

Town of Carlisle GIS Strategic Plan

Draft 2 - February 2024



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GIS NEEDS ASSESSMENT

Summary of Existing Conditions as of January 2024

Carlisle’s GIS story begins well before 2024, and for the purpose of this plan, we will focus heavily on the present. Knowing that many folks have contributed to GIS in Carlisle as early as 2012 and before, all that exists today is built on the shoulders of those who came before us. In addition, more work needs to be done for Carlisle to incorporate a GIS that helps support government business practices and decision making. It was in the 2012 report Organization And Efficiency Study Of Town Hall Departments by UMASS Boston that highlighted, “Carlisle has a GIS system, however it is under-utilized, and there is no “owner” of the data that resides on it.” Relatively speaking, these issues still exist today.

The Town Planner has been named the owner of GIS, and a few staff, volunteers, and interns have used GIS over the years, but there is still not a cohesive program, nor dedicated and trained staff to manage the tools and data. As of mid-year 2023, the Town Planner with support of the Planning Board, Select Board, and Town Administrator, were contracting with multiple vendors to build components of Carlisle's GIS. Below is a list of items at the core of any municipal GIS and their status in Carlisle as of mid-year 2023:

Item	Status	Note
GIS Software Licenses	Available	Two ESRI ArcGIS Desktop licenses
Unified GIS Database	In Progress	Data exists, but is not in a master database
Coordinated effort to update GIS Data	Not available	
In-house and On-demand map making capability	Available	Staff can make basic GIS maps
Custom GIS mapping for plans/reports	Available	Staff and volunteers create maps for plans/reports
GPS Data Collection capability	Not available	
Public or Staff Accessible Online GIS	Not available	
Individual acting as GIS Coordinator	Not available	Some staff have GIS skills
GIS Strategic Plan	Not available	
Funding for third-party GIS support	Available	

By the Fall of 2023, Carlisle had 3 contracts with third-parties to develop GIS data, maps, and tools. Nitsch Engineering was contracted to develop a GIS compatible pavement condition inventory and a catch basin inventory. CAI (formerly Cartographic Associates) was contracted to update Assessor Maps and the data contained within them, convert the CAD based parcel information to a GIS format, and develop an Online GIS using their Axis GIS product. Adam Kurowski was contracted to provide consulting liaison services between the Town and the other contracted third-parties, develop several GIS layers including cisterns, natural water sources, private septic systems, private water wells, and culverts, as well as a master GIS database, and prepare a GIS Strategic Plan.

Benchmarking and Gap Identification through Stakeholder Questionnaire

A successful GIS implementation will serve to support the needs of people who rely on it. Largely, GIS is a service for others to ask questions, retrieve data, and garner a deeper understanding of place or item. Staff, Board Members, volunteers, residents, the broader public, may all interface with a component of the GIS in some way. These become GIS users and with proper communication, the users can inform what is required from the GIS. So the user's input, regardless of their GIS experience, shall be vital to how the GIS is set up and operates, what data and maps are created, and what services are needed.

In the Fall of 2023, a GIS Questionnaire was developed by Adam Kurowski, with support by Town Planner, Julie Mercer, and distributed among potential GIS stakeholders. Over the course of 3 weeks, 65 responses were recorded, which in my experience is an extraordinary number of respondents for a survey like this. Below are some of the more important findings:

Please select the statement that best describes your knowledge of GIS

Answers	Count	Percentage
I have used GIS on a basic level	34	52.3%
I have used GIS on an intermediate level	15	23%
I have never used GIS before	14	21.5%
I am an expert in GIS	1	1.5%

Analysis: only 14 of 65 respondents have never used GIS before and 79% of all respondents had used GIS. This shows that Carlisle has a solid base of GIS-knowledgeable folks who are willing to explore this technology.

Of the respondents who have used GIS, which system have they used?

Answers	Count	Percentage
Google_Maps	50	31.3%
Google_Earth	44	27.5%
MassGIS_online_maps	27	16.9%
ESRI_ArcGIS	20	12.5%
ESRI_ArcGIS_Online	8	5.0%
other	7	4.4%
ESRI_ArcGIS_Pro	2	1.3%
QGIS	2	1.3%

Analysis: the top three most used systems are Google Maps, Google Earth, and MassGIS Online maps. These systems largely allow users to view data, move the map, click to ask questions, and search the map. They are designed to limit data editing, data creation, and custom map making. These functions are more available in ESRI ArcGIS/Online/Pro and QGIS. This is an important distinction to better understand the experience and capabilities of GIS stakeholders.

What types of map layers may be helpful to your work?

All Respondents			Staff Only Respondents			Non-Staff Respondents		
Answers	#	Perc.	Answers	#	Perc.	Answers	#	Perc.
roads	36	10.3%	roads	14	4.0%	roads	22	6.3%
buildings	29	8.3%	aerial/satellite imagery	12	3.4%	wetlands	20	5.7%
trails	27	7.7%	buildings	11	3.1%	buildings	18	5.1%
aerial/satellite imagery	27	7.7%	trails	9	2.6%	trails	18	5.1%
wetlands	26	7.4%	water	9	2.6%	zoning	18	5.1%
water	24	6.8%	town_owned_trees	8	2.3%	land_use	17	4.8%
zoning	24	6.8%	land_use	7	2.0%	parks	17	4.8%
land_use	24	6.8%	elevation_contours	7	2.0%	aerial/satellite	15	4.3%

						imagery		
parks	23	6.6%	wetlands	6	1.7%	water	15	4.3%
elevation_contours	22	6.3%	zoning	6	1.7%	elevation_contours	15	4.3%

Analysis: These are the top 10 most popular responses from each of the respondent groups listed above the table. It seems reasonable to claim that these layers should become focal points for accessibility, management, and investment.

How likely are you to use the online GIS?

Answers	Count	Perc.
Very likely	33	50.8%
Likely	26	40.0%
Unlikely	6	9.2%

Use the online GIS on a mobile device?

Answers	Count	Perc.
Very likely	21	32.3%
Likely	25	38.5%
Unlikely	19	29.2%

To add a photo to the map?

Answers	Count	Perc.
Very important	12	18.5%
Important	29	44.6%
Not important	24	36.9%

To add a document to the map? To edit, add, delete data?

Answers	Count	Perc.
Very important	12	18.5%
Important	24	36.9%
Not important	29	44.6%

Answers	Count	Perc.
Very important	6	9.2%
Important	16	24.6%
Not important	43	66.2%

Analysis: This series of questions was designed to learn how users may interact with the online GIS and what tools may need to be built in to satisfy user needs. The bottom 3 questions require more advanced tools than the first 2 questions. There seems to be a small constituent of potential users that are seeking the most advanced tools.

What type of GIS support may be needed in the coming 1-3 years?

Answers	Count	Perc.
General mapping	44	64.7%
Maps for a Report	38	55.9%
Conversion of paper map to digital	34	50.0%
GPS location and inventory data	33	48.5%
Statistical analysis about and area	24	35.3%
Other	11	16.2%

Analysis: The results show a high amount of GIS support over the coming 1-3 years. With the first 2 categories being similar requests for custom mapping, it shows the need to have map making skills in-house or on-demand to help sharing information and tell stories with maps. In addition, Conversion of paper maps requires manual scanning of paper maps, which can be done in-house or by a contractor. GPS location and inventory data requires someone in-house or a contractor to use a GPS unit and be versed at field data collection. Scanning and GPS data collection will require capital investment of equipment, staff/intern time, and/or contractors to accomplish, so the Town may consider budgeting to support these upcoming needs.

GIS GOVERNANCE MODEL

Governance is about decisions and decision-making. Specifically, it's about defining the major decisions that need to be made with regards to an organization's GIS (the decisions), and how and by whom those decisions are made (the decision-making). Done right, governance creates a system of accountability that defines and enforces the rights of stakeholders.

To be clear, governance is not management. Governance is about setting direction. Management is about executing according to those directions and this is handled by the GIS Administrator. The distinction is important because much of the GIS conversation has traditionally centered on management topics. While management is vital, we want to draw a clear line between the two to keep the focus on doing the right things (governance) versus doing things right (management). (source: <https://www.esri.com/about/newsroom/arcuser/governance-for-gis-decisions-and-decision-making/>)

Defining the GIS Governance Team

BUSINESS ADVISORS	<p>Purpose: This group is made up of influential and vocal stakeholders who do not make the final decisions on the GIS but whose input is critical to its success. They're generally interested in business value, risk, and alignment with overall business objectives.</p> <p>Who: Select Board, Town Manager, Planning Board, Town Planner</p>
STRATEGY, TECHNICAL, & OPERATIONAL ADVISORS	<p>Purpose: This group is generally responsible for developing the governance processes supporting the strategy, operations, and investment decisions.</p> <p>Who: GIS Administrator, Town Planner, Assessor</p>

Defining Governance Domains

	<p>Governance in the Strategy domain supports alignment of the GIS vision with the business vision. Specific governance processes included in this domain are guiding principles, the strategic plan, stakeholder relationships, organizational structure, and innovation.</p> <p>Primary Decision Maker: GIS Administrator</p> <p>Supporting Decision Maker: Strategy, Technical, & Operational Advisors</p>
	<p>Governance in the Platform domain enables a sustainable, flexible, and fit-for-purpose GIS technology architecture. Specific governance processes included in this domain are technology architecture, solution portfolio, platform access, and platform performance.</p> <p>Primary Decision Maker: GIS Administrator</p> <p>Supporting Decision Maker: CAI for AxisGIS, ESRI for ArcGIS Online, Strategy, Technical, & Operational Advisors</p>
	<p>Governance in the Data domain identified ownership of systems of record versus ownership of derived sources and the business rationale behind decision rights. Specific governance processes</p>

	<p>included in this domain are data architecture, data usage, data stewardship, and data quality. Primary Decision Maker: GIS Administrator Supporting Decision Maker: Strategy, Technical, & Operational Advisors, Department Heads</p>
	<p>Governance in the Workforce domain supports sustaining a skilled and informed workforce. Specific governance processes included in this domain are training, development, talent management, and partnerships. Primary Decision Maker: GIS Administrator, Strategy, Technical, & Operational Advisors Supporting Decision Maker: Business Directors, Department Heads</p>
	<p>Governance in the Delivery domain establishes an effective GIS operation. Specific governance processes included in this domain are service management, communications, business needs, and change management. Primary Decision Maker: GIS Administrator, Strategy, Technical, & Operational Advisors Supporting Decision Maker: Business Directors</p>
	<p>Governance in the Investment domain aligns resources with GIS and business priorities. Specific governance processes included in this domain are budget management and investment prioritization. Primary Decision Maker: GIS Administrator, Strategy, Technical, & Operational Advisors Supporting Decision Maker: Business Directors</p>

Strategy Domain

Strategic Plan

The Strategic Plan shall be reviewed, referenced when needed, and updated periodically, especially following a major event, such as an emergency, a large investment, addition of staff, or other dynamics that may alter the perspective in the GIS Strategic Plan. The GIS Strategic Plan includes [Use Cases for GIS](#) as determined through discussions with staff, Boards, and Committees, [Short Term Planning and Implementation Tasks](#) and [Long Term Goals](#). These sections can be found in the APPENDIX.

Stakeholder Relationships

GIS may be useful to a wide variety of users and customers. Staff, Boards, Committees, volunteers, and the general public may all seek products, data, interpretation, or advice from the GIS Administrator or the GIS products. Carlisle shall consider Stakeholder Relationships as a means to guide stakeholders habits and how they interact with the GIS Administrator. Below are a few Stakeholder Guiding Principles:

- A. GIS Requests to the GIS Administrator shall be prioritized based on requestor, timeline, importance to Town priorities, and feasibility based on time, funding, and technical details.
- B. Requestors shall be prioritized in hierarchical order: 1) Staff, 2) State Government, 3) Boards and Committees, 3) Residents, 4) Broader Public

- C. Timeline shall be prioritized: 1) Imminent Emergency Preparation or Emergency Response. 2) Short-term timeline, 3) Long-term timeline, 4) Nice to have, but no real timeline
- D. Importance to Town priorities shall be reflected upon with the requestor and/or direct supervisor, the Town Planner
- E. Feasibility may impact the GIS Administrators prioritization as the request may or may not be feasible under current conditions or at all. It is important to the success of the GIS program that the Administrator be able to communicate why a request may not be fulfilled as requested or at all.

Organizational Structure

Carlisle’s Organizational Structure may evolve overtime. The GIS Strategic Plan offers a starting point for defining a GIS Decision Making Tree and Staff GIS User Roles. The GIS Administrator, whether an existing staff member or an outside entity, should begin their role by setting Guiding Principles with all GIS stakeholders and all parties who may use a component of the GIS. The GIS Administrator shall be allowed to make day-to-day operational decisions independent of oversight and shall have a clear decision making tree for other decisions. Below is a GIS Decision Tree Model that incorporates the Governance Domains.



Potential GIS Roles and Users

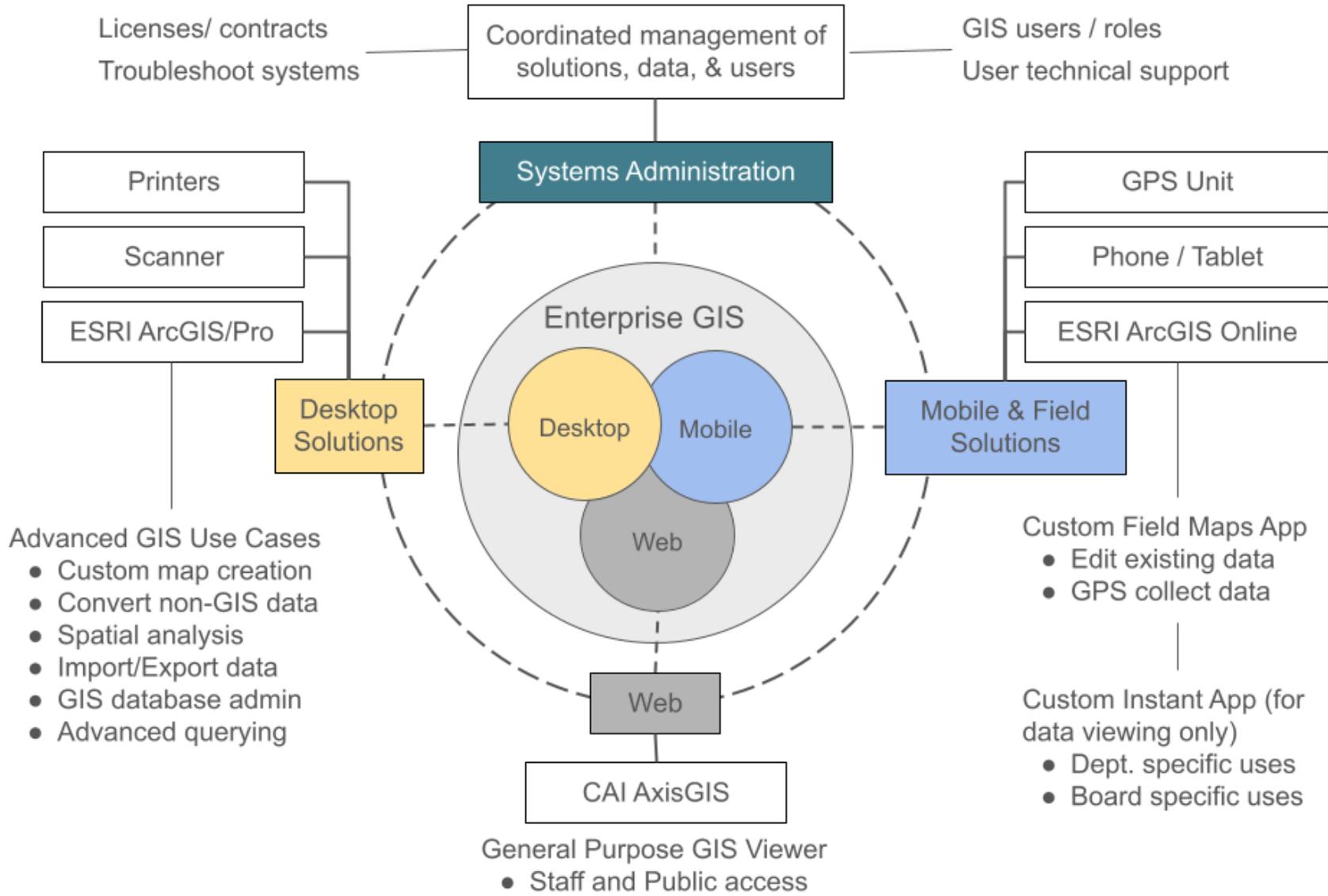
In general, it is good practice to have clear user roles. This table offers potential user levels and administrative authority to existing and potential future staff. Authority rank is based on current or future GIS experience and skill level and/or potential use of the system. A Power User and Creator role has the authority to alter system settings, develop and edit data, and create new maps and apps. An Editor can also edit data, but cannot alter system settings or create new maps and apps. A User interacts with data

in a predefined way using predefined systems without altering the underlying data or system. 10 is the highest level of Authority and 1 is the least.

Authority	Staff	Department	ArcGIS Desktop Role	ArcGIS Online Role	Axis GIS Role	GPS Collect	Mobile App Use
10	GIS Admin*	TBD*	ArcGIS Power User	ArcGIS Online Creator	Axis GIS Power User	Yes	Yes
10	Julie Mercier	Planning	ArcGIS Power User	ArcGIS Online Creator	Axis GIS Power User	Maybe	Maybe
10	Brian Macdonald	Assessor	ArcGIS PowerUser	ArcGIS Online Creator	Axis GIS Power User	No	Yes
8	Land Use & Sustainability Coordinator	Building / Planning	ArcGIS Power User	ArcGIS Online Editor	Axis GIS Power User	Yes	Yes
6	DPW Staff	DPW	None	ArcGIS Online Editor	Axis GIS User	Yes	Yes
6	Chief Bryan Sorrows	Fire	None	ArcGIS Online Editor	Axis GIS User	Maybe	Yes
6	Lt. David Newman	Fire	None	ArcGIS Online Editor	Axis GIS User	Maybe	Yes
4	Other Staff	Various	None	ArcGIS Online User	Axis GIS User	Maybe	Maybe

*See [Potential GIS Staffing Scenarios](#) in the APPENDIX.

Geospatial Software Ecosystem



Data Domain

The Data Domain identifies ownership of systems of record versus ownership of derived sources and the business rationale behind decision rights. Specific governance processes included in this domain are data architecture, data usage, data stewardship, and data quality.

Data Design of Carlisle's GIS may evolve over time. Based on the Town's Request for Qualifications, the Town chose to implement a Geodatabase-centric Data Design to transition the Town's GIS from an ad-hoc data management approach to a centralized database approach. The centralized database approach has merit across the GIS industry, especially in the case of small municipal governments. In addition, Carlisle does not have an in-house Technology Department to support advanced infrastructure or databases. Carlisle's GIS has the opportunity to make use of cloud-based services through ESRI ArcGIS Online and CAI's Axis GIS product to create an online presence that enhances its Desktop, in-house GIS.

The Data Design is simplified to the following:

- A. Production Geodatabase, stored on GIS computer or Town server
 - a. Purpose: store all of Carlisle's best and most up to date GIS data that is used to produce maps and export data to online systems
- B. Editing Geodatabase, stored on GIS computer or Town server
 - a. Purpose: store temporary data, data resulting from spatial analysis, data for unique projects and those that have shorter life-span.
 - i. At times, Production data may need to be edited. That data can be exported to the Editing Geodatabase and edited without risk of Production data being corrupted, locked, or misused during editing.
- C. Cloud based data
 - a. ArcGIS Online will receive manually exported data from the Production Geodatabase
 - i. Purpose: Carlisle can create an online data hub for the public to view and download GIS files, create themed maps that can't be created in Axis GIS, create apps for GPS data collection or use by Departments for specific use cases
 - ii. Special Use Case: Certain use cases may require the development of a specific app that allows Staff or others to edit GIS data or collect new GIS. The GIS Administrator shall create a project scope, data management and quality assurance plan, and a protocol for integrating that data into the Production Geodatabase
 - iii. Special Use Case: Certain use cases may require the development of a specific app that allows Staff or others to view data, possibly non-public data, for field operations. The GIS Administrator shall create a project scope, identify users, appropriate system permissions, and license adjustments, and quality assurance plan to ensure the solution meets the needs of the user.
 - b. CAI's Axis GIS will receive manually exported data from the Production Geodatabase
 - i. Purpose: Axis GIS will be Carlisle's default GIS data viewer. This system has limited opportunity to customize the system and is largely managed by CAI. Carlisle shall create data update protocols and map review and improvement strategies.

Data Ownership can be viewed as who owns the data, which will always be the Town of Carlisle. However, specific departments may seek to claim ownership of specific layers of data. It is advantageous of the Town to claim that the Town Planner and Assessor (STRATEGY, TECHNICAL, & OPERATIONAL

ADVISORS) are the ultimate owners of the GIS and its components. With the GIS Administrator responsible for GIS management, maintenance, and quality. In certain Use Cases, a department may want the ability to edit, update, or collect new data (See [Use Cases for GIS](#) in the APPENDIX). In these instances, the GIS Administrator can review the request, develop strong data quality guidelines and best practices with the requestor, develop tools to support their request, and grant permission for the requestor to become a data Editor or Creator. This use case will likely require the development of tools in ArcGIS Online and assigning a user license to the requestor. In this instance, the requestor assumes responsibility for data integrity and quality. The GIS Administrator shall create a quality assurance protocol and “backup” data to create resilience in the data to be edited.

Data Security was a repeated topic in Board meetings. The vast majority of GIS data represents public data and shall remain that way, including data derived from MassGIS, MassDOT, and MassDEP. Carlisle specific data will include Assessor data, parcel boundaries and associated details, recreation and open space data, and more. This type of data provides a broad public benefit and shall remain public. Data developed from physical documents transitions from being only available at Town Offices, to available to share digitally through the internet. Care shall be taken to ensure that sensitive data is not shared publicly unless approved by the department responsible for it and/or the Strategy, Technical, and Operations Advisors or Business Directors approve. Examples of this type of data are: private septic systems and water wells, culverts and drainage systems, road pavement condition inventory, fire department water systems, and more. Upon completion of the GIS Geodatabase, the Strategy, Technical, and Operations Advisors can review the data and propose which layers shall remain offline or staff-access only through Axis GIS.

Workforce Domain

The Workforce Domain supports sustaining a skilled and informed workforce with governance processes including training, development, talent management, and partnerships. The Carlisle GIS workforce has a solid starting point, with several key staff already capable of using Desktop GIS tools and many other experienced in online GIS, including Google and MassGIS solutions. Carlisle will need to determine how to staff the primary GIS Administrator. Possible staffing scenarios are available in the APPENDIX under [Potential GIS Staffing Scenarios](#).

The CAI Axis GIS tool will be the primary GIS viewer for the vast majority of staff as well as the public. This well developed solution allows non-GIS users to interact with the data and have access to a variety of advanced tools. Users on this site will likely learn-while-doing, using trial and error to figure out how they can best use this tool. Training on this tool will be limited to the few staff who need to use advanced tools, including abutters lists, mailing labels, an/or querying functions. Carlisle shall focus its Workforce development on those listed in the Potential GIS Roles and Users table. These folks have already self-identified as advanced users in a variety of ways. Below are series of available workforce development opportunities that Carlisle shall consider:

- A. Meet with staff at MassGIS, ESRI Boston, and CAI to learn about support, resources, and training
- B. Participate in MassGIS’ strategic planning initiative
(<https://www.mass.gov/info-details/massgis-2024-strategic-plan>)
- C. Review MassGIS Municipal Resources which include guidance for GIS Admin, Assessor, and 911 Address Authority (<https://www.mass.gov/gis-resources-and-services-for-municipalities>)
- D. Meet with GIS staff in neighboring municipalities to learn about their GIS
 - a.

Municipality	Has GIS Staff	Online Map	Company
Acton	Yes	MapGeo	Sanborn
Bedford	Yes	MapsOnline	PeopleGIS
Billerica	Yes	MapsOnline	PeopleGIS
Carlisle	TBD	Axis GIS	CAI
Chelmsford	Yes	MapGeo	Sanborn
Concord	Yes	MapsOnline	PeopleGIS
Littleton	No	Axis GIS	CAI
Westford	Yes	Axis GIS	CAI

- E. Join Regional GIS initiatives, including Eastern Mass Municipal GIS Group, Northeast Arc Users Group, New England URISA; attend discussions/meetings, workshops, and conferences
- F. Leverage free and paid training opportunities available through Carlisle’s ESRI license (<https://www.esri.com/training/>)
- G. Provide support for individuals to become GIS Professional certified through GISCI (<https://www.gisci.org/>)
- H. Attend conferences: ESRI User Conference and training seminars, URISA GIS-Pro, NEURISA GIS Day, NEARC Spring and Fall Conference

Delivery Domain

The Delivery Domain establishes an effective GIS operation. Specific governance processes included in this domain are service management, communications, business needs, and change management. Carlisle’s GIS Administrator shall set best practices for the following in information and communication with staff, Boards/Committees, the public, vendors, and the State, including MassGIS. Opportunities to guide the Delivery Domain include the following:

- A. Communication with staff and Board/Committees. At the on-set of the GIS Administrator role, communication shall be abundant as the GIS Administrator should get to know many people and communicate out plans and milestones.
 - a. Set a basic service level agreement. Example: When a GIS request is submitted, the GIS person will respond within a set number of hours to recognize receipt and ask for clarity. A timeline will be established. The product will be delivered back to the requestor with an opportunity to review and revise. Final product delivered within the desired timeline or reason for not being able to do so will be announced.
 - b. Set a preferred GIS request process. Example: Create an online request form. This allows for standard questions to be asked putting more onus on the requestor to develop their concept upon requesting. It also help the GIS Administrator to organize requests, prioritize them, update status, and have a tracking system for reporting.
 - c. Ensure requestors know of the various product types. Examples: paper maps including various paper sizes, spreadsheet data, PDF and JPG maps for printing or sized for PowerPoint, self-service mapping through Axis GIS, online map development and data sharing through ArcGIS Online, development of new GIS data through GPS collection, paper map conversion, or aerial imagery interpretation

Investment Domain

The Investment Domain aligns resources with GIS and business priorities. Specific governance processes included in this domain are budget management and investment prioritization. All GIS initiatives require some level of investment, whether by way of financial, time, or other effort. The goal of GIS is to add value to an organization to offset those costs. Municipal GIS' rarely, if ever generate revenue, as they are most beneficial to the community when designed to share data openly, yet conscientiously.

Carlisle has already designated \$87,500 of ARPA funds and \$24,000 of Planning Board FY23 surplus salary funds to embark on establishing a robust and publicly available GIS program. Over the summer of 2023, the Town entered into contracts with CAI Technologies (parcel updates, AxisGIS site) and Adam Kurowski (strategic plan, geodatabase design, local data development).

Below is a 3-year outlay of existing expenses and future GIS investments:

Potential 3-Year GIS Budget

Many municipalities fund GIS purchases through the Capital Budget process and department operation budgets. Other funding sources exist, including Emergency Management funds, fees from doing business with the Town, such as on a building permit, and through operating budgets. Below is a modest outlay for recurring and one-time investments.

Status	Description	Vendor	FY25	%	FY26	%	FY27	%	Total	%
Existing	Software: ArcGIS Desktop Licenses *	ESRI	\$1,500	10%	\$1,500	10%	\$1,500	10%	\$4,500	10%
New	Software: ArcGIS Online Extra User Licenses	ESRI	\$750	5%	\$750	5%	\$750	5%	\$2,250	5%
New	Software: ArcGIS Online Credits	ESRI	\$0	0%	\$300	2%	\$0	0%	\$300	1%
Existing	Annual web hosting for Axis GIS **	CAI	\$3,000	20%	\$3,000	20%	\$3,000	20%	\$9,000	20%
Existing	Annual Axis GIS add-on services **	CAI	\$1,700	11%	\$1,700	11%	\$1,700	11%	\$5,100	11%
Existing	Annual tax map updates **	CAI	\$3,000	20%	\$3,000	20%	\$3,000	20%	\$9,000	20%
New	Enhancements to AxisGIS Online GIS	CAI	\$0	0%	\$2,450	16%	\$2,450	16%	\$4,900	11%
New	3" Aerial Imagery subscription (every 3 years)	NearMap	\$0	0%	\$0	0%	\$6,000	40%	\$6,000	13%
New	GIS Laptop	Lenovo/Acer	\$1,500	10%	\$0	0%	\$0	0%	\$1,500	3%
New	GPS Antenna for Mobile Device & Credits	Bad Elf LLC	\$525	4%	\$150	1%	\$0	0%	\$675	2%
New	Tablet for use with GPS & Cell Service	TBD	\$1,000	7%	\$225	2%	\$225	2%	\$1,450	3%
New	Training and conferences	TBD	\$750	5%	\$750	5%	\$750	5%	\$2,250	5%
Estimated Total			\$13,725	92%	\$13,825	92%	\$19,375	129%	\$46,925	104%
Target Total			\$15,000		\$15,000		\$15,000		\$45,000	
Already Budgeted			\$9,200	61%	\$9,200	61%	\$1,500	10%	\$19,900	44%
Estimated New Expense			\$4,525	30%	\$4,625	31%	\$17,875	119%	\$27,025	60%

NOTES

Budget doesn't include potential additional staffing

*The annual maintenance for our concurrent use license is currently paid for from the Assessing Department budget. Assuming this arrangement continues, funds for existing license maintenance would not come out of this \$45,000 budget request.

**The next 2 years of annual hosting fees, annual add-on service fees, and routine parcel updates are budgeted for with the ARPA outlay of \$87,500, so would not be considered new expenses until FY27 at which time we would need a new contract with the vendor.

APPENDIX

Use Cases for GIS

Planning Board

- Zoning map, overlay map, conservation concerns to support review of development projects
- Land use mapping to understand development patterns and plan future growth

Fire Department

- Cistern network and accessibility across the town
- Mapping tools to assess distance from every house to a cistern or water source

School

- Student residence mapping and bus routing
- Walking / biking routes to schools

Health Department

- Private septic and water well mapping for visualizing paper maps
- Document repository linking an address on a map to the PDF plan

Assessor

- Creation of GIS Assessor parcel maps, publishing the maps through an online GIS with property photos
- Using GIS maps to answer property related questions from the public
- Creating abutters lists and mailing lists

Public Works

- Creating inventories and mapping infrastructure, such as culverts, drainage system, and pavement condition
- Mapping trouble areas to show patterns and plan for improvements
- Conduct GPS data collection and updating GIS when new infrastructure is replaced or newly installed

Conservation

- Spatial analysis of MassDEP wetlands with distance buffering

Conservation Restriction Advisory Committee and Trails Committee

- Bookmark and map recreation resources, along with land protection initiatives

Short Term Planning and Implementation Tasks

ID	Task	Category A	Category B	Developer	Year 1	Year 2	Year 3	Priority
1	Setup in-house GIS master database	GIS Setup		Vendor	2024			High
1.1	Setup in-house GIS software, folder/data connections	GIS Setup		Carlisle GIS	2024			High

1.2	Develop foundational GIS layers (roads/driveways, buildings, wetlands, zoning, water)	Data Development		Carlisle GIS	2024			High
1.3	Purchase or buy subscription to aerial imagery service	Data Development		Carlisle GIS		2025		Medium
1.3	Maintain parcels and data in MassGIS standards	Data Development		Vendor	2024			High
2	Setup in-house map templates for standard and requested maps	GIS Setup		Carlisle Staff	2024	2025		Low
2.1	Creation of maps by special request (reports, presentations, etc)	Map Creation	Staff Best Practices	Carlisle GIS	2024			Medium
3	Implement GIS coordinator role as full-time, part-time, contractor, or distributed role	GIS Setup		Carlisle Staff	2024	2025		High
3.1	Create schedule of GIS maintenance	GIS Setup		Carlisle Staff	2024	2025		Low
3.2	Develop staff best practices to deliver the GIS person needed plans and for annual updates	GIS Setup	Staff Best Practices	Carlisle Staff	2024	2025		Medium
3.3	Connect the GIS person with Carlisle's 911 Addressing Authority to discuss collaboration and Axis GIS	GIS Setup	Staff Best Practices	Carlisle Staff	2024			High
4	Launch online map with freely available/MassGIS GIS	Online Map	Map Creation	Vendor	2024			High
4.1	Test online map on mobile device, modify if needed	Online Map		Vendor	2024			Medium
4.2	Launch online map with Carlisle managed GIS data	Online Map	Map Creation	Carlisle GIS	2024	2025		High
4.3	Develop online map function to upload a photo	Online Map		Vendor		2025		Low
4.4	Develop online map function to upload a document	Online Map		Vendor		2025		Low
4.5	Develop of tools for analysis, routing, etc through online map (Fire Dept)	Online Map	Data Development	Carlisle GIS	2024	2025		Medium
5	Identify and scan paper maps to PDF and JPG	Doc. Management	Staff Best Practices	Carlisle Staff	2024	2025	2026	High
5.1	Build GIS data from map scans (septic, water well)	Data Development	Map Creation	Carlisle GIS	2024	2025		High
5.2	Launch scanned map through online map	Online Map	Doc. Management	Carlisle GIS	2024	2025	2026	Low
6	Setup online apps for GPS data collection	GPS Collection	Data Development	Carlisle GIS	2024	2025	2026	Low

Long Term Goals

Starting up a GIS program requires support from the Town Administrator, Department Heads, and Boards and Committees. Development of a solid foundation takes time, patience, communication, consistency, and funding. It is recommended that Carlisle invest properly in the first 3 years of it's GIS to promote long term success, as the first 3 years are where:

- Many aspects of the GIS are built, reviewed, and modified.
- Non-GIS staff will participate in the GIS so their buy-in, training, and consistent support are necessary.
- The GIS role will work with non-GIS to adjust workflows to better integrate and support GIS functions and data development and data maintenance

Goal: For Carlisle's Management Team to create a clear and sustainable framework and support for GIS staff, GIS funding, and important stakeholders of GIS

1. Carlisle's Management Team to determine how to staff a GIS role for the next 3 years.
 - 1.1. Action Item: Management to determine if GIS role is part-time, full-time, or a contractor. Anything less than this in the first 3 years creates risks.
2. Carlisle's Management Team to determine best funding mechanisms for long-term sustainability
 - 2.1. Note: Some towns have fully or partially funded GIS positions through
 - 2.1.1. Public Safety, DPW, Planning, or IT budgets (most common)
 - 2.1.2. Fees on certain applications or permits
 - 2.1.3. Grants and outside funds
 - 2.2. Notes Some towns have fully or partially funded GIS related purchases and licenses
 - 2.2.1. Capital Budget process (most common)
 - 2.2.2. Department budgets
 - 2.2.3. General Fund
 - 2.2.4. Grants and awards (Emergency Management)
3. Carlisle's Management Team to determine how the GIS role is supervised and
4. Carlisle's Management Team to enable GIS training for staff
 - 4.1. Note: With the agreement with CAI for development of the GIS online map, staff can access live training. This may only be offered once upon product delivery
 - 4.2. Note: With the ESRI license, staff can access free and low cost recorded GIS training videos
 - 4.3. Action Item: Management to determine which existing staff should receive live GIS training through CAI and recorded video training through ESRI
5. Carlisle's Management Team to empower GIS role and enable non-GIS Department Heads to work together to improve workflows, document sharing best practices, and a document sharing annual schedule to ensure everyone is knowledgeable about each other's work and working collaboratively
 - 5.1. Action Item: Management to set up one or more meetings to build this partnership

- 5.2. Action Item: Management to set up a consistent schedule of check-ins and team building. In the first year, a quarterly meeting would be useful
- 5.3. Action Item: The GIS manager shall create quarterly newsletters/summaries to share with all staff about GIS progress for the first year or two. This greatly helps with buy-in and knowledge sharing

Goal: GIS staff/contractor to develop a robust GIS that includes high quality data, accessible maps, custom maps, data collection, and other services to meet the needs of Town operations and residents

- 6. The GIS person shall become knowledgeable about all departments and programs across the town government to ensure the townwide GIS meets the existing and upcoming needs. Incorporate findings into the GIS Strategic Plan
 - 6.1. Meet with each Department Head to discuss existing and upcoming projects
 - 6.2. Determine which projects may require or benefit from GIS services
 - 6.3. Determine if any departmental staff already have or need GIS training
- 7. Develop a project management system to implement, track, and update the Short Term Planning and Implementation Tasks
- 8. Create a standard method and tracking system for incoming GIS requests
 - 8.1. This could be a simple form with standard questions that encourages the requestor to provide detailed information
 - 8.1.1. Description of the project, date the product is needed by, map format (printed, PDF, PowerPoint, etc), data to be shown on the map, and more
- 9. Stay informed about regional municipal GIS events, groups, and news and build relationships with key GIS groups
 - 9.1. Join the Eastern Massachusetts Municipal GIS Group
 - 9.2. Meet the regional ESRI representatives
 - 9.3. Meet the MassGIS team
 - 9.3.1. Parcel Maintenance program and how Carlisle will participate: Craig Austin (craig.austin@mass.gov)
 - 9.3.2. NextGen 911 program and how Carlisle will participate
 - 9.4. Review and determine if GISCI's GIS Professional certification is a priority

Potential GIS Staffing Scenarios

The Planning Board requested the development of a series of potential GIS staffing scenarios. Below are common staffing scenarios that exist in the GIS offices within municipalities. Which scenario is the right fit for Carlisle, will require a deeper assessment by the Town Administrator, Planning Board, Town Planner, and other stakeholders.

Hire Category	Hours Per Week	Location	Pay	Frequency	Reports To	Description	Questions
Full-Time GIS Employee	35	On-site	\$60K - \$75K	Annual	Town Planner	The pool of GIS professionals looking for full-time work at this salary will likely be larger than the other two options. The applicants will likely be early career GIS professionals or seasoned professionals. The Carlisle GIS will likely be in the best position to succeed long-term with a FTE during the first few years to get GIS setup and integrated into government. Likely, a FTE would have the highest probability of being retained for a longer duration, whereas part-time roles may result in more frequent turnover.	Will there be enough work to warrant a FTE? Is there enough budget to hire a FTE?
Part-Time GIS Employee	20	On-site/ Remote	\$30 - \$40	Per Hour	Town Planner	The pool of GIS professionals looking for a part-time role is likely less than that of a full-time role. The applicants will likely be remote freelancers, folks who already have a side or full-time GIS consulting business or a student just out of undergrad or grad school. Since Carlisle is a relatively small town, this role could be fulfilled well by a part-time staff. However, much of their time over the first year will be allocated to setup and startup tasks to ensure long-term success. During "busy" times, the part-time staff member may be asked to work more hours.	Will the part-time hours be enough to set up the GIS for long-term success while also providing the GIS support that townwide staff request? Will the applicants be of high enough quality due to part-time status? Will the town pay the part-time employee benefits?
Existing Employee given GIS responsibility	10-20	On-site	Salary Increase	Salary	Town Planner	Based on the survey of stakeholders, Carlisle already has staff with GIS knowledge. If the Town chooses this option, it should also commit to GIS training for the staff member and clear responsibilities. There may be times of the year when one of the staff's roles is more demanding and may impact their capability of fulfilling both roles. In	

						these and other instances, it would be beneficial to have backup GIS support.	
GIS Contractor	0-20	Remote/ Onsite, if needed	\$50 - \$80	Per Hour	Town Planner	The pool of potential contractors may be the smallest of these scenarios. Likely, applicants will be companies, such as CAI or AppGeo, consultants who have their own GIS-related LLC, and/or some with a full-time job who will work non-business hours of nights and weekends. This role will likely not be on-site often or at all and miss the experience of working with staff. They could certainly still build the GIS framework, however, it may lack the elements that come with truly knowing your staff, their projects, and needs. A contractor would likely largely be responsive to GIS requests by staff and less be proactive about developing tools, products, templates, and GPS data collection on-site.	Will this role be attentive enough to meet townwide staff needs? Will this role proactively build the GIS program or just be responsive to making maps?
Collaborative or Shared Staff GIS Model	0-20	Remote/ Onsite, if needed	TBD		Town Planner	This model of GIS support is a collaboration between one or more local or regional municipalities where staff and/or GIS resources are shared. The parameters would be determined to meet the needs of all participants and would aim to lower the staffing cost and leverage shared methods, knowledge, and resources, such as a GPS unit and software licenses. Although this model is more rare in New England, it is more common in areas where County governments are the authority over several jurisdictions. Regional Planning committees in New England have also explored this collaborative/shared model and could be consulted.	Which municipalities or entities may want to explore this model? Are there challenges with inter-municipal employment? How to develop a healthy and effective work model and environment for the GIS employee?
Volunteer/ Intern	0-40	On-site/ Remote	\$0 - \$30	Per Hour	Town Planner	The pool of potential volunteers or interns would likely be those attending college, those shifting careers, or retirees. This option is the least likely to deliver long-term success for Carlisle. The position would likely turnover often and the GIS may be fraught with inconsistency. I don't recommend this option as the primary GIS role.	Could a volunteer/intern be used to support a hired GIS manager?