Harris & Associates

VISIBLE VALUE

UNDERSTANDING GIS AND ITS POWER TO IMPROVE CITIES

By Randy Deodat / February 13, 2023

With increasing frequency, Harris & Associates is helping city leaders benefit from GIS technology – a tool that offers greater visibility and guides decision-making for all kinds of initiatives. This white paper explores the basics of GIS and examples of its applications.

What is GIS?

Geographic information system (GIS) capabilities have advanced considerably through the past five decades. GIS now plays a major role in helping city leaders and their partners plan for the future, gain insights into existing conditions, and gather actionable intelligence for myriad initiatives.

In the simplest terms, GIS is a platform comprising software, hardware, people, data, and application methods. Per ESRI, the world's leading supplier of GIS software:

> A GIS is a system that creates, manages, analyzes, and maps all types of data. GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there). This provides a foundation for mapping and analysis that is used in science and almost every industry. **GIS helps users understand patterns, relationships, and geographic context.**

Project leaders embed data into maps, which are easily accessible and shared. In turn, they can integrate data layers with maps using spatial location. Integration can include imagery, geographic features, and basemaps that link to spreadsheets and tables.

Spatial analysis, which combines all factors, allows for deeper understanding by illustrating any proposed changes and powering informed decision making.

On a single map, GIS can visualize data for anything from buildings and waterways to resident demographics, crime rates, income levels, and more. Forward-looking city leaders and project teams leverage GIS data to:

- Improve project management and decision making
- Enhance communication within and across teams
- Identify potential problems requiring a response
- Monitor changes to areas and circumstances
- Manage, respond to, and forecast events, including disasters related to climate change
- Prioritize actions and resource allocation

GIS Applications: Versatile and Vital

Initially used to inventory natural resources, GIS now supports problem solving and planning across a variety of functions, including the following examples.
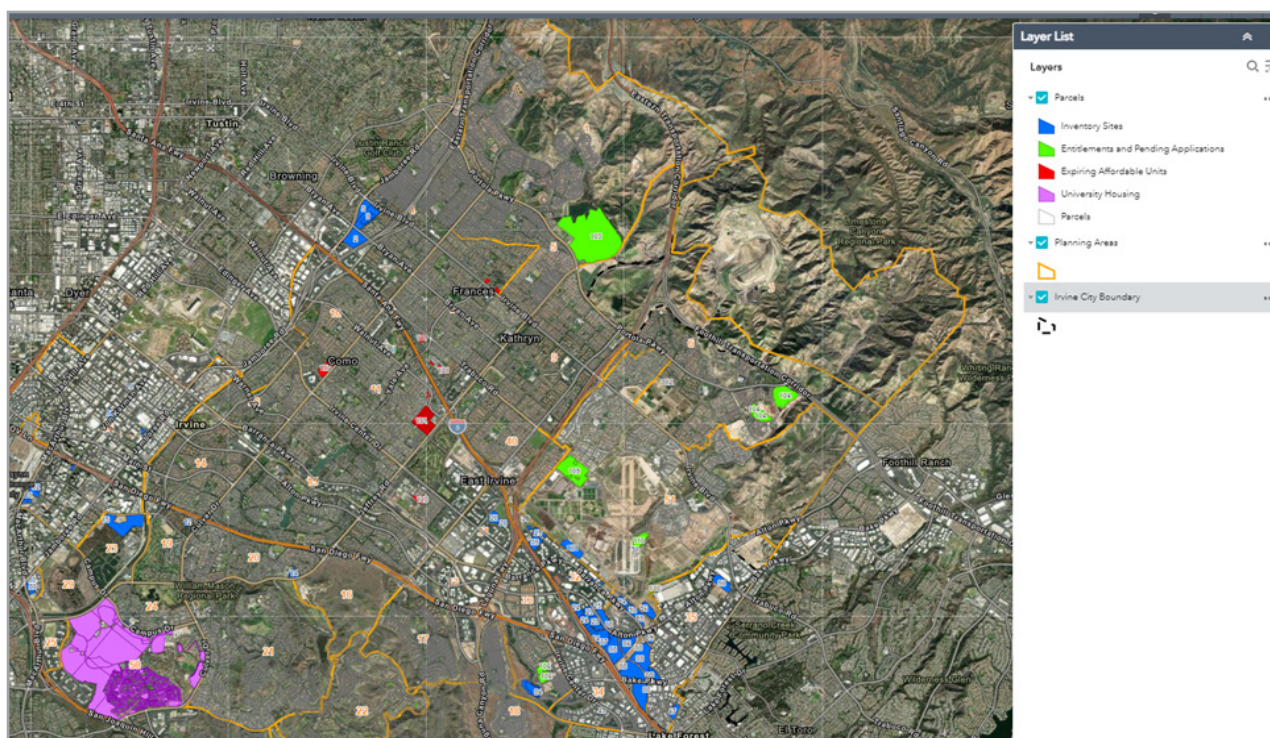
Affordable Housing Development

Community development and housing professionals use GIS web maps to visualize areas suitable for affordable housing development. Instead of creating static maps to display details of each neighborhood in the entire city, GIS web maps enable users to explore the city's parcel datasets. These include land use, zoning, dwelling units, and other necessary information.

Teams can review census data along with socioeconomic statistics to identify disadvantaged neighborhoods. By overlaying demographic and socioeconomic data onto property and housing info in GIS, officials can decide how to best serve residents in each area. They can make conclusions with the understanding that all neighborhoods have their own distinct needs and characteristics.

More specifically, policymakers can visualize housing scenarios under different zoning ordinances and measure their impacts, including accessibility to transit, education, and healthcare.

Leaders also have the potential to share GIS data with nonprofits, developers, and other collaborative partners who share their mission. They can easily present proposed development scenarios to the public for comment and debate.

Based on GIS data, leaders can develop affordable housing policies that focus on people, not just property. Such policies enhance communities by increasing their spending power, educational opportunities, and job creation while decreasing poverty rates.


GIS mapping helps city leaders see which areas in their jurisdiction are most suitable for and in need of affordable housing development.

Stormwater/Asset Management

The increasing occurrence of atmospheric rivers, bomb cyclones, and other natural disasters caused by climate change elevates the importance of accurate stormwater mapping.

Before GIS was an option, city officials across California had to manually track stormwater networks. This arduous, time-intensive method did not yield as much useful data, and updating proved difficult. In contrast, GIS maps can show which customers will be affected by an outage or a ruptured pipe. Officials can use GIS data to guide decisions about when to turn off or redirect water if necessary and to notify impacted customers.

By simulating storm flooding, GIS enables cities to implement appropriate flood management infrastructure and procedures. GIS data affords easy collaboration with other municipalities, consultants, and other stakeholders. It also aids in permitting, as inspectors can view active permits and see maps of inspections and the progress made to date.
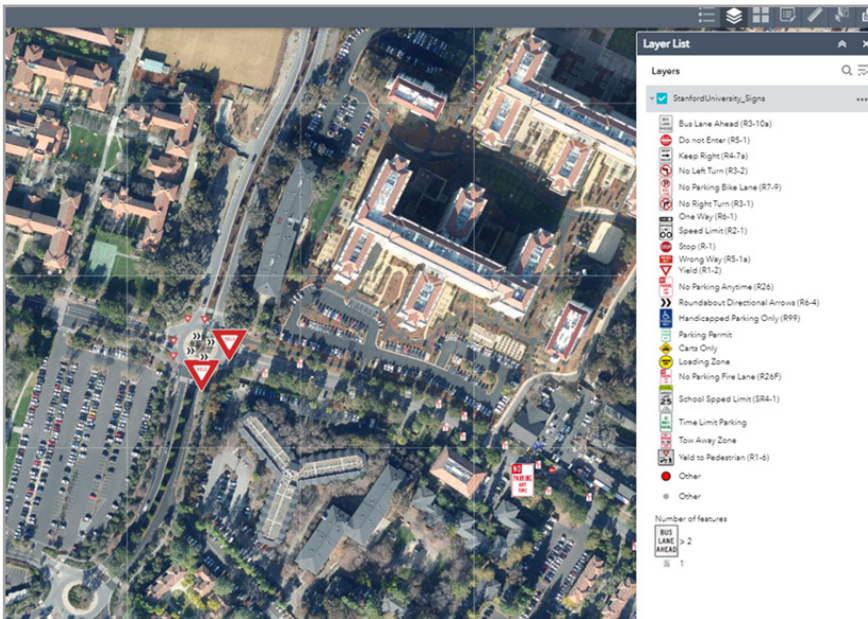
GIS data shows locations, types, and conditions of signs for enhanced asset management at Stanford University.

Seeing the Signs
Stormwater is just one of many assets manageable through GIS. As an example, Harris & Associates is using GIS as part of a sign inventory project for Stanford University.

Harris created a data collection application accessible via smart mobile devices powered by Apple or Android operating systems. Field workers use their devices to collect data about signs around the campus, including sign locations, types, and conditions, among other attributes. With this information, workers can easily schedule and manage sign replacements and upgrades.

A Clearer Picture of Progress

For the Valley Sanitary District in Indio, CA, Harris used GIS to build a dashboard that showed the progress made on the District's sewer improvement projects. It also displayed the amount of budget left for the remaining work.

The dashboard featured an interactive map (left side below) that enables users to explore the area. When they zoom in, they can see more information on the improvement recommendations for each pipeline. Meanwhile, dials (right side) depict a snapshot of the progress the district has made and helps with overall program management.

Construction Management

Construction managers have found GIS to be an invaluable tool. Along with process improvements brought about by greater visualization, GIS delivers key benefits such as:

- Risk reduction due to decreased uncertainty
- Enhanced safety via greater awareness of project sites and surrounding areas
- Improved sustainability through more detailed visualization of project impacts
- Increased productivity from reliable data and more efficient processes

Project teams can integrate GIS data with construction schedules to show progress. They can also use it to communicate milestones to project team members and other stakeholders. In addition, construction managers using GIS can monitor the supply chain to manage any risk of delays, while dashboards display important metrics for streamlined planning and communication.

GIS also enables teams to configure maps to support field workflows, including work that takes place offline and indoors. On the job, teams can easily capture and edit data, search digital maps, make and share notes, track locations, and keep project stakeholders apprised of progress.
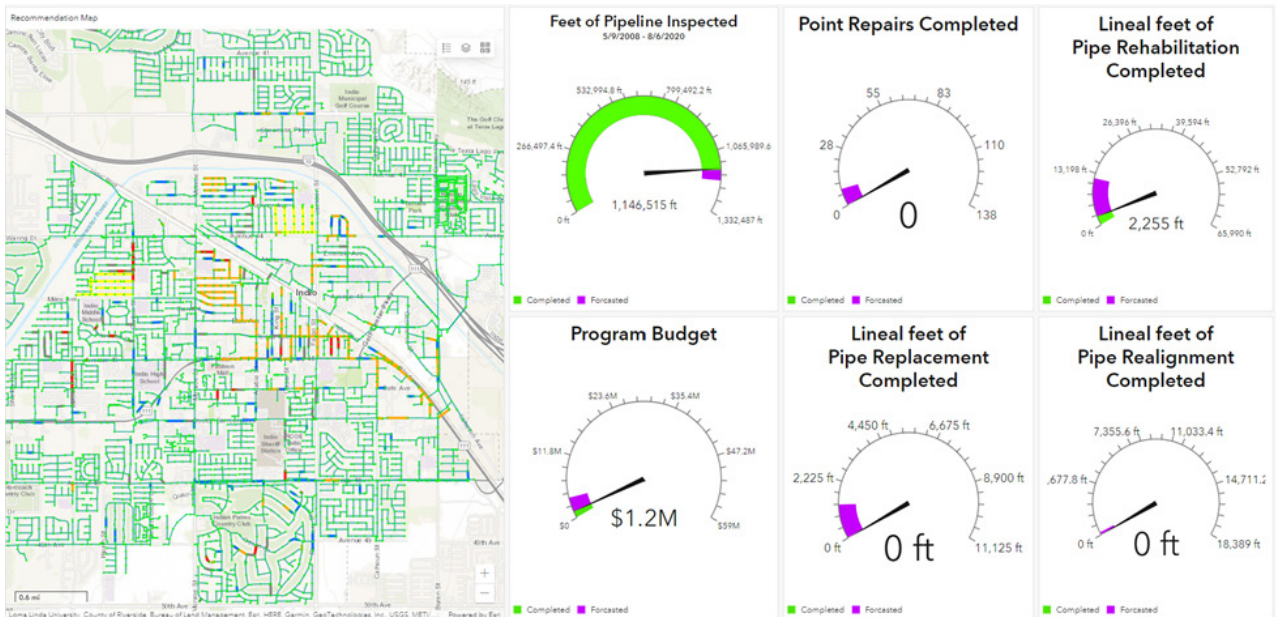
About the Author

Randy is a GIS analyst with over ten years of experience with geographic information sciences. He has worked extensively in database design and management, with GPS, and with GIS customization using Python coding and has provided GIS support for mobile software integration, spatial analysis, and online web map and mobile applications for a range of diverse projects. As the GIS lead on several large scale, fast-paced projects, he has developed mobile applications updates to use in the field, including compliance monitoring updates for solar farms, wind farms, and the California High-Speed Rail Project.

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Harris is a 100% employee-owned company focused on solving today's complex challenges in planning, construction and design. Our offices and project sites span the West Coast in California, Nevada, and Washington with a staff of over 200 employee-owners. We focus on serving clients in the municipal, water, transportation, and education markets.

To learn more about the potential of GIS and how it can help drive improvements and successful projects in your community, contact Harris & Associates. www.WeAreHarris.com

[1] https://www.esri.com/en-us/what-is-gis/overview

[2] https://www.esri.com/en-us/lg/industry/government/city-baltimore-leads-place-based-housing-interventions
[3] https://www.esri.com/about/newsroom/arcuser/taking-a-data-driven-approach-to-affordable-housing/
[4] https://mapscaping.com/stormwater-management-gis/

[5] https://www.esri.com/en-us/landing-page/industry/water/2019/modernizing-stormwater-permit-inspections
[6] https://www.esri.com/en-us/industries/water-utilities/business-areas/asset-management
[7] https://storymaps.arcgis.com/stories/731183857a5248bda3757c50a7122aed