

To: Corporate and Finance Services Committee

From: Stephanie Sinnott, Commissioner,  
Corporate and Finance Services Department  
  
Tracy Adams, Chief Administrative Officer  
Office of the Chief Administrative Officer

Report Number: CF-23-08

Date of Report: February 1, 2023

Date of Meeting: February 6, 2023

Subject: Corporate GIS and Data Strategy

Ward: All Wards

File: 03-05

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## **1.0 Purpose**

The purpose of this report is to present the Corporate GIS and Data Strategy for Council's approval and in accordance with the Province's Audit and Accountability Funding Intake 3 requirements.

Attachment 1 is the Corporate GIS and Data Strategy.

## **2.0 Recommendation**

That the Corporate and Finance Services Committee recommend to City Council:

1. That in accordance with Report CF-23-08 Corporate GIS and Data Strategy dated February 1, 2023, the Corporate GIS and Data Strategy, as outlined in Attachment 1, be approved; and,
2. That the future operating and capital budget considerations as outlined in the detailed work plan be presented to Council, when appropriate through future budget submissions as part of the City's regular budget planning process or separate reports as appropriate.

## **3.0 Executive Summary**

Not applicable

## **4.0 Input From Other Sources**

Geographic Technologies Group was retained by the City to develop the Corporate GIS and Data Strategy.

All City departments and senior personnel involved in work that includes Geographic Information and Data Systems and members of the public were consulted and provided input in the development of the Plan.

## **5.0 Analysis**

### **5.1 Background**

The need for a Corporate Data Strategy/Policy was identified in Council approved strategies, specifically, the Information Technology Strategic Plan: 2020-2024 and the Information and Records Management Strategic Plan.

In 2019, City Council approved the Information and Records Management Strategic Plan (RIM), which identified five strategies of which three relate to data: RIM and Data Management Governance, RIM and Data Management Staffing, and Data Management. The RIM also identified that the City's data management maturity level is between 0 and 1 on the Capability Maturity Model Integration (CMMI) data management maturity scale. Level 3 is the minimum target level for each Principle in any organization. In addition, the Strategy recommended the development of a Data Policy, Open Data Policy, expansion of the Geographic Information Systems (GIS) Program, to name a few.

In 2020, City Council approved the Corporate Information Technology Strategic Plan: 2020-2024, which identified the need for the City to become a Data Informed Organization, including developing a GIS and Data Strategy; establishing a data warehouse; and, implementing reporting, analytics and dashboard to support KPIs and performance management programs.

In 2021 the Capital Budget forecast identified project 30-0114 for development of a Corporate GIS and Data Strategy in the amount of \$75,000 for 2022.

In August 2021 the Ministry of Municipal Affairs and Housing announced that large urban municipalities were invited to apply to Intake 3 of the Audit and Accountability Fund for funding to undertake third party reviews with the goal of finding service delivery efficiencies.

On September 27, 2021 staff were directed as per FIN-21-89 to apply to the Audit and Accountability Fund Program – Intake 3 for the purpose of developing a Corporate GIS and Data Strategy.

Staff subsequently issued a Request for Proposal C2021-114 in accordance with the Purchasing By-law for a qualified proponent to undertake developing a Corporate GIS and Data Strategy contingent on the approval of funding.

The RFP closed on Monday, November 15, 2021 with eight qualified bids submitted. Staff reviewed and scored bid applications and selected Geographic Technologies Group (G.T.G.) as the highest ranked bidder to undertake the development of a Corporate GIS and Data Strategy.

G.T.G. specializes in GIS services that include strategic planning, GIS consulting and comprehensive data services, mapping services, software development, GIS training, and on-call GIS support and maintenance. They have clients around the globe and among their North American clients are Canadian municipalities such as City of Nanaimo, Strathcona County, City of Guelph, City of Mississauga, Brant County, Town of Ajax and City of Pickering.

The City's application for funding approval under the Audit and Accountability Fund – Intake 3 to cover the development of the Corporate GIS and Data Strategy was approved on January 27, 2022 for funding up to \$127,200 and work began on the project in February 2022.

## **5.2 Project Process**

As GIS and Data management widely impacts the organization, the project was approached as a corporate initiative, not a specific Information Technology Services Branch project. A cross-departmental staff team was selected to work alongside G.T.G. to develop the Corporate GIS and Data Strategy.

G.T.G. developed a project process to be undertaken in three phases as follows:

- Phase I – Existing and Current Assessment
- Phase II – Systems Design, and
- Phase III – GIS and Digital Return on Investment Analysis, Strategic Action Plan and Implementation

## **5.3 Assessment and Findings**

G.T.G.'s findings and recommendations are outlined in Attachment 1: Corporate GIS and Data Strategy.

### **5.3.1 City of Oshawa's GIS Success and Future Needs**

G.T.G. employed multiple data-gathering techniques and assessment methodologies including the Six Pillars of Sustainability – GIS Governance, Data and Databases, Procedures, Workflows and Integration, GIS Software, Training, Education and Knowledge Transfer – to assess the City's current GIS success and future needs.

G.T.G. reports that the City's use of GIS is mature and is used in all departments in different ways with more experienced and knowledgeable users in Engineering, Facilities Management, Operations, Planning, Recreation and Strategic and Business Services.

Their report details GIS usage across 8 internal web applications, 7 field-collection applications, 4 public-facing web applications, 1 story map and an Open Data Portal.

The report found many GIS success stories in the City and recommended that these be quantified and the return on investment articulated, for full appreciation of the impact on the organization and the lives of residents, on an annual basis.

### **5.3.2 Goals and Objectives**

G.T.G.'s report identifies the following goals as critical to defining the City's GIS and Data mission, vision and objectives:

1. Maintain an effective GIS and Data Governance Model
2. Build and maintain accurate and reliable GIS Data
3. Promote GIS integration with business systems and develop a set of procedures
4. Make GIS Data and Applications accessible to City employees and the public
5. Implement and maintain GIS IT infrastructure
6. Increase GIS skillsets and knowledge.

### **5.3.3 Standard Operating Procedures**

As GTG indicated, the City's use of GIS is mature: This enabled G.T.G. to develop Standard Operating Procedures (S.O.P.) to document internal GIS system procedures and workflows in an S.O.P. format.

S.O.P. was leveraged to:

1. Document data ownership, access, and sharing policies.
2. Document Data Creation Processes and Standards.
3. Develop GIS application selection, configuration, and deployment procedures.
4. Develop Visual Identity Templates and Accessibility Standards for GIS maps, story maps, and apps that follow the Visual Identity Manual and Accessibility standards.
5. Develop an Analytical Dashboards S.O.P. to guide decision-making for assessing the best platform for analytical dashboards.
6. Develop an ArcGIS Desktop Use S.O.P. (who should use it, for what uses, installation, training needs, annual evaluation).
7. Implement an ArcGIS Hub S.O.P. that outlines a decision-making process to assist with selecting the best data and apps to meet corporate and branch needs.

### **5.3.4 Implementation Roadmap**

The roadmap outlined for the GIS and Data Strategy details action items in Governance, Data, Workflow, Software, Infrastructure and Training and Education over the next five years broken down into annual, periodic and ongoing activities.

The report also details staffing requirements over the same period necessary to carry out the implementation of the plan.



## 6.0 Financial Implications

The cost of the development of the Corporate GIS and Data Strategy was \$100,000 and was wholly covered by funding received under the Audit and Accountability Fund – Intake 3.

The implementation of the Corporate GIS and Data Strategy will be presented to Council for consideration through future operating and capital budget considerations when appropriate as part of the City's regular budget planning process or separate reports as appropriate.

## 7.0 Relationship to the Oshawa Strategic Plan

This report supports the Oshawa Strategic Plan goal of Accountable Leadership.



Enez Perkins, Manager, Corporate Strategic Initiatives,  
Corporate Strategic Initiatives



Stephanie Sinnott, Commissioner,  
Corporate and Finance Services Department



Tracy Adams, Chief Administrative Officer  
Office of the Chief Administrative Officer



City of Oshawa, Ontario

# **CORPORATE GIS AND DATA STRATEGY**





## CITY OF OSHAWA

### GIS AND DIGITAL DATA

Successful enterprise data management results from a well-executed, multi-layer plan. The layers include an appropriate database management system (DBMS), a data governance plan, data management standards, assigned data stewards, and designated user roles.

The City of Oshawa's Geographic Information Systems (GIS) program enables all staff and the community with a wealth of highly accurate geographic data. Map layers combined with descriptive data allows GIS users to analyze, map, plan, interpret, protect, enhance, and manage their world. GIS is an integrative technology used by local governments that allows staff and the public to visualize digital data from disparate sources in a readily understandable way.

GIS and digital data systems have been in use at the City of Oshawa for decades and have facilitated the creation of over two hundred data spatial layers and many data tables and views, enabling staff and the public with intuitive mapping applications, and serving as a key decision-making platform for the City.

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*"If you don't know  
where you are going  
any path will take  
you there."*

- Lewis Carroll



*"A failure to plan is  
a plan to fail."*

- Benjamin Franklin

# GIS

**SKILLS** **DATA**  
*information*

**GEO**  
*ANALYSIS*  
*knowledge*  
**support**

*FIELD projects*  
**emerging**

**ENVIRONMENTAL**  
**APPLY**

**INDUSTRIES**  
**STATISTICAL** *MAPS*  
**INTRODUCTION**

## INTRO

A Geographic Information System (GIS) allows City of Oshawa staff and residents to visualize, search, analyze, and interpret data to understand relationships, patterns, and trends contained within location-based information. GIS has become a primary information management tool for the City and local governments worldwide. Oshawa's GIS and Data program is being advanced as a Corporate GIS and Data Program. At this time, over two hundred accurate and comprehensive data layers have been developed representing the location-based information needs of the organization.

GIS is a collaborative platform that supports the collection, sharing, and exchange of location-based information. As such, GIS underpins much of the collective organizational effort devoted toward the strategic priorities identified in the City of Oshawa 2020-2023 Strategic Plan goals of Economic Prosperity and Financial Stewardship, Accountable Leadership, Social Equity, Cultural Vitality, and Environmental Responsibility. The City recognized the need for the development of a GIS and Data Strategy to guide the City's GIS and data efforts over the next five years. The Corporate GIS and Data Strategy establishes a game plan to ensure that the GIS and data needs of the City are met and sustained.

More than 90 per cent of local government services and activities (and their representative data) have a geographic location (address, asset location, or property). Therefore, GIS is the platform that should be used by City staff to visualize their data. The usage of GIS technology is now widespread across the organization, and it has transformed into a core information technology in the City for many departments. This underscores the importance that the GIS and Data program should be well planned and well managed. To that end, the City has developed this Corporate GIS and Data Strategy to guide the further implementation of GIS technology and to ensure that the continued investment in data and GIS service delivery is most effectively managed.





## WHAT IS GIS?

A Geographic Information System (GIS) allows a local government to visualize, query, analyze, and interpret data to understand relationships, patterns, and trends contained within location-based information. GIS is an information platform comprised of data, software, and hardware that has become a primary information tool for municipalities across Canada.

Some people mistakenly see GIS as just digital maps – the conversion of paper maps to a digital form – but GIS is much more than that. GIS allows users to analyze their world geographically (spatially). Spatial analysis is how we understand our world – mapping where things are, how they relate, what it all means, and what actions to take. From the computational analysis of geographic patterns to finding optimum routes, identifying areas for economic development, site selection, and advanced predictive modeling, spatial analysis is at the very heart of geographic information system (GIS) technology.

GIS takes massive amounts of data and puts them into a context that is readily understandable and actionable. GIS enables residents to quickly and easily understand property-related issues, infrastructure work in their area, prepare and recover from natural disasters, visualize all of the services in their area, and find the information they need that affects their life.

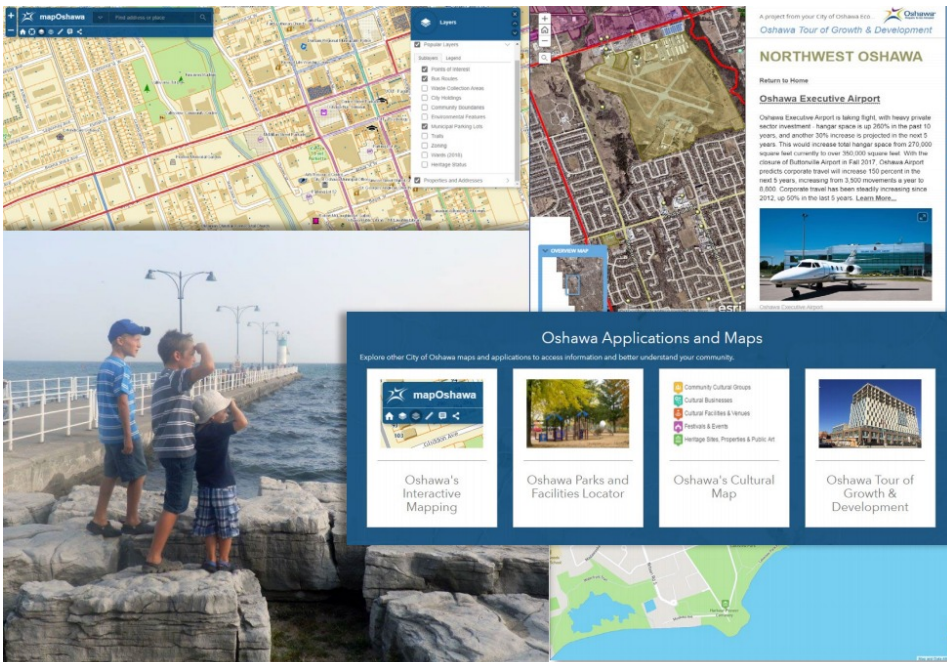
Oshawa's GIS-ITS team maintains corporate GIS and data services such as base-layer maintenance, enterprise data management, GIS application hosting, system administration, application support, and user training. Geospatial support services including customer assistance, mapping, spatial analysis, data integration, application development, and project management are provided to the public, City Council, and departments. GIS has become a primary data dissemination and decision-making platform for City staff.

- GIS
- Data Mapping
- Analysis
- Mapping
- Visualization
- Community Engagement
- Economic Development
- Infrastructure Management
- Planning and Building Services
- Recreation and Culture
- Public Safety and more

***“GIS enables staff and residents to visualize, interpret, and make decisions about their world.”***

***“GIS is the primary data visualization platform for local governments.”***





## GIS AT THE CITY OF OSHAWA

The GIS and Data program has been in use at the City of Oshawa for decades and is now being advanced as a Corporate GIS and Data Program. When GIS was adopted in the City, it was a function of the Planning Services Branch of the Development Services Department. As GIS grew into more of a **corporate asset**, it was moved to the Information Technology Services Branch (ITS). The primary platform for GIS is Esri's ArcGIS Enterprise 10.7.1 with a geodatabase and open data portal. There are 210 GIS layers in the Oshawa enterprise geodatabase, many with metadata and some with documented standards / methodology. Although data and GIS are thoroughly ingrained throughout the corporation and is used by all departments, a GIS and Data Strategy had never been undertaken.

The GIS staff in the ITS Application Support Division (GIS-ITS team) are responsible for developing solutions for branches, programming integrations, managing data sharing agreements, managing the central datasets, and other supporting data maintenance responsibilities. IT manages systems and databases that house a wide variety of data. A majority of GIS data is housed in a central database managed by the GIS-ITS team. In collaboration with the GIS-ITS team, the Engineering Services Infrastructure Planning Group authors a large volume of data layers, tables, and views, and has its own area in the GIS database.

*"GIS has always been well received in the city."*

*"The GIS and Data program has been in use at the City of Oshawa for decades and is now being advanced as a Corporate GIS and Data Program. As GIS grew into more of a corporate asset, it was moved to the Information Technology Services Branch (ITS). There are 210 GIS layers in the Oshawa enterprise geodatabase, many with metadata and some with documented standards / methodology."*

*"More than 90 per cent of the data maintained by local governments has a geographic component ripe for mapping and analysis."*

## THE CITY OF OSHAWA USES GIS FOR...

- 8 Internal web applications
- 7 Field collection applications
- 4 Public-facing web applications
- 1 Story Map
- Open Data Portal - ArcGIS Hub with 10 categories of downloadable data and links to the interactive mapping applications and story maps - [City of Oshawa Open Data \(arcgis.com\)](https://arcgis.com/open-data/city-of-oshawa)

## INTEGRATIONS WITH BUSINESS SYSTEMS INCLUDE EMBEDDED MAPS USING GIS LAYERS, ACCESS TO DATABASES, CONSUMING GIS DATA, AND OTHER INTEGRATION POINTS WITH THE FOLLOWING SYSTEMS:

- CriSys CAD and RMS Tablet Command
- Maximo - Asset Management
- OLI – Permitting and Inspections
- PeopleSoft – Financial
- Skyhawk Connect Anywhere – GPS/AVL
- TXM– Property Assessment
- Versatile - Physical Records Management

## ALL BRANCHES ACROSS THE CITY USE GIS IN DIFFERENT WAYS, WITH THE MORE EXPERIENCED AND KNOWLEDGEABLE USERS IN...

- Engineering Services – Infrastructure Services
- Facilities Management Services – Capital and Technical Services
- Operations Services – Road Operations
- Planning Services – Development and Urban Design
- Recreation and Culture Services
- Strategic and Business Services – Transportation and Parking Services





*“A GIS and Data program cannot be run haphazardly. Following best practices and a playbook is key to success.”*

## KEY METHODOLOGIES

Multiple data-gathering techniques and assessment methodologies were used to identify the City of Oshawa’s current successes and future needs. Key methodologies included:

**Six Pillars of Sustainability** – Used to evaluate the City of Oshawa in regard to gaps and to organize action items. The Pillars of GIS Sustainability are as follows:

- **GIS Governance** – How is GIS managed and maintained
- **Data and Databases** – Key data elements that feed the GIS
- **Procedures, Workflows, and Integration** – How is the GIS being integrated with other systems and within the workflows of the organization
- **GIS Software** – The appropriate software for various types of users and needs
- **Training, Education, and Knowledge Transfer** – Ensuring that GIS is understood, and that the organization has pervasive knowledge of the power of GIS and how to use it

**Voice of the Customer (Online Questionnaire)** – Internal questionnaire to solicit the feedback of GIS users in regard to what works, what needs improvements, and unmet needs.

**GIS Benchmarking** – Analysis of the City of Oshawa’s GIS and Data program as compared to comparable organizations nationwide.

**Kickoff Meeting and Seminar** – Discussion about the what, how, and why of the Strategic Plan.

**Key Performance Indicators** – Enabling the City of Oshawa with a set of KPI's to track success now and in the future based on the Six Pillars of Sustainability.

**Departmental Interviews** – On-site interviews with key users to determine an optimal move-forward strategy and discussion of possible future uses of GIS.

**Community Consultation** – Painting a clearer picture of the state of the City’s GIS initiative today with the help of those who share a vested interest.





*"Don't confuse  
activity with  
accomplishment.  
Have a plan for  
success."*

## CITY OF OSHAWA GIS SUCCESS STORIES

What constitutes a successful GIS and data program? This question has been a topic of debate for decades. Some people argue that success is a robust database some of which are GIS layers. Others contend success is the implementation of software and hardware that enables users to view and analyze data (often via a GIS). However, the ultimate success of a City-wide GIS and data program is how the GIS and corporate data are being used to impact the organization and the lives of residents.

Quantifying and articulating return on investment is very important for an organization. A GIS and data program might have very successful projects, but without visibility of these successes, the GIS and corporate data might be under-appreciated. Therefore, one of the key responsibilities of the technology leaders in an organization is documenting successes and giving visibility to these organization-wide.

One of the recommendations of this Corporate GIS and Data Strategy is to document successes annually and offer them as a white paper and present to the organization. This visibility will ensure that a) staff thinks in terms of success (and documenting them) and b) support remains strong throughout the organization because successes are understood.

Additionally, quantification of the success stories is recommended. The return-on-investment (ROI) graphic below identifies categories for consideration when documenting ROI. The next few pages document a few of the many successes of the City of Oshawa GIS and data program. The success stories were contributed by various Oshawa staff and departments.





# ENTERPRISE DATA MANAGEMENT SUMMARY

Maintaining the veracity and reliability of enterprise data requires suitable software, knowledgeable staff, a formal data management program, and training for staff in data security and management. The City's need for a data management program can be met through a secure database management system (DBMS), implementation of industry-standard database schemas, ongoing oversight from a data management team, implementation, and adherence to data policies/procedures, and training staff in best data management practices. The Enterprise Data Management Plan examines data and data management corporate-wide from a programmatic context. Additionally, this document focuses on the importance of human resources to manage and shepherd the data management program.

Currently, the City has significant data resources but no holistic data management program. The Information Technology Services (ITS) branch provides technical assistance and knowledge support for data and systems that house data. Each branch uses systems (i.e., OLI, Maximo, etc.) that house and track data. In many cases, branches are creating supplementary data repositories in Microsoft Access and/or Microsoft Excel because they have no other logical place to house key data elements. There is a high level of confidence in the quality and accuracy of much of the City's data and there is a desire and interest in gathering and using data for decision-making.

## KEY DATA MANAGEMENT ACTION ITEMS INCLUDE:

### Data Management Maturity

- Choose an industry-standard data governance maturity model and refine to meet the City's needs (all data, not just GIS) and assess the City's data governance maturity using the chosen model.
- Define data regulation and implement data management best practices, according to the strategies in this plan.

### Building a Data Management Strategy and Program

- Fill the Manager, Data & GIS Solutions position and create and fill a Data Architect position.
- Officialize a data governance strategy and operating model.
- Utilize innovative data analytics tools and easy-to-use software tools to disseminate data and include more data contributors.
- Form a data management team and an Open Data Sub-Committee and consider a Data Governance Team Steering Committee (DGTSC).

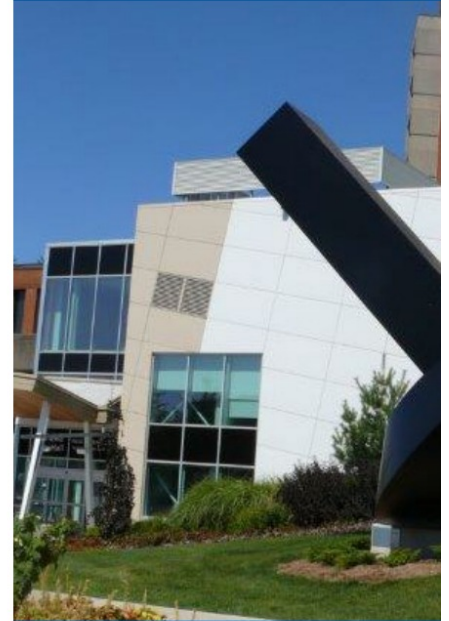
### Data as an Asset (Data Improvement Cycle)

- Develop an SOP that ensures consideration of GIS and data lifecycle management when selecting IT systems.
- Include data management life cycle progress and projects in the annual data review and work plan.
- Develop a seminar detailing the data management life cycle.

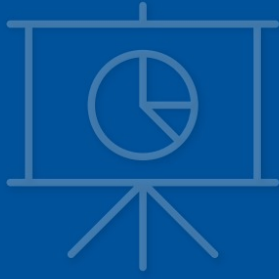
### Data Creation and Augmentation

- Prioritize the data needs and create the data.
- Further define the need and identify the best technology and process to satisfy the need.
- Identify how the data will be governed (data steward and plan to maintain).

*“Laying out a plan for success not only improves an organization’s data security and reliability...*



*but it will also make the organization more efficient in time and cost.”*



***“The City of Oshawa should identify authoritative databases from which all other systems derive common data elements.”***

#### Central Data Repository and Data Warehousing Considerations

- Consider data warehousing as staffing and resources increase.
- Use data centralization, data maintenance SOPs, GIS, and BI tools as a first step in affording staff additional data insight.
- Implement data warehousing through actionable business cases and pilot projects.

#### Data Visualization Through Business Intelligence (BI) Tools

- Assess the best platform for analytical dashboards.
- Review current BI needs, and work with branches to prioritize analytical projects.
- Initiate a pilot project to assess ArcGIS Insights.

#### System Integration and Visualization

- Complete the business application and database list with input from business units.
- Investigate, test, and acquire commercial off-the-shelf applications for data transformation and geo-enablement.
- Configure the application or scripts to transform / geo-enable each IT system.

#### Data Management

- Master Data List
  - Create a user-friendly Master Data List (MDL).
  - Form a sub-committee to review the MDL including staff from ITS and other branches.
- Metadata
  - Create, adopt, and enforce a metadata standards, policy and SOP.
  - Extend metadata to key data elements in the various IT systems.
  - Assign data coordinators responsible for creating and maintaining metadata for each dataset.
- Data Assessment
  - Acquire and install the ArcGIS Data Reviewer extension - Review and understand its capabilities, methodologies, and strategies.
  - Perform and record baseline data assessment(s).
  - Maintain data health and integrity through automated processes and checks.
- Educate users on the MDL, metadata, and data quality and solicit feedback.

#### Emerging Technology

- Drone Data Augmentation
  - If feasible with Oshawa Executive Airport air traffic, evaluate various aircraft platforms and acquire the UAS equipment, mobile devices, and software for processing imagery.
  - Obtain pilot certifications and develop procedures/checklists for drone pre-flight checks and data capture, conversion, and integration.
  - Use drones for remote image capture.

#### 3D Data

- Do a pilot with 3D data and technology, consider its value, and develop use cases.
- Develop procedures/checklists for the creation of 3D models.
- Selectively augment various viewing portals with 3D scenes.

Establishing a formal data management program is mandatory for the City of Oshawa to further reap the benefit of the wealth of data housed in various systems and databases. Data normalization, data stewardship, visualization, business intelligence, centralization, data optimization, and customer enablement (internal and external) are a few of the benefits of the combined focus of GIS and data. With each improvement and advancement, internal and external stakeholders will be better informed with an increasing array of accurate data and tools.





*“An enterprise Geographic Information System (GIS) is an organization-wide location intelligence platform that supports collecting, sharing, and exchanging geographic information.”*

## GEOSPATIAL NEEDS SUMMARY

An enterprise Geographic Information System (GIS) is an organization-wide **location intelligence** platform that supports collecting, sharing, and exchanging geographic information. GIS technology can support many diverse functions, including, but not limited to, asset and capital project plan management, planning and construction, public safety, park administration, utility infrastructure, and a host of other department-specific duties. In addition, GIS is a key enabler of map production and location-based information derived from data stored and managed in enterprise geodatabases that support the GIS and related systems. These tools can be provided to staff, contractors, stakeholders, council members, partner organizations, and the general public.

GIS and data technology facilitate data-driven decision-making, playing a key role in strategic service management and tactical service delivery. GIS is an integral component of asset management (AM), computerized maintenance management systems (CMMS), work order and workforce management systems (WOM), public safety systems (911, RMS), and an array of other information technology (IT) systems used throughout the corporation.

Sustaining a successful GIS and data program at Oshawa will require a considerable amount of planning and deliberation. A documented assessment of the current state is a logical first step. It allows for informed decision-making regarding the needs of each operating unit and the organization as a whole. The GIS Needs Assessment Report focused primarily on the discovery and documentation of the various geospatial needs of the City. The next section documents the corporate-wide enterprise needs and branch needs discovered through interviews with staff.







***“Most basic needs are common to all users within a typical local government organization; that is, most users need to be able to quickly visualize data in a geospatial context, make decisions from this data visualization, and act based on their findings.”***

## ENTERPRISE NEEDS

When examining the needs of any organization, it is informative to understand whether a need is common to all or most users (corporate-wide need) or specific to one department or branch. In reality, most basic needs are common to all users within a typical local government organization; that is, most users need to be able to quickly visualize data in a geospatial context, make decisions from this data visualization, and act based on their findings. These tasks could be as simple as answering a question for a customer about available services or as complex as finding an optimal site location for a new facility. However, the specificity of how these common needs are satisfied and the complexity of the necessary tools to satisfy these needs vary by department, branch, division, and in some cases, by specific users. Therefore, the challenge is identifying and providing for enterprise-wide needs without becoming too far-reaching and general. On the other hand, it is equally important not to provide specificity beyond what can be maintained by the central GIS team.

Each department has the following common needs, although they may require specifically targeted configurations.

- Clarification of the role of the GIS-ITS team and the branches.
- New, updated, and augmented data layers.
- Integration and geo-enablement of existing IT software systems/databases, including Maximo, OLI/CityView, Intelligenz, CriSys, Lagan, and more.
- Branch and division GIS viewers configured with data, queries, and tools specific to the needs of the users.
- Geo-centric analytical dashboards.
- Mobile mapping for field operations.
- Easy-to-use applications to include out-of-the-box specific purpose solutions and sharing pertinent information through Story Maps.
- Migration to the latest versions of GIS software that embrace advances in GIS technology like inherent 3D capabilities.
- Targeted training and education.
- Documentation and presentation of ROI ‘Success Stories’.
- Succession planning.



# BRANCH GEOSPATIAL NEEDS

## INNOVATION AND TRANSFORMATION

The Innovation and Transformation branch drives change by expanding transformative and innovative activities and programs, partnerships with both the private and public sectors, and collaboration with internal teams. This office leads Diversity, Equity and Inclusion, SmartCity, and TeachingCity corporate initiatives. A regional map of Health Neighbourhoods is available internally through the City's license with Environics Analytics and through the Durham Region ArcGIS Hub.

### Highlights of Innovation and Transformation needs include:

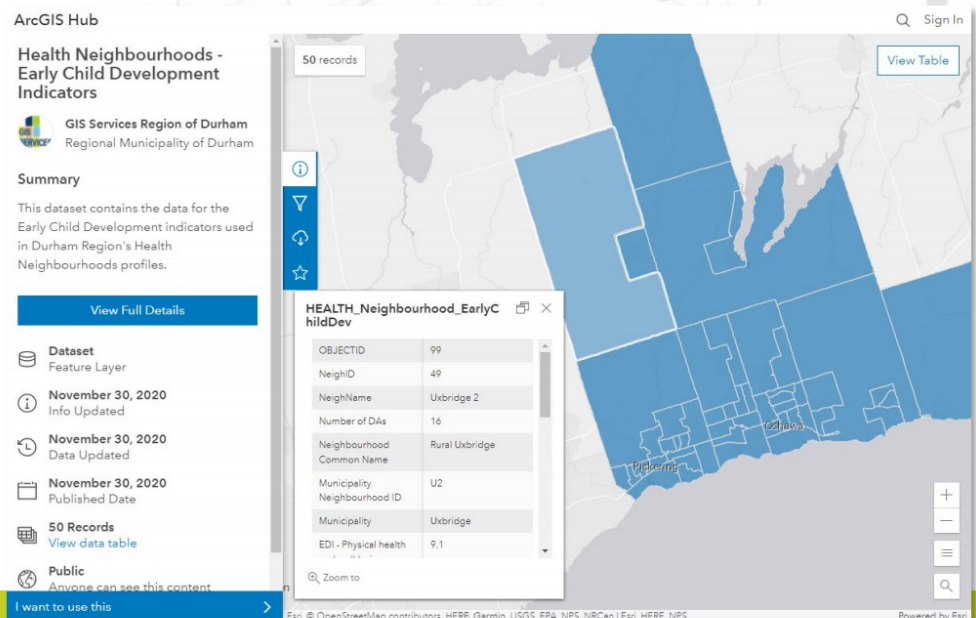
- Story Maps
  - Culture and Heritage Plan
  - Public Art Tours
  - Indigenous History and Land Acknowledgement
  - Understanding the History of the Land
  - Park Accessibility and Public Washrooms
- Dashboards to visualize Strategic Plans and Report Cards of various plans:
  - Age-friendly
  - Accessibility
  - Diversity, Equity, and Inclusion
  - TeachingCity projects (engagement of students, etc.)
  - City Council Priorities

## CORPORATE STRATEGIC INITIATIVES

Corporate Strategic Initiatives (CSI) supports the Chief Administrative Officer (CAO) and the Corporate Leadership Team (CLT) in developing and aligning corporate strategy and change management initiatives.

### Highlights of Corporate Strategic Initiatives needs include:

- Digital floor map of offices of City Hall and other buildings
- Document sharing site
- Meeting Agenda and Council and Committee Scheduling solution
- Corporate Events Scheduling solution
- New Resident and Investor Perspective Story Map
- Remote Worker Check-in/out app with a map of buildings
- Community Grants web app





## OPERATIONS SERVICES

The Operations Services Branch operates and maintains the City's infrastructure of roads, sidewalks, parks, trails, trees, playgrounds, underground assets, and fleet vehicles. This branch offers the following services to the community:

- Fleet Services
- Parks Operations
- Roads Operations
- Waste and Environmental Programs

**Operation Services uses the following targeted internal web map viewers created by the GIS-ITS team:**

- Cemetery
- Infrastructure
- Oshawa Staff Map
- Road Activities
- ROPs
- Sidewalk Snow Clearing
- Waste Collection

**Highlights of Operation Services needs include:**

- Spatial database for Operations Services data, especially Roads and Parks layers.
- Direct connection from AGOL to Maximo to create work orders from Sidewalk Inspection results.
- Link CAD plans and as-builts to a GIS viewer.
- Dashboards:
  - Open Work Order Dashboard with data from Maximo
  - Inspections Dashboard with data from Maximo
  - CIP Dashboard would be great for Planning to disseminate information and solicit feedback.
- Public Parks map with icons representing status.
- ArcGIS Desktop or ArcGIS Online and training for the Branch to maintain their data.

**Build the  
tools for the  
people to do  
their job.**

## FIRE SERVICES

Oshawa Fire Services provides fire services, emergency medical services, and emergency management coordination to protect the community from fire and other public hazards. Fire Services mission is "to promote and protect the health and well-being of the community through adaptable and progressive education, prevention, and emergency services."

**Several layers for Fire Services have been mapped in GIS:**

- Fire Stations
- Fire Response Areas
- Fire Prevention Zones
- Fire Prevention Inspections

The CriSys dispatch data has a geographic component associated with each record, which can be used to put the data on the map using a geocoding process. Also, an ArcGIS Collector app has been used on iPads to track houses visited for the Alarmed For Life program.

**Highlights of Fire Services needs include:**

- Integration with CriSys to extract data for reporting
- Site Location Analysis for any potential new station
- Fire Incident Dashboard
- Story Maps
- Alarmed for Life Story Map
- Fire Services Story Map
- Community Service Day Story Map, including video clips of the stations and bios of staff
- Fire Safety Concerns Story Map for education and prevention



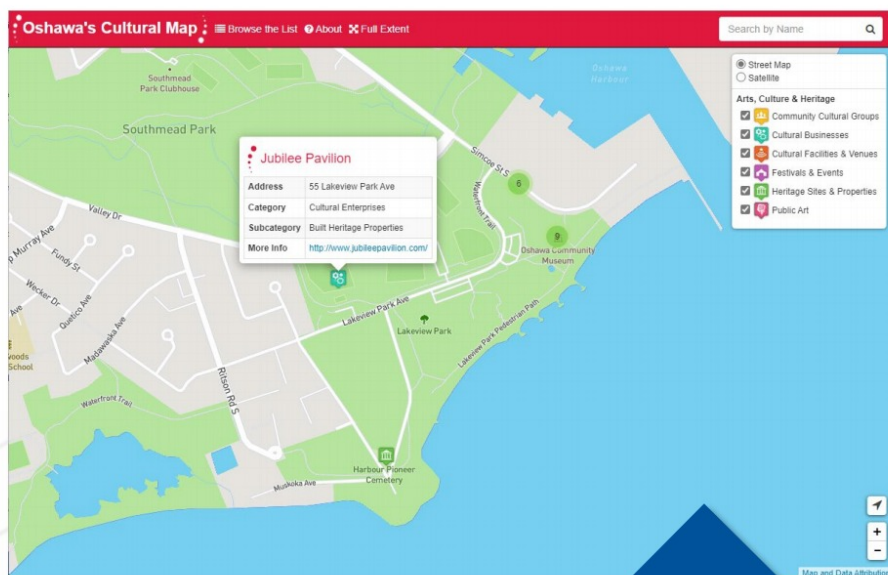
## RECREATION AND CULTURE SERVICES

Recreation and Culture Services is responsible for delivering recreation, leisure, and cultural opportunities that help create a healthy and engaged community. Key functions include planning and delivering recreation and culture programs, community events, promotion and operation of recreation facilities and community centers, and delivery of leisure services and programs.

Recreation and Culture Services worked with the GIS-ITS team to produce a Cultural Map layer and Oshawa's Cultural Map public web application.

### **Highlights of Recreation and Culture Services needs include:**

- Research adding a Recreation and Culture programs, activities, and events map to the Intelligenz active Oshawa registration system.
- Recreation and Culture Programs Viewer and Dashboard
- Recreation User Analysis
- Story Maps
  - Oshawa Museum Story Map
  - Special Event Story Map and Calendar
  - Murals Tour Story Map
  - Culture Plan Story Map



## STRATEGIC AND BUSINESS SERVICES

The Strategic and Business Services Branch of the Community Services Department oversees assistance to Community Services branches.

Four technicians on the Traffic Street Light and Parking staff are using ArcMap for lookup, data creation, and making maps. Also, ArcGIS Collector is used once a year for Street Light night inspections. Several GIS layers have been created related to TrafficStreet Light and Parking:

- Traffic Bylaw
- Street Lighting - poles, streetlights, pole attachments, underground wiring
- Traffic Counts – a list was provided to Infrastructure to add to GIS
- On-street Parking – pay-by-plate information
- Crossing Guard Locations

### **Highlights of Strategic and Business Services needs include:**

- Data Gaps
  - New Subdivisions
  - Parking Meters, Lots, Spaces
  - Traffic Control Signal Locations
  - Capital Projects layer enhancement
- Capital Project Dashboard
- Animal Shelters and Adoption Events Story Map

If you draw it  
and it's a  
system, space,  
or thing, it  
should be in  
GIS

## CORPORATE COMMUNICATIONS

Corporate Communications leads the City's efforts to promote a positive image of the city and strengthen community engagement and communications. In addition, Corporate Communications develop and implement communication and education programs that promote City programs and services.

Corporate Communications staff use the Find your Councillors and Ward GIS app monthly to find where a property or event is located and to view simple maps for their needs; however, the functionality is not intuitive or easy to use.

### **Highlights of Corporate Communications needs include:**

- Geo-enable Community Engagement Projects from the Connect Oshawa platform
- Map and Application Templates for Visual Identity and Accessibility standards
- GIS Solutions
- My Government Services web application
- Story Maps:
  - Parks Redevelopment Plan, Park Master Plans

## CITY CLERK SERVICES

The City Clerk Services branch strives to ensure accountability, transparency, and engagement by administering legislative processes, maintaining and managing public records, and conducting elections. This office performs customer service through Service Oshawa, which is a centralized multi-channel front-line service delivery provider responding to requests for information and service from various modes of contact. Although City Clerk's Office staff does not use GIS now, staff would benefit from access to several GIS data layers.

### **Highlights of City Clerk Services needs include:**

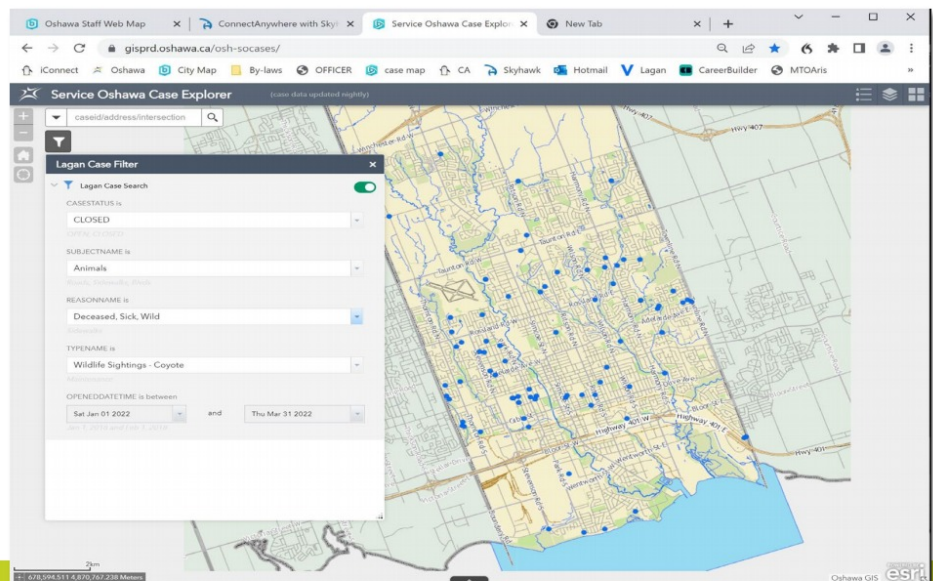
- More self-service Open Data available to the public
- Electronic Records Management System linked to GIS
- Customer Service Dashboard

## FACILITIES MANAGEMENT SERVICES

The Facilities Management Services branch is responsible for the maintenance of City facilities, including inspections, condition assessments, maintaining and upgrading of City facilities, and construction of new City facilities. GIS is used by Facilities Management Services in the initial stages of a project, such as a park redevelopment. Staff uses the general internal GIS viewer, Oshawa Staff Web Map.

### **Highlights of Facilities Management Services needs include:**

- Data Gaps
  - City-Owned Buildings
  - Grading Information - LiDAR
  - Soil Conditions, especially contaminated soils and former landfill areas
  - Bore Hole Site Locations
  - Light Standards
  - Facilities from VFA
- Recurring Renewal Tracking web application





## MUNICIPAL LAW ENFORCEMENT AND LICENSING SERVICES

The Municipal Law Enforcement and Licensing Services (MLELS) Branch is responsible for investigating by-law complaints, enforcing by-law regulations and standards, achieving resolutions to by-law infractions, inspecting property-related applications, issuing business, lottery, and pet licenses, and educating the public on relevant standards.

Both the MLE and Licensing divisions use GIS. An ArcGIS web app displays Service Oshawa calls, property boundaries, by-law layers, road occupancy permits, and zoning. The MLE officers carry laptops in the field to look up aerial photos and measurement tools.

### Highlights of MLELS needs include:

- Business License locations with the type of business
- MLE and Licensing specialized web apps
- Parking Tickets Dashboard

## ENGINEERING SERVICES

The Engineering Services (ES) branch manages the City's municipal infrastructure for Transportation & Water Resources, overseeing assets such as bridges, roads, sewers, and environmental features such as stormwater ponds and creek bank protection. Engineering Services is a large GIS-user branch at the City. The Infrastructure Planning group is comprised of five GIS-knowledgeable staff, and the Development & Technical Services Division has two CAD-knowledgeable staff. The Infrastructure Planning group is responsible for Engineering data architecture and management.

### Highlights of Engineering Services needs include:

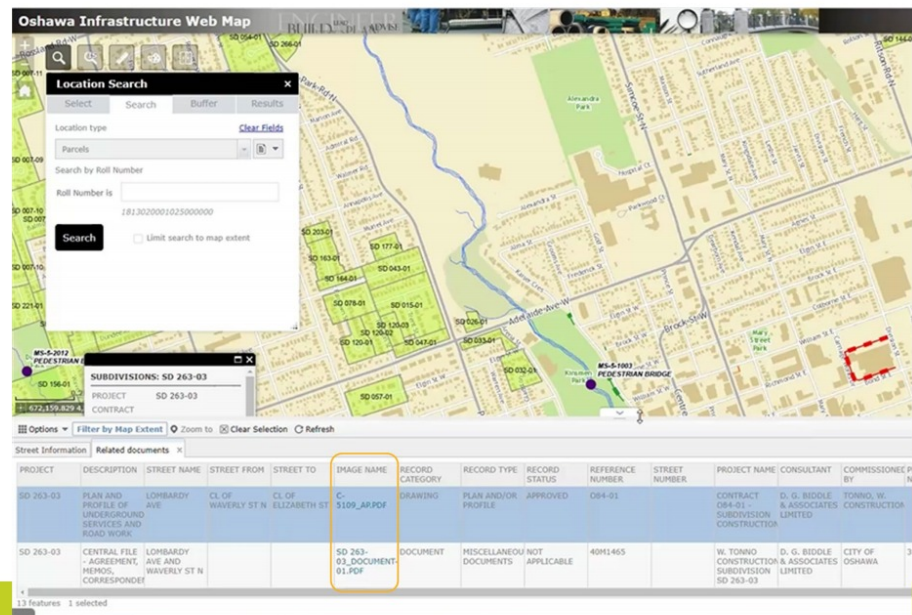
- Improved workflows and documentation
- Refine Maximo work order interoperability with GIS
- Access to Esri Network Analyst extension
- Engineering Capital Projects Story Map
- Tablets/Smartphones for field collection

## PLANNING SERVICES

Planning Services is responsible for all land use, policy, development activities, and heritage matters for the City. Planning Services handles the following major functions that are divided into the Development and Urban Design and Policy Divisions. Planning Services has one GIS Technologist on staff who supports Development Services and other departments. This position uses ArcGIS, ArcMap, Spatial Analyst, and Adobe design to perform software spatial data analysis and create, design, and maintain cartographic maps, customized data sets, and visual presentations for the City using the available GIS databases and external resources. Other Planning staff use the Infrastructure, Cemetery, and Base Map web apps.

### Highlights of Planning Services needs include:

- LiDAR data layers and 3D model for flythroughs
- Data Gaps:
  - Variances
  - Grant Projects
- ArcGIS Pro, with training for Planners
- Planning Services specialized web app
- Land Use PublicFeedback web app
- Story Maps:
  - Heritage Property Tour Story Map
  - Official Plan Story Map
  - Columbus Area Plan Story Map
- Explore ArcGIS Urban





## FINANCE SERVICES

Finance Services is responsible for the preparation of strategic financial plans and annual operating budget, capital forecasting, financial transactions and reporting, accounting, property tax billing and collection, purchasing, and procurement.

The staff has access to the Oshawa Staff Map and there are about 10 potential GIS users, encompassing a diverse group of asset managers and other managers for general interest and dashboards.

### **Highlights of Finance Services needs include:**

- Tax layers derived from MPAC
- Data Gaps:
  - Budget-Approved Capital Projects
  - Grant Sites
  - Downtown Development District
  - City Vendors in Oshawa or Durham
- Infrastructure and Tangible Capital Asset Inventory Ontario Regulation 58817 Asset Management Plan maps and apps
- Capital Projects public web app

## ECONOMIC DEVELOPMENT SERVICES

The Economic Development Services branch provides information and services to help businesses grow and prosper in the City of Oshawa.

The Economic Development Business & Investment web page contains a plethora of information and links to resources for entrepreneurs. The Oshawa Tour of Growth and Development available on that page is a Story Map format for developers and site selectors to track Oshawa's growth and investigate Oshawa's newest projects.

### **Highlights of Economic Development Services needs include:**

- Community-Related Data through Environics Analytics
- Data Gaps:
  - 3D Buildings
  - Business Licenses
  - Business Parks
  - Culture and Tourism Assets
  - Grant Locations - available and current grants, businesses eligible for improvement grants
  - Properties for Sale
  - Sales History
  - StatsCanada data layers
  - Vacant Employment Lands
- Drone Imagery and 3D Mapping
- Available Sites Story Map
- Vacant Employment Lands web app

## BUILDING SERVICES

The Building Services branch authorizes all building construction and demolition in the city. The branch provides services to residential, commercial, industrial, and institutional building sector customers.

The Zoning Review Examiners use the GIS Infrastructure map daily. Administrative staff use GIS for checking Zoning and assigning properties. The Plans Examiners use GIS for zoning checks and Central Lake Ontario Conservation (CLOCA) land checks. The Building Services branch also uses CityView Community Development and Municipal Land Management Software for permitting, inspections, and plan review.

### **Highlights of Building Services needs include:**

- 3D data above and underground – use cases for above ground include building heights for airport safety and fly-through for potential developers. Specifications for underground 3D data need to be determined as to the purpose, accuracy, and frequency of updates.
- Data Gaps
  - Inspection Zones
  - Airport Zone
  - Easements – Teranet may be working on a provision for easements to be available the same as parcel data
- CityView interoperability
- Permit and Inspections Dashboard for CBO
- Permit and Inspections specialized app
- 3D Viewer and analysis tools
- Vehicle AVL/GPS solutions

“GIS, in its digital manifestation of geography, goes beyond just the science. It provides us a framework and a process for applying geography.”

-Jack Dangermond, Esri



# VOC SURVEY

## *Internal Voice of the Customer Survey*

The City of Oshawa has realized success with its enterprise Geographic Information System (GIS) program. A solid foundation exists for Oshawa to expand GIS further throughout the corporation.

A variety of departments use GIS technology for a diverse set of needs. The customers should have a venue and a mechanism to share their needs, concerns, and opinions about the technology and program. Many GIS implementations do not reach full adoption and some even fail altogether because the customer's voice is not heard. Therefore, the City of Oshawa's GIS customers should have opportunities to make their voices heard.

The Voice of the Customer (VOC) is a method used in business and information technology fields to describe the in-depth process of capturing a customer's expectations, preferences, and aversions. It is a market research tool to help identify needs and satisfaction so that priorities can be set to satisfy those needs.

As one of the first tasks of the Corporate GIS and Data Strategy engagement, an online questionnaire was administered to Oshawa staff. This questionnaire focused on key GIS sustainability topics. In addition, a data-focused questionnaire was administered separately and is included in the separate Enterprise Data Management Plan report. The purpose of this questionnaire was to help assess the current state of GIS and determine the next steps in creating a successful GIS strategy for the City of Oshawa. Anonymous ratings and comments were gathered on users' GIS needs, constraints, and opportunities. Components of the questionnaire covered the following topics:

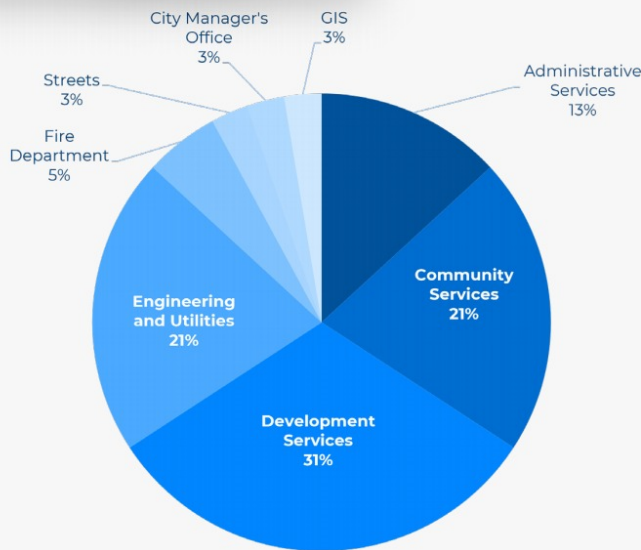
- Decision Making and Management
- Training, Education, and Knowledge Transfer
- GIS Software
- Digital Data and Databases
- Procedures, Workflow, and Integration
- Infrastructure and Architecture

Anonymous ratings and comments were gathered on GIS needs, constraints, and opportunities focused on key GIS sustainability topics. There were 40 responses internally from 13 departments/divisions. Some of the key results are captured on the following pages. A separate document has been provided of the full Voice of the Customer results.





## Departmental Representation



■ Minimal ■ Sufficient  
■ Above Average ■ Excellent  
■ Not Sure



■ Yes ■ No ■ N/A

## Accessibility

Rate your accessibility to GIS software products.

## 24/7 Access

Do you have 24/7 availability to GIS applications?



■ Yes ■ No



■ Yes ■ No



■ Yes ■ No



■ Frequently ■ Occasionally  
■ Rarely/Never

## Accuracy

Of the datasets and map layers you've used, are there any that seem inaccurate or incomplete?

## GIS Master Data List

Do you use a GIS Master Data List?

## Mobile Solutions

Do you use mobile solutions to access, create or edit digital GIS data?

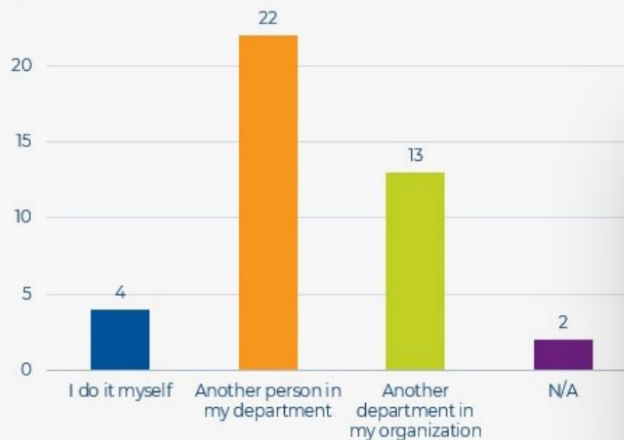
## Metadata

How often do you create new or modify existing GIS data or metadata?

## GIS Utilization



## GIS Needs



## Top 3

### Benefits chosen from using GIS technology

1. Make better quality and more effective decisions
2. Improve data accuracy
3. Improved Efficiency

## Top 3

### GIS Software currently in use

ArcGIS Online  
Collector for ArcGIS  
Google Earth/Google Maps

# COMMUNITY CONSULTATION

Municipal governments have recognized the importance of connecting with constituents and fostering a sense of trust within local communities. Many jurisdictions are increasing constituent engagement through digital communication channels.

Public consultation, public comment, or simple requests for ideas from residents, businesses, or other interested parties is a strategy aimed at soliciting feedback from key local stakeholders on matters affecting the community. The goal of public consultation is to introduce open and transparent government to improve decision-making on large-scale and important projects. Public involvement is particularly important when it comes to shaping policy and decisions made by local governments. The City of Oshawa is leveraging tools and technologies to best serve constituents, strengthen its communities, and expand civic participation.

The City of Oshawa's Corporate GIS and Data Strategy employed a community engagement strategy that broadened public participation in accessing, creating, and using geospatial data by soliciting feedback from constituents.

The City of Oshawa invited community members to share feedback on the Corporate GIS and Data Strategy project through the City's Connect Oshawa engagement platform ([Corporate GIS & Data Strategy Development | Connect Oshawa](#)). An online survey was open for 30 days, from May 25, 2022, to June 24, 2022. In addition, social media messages encouraged participation in the survey.





**“A critical key to GIS success is understanding goals and defining success. To that end, having KPIs reflective of industry best practices is an important step.”**

### **KPI's allow a GIS and Data Program to:**

- Define what success looks like;
- Focus everyone on goals;
- Measure – what gets measured gets done;
- Encourage accountability;
- Provide an opportunity for small and large victories;
- Provide a baseline for detailed annual goals;
- Measure success and progress.

## **BENCHMARKING AND KEY PERFORMANCE INDICATORS (KPI'S)**

Organizations that do not have a destination in mind may fall into the trap of having a GIS and data program that is less than effective. One of the reasons that many initiatives fail to reach full potential is the absence of metrics and goals. The relationship between metrics and goals is a cyclical one – without metrics, there is no basis for setting goals and gauging progress; without goals, there are no outcomes to measure based on metrics. The GIS and Data program at the City of Oshawa is already quite successful; however, the ongoing success of GIS at the City should rely on effective metrics and achievable goals to evaluate progress and refine objectives. Committing to setting goals and tracking metrics will help the City:

- Define success
- Prioritize objectives
- Devise a path forward
- Stay on the desired course

### **GIS BENCHMARKING**

It is important for Oshawa to establish a baseline from which to gauge the success and progress of the enterprise-wide GIS effort. Without metrics, organizational GIS and Data programs often drift over time without focus and clarity. These organizations know that GIS has benefits and that they should be using GIS but are not tracking its success. Therefore, organizations must establish metrics and begin to benchmark performance and progress against these metrics. GIS Benchmarking is a structured methodology that uses the identified gaps in an organization to compare actual existing performance with a potential or desired future performance.

GIS Benchmarking focuses on establishing key metrics and performance indicators (KPIs). This information should be tracked annually to identify progress and areas that need further attention. KPIs allow a GIS and Data program to:

- Define what success looks like;
- Focus everyone on goals;
- Measure – what gets measured gets done;
- Encourage accountability;
- Provide an opportunity for small and large victories;
- Provide a baseline for detailed annual goals;
- Measure success and progress.



## METHODOLOGY

The Benchmarking Analysis (BA) is a subjective evaluation of the existing GIS conditions of the City. It is a checklist of tasks that conventional wisdom and industry knowledge identify as prudent and essential to the success of enterprise GIS. The six categories of the BA are collectively referred to as the 'Six Pillars of GIS Sustainability,' and each component can then be used as a Best Business Practice (BBP) gauging mechanism for a successful strategic, enterprise, scalable, resilient, and enduring GIS. Each of the six pillars has a sequence of questions that are graded on a 1 to 10 scale – 1 being poor and needs significant improvement and 10 being BBP or excellent. Each component is weighted equally, although the importance of any given component varies with organizations.

This initial assessment was created by GTG's team of BBP experts based on the feedback of the online questionnaire and stakeholder interviews. This allows for a grade to be assigned for each item. These results are then refined during the planning process based on departmental and organizational feedback and empirical evidence (example: Detailed analysis of data layers). This results in an accurate and objective comprehensive picture of the organization's current status and opportunities for continued advancement. A byproduct of the BA is a series of Key Performance Indicators (KPIs). These KPIs should be used as a systematic way of monitoring progress over time.

## THE SIX PILLARS

The following sections discuss the City's existing conditions as it relates to "Six Pillars of GIS Sustainability". These pillars are the major areas that must be planned and working well to have an effective GIS and Data program. The pillars are:

1. Governance
2. Data and Databases
3. Procedures, Workflow, and Integration
4. GIS Software
5. IT Infrastructure
6. Training, Education and Knowledge Transfer

These following pages give an overview of key elements of the KPIs. A full document on Benchmarking and KPIs was provided separately.

***“Good Governance is the most important component of a successful GIS and Data program. Without it, the program will flounder.”***



## GOVERNANCE KPI

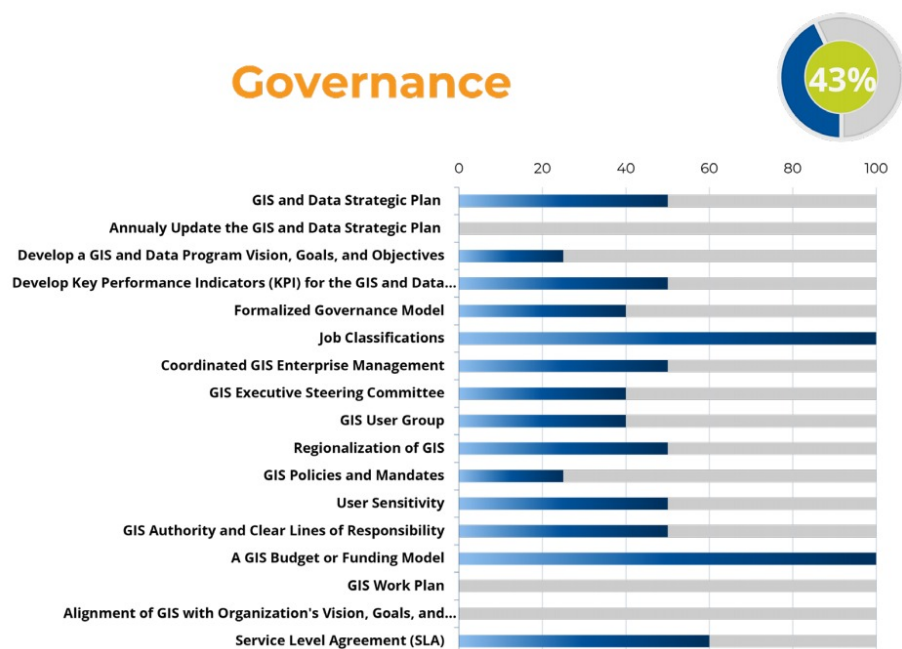


*“Data integrity is important. If everybody contributes and gives feedback, the data will continually get better.”*

Arguably, good Governance is the most important factor of a successful GIS and Data program. Without good Governance, a GIS and Data program will flounder at best and fail at worst. After a full benchmarking analysis was completed, the average score for Governance was calculated to be 43%. The GIS and Data program is doing well or following best practices in several ways relating to Governance; however, there are still areas that need significant improvement.

The City of Oshawa’s GIS governance model is centralized with some decentralized characteristics. The core system and staff are situated in the Information Technology Services (ITS) Branch, and there are GIS users of various levels in multiple branches. The central GIS team is under the ITS Application Support Division (GIS-ITS team). Most departments have GIS users that support their department and act as a liaison with the GIS-ITS team. This model is indicative of a maturing and successful GIS and data program.

Most of the Governance KPIs receiving low scores revolve around either planning or vision of the GIS. This strategic plan and subsequent updates to this plan are important. This plan assists in establishing vision, goals, and objectives and aligning the goals with Corporate goals. Also, this strategic plan lays the foundations for a formal work plan for data and GIS. Many of the deficiencies today can be easily overcome and rectified by following the recommendations in this plan.





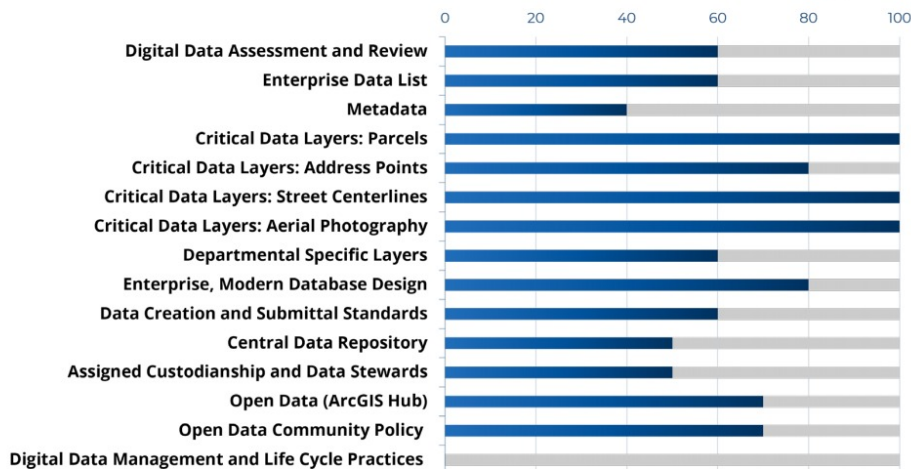
## DATA KPI

Data is a critical and expensive component of a GIS and Data program. Organizations spend millions of dollars creating and maintaining data (spatial and non-spatial). One of the most powerful aspects of GIS is that it has the potential to become the primary tool for viewing data within an organization. Most data maintained by a local government has a geographic component (e.g., address, property id). Visualizing the data spatially empowers staff to analyze and manage data in new ways. GIS should be used to 'geo-enable' the wealth of data that resides in the various IT systems maintained by the organization.

The overall score of 65% is indicative of good data management. One of the strengths of the Oshawa GIS and Data program is the GIS data and the number of key data sets that exist and are maintained. Opportunities exist to further leverage the GIS data. One part of this overall study is to make detailed data recommendations.

Without accurate and reliable data no enterprise-wide GIS and Data program can be a success. The Oshawa GIS Enterprise Database is a mature GIS database with over 200 layers. However, there have not been concerted efforts to date to evaluate the data accuracy or completeness. The core GIS team should use various tools such as the Esri Data Reviewer to analyze the veracity of the critical GIS layers (at a minimum) and fix any issues. Also, Metadata should be entered for layers in the Infrastructure, Statistics, and Regional datasets, to improve understanding of the data sources and accuracy.

### Data and Databases



*“GIS is waking up the world to the power of geography, this science of integration, and has the framework for creating a better future.”*

~ Jack Dangermond, Esri

*“Software apps  
make data  
accessible  
immediately.”*

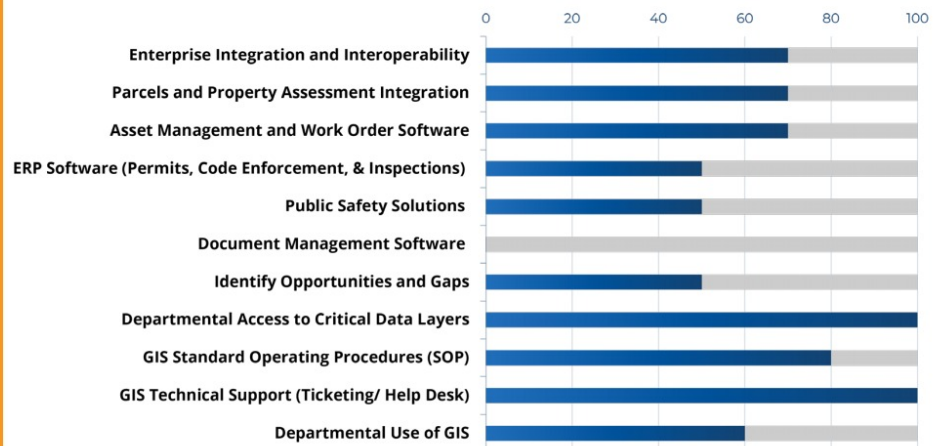


## PROCEDURES, WORKFLOW, & INTEGRATION KPI

One of the key components of any successful GIS is how well it integrates with other systems and how it improves the overall workflow of the organization. GIS implementations often fail because the GIS is seen as a stand-alone mapping technology. However, in reality, it is a primary integrative tool that should serve as an organization's portal to all its data. After a full benchmarking analysis was completed, the average score for Procedures, Workflow, and Integration was 64% indicating that Integration is a strength of the Oshawa GIS and should continue to be a major focus. By formally assessing and implementing the associated GIS recommendations for process and workflow improvements in this plan, the City will promote standardization, uniformity, sustainability, and scalability of GIS support for the enterprise.

The sustainability of GIS, no matter how successful, requires good documentation. The creation and maintenance of standard operating procedures should be an area of focus for the GIS team. The GIS team should review their workflow, integration, and documentation efforts annually.

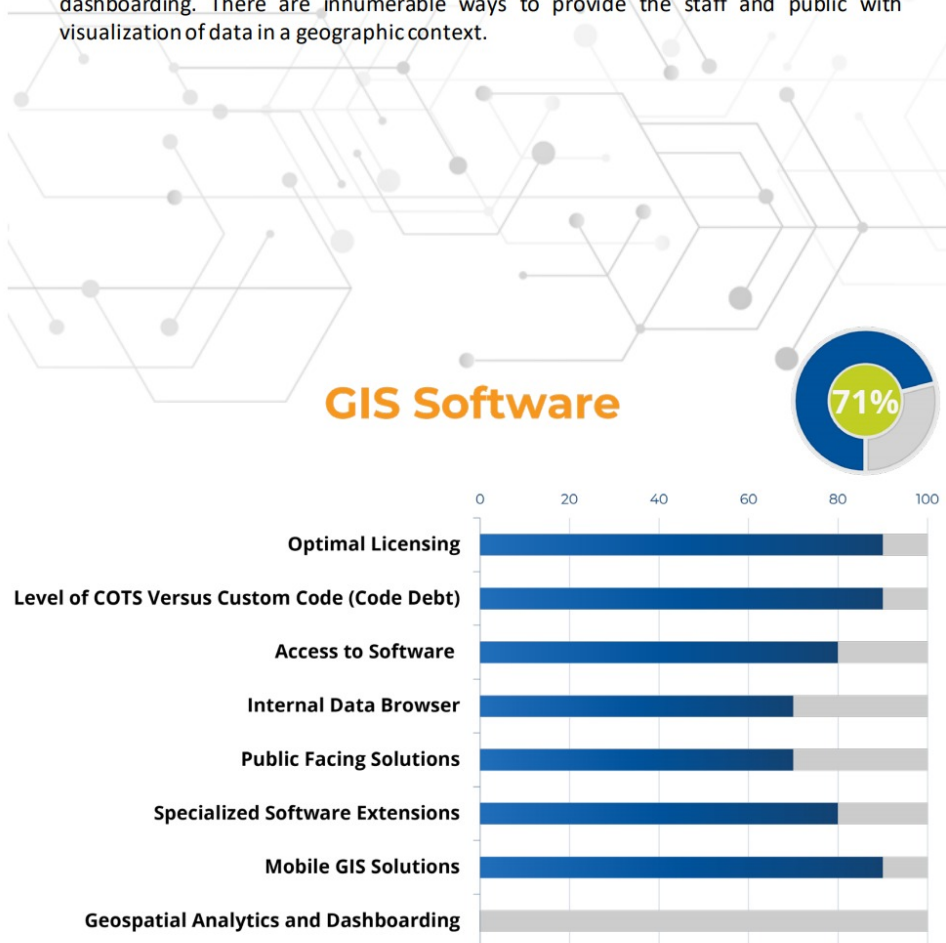
### Procedures, Workflow, and Integration



## GIS SOFTWARE KPI

Software is often the culmination of GIS success. The end-user should have access to tools that allow them to serve their customers better and get their job done more effectively. The GIS model in North America has migrated from data creation to data consumption. There are a plethora of tools for targeted needs that have been introduced over the past few years. Most local government organizations need to restructure their GIS efforts to better harness and support these new software tools.

The benchmarking analysis found the average score for GIS Software was 71%, indicating that the Oshawa GIS-ITS team has done a fantastic job of implementing end-user tools. They are leveraging the appropriate tools for the appropriate users. The City should focus on two areas of growth over the next few years – analytics and dashboarding. There are innumerable ways to provide the staff and public with visualization of data in a geographic context.



***“GIS software has become untethered. No longer do we have to sit at our desk using a PC. GIS can be used anywhere.”***







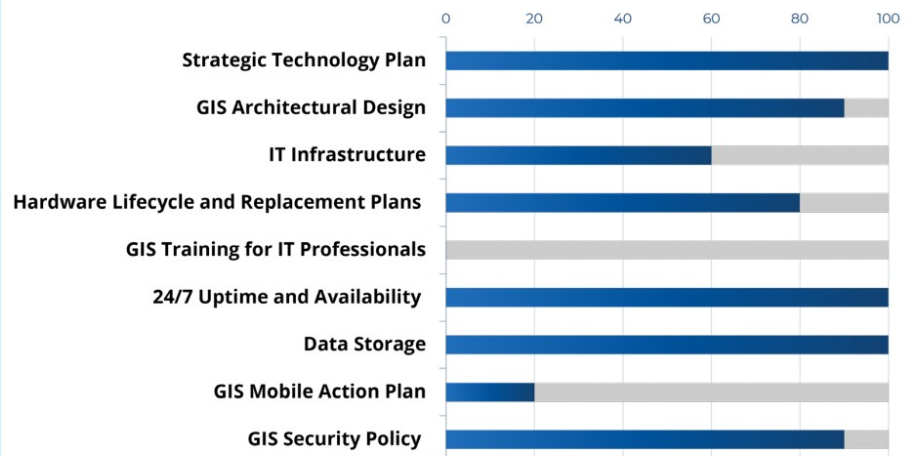
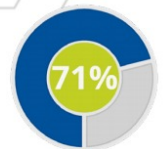
*“90% of people  
don't understand  
the power of GIS,  
what it is, and  
what it can be used  
for.”*

## INFRASTRUCTURE KPI

Arguably the least glamorous component of an enterprise GIS is the infrastructure necessary to keep it running. The last two letters of GIS represent Information Systems. This is indicative of the technology's overall reliance on traditional information technology components (databases, networks, servers, data storage, etc.). Overall, Oshawa's ITS Branch has done a good job of ensuring that the infrastructure of the City meets the business needs as they relate to GIS and data. The GIS-ITS team works closely with the Information Systems teams to identify optimal configurations for GIS-related infrastructure.

After a full benchmarking analysis was completed, the average score for Infrastructure was 71%, indicating that the GIS infrastructure is well provisioned, resulting in good end-user connectivity. Growth opportunities are similar to previous pillars in regard to documenting and planning. Additionally, a GIS Mobile Action Plan should be put in place documenting the Corporation's game-plan, standards, and recommendations for mobile technology. GIS mobility will become much more prevalent and needs to be guided by best practices and standards.

### IT Infrastructure

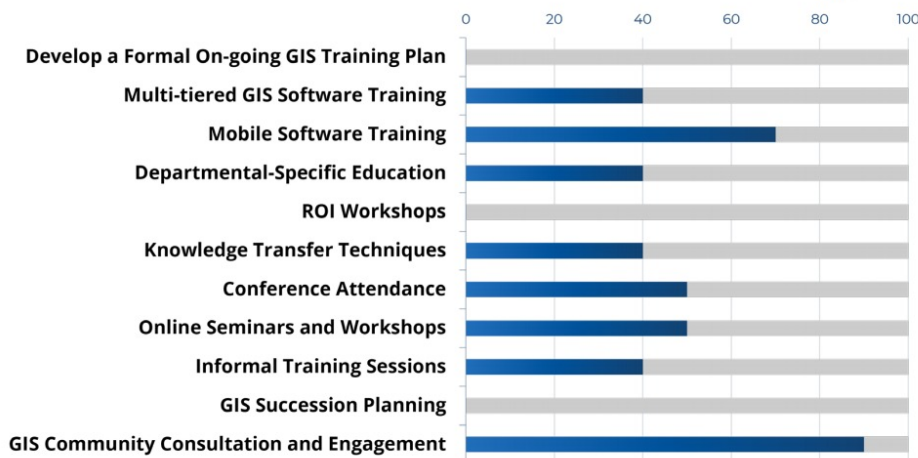


# TRAINING, EDUCATION, AND KNOWLEDGE TRANSFER KPI

Training, Education, and Knowledge Transfer are one of the most important components of a successful enterprise-wide GIS effort. However, it is the one pillar of GIS success that is most often overlooked or underdeveloped. Many excellent GIS implementations languish because the power of GIS is not understood. Some organizations mistakenly believe that software training is enough. However, education and understanding of what GIS can do for the end-user are equally (if not more) important.

Oshawa's GIS is very successful. However, one of the biggest growth areas necessary to sustain that success is documented in this set of Key Performance Indicators. The benchmark score for Training, Education, and Knowledge Transfer is 38%. The GIS team should create a comprehensive training and education plan that is updated each year. Internal training and education workshops should be offered throughout the year and should be focused on how GIS can help the end-users. Engaging end-users in this process through the GIS Solutions Working Group is important. Educating each department about how GIS can benefit their process is a must.

## Training, Education, and Knowledge Transfer

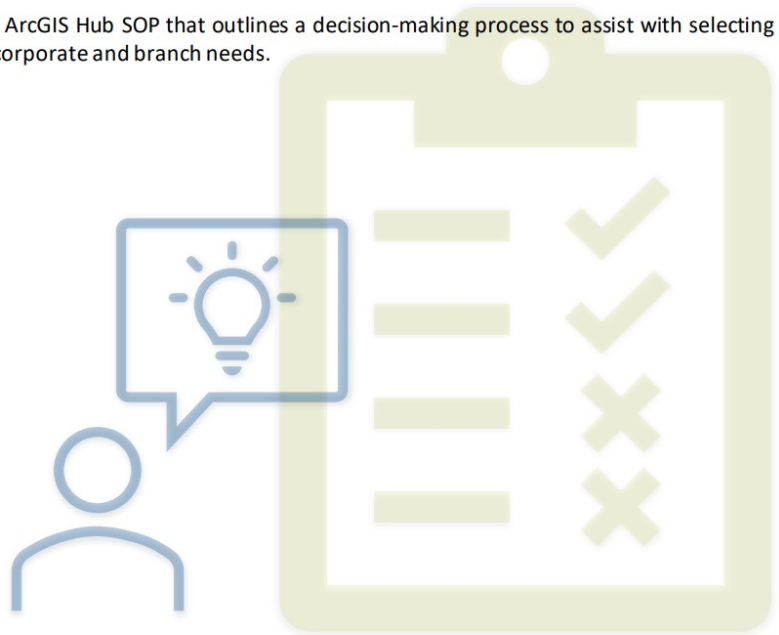


# DEVELOP GIS AND DATA STANDARD OPERATING PROCEDURES AND POLICIES

One of the findings of the assessment was that some ITS and branch GIS processes and workflows have not been documented. A full set of GIS Standard Operating Procedures (SOPs) documents the organization's GIS and Data program policies, procedures, processes, methodologies, and system administration and architecture. SOPs allow the organization to be sustainable and resilient to change. These standards are the guiding principles that bring stability and confidence to the program. SOPs need to be created and enforced to govern all GIS and Data current procedures and processes, and new SOPs should be documented as developments occur.

Creating SOPs to creating SOPs and policies is the first step in the GIS and Data Strategy and will form the foundation for efforts going forward. The project will document the following internal GIS policies and standard operating procedures using the City's existing policy template for documents.

1. **Data Ownership Policy** - Document data ownership, access, and sharing policies.
2. **Data Creation Processes and Standards** - Standardizing guidelines for how the organization's data are collected, cataloged, and turned into information products.
3. **Application Development Procedures** - Develop GIS application selection, configuration, and deployment procedures.
4. **Visual Identity Templates and Accessibility Standards** - Develop Visual Identity Templates and Accessibility Standards for GIS maps, story maps, and apps that follow the Visual Identity Manual and Accessibility standards.
5. **Analytical Dashboards SOP** - Develop an Analytical Dashboards SOP to guide decision-making for assessing the best platform for analytical dashboards.
6. **ArcGIS Desktop Use SOP** - Encompassing both ArcGIS Desktop products, ArcMap and ArcGIS Pro, to direct and manage the activities of branch users, such as who should use it, for what uses, installation, training needs, annual evaluation.
7. **ArcGIS Hub SOP** - Implement an ArcGIS Hub SOP that outlines a decision-making process to assist with selecting the best data and apps to meet corporate and branch needs.







*"Success  
not recognized  
nor celebrated  
is an  
opportunity  
wasted."*

## SUMMARY OF THE IMPLEMENTATION ROADMAP

The work compiled during Phases I and II of the strategic planning effort identified numerous needs, goals, projects, and action items. The next step of this project is to prioritize the implementation of the identified needs. This GIS and Digital Data Strategic Action Plan should be used to guide direction, development, investment, and decision-making. Additionally, this framework should be used as input to an annual tactical work plan that concentrates on actionable projects and tasks.

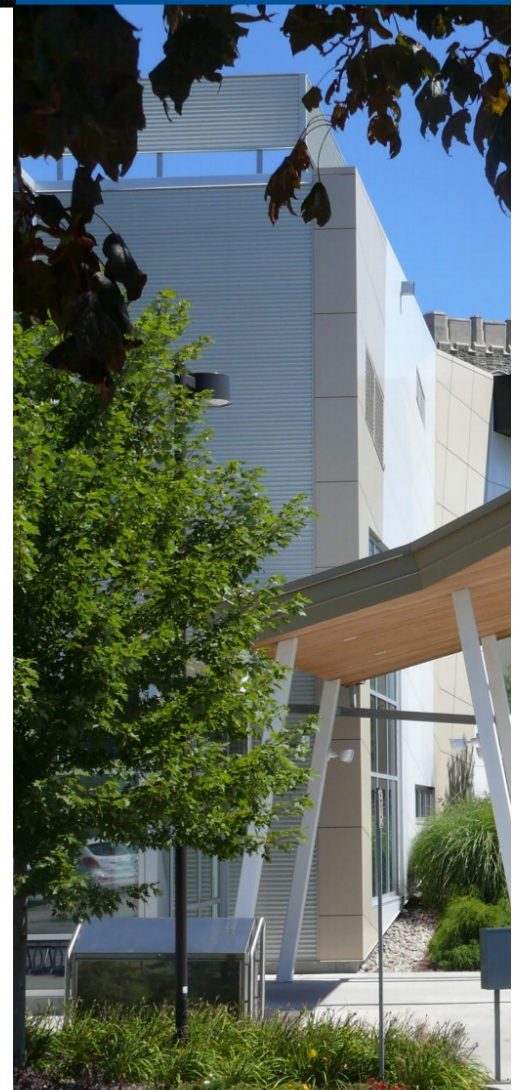
### Timeline and Schedule

The tables below lay out a timeline and schedule for each objective. A high-priority ranking does not necessarily mean that it should be done in year one. Some projects have been spread out throughout the years to accommodate staff time while considering priority.

Each objective is divided into descriptive columns as follows:

- Task – a descriptive title of the item
- Branch/Division – the branch or division that was identified to need the item
- Priority – Color ramp with green as the highest priority moving to red as the lowest priority
- Year 1 – 5 Implementation Timeline – these are scheduled based on the scoring and the collective knowledge of workload and what can/should be accomplished annually. The timeline is color-coded as follows:

Quarterly   Annually   On-going   As-needed   One-time





## GOVERNANCE TASKS

An organization's governance of GIS and data is a critical indicator of its long-term success. ITS will be the primary driver of GIS and data governance. However, in most cases, the data custodians are the branch end-users. Both the Enterprise Data Management Plan and System Design reports contain extensive material on the need for human resources to carry out this plan. It is not an exaggeration to state that the City Council Strategic Goals cannot be fully realized without many of the data elements and tools identified throughout this plan. Without human resources, the necessary systems, data, and applications cannot be sustained and expanded upon. Many organizations use a combination of new staff and contractors to fulfill these needs. Regardless, it is wise to have funds for specialized expertise via contractors.

Goals/Objectives: Timeline & Schedule	Priority	Year 1	Year 2	Year 3	Year 4	Year 5
Conduct an Annual City Council Strategic Goals Alignment Study	42			Annually		
Form a GIS and Data Management Team	37					
Update the Corporate GIS and Data Strategy Annually	35			Annually		
Formalize the Governance Model	34					
Information Technology Governance Committee (ITGC)	31			On-going		
Develop Service Level Agreements with Branches	28					
Prepare an annual Project ROI Compendium	27			Annually		
Hold User Group Meetings	20			Quarterly		
Add GIS/Data Technician and Data Architect positions to DGS	18					
Add GIS Technician or contractor to the Operations Services	18					
Add GIS Specialist or contractor to Park Operations	18					
Add GIS Analyst or GIS Technician position to Engineering	18					
Include City Clerk Corporate Records staff in public data	16			On-going		

## DATA AND DATABASES TASKS

Data is arguably the most important foundation of GIS and data sustainability, as it is widely understood that poor data quality yields uninformed decision-making. These tasks ensure that an organization is keeping data in good health. Data needs were identified in every phase of this report. The Needs Assessment, Enterprise Data Management Plan, and System Design reports detailed numerous data and data custodian needs/tasks.

Goals/Objectives: Timeline & Schedule	Priority	Year 1	Year 2	Year 3	Year 4	Year 5
Create or Augment Data as identified in the Needs Assessment	32			On-going		
Conduct Annual Digital Data Assessment	24			Annually		
Evaluate Data Security Practices	24					
Assign Data Custodians and Promote Branch Data Stewardship	23			As-needed		
Develop Centralized Data Storage Standard Operating Procedures	21					
Adopt Database Design Standards	21					
Update Metadata	21			As-needed		
Document Data Creation Processes and Standards	18					
Monitor usage and enhance and update data published on the Open Data site	15			On-going		
Enhance the Business Application and Database List	14					



## PROCEDURES, WORKFLOW, AND INTEGRATION TASKS

One of the most critical elements of the Procedures, Workflow, and Integration grouping is the integration component. Data from existing business systems can and should be exploited for use in other systems (such as BI and GIS). In local government, integration and interoperability with GIS are critical so that data from other business systems, such as Asset Management, Work Order, Computerized Maintenance Management, Enterprise Resource Planning, Automatic Identification System, Document Management, and Public Safety solutions, are all accessible from within a GIS interface. Additionally, in some cases, GIS is a data source that serves to populate data within these business systems. Other important tasks involve the sustainability of the programs through the creation and administration of SOPs.

Goals/Objectives: Timeline & Schedule	Priority	Year 1	Year 2	Year 3	Year 4	Year 5
Expand business system integration as identified in the Needs	35			On-going		
Corporate-wide GIS and Data Project Management	18			On-going		
Develop Visual Identity and Accessibility Standards and Template	18					
Secure sensitive data during integration and interoperability	18			As-needed		
Adopt CAD Standards	15					
Develop Standard Operating Procedures (SOPs)	15					

## SOFTWARE TASKS

GIS and data management software encompass the tools available to end-users by an organization as well as the platform on which they run. This strategy analyzed licensing, levels of GIS customization, how accessible the software products are, intranet and internet solutions, dashboards, story maps, mobile GIS applications, and any software extensions or add-ons in use. The below set of tasks is voluminous. The GIS and Data Management Team would need at least one full-time resource to implement and manage the breadth of applications. Additionally, branches should be enabled to contribute to the content and some configurations under the guidance of the GIS and Data Management Team, especially on public-facing Story Maps. Also, branches that have a high level of expertise may desire to manage their branch-level instances of dashboards and/or viewers.

Goals/Objectives: Timeline & Schedule	Priority	Year 1	Year 2	Year 3	Year 4	Year 5
Develop and implement GIS Software Solutions as identified in the Needs Assessment	48			On-going		
ArcGIS Enterprise: Consider the deployment of an additional ArcGIS Server to compensate for growth	29					
ArcGIS Enterprise: Assess GIS needs for ArcGIS Server roles	26					
ArcGIS Enterprise: Install and configure ArcGIS Monitor to track service, database, and system performance	26					
Evaluate License needs and determine license funding structure	26					
Assess Analytical Dashboard options	26					
Evaluate AGOL credit, user level, and user count needs	23					
Implement an ArcGIS Hub SOP	17					
Draft an ArcGIS Desktop Upgrade Plan	16					
Develop an ArcGIS Desktop Use SOP	16					
Monitor feedback and upgrade to continuously meet user needs	16			Annually		
Develop an Analytical Dashboards SOP	13					
Review the new and emerging GIS software solutions	11					





## IT INFRASTRUCTURE TASKS

This report examined IT infrastructure only as it applies to the narrower lens of a GIS and Data Management Program. The IT Infrastructure that an organization maintains is another key piece to sustaining GIS and data success.

City of Oshawa Action Items Summary and Priority Table - Infrastructure						
Goals/Objectives: Timeline & Schedule	Priority	Year 1	Year 2	Year 3	Year 4	Year 5
Develop Mobile GIS Procurement and Use Standards and Mobile Action Plan	32					
Provide specific GIS training to the ITS staff who support the GIS-ITS team	28					
Conduct an annual user survey containing hardware and application speed and performance feedback	26	Annually				
Assess the infrastructure and GIS System Architecture Design	25	Annually				

## TRAINING, EDUCATION, AND KNOWLEDGE TRANSFER TASKS

Training, Education, and Knowledge Transfer embody the 'sustainability' aspect of implementation. One of the largest threats to long-term GIS and data management success is the loss of funding due to a lack of understanding of the benefits of the technology. Another threat is the loss of institutional knowledge upon the departure of key staff. Therefore, it is incredibly important for organizations to make a concerted effort to analyze the Return on Investment (ROI) of GIS technology and promote the success to organizational leaders. Additionally, providing training to staff on the use of technology tools, creating succession plans for various staffing levels, and implementing knowledge transfer techniques and formal education plans are crucial to GIS becoming intertwined with all the organization's activities.

City of Oshawa Action Items Summary and Priority Table - Training, Education & Knowledge Transfer						
Goals/Objectives: Timeline & Schedule	Priority	Year 1	Year 2	Year 3	Year 4	Year 5
Execute and administer the training plan classes/sessions	28	Quarterly				
Develop a formal GIS Training Plan and update annually	25	Annually				
Develop a Succession Plan including training and documentation	24			Update		Update
Promote data and GIS successes	23	Annually				
Plan and conduct informal educational sessions	21	On-going				
Hold regular GIS and Data user and technical group meetings	21	Quarterly				
Conduct 'GIS Fundamentals' onboarding sessions	18					
Provision ArcGIS Desktop / ArcGIS Pro / ArcGIS Online training for Operations Services and Planning Services	15					



A background image showing a park scene with large trees, some with green and some with yellowing autumn leaves. In the distance, a statue on a pedestal is visible through the foliage.

# **MISSION, VISION, AND OBJECTIVES**

## **VISION STATEMENT**

## **ENTERPRISE-WIDE GOALS AND OBJECTIVES**





A well-thought-out vision, goals, and objectives are important for an enterprise GIS and data management program to succeed. It is important to articulate the overall vision for the City of Oshawa to help define the purpose of the GIS and Data program and give it its identity. Having a vision and goals solidifies a common purpose that everyone can understand and rally around. An effective vision statement must be developed with the participation of key stakeholders and encapsulate the key focus of the program. The following vision statement is suggested for the City of Oshawa GIS and Data program:

*“The vision of the Oshawa GIS and Data program is to promote an enterprise, scalable, sustainable, and secure GIS and Data program that provides effective and innovative use of geospatial technology to support corporate strategic goals and the delivery of service excellence to all Oshawa residents, businesses, and visitors.”*

The GIS and Data vision will be upheld by six overarching GIS and Data goals and associated objectives that the City should strive toward. Specific steps to be taken to achieve these goals and objectives should be documented in an annual work plan.



## GOAL 1: MAINTAIN AN EFFECTIVE GIS AND DATA GOVERNANCE MODEL.

- **OBJECTIVE 1:** Clarify the strategy for the effective administration of the GIS and Data program to ensure efficient use of corporate-wide geospatial resources.
- **OBJECTIVE 2:** Empower and encourage branches to expand their GIS and data opportunities and increase GIS and data stewardship.
- **OBJECTIVE 3:** Gather feedback regarding customer satisfaction to ensure needs are being met.
- **OBJECTIVE 4:** Use this Corporate GIS and Data Strategy as a work plan for projects and products to support the Oshawa Strategic Plan.

## GOAL 2: BUILD AND MAINTAIN ACCURATE AND RELIABLE GIS DATA.

- **OBJECTIVE 1:** Maintain and enforce the central repository to store the City's collection of geospatial and non-spatial data.
- **OBJECTIVE 2:** Maintain up-to-date core data, utility data, and asset inventory.
- **OBJECTIVE 3:** Continue to expand geospatial data layers to meet branch needs.
- **OBJECTIVE 4:** Establish standards and procedures for the development, maintenance, and quality control of data and metadata.

## GOAL 3: PROMOTE GIS INTEGRATION WITH BUSINESS SYSTEMS AND DEVELOP A SET OF PROCEDURES.

- **OBJECTIVE 1:** Expand integration of GIS with existing and future business systems to incorporate location intelligence of the City's digital data.
- **OBJECTIVE 2:** Use state-of-the-art technologies to ensure seamless technology integration.
- **OBJECTIVE 3:** Ensure that future and existing IT investments are leveraged, and that the technology is interoperable with existing business processes.
- **OBJECTIVE 4:** Continue to document internal GIS and data system procedures following a standard template.

## GOAL 4: MAKE GIS DATA AND APPLICATIONS ACCESSIBLE TO CITY EMPLOYEES AND THE PUBLIC.

- **OBJECTIVE 1:** Establish effective, secure, corporate-wide access to geospatial data.
- **OBJECTIVE 2:** Guide the implementation of targeted web-based applications to provide timely and accurate information to decision-makers.
- **OBJECTIVE 3:** Ensure GIS applications meet accessibility specifications.
- **OBJECTIVE 4:** Use GIS as a tool to engage the community.
- **OBJECTIVE 5:** Establish standardized methods and procedures for application and mobile device acquisition, development, and deployment that involve branch stakeholders.

## GOAL 5: IMPLEMENT AND MAINTAIN GIS IT INFRASTRUCTURE.

- **OBJECTIVE 1:** Maintain a scalable system design for enterprise GIS architecture that will sustain growth and change.
- **OBJECTIVE 2:** Implement the most optimum internal and mobile network connectivity and system architecture to handle office, fieldwork, and public needs.
- **OBJECTIVE 3:** Develop data storage and distribution strategies to support the growth of the GIS initiative.
- **OBJECTIVE 4:** Provide GIS-specific training to the IT team to support the GIS and Data program.

## GOAL 6: INCREASE GIS SKILLSETS AND KNOWLEDGE.

- **OBJECTIVE 1:** Implement methods for sharing ideas and information about GIS, data, and emerging technologies.
- **OBJECTIVE 2:** Provide GIS training and education opportunities for all new and current staff and empower them to make full use of GIS capabilities.
- **OBJECTIVE 3:** Facilitate a GIS and Data user group within the Corporation to foster collaboration and growth and to encourage branches to discuss new ideas for GIS use.
- **OBJECTIVE 4:** Continue to improve the GIS and data knowledge base within branches.
- **OBJECTIVE 5:** Plan for sustainability and succession with system documentation and cross-training of key responsibilities.







***“This Strategy will serve as a road map for the future and should be updated incrementally to reflect accomplishments and changing priorities.”***

## CONCLUSION

Oshawa has a wealth of data and a successful GIS. This is due to talented staff who understand the technology, local government, and the importance of listening to their customers. However, with success, Oshawa needs to guard against complacency and resting on the laurels of past accomplishments. The fact that this plan was commissioned makes it readily apparent that the organization understands the importance of planning for the future. A major focus has been given to those things that can sustain the success of the City's GIS and data programs. Although the effort to date has been successful, the technology changes daily, requiring a GIS and data management review from time to time. Many annual action items have been recommended that further promote self-reflection and critical analysis of the GIS and data effort.

The importance of GIS and data in Oshawa will continue to increase. The City has invested in this and will continue to do so. Therefore, it is critical to the success of the organization as a whole that the recommendations made in this Corporate GIS and Data Strategy are adopted, ensuring that the City's GIS investment will be viable and able to meet the ever-increasing demand.

***“Data integrity is important. If everybody contributes and gives feedback, the data will continually get better.”***

## APPENDIX: Reference Reports

- Voice of the Customer – August 2022
- Benchmarking and Key Performance Indicators – October 2022
- GIS Needs Assessment Report – October 2022
- System Design Recommendations Report – October 2022
- Enterprise Data Management Plan – October 2022
- Return on Investment and Successes – December 2022
- GIS and Digital Data Strategic Implementation Roadmap – December 2022







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