Esri Airport GIS Webinar Series

GIS in Airports: Best Practice

Airports Succeed with GIS

Terry Bills, Esri
Randy Murphy, Arora Engineers
David Grigg, Arora Engineers

esri | THE SCIENCE OF WHERE

Introducing the Esri Airport GIS Webinar Series

- **Designed for the Airport GIS and IT Community**
- **Thought Leadership**
- **Mix of Business Focus and Technical Presentations**
- **Strong Community**

The Connected Smart Airport

Interconnected Information, Processes, and Workflows . . .
. . . All Happening at the Same Time

Using the Power of Location to Integrate Everything

Airports Succeed with GIS

esri

Rethinking Infrastructure®

ARORA®

PRESENTING TODAY

David Grigg, GISP
Vice President, Geospatial Practice Lead

Randy Murphy
Geospatial Technical Practice Lead

Agenda

- An Increasing Number of Airports are Using GIS: Why? How?
- What Airport GIS Professionals are Saying (Industry Survey Results)
- Successful Geospatial Solutions in Use at Airports
- Trends Related to GIS at Airports
- Success Stories
- How to Get Started Down the Roadmap to Success
- Resources Required (money, people, organizational support)
- Overcoming Common Challenges

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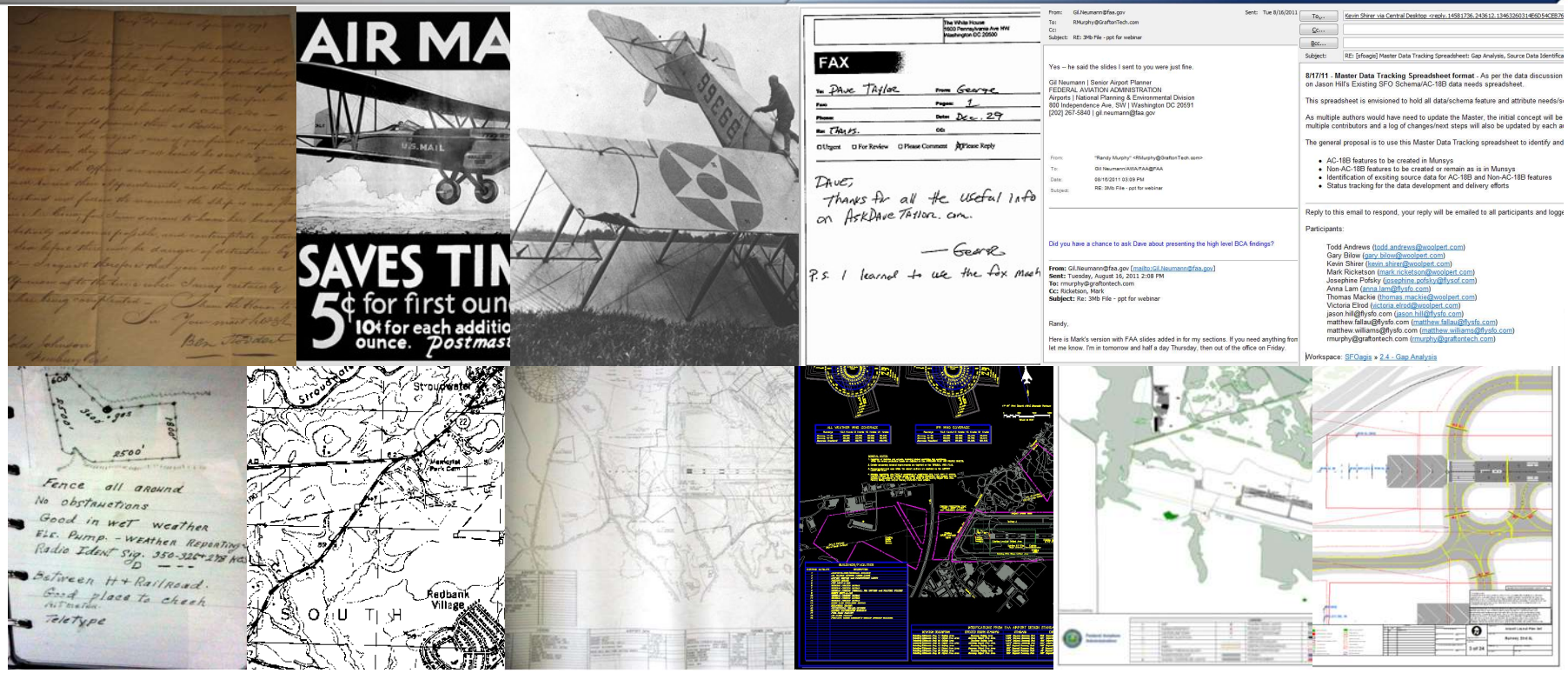
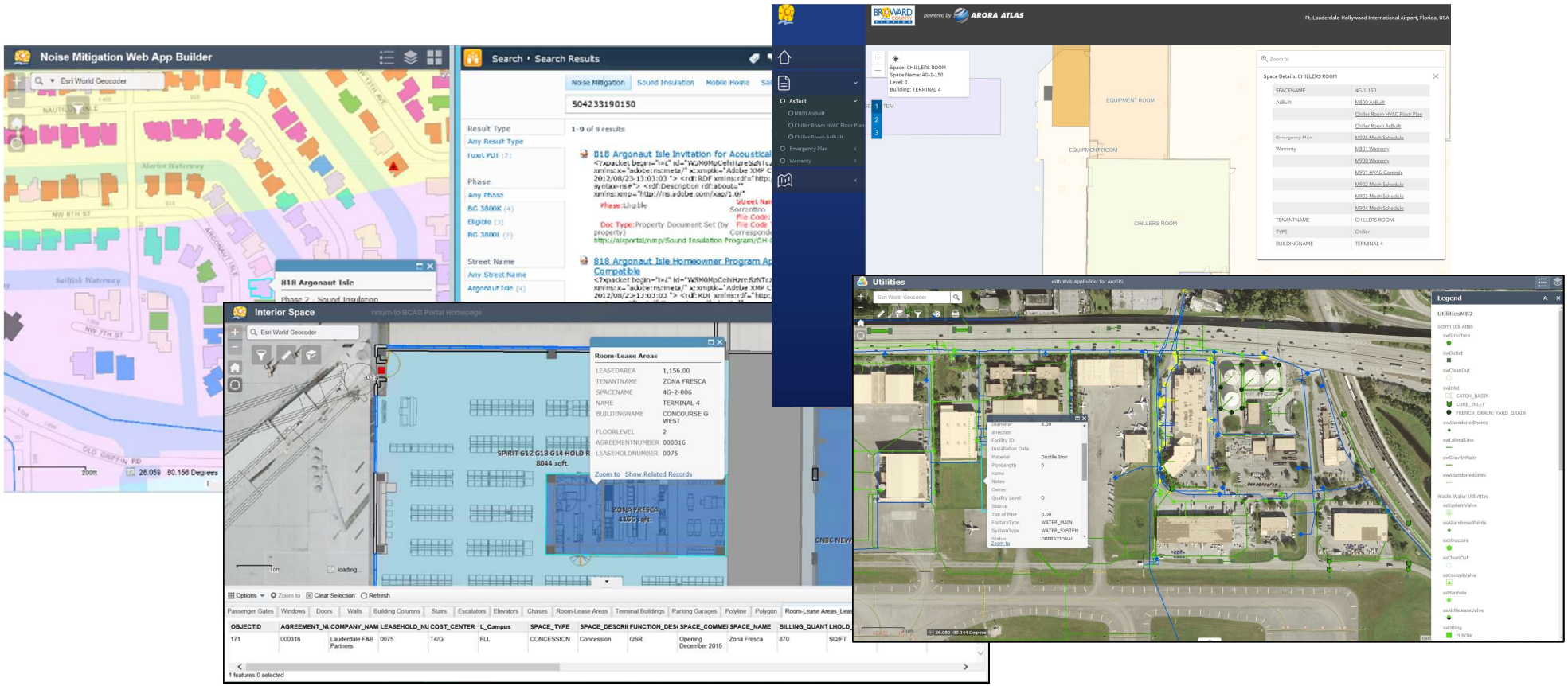
GIS is an Inevitable Transition for Airports

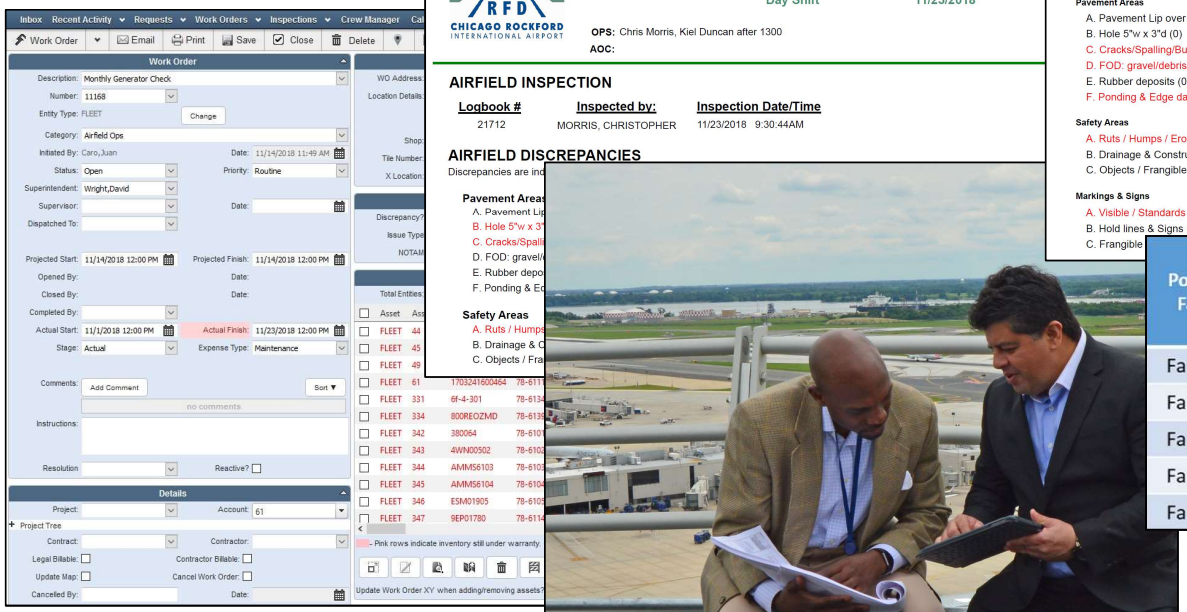
Old Methods → **Technological Advances**

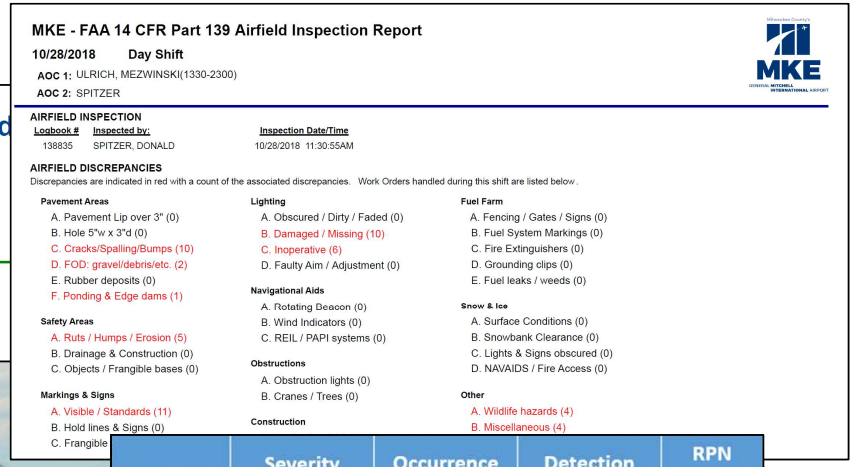


Airports Use GIS to Collaborate



Geospatial Data Drives Intelligence





Potential Failure	Severity Ranking 1 to 10 (10=most severe)	Occurrence Ranking 1 to 10 (10=most likely to occur)	Detection Ranking 1 to 10 (10=no advance warning)	RPN Severity X Occurrence X Detection
Failure 1	7	1	3	21
Failure 2	10	8	8	640
Failure 3	2	10	5	100
Failure 4	7	8	6	336
Failure 5	4	7	10	280

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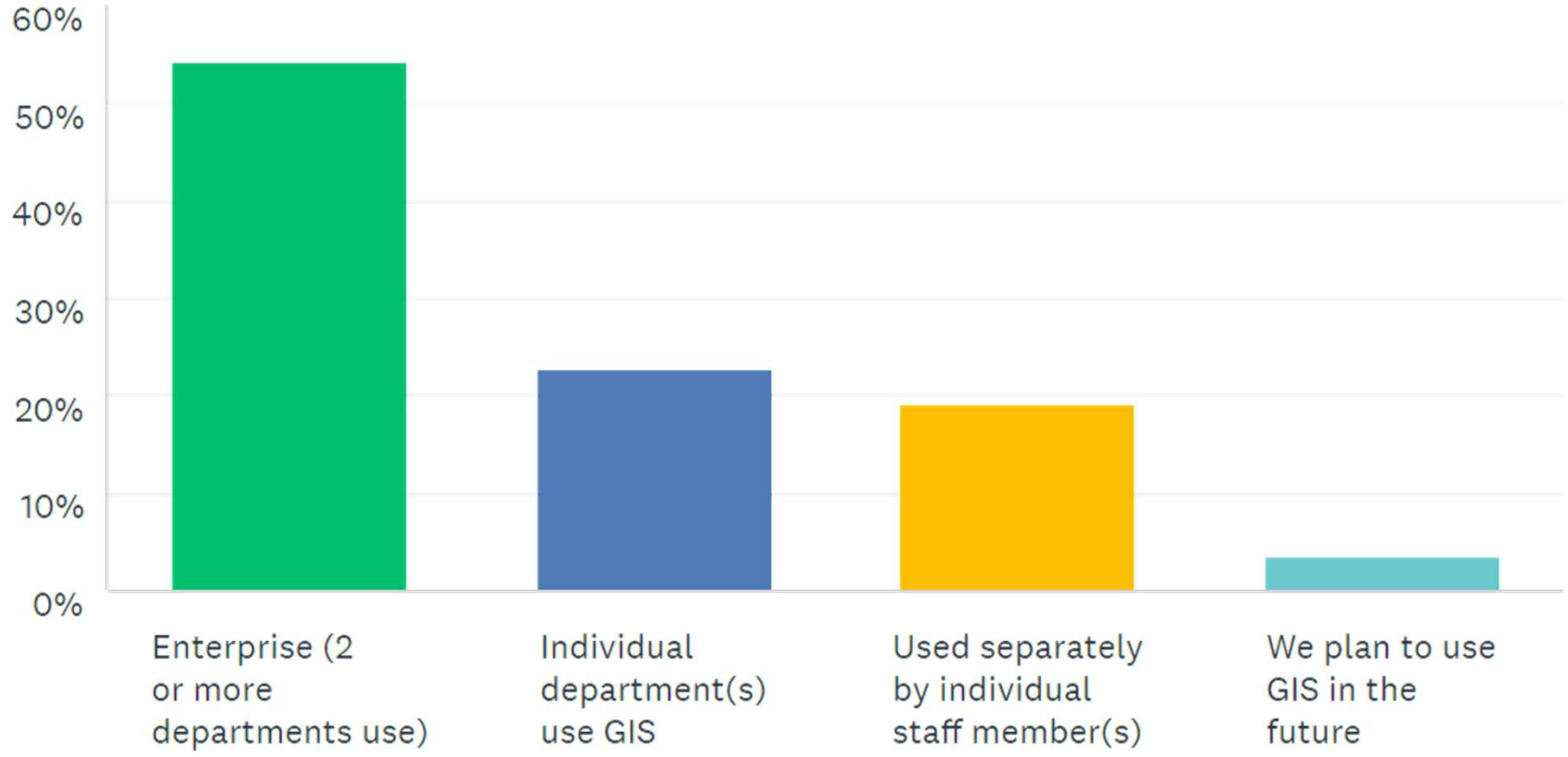
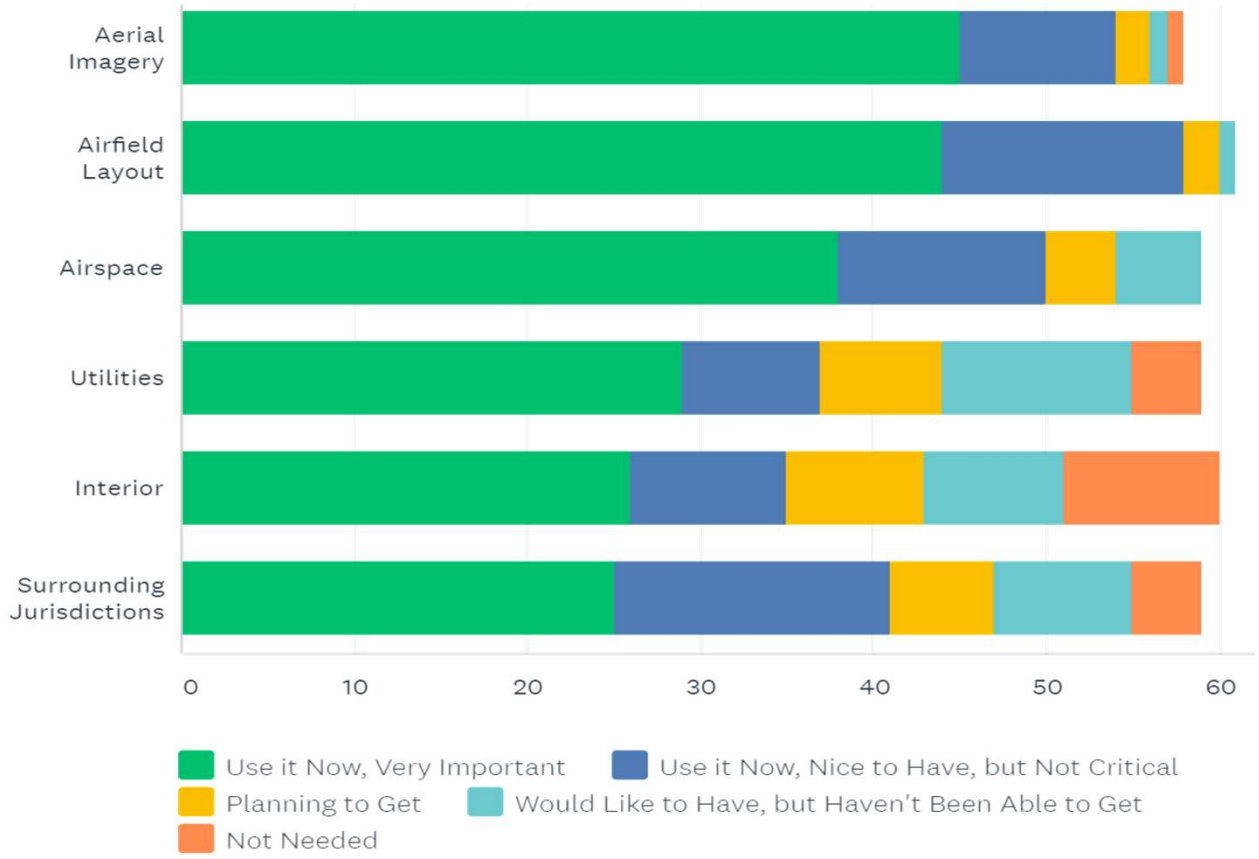
Level of GIS


60%
50%
40%
30%
20%
10%
0%
Enterprise (2 or more departments use)
Individual department(s) use GIS
Used separately by individual staff member(s)
We plan to use GIS in the future

Important Data Sets



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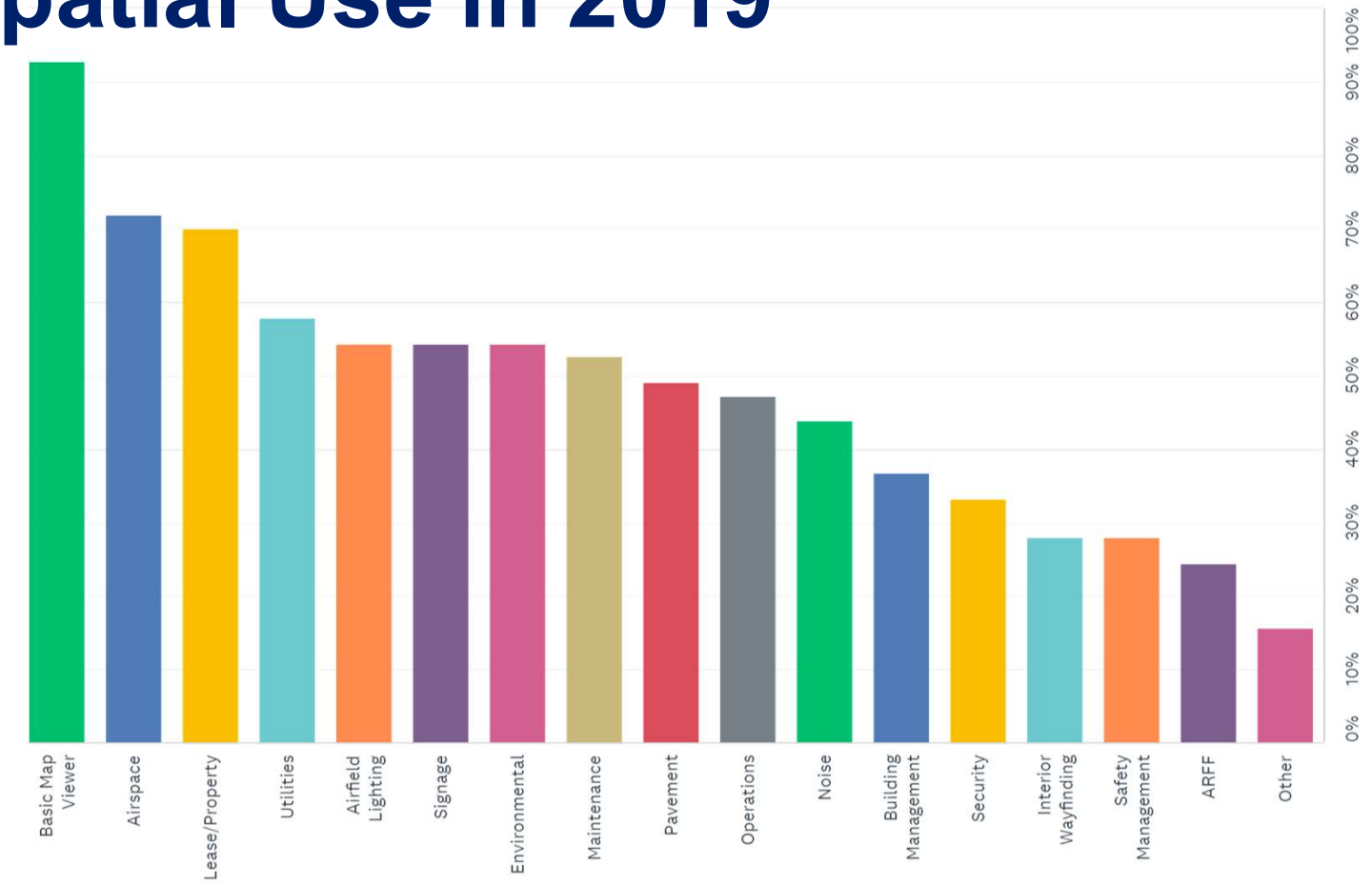
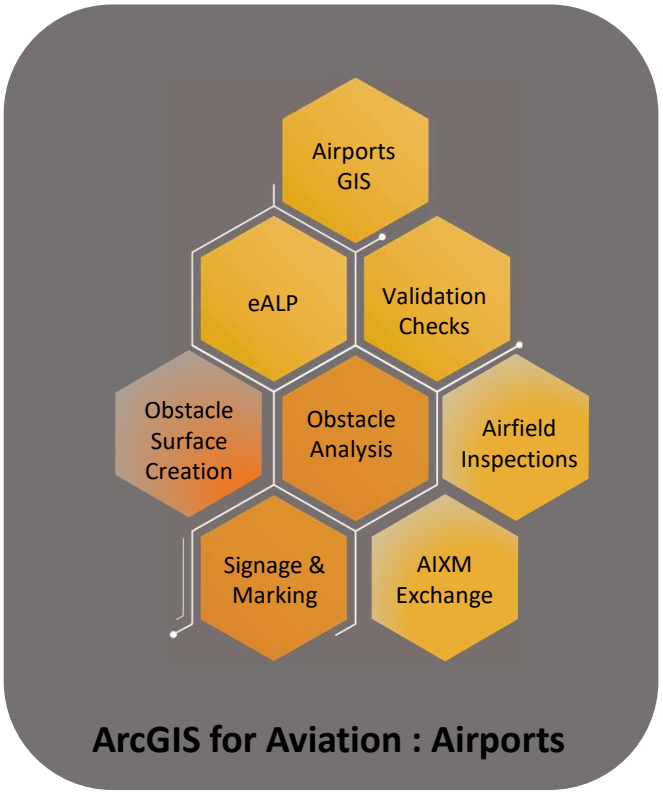
Geospatial Use in 2019



Importance of Geospatial for Airspace

- Demand for Air Travel Continues to Grow
- Pavement Continues to Age
- Few New Airports or Runways are Being Constructed
- “Second” most popular app in industry survey

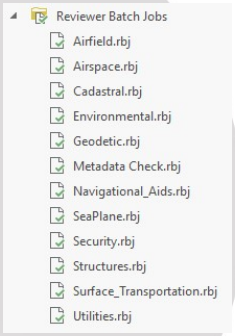
ArcGIS for Aviation : Airports



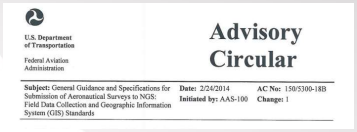
ArcGIS for Aviation : Airports

Airports GIS

Data Collection

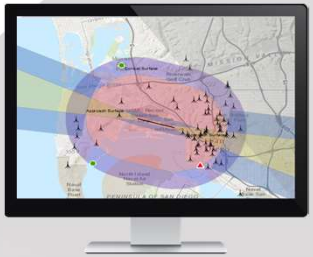


Validation

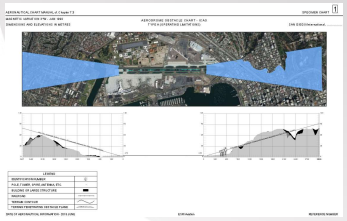


Standards Driven

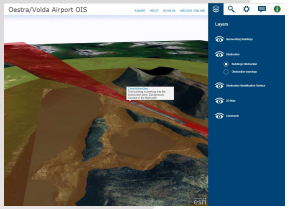
Obstacle Analysis



Obstacle Surface Creation & Analysis



Obstacle Planning Charts



3D Scenes

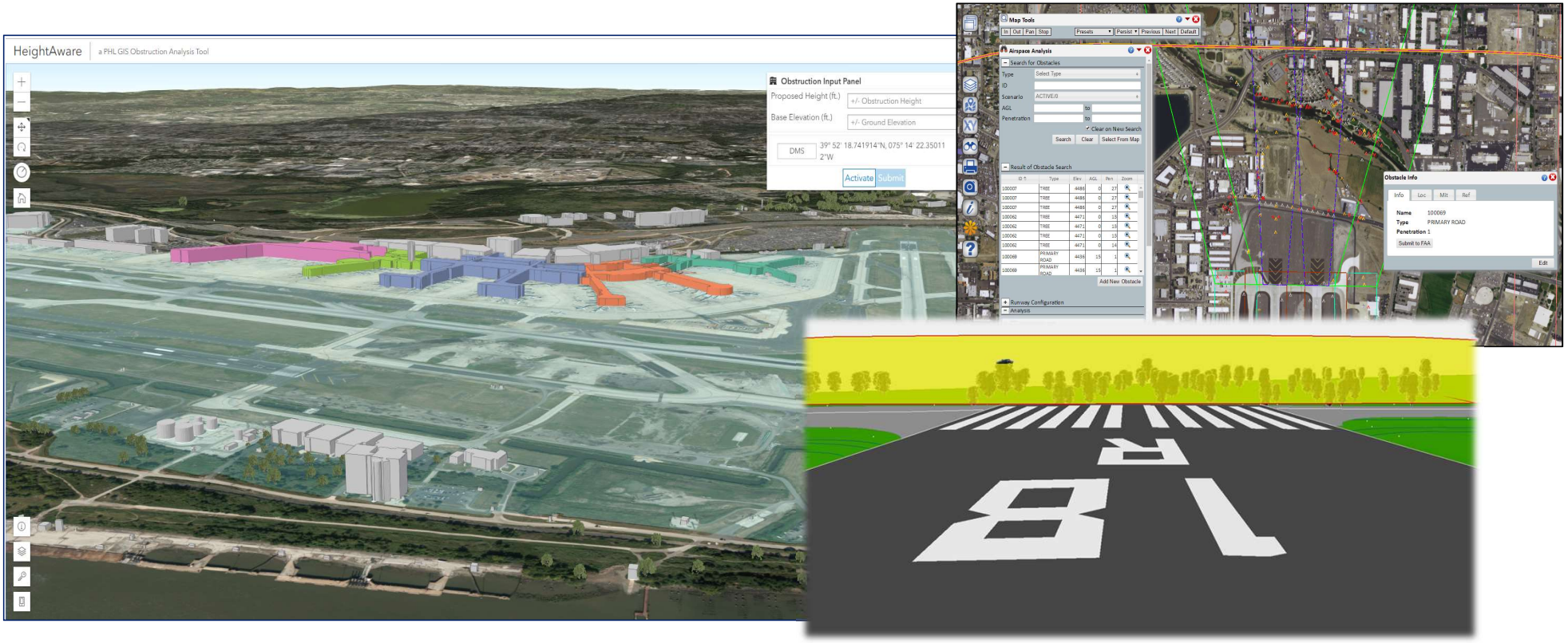
Signage and Marking

Templates

3D Editing

3D Content and Visualiation

GIS Solutions: 3D Airspace Analysis



GIS Solutions: Obstacle Action Plan (OAP)

Federal Aviation Administration

MEMORANDUM

Date: August 18, 2015

To: Regional Airports Division Managers
610 Branch Managers
620 Branch Managers
Airports District Office Managers

From: Director, Office of Airport Safety and Standards (AAS-1)
Director, Office of Airport Planning and Programming (APP-1)
Director, Office of Airport Compliance (ACO-1)

Subject: **Reminder of Responsibilities for FAA Personnel and Airport Sponsors for Protecting Approach and Departure Surfaces**

Introduction

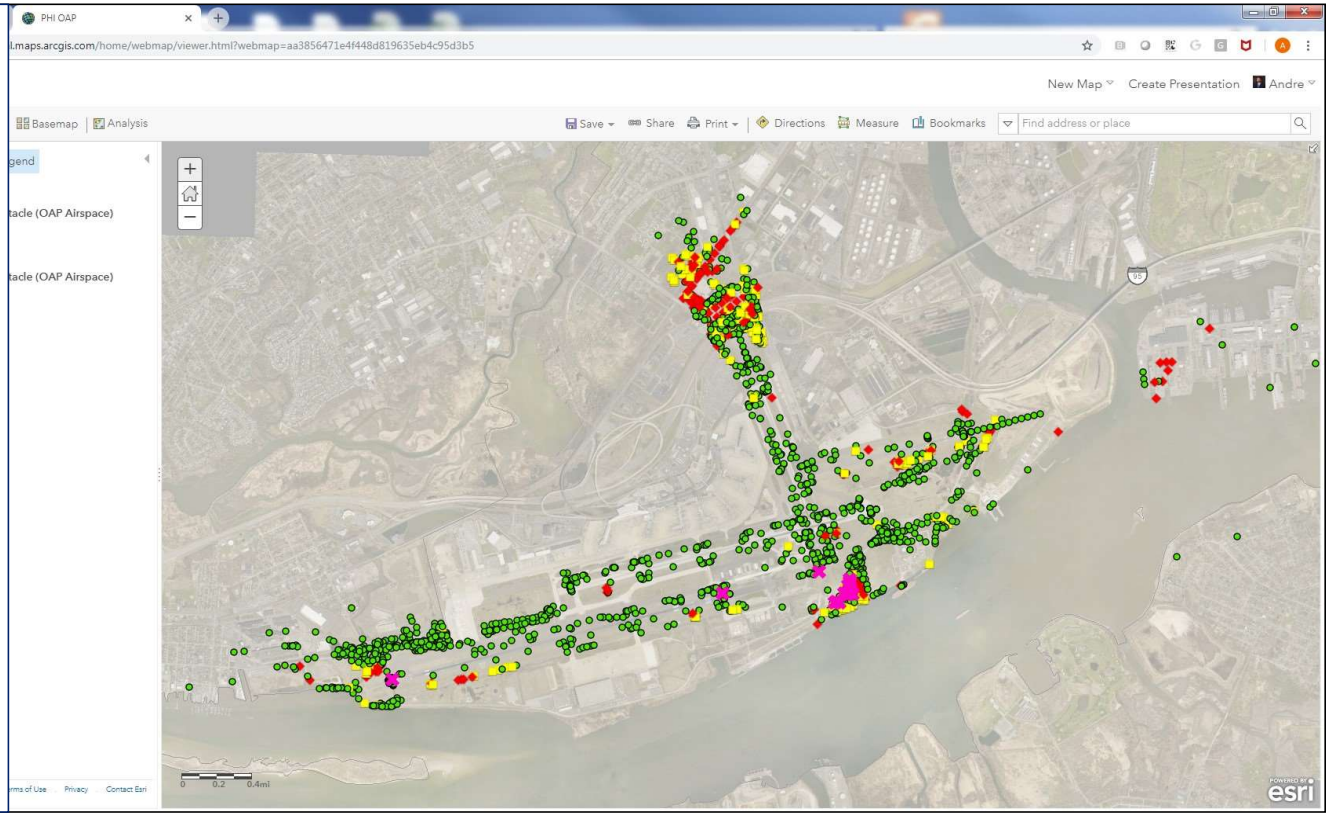
The purpose of this memo is primarily to remind FAA Office of Airports staff about their responsibilities (as well as the responsibilities of airport sponsors) in establishing and maintaining clear approach and departure surfaces at airports. We encourage personnel in all Regions and ADOs to relay this memorandum to all Federally obligated airports and any that are certificated under 14 CFR part 139, as well as all state aeronautical agencies. This memorandum will also be available on the FAA's public website under Safety, Planning and Compliance.

The airport sponsor is ultimately responsible for ensuring clear runway approach and departure surfaces. However, ARP plays an important role in this process. This role is detailed in a separate section below.

The approach and departure surfaces required to be maintained are those identified by Advisory Circular (AC) 150/5300-13A, Airport Design and FAA Order 8260.3B, The United States Standard for Terminal Instruments Procedures (TERPS). The focus of this document is on the TERPS 20:1 surface. While Part 77 civil airport imaginary surfaces are important, they are not the surfaces discussed in this document as they do not directly affect procedures.

Role of the Office of Airports (ARP)

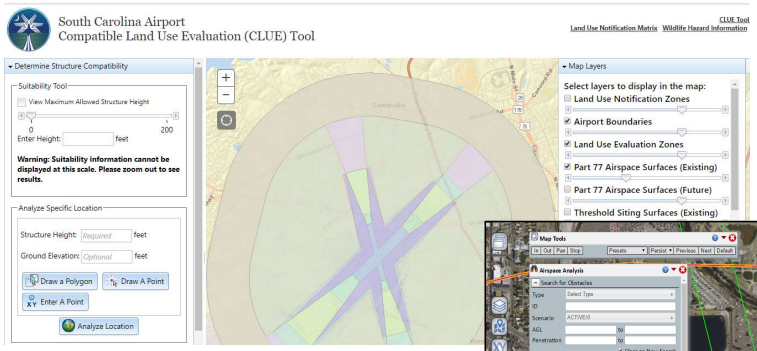
- A core part of ARP's mission is to help maintain and enhance the safety, capacity

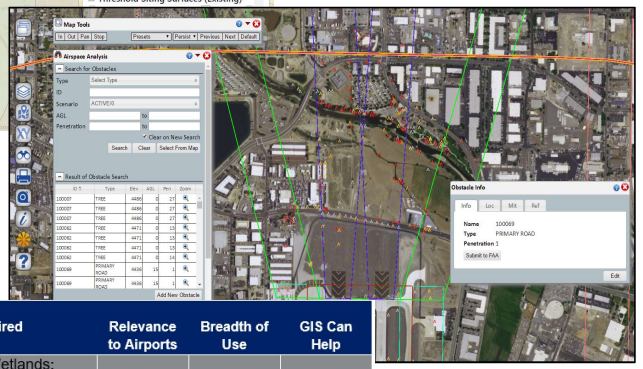


GIS Solutions: Land Use Compatibility

- Applications for Airspace, Noise, and Other Factors
- Based on Research

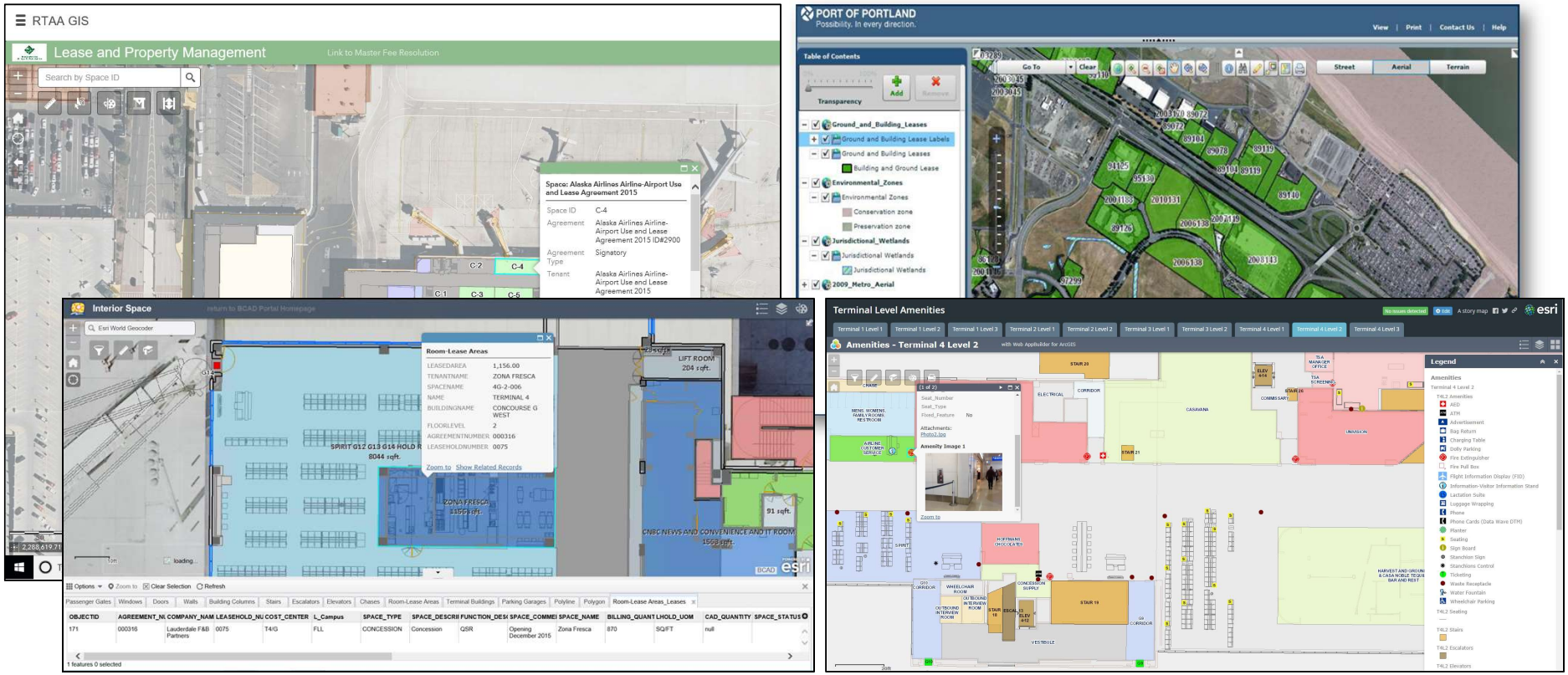
  (ACRP Reports 200 & 206)
- Policy guidance on effective land use compatibility planning



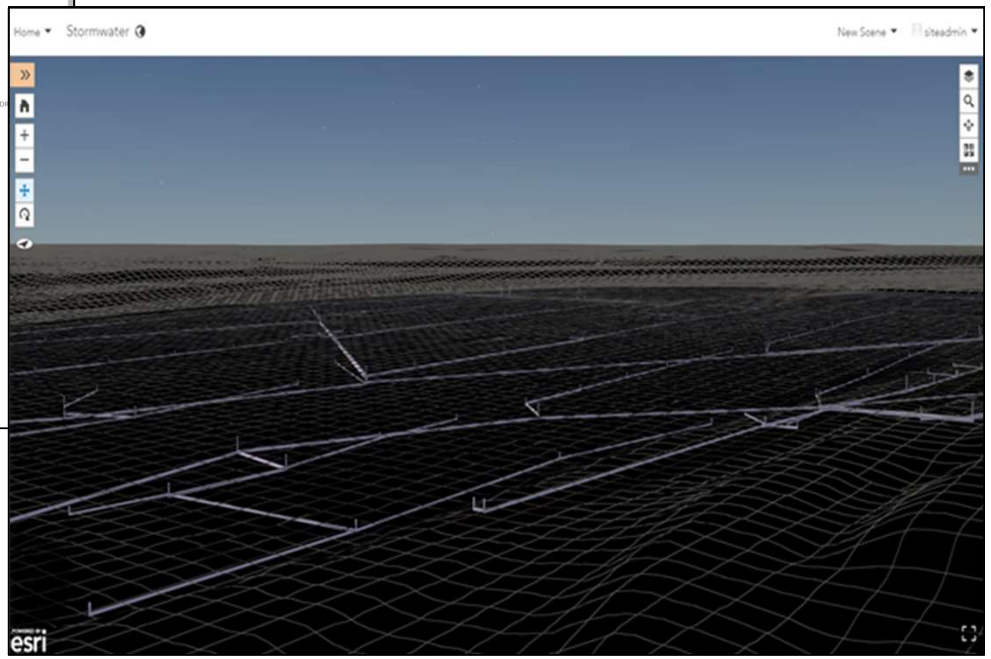


Compatible Land Use Impact Issue	Stakeholders (Impacted or Influencers)	Information Required	Relevance to Airports	Breadth of Use	GIS Can Help
Fauna that is Hazardous to Aircraft Operations	Airport Planning, Engineering, Environmental Agencies	Habitat Areas; Wetlands; Species Types; Migration Patterns; Location of Control Devices; Incident Locations; Drainage and Physical Characteristics of Detention Ponds and Other Storm Water Best Management Practices (BMPs)	✔		Helpful
Degradation of Air Quality	Airport Environmental, Planning, Operations; FAA Environmental;	Access to Airport and Fuel Facilities; Fuel Utilities; Vehicle Circulation Routes;	✔		Limited

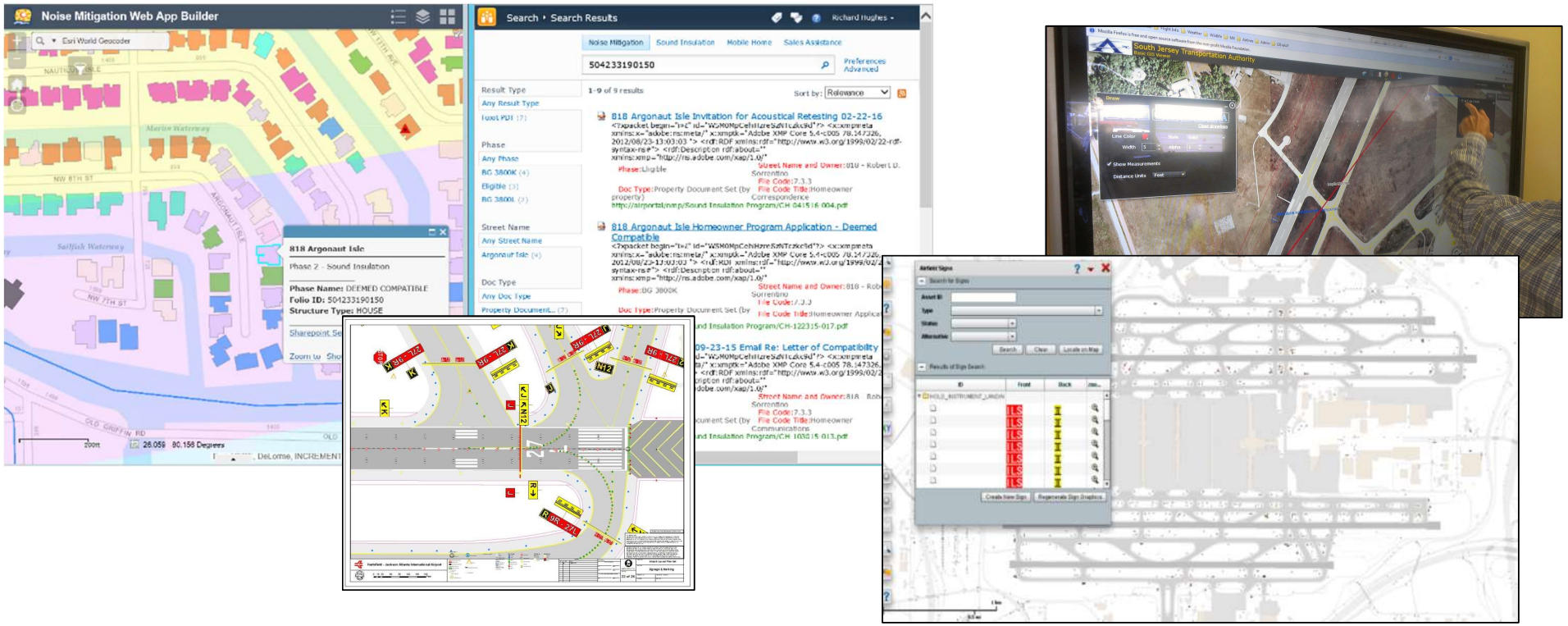
GIS Solutions: Leasing & Properties



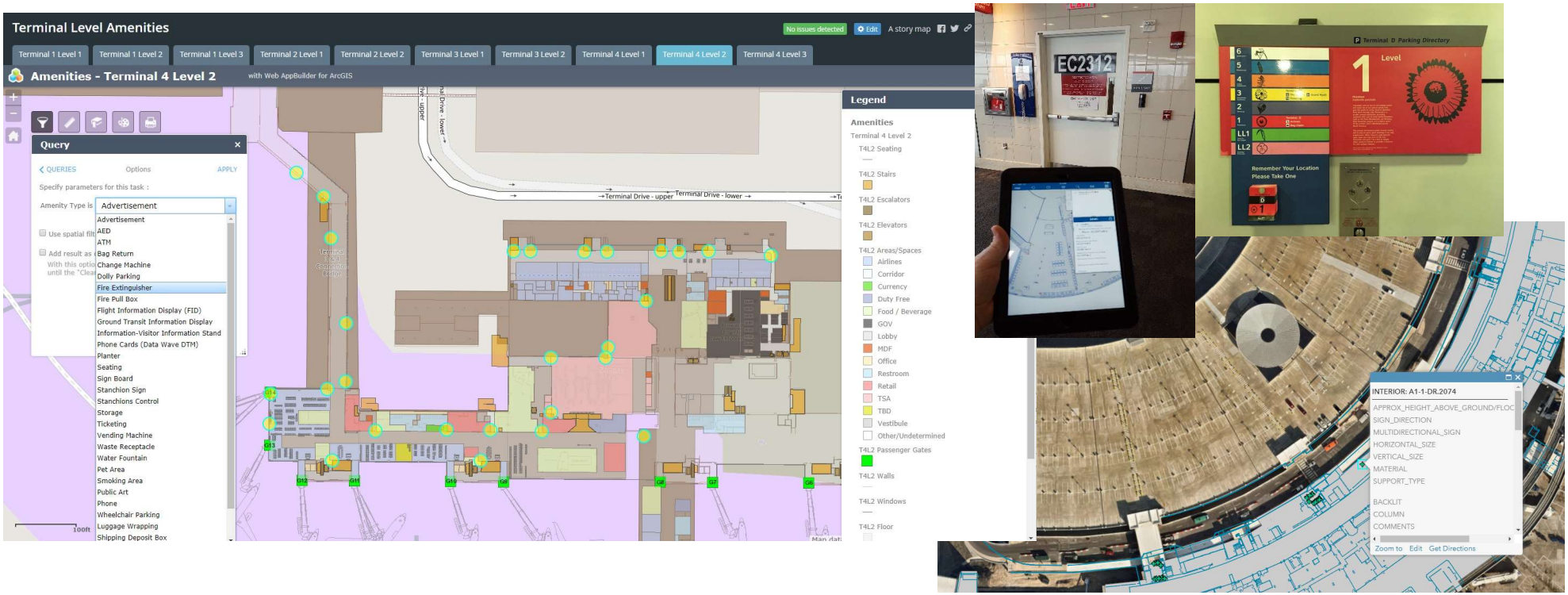
GIS Solutions: Utilities



GIS Solutions: Environment, Operations



GIS Solutions: Asset Management



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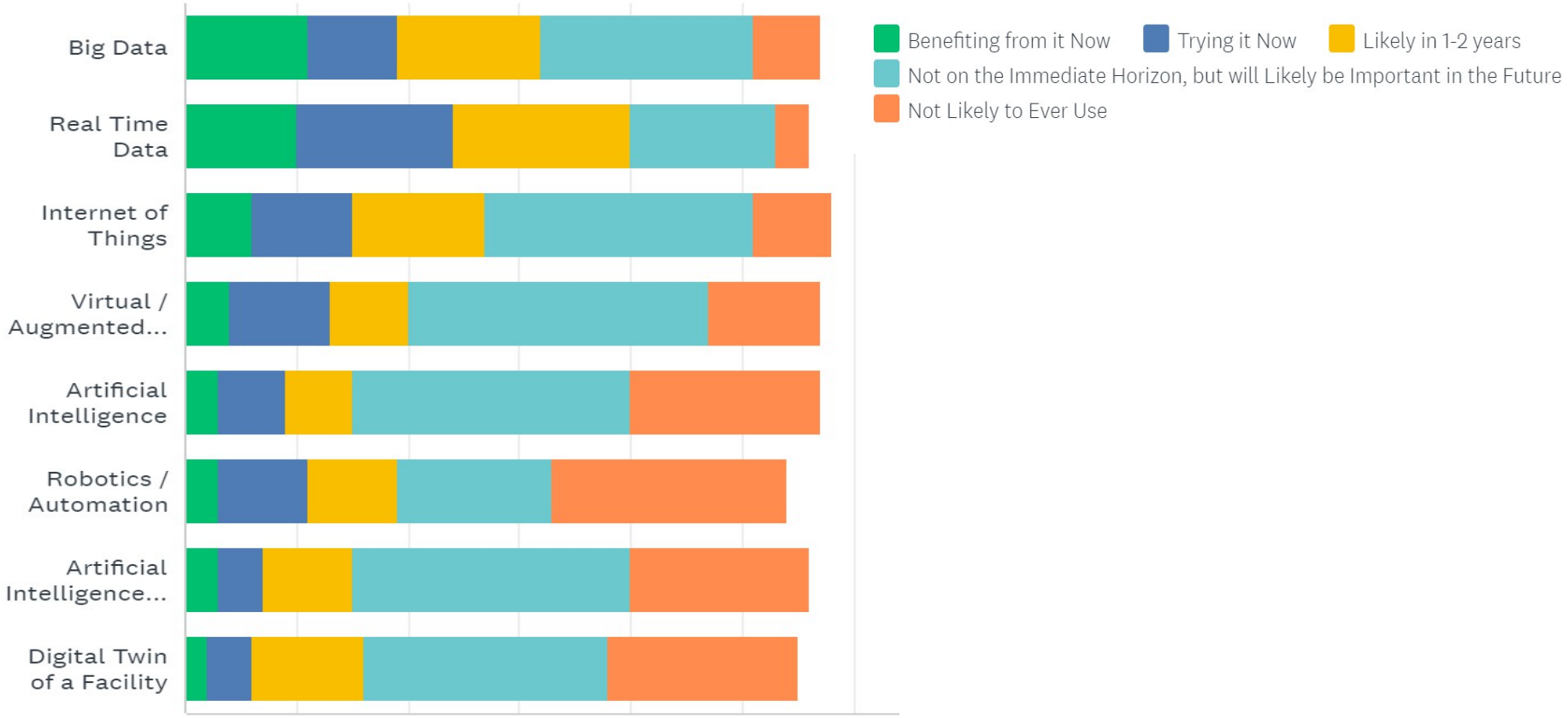
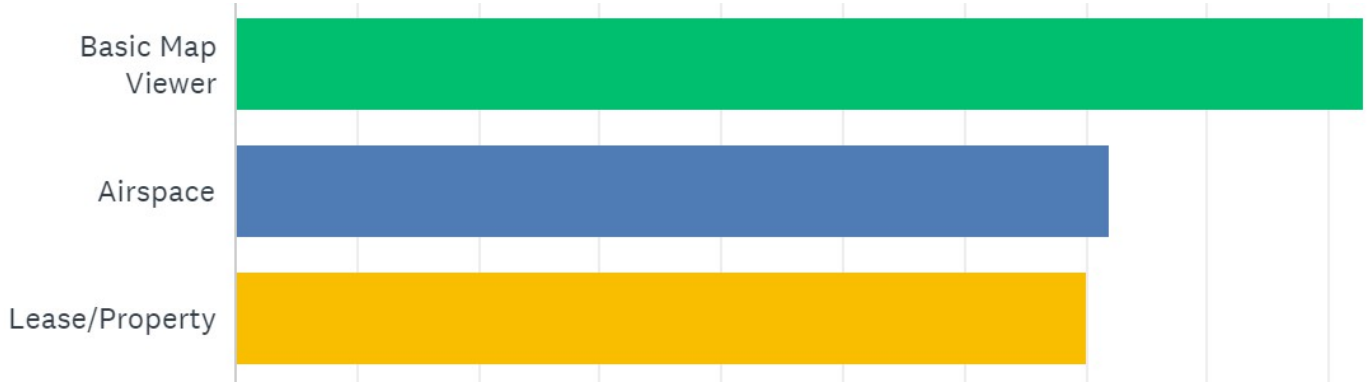
Emerging Technologies



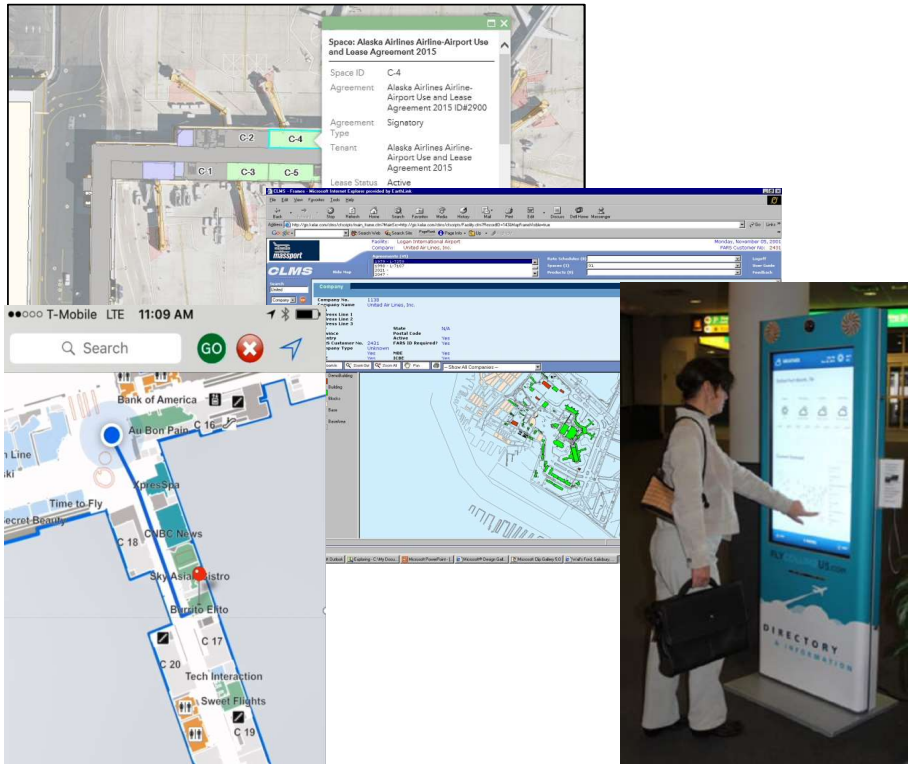
The Importance of Geospatial Indoors

- We spend 90% of our time indoors
- Interior space generates significant revenue for airports
- Terminal space is constantly changing
- “Third” most popular app in industry survey



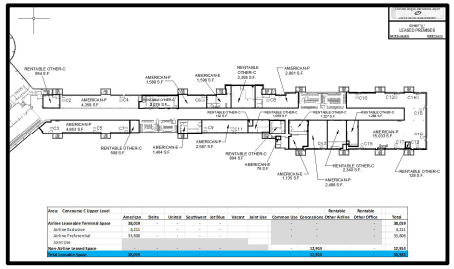
Growing Demand for Indoor Apps

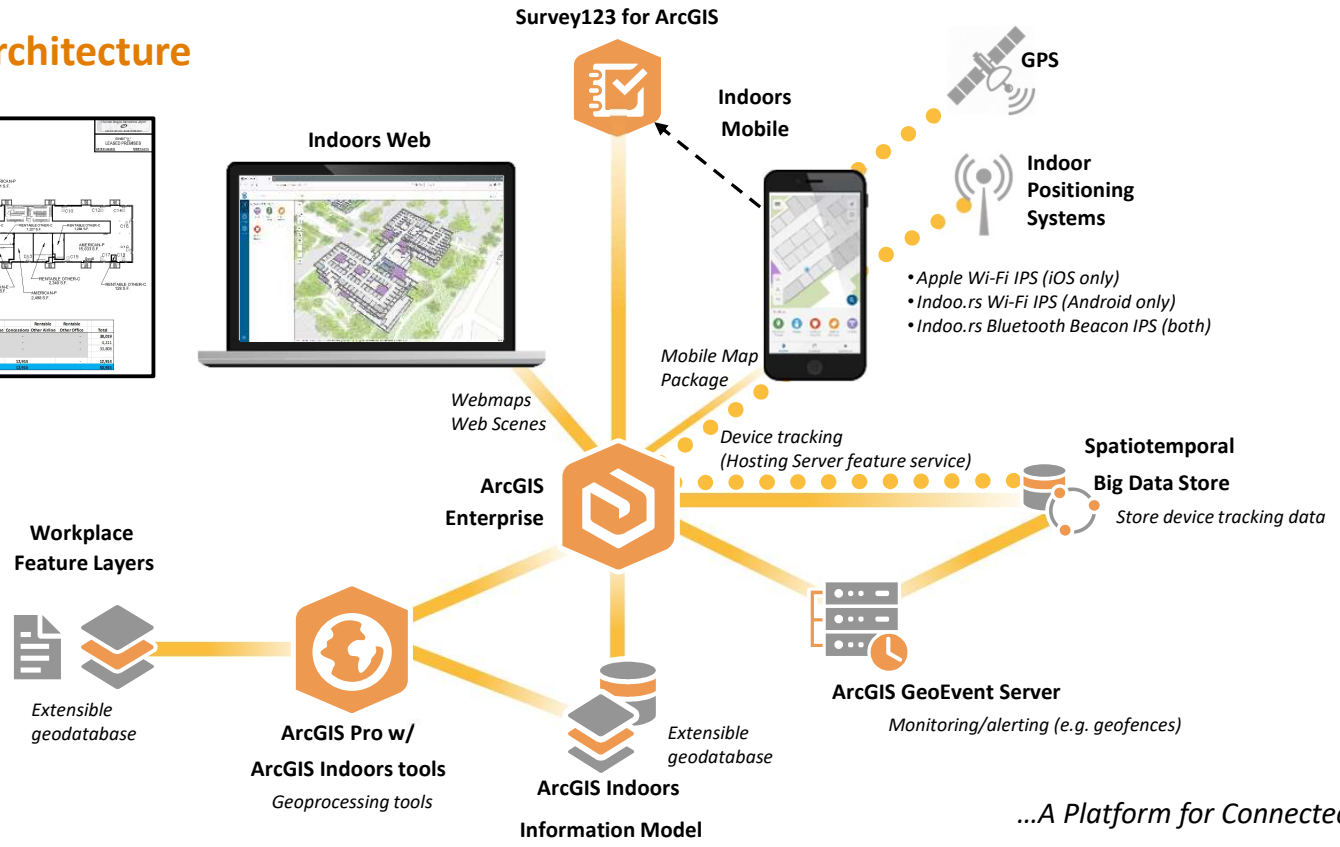
- Basic Viewer
- “Who is Where”
- Asset Management Systems
- Lease Management Systems
- Wayfinding on Mobile Devices
- Computer Aided Dispatch
- Kiosks



What is Esri's ArcGIS Indoors

High Level Architecture

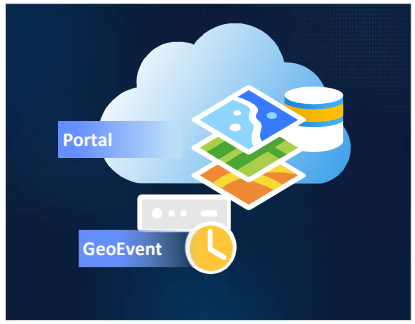




…A Platform for Connected Buildings and Workplaces

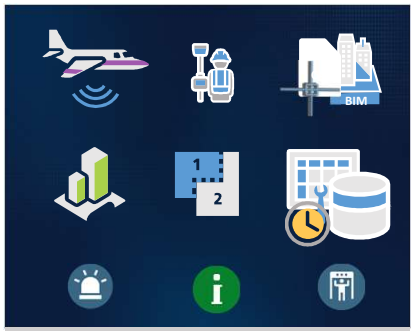
Implementation of ArcGIS Indoors

Getting Started



Infrastructure

- Cloud/On Premise
- ArcGIS Enterprise
- ArcGIS Event Server

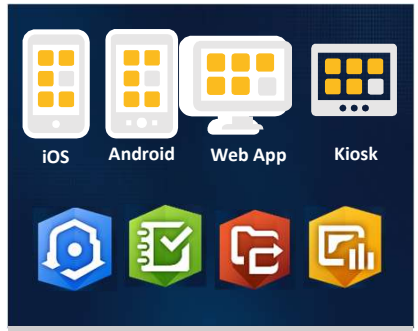


Indoor Maps

- 2D/3D
- POIs
- Site Plans

Indoor Positioning

- Wi-Fi
- BLE
- Deployment & Survey

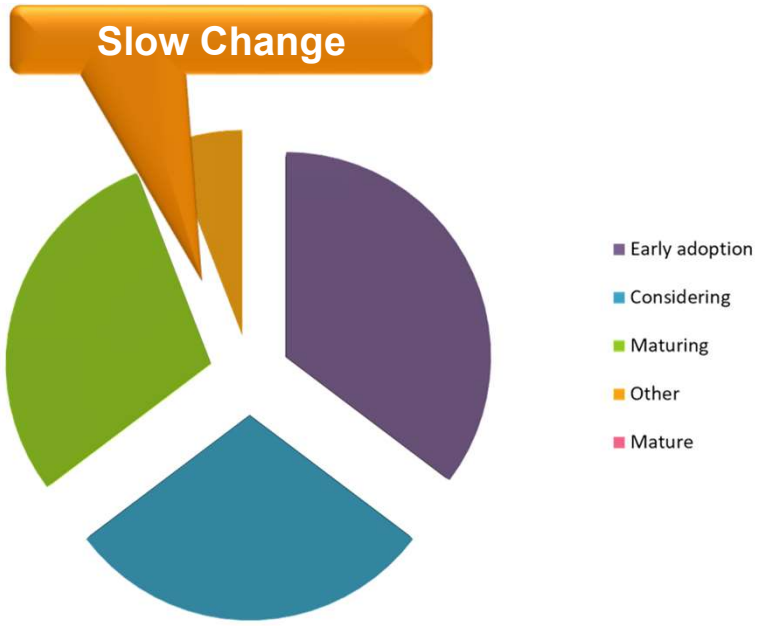


Indoor Software

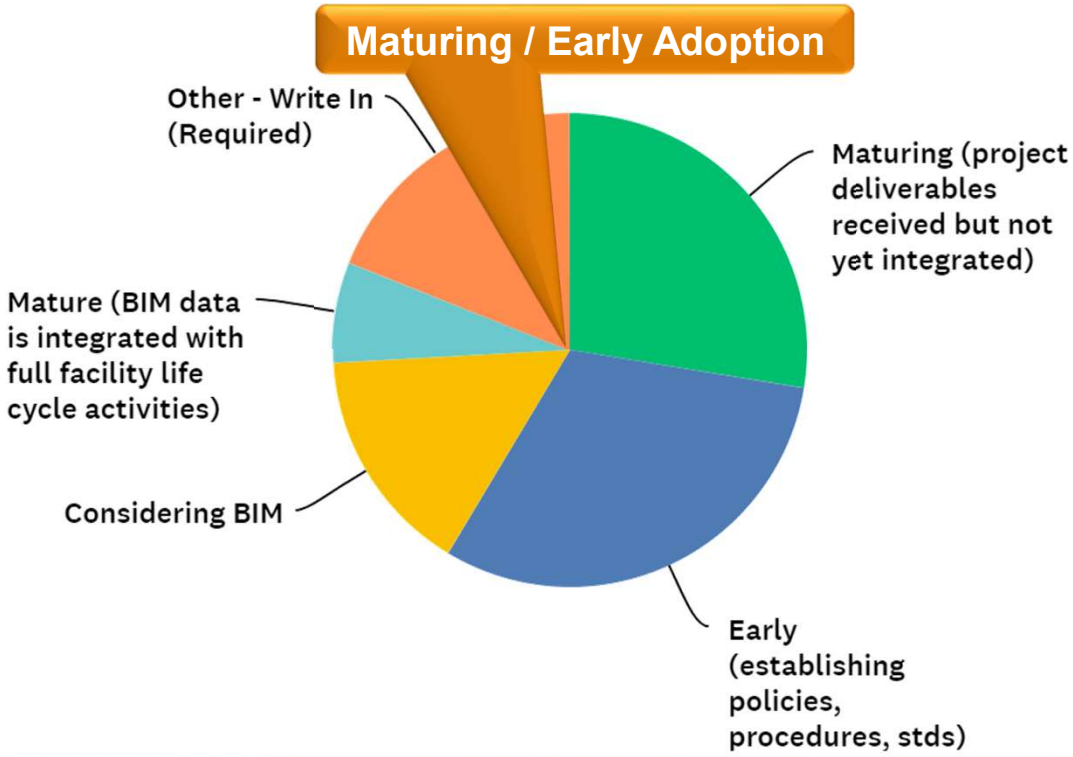
- Configuration
- Integration
- Extension

BIM Implementation at Airports

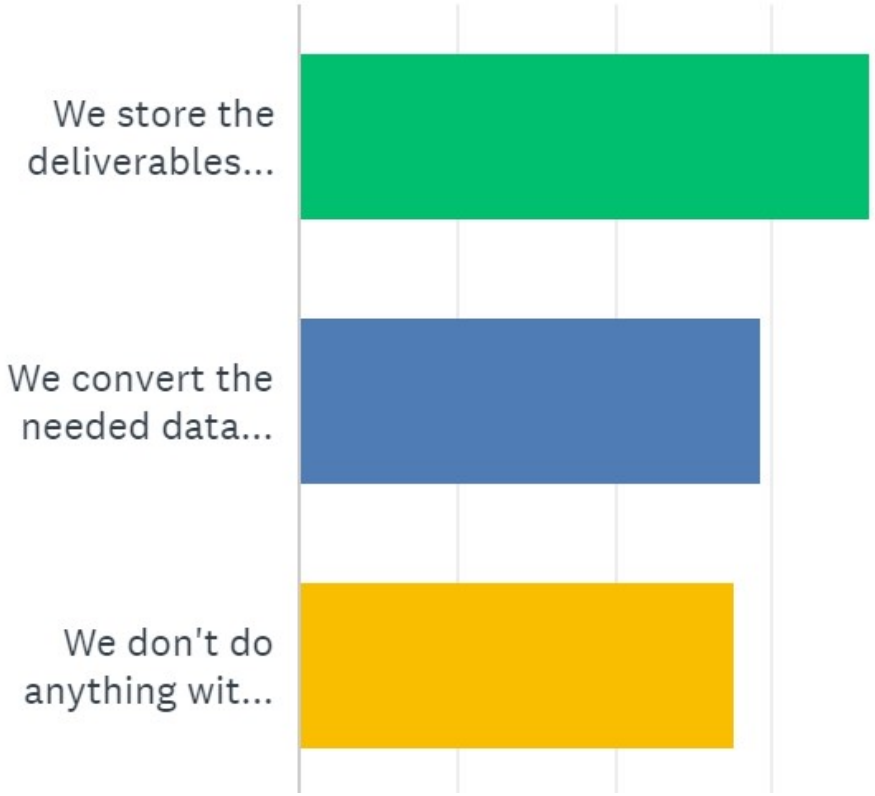
2016



2019



What Happens with BIM Deliverables?



Geospatial Data Interoperability

- Estimates that the world will need to spend $57 trillion on infrastructure through 2030 to keep up with global GDP growth [1]
- Large construction projects typically take 20 percent longer to finish than scheduled and are up to 80 percent over budget [1]
- Construction industry is ripe for disruption and two of the technologies that it believes will be key in that anticipated transformation are geospatial and BIM [1]
- The big payoff of a digital model will be during operations and maintenance, which typically represents 80% of the cost of a facility [2]
- It can take the operator of the facility a year to go through this information to find the information required to operate the facility [3]
- For many types of equipment the highest probability of failure is in month 1-2 of operation [3]
- Integration of geospatial and BIM essential to address the challenges of the 21st century [3]

Sources
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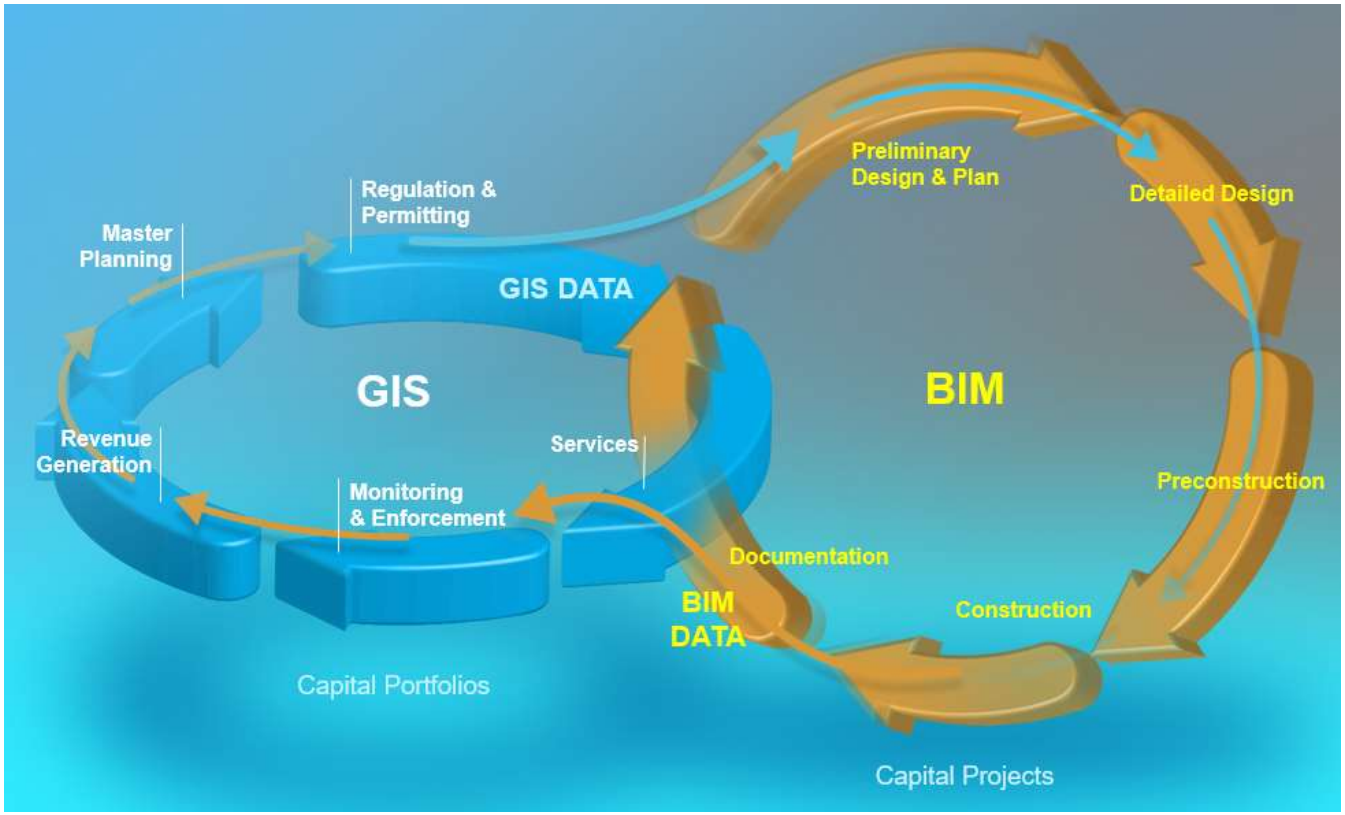
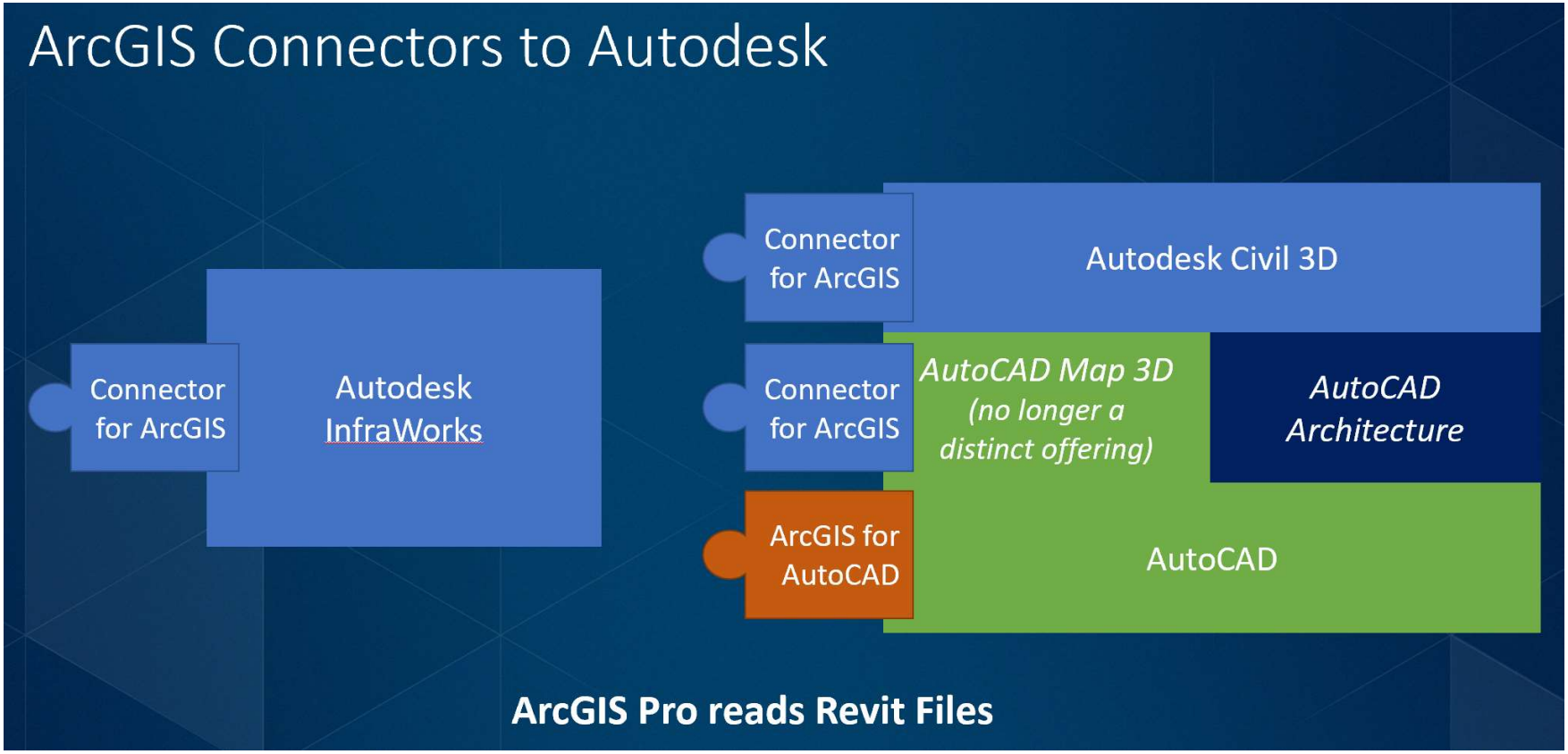
Evolution of BIM and GIS (Esri's View)

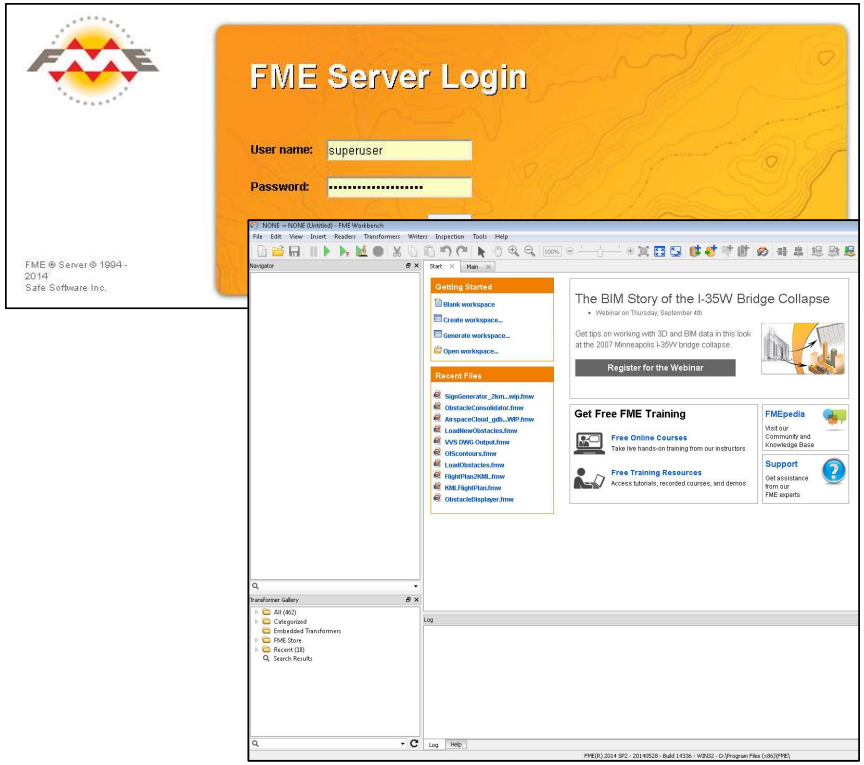


Esri's Integration with Autodesk

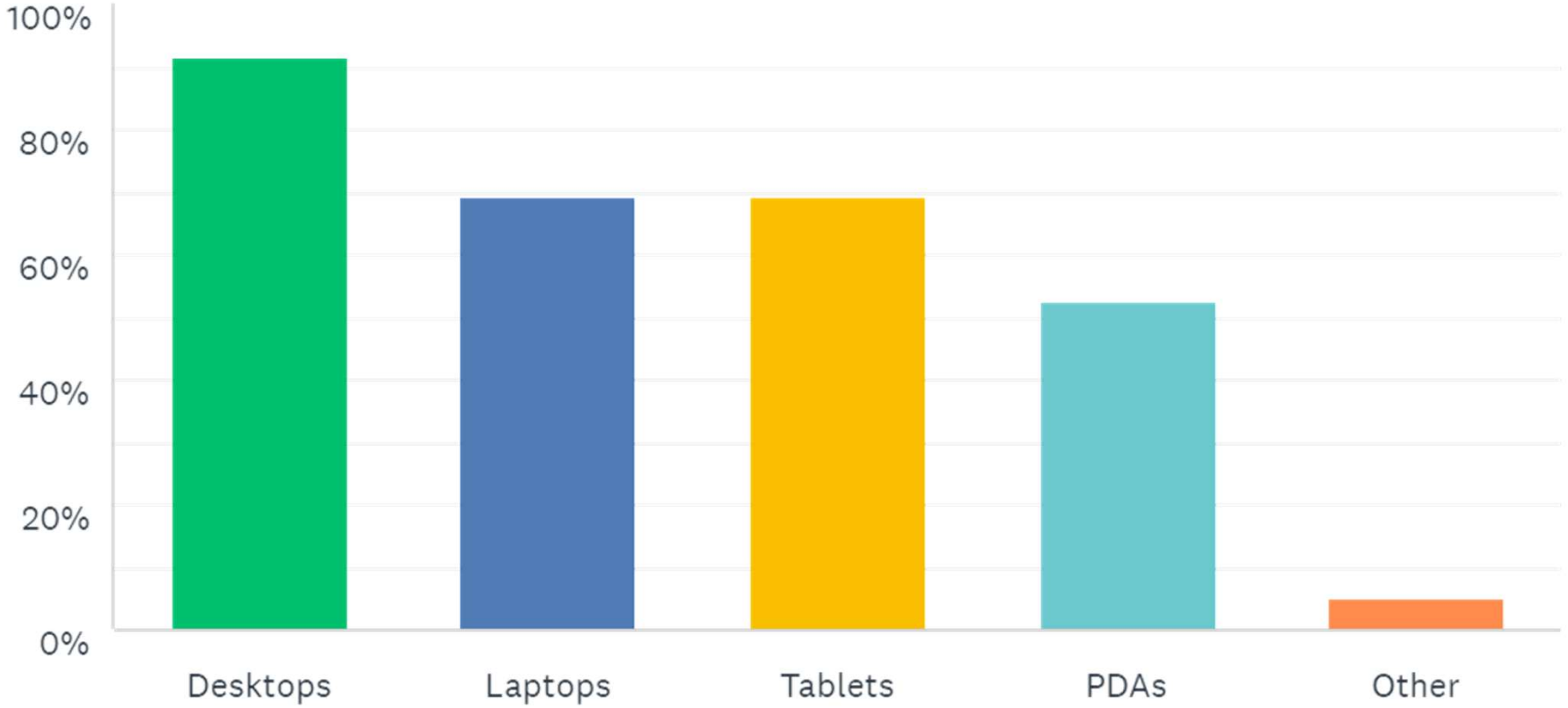


Safe: Feature Manipulation Engine (FME)

- Tool for transforming geospatial data into what we need
- Also a great tool for visualizing and checking data
- Not just for geospatial data anymore
- Comes in 3 flavors
  - Desktop, Server, and Cloud)



Types of Devices



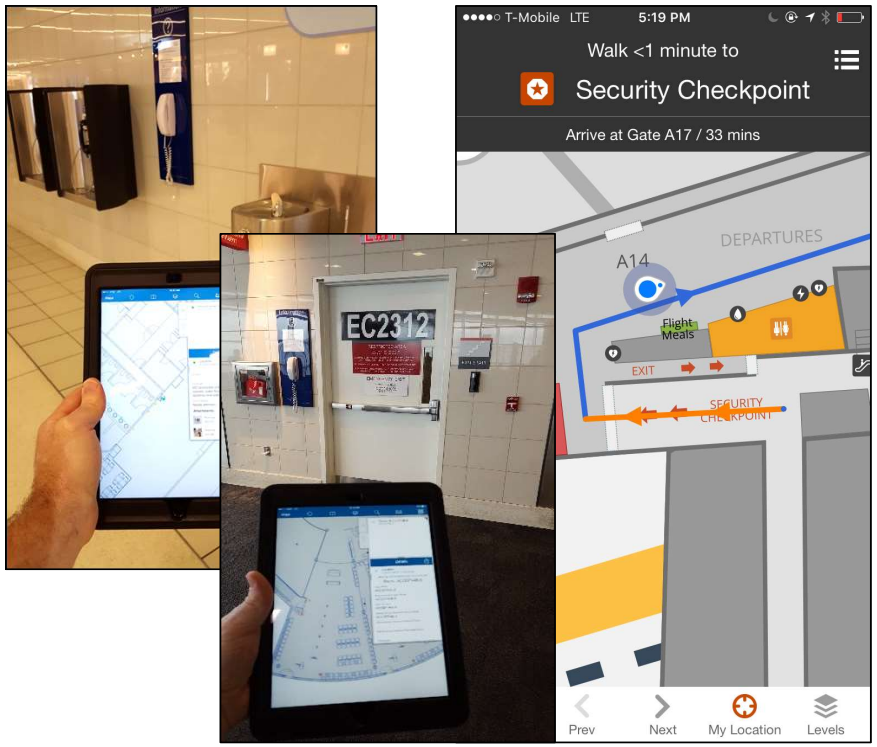
Mobile Access to Geospatial Data

Availability

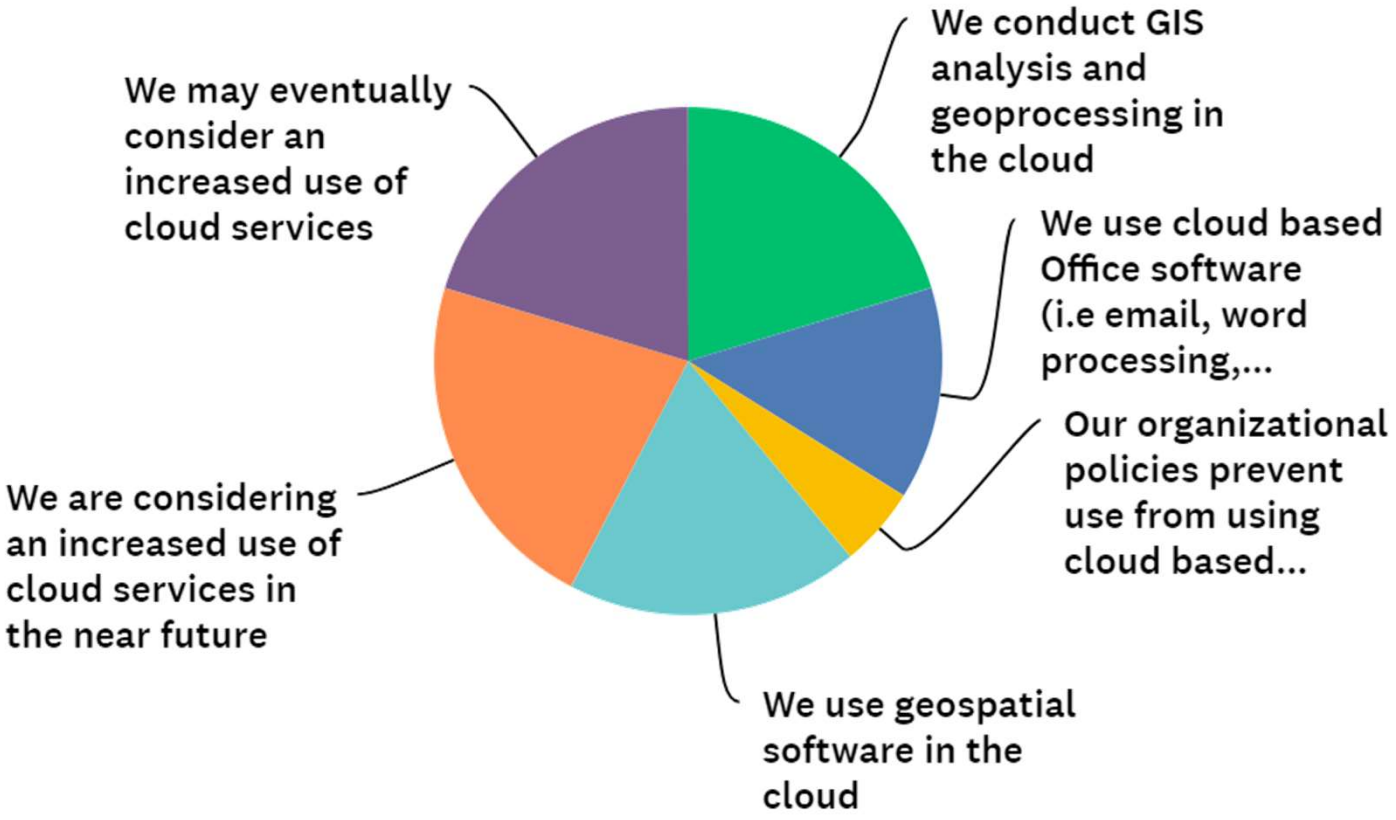
- Where and When Needed
- On a Variety of Devices
- If Disconnected

Support

- Operations
- Maintenance
- Inspections
- Revenue Management



Use of Cloud Based Services



Comparing the Alternatives

Cloud

- Low Entry Cost
- Quick to Implement
- Easy to Scale
- Mobile Access
- Current Trend
- Increasing Capabilities

Internal

- Within Firewall
- Customization Options
- Less Upgrade Issues
- Control & Flexibility

Geo-centric Asset Management

Agenda

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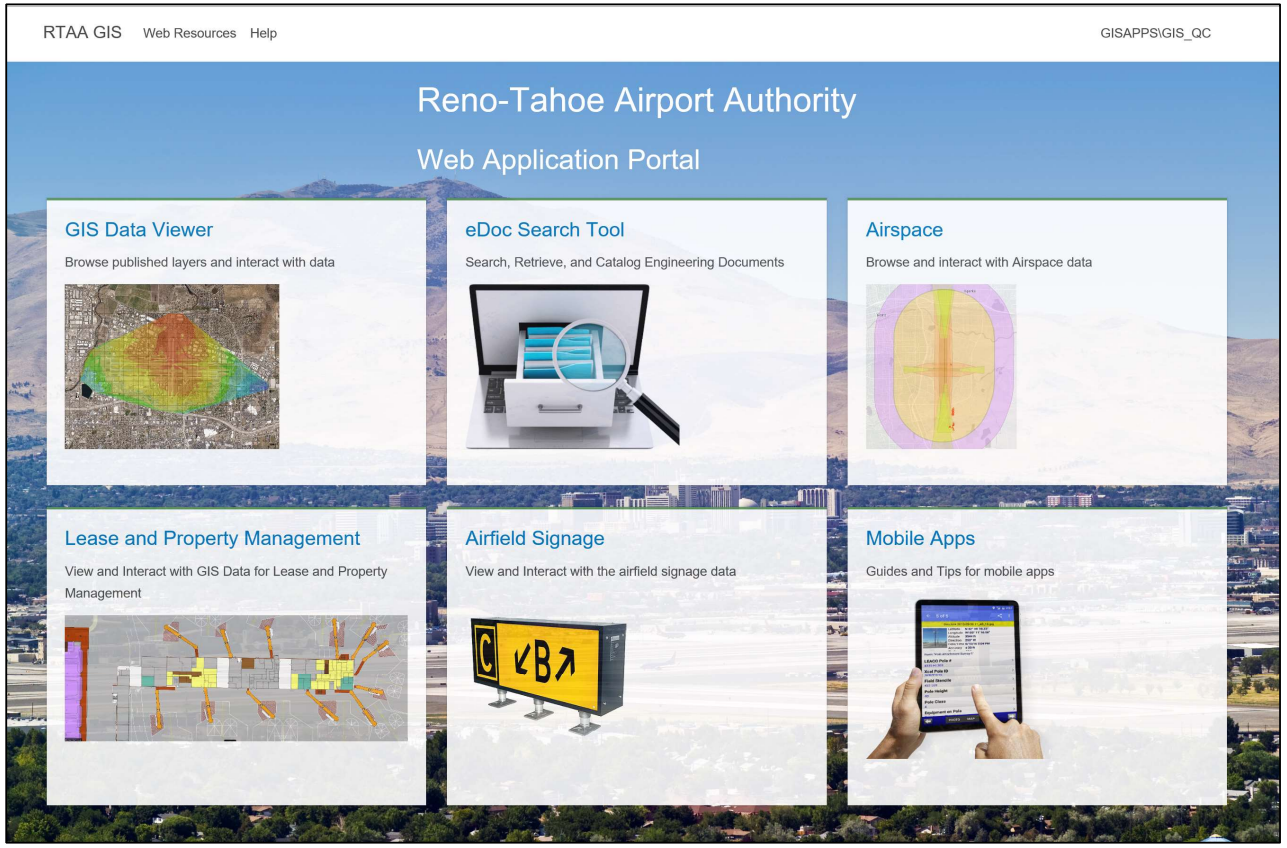
- **Success Stories**
- How to Get Started Down the Roadmap to Success
- Resources Required (money, people, organizational support)
- Overcoming Common Challenges

Success Story: Reno-Tahoe (RNO)



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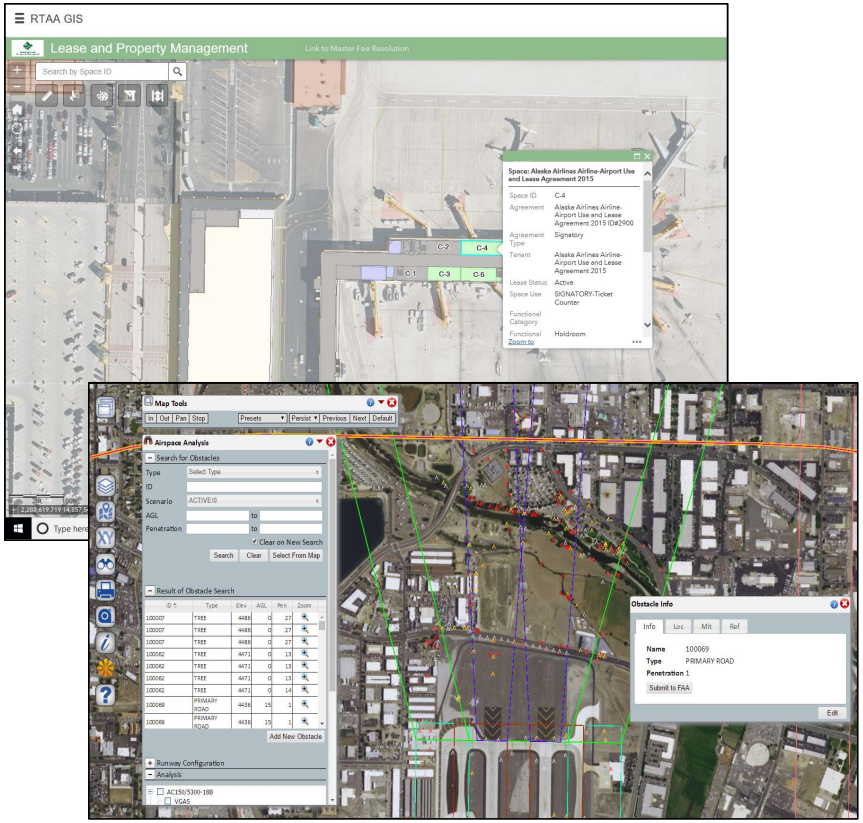

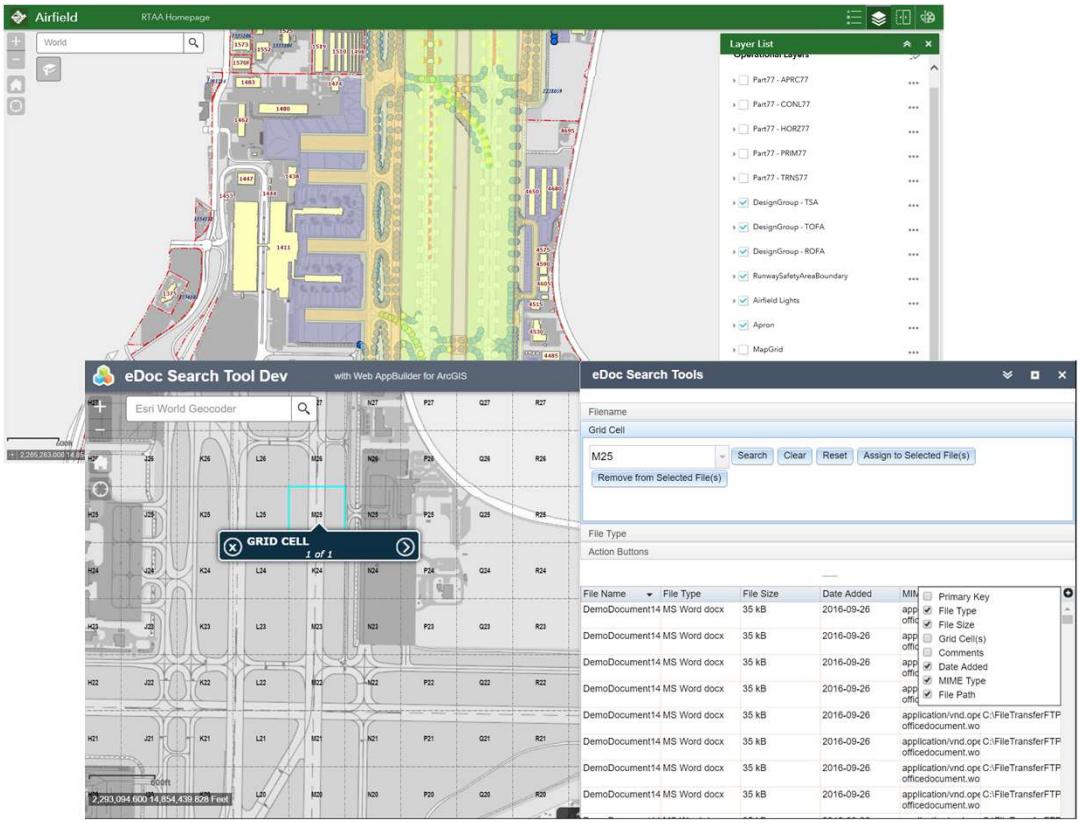

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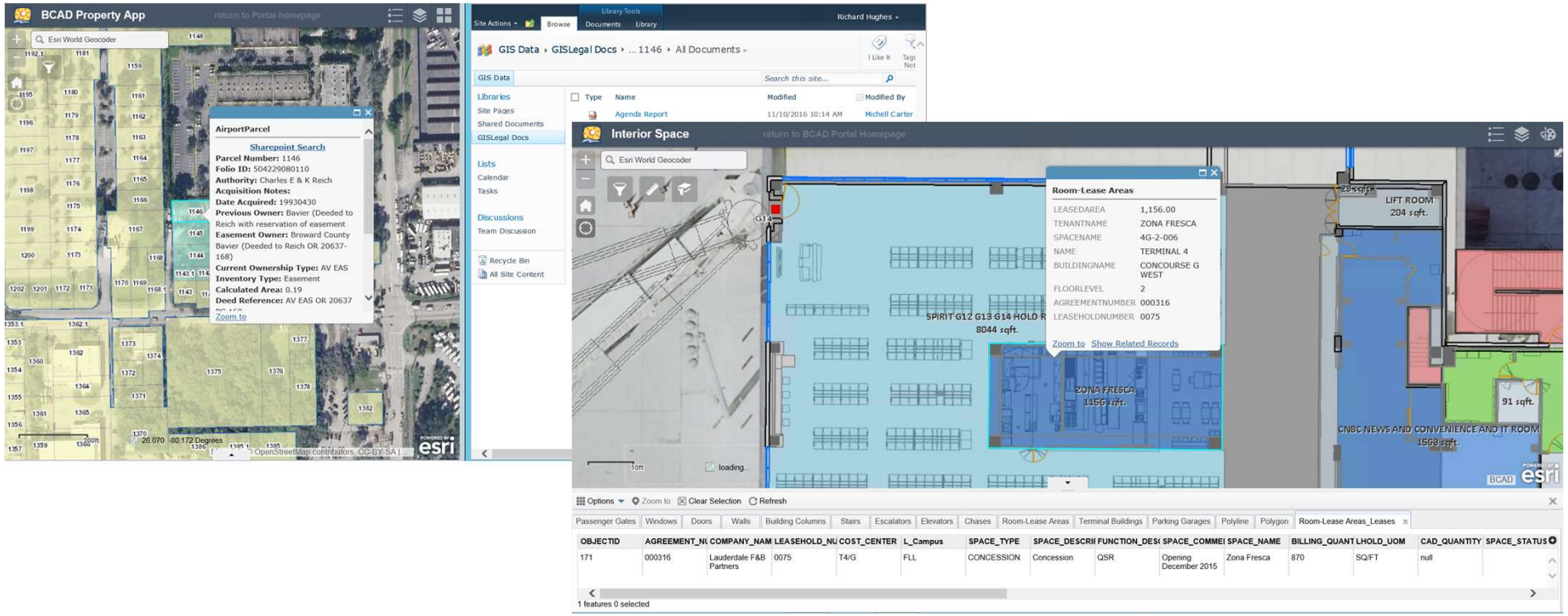

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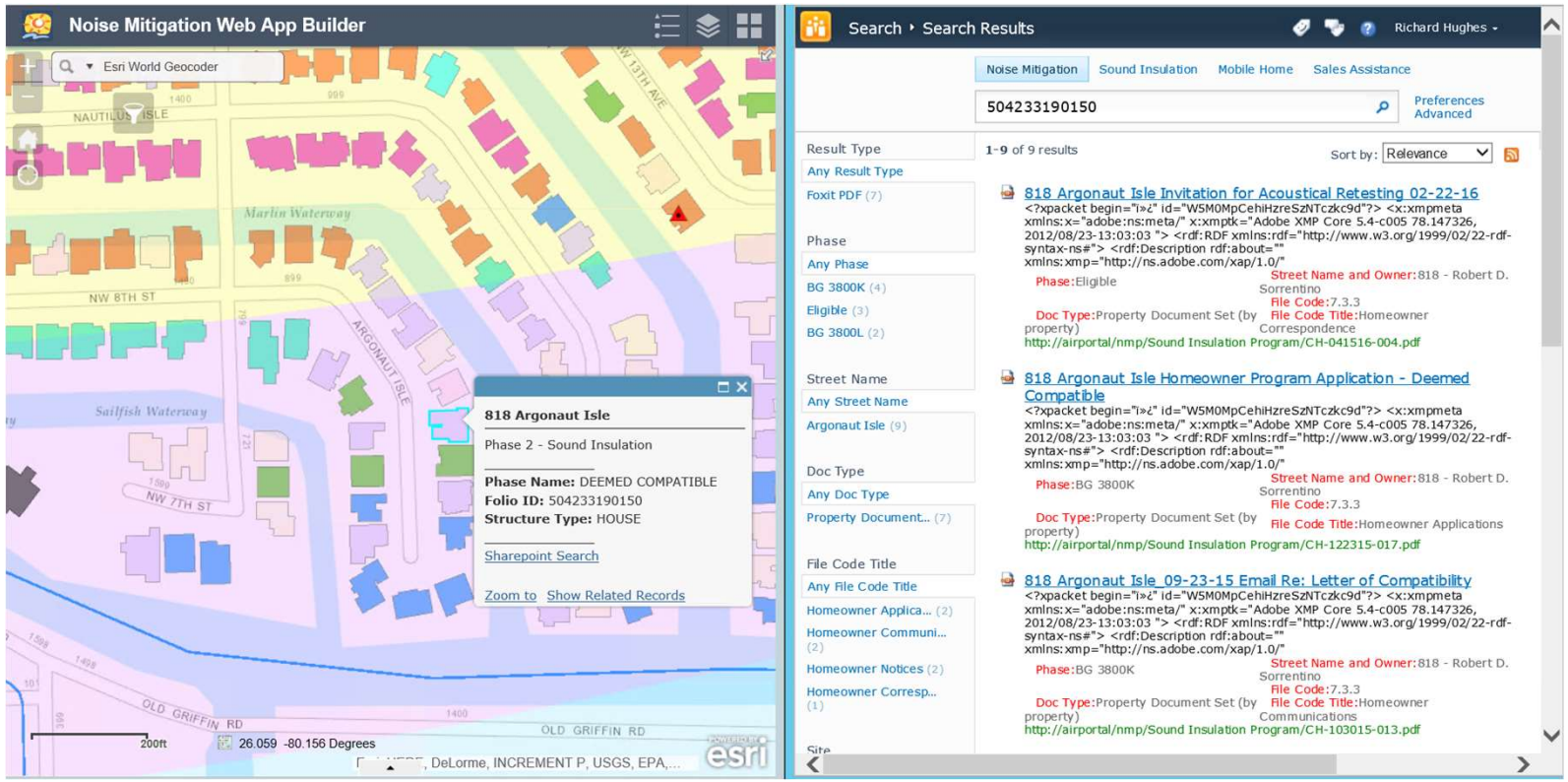

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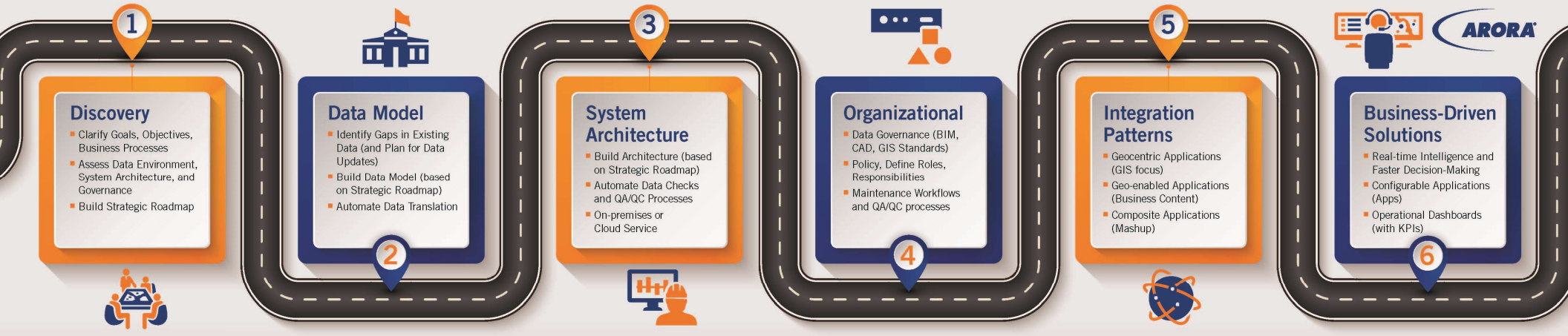
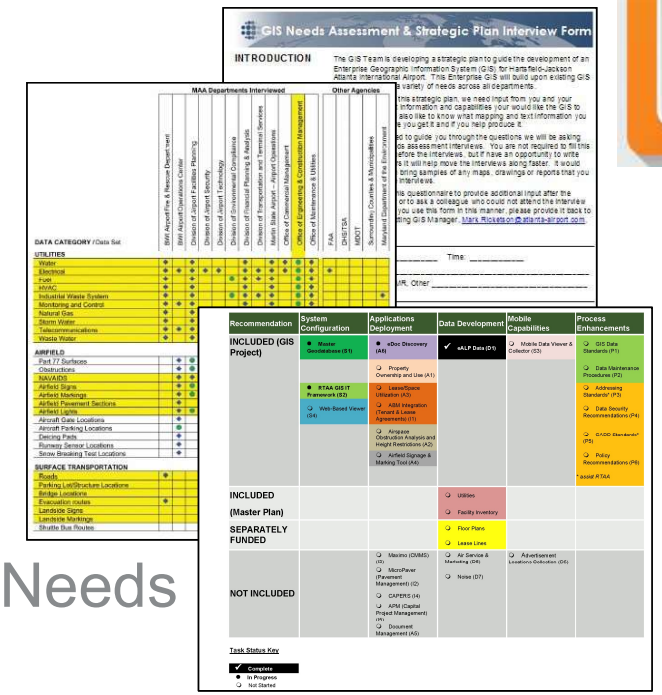
Follow a Proven Path for Success

Whether your organization is just getting started or a mature trend setter, our team can help you reach your geospatial business goals by leveraging our national reputation for delivering high quality and innovative products and services.



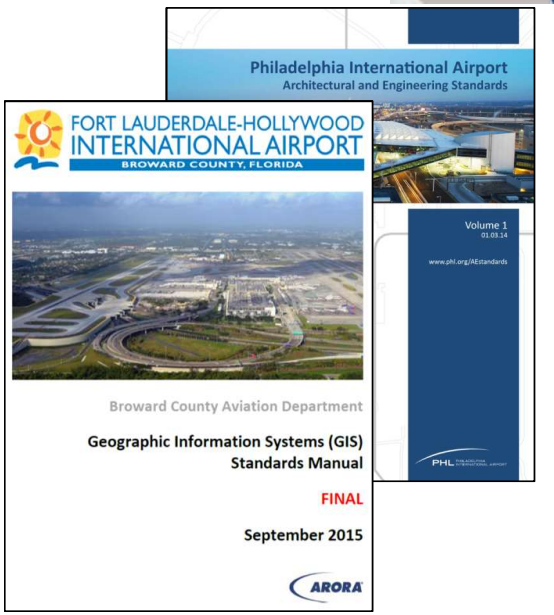
Identify & Prioritize Needs

- Evaluate Existing Usage
- Identify Unmet Needs
- Consider Other Airports
- Prioritize Based On:
  - ROI
  - Technical Feasibility
  - Logical Order
- Define Tasks to Address Priority Needs



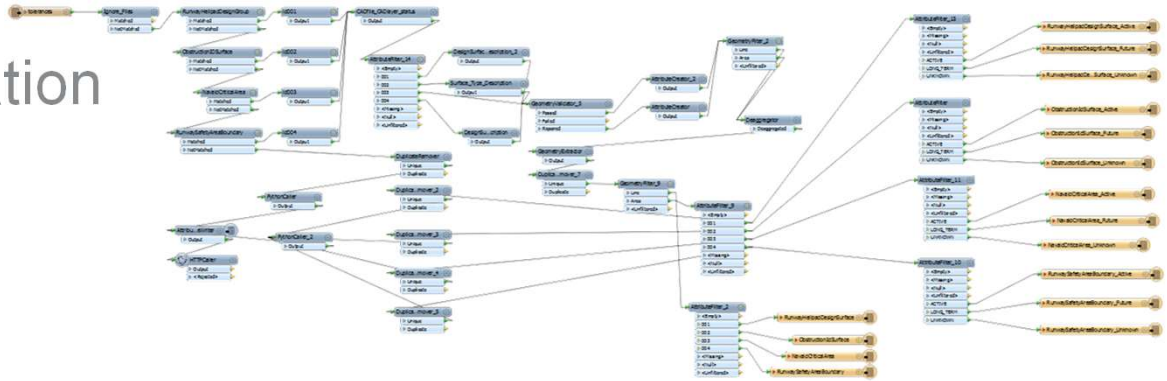
Adopt/Adapt a Data Model

- GIS Data Structure
- CAD Data Structure
- BIM Delivery Guidelines
- Data Quality
- Remote Sensing
- Identification and Addressing
- Data Security



Migrate Existing Data

- Data Interoperability and Exchange
- Quality Assurance
- Data Publishing
- Reporting and Visualization

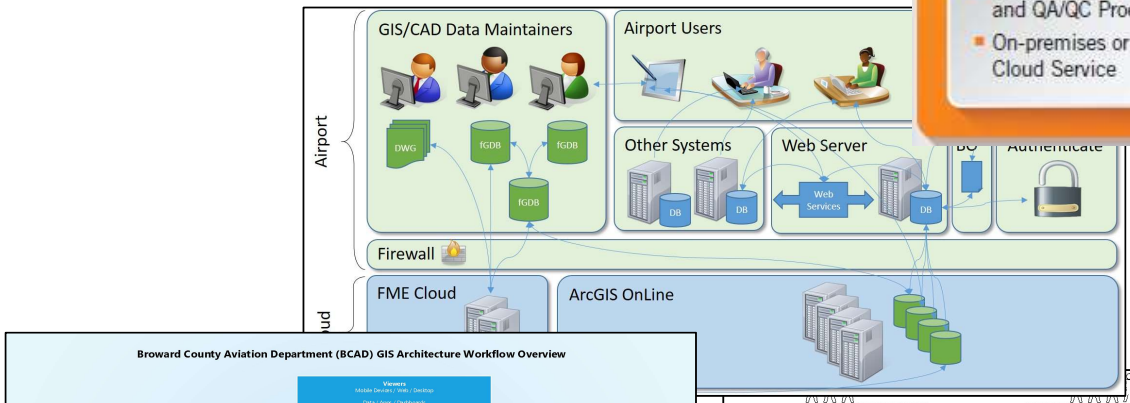


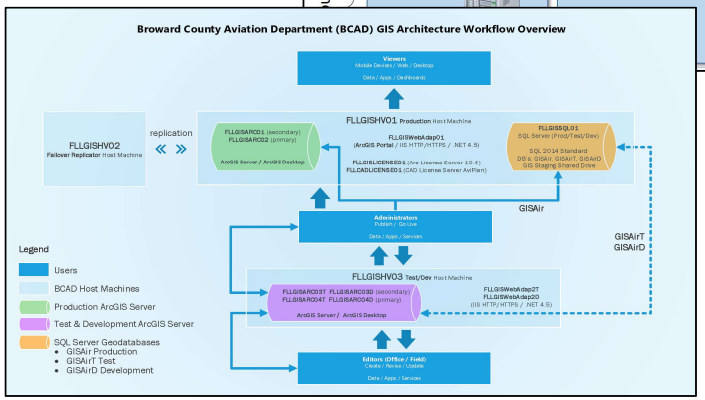
Establish System Architecture

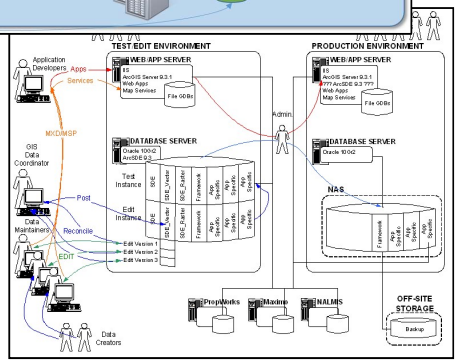
- Conceptual for a High-Level Understanding
- Physical to Guide Implementation
- As-Built to Document Configuration

System Architecture

- Build Architecture (based on Strategic Roadmap)
- Automate Data Checks and QA/QC Processes
- On-premises or Cloud Service







Deploy Applications

- Leverage Roadmap from Discovery Phase
- Provide Real-time Intelligence and Faster Decision-making
- Use Esri Web App Builder for “Quick Win” configurable solutions
- Integrate to Provide Access to “unseen” Business Content
- Engage Leadership Through Operational Dashboards

Establish Organizational Support

- Establish Data Governance
  - Geospatial Data Standards (CAD/GIS/BIM)
- Define Policies & Procedures
  - Data Development & Maintenance Procedures
  - Data Submittal Requirements & 3rd Party Requests
- Document Workflows
  - Resources
  - Roles and Responsibilities
  - QA/QC

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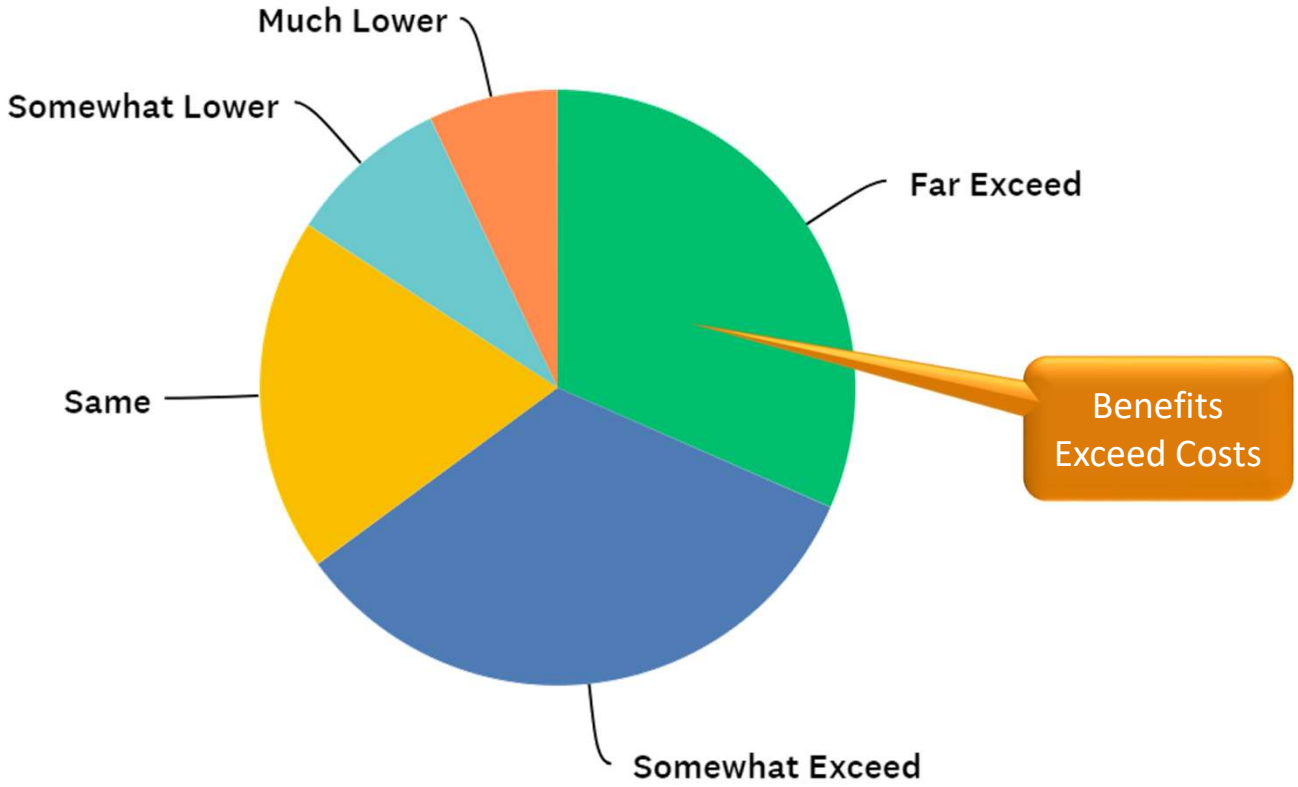
What Does it Cost?

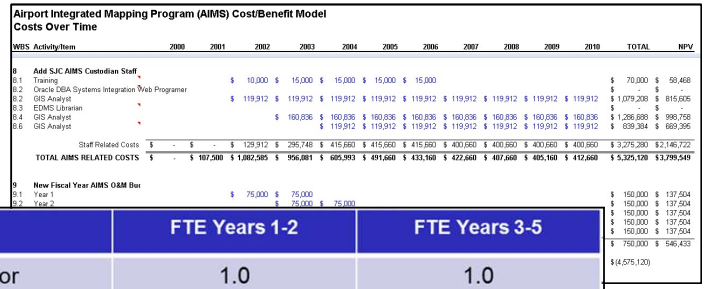
- "It costs millions and requires a lot of staff to support" … an unfortunate and common misconception
- Costs vary depending on an airport's needs and resources
  - Some have leveraged existing airport, city, or country staff; acquired minimal software licenses sometimes through an existing ELA; and engaged consultants on limited or on-call contracts to help them get started for **under $100k**
  - Some have several people on staff; established enterprise systems; and engaged multiple consultants on on-going support tasks for **$1-2 million**
- Seeking grants of $50-250k for FAA AGIS data collections is a great way to get started

Benefit's Exceed Costs

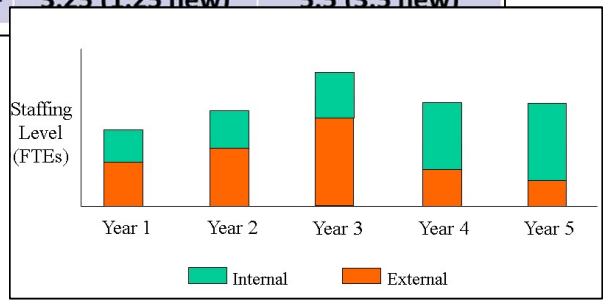


Staffing a Geospatial Program

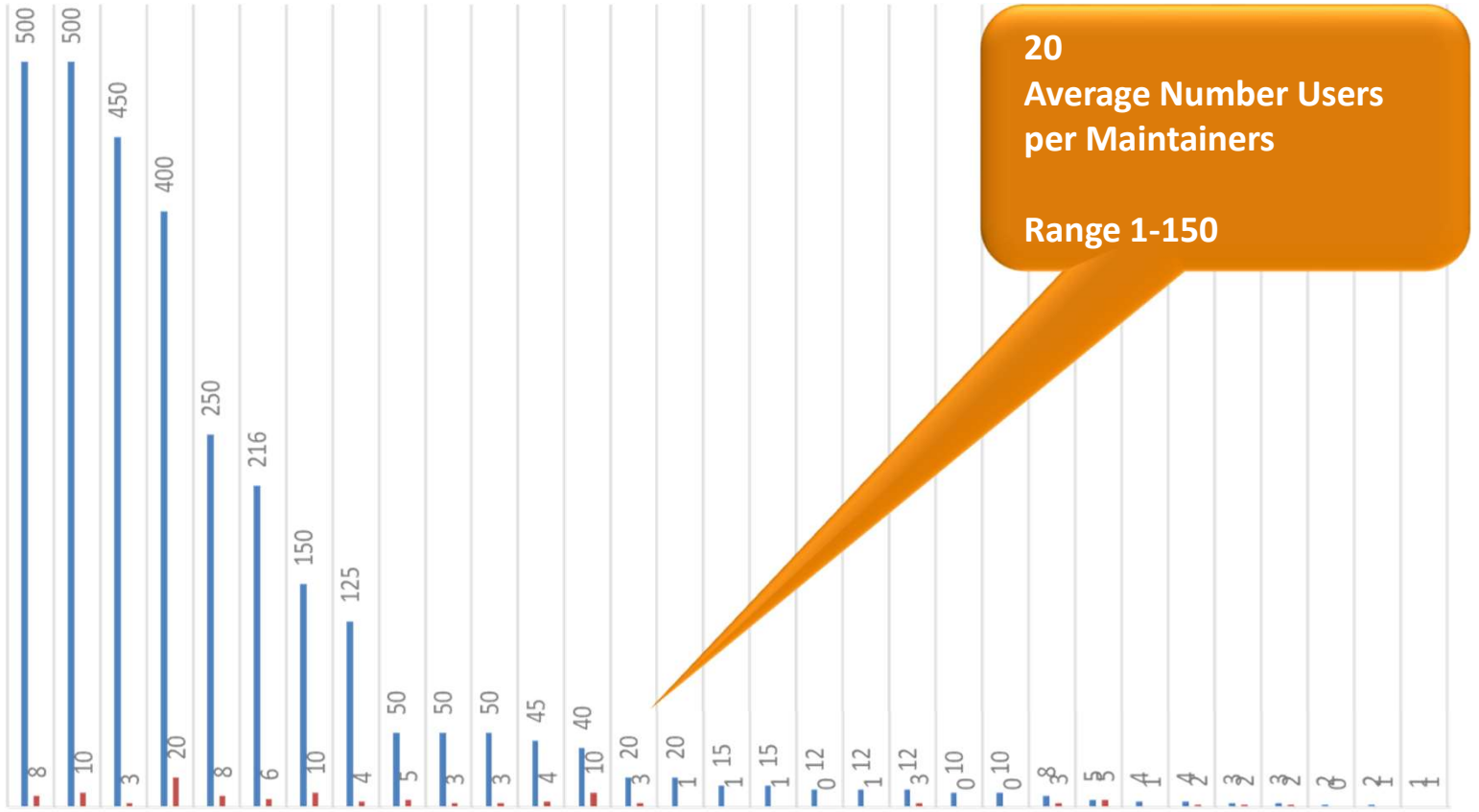
- Identify Tasks and Processes
- Group into Roles
- Describe Skills Required
- Estimate Level of Effort
- Cross-check with Peers



Staff Role	FTE Years 1-2	FTE Years 3-5
Data Coordinator	1.0	1.0
Data Maintainer- GIS	1.0	2.0
Data Maintainer- CAD	1.0	2.0
Data Maintainer- BIM	0.25	0.5
TOTAL	3.25 (1.25 new)	5.5 (3.5 new)



Number of GIS Users & Maintainers



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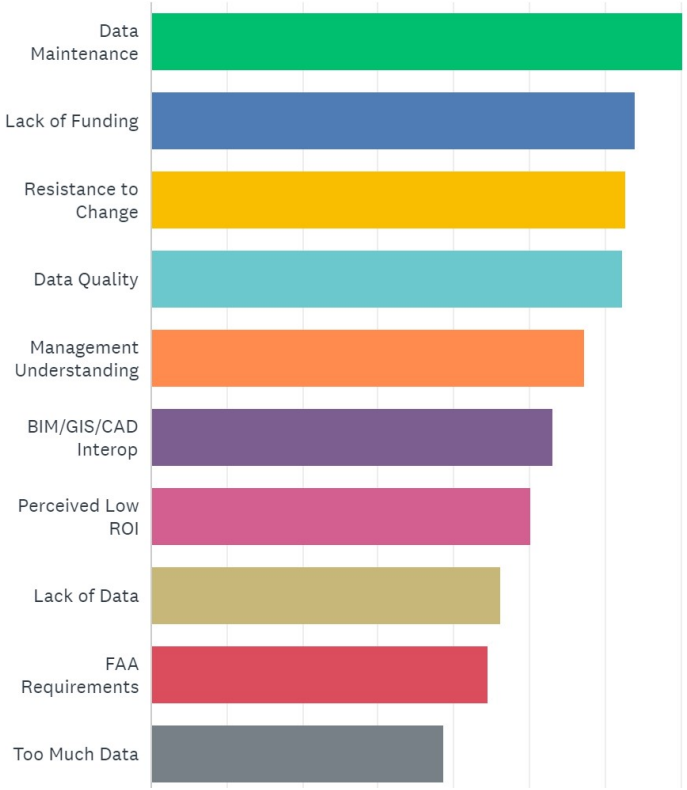
Challenges Faced

2019



2016

Item	Rank Distribution
Resistance to Change	
Data Maintenance	
Lack of Funding	
Staff Skills / Expertise	
Out of Date Data	
Lack of Management Understanding	
Staff Skills	
Perceived Low ROI	
Lack of Data	
FAA Requirements	
Lack of Useful Applications	
Poor Accuracy	
Training is Unavailable	

Challenges Overcome

Organizational Placement

- Not Unanimous
- Often Fragmented
- Typical Options:
  - IT, Planning, Engineering
- Factors to Consider
  - Staff Skills and Interest
  - Managerial Support
  - Organizational Roles

Acceptance of Change

- Change Models
- Important Strategic Questions
  - What is the impact to IT?
  - Structure of Group
- Staffing, End Users
- Support Users with New Tools
- Training and Development
  - People Before Technology

Questions & Answers

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