AECOM
Delivering a better world

Asset Management

Delivering Infrastructure Sustainability
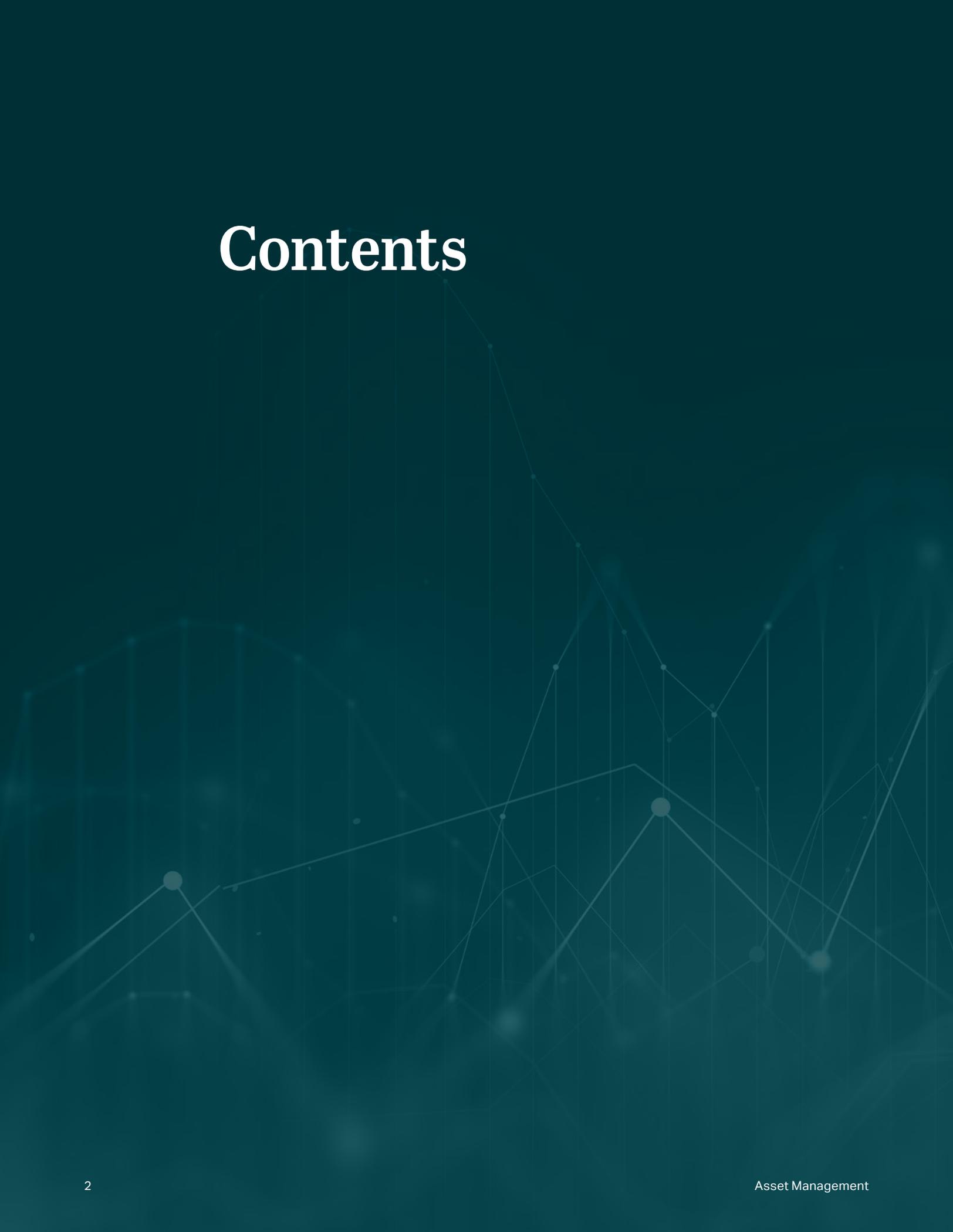
Contents

Green Infrastructure

Value Through Asset Management

Infrastructure owners are facing an urgent need to adapt to changing environments. From sustainability to resilience, profitability, reputation, and compliance with regulatory targets, the challenges are pressing. AECOM helps owners use asset management to make the best investment decisions and realize the maximum value from assets through the following services:

– Policy and strategy development
– Life-cycle delivery
– Asset management program development
– Risk management and performance improvement

Driving the achievement of infrastructure owner objectives through development and implementation of asset management systems

Using our understanding of the asset management landscape, from agency-customized delivery methodologies to the Asset Management ISO 55000 series, AECOM is helping infrastructure owners initiate and develop asset management systems. This includes supporting the alignment of financial and non-financial functions so that value is obtained from the assets, for the infrastructure owners, their customers, and other stakeholders.

Guiding infrastructure owners from setting their asset management strategy through the planning process, and by assisting with asset management policy, objective definition, and formulating asset management plans, we provide clear views of how assets can be best managed on a day-to-day basis to achieve organizational goals.

Optimizing decision-making to drive best value

Establishing asset management decision-making processes that reflect customer and stakeholder needs and define value are some of the biggest challenges that infrastructure owners face. The asset management decision-making spectrum covers multiple objectives and considers whether to defer action, rehabilitate, replace, or build a new asset based on business and regulatory drivers.

Drawing on our experience, AECOM can help infrastructure owners understand the bigger picture, enabling them to make better informed decisions, balancing risk, cost, and performance, in the pursuit of best value.

Balancing risk, cost, and performance throughout capital project delivery

CHALLENGE
Managing the activities and associated risks of asset life-cycle delivery is essential for an infrastructure owner to achieve their objectives.

SOLUTION
AECOM leverages our understanding of effective capital project delivery, delivering projects in innovative ways while extending the whole-life value, by:

– Mitigating the effects of factors such as energy costs, water leakage, sewer flooding, and aging assets.

– Applying our expertise in areas such as condition monitoring, environmental management, sustainable development, asset inspection, energy management, operations and maintenance support, asset rationalization, and asset disposal.

– Balancing between risk, cost, and performance is achieved at all stages of the asset's life.

Knowing when a life-cycle stage should end and another begin can help infrastructure owners achieve considerable savings, with modeling of asset data and analysis crucial to successfully implementing asset management plans.

Using digital processes to manage asset information can inform decision-making

CHALLENGE
Observing large amounts of data being generated throughout an asset's life.

SOLUTION
AECOM creates new ways to manage this information, translating it into knowledge that informs owner strategies. Through development of integrated, consistent processes and workflows, we use digital engineering to generate opportunity for more informed decision-making.

Building an asset management culture through workshops, training, and hands-on advice

CHALLENGE
Delivering an effective asset management strategy depends on engagement from an infrastructure owner's team.

SOLUTION
AECOM helps increase asset value by supporting the asset management decision-making process. Encouraging strong leadership support of asset management practices, which has been shown to increase organization-wide engagement.

Mitigating risks and improving performance through asset management solutions

CHALLENGE
Seeking to identify the optimum blend of cost, performance, and risks over the life cycle of assets.

SOLUTION
Infrastructure owners need to develop risk management processes which capture all risk factors in a common way, as well as provide assurance to stakeholders of their asset management activities and performance monitoring. AECOM assists infrastructure owners achieve better asset stewardship to become more resilient and sustainable. Providing assurance to stakeholders of owner asset management activities and performance monitoring. Capturing all risk factors—reputational, environmental, social, economic, political, technological, legislative, regulatory and safety—in a common way by supporting operational, financial, and technical managers in delivering asset management solutions with coherent alignment of financial and non-financial risks in all business activities.

We Support

An organizational culture of continuous improvement that is at the core of effective asset management.

Infrastructure owners who apply risk-based decision-making to appraise investment options, apply whole life-cycle costing principles, and plan for contingencies.

Use of emerging technologies that enable capture of real-world data in new ways—data processed to knowledge combined with risk mitigation as the foundation of effective asset management.

Why Asset Management?

AECOM understands that many of our clients are under increasing pressure to gain additional value from their assets. We help our clients plan, design and construct many of their assets and is perfectly positioned to help clients build their asset management systems.

Asset management is the systematic approach to the realization of value of an organization's tangible and intangible assets over the entire lifecycle. Asset management seeks to maximize "value from assets" to best achieve strategic goals. Wider benefits may include:

– Improved financial performance

– Informed investment decisions

– Better management of risk

– Demonstrated social accountability

– Improved services and outputs

– Enhanced reputation

– Improved organizational sustainability

Maintenance Cost Reduction

Organizations without asset management often focus on "worst first"—assets are replaced when they fail within current budget allowances. AECOM's asset management team can identify and analyze alternative preservation, rehabilitation, and replacement options that focus on preservation over the longer term, yielding an overall net savings in life-cycle costs.

Holistic Framework

The AECOM asset management team collaborates with management to consider a wide range of decision factors, including:

– Financial costs, such as the acquisition and retirement costs of assets

– Economic costs, such as environmental effects, social costs, and political effects

## Improved Management Insight

AECOM provides a comprehensive, integrated framework for undertaking analysis of alternative budget, maintenance, and capital investment strategies. We help define and support a structured framework for investment planning. We seek the most cost-effective solutions for delivering acceptable levels of service over the entire asset life cycle while minimizing risk.

How AECOM Implements Asset Management

The 4-Pillar Approach

AECOM's asset management approach draws on the guidance of the Institute of Asset Management, International Infrastructure Management Manual and the International Standards Organization. Thus, we have combined the best of all the processes to develop our 4-Pillar approach. Our clients are becoming increasingly sophisticated in asset management especially after using the concise methodology that we have developed.

4-Pillar Approach
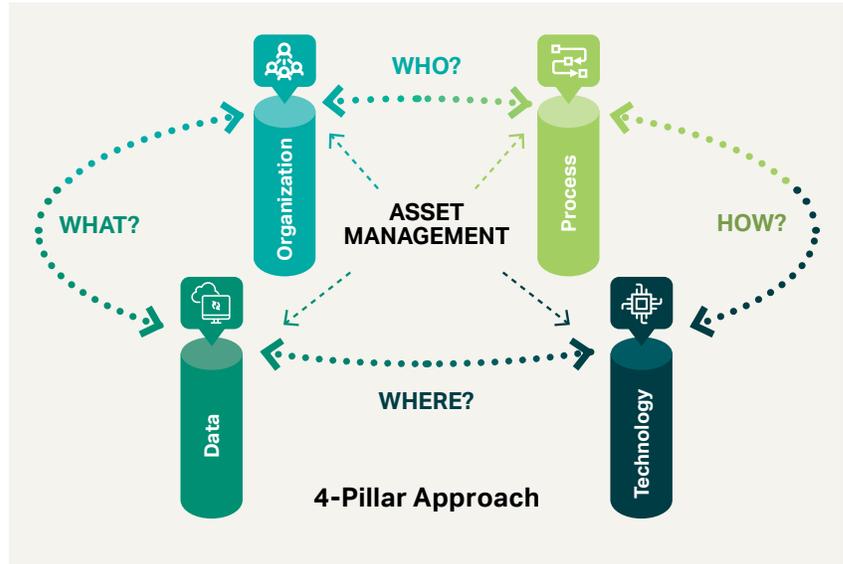
PILLAR 1 — Organizational and People

Challenge: Successful asset management requires people to work in teams to create organizational structures that are supported throughout.

AECOM Solution: We have a robust change management program, have training experience, and have assisted many agencies to understand and learn how to support asset management from the top down and bottom up.

PILLAR 3 — Business Processes

Challenge: Moving from reactive to proactive maintenance.

AECOM Solution: We help organizations to build objective backup that demonstrates the benefits of proactive care and we assist with implementation, generally in incremental steps.

PILLAR 2 — Data Collection and Use

Challenge: Clients are collecting so much data that it can be overwhelming for them to understand what is truly needed and how to use it.

AECOM Solution: We know how to collect data efficiently and effectively and set data hierarchy. We have extensive experience collecting and assessing a wide range of assets and data.

PILLAR 4 — Technology

Challenge: How to select one of the many great software packages that aid in asset management.

AECOM Solution: We know that one size does not fit all, and we have experience with a wide range of software packages. We help customize the right fit for any organization, including maximizing programs already in place.

Pillar 1
Organizational and People

Infrastructure owners often struggle to promote asset management at various levels within their organization, as it frequently is viewed as a single department's role. AECOM supports infrastructure owners in their asset management journey through workshops, training, and hands-on advice, enabling them to motivate and engage teams through changes to processes and organizational structure.

Training and Change Management

The evolution of an organization in adopting and integrating new asset management procedures often requires change management.

Two critical components of communication protocols should be planned during change management:

– **Leadership Communications:** The support and clear vision of leaders promotes implementation of an asset management plan to maintain goals and objectives.

– **Workshops and Training:** These increasingly are run online. Keeping participants engaged who are not in the same room sometimes can be a challenge, although exercises and tools can help keep participation focused. AECOM has developed a virtual reality consultation tool that allows content to be shared in an engaging way.
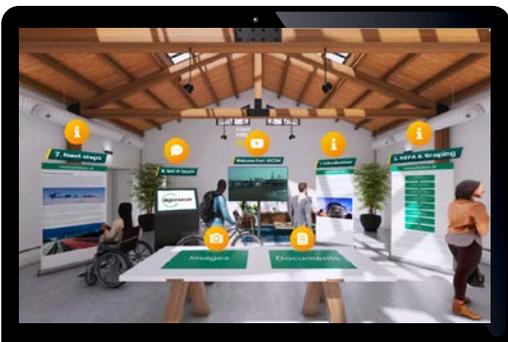
AECOM's virtual reality interactive consultation rooms can be used to articulate the process and solicit feedback from multiple audience types.

Change Management Plan

A change management plan establishes the strategy for implementing changes and provides guidance for adoption of changes, including the following:

– **Vision Setting:** Stakeholder groups confirm overall objectives, establish channels of communication and decision-making processes, review and approve the vision for the change management plan, identify departmental change agents, and assess overall change readiness.

– **Environmental Scan and Data Analysis:** Through surveys and data requests, we simultaneously undertake gap analysis of readiness for change in identified stakeholder groups.

– **Integration Framework:** Differentiation between the business transformation aspects are defined by the stakeholders and the processes and goals of the plan.

– **Planning and Goal Setting:** Clear and defined metrics and goals are necessary.

– **Measures of Success:** We establish priority metrics as measures of success, focused on the transformational, operational, and technical impacts of the asset management system rollout. These measures include project management aspects, such as meeting change activity dates and milestones as well as integrating operations and the financial and cultural goals set by the plan.

– **Organizational Model Development:** This development includes the project governance structure in what is needed to make decisions, establishes guidelines and policies for operation; identifies key roles and resources for who will help implement the plan; and defines clear communication channels.

- **Change Initiatives Prioritization and Timeline:** We outline sequencing of critical milestones and activities required to implement the plan, including meetings and engagements with key stakeholders, types of communications, deliverables to be created, and by who and when information will need to be distributed to specific audiences. Feedback loops are built into the plan, to provide continuous improvement. Development of the change plan requires input and alignment from key stakeholders and serves as the road map for change implementation.
- **Standard Performance Reporting Dashboard:** All the aspects of the plan are formatted into standardized reporting documents, and a dashboard is used for monitoring throughout the implementation process. This confirms that goals are measured systematically and corrections are made as necessary to meet goals.

Challenges and Considerations

Our deep experience in the development and implementation of Change Management projects has enabled us to anticipate and develop mitigation strategies to address most of the common challenges experienced in Change Management programs.
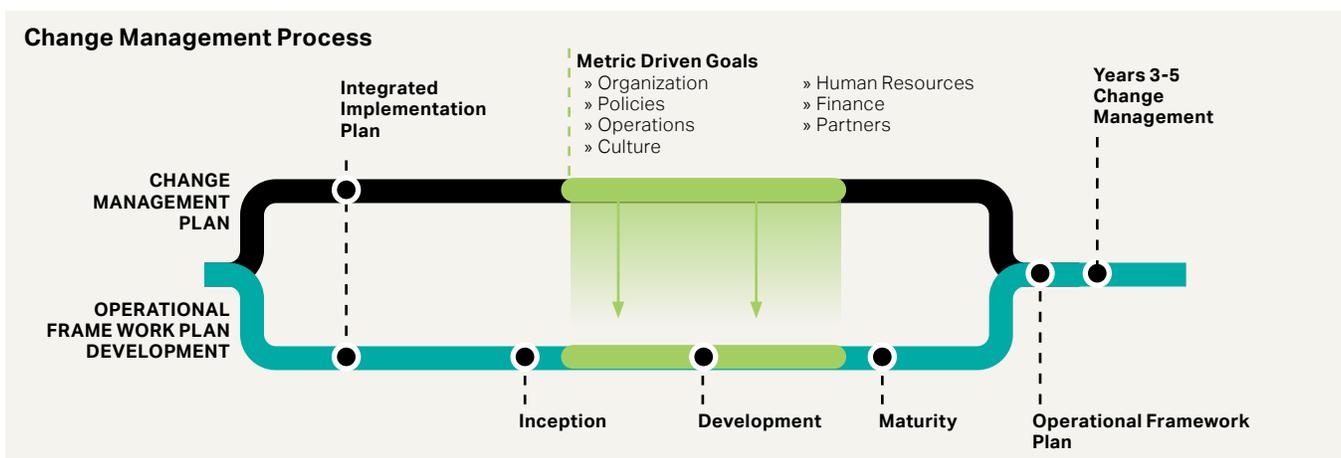
Training

Working in close coordination with the organization's Change Management planning, our team implements an asset management system training program to provide materials and support for a smooth rollout.

AECOM has experience in multiple formats to accommodate different learning styles and remote learning. The features include:

- Visual training materials
- Identification of a Train-the-Trainer team
- Development of key performance indicators, including direct and indirect feedback tools

- **Identify and Train a Train-the-Trainer Team:** The most excited, tech-savvy individuals on staff are great ambassadors to drive organizational changes, and AECOM helps train them with the tools they need to continue the vision of asset management.
- **Develop Key Performance Indicator Tools:** AECOM helps determine key performance indicator (KPI) tools. The tools measure success in meeting established goals and objectives in the following ways:
  - Direct Client Feedback Tools:
    - Online user surveys
    - Feedback from the Train-the-Trainer team
    - Online portal that is used to collect user requests/feedback on tools in one central location
  - Indirect Tools:
    - Tracking log-ins by user type, frequency, and duration to observe which tools are being used most frequently

AECOM is an Institute of Asset Management (IAM) Corporate Member, Endorsed Trainer, and Endorsed Assessor. Being an IAM Endorsed Assessor means that we train staff to provide quality service to clients when advising on development of an organization's asset management system that conforms to the requirements of ISO 55000.

AECOM's Asset Management Learning Portal provides access to e-learning materials and webinars that have been developed by global leaders and IAM Endorsed Trainers. These prepare individuals to pass the Principles of Asset Management exam, to earn an IAM Certificate.

Change Management Process

Integrated Implementation Plan

Metric Driven Goals
» Organization
» Policies
» Operations
» Culture
» Human Resources
» Finance
» Partners

Years 3-5 Change Management

CHANGE MANAGEMENT PLAN

OPERATIONAL FRAME WORK PLAN DEVELOPMENT

Inception   Development   Maturity   Operational Framework Plan

Pillar 2
Data Collection and Use

Every infrastructure owner operates within an environment of incomplete data. We address data management challenges by collecting the right data at the right intervals and storing it appropriately for easy access to inform current and future investment decisions. This enables infrastructure owners to create and maintain an end-to-end, whole-asset library, and to capture every detail of an asset from design, build, commission, maintain, and rebuild through decommissioning, which realizes significant savings throughout the asset's life cycle.

AECOM is well suited to perform a wide variety of inventories and condition assessments, often the largest effort of any asset management program. Our team is equipped, experienced, and capable of scaling up to meet any project's schedule and delivery needs.

Our digital practice and technology experts have decades of experience in incorporating digital technologies and delivery methods into intelligent modeling, using GPS, conventional survey, LiDAR, photogrammetry, databases, and Building Information Modeling (BIM) technologies. Our team is trained to recognize and comprehend the most intricate details that may significantly impact project decisions during the planning, design, construction, and maintenance phases.

By leveraging our enterprise agreements with leading software vendors—including Autodesk, Bentley, ESRI, and Leica Geosystems—AECOM is on the leading edge of project technologies and delivery. Equipped with nine laser scanners (Leica P40, RTC360, BLK2GO and GeoSLAM Zeb-Revo), six combined robotic total stations/laser scanners (Leica MS60), and three UAS platforms, our team can scale to meet the needs of even the largest programs.

Our team has successfully delivered the following asset management projects in nine countries, including the U.S. and Canada, and spanning four continents:

– **Laser Scan to BIM:** architecture, structure, mechanical/electrical/plumbing (MEP), Building Owners and Managers Association, asset management, digital twin, photogrammetry

– **UAS/Drone:** visual inspection, orthoimagery, mapping thermal photogrammetry

– **Visualization:** virtual reality, augmented reality, site walk

– **Land Surveying:** topography, property/ALTA surveys, subcontractor liaison/management
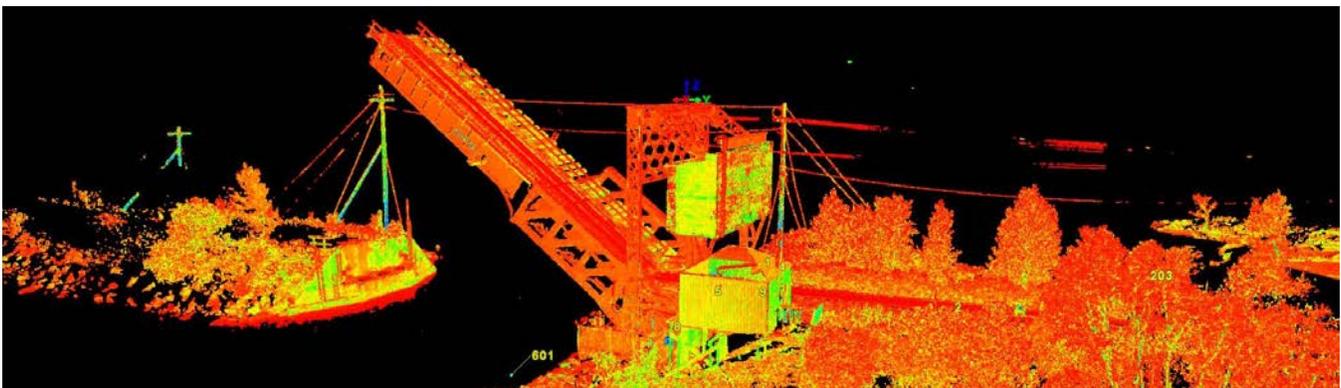
Complex Bridge Structure (Laser Scan)
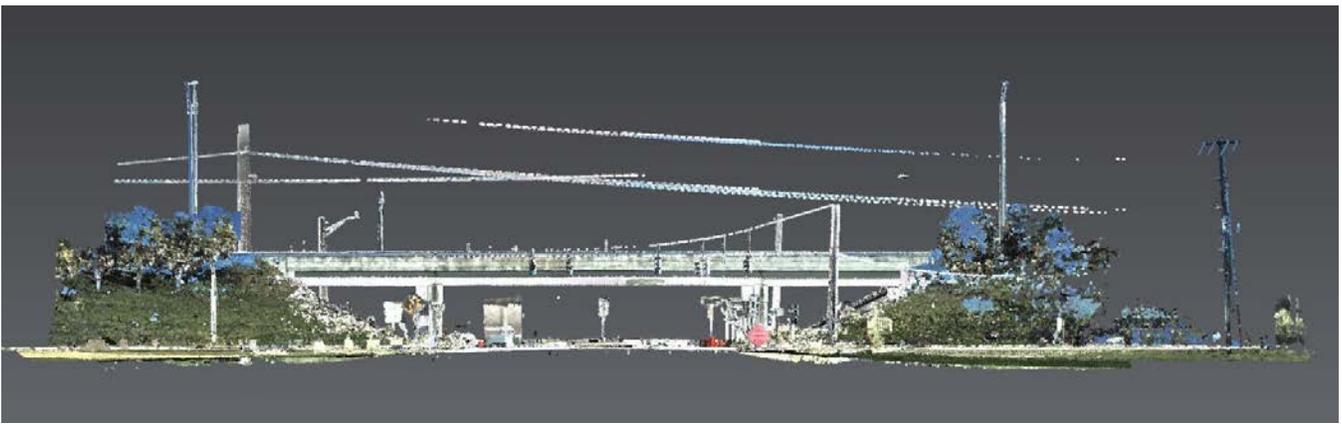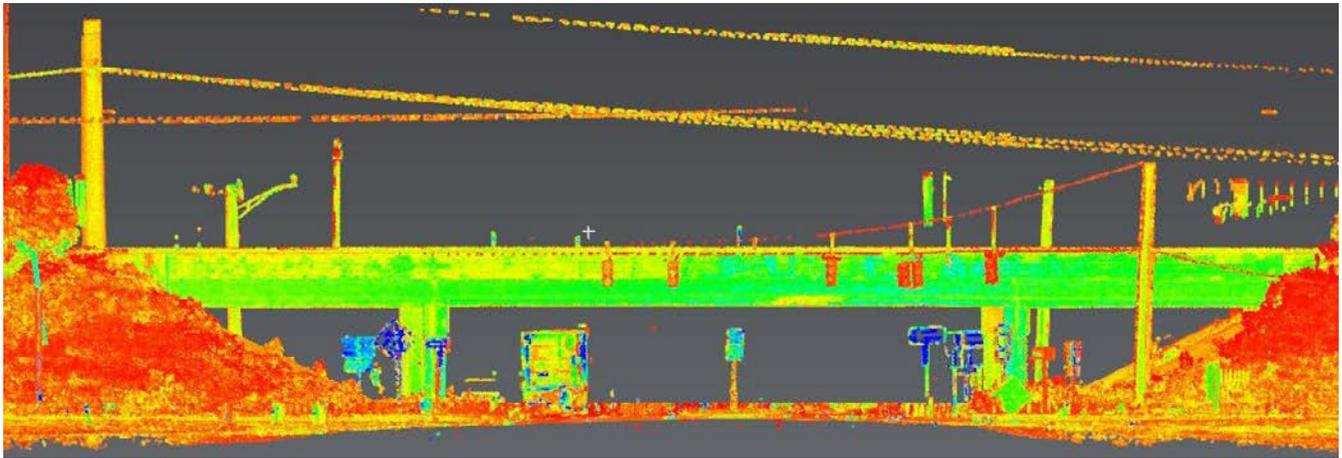
MicroStation View: Laser Scan processed with TopoDOT

AECOM Assessor Overview

AECOM Assessor is a mobile software application that was developed internally for use on various facility condition assessment (FCA) and asset inventory projects. FCA projects require field assessors to capture a multitude of data quickly, accurately and consistently, often under strict schedule constraints. AECOM Assessor's streamlined user interface, camera functionality, and automated quality controls optimize the mass data collection process, allowing field teams to cover large areas efficiently and capture data with increased accuracy. The resulting database contains fewer errors and greater consistency, reducing the time required to perform post-site data cleanup and edits.

Pillar 3
Business Processes

Using the latest decision-making and optimization tools and frameworks, including our own in-house tools, AECOM helps asset owners to align operational and maintenance decisions with their asset management strategy and organizational objectives. We use many varied asset management programs. Our multi-dimensional, bottom-line approach involves taking better account of non-financial information, such as natural, social, and human capital, in organizational decision-making factors. This facilitates recognizing and responding to emerging risks, while creating opportunities to enhance efficiency and resilience.

Decision Support Tools

Decision support tools are an analytical platform to support strategic decision-making on how large an infrastructure renewal and replacement program should be and what the allocations should be by asset category. With sufficiently current, precise, and accurate data, they support tactical decisions about specific assets in which to invest.

The application of decision support tools is a key element in development of many asset management plans and in reporting asset management performance targets. AECOM applies government and commercial off-the-shelf software and our proprietary cloud-based PlanSpend platform to determine infrastructure renewal needs and project asset condition and performance in different funding scenarios.

AECOM works with asset owners to get more life out of their assets, reduce business risk, and optimize asset maintenance and renewal spending by:

– Capturing reliable asset condition and risk data to forecast future expenditures;
– Optimizing business processes that deliver better outcomes on the ground and to the bottom line;
– Using tailored analytics tools and technology solutions; and
– Working collaboratively and exchanging knowledge and skills with clients

What Questions Do the Decision Support Tools Address?
– What is the State of Good Repair (SGR) backlog? What assets are already beyond their useful life and what is their replacement value?
– What are future annual SGR needs? What assets will reach the end of their useful life in each future year and what will be their replacement value at that time?
– What is the impact of not fully funding the SGR backlog and future SGR needs? How will this affect future asset conditions and performance?

How the Tools Work
Decision support tools age assets every year over an analysis period. Assets exceeding their useful life are placed in a queue for prioritization. In each year, spending constraints are applied, and asset renewals and replacements are funded in priority order. Renewals and replacements that cannot be funded are deferred to subsequent years, and their priority increases with delayed investment.

Financial Planning

Sources and Uses of Funds Analysis

AECOM applies SGR analyses to support development of an asset owner's financial plans. The focus of financial plans is a sources and uses of funds analysis that integrates annual projections of expenses and revenues, both capital and operating.

The AECOM cash flow model provides the ability to rapidly examine several conventional and innovative financing structures and project delivery methods. The model generates useful graphic reports, summarizing underlying assumptions and projections that assist in presenting the results to technical staff, senior management, elected officials, and the public.

AECOM supports asset owners through development of long-range financial plans that demonstrate the financial capacity and commitment of the sponsoring agencies.

Conceptual Model Integrating Asset Management and Financial Planning

By incorporating cash flow analyses, AECOM developed a comprehensive conceptual approach to integrate asset management with financial planning. The asset management elements include both the analytical and business process aspects.

The financial planning elements address operating and maintenance (O&M) modeling, infrastructure capital programming, planning for major capacity improvements, and development of pro forma financial plans. This approach applies tools already developed to support the planning process and recently developed analytical concepts that support contemporary asset management best practice. This approach also leverages the understanding that asset owners have regarding physical asset condition, maintenance experience, and market response to service quality. It applies detailed data and analysis where available and/or the insights of knowledgeable asset managers where not available.

Asset Management, Predictive Failure and Analytics

We analyze performance data to model the deterioration and failure of linear infrastructure assets, helping drive effective maintenance and asset management strategies. Predictive analytics enable clients to harness the power of their data, using the Internet of Things, information processing technologies, and intelligent algorithms to make predictions about unknown future events.

Following the catastrophic impact of Hurricane Irma on Florida in 2017, AECOM developed a digital model to help community officials better estimate the overall impact of hurricane damage and accelerate relief and recovery. As part of the COMPASS Joint Venture, AECOM developed the Substantial Damage Data Analytic Model Application (DAMA) for the Federal Emergency Management Agency, to assist State and community officials, as well as disaster response and recovery agencies. The DAMA allowed them to identify substantial damage to residential and non-residential structures. The model also provided information to determine more quickly how many field teams needed to be deployed and where they should focus their efforts. The DAMA uses data available before or during a disaster event, to model and predict damage estimate outputs. It predicts individual structure damage by using multiple datasets, which can be combined with modeled depths of flooding, recorded structure values, and known building materials to create an assessment.

Sample SGR Output
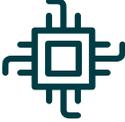
Pillar 4
Technology

AECOM is improving the process of collecting, storing, interpreting, and conveying meaning from data. Our close integration with subject matter experts in many scientific and engineering disciplines makes our solutions better integrated and capable of meeting client needs. Our expertise helps clients realize objectives, achieve efficiencies, and gain more value from their data.

Implementation Process

Requirements Gathering. AECOM's subject matter experts, IT professionals, and business analysts work with owner teams to turn "wish lists" into system requirements. Our real-world exposure enables us to identify, refine, and prioritize client-specific requirements using our proven methodology.

Business Case/Return on Investment. We help develop the business case required to get the organization's commitment and alignment on project vision. As agencies move beyond compliance, we help "sell" the project internally by identifying how these systems can be used to improve performance and sustainability.

Use Case/Business Analysis. Our team establishes enterprise asset management (EAM) implementation projects to engage the full range of stakeholders. We believe that the system should enable optimal, desired workflows and processes instead of having inflexible systems dictating them. The key to our process is capturing the types of users and their expected interactions with the selected system. Using this approach, we deliver systems with a high degree of user acceptance, making those systems sustainable.

System Selection Support. AECOM is vendor neutral. We have established relationships with the leading vendors in this space, and can help identify the best options, saving valuable time and resources. Based on the specific requirements and use cases for the system, we develop scripted demonstrations, designed to help recognize comparative benefits and potential shortcomings of vendor offerings. We also can provide custom software solutions that build on platforms, such as SharePoint, Sitefinity, or Drupal, or we can build from the ground up.

System Conceptual Design. The design may focus on determining which modules and elements of those modules will be necessary to meet the requirements. At the design stage, the project team's ability to efficiently and cost effectively make changes is greater than at any other time. Thus, our team works closely with the client to identify use cases, and the design focuses on delivering on those.

System Implementation. During this configuration phase, AECOM works to set up the solution, to model company hierarchy, business entities, user profiles, and embed the required business logic necessary to process and report the data.

Content Development, Integrations, and Migrations. We work with the client to integrate or link existing systems with the EAM system, to enhance data flow and take advantage of software already in place (e.g., human resource systems, work order management) and valuable historical data.

Report Building. We design and build tailored reporting and dashboard systems that integrate with existing reporting software for quick, cost-effective business enhancements.

Training. AECOM starts the training process during the initial steps of the project and continues throughout. Our training approach is to focus on the way the client wants to use the system. We want our clients to be comfortable and confident that they can maintain their systems independently.

Testing. Test cases reflect desired workflows and business rules. We use a "traceability matrix" approach that allows verification and validation that the agreed to requirements have been met.

Operation and Maintenance Support. Although our philosophy is to train client teams to be able to operate and maintain their own asset management system, we are willing to provide post-implementation O&M support as a transitional or longer term service.

Software Applications

AECOM can develop in-house software to assist with asset management and also can implement third-party software, such as Agile Assets, Maxino, Cartegraph, SEAMS, Deighton, Probit, and Fulcrum.

PlanSpend

PlanSpend is AECOM's flexible Enterprise Asset Management System software, designed to aggregate data from all asset types, including existing data systems (maintenance and work order tracking). It was developed by our experts to provide visibility across a complete vertical and horizontal asset portfolio, by collecting data, identifying projects, estimating costs, quantifying impacts, and objectively comparing alternative scenarios.

SGR Tool®

This tool supports agencies in developing asset-based projections of SGR backlog, future SGR needs, and future condition of assets, as well as operating performance in fiscally constrained scenarios. The underlying goals of such an examination are to develop a compelling justification for funding the capital program and better anticipate future capital funding needs.

TRACER™

AASHTOWare Project TRACER is a parametric cost estimating tool, created and developed in conjunction with the American Association of State Highway and Transportation Officials (AASHTO) to help plan and budget transportation construction, renovation, and demolition projects at the preliminary design and scoping phases.

PACES®

The PACES software is a parametric cost engineering tool used to plan construction and renovation costs for facilities and infrastructure. PACES uses construction criteria and pre-engineered model parameters to generate construction cost estimates, even with limited design information.

RACER®

AECOM's RACER software is a parametric cost estimating tool, specifically developed for environmental remediation and restoration projects.

AECOM Asset Management Project Experience

Asset management programs often have multi-faceted needs. Samples of asset management projects and their application to AECOM's 4-Pillar approach in **key markets** is presented next.

	PROJECT	CLIENT
Airports	Denver International Airport Enterprise GIS	Denver International Airport
	Milwaukee County General Mitchell International Airport GIS, Asset Management, SMS, and Cityworks©	General Mitchell International Airport, Milwaukee
	Charlotte Douglas International Airport Asset Management	Charlotte Douglas International Airport
	King County International Airport, Seattle, WA	King County International Airport
Bridges	Bridge Asset Management Plan	Massachusetts Department of Transportation (MassDOT)
	Engineering Guide to Bridge Asset Management	Austroads
	FASTER Bridge Enterprise Program	Colorado Department of Transportation (CDOT)
	Bridge Asset Management Program	Maryland Transportation Authority (MDTA)
Pavement	Pavement and Asset Extraction	Delaware Department of Transportation
	City and County of Honolulu Pavement Management Program	City and County of Honolulu, HI Department of Facility Maintenance
	Facility Site Assessments – Pavement Program	BNSF Railroad
	Pavement Condition Study at Multiple Bases	U.S. Air Force
	Baltimore/Washington International Thurgood Marshall Airport	Maryland Aviation Administration
Ports & Waterways	Infrastructure Asset Management Services	Port of Melbourne (PoM)
	Geospatial Security Mapping System (GSMS)	Port of Oakland
	Port of Los Angeles Wharf Inspection & Repair Program	Port of Los Angeles
	Environmental and Engineering Assessments	Maersk Facilities
Power	WMATA Enterprise Energy Monitoring System	Washington Metropolitan Area Transit Authority (WMATA)
	New York Power Authority Robert Moses Power Plant Life Extension and Modernization Program Management	New York Power Authority
	Fresno Country Rural Transit Agency Grid Infrastructure Assessment	Fresno County Rural Transit Agency
	ComEd AI/ML Asset Inspection Management Pilot	Commonwealth Edison (ComEd)
Roadways	Asset Management and Capital Planning	Illinois Tollway
	Barrier End Terminal Inventory and Asset Project	Minnesota DOT
	ITS Statewide Traffic Signal Inventory	Indiana DOT
	Asset Management System	Cook County Department of Transportation and Highways

PROJECT DURATION	LOCATION	Government Standards	PILLAR 1 Organizational & People						PILLAR 2 Data				PILLAR 3 Business Processes				PILLAR 4 Technology
			RFP Authoring / Project	Risk Assessment	Strategic Planning	Capital Investment Planning	Regulations & Compliance Support	Enterprise / Multi-Department	Data Collection	Condition Assessment	Integration of Design Files/BIM in Asset	Data Integrations	Gap Analysis	Workflows	Asset Valuation & Cost Estimation	Work Orders / O&M	Software Technology
2015–2024	CO	■		■	■	■			■	■	■	■			■	■	Revit, Maximo, TRIRIGA, AECOM Assessor
2009–ongoing	WI	■		■	■		■	■	■	■		■	■	■	■	■	Cityworks, Esri ArcGIS, Insights for ArcGIS
2014–ongoing	NC	■				■	■	■				■	■	■	■	■	Cityworks, Radley, Esri, ArcGIS
2015–ongoing	WA	■					■	■	■	■		■	■	■	■	■	Cityworks, Esri ArcGIS, Insights for ArcGIS, Power BI
2019–ongoing	MA		■		■			■		■	■	■	■	■			■	4D Bridge Management System; AASHTO BrM
2017–2021	Australia			■	■	■	■		■	■	■	■	■	■	■			
2010–ongoing	CO	■	■	■	■	■	■	■	■	■		■	■	■	■	■	Access and Power BI
2017–ongoing 2017–ongoing	MD	■		■	■	■			■	■	■	■	■	■	■	■	VisualBasic, Macro programming
2015–ongoing	DE		■		■	■		■	■	■	■				■	■	AgileAssets
2017–ongoing	HI		■		■	■			■	■	■	■	■	■	■	■	CityWorks & PAVER
2019–ongoing	Various		■	■	■	■	■	■	■	■	■	■	■	■	■	■	PAVER
2016–2019	Worldwide		■		■	■			■	■		■			■		PAVER
2015–ongoing	MD		■	■	■	■			■	■	■	■	■	■	■	■	PAVER
2006–2012	Australia		■	■	■	■			■	■	■	■		■			
2011–2014	CA	■		■	■		■	■	■		■	■	■	■			ArcGIS, SQL Server technology, Safe Software FME Desktop, PortView, Geographics Geocortex Essentials and Microsoft Silverlight
2005–2008	CA			■	■	■			■	■	■	■			■		AIRIS Database
2006–2014	US, Canada	■		■	■	■	■	■	■	■	■	■	■		■		
2019–ongoing	DC			■			■	■	■			■		■			Cloud-based energy management system, EnergyCAP,
2018–ongoing	NY		■	■	■	■			■	■	■	■	■	■	■		Project management information system
2020–ongoing	CA		■	■	■	■			■			■	■		■		GIS analysis
2019	IL		■				■	■	■		■					■	InstaPro 360
2004–2017	IL		■		■	■	■	■	■	■		■			■	■	■	Cartegraph
2017–2019	MN				■				■	■		■	■	■			Cartegraph
2019–2020	IN					■	■		■	■		■	■	■			GIS Cloud
2018–ongoing	IL			■	■	■	■	■	■	■		■	■	■	■	■	Cityworks, GIS Cloud, PAVER and AASHTOWare BrM

AECOM Asset Management Project Experience

Asset management programs often have multi-faceted needs. Samples of asset management projects and their application to AECOM's 4-Pillar approach in **key markets** is presented next.

	PROJECT	CLIENT
Stormwater, Environment & Green Infrastructure	Stormwater Asset Management Plan	City of Greater Sudbury
	Stormwater Funding Study and Stormwater Rate Implementation	City of Guelph
	National Water and Wastewater Benchmarking Initiative: Stormwater Module	50 Canadian Municipalities/Regions
	Asset Management Plan	Comox Valley Regional District
Transit	Asset Inventory & State of Good Repair Analysis	Southeastern Pennsylvania Transportation Authority
	State of Good Repair Decision Support Tool	New York Metropolitan Transportation Authority
	Transit NYNH Management Plan	Central Florida Regional Transit Authority
	Asset Management System for Facility Assets	Chicago Transit Authority
	SGR Analysis Supporting Development of Central Subway Financial Plan	San Francisco Municipal Transportation Agency
Tunnels	Central Artery Tunnel System - Condition Assessment	Massachusetts Department of Transportation
	Bridge and Tunnel Inspections	Maryland Transportation Authority (MDTA)
	Tunnel Condition Assessment and Asset Management Strategy	Elizabeth River Crossing, VA
	NY Queens Midtown Tunnel (QMT)	Metropolitan Transportation Authority
	MBTA Tunnel Inspections	Massachusetts Bay Transportation Authority (MBTA)
Vertical Infrastructure	Physical Needs Assessment Program	New York City Housing Authority
	On-call Asset Condition Assessments	Denver International Airport
	FCA and Deferred Maintenance Management	County of Los Angeles
	NYC Department of Buildings Waterfront Code Development Program	NYC Department of Buildings Development
Water & Wastewater	National Water and Wastewater Benchmarking Initiative (NWWBI)	More than 50 Canadian municipalities
	Potable Water Main Assessment	Colorado Springs Utilities
	SSIP Condition Assessment Program and Asset Management Support	San Francisco Public Utilities Commission
	Detroit Capital Improvement Program Management Organization	Detroit Water and Sewerage Department

Project Duration	Location	Government Standards	RFP Authoring / Project	Risk Assessment	Strategic Planning	Capital Investment Planning	Regulations & Compliance Support	Enterprise / Multi-Department	Data Collection	Condition Assessment	Integration of Design Files/BIM in Asset	Data Integrations	Gap Analysis	Workflows	Asset Valuation & Cost Estimation	Work Orders / O&M	Software Technology (PILLAR 4)
			PILLAR 1 Organizational & People						PILLAR 2 Data				PILLAR 3 Business Processes				
2019–2020	Canada	■	■	■	■	■	■	■			■		■	■	■	■	
2017–2019	Canada			■	■	■	■		■	■	■		■	■	■		AECOM Loads Analysis
1999–ongoing 2017–ongoing	Canada		■	■	■	■	■	■	■	■		■			■	■	Access and Power BI
2019–2020	Canada			■	■	■	■		■	■							
2015–2017	PA				■	■											SGR Database
2018–2020	NY				■	■										■	MTA SGR Tool
2017–2018	FL				■	■							■				TERM Lite
2011–2017	IL						■		■	■	■					■	AECOM Assessor, Infor
2010	CA				■	■			■								SGR Database
2007–ongoing	MA					■	■	■	■	■	■						4D Bridge Management System
2013–ongoing	MD					■	■	■	■	■					■	■	Asir by BeyondAsset
2017–2019	VA			■	■	■	■	■	■	■	■		■	■	■	■	SGR/CIP Tool
2012–2020	NY								■	■		■		■	■	■	
2006–ongoing	MA	■							■	■	■			■			Excel Macros
2016–ongoing	NYC, NY	■	■	■	■	■	■	■	■	■	■	■		■	■		PlanSpend; PNA Application
2015–2024	CO	■		■	■	■			■	■	■	■			■	■	Revit, Maximo, TRIRIGA, AECOM Assessor
2010–ongoing	CA	■	■	■	■	■	■	■	■	■		■	■	■	■	■	SAM
2019–2023	NY		■	■		■	■	■			■		■	■			Code development tracker tool
1998–ongoing (annual)	Canada	■			■	■	■	■	■		■		■	■	■		
2016–ongoing	CO	■	■	■	■	■	■	■	■	■	■		■	■	■	■	
2011–ongoing	CA	■	■	■	■	■	■	■	■	■		■	■	■	■		
2017–ongoing	MI	■	■	■	■	■	■	■	■	■	■		■	■	■	■	InfoMaster & InfoAsset Planner; ArcGIS; Cityworks

Airports

AECOM supports airport owners by understanding their current infrastructure backlog and future infrastructure needs and planning a program of maintenance activities and capital investment to maintain and improve asset performance and value.

### Denver International Airport Enterprise GIS

AECOM assisted Denver International Airport to shape and realize a vision of an enterprise GIS that introduced strategic efficiencies into the organization. AECOM navigated the logistics of asset inventory collection, condition evaluation, functional testing, and deficiency identification, and then recommended corrective actions, costs to correct, data integration with Maximo, TRIRIGA, and BIM of systems investigated across the diversity of airport facility and system types, within the operational environment of the fifth busiest airport in the U.S.

ORGANIZATIONAL AECOM delivered strategic investment planning recommendations to support proactive capital planning efforts.

DATA Architectural, electrical, mechanical and fire protection system facility assets across concourses, airfield lighting vaults, glycol systems, hangars, and emergency response facilities.

PROCESSES Data integration introduced a diversity of building-related management items into the decision-making process.

TECHNOLOGY AECOM's customized electronic mobile data collection application was aligned to existing Revit, Maximo, and TRIRIGA requirements.
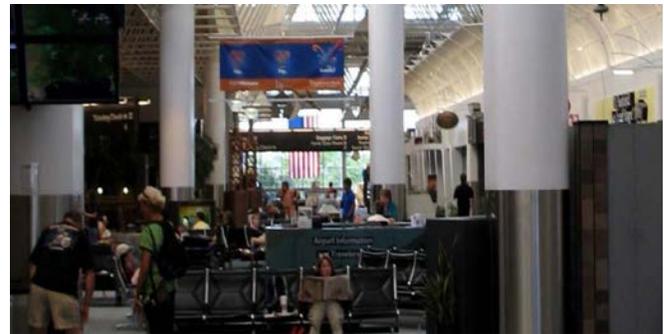
Milwaukee County General Mitchell International Airport: GIS, Asset Management, SMS, and Cityworks©

The server-based asset management system application gives the airport the capability to leverage its existing GIS data within Cityworks to create work orders against assets or locations that are spatially represented on its map. AECOM's implementation effort also converted the existing paper electronic log of the airport into a Cityworks-based Logbook process. Furthermore, AECOM implemented Part 139 and other key airport inspections within Cityworks.

ORGANIZATIONAL AECOM worked with the airport to define and develop revised business processes and procedures. AECOM conducted training for all users and continues to provide support.
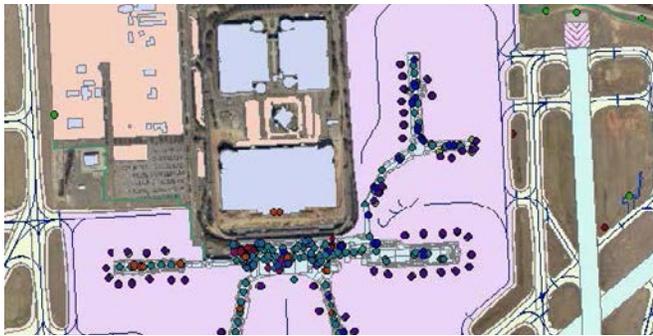
DATA All airside and landside assets, including pavement and utilities.

PROCESSES All business processes were revised. Paper-driven systems were replaced; systems using Excel or other software were migrated to Cityworks.

TECHNOLOGY A Cityworks asset management system was established.

Historically, airports have made decisions about essential assets, such as pavement, based on an immediate need, rather than planning for effective maintenance and rehabilitation (M&R) practices. This approach has not allowed airports to evaluate the cost-effectiveness of various alternative strategies and has resulted in the inefficient use of M&R funds. In addition, a reactive response to asset failure has not allowed airports to distribute a budget to cover asset maintenance activities that can prolong the useful life of assets.

An asset management program allows airports to identify and optimize strategies for maintaining airport assets so that operations can continue in a safe manner, over a known period, for the least cost. Asset management also defines proper asset inspection procedures, condition assessment tolerances, and maintenance protocols.

Charlotte Douglas International Airport Asset Management

AECOM has implemented the Cityworks AMS solution, in conjunction with the Cityworks Storeroom inventory management solution that closely integrates with the Cityworks Server software to provide a full asset and materials inventory. The airport also uses Cityworks for operational management, safety, and security.

ORGANIZATIONAL AECOM worked with the airport to define and develop revised business processes and procedures. AECOM conducted training for all users and continues to provide support.

DATA All airside and landside assets, including pavement and utilities.

PROCESSES Multiple business processes were revised to take advantage of the functionality of Cityworks. Existing work order and asset management workflows were modified and migrated to Cityworks.

TECHNOLOGY A Cityworks asset management system was established, including incorporation of mobile platforms and related technology.

King County International Airport Asset Management

AECOM has implemented the Cityworks AMS solution for O&M, including the use of Cityworks mobile applications geared toward mobile and tablet users.

ORGANIZATIONAL AECOM worked with the airport to define and develop revised business processes and procedures. AECOM conducted training for all users and continues to provide support.

DATA All airside and landside assets, including pavement, utilities, and fleet vehicles.

PROCESSES All business processes were revised. Paper-driven systems were replaced; systems using Excel or other software were migrated to Cityworks. Maintenance workers provided handheld devices to facilitate the new processes.

TECHNOLOGY A Cityworks asset management system was established, including incorporation of mobile platforms and related technology.

Bridges

AECOM has more than 800 bridge engineers in North America. These engineers have extensive working knowledge of bridge preservation, maintenance, and inspection, and they form the core of our Bridge Asset Management team. Over the past 10 years, this team has been at the forefront of developing bridge deterioration curves for owners, a key differentiator of AECOM.

Massachusetts Department of Transportation Bridge Asset Management Plan

AECOM is developing a Bridge Asset Management Plan. This involves reviewing inspection data; categorizing the bridge inventory; producing deterioration curves that suit the environment; and developing cost models of the prediction for a variety of intervention actions.

ORGANIZATIONAL AECOM is helping implement an asset management plan for all the bridges owned and maintained by the State.

DATA Inspection data and records from maintenance, rehabilitation, and replacement contracts from all bridges.

PROCESSES Production of deterioration curves in the form of step functions assists MassDOT in optimizing its maintenance and capital programs.

TECHNOLOGY AECOM is providing decision-making tools and a process to assist MassDOT in improving the condition of their bridge inventory.

Austroads Engineering Guide to Bridge Asset Management

AECOM developed an engineering guide for Austroads, sharing pragmatic advice on all areas of bridge asset management, based on the principles of ISO 55000 and the International Infrastructure Management Manual. The guide necessitates sound engineering judgement to support informed decision-making that balances risk, cost, and performance. The guide is bridge-specific but promotes transparency through all levels of an organization, as bridges ultimately provide a service to wider transport networks.

ORGANIZATIONAL Thousands of bridge assets are being included across Australia and New Zealand.

DATA Suggested decision-making tools and asset management information systems.

PROCESSES The guide discusses risk management, performance monitoring, decision-making, maintenance, capital renewals planning, and financial management.

TECHNOLOGY This guidance promotes risk-based asset management practices, tailored to bridge structures.

AECOM's SGR tool includes risk as a main metric, allowing owners to optimize spending on maintenance and capital improvements while minimizing their exposure to the risk of structural failure. The tool is easy to use and does not involve any investment by the bridge owner in untried and expensive third-party software.

Colorado Department of Transportation: FASTER Bridge Enterprise Program

AECOM served as the owner's representative and program manager for the Colorado Bridge Enterprise (CBE) Program since in 2010. The CBE is an autonomous, government-owned business, created to finance, repair, rehabilitate, and replace structures rated "poor" by the National Bridge Inspection Standards. We are responsible for managing all facets of this program, which has a dedicated annual revenue of more than $120 million. The program addressed nearly 1.8 million square feet of "poor" deck area.

ORGANIZATIONAL AECOM i acts as the owner's representative for a State-owned bridge management program.

DATA Statewide bridge inventory and condition data, maintenance records, deterioration models, historic cost and schedule data, project financials, safety data, and key performance indicators for 70 structures.

PROCESSES AECOM's work included project pre-scoping, feasibility studies, and bridge testing and monitoring; statewide project prioritization; risk-based cost estimating and scheduling; financial modeling and management; bond delivery plan development and execution; reporting and statutory compliance; and key performance indicator tracking.

TECHNOLOGY We developed a full suite of program and asset management tools, to streamline CBE Program delivery.

Maryland Transportation Authority: Bridge Asset Management Program

AECOM developed an Excel tool to assist data-driven decisions in maintenance, rehabilitation, replacement, and forward-looking budgetary planning for 325 workhorse bridges.

ORGANIZATIONAL We supported the Office of Engineering and Construction in bridge asset management and development of capital.

DATA 325 workhorse bridges, two turnpikes, and six signature bridges.

PROCESSES AECOM identified and prioritized bridge improvement work needs; developed construction projects for MDTA's 26-year Long Range Needs and 6-year Consolidated Transportation Program; predicted future bridge conditions and construction costs for different scenarios of planned projects and budgets; and produced information for Transportation Asset Management Plan reports to meet FHWA MAP-21/FAST requirements.

TECHNOLOGY We developed an advanced Excel tool for asset management.

Pavement

AECOM's Pavement Center of Excellence has extensive experience inspecting and analyzing pavement distress data, implementing pavement management software, and developing work plans incorporating various budget analysis scenarios.
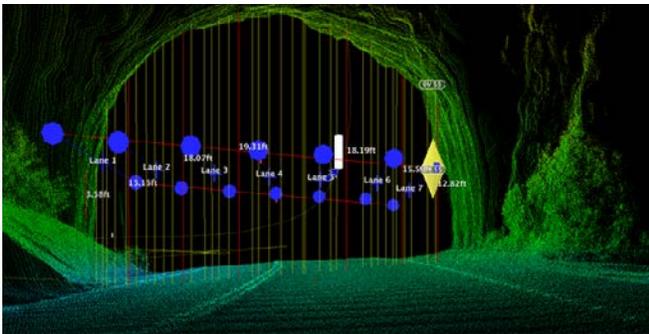
## Delaware Department of Transportation: Pavement and Asset Extraction

AECOM provides pavement and asset data collection services using high-speed 3D video, right-of-way imagery, and LiDAR equipment on 6,000 centerline miles of Delaware Department of Transportation (DelDOT) roadway network. These services include collection and reporting of Highway Performance Monitoring System data for the statewide network and integration of data into DelDOT's AgileAsset Asset Management System.

ORGANIZATIONAL AECOM conducted training and implementation of desktop viewing software for pavement and asset data.

DATA 6,000 centerline miles; Americans with Disabilities Act ramps, signs, signals, guardrails, intersections, curbing, and sidewalks; vertical clearance for overhead structures.

PROCESSES We incorporated procedures to evaluate pavement condition performance standards and performed a condition trend analysis. Furthermore, we developed quality control tools.

TECHNOLOGY AECOM assisted in developing the Laser Crack Measurement System (LCMS), LiDAR, road surface profilers, integrated right-of-way imaging, and global positioning systems.
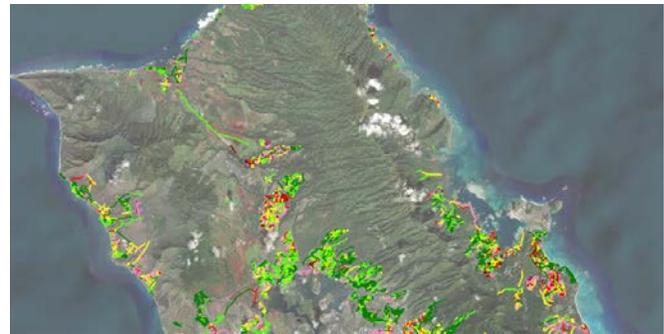
City and County of Honolulu: Pavement Management Program

AECOM is providing roadway pavement management for 1,500 miles and asset management services to the City and County of Honolulu, through integration of Cityworks and PAVER. Our services include roadway condition assessment, software training, and treatment alternatives evaluation.

ORGANIZATIONAL We conducted training on pavement management and preservation techniques, to help extend asset life. We developed machine learning-based quality control tools for automated data.

DATA 3,500 lane miles, sign faces, sign support (assemblies), medians, curbs, sidewalks, guardrails.

PROCESSES We developed a pavement management system to better manage pavement and integrated pavement and assets using PAVER and Cityworks. We set up a web viewer to view collected assets and conditions through the collected imagery.

TECHNOLOGY We helped develop an LCMS, LiDAR, road surface profilers, integrated right-of-way imaging, and global positioning systems.

AECOM's approach to pavement management is to bring full-service pavement expertise to the process, addressing client-specific needs and providing cost-effective solutions and/or design alternatives within set time and budget constraints.

We offer in-house analysis options but also have expertise with a variety of proprietary solutions, such as PAVER, Cityworks, Agile Assets, and Cartegraph. Our goal is to provide an appropriate engineering solution and full technical support through its implementation.

We understand capital improvement planning to be an integral aspect of maintaining assets in a cost-effective manner. Using the data captured in the pavement management process, we plan and program short- and long-term pavement repair projects. Currently, AECOM is implementing pavement management programs for diverse agencies, including various states' departments of transportation, counties and municipalities, airports, railroads, ports, and facility distribution centers.

BNSF Railroad: Facility Site Assessments–Pavement Program

AECOM provides a full suite of pavement services to BNSF's 25+ facilities, including pavement inventory setup, current conditions evaluation, capital plan development, design rehabilitation, and management of construction activities.

ORGANIZATIONAL AECOM helped to transform the agency's pavement repair strategy, using life-cycle analysis. We provided cost-effective treatments based on available funding and future utilization of pavement area.

DATA Pavements, 26 facilities, 40 million square feet, utilities (manholes, lamppost, drainage, fire hydrants).

PROCESSES We implemented a pavement management system to assist the agency set and allocate capital funding for pavements. Furthermore, we developed short- and long-term capital improvement plans.

TECHNOLOGY We helped develop an Excel-based data collection form.

U.S. Air Force: Pavement Condition Study at Multiple Bases

AECOM provided pavement condition surveys and capital plan developments, including airfields and road and parking networks at 23 bases throughout the U.S. and Europe. AECOM performed inventory setup, pavement condition assessments, and capital budget determination.

ORGANIZATIONAL We incorporated overall condition metrics to evaluate pavements using functional, structural, and friction condition values.

DATA Pavements of 23 installations, totaling more than 100 million square feet.

PROCESSES AECOM implemented a PAVER pavement management system to assist the agency evaluate various budget scenarios, to set the funding level at each installation. We also developed short- and long-term capital improvement plans.

TECHNOLOGY AECOM developed an Excel-based data collection form.

Ports and Waterways

AECOM offers more than 110 years of professional experience working to inspect, design, and construct all asset types across a typical port facility, with expertise in cargo, cruise, naval, and shipyard terminals.

Port of Melbourne: Infrastructure Asset Management Services

AECOM developed the strategic asset management plan and condition rating manuals for consistent asset evaluation and rating across 40 berths, piers, wharves, and jetties. We managed deteriorating conditions of all assets, which included preparing a life-cycle cost analysis to compile a business case for each asset.

ORGANIZATIONAL We developed a strategic asset management plan.

DATA Wharves and berths data, focused on structural and berthing components, and . This also included data pre- and post rehabilitation assets and associated data.

PROCESSES Nearly a decade ago, AECOM developed the condition assessment manual. Recently, AECOM illustrated a probabilistic analysis as a basis for risk-based decision-making, aligning with the Port's improvement plan for asset management.

TECHNOLOGY We used data capture technology for site inspections, data management (hard drives and cloud), data analysis (including for future deterioration prediction), and visualization (condition and risk heat maps, which AECOM pioneered for the Port; this has become a standard requirement for condition assessments).

Port of Oakland: Geospatial Security Mapping System

The Geospatial Security Mapping System (GSMS) produced an enterprise geographic information system (GIS), made up of data, hardware, software, process documentation, training, and support to be used by the Port of Oakland to improve daily operations.

ORGANIZATIONAL AECOM conducted a needs assessment and IT systems analysis to determine the requirements for functionality, data, and system architecture; implemented an outreach strategy; conducted formal training; and provided maintenance.

DATA The GSMS provided increased situational awareness of the physical condition of the emergency response infrastructure system, and it disseminates information that may affect the daily operation plan, security, business continuity, and incident response in a user-friendly spatial interface.

PROCESSES We produced an enterprise GIS made up of data, hardware, software, process documentation, training, and support to improve daily operations, prepare for and manage crisis events, and advise recovery efforts.

TECHNOLOGY Based on ArcGIS for Server and SQL Server technology, we were able to convert, migrate, and collect geospatial data from many sources, including Safe Software FME Desktop.

Asset Management

Our ports and waterways experts can develop and implement a defined asset management strategy that is cost-effective, preserves the long-term value of port assets, and can meet regulatory and contractual requirements of operating and maintaining a safe and operationally efficient port. AECOM's self-developed state-of-the-art software is being used to optimize port operations and fleets.

Port of Los Angeles Wharf Inspection and Repair Program

AECOM undertook facility inspections, prepared construction documents, and performed asset database updates for maintenance of wharf structures. We developed similar program procedures and manuals for port bridges.

ORGANIZATIONAL We conducted routine general condition assessment inspections and regular above and underwater inspections of concrete wharf structures and bridges; provided construction support services for repair projects; prepared a repair manual to be used as a specification for standard distress repair, and gave engineering/programming support for the AIRIS database.

DATA Concrete wharves, over 200 distinct structures with a total length of 14 miles and supported on 35,000 concrete piles, and 12 miles of port bridges.

PROCESSES We created a tool to provide an ordered regimen of proactive inspection and maintenance, to safeguard quality and extend the life of the structures.

TECHNOLOGY AECOM's custom-designed (Automated Inspection and Repair Information System) program database provides a means of recording, storing, optimizing, and retrieving information.

Maersk Facilities: Environmental and Engineering Assessments

AECOM has provided support to Maersk (including Bridge Terminal Transport, P&O Nedlloyd Logistics, and Gilbert) since 2006 at locations in the U.S. and Canada. Assessments have been conducted in support of acquisitions, divestitures, and short/long-term leases.

ORGANIZATIONAL AECOM conducted Phase I Environmental Site Assessments and property condition assessments that included: visual evaluations for potential business risks, asbestos-containing materials, lead-based paint, radon, and wetlands; evaluation of environmental regulatory compliance status; and condition assessments of structures and evaluation of potential capital expenditures.

DATA Greenfield land, existing warehouses and distribution facilities in ports, trucking terminals, and intermodal yards.

PROCESSES We performed site assessments in support of acquisitions, divestitures, and short/long-term leases.

TECHNOLOGY We developed Excel-based databases.

Power

AECOM's team of energy professionals takes a planning perspective to understand owner assets and how the grid can change over time.

Washington Metropolitan Area Transit Authority: Enterprise Energy Monitoring System

AECOM serves as the dedicated project manager for WMATA's Sustainability Department. AECOM worked with WMATA and software vendors to verify system and performance requirements were met and successfully integrated 1,000+ utility accounts (including electricity, natural gas, water, and fuels) to track, monitor, and gain insights from the data. AECOM is creating information dashboards to increase WMATA's use of its data and identify cost-saving opportunities.

ORGANIZATIONAL AECOM coordinated multiple in-person and virtual training sessions.

DATA We analyzed sustainability and facility performance benchmarks for an energy and water utility portfolio of more than $100 million annually across 26 utility vendors.

PROCESSES We documented vendor bill upload procedures, greenhouse gas calculation methods, electric interval data reporting procedures, and COVID-19 impacts on energy performance. We also created more efficient steps to respond to regional stakeholder information requests.

TECHNOLOGY We supported implementation of a cloud-based energy management system, EnergyCAP, to process and organize all available utility bill and interval meter data under one database for facility, financial, and sustainability performance tracking.

New York Power Authority Robert Moses Power Plant: Life Extension and Modernization Program Management

AECOM provides program management services for the Robert Moses Life Extension and Modernization Program, which constitutes seven interdependent projects at both the Robert Moses Power Plant and the Lewiston Pump Generating Plant. In collaboration with NYPA, we developed a plan to implement the program over the course of 10+ years, including procurement plans, master scheduling, program cost estimates, and risk assessment and management.

ORGANIZATIONAL AECOM provided multiple in-person and virtual training sessions to various stakeholder groups.

DATA We were responsible for the flow of information between NYPA and more than 15 vendors (15+) over a 14-year project.

PROCESSES We implemented a project manual, which was a handbook of processes, procedures, and workflows to dictate ownership of tasks, delegation of authority, and flow of information.

TECHNOLOGY We implemented a project management information system to host a common data environment.

Asset Management

AECOM has expertise in supporting:

– Transmission line asset management, including the ability to catalog and assess structures, insulators, and conductors;

– Sub-transmission distribution asset management, including substations, sub 69kV lines, and underground assets such as manholes; and

– Vegetation management.

Our team uses its historical knowledge of utility requirements and standards, combined with a suite of tools including artificial intelligence/machine learning, virtual reality, and analytics platforms such as SkySpark, to provide an industry-leading approach to asset management.

Fresno Country Rural Transit Agency: Grid Infrastructure Assessment

The FCRTA selected AECOM to perform a grid infrastructure analysis, to identify all current grid assets, forecast load growth, forecast thermal overloads, identify asset requirements, and perform an options analysis to address grid deficiencies throughout the service territory, with an emphasis on disadvantaged communities.

ORGANIZATIONAL AECOM leads a broad outreach effort to educate and inform local leaders and community members about the project's goals and the grid in general.

DATA We collected datasets to understand grid conditions and forecast future needs, including generation, transmission, and distribution data for the electric grid as well as data on demographics, building stock, electric vehicles and transit fleet routes, depots, and assets.

PROCESSES We made specific recommendations for FCRTA and its service area regarding transition of the transit bus fleet to fully electric and have proposed specific future grid infrastructure projects.

TECHNOLOGY Forecasts and grid infrastructure analyses are being performed through application of an integrated distribution planning framework, using simulation software and GIS analysis.

Commonwealth Edison: AI/ML Asset Inspection Management Pilot

AECOM is demonstrating how artificial intelligence and machine learning concepts can combine with asset management policies and asset data collection to better align maintenance, repair, and replacement strategies as well as better allocate resources. In addition to data collection using a spherical 360-degree view camera to collect Google Street View-compatible imagery, the pilot is using a two-algorithm approach to evaluate ComEd's strengths and weaknesses in terms of application toward asset management.

ORGANIZATIONAL AECOM trained ComEd staff in how to capture imagery properly, process data, and store imagery.

DATA We conducted an inventory and evaluation of geographic location for transformers in the Bronzeville neighborhood. The transformers were captured in imagery that was stitched together to create a video to which customized machine learning algorithms could be applied.

PROCESSES Not applicable.

TECHNOLOGY We used an InstaPro 360 to capture imagery, Google Cloud platforms for stitching imagery and storage, as well as machine-learning algorithms to identify the priority assets.

Roadways

AECOM's expertise includes all roadway appurtenances (e.g., curb and gutters, sidewalks, driveways, drainage structures, guardrails, signs, ITS devices, traffic signals, and light poles). We help clients plan throughout the full asset management life cycle of roadways and roadway appurtenances.

Illinois Tollway Asset Management and Capital Planning

AECOM implemented an asset management system for the Illinois Tollway in 2006. We further enhanced and improved the system over the next decade by updating to the Computerized Asset Management System in 2016, to allow efficient performance of asset management tasks. AECOM provided annual inspections and developed 50-year rolling asset management programs that inform the capital plan, develops the needed yearly deposit for annual system maintenance, reviews of the annual budget, and develops inspection reports, certification for bond sales, and assisted with emergencies.

ORGANIZATIONAL AECOM developed staff training from for data collection, inventory, and work orders.

DATA 2,280 lane miles and more than 114,000 assets covering bridges, overhead sign structures, structural walls, safety appurtenances, drainage, facilities, lighting, and intelligent transportation system.

PROCESSES We developed a work order process for inspection data, set up a maintenance work order for ITS elements from the field to inventory on vehicles to warehouse, and we created an interface to traffic management software.

TECHNOLOGY AECOM utilized Cartegraph, AECOM photograph import, AECOM bridge rating and CIP tool.

Minnesota Department of Transportation Barrier End Terminal Inventory and Asset Project

AECOM completed a comprehensive inventory and performed a condition assessment of all longitudinal metal barriers, end terminals/anchors, and bullnose crash cushions being managed. The project developed comprehensive reference materials and condition assessments, reported critical issues quickly, trained MnDOT personnel in the use of reference materials, completed condition assessments, and delivered data in a format compatible with MnDOT's enterprise asset management software.

ORGANIZATIONAL AECOM created a field inventory identification and inspection guide for roadside safety hardware and trained all MnDOT roadway maintenance staff.

**DATA** 20,000 miles of LiDAR data yielded 50,000 safety assets, including end terminals for all longitudinal metal barriers (guardrail and cable barrier), crash cushions, and impact attenuators.

PROCESSES Using tools developed by AECOM, MnDOT changed how it performs condition assessment and inspection of all roadside safety hardware assets.

TECHNOLOGY AECOM utilized Cartegraph OMS with ESRI AGOL.

AECOM can provide several specific applications and software that assist in the inventory, assessment, and analysis process, and we can customize and deploy various off-the-shelf programs for our clients. We also can provide longer range capital, SGR planning and analysis. AECOM have options for capital renewal and O&M tools to balance finances with asset renewal needs.

The ability to inventory and assess assets across a full range of classes provides our clients with quality data. These inventories/assessments also can be used for long-term analysis and planning, to meet specific goals.
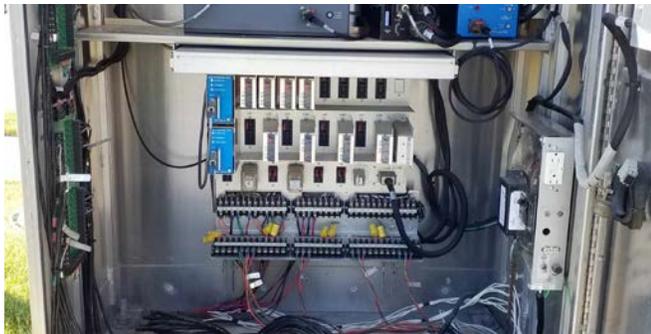
Indiana Department of Transportation ITS Statewide Traffic Signal Inventory

AECOM developed a data collection app using online cloud-based GIS services to inventory and assess over 1,000 traffic signals and control cabinets across the state. The approach ensured data quality by having pre-determined responses to questions and not allowing blank responses in required fields. The client could view the data and track results in real-time.

ORGANIZATIONAL AECOM created a data collection application to verify that the proper information was collected quickly and efficiently.

DATA More than 1,000 traffic signals were included.

PROCESSES INDOT awarded additional data collection projects with an Internet-based GIS data collection requirement. AECOM developed PS&E packages for INDOT, to upgrade communication to traffic signals.

TECHNOLOGY AECOM utilized Internet-based GIS-Cloud.

Cook County Department of Transportation and Highways Asset Management System

AECOM is developing a robust asset inventory and condition assessment pilot program for identified areas under Cook County's jurisdiction. The program will include activities such as reviewing existing Department sources, identifying asset classes, developing asset libraries, and developing an asset condition assessment framework and procedures.

ORGANIZATIONAL AECOM is developing Department-specific training, along with rollout services.

DATA 15,000 lane miles and more than 211,635 assets, including bridges, culverts, pavement, signs, and Americans with Disability Act ramps

PROCESSES We developed work order management workflows.

TECHNOLOGY This work involves application of Cityworks, GIS Cloud, PAVER, and AASHTOWare BrM software programs.

Stormwater, Environment, and Green Infrastructure

AECOM has a comprehensive understanding of stormwater management, assets, and levels of service.

City of Greater Sudbury Stormwater Asset Management Plan

AECOM developed an asset management plan that included a state of the infrastructure summary, a life cycle analysis, identification of current and desired levels of service, an asset management strategy, an O&M plan, a capital improvement plan, and financial plans.

ORGANIZATIONAL AECOM completed development of a stormwater asset management plan. Sudbury now is considering changing its O&M strategy, to prioritize cleaning catch basins in areas that discharge to environmentally sensitive water bodies, and to implement a stormwater utility.

DATA Assets included in the Stormwater Asset Management Plan are sewers, catch basins, oil-dirt separators, lakes, ponds, creeks, culverts, manholes, and ditches.

PROCESSES We identified levels of service for Sudbury's stormwater program, identified targets for O&M activities, and digitized historic record drawings. AECOM proposed changes to work orders and data management procedures.

TECHNOLOGY The project was completed using GIS, CADD, Cityworks, and Excel.

City of Guelph Stormwater Funding Study and Stormwater Rate Implementation

AECOM investigated alternative financing mechanisms and identified the most appropriate revenue source (stormwater rate) for the City's stormwater capital and operational program needs. We developed a stormwater rate and credit program and assisted with its implementation.

ORGANIZATIONAL Guelph has a separate stormwater utility with a credit and rebate program to fund its stormwater management program and to encourage sustainable stormwater practices.

DATA Assets included are sewers, catch basins, oil-dirt separators, streets, lakes, ponds, creeks, culverts, manholes, and ditches. Information and data resulting from public consultation were used to inform development of a new stormwater rate.

PROCESSES Guelph developed a separate stormwater utility, where properties are charged a stormwater fee based on land use, imperviousness, and best management practices. The City changed its billing system for stormwater and how it is collecting property information from new developments. The City also completed a stormwater education and consultation program.

TECHNOLOGY The project uses utility billing software.

Our professionals know the unique aspects of stormwater management that must be considered in asset management, including:

– The value of natural and engineered stormwater assets
– Future potential impacts of climate change
– Evolving regulatory requirements
– Increased development and increasing environmental awareness

We have unique experience in stormwater financing, O&M planning, benchmarking, and natural infrastructure valuation. We understand that the life cycle of a pond or a rain garden is very different from that of a pipe and must be treated differently in any stormwater asset management plan.

Canadian National Water and Wastewater Benchmarking Initiative Stormwater Module

AECOM is benchmarking municipal stormwater programs from 50 municipalities across Canada and facilitating workshops where municipalities share best practices and lessons learned. AECOM works with participating municipalities to develop standard operating procedures for all common engineered and green stormwater assets.

ORGANIZATIONAL AECOM conducts semi-annual workshops and annual metric benchmarking to support the sharing of best practices in municipal stormwater management and process improvements. We have provided training on the database, the dashboard, climate change adaptation planning, stormwater O&M planning for grey and green infrastructure, and stormwater financing.

DATA Assets include sewers, catch basins, oil-dirt separators, streets, lakes, ponds, creeks, culverts, manholes, ditches, filters, rain gardens, underground infiltration facilities, underground storage facilities, dikes, pervious pavement, green roofs, trash racks, service connections, pump stations, and fish ladders.

PROCESSES Because of this work, many municipalities have changed how they fund, construct, and maintain stormwater systems.

TECHNOLOGY The work uses MS Access and Power BI.

Comox Valley Regional District Asset Management Plan

To support the District, AECOM developed a tailored asset management policy, strategy, and plan for its assets. This will help the District face the impending challenge of requiring tens of millions of dollars' worth of capital investments to meet regulatory requirements while the existing infrastructure continues to age.

ORGANIZATIONAL As part of the asset management plan, AECOM identified and assessed the value of natural assets, such as the watershed and natural water bodies.

DATA The asset management plan addressed all regional water, wastewater, solid waste, and recreational infrastructure, including natural assets such as watersheds and oceans (e.g., for wastewater discharge).

PROCESSES The District has developed valuations for its natural assets as well as its engineered assets.

TECHNOLOGY AECOM used GIS and CMMS.

Transit

AECOM's experience in transit asset management dates from the 1970s, when we evaluated the Urban Mass Transportation Administration Rail Modernization Program, and from the 1980s, when we developed the first-ever projection of infrastructure renewal and replacement needs for the Washington Metropolitan Area Transit Authority.

SEPTA Asset Inventory and State of Good Repair Analysis

AECOM prepared a comprehensive inventory of the current state of all capital assets and determined the measures needed to bring them to an SGR. We developed a uniform, replicable system to identify and prioritize capital renewal and replacement needs and also analyzed the impacts of various funding and policy scenarios.

ORGANIZATIONAL AECOM supported asset management staff in development of a capital program.

DATA More than 6,300 assets, including motor bus, trolley bus, light rail, heavy rail, commuter rail, and paratransit.

PROCESSES We supported justification to secure dedicated capital funding from the Commonwealth of Pennsylvania.

TECHNOLOGY The SGR Database decision support tool was used for this work.

New York Metropolitan Transit Authority State of Good Repair Decision Support Tool

AECOM supported MTA in developing asset-based projections of SGR backlog, future SGR needs, and future condition of assets and operating implications in fiscally constrained scenarios. This provides an analytical enhancement to the MTA's existing 20-year Needs Assessment process. The underlying goals of such an examination are to develop a compelling justification for funding the MTA Capital Program and better anticipate future capital funding needs for each operating agency.

ORGANIZATIONAL AECOM assisted the agency with reviewing its current budgets.

DATA 65,000 assets, including rail, buses, stations, yards, buildings, bridges, and tunnels.

PROCESSES We created a process to take in information from EAMS to the CIP tool.

TECHNOLOGY AECOM used Capital Investment Planning tool (SGR).

We supported the Federal Transit Administration (FTA) in the 1980s and 1990s, in articulating the needs for transit agencies to address infrastructure investment to support existing transit services when applying for federal grants for new or existing systems. Later, in the early 2000s, AECOM supported the FTA in exploring which transit asset data should be reported in the national database. We also developed the introduction to transit asset management course for the National Transit Institute and have delivered the course to more than 1,000 participants.

Central Florida Regional Transit Authority LYNX: Transit Asset Management Plan

AECOM led the examination of infrastructure renewal requirements of LYNX in response to a new federal statute and regulations. As part of the analysis, we completed a comprehensive condition assessment of capital assets, estimated the backlog of assets beyond their useful lives, and projected 20-year capital investment needs.

ORGANIZATIONAL AECOM supported development of an asset management culture in the organization.

DATA 1,000 assets, covering bus and paratransit.

PROCESSES We assisted development of a transit asset management plan.

TECHNOLOGY The work involved FTA TERM Lite decision support.

Chicago Transit Authority Asset Management System for Facility Assets

AECOM developed a strategy to leverage the existing enterprise asset management system, to incorporate facility capital asset and condition information as well as to update actual field condition ratings for these asset categories. The project included the migration of current facility capital asset information to a central database, incorporating additional information and new data fields as required, performing an engineering condition assessment field study for certain facility assets, and developing a long-term plan for maintaining up-to-date information on asset condition.

ORGANIZATIONAL AECOM developed a roadmap for implementation of information.

DATA Over 300 buildings, 216 miles of linear infrastructure, and more than 350,000 assets, including facilities, yards, vehicles, and rail assets.

PROCESSES We developed procedures to update and evaluate data collection and systems. We defined levels of service, developed performance metrics, and prioritized critical reports.

TECHNOLOGY We applied AECOM Assessor technology.

Tunnels

AECOM is at the forefront, leading the effort in assuring that owners have a full understanding of the values of their transportation tunnel assets, have accurately derived quantities for every component of every system, and understand the condition not only of each component, but also of each system and the tunnel asset as a whole.

Massachusetts Department of Transportation Central Artery Tunnel System–Condition Assessment

AECOM has worked with MassDOT since 2007, assessing the condition of the numerous tunnels making up the Central Artery Tunnel (CA/T) system, a complex network of miles of tunnel along I-90 and I-93 in Boston. AECOM led the way in developing methodology for accurately quantifying the conditions of each component and system within these tunnels.

ORGANIZATIONAL AECOM developed the procedure for ceiling hanger assessment and participated in collaborative meetings to discuss all data elements.

DATA The CA/T includes numerous tunnel types with a wide variety of interconnected structural, mechanical, and electrical systems. MassDOT uses a program called 4D, plus an AASHTOWare BrM database management program for all asset management needs, including the transfer of information into the Federal Highway Administration's National Tunnel Inventory.

PROCESSES Additional data elements were added or the definitions of elements were revised.

TECHNOLOGY 4D, AASHTOWare BrM, tablet technology for data collection were used.

Maryland Transportation Authority Bridge and Tunnel Inspections

AECOM has been performing routine and in-depth level inspections of tunnel facilities throughout the Maryland since 2012. This work includes National Tunnel Inspection Standards (NTIS) inspections of the Fort McHenry and Baltimore Harbor tunnels, both part of the MDTA system. AECOM revised the MDTA Facilities Inspection Manual, fourth edition, to incorporate the NTIS, which included developing Agency Defined Elements (ADEs) to accurately describe and track the condition of components, particularly in their functional systems.

ORGANIZATIONAL AECOM developed the ADE tracking condition, determined division of responsibilities to meet the NTIS, and supported NTIS milestones attainment.

DATA Fort McHenry Tunnel (four-bore immersed tube tunnel nearly 1.7 miles in length) and Baltimore Harbor Tunnel (two bore immersed tube tunnel approximately 1 mile long).

PROCESSES We revised the Facilities Inspection Manual to incorporate the NTIS.

TECHNOLOGY We used Authority's Structural Inspection and Repair Management System.

AECOM also has extensive experience both in projecting rates of deterioration and the associated future maintenance costs and in presenting that data in a way that is readily understandable with the proper amount of urgency, without being alarmist. AECOM understands that tunnel assets are of primary importance to their owners, and our goal is to earn the confidence of our clients through proactive diligence, responsiveness, and sharing of knowledge.
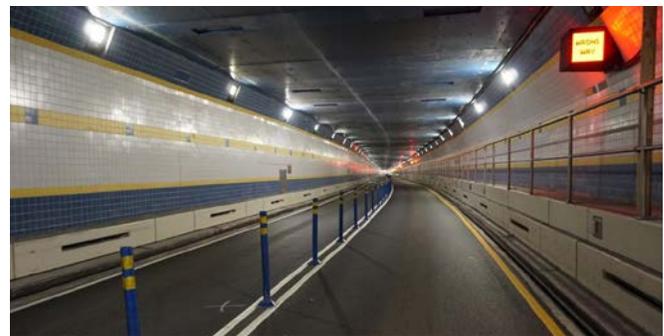
Elizabeth River Crossing Tunnel Condition Assessment and Asset Management Strategy

The Elizabeth River Crossing has a 58-year concession to operate and maintain the Downtown and Midtown tunnels and associated highway infrastructure in Norfolk, Virginia. AECOM provided a condition assessment of the tunnels. We also supported development of strategic asset management, including tunnel, highway, bridge, and support assets. A capital investment planning tool was put in place, to allow investigation of the SGR within budget constraints and determine optimal capital investment strategies.

ORGANIZATIONAL AECOM provided asset management training sessions on the use of the tools.

DATA Inventory of 4,500 assets, covering all facets of the two tunnels, 27 bridges, approximately 60 miles of highway (including ITS equipment, retaining walls), and associated support maintenance and buildings.

PROCESSES We assisted with improvements to processes for preventative maintenance activities on the tunnels and inclusion of risk in decision-making.

TECHNOLOGY FacilityDude (FD) supported asset management. Data from FD was entered in a capital investment planning tool, the SGR/CIP tool.

Metropolitan Transportation Authority NY Queens Midtown Tunnel

The Queens Midtown Tunnel connects Queens via I-495, the Long Island Expressway with Manhattan in New York. Under a facility inspection contract, AECOM completed the comprehensive inspection of the tunnel, including the vent buildings and all ancillary mechanical and electrical fire and life-safety systems.

ORGANIZATIONAL AECOM performed an in-depth inspection of the tunnel components, including pumps, intake and exhaust fans, and Megger testing of electrical equipment using subcontractors.

DATA We completed a comprehensive inspection and provided post-Hurricane Sandy rehab design services for the tunnel from 2012 to 2020. We used Microsoft Access to set up an inspection database as a start to the Federal Highway Administration's National Tunnel Inventory.

PROCESSES The database was adapted to the tunnel following client input and then was submitted for other teams to continue development.

TECHNOLOGY Microsoft Access and Micro-station for CADD were used for this work.

Vertical Infrastructure

AECOM's clients benefit from our reliable, accurate, and credible asset management strategies that are essential for making informed decisions on facility and infrastructure system repair, improvement, or replacement.

New York City Housing Authority Physical Needs Assessment Program

AECOM led program operations and logistics, energy auditing and modeling, and the capital planning program and related software development. We directed the team of 100+ personnel, organized and defined operational protocols, and currently are responsible for the day-to-day performance of the teams. We modeled more than 30 building types and developed energy conservation measures to help reduce energy and water consumption across the portfolio.

ORGANIZATIONAL AECOM provided a 5-day training program that detailed the function and use of PlanSpend and the capital improvement development process.

DATA 325 developments/properties; 2,375 buildings with an average age of 60+ years; 766 facilities/ancillary structures; 177,666 apartments; 3,314 elevators; all utility assets/service equipment at all properties

PROCESSES NYCHA changed its capital planning, decision-making processes to include PlanSpend.

TECHNOLOGY We assisted with the data collection application, database and cloud server IT infrastructure, infrared roof thermographic imaging, systems integration services to support ongoing Maximo utilization and interoperability with PNA data, ASHRAE level II modeling, and PlanSpend.

Denver International Airport On-Call Asset Condition Assessments

AECOM performed an inventory, condition evaluation, functional testing, and deficiency identification. We recommended corrective actions and projected costs. Our analysis included data integration touchpoints across the facility and systems. We coordinated activities to properly manage security aspects, federal agency oversight, and we scheduled access and necessary shutdown. We performed testing for glycol, HVAC and electrical distribution systems, and added barcodes to assets in the field. Work was completed without affecting airport operations or customer experience.

ORGANIZATIONAL AECOM performed maintenance and strategic planning by facility type. We delivered strategic investment planning recommendations.

DATA We collected architectural, MEP, and fire protection data across concourse/terminals, landside/airside support, and administrative and emergency spaces.

PROCESSES We introduced diverse building-related management items into the decision-supporting programs. We provided immediate access to inventory, current conditions, probabilistic condition predictive models, and we assisted with functionality-based mission, compliance, and obsolescence issues.

TECHNOLOGY We customized our electronic mobile data collection application to align with the airport's existing system requirements. MAXIMO, TRIRIGA, and BIM were used.

Asset Management

This includes the capability to predict cost and impact of asset deficiencies, and to define the end-of-life for building and infrastructure systems. We help:

- Prioritize real estate portfolio growth and maintenance investments to make capital planning decisions.
- Use life-cycle cost analysis to support asset repair or replacement decisions.
- Increase asset efficiency and effectiveness of maintenance.

- Identify risk associated with rolling out new asset management strategies.
- Reduce the chance of costly emergency repairs and operational disruptions.
- Model asset corrective actions within budgetary constraints.
- Consolidate or repurpose buildings and infrastructure assets for optimized use.

County of Los Angeles Facility Condition Assessments and Deferred Maintenance Management

AECOM performed facility condition assessments and managed the development of nearly $1 billion of deferred maintenance and capital asset budget scenarios. We were responsible for creation of an automated project development tool for estimating the costs required to address deferred maintenance needs.

ORGANIZATIONAL AECOM provided training for all parts of the program: data collection, quality assurance and data management, facility deficiency analysis, project development including cost estimation, and capital plan prioritization and development.

DATA Facility condition assessment of more than 50 million square feet across 3,600 facilities and 60 different building types and 2.1 million square feet of surface parking; plus asset tagging of 60,000 pieces of equipment.

PROCESSES We developed nearly $1 billion of deferred maintenance and capital asset budget scenarios.

TECHNOLOGY We processed and managed millions of data points in an EAM system that was custom-developed for the County.

New York City Department of Buildings Development Waterfront Code Development Program

AECOM is developing new waterfront development code provisions and recommendations for the organizational structure, business processes, and resources required to establish a Waterfront Marine Administrative Unit. This new entity will regulate the design, permitting (construction and maintenance), licensing, inspections, and enforcement activities for marine structures along the City's waterfront.

ORGANIZATIONAL AECOM is providing organizational mapping, definitions of roles and responsibilities, resource requirements, analysis of current waterfront permitting procedures, and associated staffing resources requirements. We also are giving training and onboarding to new operational norms as well as providing technological tools and processes.

DATA The new code will regulate activities for all in- and over-water marine structures along all 578 miles of the NYC waterfront. Data include definition of all marine structures and components; special inspection and maintenance requirements for impact events (e.g., storm, ice, vessel impact, hazardous).

PROCESSES We developed procedures, business modeling, organizational structure planning, gap analyses, and resource identification.

TECHNOLOGY Technologies that were used were typical/common software platforms such as MS Office Suite, Adobe Creative Suite applications and Waterfront Maintenance Management System.

Water and Wastewater

For more than 20 years, AECOM has been at the forefront of implementing asset management and sustainable infrastructure planning solutions for drinking water, wastewater and stormwater. We assist in developing prioritized budgets as well as repair and replacement schedules, to project the long-term revenue stream necessary to support infrastructure in a sustainable manner.

Canadian National Water and Wastewater Benchmarking Initiative (NWWBI)

The NWWBI was established in 1997 and has developed into a partnership of more than 50 Canadian water, wastewater, and stormwater utilities, cities, and regional organizations. Members represent more than 70 percent of the Canadian population, and NWWBI is considered to be one of the world's most advanced benchmarking entities for the public sector.

ORGANIZATIONAL AECOM developed an online asset management learning portal where clients can study the necessary information to take the Institute of Asset Management's certificate exam (see aecom.kineoportal.com for more information).

DATA Water treatment plants, water transmission and distribution, wastewater collection, wastewater treatment, and stormwater systems for 50 participants.

PROCESSES KPIs are used to compare utility performance and identify areas for improvement. Improvement areas then are investigated in greater detail to identify and implement improvement strategies, closing the "Plan–Do–Check–Act" loop.

TECHNOLOGY AECOM created an online data collection portal where utilities can enter data and progress through a single sign-on facility to a site to view and download benchmarking KPI graphs (see nationalbenchmarking.com).

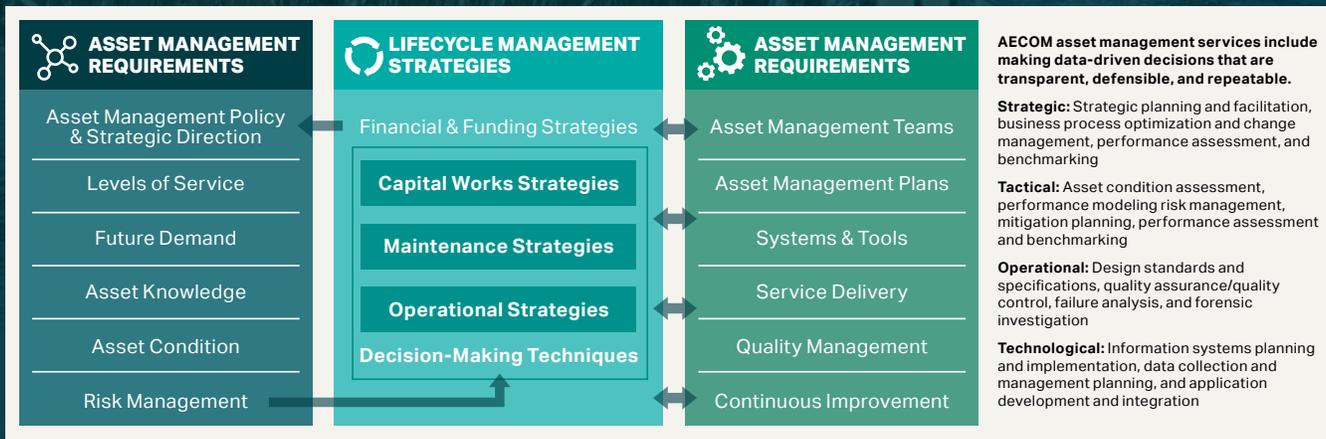## Colorado Springs Utilities Potable Water Main Assessment

AECOM merged existing asset management efforts and tools at wastewater facilities, best practices, and our proprietary condition assessment application to integrate asset data rapidly into a repeatable capital forecasting effort.

ORGANIZATIONAL AECOM prototyped tools off-site, assisted with the implementation process within systems, and trained staff in their use and long-term maintenance.

DATA Potable water transmission and distribution system (2,000 miles), raw water supply system, non-potable water system, and wastewater collection systems for a service area of 668,000 people.

PROCESSES The risk-based assessment approach and overall process of linking funding to actual service-level targets were fundamentally changed for the water and wastewater divisions. Similar models are being developed to manage gas and electric utilities.

TECHNOLOGY AECOM used database and spatial management tools for overall system management, condition assessment storage and data interpretation tools, deterioration models, predictive modeling, capital planning tools, progress benchmarking and optimization tools.

ASET MANAGEMENT REQUIREMENTS	LIFECYCLE MANAGEMENT STRATEGIES	ASSET MANAGEMENT REQUIREMENTS	AECOM asset management services include making data-driven decisions that are transparent, defensible, and repeatable.
Asset Management Policy & Strategic Direction	Financial & Funding Strategies	Asset Management Teams	**Strategic:** Strategic planning and facilitation, business process optimization and change management, performance assessment, and benchmarking
Levels of Service	**Capital Works Strategies**	Asset Management Plans	**Tactical:** Asset condition assessment, performance modeling risk management, mitigation planning, performance assessment and benchmarking
Future Demand	**Maintenance Strategies**	Systems & Tools	
Asset Knowledge	**Operational Strategies**	Service Delivery	**Operational:** Design standards and specifications, quality assurance/quality control, failure analysis, and forensic investigation
Asset Condition	**Decision-Making Techniques**	Quality Management	**Technological:** Information systems planning and implementation, data collection and management planning, and application development and integration
Risk Management		Continuous Improvement	

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San Francisco Public Utilities Commission Sewer System Improvement Program Condition Assessment Program and Asset Management Support

AECOM assessed a variety of pipelines, including cast iron, ductile iron, steel, HDPE, and PCCP pipe materials for a condition assessment, risk-based asset analysis, and improvement program development.

ORGANIZATIONAL AECOM developed a collection system for condition assessment protocols and provided training on large-diameter collection system assets.

DATA Wastewater treatment plant assets (equipment and structures), pump stations (equipment and structures) and associated force mains, collection system linear assets, and discharge facilities. Data included CMMS (Maximo) data, GIS asset databases, hydraulic model data, and condition assessment data (reports, NASSCO data).

PROCESSES We facilitated structured/tiered condition assessment protocols, supported asset management-based capital improvement planning, and assisted with evaluation of trenchless-based collection system rehabilitation to reduce costs.

TECHNOLOGY Inspection included destructive and non-destructive materials testing on structures and linear assets (concrete testing, ultrasonic, BEM). Multi-sensor remote inspection technologies were used for large-diameter collection system assets.

Gravity Mains By Risk
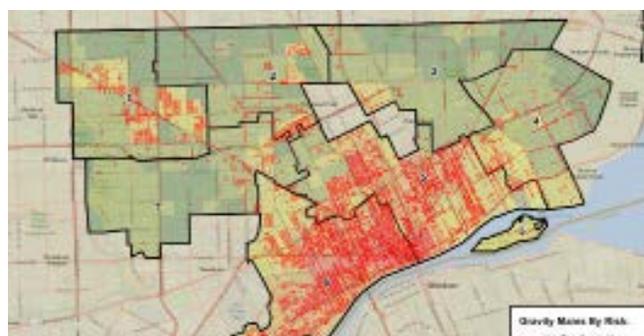
Detroit Water and Sewerage Department Capital Improvement Program Management Organization

Asset management principles provided the foundation for this $57 million water and sewer program. Responsible for operating and maintaining 6,000 miles of water and sewer piping networks, the Detroit Water and Sewerage Department retained AECOM to manage the $400 million program directing renewal of their buried infrastructure.

ORGANIZATIONAL AECOM prioritized, assessed, and rehabilitated all linear water distribution and wastewater collection system assets and implemented policies and procedures to optimize future activities.

DATA All data was compiled into ArcSDE on AWS Cloud c/w AGOL dashboards, collector apps, Cityworks, and integrated engineering software (InfoAsset Planner, InfoAsset Manager, InfoWorks ICM, and InfoWater) for Capital Improvement Program (CIP) development and maintenance planning.

PROCESSES We developed and documented business processes for risk assessment, prioritized condition assessment, CIP development and design/delivery, and use of supporting technologies. The CIP value quadrupled to $100 million annually.

TECHNOLOGY AECOM co-located with DWSD and trained staff on technology and business process changes throughout the program.

Benefits of Asset Management

Improved financial performance

Informed asset investment decisions

Managed risk

Improved services and outputs

Demonstrated social responsibility

Demonstrated compliance

Enhanced reputation

Improved organizational sustainability

Improved efficiency and effectiveness

Why AECOM?

- We simplified and pulled the best from all asset management frameworks and developed our 4-Pillar approach.
- We are a full service firm, with experience across all asset types and processes, and we cover all four pillars: Organization and People, Data, Business Processes, and Technology.
- AECOM staff have contributed to federal and international field guides in asset management.
- We know our clients' assets because we already have worked with them, for condition assessment or capital planning.
- AECOM applies a collaborative process to engage clients, and we believe in empowering every client!

Services Offered:

- Asset data collection and assessment
- Data integration
- Deterioration modeling
- Risk assessments
- Gap analysis
- Change management
- Training
- Decisions support tools
- Financial planning
- System selection
- Performance measures
- Preventive maintenance and more!

AECOM Differentiators

LIFE CYCLE

Full service, cradle-to-grave life cycle of a project

DESIGN

Asset management dictates our designs

INTEGRATION

Whole project integration

About AECOM

AECOM is the world's trusted infrastructure consulting firm, delivering professional services throughout the project lifecycle – from advisory, planning, design and engineering to program and construction management. On projects spanning transportation, buildings, water, new energy and the environment, our public- and private-sector clients trust us to solve their most complex challenges. Our teams are driven by a common purpose to deliver a better world through our unrivaled technical and digital expertise, a culture of equity, diversity and inclusion, and a commitment to environmental, social and governance priorities. AECOM is a *Fortune 500* firm and its Professional Services business had revenue of $13.1 billion in fiscal year 2022. See how we are delivering sustainable legacies for generations to come at aecom.com and @AECOM.

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