I. Volume I: Technical Application Cover Page

Advanced Digital Construction Management Systems				
Cover Page				
Entity Type	STATE DOT			
Organization Name	Maine Department of Transportation (MaineDOT)			
Project Name	DIRIGO 2030: Digital Delivery for Asset Management			
Previously Incurred Project Cost	\$0			
Future Eligible Project Cost	\$1,895,250.00			
Total Project Cost (from all funding sources)	\$1,895,250.00			
<b>ADCMS Program Funding Request</b>	\$1,516,200.00			
Non-Federal Share for ADCMS Program Funding Request	\$379,050.00			
Total Federal Funding (Including ADCMS Program)	\$1,516,200.00			

# Table of Contents

I. Volume I: Technical Application Cover Pagei
Table of Contentsii
II. Volume I: Technical Application Project Description1
2. Existing Challenges
3. Project Outcomes
4. Program Goals and the Administration's Priorities Geographic Area
III. Volume I: Technical Application Project Team Information7
1. MaineDOT Staffing
2. Consultant Staffing
3. Partners
IV. Volume I: Project Readiness
1. Technical Feasibility
A. Current State of Processes at MaineDOT9
B. Management of DIRIGO 2030 Efforts 10
2. Project Schedule
3. Project Risks and Mitigation Strategies 11
V. Responsiveness to Merit Criteria12
1. Criterion #1 – Technical and Management Approach 12
2. Criterion #2 – Promotes efficient information sharing among stakeholders
3. Criterion #3 – Accelerate technology adoption and deployment
4. Criterion #4 – Safety
5. Criterion #5 – Workforce Development, Job Quality and Wealth Creation
6. Criterion #6 – Environment, Climate Change and Sustainability, and Equity 14

## **II. Volume I: Technical Application Project Description**

### 1. Project Summary

The DIgital Results and Innovation are a GO for 2030 (DIRIGO 2030) project will close the information exchange gaps currently existing with MaineDOT's data collection efforts and will create standards, processes, and technology solutions to properly capture, share, and store digital asbuilt information for State-owned assets. DIRIGO 2030 will result in a future where our staff and industry partners are engaged in a culture that is open to new ideas, best practices, and technologies that will result in continuous and sustainable improvement of Maine's transportation system.

A key guiding principle noted in our most recent Long Range Transportation Plan is "to improve continuously and embrace the future". The DIRIGO acronym in the project title is also the state motto for Maine, and it is a Latin verb meaning "I lead," so it is a fitting title for this initiative, as it will lead the department into the future, improving its processes through digital delivery. MaineDOT has chosen 2030 as a target year for digital delivery processes to be ready to implement department wide.

MaineDOT acts as a responsible steward of the transportation network by making reasoned, longterm decisions that include looking at the benefits and cost of transportation investments, including the need for operations and maintenance after assets are improved. Without quality data made available through connected processes we are hindered in our ability to make the best decisions given the available resources. The figure below represents how MaineDOT currently manages the transportation system assets. The icons between the process steps represent information flows. The digital delivery efforts where our improvements outlined in this application are represented by the larger circles between Plan-Deliver-Measure.

Figure 1: MaineDOT Management Process



#### 2. Existing Challenges

MaineDOT collects data in many formats that are not used efficiently through the asset management lifecycle. Asset data also does not flow continuously through the asset management lifecycle, resulting in duplication, inconsistency and increased cost.

The current gaps in our information exchange processes have been created over time by managing information in siloed legacy systems that are disconnected making it difficult and labor intensive to combine data in support of relevant use cases such as construction to asset maintenance processes, as-built information to Linear Referencing System (LRS), ancillary asset data inventory management, and LiDAR data to asset management. The future processes will consider the full lifecycle of the asset information and work to close the gaps.

The department also faces increasing costs of construction projects. There are many factors contributing to this trend; one related to digital delivery is that our contractors are building the cost of converting our 2D plans to 3D into bids in order to more accurately perform their work. The department therefore must modernize our design processes and capabilities to transition to 3D models as the legal document and away from paper and electronic 2D plans to streamline contractor processes which will help reduce project costs.

The improved accuracy of the information with the 3D model will also improve confidence in MaineDOT designs and estimates, reduce re-work and should result in cost savings and time savings prior to contractors bidding on projects. The use of a 3D model also improves the delivery of projects on-site as construction staff can see conflicts within the design during construction.

This digital delivery transformation at MaineDOT will also require training, technology changes, and new data integration across our applications. A mature data governance program is foundational to this accomplishment and therefore that initiative has been included as part of this grant application and will be part of the DIRIGO 2030 Roadmap.

#### 3. Project Outcomes

It is intended for this project to create the following seven outcomes outlined below that align with the program goals and advance Federal Highway Administration's BIM National Strategic Roadmap:

• Development of the DIRIGO 2030 Roadmap

The department will hire one or more consultants to work with asset management, project delivery, planning, operations and with data governance management teams to develop the DIRIGO 2030Roadmap.

The roadmap will be evaluated annually by MaineDOT and adjusted if necessary for implementation in the following year. The Department expects this roadmap to be an example for smaller states with central office control. It is also intended for the roadmap to govern the decisions in the other outcomes below.

Communication Plan

After participating in multiple peer exchanges with various states, it is clear to MaineDOT that a defined Communication Plan will be critical to a successful implementation of the roadmap. A matrix will be developed that outlines the necessary communications that MaineDOT must perform to build successful programs around digital delivery. The Plan must be developed with feedback loops enabled so that all stakeholders are engaged. Once developed, the Plan will be periodically analyzed and adjusted as necessary. MaineDOT expects it to serve as a model for other smaller state agencies with central office control.

• Data Governance for Digital Delivery and Asset Management

The Data Governance Committee will be stood up and operationalized in the department. A consultant will work with the agency to develop the program including organization structure, standards development, process development, communication plans and an information portal. Staff resources will be aligned to support the ongoing program of governance.

Standardization across data capture systems in planning, project delivery, construction, maintenance and operations are needed to enable seamless decision making. Data governance processes and standards need to be adopted to facilitate the documentation of standards, log decisions, develop data quality measures for each asset, identify the asset owners and the inventory of information and data dictionary needed to support stewardship of our assets. This standardization is foundational to the success of the DIRIGO 2030 initiative.

• Ancillary Asset Management Process Documentation

An asset management cradle to grave process evaluation will be performed for each ancillary asset class that is currently managed in our maintenance management system. This effort will work towards creating a department level Asset Management Data Dictionary that is accessible through mobile devices and on the governance information portal. It will encompass the update and expansion of the existing Inventory of Managed Assets Data Collection Manual and relate to the data standards that support the seamless transfer of the data through each step of the digital delivery process. This work will operationalize data governance processes, develop data quality measures for each asset and work towards linking construction contract pay items to the asset inventory processes.

• Pilot Project Experience and Technology

Maine DOT anticipates two pilot projects to be funded with this grant. The Department will use a large culvert project and a rural intersection project as our pilots. Both projects will utilize a 3D model which would cover roadway, alignment, Right of Way limits for construction layout. There will also be a limited 2D electronic plan set for each. No paper will be utilized for plans or documentation. The 3D models would also contain excavation, gravel quantities, traffic signal components, signs, lane usage, drainage structure details as well as any site-specific features would be identified as focus points for our collection of data for inspection, acceptance and digital as-built development.

Asset information to be collected as digital as-builts for each pilot project will be developed and determined as part of the roadmap and ancillary asset process documentation. The experience from the pilot projects is also expected to require adjustments to standards and procedures that will be used for subsequent pilot projects in later stages of the roadmap.

The department also expects to procure technology that will be used in the initial two pilots and subsequent pilot projects of DIRIGO 2030 as well if it proves to be sufficient.

• Improved Safety of MaineDOT Staff

There are an average of more than 500 crashes in Maine work zones each year, with an average of two fatalities and hundreds of injuries that occur as a result. Just one life lost or significantly impacted due to a worksite injury is one too many.

With the ability for asset information to be collected as the project is being constructed, there will no longer be a need to send Bureau of Maintenance and Operations workers to collect this information for asset management after projects are built, which is common practice currently. This will keep these workers from being exposed to moving traffic unnecessarily and the dangers that result from that exposure.

• Increasing Capabilities of MaineDOT for Digital As-Builts

In November 2023, MaineDOT representatives participated in a two-day Regional Digital As-Built Workshop by FHWA in Connecticut. One of the exercises was to map current capabilities for digital as-builts using a <u>Digital As-Builts Capability Maturity Tool</u> that created an assessment based on six Critical Success Factors: Awareness, Systems and Programs, Culture and Organization, Innovation Supportive Staff, and External Collaboration and Software, Hardware, Data Models and Exchange.

The capabilities were categorized as follows:

- Level 0 Siloed management
- Level 1 Ad-hoc Enterprise
- Level 2 Systematic Enterprise
- Level 3 Governed Enterprise

MaineDOT was at Level 1 or lower for most of the factors as shown on the following radar chart below (left). With the DIRIGO 2030 efforts, MaineDOT expects to further increase its capability in all areas to Level 2 or beyond, as shown on the radar chart below (right).





### 4. Program Goals and the Administration's Priorities Geographic Area

The project vision aligns with many of the goals outlined in Section A.4 of the Notice of Funding Opportunity as well as the administration goals listed in Section A.5 as described below and in greater detail in the Merit Criteria and Project Outcomes sections:

ADCMS Program Goals	DIRIGO 2030 Activity	
Accelerated State adoption of ADCMS applied	<ul> <li>Development of the DIRIGO 2030</li></ul>	
throughout the construction lifecycle (including	Roadmap <li>Data Governance for Digital Delivery for</li>	
through the design and engineering, construction,	Asset Management	

and operations phases) that maximize interoperability with other systems, products, tools or applications; boost productivity; manage complexity; reduce project delays and cost overruns; and enhance safety and quality	<ul> <li>Increasing Capabilities of MaineDOT for Digital As-Builts</li> <li>Pilot Project Experience and Technology</li> </ul>
More timely and productive information sharing among stakeholders through reduced reliance on paper to manage construction processes and deliverables such as blueprints, design drawings, procurement and supply-chain orders, equipment logs, daily progress reports, and punch lists;	<ul> <li>Communication Plan</li> <li>Data Governance for Digital Delivery for Asset Management</li> <li>Ancillary Asset Management Process Documentation</li> </ul>
The development and deployment of the best practices for the use in digital construction management;	• Pilot Project Experience and Technology
Increased technology adoption and deployment by States and units of local government that enables project sponsors to integrate the adoption of digital management systems and technologies in contracts and to weigh the cost of digitization and technology in setting project budgets	<ul> <li>Communication Plan</li> <li>Development of the DIRIGO 2030 Roadmap</li> </ul>
Development of guidance to assist States in updating regulations of the State to allow project sponsors and contractors to report data relating to the project in digital formats and to fully capture the efficiencies and benefits of ADCMS and related technologies;	<ul> <li>Communication Plan</li> <li>Development of the DIRIGO 2030 Roadmap</li> </ul>
Enhance worker and pedestrian safety resulting from increased transparency.	Improved Safety of MaineDOT Staff

The project aligns with the Administration's Priorities as noted in Section A.5 of the NOFO:

- **Safety:** The project is expected to increase the safety of MaineDOT staff in the field by substantially reducing the amount of exposure to roadside work.
- Climate Change and Sustainability: The project advances MaineDOT's efforts to reduce the lifecycle GHG emissions from the project materials and avoid adverse environmental impacts to air or water quality, wetlands, and endangered species through better data collection and integrated use to further advance our asset management approach toward preserving our transportation infrastructure.

• Workforce Development, Job Quality and Wealth Creation: As a result of the DIRIGO 2030 effort, the department will modernize our design processes and capability to transition to 3D models as the legal document and away from paper and electronic 2D plans to streamline contractor process which will reduce their costs and increase the skills of their workers by integrating this technology in both the private and public sectors.

## **III. Volume I: Technical Application Project Team Information**

## 1. MaineDOT Staffing

MaineDOT will have at minimum two dedicated staff members (yet to be determined) to coordinate and execute grant activities for DIRIGO 2030. These positions with responsibilities are as follows:

- Digital Delivery Manager (lead)
  - Primary contact for DIRIGO 2030 efforts at MaineDOT
  - Responsible for maturing and aligning digital delivery processes through developing and implementing DIRIGO 2030 Roadmap
  - Responsible for Develop and maintain communication plan
  - Coordinates and communicates with internal and external stakeholders construction industry, consultants
  - Communicate with executive management on resource alignment and changes required for process improvements
  - Manages overall budget and schedules for digital delivery efforts in the department
  - Responsible for development and deployment of digital delivery standards and procedures including data standardization
  - Manages grant efforts and necessary reporting
  - Develop performance measures for digital delivery program
- Digital Delivery Analyst (co-lead)
  - o Secondary contact for DIRIGO 2030 efforts at MaineDOT
  - o Develop criteria and select pilot projects with Manager
  - Plan and execute pilot projects
  - Review and approval of pilot project budgets and schedules and schedules
  - Coaching and support of Department staff for digital delivery efforts
  - Communicates with vendors with issues related to digital delivery product defects and enhancements and troubleshoots directly with developers and product leads
  - Change management
  - Execute communication plan
  - Works with management staff to ensure statewide consistency in the application of digital delivery standards, procedures and quality control for the Department
  - o Assess technologies for application in digital delivery

In addition to the two department positions, there will be two groups with members assigned parttime to advise the Digital Delivery Manager and steer DIRIGO 2030 efforts at MaineDOT: the Data Governance Committee and Digital Development for Asset Management Workgroup. These groups are defined below:

• Data Governance Committee

The Committee will be led by the Results and Information Office and include stakeholders in asset management, project delivery, planning, maintenance and operations management. A consultant with expertise in data governance will work to enable the office to mature data governance practices.

• Digital Delivery for Asset Management (DDAM) Workgroup

This Workgroup will consist of representation of the Bureau of Project Development, Bureau of Maintenance and Operations, Bureau of Planning, Results and Information Office and Executive Office along with other affected sections of the Department as warranted based on the roadmap milestones. The department's consultant(s) for DIRIGO 2030 efforts will also be part of this Workgroup as well as any external partners as warranted. The Chief Engineer will lead this Workgroup.

Current proposed members of the Workgroup that have been working on the DIRIGO 2030 initiative framework are Jonathan French, Engineering Data Manager and Shawn Smith, Construction Manager, Regional Program, both in the Bureau of Project Development, and Cindy Owings-Hutchison, Assistant Director, Results and Information Office. Joyce Taylor, Chief Engineer, will be the executive sponsor of the workgroup.

The Data Governance Committee will work on developing data quality metrics and standards. They will work with asset information owners to modernize the current ancillary asset manual in concert with efforts to enable data interoperability across the entire department. Data governance will build the department level data glossary with focus beginning on digital delivery related documentation. It will develop a 3-year plan for improving data literacy, data quality, data availability and maturing data governance practices at the department. The DDAM Workgroup will work on the development and implementation of the of the roadmap. They work within the data governance framework on prioritization of data and system related tasks to achieve the outcomes outlined above.

Figure 3: An organizational chart defining these working relationships



#### 2. Consultant Staffing

As mentioned earlier, the Department's consultant(s) for DIRIGO 2030 will also be providing staffing for this grant effort and will be part of the project team. The bulk of the funding from the grant will be dedicated to the consultant contract(s) and activities.

#### 3. Partners

MaineDOT will partner with the Associated General Contractors (AGC) of Maine to further spread ADCMS efforts throughout the construction industry in the state. MaineDOT has obtained a letter of endorsement from the AGC of Maine that can be found in the Letters of Endorsement section.

Likewise, MaineDOT will also partner with the American Council of Engineering Companies (ACEC) of Maine to implement ADCMS design practices throughout the state. A letter of endorsement from the ACEC of Maine can also be found in the Letters of Endorsement section.

MaineDOT will also be sharing information with New Hampshire DOT including holding peer exchanges to share ADCMS experiences. A letter of endorsement from New Hampshire DOT is included in the Letter of Endorsement section.

## **IV. Volume I: Project Readiness**

#### 1. Technical Feasibility

#### A. Current State of Processes at MaineDOT

• Asset Management

MaineDOT collects data in many formats that is not being used efficiently through the asset management lifecycle. Asset data also does not flow continuously through the asset management lifecycle, resulting in duplication and inconsistency. We have made efforts to bring our data together through our data warehouse and spatial analysis tools but have not aligned the processes with common data standards that will allow further data integration and better management decision making.

• Design and Plans Production

Currently, MaineDOT's main design deliverable from Project Development is a set of 2D plans for construction. These plans are both available to contractors and the public in both electronic (PDF) and paper formats. 3D models are created during the design process to create plans, but they are only available to contractors for informational purposes only and not used as a legal document. If desired, contractors must create their own model for construction that is checked and verified by the Department prior to construction.

• Construction and Field Documentation

The current state of practice of MaineDOT projects is to produce a 2D paper set of plans as the legal document. However, the Contractor is allowed to create a model by Section 105.6 of the department's Standard Specifications with approval. Once approved the Contractor will submit a survey plan and supply equipment (GPS rovers) and training to the Department's inspection team for inspection use.

MaineDOT inspection staff on projects that use a 3D model are utilizing GPS rovers for multiple inspection tasks. Tasks include recording location grade checks for excavation, rock, gravel, pipes and other items. The inspection staff are also using the rover with 3D model to quickly and accurately locate material tests for our testing personnel, saving time.

Our objective for GPS rover uses in the field is to reduce the time needed in the roadway, increase accuracy on location, quantities of materials, and develop a digital as built. Key asset information would be transmitted electronically to department asset management systems utilized by the Bureau of Maintenance and Operations.

• Data Governance

In 2023 staff from MaineDOT and MaineIT participated in a pilot test of a data governance maturity model being developed by NCHRP 23-23. The self-assessment highlighted real needs around formalizing a data governance program for the department that includes development of data stewards, agency policy gaps, need for more procedures around procuring and using data and technologies supporting data. Digital Delivery combined with maturing Data governance is a win-win combo for MaineDOT.

### B. Management of DIRIGO 2030 Efforts

The project manager and assistant project manager for grant activities will be the Digital Delivery Manager and Digital Delivery Analyst respectively. The manager will be the primary contact for the project and will manage the schedule, budget and necessary reporting. The analyst

will be the secondary project contact and will plan and execute the pilot projects with the various Programs. The analyst will also ensure statewide consistency with digital delivery standards, procedures and quality control that is created from the DIRIGO 2030 efforts.

As mentioned above, the Data Governance Committee and DDAM Workgroup will be consulted regularly, and especially for yearly evaluations of the DIRIGO 2030 Roadmap for changes in the business plan for implementation.

The roadmap will be evaluated yearly to develop an implementation plan for the following year. Any design and asset information requirements will be revised based on the experience from the pilot projects.

### 2. Project Schedule

The following schedule lists the expected milestones of DIRIGO 2030 for each calendar year. MaineDOT expects this grant to fund activities from Q3 2025 through Q4 2028.

Droiget Milestones	Projected	Projected
rioject Milestones	Degin	Ella
Project Initiation	Q3 2025	Q3 2025
DIRIGO 2030 Roadmap	Q3 2025	Q4 2027
Communication Plan	Q3 2026	Q4 2028
Data Governance for DIRIGO 2030	Q3 2025	Q3 2028
Asset Management Process	Q3 2026	Q1 2028
Pilot Projects (Equipment, Training, Technical Assistance.)	Q3 2026	Q4 2028

### 3. Project Risks and Mitigation Strategies

There are two risks that could impact this project: staffing turnover and the need to replace multiple aging systems in the department.

Staffing turnover is a reality that every State DOT is having to face due to the aging workforce and the competition for workers. Workers will both be retiring and leaving the department for other employment opportunities. This could pose a risk of having institutional knowledge of DIRIGO 2030 efforts potentially be lost with these employee departures.

The Communication Plan developed as part of the roadmap will therefore be key to mitigate any loss of knowledge. The Plan will include how new employees will receive information about the DIRIGO 2030 initiative as part of their orientation. A Microsoft SharePoint site will also be created as the central location for department communications and information about DIRIGO 2030. The site will be accessible by employees to reinforce critical knowledge as part of that Plan.

Having the members of the DDAM Workgroup and Data Governance Committee retain institutional knowledge will also mitigate against employee departures. There are potential departures of concern in the Executive Office which will be likely be occurring with a new administration set to arrive in 2027 due to the term of the current governor expiring in 2026. These two groups will work with the new incoming administration to continue DIRIGO 2030 efforts.

In addition, multiple department systems are aging and due for modernization such as the department's LRS system and current 2D as built and property plan archive, MEPLANS. The Information Strategic Plan workplan for future-states of these systems will be coordinated with DIRIGO 2030 efforts to ensure all requirements to fulfill digital delivery goals are considered including proper integration and flow of information.

## V. Responsiveness to Merit Criteria

MaineDOT's application has met the qualifications to be "Highly Qualified" by addressing all six Criterion and Evaluation Factors 1 and 2 for Criterion #1 and #2. Each Criterion and how MaineDOT will address the Evaluation Factors are described further below:

## 1. Criterion #1 – Technical and Management Approach

The project builds upon an existing framework currently underway at MaineDOT. The first two phases of the department's Strategic Information Plan are complete with expected final plan to be delivered in January of 2025. This strategic plan is integrated with the digital delivery efforts by the stakeholder involvement in each phase of the planning. The technology strategic plan encompasses evaluation in the following areas:

### Figure 4: MaineDOT Strategic Information Areas of Focus



The results of the project will fill a critical need for MaineDOT and support future phases. The MaineDOT Information Strategic Plan will inform all other phases of DIRIGO 2030 as needs for technologies and improved processes continue to be understood.

A team of cross-disciplinary staff participated in peer exchanges in 2023 to learn from other states what they were doing and what it would take to digitally enable our construction related processes. Participation in the peer exchanges was the first step in enabling team members to look to the future of digital delivery in the department. This project will advance MaineDOT's ability to

address critical challenges in implementing the use of this type of technology. The timeline of MaineDOT's efforts can be found below:



Figure 5: Timeline of Digital Delivery Learning at MaineDOT

#### 2. Criterion #2 – Promotes efficient information sharing among stakeholders

3D models with included asset types and attribute information included will be part of the pilot projects of DIRIGO 2030. This attribute information will be directly transferred electronically to MaineDOT's asset management systems upon construction staff acceptance, reducing the need for department staff to collect this information after the project is constructed.

Model information supplied directly to the contractor for construction will eliminate the need for the contractor developing their own model creating a time and cost savings.

Documentation will be entirely electronic for the pilot projects with quantities determined from the model. Electronic and digital as-builts will also be produced.

The DIRIGO 2030 Roadmap will also include phasing out of paper documentation (where not mandated by statute/outside entity) thereby eliminating the use of paper documentation.

#### 3. Criterion #3 – Accelerate technology adoption and deployment

The DIRIGO 2030 Roadmap and Communication Plan can both be used as an example for smaller State DOTs with central control. Municipal Planning Organizations may also use these deliverables to serve as an example to plan and implement their digital delivery efforts.

Project outcomes could lead to lower bid prices because of having verified data from the 3D model. It is estimated that savings of between \$20-35K may be seen per project.

Also, other state agencies, local maintenance agencies, and public utilities could all benefit from up-to-date asset information.

#### 4. Criterion #4 – Safety

Improving safety is critical to the success of MaineDOT's mission, especially the safety of its workforce. One of the outcomes of DIRIGO 2030 is that Bureau of Maintenance and Operations workers will no longer need to collect data for certain asset types from the pilot projects that have been completed. This will reduce the time that these workers are on the roadway and exposed to traffic.

### 5. Criterion #5 – Workforce Development, Job Quality and Wealth Creation

MaineDOT's partnerships with others such as AGC Maine and ACEC of Maine will provide opportunities for joint training for the technology and processes used in the DIRIGO 2030 pilot projects.

AGC Maine has a yearly "Construction College" where digital delivery processes and technology could be demonstrated to attendees by MaineDOT staff.

Also, digital delivery efforts could be a recruitment and retention tool for both construction and design staff in the public and private sectors in Maine.

#### 6. Criterion #6 – Environment, Climate Change and Sustainability, and Equity

The asset information that is collected in DIRIGO 2030 pilot projects could include environmental and historical data for avoidance in future projects.

Also, with better contractor planning due to the existence of a 3D model, overall machine time should be reduced in the pilot projects compared to a conventional project with 2D plans.