# QUICK START GUIDE

## GIS Tools and Apps — Integration with Asset Management

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Pro-West & Associates

Data Development and Management • Software • Staff • Funding • Equipment • Training

**LRRB**
LOCAL
**ROAD RESEARCH**
BOARD

**Project Overview**

Asset management is critical for local and state governments to track assets and plan for maintenance of assets that will provide the greatest return on investment (ROI) for the agency. The use of geographic information system (GIS) applications, tools and geospatial data can provide agencies with the most accurate inventory of assets, a basis to determine and maintain condition, cost-effective mobile tracking and maintenance of assets such as signs, culverts, roads and bridges, and reporting tools to justify asset expenditures. However, challenges such as agency size and location, access to accurate and timely geospatial data, and lack of information about the best data processes, applications and tools to use limits local agency use of GIS for asset management.

A Minnesota Local Road Research Board project examined current local agency practices and reviewed existing mobile technologies to recommend best practices for the efficient, cost-effective use of GIS mobile technology for better managing agency assets. This *Quick Start Guide* offers brief synopses of the three case studies appearing in the project's final report and highlights five software options used by Minnesota local agencies.

**Current State of the Practice in Minnesota**

### DATA SOURCE

The data that follows was gathered using a preliminary survey that received 79 responses from 75 cities and counties; a follow-up survey of GIS users received 33 responses from 32 cities and counties.

### GIS USE
- A quarter of respondents are currently nonusers of GIS but are interested in using GIS to manage assets.
- Almost half of respondents use GIS for asset management without full integration.
- Relatively few respondents consider themselves to be fully integrated users of GIS (only 16.5%).
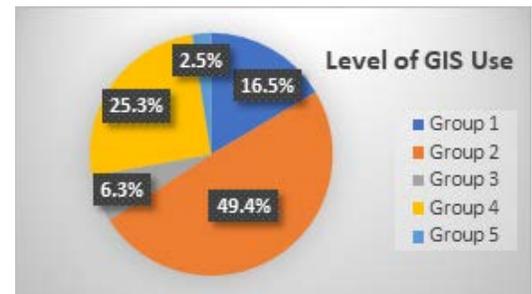
**Group 1**: Fully integrated users of GIS for asset management **(16.5%)**

**Group 2**: Using GIS for asset management without full integration **(49.4%)**

**Group 3**: Using GIS for asset management for three years or less **(6.3%)**

**Group 4**: Nonusers interested in using GIS to manage assets **(25.3%)**

**Group 5**: Nonusers uninterested in using GIS to manage assets **(2.5%)**



### NEEDS, PLANS AND INTERESTS
- Respondents want a GIS tool that can be used for asset inventory, a tool that is simple to use for field staff, provides an asset history and allows for changes to assets in the field, and gathers accurate data in the field.
- Half of respondents have plans for some type of asset management data initiative in the next three years.
- Almost half of respondents expressed interest in collaborating with other local agencies on development of a suite of lightweight GIS apps for asset management.

### GIS TOOL USE
- Almost three-quarters of respondents using GIS use Esri products; almost all use ArcGIS Desktop.
- Most agencies supplement GIS tools with other methods and systems, most often with spreadsheets.
- Agencies are most often using tablets and GPS devices to capture field data.
- More than 40% of respondents employ connected mobile collection practices.

### STAFFING LEVELS
- One or more FTE is the most typical staffing level among all respondents.
- Respondents are most likely to have dedicated GIS staff within various departments.
- More than two-thirds of respondents plan to either hire or train GIS staff in the next three years.

**Agencies just getting started with GIS for asset management and mobile technology**. These agencies may have the beginnings of a GIS program or none at all and want to use a mobile GIS system for work orders, field inventory and data collection.

**This Quick Start Guide is an appendix to the GIS Apps and Tools – Integration with Asset Management project report.** The report documented county and city engineer surveys, GIS technology demonstrations, and case studies conducted during the Local Road Research Board (LRRB) project to answer the questions:

- What is out there for agencies to get started?
- What currently exists for mobile technology and what can be developed?
- How do agencies grow great asset management systems, moving beyond "what and where"?

Below is key information gleaned from the report to assist agencies just getting started with GIS for asset management to begin the process.

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| | <div align="center">**Key Takeaway: START SIMPLE.**</div><br>DATA COLLECTION<br><br>• Plan data collection and development to set cost-effective priorities within your budget.<br>• The most successful collection efforts have occurred when development is a coordinated effort between GIS and maintenance workers, technicians and engineers. Staff need ownership.<br>• Start with easy-to-collect assets like signs and culverts. Use these simple data collection efforts as a test case to refine how you'll collect assets in the field for erosion, potholes, guardrails, ADA inventory, bridges, weeds, playground equipment, signalized systems or pavement markings.<br>• Start simple and build a program. Teaching non-GIS staff to run GIS applications for asset management "has been a game changer" for some agencies. Use non-GIS staff and summer workers to collect and digitize data; consider consultants and vendors for data collection.<br>• Invest in the highest level of GPS receiver as possible to support data collection. Collecting data using a higher accuracy receiver requires the same amount of time to collect as using a lower accuracy receiver, but higher accuracy collection will ensure the data is ready for unforeseen future uses.<br><br>DATA MANAGEMENT<br><br>• Use simple configurable applications like Esri's Collector for ArcGIS or GRIT to create data in the office or field. GRIT has a user community to support software functions. Esri software templates can be developed as a user group of agencies and can be bundled to pick and choose needed functionality for individual agencies.<br>• Begin migrating asset information from spreadsheets and other formats to geospatial databases. *Consider this critical question*: How much historical information is needed?<br>    ○ Plan for cost-effective data migration. Some data are best managed using spreadsheets and migrating over time.<br>    ○ Time to locate and organize information is a limiting factor for developing asset data. Plan for staff time.<br>• Consider adopting the data model included with asset management software, or a neighbor agency's data model.<br>• Begin to capture data as it goes to ground and schedule data updates.<br>• As GIS use for asset management grows (application and tool use, data collection), the need for internal support increases. The rate of expansion can create a backlog due to requests for GIS asset data. The demand for location-based services can, at times, be greater than the availability of staff to provide services and security. |
| **Data Development and Management** | |

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| **Software** | **Key Takeaway: Purchase scalable software and only what you need.**<br><br>• 72.2% of project survey respondents are using GIS for asset management.<br><br>Software may have additional specifications such as training limitations, user requirements, additional software needed, or population-based cost. Refer to Appendix H, Software Matrices for full details.<br><br>### MANAGEMENT PRACTICES<br>• Agencies successful in the use of mobile technology for asset collection conducted a survey of department needs to ensure needs are met when selecting software.<br>• If you don't have staff or staff are not skilled or do not have time, use a vendor to maintain software.<br>• Purchase cloud-hosted solutions; all featured software offer cloud-hosting of software and data.<br>• Participate in collaborative development (GRIT, Esri bundles) or cooperative purchasing (Cartegraph, Elements XS, ICON) for cost-effective software.<br>• Iteratively develop functions and tools based on priority and over time to vet and become familiar with the function before developing the next application. Each iteration creates buy-in from staff and administration based on end user success. More is not necessarily better. Start simple with scalable software focused on small agencies.<br>• Roll out mobile technology as applications are being developed or data are ready to collect.<br><br>### SUGGESTED SOFTWARE<br>• *Cartegraph.* Two Options: 1. Focused applications for signs and work orders, pavement and parks. **Cost for Focused Apps: $1,500 to $7,500 per application/$1,500 to $7,500 annual maintenance per application.** 2. Cartegraph Essentials – enterprise asset management software developed for small agencies. **Cost for Cartegraph Essentials: $10,500 to $15,000 dependent on population 2,500 to 20,000; $7,500 annual maintenance, plus installation fee.** Cartegraph will consider cooperative purchasing for group discount.<br><br>• *Elements XS*. Enterprise software for the entire agency designed for public works, transportation, utilities, planning and zoning, parks and recreation. **Cost: $15,000 to $50,000 dependent on population from 25,000 to 100,000. Additional costs for implementation.** Novotx will consider cooperative purchasing for group discount.<br><br>• *Esri Modules.* 41.4% of survey respondents use Esri products for mobile technology. Pro-West will bundle modules for collection/inventory, work orders, inspections, citizen engagement, reporting/analysis dashboards, advanced data management. Agency selects desired modules. **Cost: $1,200 per module/$500 annual maintenance per module**. Esri licensing to be discussed with agency. Collaborative development of 5 agencies or more will include a free dashboard module.<br><br>• *GRIT.* Easy-to-use web- and map-based application focused on features within the right of way. **Cost: $1,500 annually.** One version for all users with a user group to set development priorities for functionality. UGPTI will work with agencies to enhance and customize the software collaboratively. Signs and work order functionality being considered for future development. |

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| **Software (continued)** | • ***ICON.*** Functionality level priced for small agencies; more complex than simpler Cartegraph focused applications, Esri and GRIT. Software includes pavement analysis, asset management collection, analysis and reporting for signs, pavement, right of way, AVL, parks, sewer and universal asset management. **Cost: Small county 50,000 or less in population—$2,500 to $7,500 (5 users); large cities and counties—$7,500. Additional costs for implementation.** Goodpointe Technology will consider cooperative purchasing for group discount. |
| **Staff** | **Key Takeaway: Most agencies will require 25% to 50% dedicated GIS staff.**<br><br>• **Getting started requires .25 to 1 FTE.** Need up to 1 FTE if using GIS staff to collect data in the field, configure apps, and do in-house data development and maintenance.<br>• Hire for a GIS position based on skills to develop data, configure applications, train and supervise. To get the most productivity and greatest range of services, staff need GIS skills beyond collecting data. Staff need time to develop data, test software and train users on the software and equipment.<br>• Outsource maintenance of applications (Cartegraph, Elements XS, Esri modules, GRIT, ICON) to limit staff engagement. More function and complexity in software translates to more staff time to learn and maintain.<br>• Staff time dedicated to GIS for asset management is a limiting factor for data and application development and use; consider outsourcing data development to a vendor, if no staff available.<br>• Engage non-GIS staff, summer workers or interns to collect data.<br>• Data collected by staff or a third party will require periodic updating to ensure up-to-date and reliable data. If only one person is being relied on to create data and that person leaves the agency, the data can become out of date unless there is redundancy of GIS skills.<br>• Consider a GIS shared position with other departments. |
| **Funding** | **Key Takeaway: Fund changing technology as a project rather than a program.**<br><br>• 82.4% of agencies have no dedicated budget for GIS for asset management. Funding sources include operating costs, budget for IT or public works, and countywide general fund.<br>• **Initial costs for mobile technology** varied widely for agencies from $2,000 to $60,000 based on existing equipment and rollout of major implementations of technology (such as an enterprise software system).<br>• **Maintenance costs for mobile technology** varied from $100 to $30,000 annually. For many agencies, maintenance costs annually were 10% to 25% of initial costs for equipment and software.<br>• Request dedicated GIS staff time when staff retire.<br>• Consider costs for computers, GPS receivers.<br>• Consider the cost of acting versus not acting. ROI and benefits include ability to complete work orders in the field, improved accuracy of agency records, and ready access to data in the field and in the office.<br>• Lack of GIS for asset management impacts include issues with inspection standardization and data entry, lost historical data when staff retire or leave organization, data collection inconsistencies, and low productivity.<br>• Lack of data currency and data maintenance creates an ineffective asset management program. |

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| **Equipment** | **Key Takeaway: Esri ArcGIS is the most often-used GIS editing software among survey respondents.**<br><br>• A hosted software option requires no internal server equipment or software; a laptop or desktop computer is used to develop data and configure applications.<br>• Agencies are most often using tablets (78.8%) and GPS devices (72.7%) to capture field data. Other commonly used practices include use of cell phone (66.7%) and pencil and paper (48.5%).<br><br>**Costs**<br>• Laptop computer – approximately $1,500 to $2,300.<br>• Desktop computer – approximately $1,200.<br>• Esri ArcGIS Server with workgroup license – $100 per user/year, excluding server architecture.<br>• Tablet – approximately $350 to $500.<br>• GPS Bluetooth receivers – $300 to almost $20,000 (based on accuracy). |
| **Training** | **Key Takeaway: Take advantage of low-cost or free training offered by vendors, user groups and others.**<br><br>• Training for lightweight, simple collection applications generally requires one to two hours per application. Roll out mobile technology as applications are ready to collect.<br>• Train the trainer; have GIS staff train non-GIS staff. Training non-GIS staff may need to be conducted numerous times for different seasons, updated software or changing agency needs.<br>• Encourage participation in user groups.<br>• Develop mini trainings for non-GIS staff on how to use dashboards and reporting to help them become familiar with the technology.<br>• Bring together GIS-related staff monthly to discuss software, new discoveries and benefits that can be shared with other departments. |

**For more information:** This quick start guide is a companion to final report *GIS Tools and Apps - Integration with Asset Management* (2019RIC15). Both are available on the Local Road Research Board website at lrrb.org.