMENT

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# ROADMAP

Today we will cover...

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# INTRODUCTIONS

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# TRB POSTER

## A SUCCESS STORY STAKEHOLDER ENGAGEMENT AND DATA UNIFICATION FOR TRANSPORTATION ASSET MANAGEMENT

### INTRODUCTION

TRANSPORTATION ASSET MANAGEMENT IS A HIGHLY COMPLEX ENDEAVOR AFFECTING MANY STAKEHOLDERS ACROSS THE LIFE CYCLE OF HIGHWAY AND CITY INFRASTRUCTURE FEATURES MAINTAINED BY FEDERAL, STATE, AND LOCAL AGENCIES. THE USE OF CENTRALIZED DATA TO ASSIST AGENCIES TASKED WITH THIS MANAGEMENT IS BECOMING COMMON PRACTICE AS GEOGRAPHICAL INFORMATION SYSTEMS (GIS) ALLOW FOR BETTER DATA INTEGRATION. THE IOWA DEPARTMENT OF TRANSPORTATION HAS BEEN A GREAT EXAMPLE OF FOSTERING A CULTURE OF DATA SHARING AND BUREAU COLLABORATION WHILE DEVELOPING A ROBUST ROADWAY ASSET MANAGEMENT SYSTEM (RAMS) TO HOUSE ALL ASSET INVENTORY INFORMATION WHICH SUPPORTS THE MANY BUREAUS OF THE DEPARTMENT. THIS WORK DETAILS SOME ASPECTS OF THE SUCCESSFUL PRACTICES FOUND IN TRANSPORTATION ASSET MANAGEMENT FROM THE PERSPECTIVES OF THE DOT, AN INDUSTRY LEADER, AND AN EDUCATIONAL INSTITUTE FOR ENGAGING AND COLLABORATING WITH THE STAKEHOLDERS INVOLVED IN ASSET MANAGEMENT. SUCCESSFUL SOLUTIONS REALIZED IN THIS PAPER INCLUDE:



### PROJECT HIGHLIGHTS

#### A CULTURE OF SHARING: THE GROUNDWORK FOR SUCCESS

BY THE ACCOUNTS OF NUMEROUS LONG-TIME EMPLOYEES AT THE IOWA DEPARTMENT OF TRANSPORTATION, THE AGENCY IS FOUND TO THRIVE WITH A CULTURE OF COLLABORATION AND DATA SHARING FROM BUREAU TO BUREAU. COMMUNICATION IS HIGHLY VALUED IN THE DOT AND THE MENTALITY OF ALWAYS ASKING "WHO ELSE COULD USE THIS DATA?" (1) HAS BEEN INGRAINED IN THE CULTURE OF THE ORGANIZATION. THIS WORK WOULD BE INCOMPLETE WITHOUT RECOGNIZING THAT REPLICATION OF AN ENTIRE OFFICE CULTURE IS FAR MORE EXTENSIVE THAN A SINGLE PAPER CAN INCORPORATE, AND YET, IT IS THE ATTITUDE TOWARDS COLLABORATION THAT IS AN IMPORTANT ASPECT FOR ANY SUCCESSFUL COORDINATION WITH STAKEHOLDER INVOLVEMENT.

#### AN EXAMPLE: STATEWIDE ASSET EXTRACTION - THE STAKEHOLDERS

THE IOWA DEPARTMENT OF TRANSPORTATION IS STRUCTURED SIMILARLY TO OTHER STATE AGENCIES IN THAT EACH FOCUS OF TRAFFIC CONTROL AND INFRASTRUCTURE DEVELOPMENT AND MAINTENANCE ARE CLUSTERED TOGETHER WITH SPECIALISTS OF EACH FIELD DIVISION, COMMONLY LABELED A "BUREAU" WITHIN THE DOT. THE SEPARATE BUREAUS CONCENTRATE ON THEIR UNIQUE CHALLENGES, EACH WITH THEIR OWN INVENTORY PROCESSES AND PLANNING METHODOLOGIES, BUT SEVERAL BUREAUS ARE SUPPORTED BY THE DATA FROM A UNIFYING SECTION, THE ANALYTICS BUREAU. MANY DIVISIONS' DATA FLOWS THROUGH THE ANALYTICS BUREAU CREATING A CENTRAL LINE OF DATA FOR WHICH THE BUREAU IS TASKED WITH MANAGING. LEVERAGING THEIR FAMILIARITY WITH THE NUMEROUS OTHER BUREAUS' NEEDS, THE PERSONNEL WITHIN THE ANALYTICS BUREAU HAD AN IN-DEPTH UNDERSTANDING OF WHICH GROUPS COULD BENEFIT FROM A STATEWIDE ASSET EXTRACTION PROJECT TO UPDATE AND ENHANCE THE ASSET INVENTORY AND CONDITION ASSESSMENT MEASURES. THE BUREAUS TARGETED FOR PARTICIPATION INCLUDED: SYSTEMS PLANNING, BRIDGES AND STRUCTURES, RAIL, TRAFFIC AND SAFETY, CONSTRUCTION AND MAINTENANCE, MOTOR CARRIER, LOCATION AND ENVIRONMENT, AND TRAFFIC OPERATIONS.

#### PRIORITIZING ASSET NEEDS WITH EXTRACTION METHODOLOGY

EACH GROUP WAS INVITED TO AN IN-PERSON MEETING BY THE ANALYTICS BUREAU AND PRESENTED WITH A GUIDE OF ROADWAY ASSET ITEMS THAT COULD BE INVENTORIED FROM ANNUALLY COLLECTED IMAGERY DATA. THEY WERE ASKED TO GAUGE THE ASSETS BY LEVEL OF INTEREST TO PROVIDE ALL POSSIBLE ASSET ITEMS THEIR GROUP WOULD UTILIZE FROM SUCH AN EXTRACTION EFFORT.



### PROJECT PROCESSES

#### DEVELOPING ASSET DEFINITIONS

THE ANALYTICS BUREAU, IN CONJUNCTION WITH PATHWAY SERVICES INC., HELD IN-PERSON MEETINGS WITH EACH GROUP TO DISCUSS IN DETAIL THE NEEDED CHARACTERISTICS FOR EACH ASSET DEFINITION. THE BEST SUPPORT A CENTRALIZED DATA SYSTEM CAN PROVIDE STARTS WITH THE LOWEST LEVEL OF INFORMATION, AS GRANULAR AS THE INVENTORY CAN ALLOW. TO ILLUSTRATE THIS CONCEPT, WE CAN DISSECT A COMMON HIGHWAY PERFORMANCE MONITORING SYSTEM (HPMS) REQUIREMENT AS IT CONNECTS TO A MODEL INVENTORY OF ROADWAY ELEMENTS (MIRE) DESCRIPTION AND ALSO TYPICAL DESIGN, SAFETY, AND MAINTENANCE ASPECTS OF GUARDRAIL DATA. (SEEN IN EXAMPLE OF MEDIANS/GUARDRAILS)

#### MANAGING ASSET EXTRACTION QA / QC

IN ADDITION TO MULTIPLE LAYERS OF QUALITY CONTROL DURING THE DATA REDUCTION PERIOD OF ASSET EXTRACTION, THE ANALYTICS BUREAU DESIGNED AN ASSET REVIEW PROCESS SEEN IN FIGURE 3 BELOW. ASSET DATA DELIVERIES RECEIVED DETAILED QUALITY ASSURANCE MEASURES AND WERE RETURNED FOR CORRECTION AT ANY POINT ALONG THE WAY.

#### STAKEHOLDER ENGAGEMENT AT THE IOWA DOT

WITH THE PASSAGE OF THE MAP-21 AND FAST ACT, STATE DOTs HAVE EMBRACED THE STAKEHOLDER ENGAGEMENT APPROACH TO PUT TOGETHER THEIR TAMP DOCUMENTS. A 2018 SURVEY OF HOW STATE DOTs ARE INTEGRATING RISK IN THEIR TAMPs FOUND THAT MORE THAN 90% OF AGENCIES THAT RESPONDED HAVE ALL CREATED A TAM TASK FORCE THAT IS MADE UP OF ASSET MANAGERS, REPRESENTATIVES FROM VARIOUS DIVISIONS/DEPARTMENTS- BASICALLY A COLLECTION OF THE STAKEHOLDERS IN ORDER TO PUT TOGETHER THEIR TAMP DOCUMENTS (7). THE IOWA DOT, IN ORDER TO MANAGE ITS PAVEMENT CONDITION DATA COLLECTION EFFORTS, SETUP A DATA MANAGEMENT WORKING GROUP, THAT IS MADE UP OF A GROUP OF ENGINEERS AND SUBJECT MATTER EXPERTS FROM THE DISTRICTS AND CENTRAL OFFICE, AS WELL AS EXTERNAL PARTNERS SUCH AS FHWA, IOWA STATE UNIVERSITY, AND THE DATA COLLECTION VENDOR.

#### LOCAL ENTITY INVOLVEMENT

IPMP (IOWA PAVEMENT MANAGEMENT PROGRAM) PROVIDES A SYSTEM FOR LOCAL AGENCIES TO COMMUNICATE AMONG THEMSELVES AND WITH THE IOWA DEPARTMENT OF TRANSPORTATION (IDOT), AS WELL AS BE PART OF THE PROCESS FOR PROVIDING VALUABLE FEEDBACK IN STREAMLINING THE PAVEMENT DATA COLLECTION PROCESS TO ENSURE THAT IT PROVIDES ATTRIBUTES THAT THE LOCAL AGENCIES CAN USE FOR SYNTHESIZING MAINTENANCE AND INVESTMENT STRATEGIES IN ADDITION TO MAINTAINING DATABASES OF INFORMATION THAT CAN BE UTILIZED TO PROVIDE STATEWIDE LOCAL AGENCY INFORMATION. BELOW IS A SUMMARY OF THE AREAS LOCAL AGENCIES BENEFIT MOST FROM THE DATA:

- PAVEMENT INVENTORY AND CONDITION
- SHORT- AND LONG-TERM PLANNING
- COMMUNICATION TO UPPER LEVEL AND FIELD STAFF
- ASSET INVENTORY FOR LOCAL AGENCIES

#### DISTRICT-LEVEL COLLABORATION

DISTRICT PERSONNEL HAVE ACCESS TO SIMILAR INFORMATION THAT LOCAL AGENCIES HAVE ACCESS TO WITH THE ADDED BENEFIT OF GREATER DETAIL OF THE INFORMATION CONTAINED WITHIN RAMS AS THEY ARE ABLE TO PROVIDE GREATER LEVELS OF DETAIL THROUGH CONSTRUCTION PLANS AND AS-BUILT SPECIFICATIONS. ADDITIONALLY, THE ANALYTICS BUREAU PROVIDES INFORMATION ON HISTORICAL ROAD CONSTRUCTION AND PROJECTS ON STATE OWNED ROUTES WHERE INFORMATION HAS BEEN PROVIDED. THIS INFORMATION CAN BE VIEWED IN CONJUNCTION WITH THE ROADWAY IMAGERY AND PAVEMENT IMAGERY/INFORMATION THROUGH THE USE OF VARIOUS APPLICATIONS ALSO SUPPORTED BY THE ANALYTICS BUREAU.

MEDIANS / GUARDRAILS				
ASSET TYPE	Analytics Group		Traffic & Safety	
	HPMS	MIRE	Maintenance	RAMS
Presence				
Unprotected				
Curbed				
Undivided				
Divided, separate grades / no wall				
Divided, separate grades / with wall				
Divided, other				
Flush paved median				
Raised median				
Depressed median				
2-way left turn lane				
Railroad / rapid transit				
Guardrail				
Positive barrier-unsheathed (other)				
Positive barrier-flexible (cable)				
Positive barrier-semi-rigid (wood)				
Positive barrier-semi-rigid (steel beam)				
Positive barrier-semi-rigid (hand rail)				
Positive barrier-semi-rigid (box beam)				
Positive barrier-semi-rigid (w-beam 2 rail)				
Positive barrier-semi-rigid (w-beam 4 rail)				
Positive barrier-rigid (concrete)				
Height				
Width				
Length				
End treatment				
Post type				
Attenuator type				
Distance from edge				
Condition				

### CONCLUSION

THANKS TO THE CHAMPIONS OF ASSET MANAGEMENT WITHIN THE IOWA DEPARTMENT OF TRANSPORTATION WHO ADDRESSED THE NEEDS AND ENVISIONED SUCH A LARGE-SCALE SOLUTION, A SINGLE PROJECT WAS ABLE TO SERVE MORE THAN 9 AGENCY BUREAUS AND INSPIRED FUTURE USES AND COLLABORATIVE EFFORTS. BELOW ARE THE SUMMARY HIGHLIGHTS:

- ISOLATING THE LOWEST LEVEL OF ASSET INVENTORY NEEDS AND DEFINING THE EXTRACTION TERMINOLOGY AND METHODOLOGY BY ENGAGING ALL STAKEHOLDERS THROUGH IN-PERSON MEETINGS AND EMAIL SURVEYS WERE SOME OF THE BEST PRACTICES REALIZED DURING A STATEWIDE ASSET INVENTORY PROJECT.

- THE DESIGN AND DEVELOPMENT OF A CENTRALIZED DATA INTEGRATION SYSTEM ALSO MADE IT POSSIBLE FOR MANY BUREAUS TO EASILY ACCESS AND MANIPULATE THE NEWLY ENHANCED DATA FOR PLANNING AND ANALYSIS PURPOSES.

- GARNERED FROM THE REAL-WORLD EXPERIENCE OF APPLYING THE INTEGRATION OF ASSET DATA, VALUABLE TIME SAVINGS WERE DISCOVERED VIA MITIGATION OF DOT ENGINEER IN-FIELD INSPECTION TIMES THROUGH USE OF THE COLLECTED IMAGERY.

- SUPPORTING THE LOCAL AGENCIES THROUGH THE IOWA PAVEMENT MANAGEMENT PLAN MANAGED BY THE IOWA STATE UNIVERSITY EXTENDS FURTHER THE VERSATILITY AND USE OF UNIFIED ASSET DATA.

PERHAPS A MOST VALUABLE TAKE AWAY DISCOVERED, DURING AN INTERVIEW WITH THE RAMS ADMINISTRATOR AT THE DOT, WAS THAT IF ANOTHER AGENCY ATTEMPTED TO REPLICATE THE FUNCTIONS OF THE IOWA ANALYTICS BUREAU OR THE DATA INTEGRATION METHODS OF RAMS, THERE IS A KEY ASPECT THAT MUST BE PRESENT. THAT KEY IS THE CONTROL AND AUTHORITY THE ANALYTICS BUREAU MAINTAINS OVER DATABASE ADMINISTRATION AND OTHER SCHEMA CHANGES TO BE ABLE TO FREELY CHANGE WHAT NEEDS TO BE CHANGED, WHEN IT NEEDS TO BE CHANGED. (10) THIS WAS MADE POSSIBLE THROUGH A NUMBER OF ELEMENTS. FIRSTLY, THE WORK TO CENTRALIZE ASSET MANAGEMENT DATA HAS BEEN ONGOING IN IOWA FOR MORE THAN 15 YEARS, WHICH ALLOWED AMPLE TIME TO BUILD TRUST AMONG THE PERSONNEL SPEARHEADING THE PROJECT FROM BOTTOM-UP WITHIN THE AGENCY. NEXT, THE GIVEN AUTHORITY TO MAKE SUCH VALUABLE CHANGES HAD BEEN ENDORSED BY ENTERPRISE DIRECTION, A CHAMPION OF THE EFFORTS CONTRIBUTING FROM TOP DOWN. FROM A CULTURE OF DATA-SHARING TO PROPER AUTHORIZATION IN THE STRUCTURE OF THE DATA INTEGRATION, COMBINED WITH FREQUENT AND PROFICIENT COLLABORATION AMONG THE STAKEHOLDERS AND BOTTOM-UP LEVEL OF DETAIL FOR ASSET INVENTORY, THIS EFFORT HAS BEEN SUCCESSFUL IN SUPPORTING THE IOWA DOT'S TRANSPORTATION ASSET MANAGEMENT.

#### ACKNOWLEDGMENTS

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#### AUTHOR CONTRIBUTIONS

THE AUTHORS CONFIRM CONTRIBUTION TO THE PAPER AS FOLLOWS: ALL WORK, CONCEPTS, DIAGRAMS, FIGURES, AND 6 TABLES ARE OUR OWN.

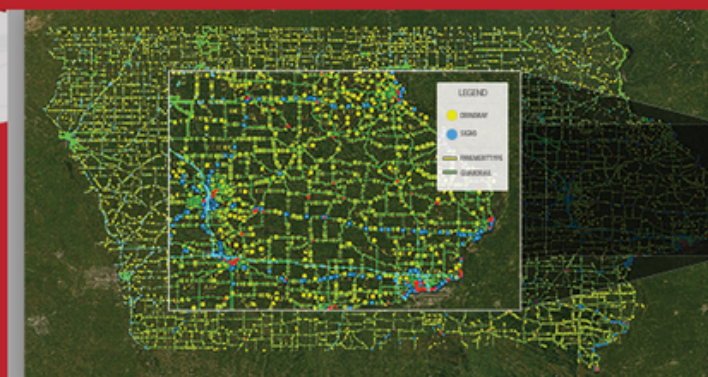
### STATEWIDE ASSET PROJECT SUMMARY

#### PROJECT SUMMARY

USING ROADWAY IMAGES WHICH COVERED 45,900 MILES WORTH OF IOWA'S PAVED ROADWAY NETWORK OVER THE COURSE OF A 2-YEAR CYCLE, AND THROUGH THE COLLABORATIVE EFFORTS OF THE 9 BUREAUS, LED BY THE ANALYTICS BUREAU AND PATHWAY SERVICES INC., IDOT NOW OWNS MILLIONS OF ASSET ITEMS AND ENHANCED DATA DEFINITIONS THE ENTIRE AGENCY CAN LEVERAGE FOR PLANNING AND ANALYSIS. THE SOPHISTICATED MANUALS OF DETAILED ASSET DEFINITIONS AND EXTRACTION METHODOLOGIES WILL SUPPORT THE IOWA DOT FOR FUTURE PROCESSES AND FEED NEW AND DIFFERENT PROJECTS AS MORE VERSATILE USES ARE FOUND.

#### DISTRIBUTION TO END USERS

DISTRIBUTION TO AGENCY USERS WILL UTILIZE THE ARCHITECTURE OF THE CURRENT GIS DATABASES IN THE AGENCY. THIS INCLUDES AUGMENTATION OF EXISTING TABLES THROUGH THE INCLUSION OF THE DATA GATHERED FROM THE IMAGERY AS WELL AS CREATION OF NEW TABLES FOR SOME ASSETS THAT WERE PREVIOUSLY NOT INVENTORIED. AS SEVERAL DIVISIONS WITH THE DEPARTMENT ARE ENGAGED IN ACTIVITIES RELATED TO ROADWAY ASSET COMPONENTS, THE DIVISION OF INFORMATION OFFERS THE GREATEST OPPORTUNITY TO BOTH IMPROVE UPON WHAT DATA IS ALREADY AVAILABLE AS WELL AS ENSURE THAT THE MAINTENANCE OF THE DATA IS UNDERTAKEN BY THOSE WHOM RELY UPON IT.



#### ORGANIZATIONS



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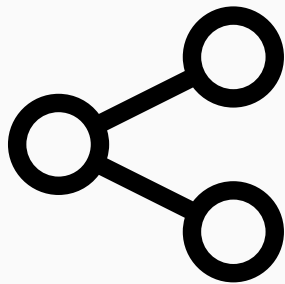


# PROJECT HIGHLIGHTS

This success story is grounded in positive foundations at each institute and guided with careful organization.

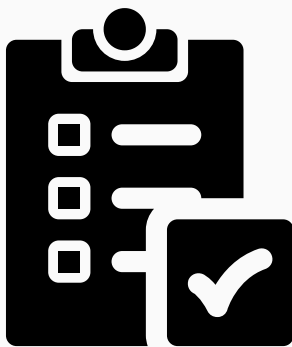
## STAKEHOLDER ENGAGEMENT AND DATA UNIFICATION FOR TRANSPORTATION ASSET MANAGEMENT

	A	B	C	High	Moderate	Not Needed	Please name your group and indicate which asset types have the highest priority to your department and inventory needs. Feel free to add any asset types not listed here at the bottom of the list.		
Asset Type	OSP PLANNING TEAM	RAIL OFFICE	TRAFFIC AND SAFETY	LOCATION & ENVIRONMENT	OW/OS PERMIT ROUTING	MAINTENANCE	CONSTRUCTION	BRIDGE	
Paved Shoulder Type	A	B	A	A	A	A	A	B	
Paved Shoulder Width	A	B	A	A	A	A	A	B	
Paved Shoulder Location	A	B	A	A	A	A	A	B	
Unpaved Shoulder Type	A	B	A	A	B	A	A	B	
Unpaved Shoulder Width	A	B	A	C	B	A	A	B	
Unpaved Shoulder Location	A	B	A	A	B	A	A	B	
Pavement Type	A	A	A	A	B	A	A	B	
Pavement Width	A	A	A	A	A	A	A	B	
Lane Width	A	B	A	A	A	A	A	B	
Number of Lanes	A	A	A	A	A	A	A	A	
Median Presence	A	A	A	A	B	A	A	B	
Median Type	A	A	B	A	B	A	A	B	
Median Width	B	B	A	A	B	A	A	B	
Guardrail Type	B	A	A	C	C	A	A	A	
Guardrail Location	B	A	A	C	C	A	A	A	
Guardrail Post Type	C	C	A	C	C	A	A	A	



### A CULTURE OF SHARING

The Iowa DOT has an established culture to share information across departments



### STATEWIDE ASSET EXTRACTION

Pathway Services inventoried numerous roadway asset types



### PRIORITIZING ASSET NEEDS

Stakeholders were polled on their individual needs for all possible asset types



# DEVELOPING ASSET DEFINITIONS

Each stakeholder had individual needs, but many overlapped each other.

By focusing the asset definitions as granularly as possible, the project was able to support all departments from the lowest level of detail up.

MEDIAN / GUARDRAILS					
		Analytics Group	Traffic & Safety	Maintenance	RAMS
		HPMS	MIRE	Detailed	Cumulative
ASSET TYPE	Presence	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div><div></div><div></div></div>
	Unprotected	<div><div></div></div>	<div><div></div></div>		<div><div></div><div></div></div>
	Curbed	<div><div></div></div>	<div><div></div></div>		<div><div></div><div></div></div>
	Undivided		<div><div></div></div>		<div><div></div></div>
	Divided, separate grades / no wall		<div><div></div></div>		<div><div></div></div>
	Divided, separate grades / with wall		<div><div></div></div>		<div><div></div></div>
	Divided, other		<div><div></div></div>		<div><div></div></div>
	Flush paved median		<div><div></div></div>		<div><div></div></div>
	Raised median		<div><div></div></div>		<div><div></div></div>
	Depressed median		<div><div></div></div>		<div><div></div></div>
	2-way left turn lane		<div><div></div></div>		<div><div></div></div>
	Railroad / rapid transit		<div><div></div></div>		<div><div></div></div>
	<b>Guardrail</b>				
	Positive barrier-unspecified (other)	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div><div></div><div></div></div>
Positive barrier-flexible (cable)	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div><div></div><div></div></div>	
Positive barrier-semi-rigid (wood)	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div><div></div><div></div></div>	
Positive barrier-semi-rigid (steel beam)			<div><div></div></div>	<div><div></div></div>	
Positive barrier-semi-rigid (hand rail)			<div><div></div></div>	<div><div></div></div>	
Positive barrier-semi-rigid (box beam)			<div><div></div></div>	<div><div></div></div>	
Positive barrier-semi-rigid (w-beam 3 rail)			<div><div></div></div>	<div><div></div></div>	
Positive barrier-semi-rigid (w-beam 4 rail)			<div><div></div></div>	<div><div></div></div>	
Positive barrier-rigid (concrete)	<div><div></div></div>	<div><div></div></div>	<div><div></div></div>	<div><div></div><div></div><div></div></div>	
ASSET ATTRIBUTE	Height			<div><div></div></div>	<div><div></div></div>
	Width			<div><div></div></div>	<div><div></div></div>
	Length			<div><div></div></div>	<div><div></div></div>
	End treatment			<div><div></div></div>	<div><div></div></div>
	Post type			<div><div></div></div>	<div><div></div></div>
	Attenuator type			<div><div></div></div>	<div><div></div></div>
	Distance from edge			<div><div></div></div>	<div><div></div></div>
	Condition			<div><div></div></div>	<div><div></div></div>



# ASSET GUIDE SAMPLE PAGE

## TYPES

- W-Beam 3 Rail
- W-Beam 4 Rail
- Box Beam
- Concrete or Jersey
- Cable (brifen, gibraltar, nucor, gregory)



W-Beam



Box Beam

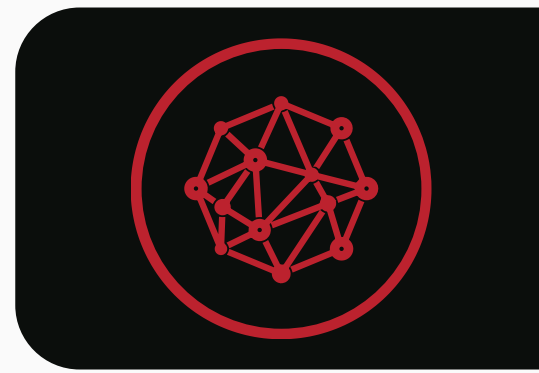


Concrete



Cable





# MANAGING ASSET EXTRACTION QA/QC

Random selection of individual assets

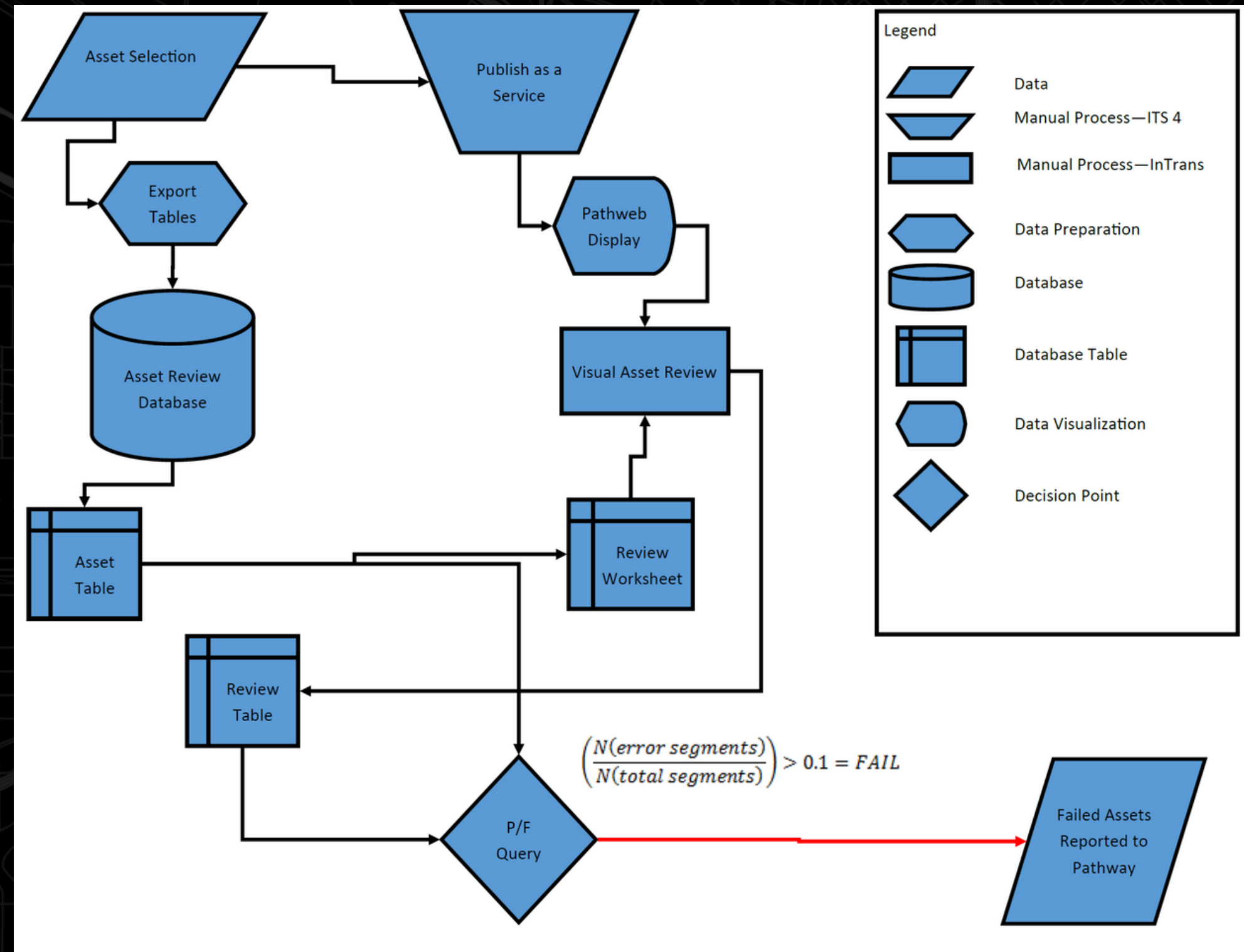
Visual review of selected assets within  
Pathweb viewer

No greater than 10% error of asset or whole  
group rejected





# ASSET REVIEW WORKFLOW





# STAKEHOLDERS

## Internal

- Maintenance
- Traffic Safety
- Design
- Rail
- Bridge
- District Personnel

## External

- County Engineers
- Municipalities
- Planning Organizations
- Other Agencies
- Private Sector







**Local Entity**

Outreach through  
MPO/RPA

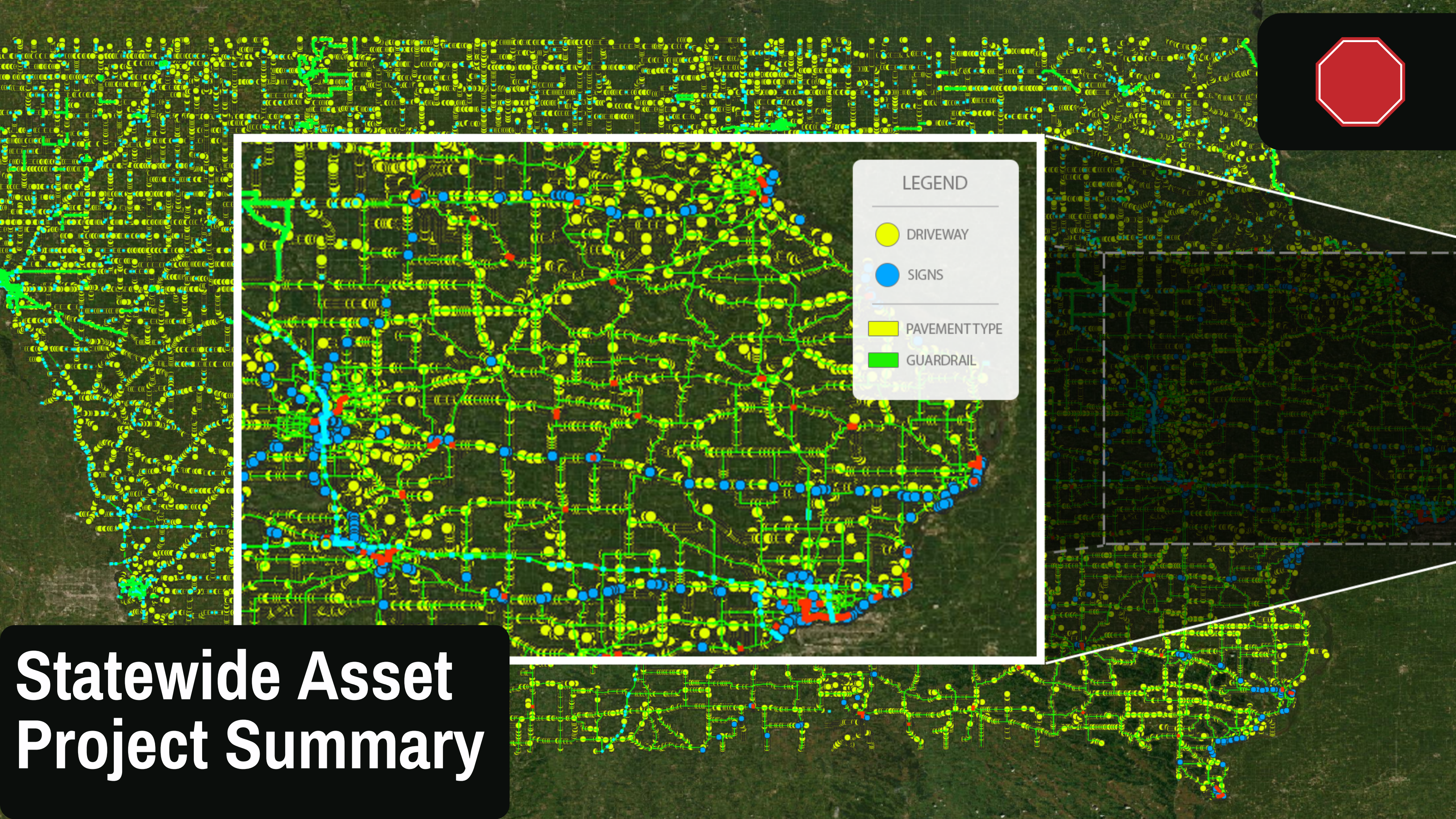
**District-Level**

District Engineers  
Design Personnel

**Statewide**

ISAC  
IGIC





LEGEND

DRIVEWAY

SIGNS

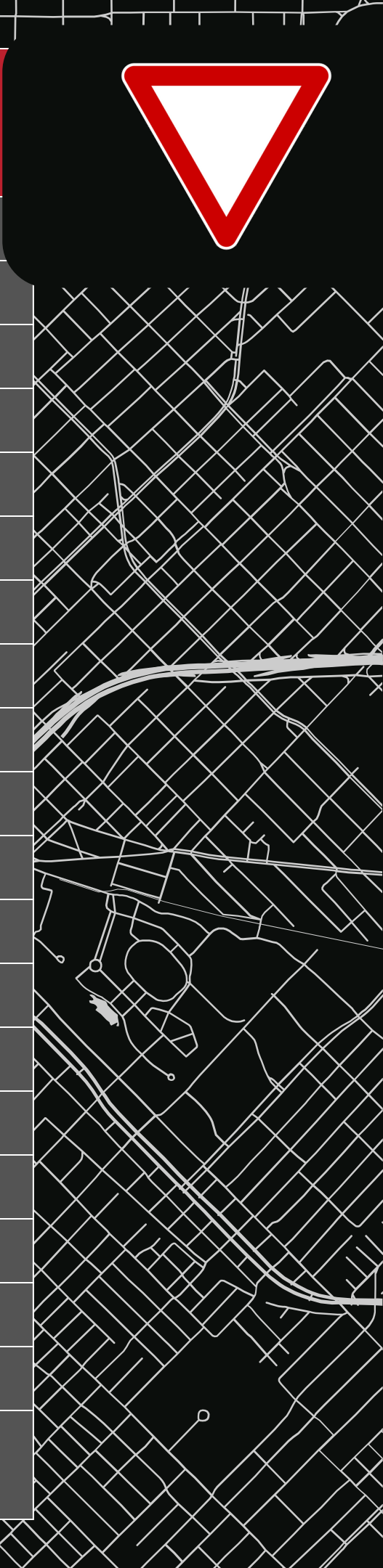
PAVEMENTTYPE

GUARDRAIL

# Statewide Asset Project Summary



Assets Item Names	Total Extracted Records (Count)	Total Length (Miles)	Total Length (Feet)	Total Width (Feet)
Auxiliary Lanes	26,060	2,184	11,530,057	296,190
Barriers & Guardrails**	21,888	597	3,151,280	-
Bike Lanes	3,188	2,217	11,703,172	11,434
Bridges	11,677	399	2,104,729	-
Driveways	987,769	-	-	-
Lane Widths	180,730	46,474	245,385,068	2,104,661
Medians	14,850	6,832	36,073,727	605,195
Parking Zones**	40,498	4,402	23,242,137	-
Passing Zones**	107,240	29,462	155,558,659	-
Paved Shoulder 1	2,074	2,252	11,889,446	12,602
Paved Shoulder 2	165,462	59,706	315,247,552	344,131
Unpaved Shoulder	94,215	67,106	354,322,318	369,982
Pavement Type	106,873	46,302	244,472,133	-
Pavement Width	180,744	46,474	245,384,358	4,741,550
Railroad Crossings	3,119	-	-	-
Retaining Walls**	1,001	39	205,529	-
Rumble Strips	20,169	16,302	86,072,525	-
Signs**	267,636	-	-	-
Speed Zones**	3,713	10,958	57,859,937	
** Asset items NOT extracted on the full network mileage				





# What's Next?

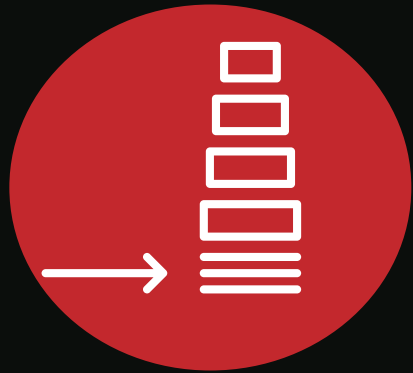
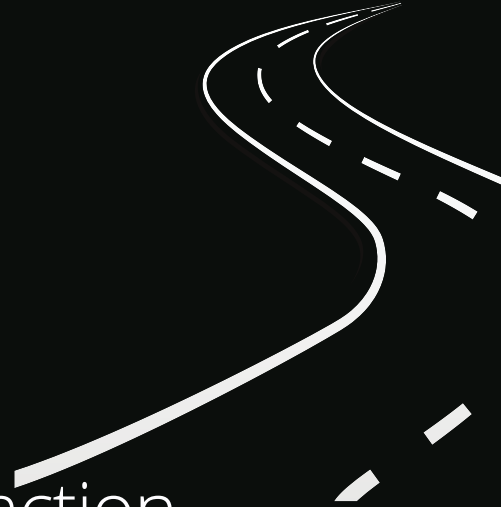
- Get engaged!
- Start a poll
- Prioritize needs

## STAKEHOLDER ENGAGEMENT AND DATA UNIFICATION FOR TRANSPORTATION ASSET MANAGEMENT

	A	High	Please name your group and indicate which asset types have the highest priority to your department and inventory needs. Feel free to add any asset types not listed here at the bottom of the list.					
	B	Moderate						
	C	Not Needed						
Asset Type	OSP PLANNING TEAM	RAIL OFFICE	TRAFFIC AND SAFETY	LOCATION & ENVIRONMENT	OW/OS PERMIT ROUTING	MAINTENANCE	CONSTRUCTION	BRIDGE
Paved Shoulder Type	A	B	A	A	A	A	A	B
Paved Shoulder Width	A	B	A	A	A	A	A	B
Paved Shoulder Location	A	B	A	A	A	A	A	B
Unpaved Shoulder Type	A	B	A	A	B	A	A	B
Unpaved Shoulder Width	A	B	A	C	B	A	A	B
Unpaved Shoulder Location	A	B	A	A	B	A	A	B
Pavement Type	A	A	A	A	B	A	A	B
Pavement Width	A	A	A	A	A	A	A	B
Lane Width	A	B	A	A	A	A	A	B
Number of Lanes	A	A	A	A	A	A	A	A
Median Presence	A	A	A	A	B	A	A	B
Median Type	A	A	B	A	B	A	A	B
Median Width	B	B	A	A	B	A	A	B
Guardrail Type	B	A	A	C	C	A	A	A
Guardrail Location	B	A	A	C	C	A	A	A
Guardrail Post Type	C	C	A	C	C	A	A	A
Leading Attenuator Type	C	C	A	C	C	A	A	A
Leading Attenuator Location	C	C	A	C	C	A	A	B
Trailing Attenuator Type	C	C	A	C	C	A	A	A
Trailing Attenuator Location	C	C	A	C	C	A	A	B
Passing Zone	A	C	A	A	C	A	A	C
Sign Presence	A	A	A	C	B	B	A	A
Sign Type/MUTCD	A	A	A	C	B	B	A	A
Sign Legend	A	A	A	C	B	B	A	A
Sign Location	A	A	A	C	B	B	A	A
Intersection Presence	A	B	B	A	A	B	A	A
Intersection Geometry Type	A	B	B	A	A	B	A	A
Intersection Traffic Control Type	B	B	B	A	B	B	A	A
Bridge Presence	A	C	C	A	A	B	A	A
Bridge Vertical Clearance	A	C	B	A	A	B	A	A
Construction Presence	B	C	C	A	A	B	A	B
Speed Limit Zones	A	B	A	A	B	B	A	B
Auxiliary Lane Type	B	B	A	A	A	A	A	C
Auxiliary Lane Width	B	C	A	A	A	A	A	B



# CONCLUSION



- Isolating the lowest level of asset inventory needs and defining the extraction terminology and methodology by engaging all stakeholders through in-person meetings and email surveys were some of the best practices realized during a statewide asset inventory project.



- The design and development of a centralized data integration system also made it possible for many bureaus to easily access and manipulate the newly enhanced data for planning and analysis purposes.



- Garnered from the real-world experience of applying the integration of asset data, valuable time savings were discovered via mitigation of DOT engineer in-field inspection times through use of the collected imagery.



- Supporting the local agencies through the Iowa Pavement Management Plan managed by the Iowa State University extends further the versatility and use of unified asset data.



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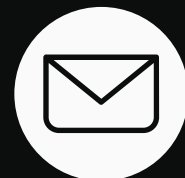
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# QUESTIONS



## A SUCCESS STORY STAKEHOLDER ENGAGEMENT AND DATA UNIFICATION FOR TRANSPORTATION ASSET MANAGEMENT

### INTRODUCTION

TRANSPORTATION ASSET MANAGEMENT IS A HIGHLY COMPLEX ENDEAVOR AFFECTING MANY STAKEHOLDERS ACROSS THE LIFE CYCLE OF HIGHWAY AND CITY INFRASTRUCTURE FEATURES MAINTAINED BY FEDERAL, STATE, AND LOCAL AGENCIES. THE USE OF CENTRALIZED DATA TO ASSIST AGENCIES TASKED WITH THIS MANAGEMENT IS BECOMING COMMON PRACTICE AS GEOGRAPHICAL INFORMATION SYSTEMS (GIS) ALLOW FOR BETTER DATA INTEGRATION. THE IOWA DEPARTMENT OF TRANSPORTATION HAS BEEN A GREAT EXAMPLE OF FOSTERING A CULTURE OF DATA SHARING AND BUREAU COLLABORATION WHILE DEVELOPING A ROBUST ROADWAY ASSET MANAGEMENT SYSTEM (RAMS) TO HOUSE ALL ASSET INVENTORY INFORMATION WHICH SUPPORTS THE MANY BUREAUS OF THE DEPARTMENT. THIS WORK DETAILS SOME ASPECTS OF THE SUCCESSFUL PRACTICES FOUND IN TRANSPORTATION ASSET MANAGEMENT FROM THE PERSPECTIVES OF THE DOT, AN INDUSTRY LEADER, AND AN EDUCATIONAL INSTITUTE FOR ENGAGING AND COLLABORATING WITH THE STAKEHOLDERS INVOLVED IN ASSET MANAGEMENT. SUCCESSFUL SOLUTIONS REALIZED IN THIS PAPER INCLUDE:



### PROJECT HIGHLIGHTS

#### A CULTURE OF SHARING: THE GROUNDWORK FOR SUCCESS

BY THE ACCOUNTS OF NUMEROUS LONG-TIME EMPLOYEES AT THE IOWA DEPARTMENT OF TRANSPORTATION, THE AGENCY IS FOUND TO THRIVE WITH A CULTURE OF COLLABORATION AND DATA SHARING FROM BUREAU TO BUREAU. COMMUNICATION IS HIGHLY VALUED IN THE DOT AND THE MENTALITY OF ALWAYS ASKING "WHO ELSE COULD USE THIS DATA" (1) HAS BEEN INGRAINED IN THE CULTURE OF THE ORGANIZATION. THIS WORK WOULD BE INCOMPLETE WITHOUT RECOGNIZING THAT REPLICATION OF AN ENTIRE OFFICE CULTURE IS FAR MORE EXTENSIVE THAN A SINGLE PAPER CAN INCORPORATE, AND YET, IT IS THE ATTITUDE TOWARDS COLLABORATION THAT IS AN IMPORTANT ASPECT FOR ANY SUCCESSFUL COORDINATION WITH STAKEHOLDER INVOLVEMENT.

#### AN EXAMPLE: STATEWIDE ASSET EXTRACTION - THE STAKEHOLDERS

THE IOWA DEPARTMENT OF TRANSPORTATION IS STRUCTURED SIMILARLY TO OTHER STATE AGENCIES IN THAT EACH FOCUS OF TRAFFIC CONTROL AND INFRASTRUCTURE DEVELOPMENT AND MAINTENANCE ARE CLUSTERED TOGETHER WITH SPECIALISTS OF EACH FIELD DIVISION, COMMONLY LABELED A "BUREAU" WITHIN THE DOT. THE SEPARATE BUREAUS CONCENTRATE ON THEIR UNIQUE CHALLENGES, EACH WITH THEIR OWN INVENTORY PROCESSES AND PLANNING METHODOLOGIES, BUT SEVERAL BUREAUS ARE SUPPORTED BY THE DATA FROM A UNIFYING SECTION, THE ANALYTICS BUREAU. MANY DIVISIONS' DATA FLOWS THROUGH THE ANALYTICS BUREAU CREATING A CENTRAL LINE OF DATA FOR WHICH THE BUREAU IS TASKED WITH MANAGING. LEVERAGING THEIR FAMILIARITY WITH THE NUMEROUS OTHER BUREAUS' NEEDS, THE PERSONNEL WITHIN THE ANALYTICS BUREAU HAD AN IN-DEPTH UNDERSTANDING OF WHICH GROUPS COULD BENEFIT FROM A STATEWIDE ASSET EXTRACTION PROJECT TO UPDATE AND ENHANCE THE ASSET INVENTORY AND CONDITION ASSESSMENT MEASURES. THE BUREAUS TARGETED FOR PARTICIPATION INCLUDED: SYSTEMS PLANNING, BRIDGES AND STRUCTURES, RAIL, TRAFFIC AND SAFETY, CONSTRUCTION AND MAINTENANCE, MOTOR CARRIER, LOCATION AND ENVIRONMENT, AND TRAFFIC OPERATIONS.

#### PRIORITIZING ASSET NEEDS WITH EXTRACTION METHODOLOGY

EACH GROUP WAS INVITED TO AN IN-PERSON MEETING BY THE ANALYTICS BUREAU AND PRESENTED WITH A GUIDE OF ROADWAY ASSET ITEMS THAT COULD BE INVENTORIED FROM ANNUALLY COLLECTED IMAGERY DATA. THEY WERE ASKED TO GAUGE THE ASSETS BY LEVEL OF INTEREST TO PROVIDE ALL POSSIBLE ASSET ITEMS THEIR GROUP WOULD UTILIZE FROM SUCH AN EXTRACTION EFFORT.



### PROJECT PROCESSES

#### DEVELOPING ASSET DEFINITIONS

THE ANALYTICS BUREAU, IN CONJUNCTION WITH PATHWAY SERVICES INC., HELD IN-PERSON MEETINGS WITH EACH GROUP TO DISCUSS IN DETAIL THE NEEDED CHARACTERISTICS FOR EACH ASSET DEFINITION. THE BEST SUPPORT A CENTRALIZED DATA SYSTEM CAN PROVIDE STARTS WITH THE LOWEST LEVEL OF INFORMATION, AS GRANULAR AS THE INVENTORY CAN ALLOW. TO ILLUSTRATE THIS CONCEPT, WE CAN DISSECT A COMMON HIGHWAY PERFORMANCE MONITORING SYSTEM (HPMS) REQUIREMENT AS IT CONNECTS TO A MODEL INVENTORY OF ROADWAY ELEMENTS (MIRE) DESCRIPTION AND ALSO TYPICAL DESIGN, SAFETY, AND MAINTENANCE ASPECTS OF GUARDRAIL DATA. (SEEN IN EXAMPLE OF MEDIANS/GUARDRAILS)

#### MANAGING ASSET EXTRACTION QA / QC

IN ADDITION TO MULTIPLE LAYERS OF QUALITY CONTROL DURING THE DATA REDUCTION PERIOD OF ASSET EXTRACTION, THE ANALYTICS BUREAU DESIGNED AN ASSET REVIEW PROCESS SEEN IN FIGURE 3 BELOW. ASSET DATA DELIVERIES RECEIVED DETAILED QUALITY ASSURANCE MEASURES AND WERE RETURNED FOR CORRECTION AT ANY POINT ALONG THE WAY.

#### STAKEHOLDER ENGAGEMENT AT THE IOWA DOT

WITH THE PASSAGE OF THE MAP-21 AND FAST ACT, STATE DOTs HAVE EMBRACED THE STAKEHOLDER ENGAGEMENT APPROACH TO PUT TOGETHER THEIR TAMP DOCUMENTS. A 2018 SURVEY OF HOW STATE DOTs ARE INTEGRATING RISK IN THEIR TAMPs FOUND THAT MORE THAN 90% OF AGENCIES THAT RESPONDED HAVE ALL CREATED A TAM TASK FORCE THAT IS MADE UP OF ASSET MANAGERS, REPRESENTATIVES FROM VARIOUS DIVISIONS/DEPARTMENTS- BASICALLY A COLLECTION OF THE STAKEHOLDERS IN ORDER TO PUT TOGETHER THEIR TAMP DOCUMENTS (7). THE IOWA DOT, IN ORDER TO MANAGE ITS PAVEMENT CONDITION DATA COLLECTION EFFORTS, SETUP A DATA MANAGEMENT WORKING GROUP, THAT IS MADE UP OF A GROUP OF ENGINEERS AND SUBJECT MATTER EXPERTS FROM THE DISTRICTS AND CENTRAL OFFICE, AS WELL AS EXTERNAL PARTNERS SUCH AS FHWA, IOWA STATE UNIVERSITY, AND THE DATA COLLECTION VENDOR.

#### LOCAL ENTITY INVOLVEMENT

IPMP (IOWA PAVEMENT MANAGEMENT PROGRAM) PROVIDES A SYSTEM FOR LOCAL AGENCIES TO COMMUNICATE AMONG THEMSELVES AND WITH THE IOWA DEPARTMENT OF TRANSPORTATION (IDOT), AS WELL AS BE PART OF THE PROCESS FOR PROVIDING VALUABLE FEEDBACK IN STREAMLINING THE PAVEMENT DATA COLLECTION PROCESS TO ENSURE THAT IT PROVIDES ATTRIBUTES THAT THE LOCAL AGENCIES CAN USE FOR SYNTHESIZING MAINTENANCE AND INVESTMENT STRATEGIES IN ADDITION TO MAINTAINING DATABASES OF INFORMATION THAT CAN BE UTILIZED TO PROVIDE STATEWIDE LOCAL AGENCY INFORMATION. BELOW IS A SUMMARY OF THE AREAS LOCAL AGENCIES BENEFIT MOST FROM THE DATA:

- PAVEMENT INVENTORY AND CONDITION
- SHORT- AND LONG-TERM PLANNING
- COMMUNICATION TO UPPER LEVEL AND FIELD STAFF
- ASSET INVENTORY FOR LOCAL AGENCIES

#### DISTRICT-LEVEL COLLABORATION

DISTRICT PERSONNEL HAVE ACCESS TO SIMILAR INFORMATION THAT LOCAL AGENCIES HAVE ACCESS TO WITH THE ADDED BENEFIT OF GREATER DETAIL OF THE INFORMATION CONTAINED WITHIN RAMS AS THEY ARE ABLE TO PROVIDE GREATER LEVELS OF DETAIL THROUGH CONSTRUCTION PLANS AND AS-BUILT SPECIFICATIONS. ADDITIONALLY, THE ANALYTICS BUREAU PROVIDES INFORMATION ON HISTORICAL ROAD CONSTRUCTION AND PROJECTS ON STATE OWNED ROUTES WHERE INFORMATION HAS BEEN PROVIDED. THIS INFORMATION CAN BE VIEWED IN CONJUNCTION WITH THE ROADWAY IMAGERY AND PAVEMENT IMAGERY/INFORMATION THROUGH THE USE OF VARIOUS APPLICATIONS ALSO SUPPORTED BY THE ANALYTICS BUREAU.

MEDIANS / GUARDRAILS				
ASSET TYPE	Analytics Group	Traffic & Safety	Maintenance	RAMS
	HPMS	MIRE	Detailed	Cumulative
Presence				
Unprotected				
Curbed				
Undivided				
Divided, separate grades / no wall				
Divided, separate grades / with wall				
Divided, other				
Flush paved median				
Raised median				
Depressed median				
2-way left turn lane				
Railroad / rapid transit				
Guardrail				
Positive barrier-unspecified (other)				
Positive barrier-flexible (cable)				
Positive barrier-semi-rigid (wood)				
Positive barrier-semi-rigid (steel beam)				
Positive barrier-semi-rigid (hand rail)				
Positive barrier-semi-rigid (box beam)				
Positive barrier-semi-rigid (w-beam 2 rail)				
Positive barrier-semi-rigid (w-beam 4 rail)				
Positive barrier-rigid (concrete)				
Height				
Width				
Length				
End treatment				
Post type				
Attenuator type				
Distance from edge				
Condition				

### STATEWIDE ASSET PROJECT SUMMARY

#### PROJECT SUMMARY

USING ROADWAY IMAGES WHICH COVERED 45,900 MILES WORTH OF IOWA'S PAVED ROADWAY NETWORK OVER THE COURSE OF A 2-YEAR CYCLE, AND THROUGH THE COLLABORATIVE EFFORTS OF THE 9 BUREAUS, LED BY THE ANALYTICS BUREAU AND PATHWAY SERVICES INC., IDOT NOW OWNS MILLIONS OF ASSET ITEMS AND ENHANCED DATA DEFINITIONS THE ENTIRE AGENCY CAN LEVERAGE FOR PLANNING AND ANALYSIS. THE SOPHISTICATED MANUALS OF DETAILED ASSET DEFINITIONS AND EXTRACTION METHODOLOGIES WILL SUPPORT THE IOWA DOT FOR FUTURE PROCESSES AND FEED NEW AND DIFFERENT PROJECTS AS MORE VERSATILE USES ARE FOUND.

#### DISTRIBUTION TO END USERS

DISTRIBUTION TO AGENCY USERS WILL UTILIZE THE ARCHITECTURE OF THE CURRENT GIS DATABASES IN THE AGENCY. THIS INCLUDES AUGMENTATION OF EXISTING TABLES THROUGH THE INCLUSION OF THE DATA GATHERED FROM THE IMAGERY AS WELL AS CREATION OF NEW TABLES FOR SOME ASSETS THAT WERE PREVIOUSLY NOT INVENTORIED. AS SEVERAL DIVISIONS WITH THE DEPARTMENT ARE ENGAGED IN ACTIVITIES RELATED TO ROADWAY ASSET COMPONENTS, THE DIVISION OF INFORMATION OFFERS THE GREATEST OPPORTUNITY TO BOTH IMPROVE UPON WHAT DATA IS ALREADY AVAILABLE AS WELL AS ENSURE THAT THE MAINTENANCE OF THE DATA IS UNDERTAKEN BY THOSE WHOM RELY UPON IT.

### CONCLUSION

THANKS TO THE CHAMPIONS OF ASSET MANAGEMENT WITHIN THE IOWA DEPARTMENT OF TRANSPORTATION WHO ADDRESSED THE NEEDS AND ENVISIONED SUCH A LARGE-SCALE SOLUTION, A SINGLE PROJECT WAS ABLE TO SERVE MORE THAN 9 AGENCY BUREAUS AND INSPIRED FUTURE USES AND COLLABORATIVE EFFORTS. BELOW ARE THE SUMMARY HIGHLIGHTS:

- ISOLATING THE LOWEST LEVEL OF ASSET INVENTORY NEEDS AND DEFINING THE EXTRACTION TERMINOLOGY AND METHODOLOGY BY ENGAGING ALL STAKEHOLDERS THROUGH IN-PERSON MEETINGS AND EMAIL SURVEYS WERE SOME OF THE BEST PRACTICES REALIZED DURING A STATEWIDE ASSET INVENTORY PROJECT.
- THE DESIGN AND DEVELOPMENT OF A CENTRALIZED DATA INTEGRATION SYSTEM ALSO MADE IT POSSIBLE FOR MANY BUREAUS TO EASILY ACCESS AND MANIPULATE THE NEWLY ENHANCED DATA FOR PLANNING AND ANALYSIS PURPOSES.
- GARNERED FROM THE REAL-WORLD EXPERIENCE OF APPLYING THE INTEGRATION OF ASSET DATA, VALUABLE TIME SAVINGS WERE DISCOVERED VIA MITIGATION OF DOT ENGINEER IN-FIELD INSPECTION TIMES THROUGH USE OF THE COLLECTED IMAGERY.
- SUPPORTING THE LOCAL AGENCIES THROUGH THE IOWA PAVEMENT MANAGEMENT PLAN MANAGED BY THE IOWA STATE UNIVERSITY EXTENDS FURTHER THE VERSATILITY AND USE OF UNIFIED ASSET DATA.

PERHAPS A MOST VALUABLE TAKE AWAY DISCOVERED, DURING AN INTERVIEW WITH THE RAMS ADMINISTRATOR AT THE DOT, WAS THAT IF ANOTHER AGENCY ATTEMPTED TO REPLICATE THE FUNCTIONS OF THE IOWA ANALYTICS BUREAU OR THE DATA INTEGRATION METHODS OF RAMS, THERE IS A KEY ASPECT THAT MUST BE PRESENT. THAT KEY IS THE CONTROL AND AUTHORITY THE ANALYTICS BUREAU MAINTAINS OVER DATABASE ADMINISTRATION AND OTHER SCHEMA CHANGES TO BE ABLE TO FREELY CHANGE WHAT NEEDS TO BE CHANGED, WHEN IT NEEDS TO BE CHANGED. (10) THIS WAS MADE POSSIBLE THROUGH A NUMBER OF ELEMENTS. FIRSTLY, THE WORK TO CENTRALIZE ASSET MANAGEMENT DATA HAS BEEN ONGOING IN IOWA FOR MORE THAN 15 YEARS, WHICH ALLOWED AMPLE TIME TO BUILD TRUST AMONG THE PERSONNEL SPEARHEADING THE PROJECT FROM BOTTOM-UP WITHIN THE AGENCY. NEXT, THE GIVEN AUTHORITY TO MAKE SUCH VALUABLE CHANGES HAD BEEN ENDORSED BY ENTERPRISE DIRECTION, A CHAMPION OF THE EFFORTS CONTRIBUTING FROM TOP DOWN. FROM A CULTURE OF DATA-SHARING TO PROPER AUTHORIZATION IN THE STRUCTURE OF THE DATA INTEGRATION, COMBINED WITH FREQUENT AND PROFICIENT COLLABORATION AMONG THE STAKEHOLDERS AND BOTTOM-UP LEVEL OF DETAIL FOR ASSET INVENTORY, THIS EFFORT HAS BEEN SUCCESSFUL IN SUPPORTING THE IOWA DOT'S TRANSPORTATION ASSET MANAGEMENT.

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#### AUTHOR CONTRIBUTIONS

THE AUTHORS CONFIRM CONTRIBUTION TO THE PAPER AS FOLLOWS: ALL WORK, CONCEPTS, DIAGRAMS, FIGURES, AND 6 TABLES ARE OUR OWN.

