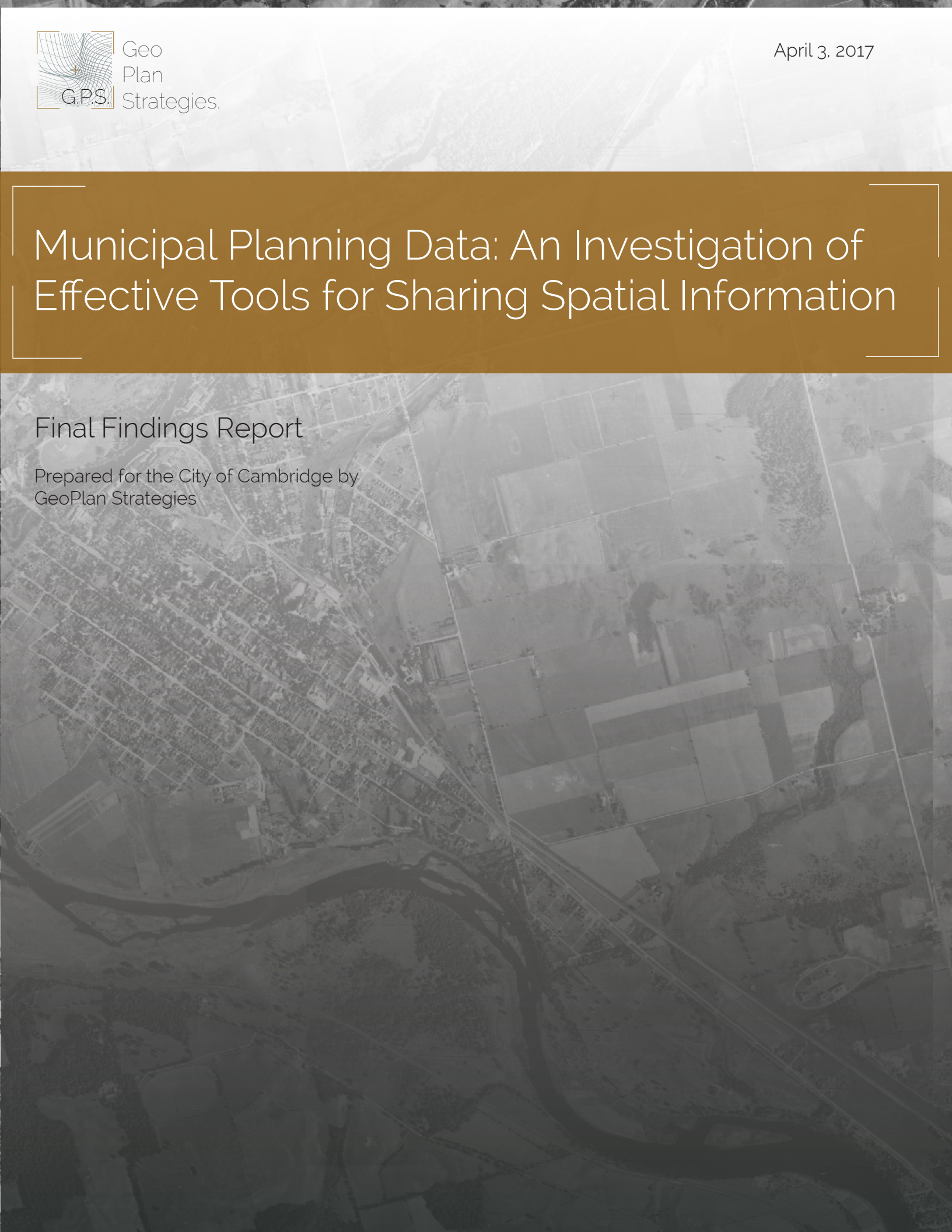
Geo Plan Strategies.

April 3, 2017

Municipal Planning Data: An Investigation of Effective Tools for Sharing Spatial Information

Final Findings Report

Prepared for the City of Cambridge by
GeoPlan Strategies



April 3, 2017

Robert Delorme
Manager IT Strategy, Planning & Portfolio
City of Cambridge
519.740.4680 ext. 4784
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Dear Mr. Delorme,

Re: Municipal Planning Data: An Investigation of Effective Tools for Sharing Spatial Information

GeoPlan Strategies Inc. is pleased to submit this report as the conclusion to our investigation of effective tools for sharing spatial information for the City of Cambridge. Please consider this letter of submission as authorization for us to submit this report.

We hope you will find this report to be of assistance to the City in defining the future direction of the corporate GIS team and Planning Division. We have undertaken this investigation and analyzed available spatial information sharing tools to provide recommendations that reflect the needs of the City and its citizens.

We would like to thank you for providing us the opportunity to work with you and sincerely appreciate all of the assistance you have provided.

Yours truly,

GeoPlan Strategies Inc.

Johanna Caesar

Johanna Caesar
Senior Analyst/Project Manager

Geo
Plan
Strategies.

Acknowledgement

We would like to thank the City of Cambridge for the opportunity to complete this project as part of our fourth year capstone project at the School of Planning. We would also like to acknowledge the support of Dr. Dawn Parker from the School of Planning at the University of Waterloo who acted as our mentor for this project.

Company Information and Roles

GeoPlan Strategies is a company dedicated to producing thorough GIS and planning research and data compilations. We are proud to assist our clients by performing exceptional work and research in the areas of GIS and Planning.

Johanna Caesar

Project Manager / Senior Analyst

Johanna served as the Project Manager for this assignment, and was responsible for the management of the project, acting as the primary contact, while producing deliverables on time and within budget. Johanna contributed directly to the preparation of deliverables, and provided assistance with the analysis of GIS applications.

Aaron Cheng

Senior Planner

Aaron provided research support and assisted in project management. As the Senior Planner, Aaron was the primary member in charge of contacting and interviewing key contacts at each of the identified municipalities.

Allen Yu

Senior GIS Technologist

Allen dedicated his GIS expertise to conduct spatial analysis, and provided his professional opinions on the project. Allen focused on data collection, statistical and GIS calculations, and helped to propose recommendations based on interview and analysis results.

Kelly Livingstone

Planner / Research Analyst

Kelly provided research expertise on the project, especially during the review phase of how other municipalities access spatial data. He also assisted the Senior Planner during interviews with stakeholders.

Jelena Mancic

Design Lead / Planner

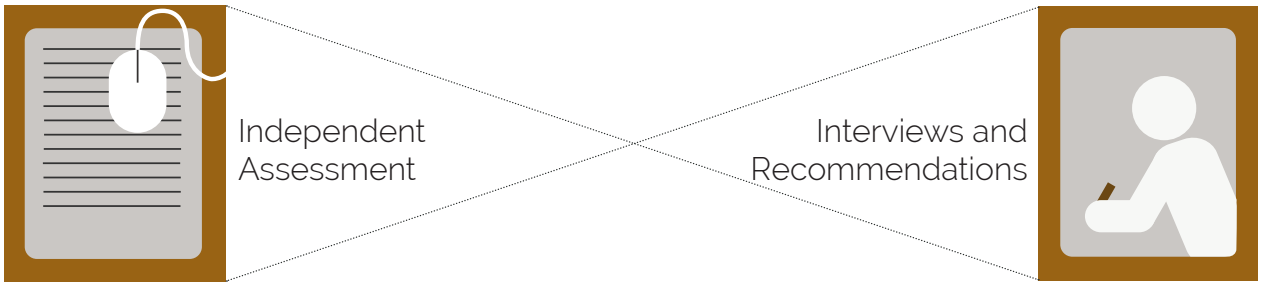
Jelena helped to present possible options to increase stakeholder interest through visual culture. Jelena provided input on information delivery options, assisted with interviews, and played a critical role in the compilation of reports at each phase of the project.

Table of Contents

Executive Summary

The City of Cambridge has retained GeoPlan Strategies to conduct a best practice review of municipalities in Ontario, finding how they provide spatial data and information to the public. In coordination with the City of Cambridge, eight municipalities were selected for the review: **the City of Mississauga, the Town of Oakville, the City of Waterloo, the City of Kingston, the City of Peterborough, the City of Barrie, York Region, and the County of Frontenac.**

The review consisted of two parts, the first of which was an independent assessment of the existing publicly available mapping applications provided by each municipality. The second part included an interview portion with each of the eight municipalities. Through the independent assessments and the interviews conducted, GeoPlan Strategies found common trends between the municipalities and used those findings to create a set of recommendations for the City of Cambridge. The objectives for the provided recommendations is help inform the City of Cambridge how they may best provide spatial data and information to the public.



The **first recommendation** to the City of Cambridge is to create a stand-alone map to display development application data spatially. Development applications should be represented as point features which would be linked to additional information regarding the application including documents and reports submitted by the applicant. The **second recommendation** is to implement workflows that link case management software and GIS tools. The studied municipalities have reported success with integrating AMANDA and GeoCortex to automatically update map information which would also allow for planners to retain stewardship over planning specific data. The **third recommendation** is to use software such as FME to perform routine automatic audits to ensure data accuracy. These automatic audits can eliminate duplicated data and ensure data quality within the applications.The **fourth recommendation** is to ensure the City's web page is laid out in a easy-to-navigate manner. Currently the City's interactive map can be accessed by an in-text hyperlink accessible on the "Maps" page; however a large icon instead of a hyperlink would increase visibility and accessibility. The **fifth recommendation** is to provide additional incentives to draw the public to use the mapping applications. Currently other municipalities offer features such as historical maps to draw users to their mapping applications.

Introduction

The City of Cambridge has recently developed a GIS strategy that introduces a brand new vision for GIS in the City, which is to use geographic data to create a better Cambridge. Urban Planning is primarily a public process, and the quality of Planning in a city is often linked to an engaged and informed public. It is very important to provide the public the opportunity to access relevant planning data as this information may help them to provide better feedback during planning engagement and review processes. To prepare an appropriate implementation plan for their GIS strategy, the City of Cambridge must determine what opportunities exist and are best suited to meet their needs. To reach this determination, a better understanding of how other municipal organizations are sharing spatial planning data with the public is needed, which will allow for recommendations unique to Cambridge to be made.

Project Information

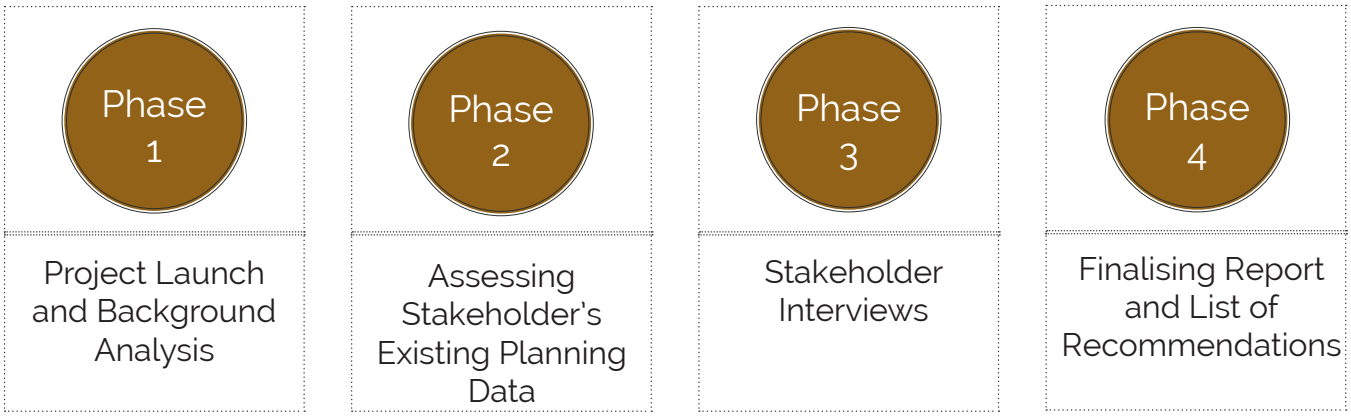
The purpose of this proposal is to identify how municipalities of a size and context similar to the City of Cambridge currently provide and allow access to spatial planning data. Many municipalities currently provide some information through interactive maps and open data. Our review will involve an assessment of these interfaces across various municipalities, as well as consultation with these organizations learn more about the insights and challenges they have found in implementing GIS for displaying planning information. We will use the insights gained from this work to identify recommendations for the City of Cambridge in order that they can better meet their needs for sharing spatial information. To complete this investigation we analyzed the following municipalities:

+ Kingston
+ Barrie
+ Mississauga
+ Frontenac County
+ Peterborough
+ Oakville
+ Region of Waterloo
+ York Region

Our analysis was completed in a two-pronged approach, involving both an independent assessment of each municipality's current methods for providing spatial information, followed by interviews with key individuals from these organizations. The methodology for these two different research methods will be discussed further in the following section.

Methodology

This project was completed by following a four phased approach:



The **first phase** began after the City approved our proposal. An important step during this phase was to analyze Cambridge's existing spatial data provision processes and needs. We then began gathering information on and identifying possible stakeholders for this project and determined their similarities and differences with Cambridge. Our final list of stakeholders for the project was: Kingston, Barrie, Mississauga, Frontenac County, Peterborough, Oakville, Waterloo and York Region. This list of municipalities was provided to the City.

To complete our external assessment of municipality's current capabilities during the **second phase** it was necessary to ensure a consistent approach was utilised when analyzing each municipality individually. A standardized list of characteristics was determined based on information contained in the RFP and discussions with the City of Cambridge. Mapping applications for each stakeholder municipality were evaluated as follows:

Utility
- + What data/information is available?
- + What type of tool is used (spatial, tabular, multimedia, interactive, other... etc).
- + Link between planning/development information and any spatial/GIS information.

Functionality
- + Ease of access (easy to find).
- + Ease of use (intuitive and not confusing).
- + Cross device availability (responsive design – desktop, tablet, phone).

Benefits
- + What interesting elements were there?
- + What were the benefits?
- + Did anything stand out?

Restrictions
- + Privacy issues.
- + Confidentiality issues.
- + Third party data ownership issues (e.g., Teranet, MPAC, etc.).
- + Restricted data (zoning, properties ID's, etc.).
- + Evaluation of tools and process based upon on-line presence and stakeholder interviews.

Further Developments (if applicable)
- + Metrics and results.
- + Future plans or additional activities underway.

Methodology

Device	Screen Resolution	Interaction Method	OS	Browser	Make/ Specs
Laptop 1	1920x1080	Keyboard and Touchpad	Windows 10	Internet Explorer 11	HP Envy, Intel i7 6500
Laptop 2	1366x768	Keyboard and Touchpad	Windows 7	Firefox	HP Pavilion, Intel i7 3610 QM
Laptop 3	1280x800	Keyboard and Touchpad	Mac OS X 10.11.6	Google Chrome / Safari 9.1.2	Macbook Pro 2012, intel i5
Laptop 4	1920x1080	Keyboard and Touchpad	Windows 10	Google Chrome	HP i7-6700 HQ
Desktop 1	1920x1080	Keyboard and Mouse	Windows 10	Google Chrome	I5-3570k and GTX 660Ti
Phone 1	1920x1080	Touch	Android 6.0.1	Google Chrome Mobile	Snapdragon 800, 2GB RAM
Phone 2	1136x640	Touch	IOS 10.2.1	Safari	iPhone 5S 32GB

Table 1: Technical Specifications for Devices used in External Assessment of Stakeholder Municipalities

To properly evaluate the cross device availability of these applications it was necessary to access these tools from multiple devices and using multiple browsers. Since it would not be feasible to evaluate all possible hardware and software combinations for this project a list of those GeoPlan Strategies was able to test is provided below in Table 1 as a reference.

Phase three involved interviews with key individuals from the stakeholder municipalities to better comprehend the internal dynamics of these organizations. A standardized list of questions was created based on information contained in the RFP and discussions with the City of Cambridge, this interview guideline is contained in Appendix 1. General topics of discussion during interviews were:

+ Business drivers – what stimulated the provision of information
+ Process definition – how was the process initiated and continued
+ Governance – who maintains, monitors, updates the information
+ Tools deployed
+ Metrics and results
+ Future plans or additional activities underway

Interviews were conducted over the phone by two team members with key individuals from the GIS and/or Planning divisions of each municipality and ran approximately 30 minutes in length.

The **final phase** of this project required the synthesis of all data collected to determine common themes and trends across municipalities. This assessment allowed us to create appropriate recommendations for the City of Cambridge's consideration. Please see the following sections for a full breakdown of our results from each municipality and for our final recommendations. The submission of this report marks the conclusion of this project.

Kingston

Functionality

Cross Device Availability: **Satisfactory**

Ease of Access: **Good**

Ease of Use: **Very Good**

KMaps

Kingston exhibited a very detailed interactive map called KMaps that provides useful information such as zoning classification, planning and land development, historic images, electoral districts, neighbourhoods, cycling routes and much more. This application is run by ROLTA Onpoint. A unique characteristic with KMaps would be its ability to allow the user to build their own maps. The many tabs and buttons featured in the toolbar at the top of the map can be confusing to understand, which could cause confusion for users.

The location of the interactive KMaps is very easy to access, navigating from both the home page and the search bar of the city's' website. When clicking on the Maps tab, there are four categories that pop up; Historical Maps, Map Gallery, KMaps and Data Catalogue. The Map page is presented in a clean manner, is not cluttered with text and hosts useful information for both the professional user and regular civilian user.

Unfortunately, the interactive map is only viewable for Microsoft Internet Explorer 8 or 9, Mozilla Firefox 19 and Google Chrome 26, other versions might not be able to view information.

Additionally, the site provides a lengthy list of maps outside of KMaps including; Noise Control Maps, City-Owned Industrial Lands, Property Standards Inspection Maps and more. These maps can be found under Map Gallery and some can directly be linked to KMaps.

Map Gallery

This section includes a lengthy list of web based maps interactive and pdf maps that serve a wide variety of purposes. Many of these maps are more detailed than the interactive KMaps map, therefore, this section will be more likely utilized by professionals such as developers. Additionally, this gallery is well laid out with a sample picture and description listed beside it while also being easy to understand the content of each map.

Historic Maps

This section incorporates old planning documents and drawings of the Kingston area. Since Kingston is one of the oldest cities in Canada, there are many documents and records that helped establish development and zoning in the early days.

These hand drawn and printed documents were scanned and placed in an innovative manner in the form of a timeline, accurately portraying the evolution of the kingston area. This timeline dates back from 1865 to 2013, and also shows the gradual evolution from hand drawings to the aerial imagery we see in planning practices today. The only issue experienced with this map would be that the dated information is quite blurry around 1903 and it is difficult to depict. This map is powered by ESRI, which is a different software than the interactive KMaps map.

Utility

List of Maps Provided

+ Land Use
+ Addresses
+ Buildings
+ Council Contact List
+ Driveways
+ Electoral Districts
+ Kingston Transit GTFS
+ Municipal Boundary
+ Neighbourhoods
+ Parking Areas
+ Parks
+ Paths
+ Rivers
+ Points of Interest
+ Roads (Paved and Centerline)
+ Sidewalks
+ Trails
+ Waterbodies
+ Zoning

Types of Tools Used

+ Interactive Map (KMaps)
+ Interactive Individual Map Apps (Public Map Gallery)
+ PDF Version Maps (Public Map Gallery)
+ Historic Maps
+ Data Catalogue (Open Data Portal)

Link between Planning and GIS Data

There are a number of overlaps in terms of the types of data seen within the maps. The City of Kingston prides itself on using GIS data to produce maps for a variety of departments that includes planning information integration. Planning

Future Developments

There are initiatives to continue updating the GIS data and open data catalogue in the coming year.

Benefits

+ Bonus feature is that you can create your own map!
+ Very unique and interesting ways of displaying information, such as for the historic maps timeline
+ Each web based interactive map featured under the Map Gallery section has extensive information dealing with that particular topic, which is very helpful
+ When you click identify, and select a point on the map you can get more information about the site selected
+ Very good, was never confused and the amount of mapping available is impressive
+ Search bar helps navigation to the maps as well
+ The Maps sometimes link to planning documents and important documents for the map
+ Very understandable and easy to find information
+ Kingston is continuing to update and improve the information provided and their site aesthetics

Restrictions

+ KMaps is only available for certain browsers (IE 8 and 9), so anyone with a dated device or that doesn't have the proper versions of the browser in use might not be able to access it or view it properly.
+ There are two different software types being used, KMaps uss the ROLTA Onpoint and the other web based interactive sites and the historic maps are run by ESRI, there might be some inconsistencies between the two.

Interviews

Interview Conducted by: Johanna Caesar, Kelly Livingstone
Interview Method: Phone
Interview Length: 25 Minutes
Interviewees: Phil Healey

Johanna Caesar and Kelly Livingstone conducted a 25 minute phone interview with Phil Healey the GIS Manager Information Systems and Technology from the City of Kingston at 9:00 am on Monday March 13, 2017.

Municipal Processes

Kingston's map gallery and data catalogue have been in place for 5-6 years, these systems utilize the ESRI platform. KMaps has been in place since amalgamation (~16 years). The enterprise license agreement with ESRI was within the GIS department's operating budget and it was a staff driven initiative to implement tools. Initially it was anticipated that these tools would be for internal users with GIS employees anticipating needs of other departments but public access followed. The bulk of information available is only accessible internally. Publicly accessible data is run-by department's responsible for data to determine if it was appropriate for external access. Open data has changed dynamic from internal users providing data to public asking for specific data sets.

Planning specific web-applications are more customer-focused and City Council asked for public information about where applications and projects are occurring. More recent applications are reflecting shift to open data movement. Externally focused applications have some limitations as to what can be shared including project values, and owner names these restrictions are not decided by GIS department but rather by departments responsible for data.

It is extremely important to understand data quality issues. Kingston uses Data Reviewer product and FME to perform data quality audits, and resulting reports are sent to data managers for review in order to ensure the success of these processes. Kingston does not have specific metrics for success for these tools. Their service desk is available for users wishing to provide feedback. There is contact information on map page; goes through call centre and calls are redirected by service staff to GIS. Kingston has begun to use GEOJOBE software to see how many hits applications receive and from where, though this is still a fairly new process.

Planning and GIS Linkages

Kingston is moving towards enterprise GIS. The GIS department is responsible for management of information in geodatabase but is looking towards having multiple data stewards.

GIS and planning department relationship is in early days; two years ago planning implemented a land management system, which has been a driver for changing view of GIS. Kingston uses EXCELLA (Accela?) for their land management system and GIS is directly integrated into this system. Many of the fields pre-populated in planning applications in the land management system come from GIS.

The planning department authors the development map, and it comes to GIS to develop and test with the planning department, after which GIS publishes. At Kingston Planning has two editors maintaining information. Maps populate based on information input into land management system. Changes to EXCELLA update public facing viewer.

Future Developments

Kingston is looking to implement GIS and geospatial technology within planning department. CITY ENGINE (3D GIS) could be used to publish development concepts for public to interact with rather than requiring in-person access. Kingston would also like to see more planners with capability to build their own maps. GIS as a whole may be looking at using drone technology to capture aerial imagery and create real-time mapping. Kingston is also looking to improve open data availability.

Barrie

Functionality

Cross Device Availability: **Good**

Ease of Access: **Very Good**

Ease of Use: **Satisfactory/Good**

Discover Barrie

Discover Barrie is the City of Barrie's Official Interactive Mapping Portal. It can be accessed from the front page of the website by clicking "Online Services Geographic Information Systems" and then by clicking on any of the "Discover Barrie Quick Links".

In terms of ease of use, Discover Barrie can be a bit cumbersome and annoying to navigate, the map view loads the information over again when panning or zooming in the application. This makes it so there are multiple ~2 second pauses as the user changes the map view even slightly, and rendering the experience as mediocre. When loading information from this interactive map, it loads slowly when changing layers, even on a fast computer with fast internet connection, suggesting the application is the bottleneck.

ArcGIS Online Applications

Found on the same webpage as Discover Barrie, there are hyperlinks to five additional web mapping applications. Barrie provides residents with multiple customised map views based on the link they select under "Web Mapping Applications". In terms of ease of access, it is relatively easy to find this map archive. All these links are provided within the same location of the website under "Geographic Information Systems".

Like any ArcGIS online map, the application is very easy to navigate and quite intuitive. The Neighbourhood services app is particularly easy to navigate, with a single click which allows the selection of an address from which a search is performed, but all are well done.

Data and Mapping Products/Links

The data and mapping products and links were also easy enough to find, only taking 1-2 clicks from the main page. Clicking "Planning Resources" redirects immediately to the OP policy page, which shows the OP Schedules immediately, which allows access to important planning information relevant to the data.

All in all, the application was easy to use and navigate with little to no issues experienced.

Utility

List of Maps Provided

- Street Map
- Official Plan Maps
- Zoning Maps
- Transit Maps
- Park Maps
- Engineering Standards
- Ward Maps
- Residents and Visitors
    - Downtown Parking
    - Tourism
    - Recreation and Parks
    - Wards
    - Beaches
    - Marinas
- City Services
    - Road Closures
    - Garbage Collection
    - Surface Water Supply
- Business
    - Find a Business
    - Zoning
    - Traffic Counts

Types of Tools Used

- Interactive Map (Discover Barrie: City of Barrie's Official
- Interactive Mapping Portal)
- ArcGIS Online Applications (Web Based Maps)
    - Curbside Collection Information
    - Resident Parking Pass - Valid Parking Locations
    - Heritage Walking Tours
    - Historic Waterfront Locations
    - Neighbourhood Services
- Data and Mapping Products/ Map Links

Link between Planning and GIS Data

The planning data and the GIS data for zoning purposes are linked to the Zoning By-Law. Other maps also link important documents when a parcel is identified. There are no data sets that are relating to development, committee of adjustment or planning applications that residents can access.

Future Developments

There are initiatives to continue updating the GIS data and open data catalogue in the coming year.

Benefits

- Has a wealth of information, which are sorted into categories that make sense for different users who would be looking within this application.
- Has a decent number of tools for users to use, including demographic tools, changing between map views, selections and measurement.
- Organized and neat.

Restrictions

- Can't click directly on items in the map, have to click the identify tool before selecting points of interest. Even when a point of interest is selected the data is loaded in a table view that is not friendly to users who are not familiar working within GIS applications.
- Slow loading times and a dated design, but functions well enough.

Interviews

Interview Conducted by: Jelena Mancic, Allen Yu
Interview Method: Phone
Interview Length: 14 minutes
Interviewees: Jennifer Roberts

An interview with City of Barrie representative, Jennifer Roberts, was conducted by Jelena Mancic and Allen Yu on March 8th 2017. This interview lasted 14 minutes and the questions asked originated from the interview question methodology mentioned in the Appendix. Right from the start, the main focus of forming a GIS data portal for the City of Barrie is the accessibility of this information to the public.

Planning and GIS Linkages

The City of Barrie created its GIS portal in 2010 and has grown in complexity since. Planning information and GIS data linkages within the municipality resources for GIS used to be integrated into various departments across the organization, but they centralized the GIS department and now resides in the IT sector of the corporation. Centralization of the GIS resources working well with the organization since the restructuring occurred. In terms of the portal that is available for the publics' use, there are 4 GIS Specialists that gather the data, while 3 Analysts deal with putting the data up onto the server.

Municipal Processes

Due to the evolution in GIS data and GIS data representational methods in the past few years, there are efforts in place in the City of Barrie to adapt and provide a GIS portal that is more flexible and more accessible to the public. Barrie intends to continue providing the existing mapping tools but do not intend to modify them, other than updating the interactive map app from OnPoint Rolta to the Geocortex software system. However, City of Barrie recently obtained a large amount of useful data and does intend to provide more detailed and flexible information through a variety of GIS data display mechanisms, they are currently searching for a suitable software, ideally a software that is compatible with ESRI. Other planning data and GIS linkages may be provided through these new updates in the future. City of Barrie also utilizes two portal for storing their information, one for public data and the other for data that is used internally or contains a private individual's sensitive information, such as property ownership.

Future Developments

As for City of Barrie's metric results or monitoring methods, there are no methods in place to record the viewer statistics as of yet.

Some issues that were raised would include making sure certain pieces of data is kept private, in regards to corporate data or an individuals' private information and the difficulty sometimes experienced with keeping updates consistent. In the future, the City of Barrie aims to lean more towards automated updating methods and processes to resolve the updating and editing issue.

Additionally, there is some considerations given towards finding the funding to try Amanda software and the Collector app services. Moreover, since there is no open data portal currently in place, students from Fleming College are in the midst of developing an open data portal for Barrie.

Mississauga

Functionality

Cross Device Availability: **Very Good**

Ease of Access: **Satisfactory**

Ease of Use: **Good**

The Mississauga maps webpage can be difficult to find and may present a problem for people who are not familiar with their webpage structure. This is because no link to their maps page is available on the homepage of Mississauga's website and instead user needs to click on 'Services Online', 'More' and then on the left side, there are 'Mobile Apps' and 'Online Apps', which contain the maps and open data portal. Once a user finds these, navigation becomes much easier. Most the maps, features and links reside on the Maps page, with few exceptions such as Pingstreet, Mississauga Roads and Open Data Portal as they are on the Services page. The featured maps grouped under 'SERVICES ONLINE' – 'Maps' are PDF maps and the map the main application is opened through clicking on the Interactive Online Mapping Service. Overall, Mississauga provides a variety and abundance of the data geared towards different groups of users – For example, their Business Development and Urban Development Maps can greatly help both public and private users, and their 'Mississauga Culture On The Map' is a great way for residents and travelers to explore the city's events and cultural resources.

The interactive mapping application, made in javascript allows user to browse and explore accurate, regularly maintained mapping data, and it also provides several search functions and a measurement tool. The search function is not very well designed because the user has to type the exact phrase and fill it in based on the suggestion. The layers can be toggled on and off and are categorized nicely. It is easy to handle and works well on the major desktop browser platforms and on mobile, especially well on touch screen devices but it is very slow on devices that have slow processors and low RAM. The top of the map says 'BETA' meaning it is still in testing stage and may experience more changes. The featured maps section provides maps only in PDF format but the data they used can all be found in the interactive online map. This situation can be improved by creating links to the online map that has the intended layer selected, however PDF maps tend to load faster than mapping platforms. The open data portal has nine data groups and provides very well maintained data.

The Planning Information Hub contains many planning featured maps and is listed under 'Residents' - 'Planning & Building'. Within the Planning Information Hub, there are 17 maps available. One of these maps of special interest for this investigation is the Development Application map. The map is thorough, but some information is not provided such as the date of Development Application and any reports that were submitted for application.

Utility

List of Featured Layers Provided

- Community
  - Cemeteries
  - Community Centres
  - Leash Free Zones
  - Libraries
  - Park Sites
  - Photo Sites
  - Picnic Areas
  - Play Sites
  - Senior Centres
  - Spray Pads
  - Washrooms
- Recreation
  - Arenas
  - Golf Courses
  - Baseball Diamonds
  - Football Fields
  - Basketball Hoops
  - Soccer Fields
  - Tennis Courts
  - Track & Field
  - Pools
- Government Offices (Civic, Regional, Provincial, Federal) and Courthouses
- Transportation
  - Airport
  - GO Stations
  - Launching Ramps
  - MiWay Stations
  - Parking Lots
  - Transitway Stations
- Land
  - OpenStreetMap
- Culture
  - Art Galleries
  - Heritage Properties
  - Museums
  - Performing Arts
  - Theatres
- Elementary & Secondary Schools and School Board Offices
- Health & Safety
  - Fire Stations
  - Hospitals
  - Police
- Transportation
  - Airport
  - GO Stations
  - Launching Ramps
  - MiWay Stations
  - Parking Lots
  - Transitway Stations
- Base Map
  - OpenStreetMap
  - City Street
  - Aerial Photos (Past and Present)

List of Maps Provided

- Business Development
- Community
- Environmental
- Political Information
- Transportation
- Urban Development

Types of Tools Used

- Pingstreet
- Mississauga Maps:
- Interactive Online Mapping Service
- Mississauga Open Data Portal
- Mississauga Zoning By-Law
- City Wards
- Mississauga Culture On The Map
- Planning

Link between Planning and GIS Data

The Mississauga's Planning Information Hub holds the most essential planning data including projects, development applications, permits and growth forecasts. The maps page however, does not have a link to the Planning Information Hub, and the most planning related links are to the Zoning By-law maps which shows the zone areas and zoning indexes. Other related maps can be found in 'Urban Development Maps' section such as 'Building Inspection Areas' and 'Development Areas'. There is no specific planning group in the main mapping platform's featured layer panel. Their open data portal has an Infrastructure data section and Land Use & Development data section, which are heavily used for planning purposes. Their Planning Information Hub, which holds the collective planning projects and information, does not show their zoning map.

Future Developments

Since they are still in the phase of improving their online maps, the original Mississauga eMaps online mapping service has yet been removed. It is still accessible but it will be taken down soon.

Benefits

+ The interactive map is very easy to use and the range of layers are impressive, usable by different groups
+ Displays helpful information to residents, gives a lot of information on cultural events, sports and community facilities
+ The open data portal is nicely designed
+ The maps are loading seamlessly in all platforms and on mobile as well
+ Providing some important information in PDF maps has one main advantage, which is the loading speed

Restrictions

+ It may be a little challenging for first time user to locate the maps
+ Mapping functions can be improved, i.e. search bar
+ There is not planning specific data section or layer grouping and only a handful of planning related datasets
+ Maps page is not linked with Planning Information Hub
+ Very slow on computers (and phones) with slow processors and no RAM

Interviews

Interview Conducted by: Jelena Mancic, Kelly Livingstone
Interview Method: Phone
Interview Length: 30 minutes
Interviewee: Steve Czajka

The City of Mississauga interview commenced on March 7th 2017 with interviewers Jelena Mancic and Kelly Livingstone, and interviewee Steve Czajka. Mississauga was amongst the first municipalities to dive into providing open data portals in Ontario. Something that was noticed later on, was that the people utilizing the data, were the people that understood the information. Mississauga's main goal is to provide adequate data for all audience types, from a professional in the field to a citizen looking for snow route information.

Planning and GIS Linkages
The GIS information within the City of Mississauga was presented to the public around the mid – 1990's. The municipality has grown rapidly since then and the demand for more planning and GIS information has sent the municipality on a search for unique ways of displaying the information. A few of those systems include the Planning Information Hub, Beta tester of a GeoSpatial Masterplan using ActiveX control, a development application called Max, Amanda and more systems to come.

The Planning Information Hub was created in 2009 and was published midway through last year. The main purpose for this map application was to provide a method for self-service information and to develop a method of displaying/providing open data. The Planning Information Hub's structure is a story map produced through ESRI.

The information that is recorded in the P.I.H. is set in place by the development application called Max, which pulls data once a month that is placed into a table and this information is then sprayed onto a map within the P.I.H. Potentially more planning information is to be offered through the P.I.H., however, the planning information will need to be updated more than just once a month to say accurate, therefore, there are some obstacles that need to be resolved first.

The Beta version of the interactive map seen online is experiencing some inconveniences since the map cannot be opened from the browser, but from a separate software. Additionally, there are some limitations in terms of the data but these problems are scheduled to be fixed within a year or two. This map will aim to provide all possible data in one map, including items such as orthographic views and parcel identification. This further helps tie the link between planning and GIS data.

Municipal Processes

Currently, the municipality has a license for Amanda, but is still in the process of applying the software. An issue that was identified about using this software within this corporation is the limitations experienced due to the large size of Mississauga as a municipality and the multiple levels of departments that deal with the same data.

Departments that are linked to planning data and GIS information are the Geomatics group, responsible for 2D and 3D information, and the team that Mr. Cjazka is responsible for, dealing with the analysis of information and data from geo data and planning data. These groups have been formed, but due to the scale of municipality in question, there are planning and analysis professionals throughout the corporation.

Mississauga has Google Analytics in place and their audience count has climbed to about 60 000 people.

Future Developments

For future improvements, there are many exceptional opportunities mentioned during the interview. To start, there are the opportunities that are being contemplated within the municipality itself. First, there is an initiative in place to integrate 3D tabs of information into the P.I.H. to display objects such as trees or buildings. Second, the Mississauga website is currently being optimized and will have its beta launch in April, which will allow for better accessibility to all these planning and geo data provisions.

Functionality

Cross Device Availability: **Very Good**

Ease of Access: **Very Good**

Ease of Use: **Very Good**

The County of Frontenac provides a link to the Frontenac Maps webpage from the main page of their website making it simple to access. A link to this resource is also provided in the GIS and Land Use Planning sections of the County's website. The Google Drive folder for current planning applications can be accessed from the "Current Planning Applications" subheading under "Land Use Planning" in the "About Us" tab of the County's website. However, if users access Land Use Planning under the "Services for You" tab of the website "Current Planning Applications" is no longer available making it slightly confusing for users to access.

Frontenac Maps is a simply laid out interface that provides links to the Interactive Map, the Map Gallery (of PDF maps) and available applications created by Frontenac County, the Province and the Township of North Frontenac that citizens might find useful. The interactive maps is built within Geocortex while the applications run through ArcGIS Online.

The interactive map allows users to display varying levels of information about Frontenac County including boundaries, zoning and subdivision applications; users can use the identify tool on the map features active layers for more information. The map gallery provides an array of static maps as listed above as well as providing information on access to custom mapping for more specialized needs. The applications provide a more in-depth look at a single topic as listed above. These applications are attractively laid out; they present data in an easy to navigate manner and provide additional media sources to the map including photos and graphs to further improve user understanding.

The Google Drive folder containing current planning applications is easy to navigate and lists applications by name and type. Folders are further subdivided by project stage and include the initial application documents, public and reviewer comments and any revisions made to the application. Access to the Google Drive appears to be available to anyone with the link though editing and uploading privileges seem to be limited to only municipal staff.

The individual applications and maps had no issues running on any of the devices tested and there appeared to be no differences across browsers. There also was not an issue accessing this information from a mobile device as the Frontenac Map website and associated map products were properly scaled to the screen size.

Utility

List of Maps Provided

- Map Gallery (PDF)
  - County of Frontenac
  - Frontenac in Eastern Ontario
  - County Proximity
  - County Office Directions
  - Lot/Concession Maps by Geographic Township
  - Hamlet Maps
  - Points of Interest Maps
  - County of Frontenac Official Plan Basis Document Maps
  - Frontenac K&P Trail
- Applications
  - Frontenac Brand Ambassadors
  - South Frontenac Cycling Routes
  - Frontenac Paramedic Services - Stations
  - Frontenac K&P Trail - Picture Tour
  - Frontenac K&P Trail - Elevation Profile
  - County of Frontenac - Mobile Mapping
  - Verona Community Improvement Plan

Types of Tools Used

- Frontenac Maps
  - Interactive Mapping
  - Map Gallery (PDF format)
  - Web Applications
- Land Use Planning
  - Google Drive Folders

Link between Planning and GIS Data

There is a moderate link between Frontenac County's Planning and their GIS Data as some planning information including zoning, subdivision applications and community improvement plans is spatially represented in maps. However, it appears as though the status of subdivision applications represented on the Interactive Map may not be up-to-date and information on newer applications may be missing. All information relating to current planning applications is also available separately from GIS Data in the form of a Google Drive. The County does not provide Open Data on their website.

Future Developments

No further developments are listed on Frontenac County's website.

Benefits

- The use of a single hub for accessing mapping resources makes it easy for users to browse through available data to find the information of interest to them
- Maps are provided in a variety of formats and display varying degrees of detail
- Interactive map provides layer displaying subdivisions, when the identify tool is used further information including township, units/lots, application status and contact is provided
- The use of a Google Drive folder to share planning application data makes finding information on current applications relatively simple as these folders are further divided based on application stage

Restrictions

- Though the interactive map displays some subdivision application data it is unclear if this information is up-to-date as applications in Google Drive folder are not reflected on the map (It appears as though the information is accurate to January 2012)
- The Google Drive folder only contains current planning applications meaning their is no records for previous planning applications available online
- The County does not provide Open Data on their website

Interviews

Interview Conducted by: Johanna Caesar, Aaron Cheng
Interview Method: Phone
Interview Length: 26 minutes
Interviewees: David Millard, Joe Gallivan, Kevin Farrell

Planning and GIS Linkages

The planning and GIS departments have a very close relationship. In fact it was through the recommendation of the planning department to council that led to the creation of its first full-time GIS position. Prior to 2009, the County did not have any GIS capability and in 2010 the current interactive map was launched. .80% of GIS work is planning related.

Municipal Processes

The GIS department uses GeoCortex Essentials as it's main tool for their interactive map. The County GIS department provides GIS services to the lower municipalities within Frontenac County. Communication and requests for updates to the maps generally occur over email and phone due to the low volume of changes in the county. Otherwise regular updates to the mapping application include quarterly updates from the Planning department. Currently, the interactive map is not responsive to common browser updates and must be updated manually by the GIS department.

Special Interview Notes

Planning application files and information is provided through a Google Drive that is publically accessible and maintained by the Planning department. This is separate from the responsibilities of the GIS department.

Future Developments

Future developments include a major update coming this year to update the maps to utilize the newest version of Geocortex. The County is also considering creating "one-off" map applications to show specific themes to avoid crowded data for users. The County is also working towards an official open data portal.According to staff, county and township staff are pushing for cross-device capabilities rather than the public.

Functionality

Cross Device Availability (Maps): **Very Good**

Cross Device Availability (Interactive): **Poor**

Ease of Access: **Very Good**

Ease of Use: **Very Good**

The Peterborough "Geomatics/Planning" webpage is relatively easy to access with various links found on other related pages directing the user to this page. A direct link is provided on the home page of Peterborough's website above the header in the "Visiting" tab. Online search engine searches for Peterborough 'maps' all return a direct link to the maps. Overall, the site is simple and allows for users to easily access all maps, interactive or otherwise, on one single webpage. The variety of maps is impressive, though none are relevant to current pending planning applications and are more pertinent to residents of Peterborough.

All of Peterborough's Interactive maps are provided through ESRI. The ESRI interface performs poorly on phones as the toolbars and side bar take up most of the screen. All static maps are provided as PDF files which can be accessed on most devices.The interactive map includes a search tool that enables users to search based on criteria such as schools, parks, major buildings, and address. Information can also be toggled to show up on the map.

These layers include "Living", "Planning" (which includes zoning and official plan designations), "Garbage and Recycling Pickup", and "Transit".

Overall, both the interactive maps and the static maps were easily accessible and were able to run without any noticeable problems. There seemed to be no differences across browsers either. The one issue found with hardware accessibility was that Peterborough's interactive maps did not have separate user interfaces (UI) when accessed by phone which resulted in limited performance as the UI took up most of the phone screen.

Utility

List of Maps Provided

- City Maps
  - Ward Map
  - Large City Map
  - Small City Map
  - Peterborough Region Map
  - Downtown Visitor's Guide
  - Historic City Limits
  - Southern Ontario
  - Terrain City Map
  - Horizontal Control
  - Monument Location Map
  - Peterborough Transit Map
  - Waste Collection Zones
  - Peterborough Airport Site Map
- Recreation
  - Bikeways and Trails Map
  - Peterborough
  - Recreational Cycling Routes Map
  - Parks Location Map
  - Playground Location Map
  - Wading Pool Location Map
  - Recreation Map
  - Sports Field Location Map
  - Soccer Field Location Map
- Recreation
  - Major Bennett Industrial Park
  - Peterborough Industrial Park
  - Official Plan Schedules
  - Zoning By-law Maps
- Various Statistics Canada Based Maps
- Various Census Maps

Types of Tools Used

- Interactive Map (e-Maps Peterborough)
- Interactive Map (Ash Tree Inventory Map)
- Municipal Cultural Mapping webpage
  - Public Art (Interactive Map)
  - Cultural Facilities and Spaces (Interactive Map)
  - Cultural Organizations (Interactive Map)
  - Heritage Resources (Interactive Map)
  - Cultural Economy and Businesses (Interactive Map)
- 3D Interactive Map (Downtown Peterborough in 3D)
- PDF Static Maps

Link between Planning and GIS Data

Peterborough makes no distinction between 'planning' and 'GIS' specific data. All maps are provided with a self-explanatory title and properties of each map (size, colour, printable).

Future Developments

Peterborough's Downtown Peterborough in 3D" is still incomplete however the tool can be accessed and used currently.

Benefits

- Interactive and static maps are all very clear about what data they will contain and represent
- Maps provide a variety of information that is pertinent to people who live in Peterborough
- Providing the static maps in PDF form allow for access by most devices and also allow for offline viewing if downloaded previously

Restrictions

+ Lack of information regarding current pending planning applications
+ The UI in the interactive maps hinder the performance of applications on phones

Interview

Interview Conducted by: Aaron Cheng, Allen Yu
Interview Method: Phone
Interview Length: 30 Minutes
Interviewee: Kristine Muma, Spatial Data Analyst at City of Peterborough

Planning and GIS Linkages

GIS has always resided within the Planning Development Services Department, because they have mapping group and helpful Director. Started in around 1997, GIS established a very close relationship with Planning but also provided their services to other departments. Currently there is one GIS staff in Engineering and Infrastructure Planning Department, all other GIS staff are in Planning. They have an emphasis on Planning data and they will be releasing more planning data through open data portal in the future. They noticed that some people are still more comfortable using static zoning maps than others, while some others prefer interactive mapping, so the users are evenly split – they prompted them to keep static maps on their site.

Municipal Processes

From the interview, we knew that their interactive map system was established since around 2003, motivated by their own idea without any financial or political roadblocks. Their primary intended Audience are anyone from the tax base to consultants who might need a quick look, and companies who need information for their processes. She commented that possibly public/tourist takes priority over companies who want to do development, because they most likely need to make data requests more detailed information.

Originally, they produced the product in AutoDesk MapGuide because it was easy and cheap to purchase; then they tried GeoMedia from Intergraph but they do not have web mapping product and it needs heavy maintenance; eventually in 2012, they decided to go with ESRI that reduced its price, and ESRI created E-MAPS for them. The rationale for this is that they wanted to get the new product out asap so having someone else to do it instead of having staff learning themselves was the best option. Their most valued need was the ability to produce something easily and quickly for the staff and public, ESRI has ArcGIS Online and tons of other options, and they are also easy to use and efficient. They focused on providing data that helps with basic orientation for the public, popular searches people may want, and zoning because internally they believe it is important and popular; they put up their what they thought are the most sought after information, and they briefly researched what other municipalities have, (i.e. transit routes and garbage collection data, planning info), and shared what could be easily mapped. They did not put any data that may have any potential constraints or issues, however all sensitive data can be requested.

They rely on the relevant departments to inform them of the changes, and then they go through a formal process from change taking place to actual updates on the site. The changes happen regularly but based on needs, (i.e. zoning does not change often, so they update it every half a year, others are on-going and has their own schedules unless there are big changes.)

They used a good chunk of automated processes, and utilized Python scripts to make the system easier to update, but data type changes can make it complicated. They had always been using AMANDA system, and they are updating to AMANDA 7, which cost them significantly.

They considered themselves lucky because they had always planned well, thus they were always able to obtain the funding and staff to reach their goals; she also commented that "you only can only always work with the budget you have". They do not have a specific system to monitor the feedback for their system but occasionally they get a phone call but generally not a lot of feedback. - They do not have specifically anyone to check feedback but they all look after it, and Google Analytics is their new monitoring tool. She commented that it has been difficult to tell how many users there actually are, but they considered themselves successful, if they keep improving and updating it, and think what the users actually need.

Future Developments

Their future development project includes switching from ESRI to Geocortex. It will be an update to the current planning information, and will provide more schedules/zoning info/may be even zoning by-law, by the end of this year. The benefits include no heavy programming needed for using it, simple training process, and the option to do complex projects through high level programming. She personally thinks the legends and layers are more obvious and easier to use, and commented that Geocortex runs on their current projections so it is convenient, as ESRI had different projections they had to re-project the layers every time they made an update. By the end of this year or early 2018, motivated by huge trend, and the idea that data should be free, they are going to establish their own open data portal. By doing this, increased transparency of the data will also help the public understand what they do, also takes time off staff. It will contain categorized planning data. Other technologies they are looking into are 3D Planning and Public Feedback styled apps.

What Google Analytics provides Peterborough:

+ Hits in a date range (you set the date range)
+ Bounce rate i.e. what percent leave the site with no interaction
+ Where hits are coming from i.e. country, region, city
  also if hits are internal or external (Timm set that up)
+ Browser used to access site

Functionality

Cross Device Availability: **Good**

Ease of Access: **Very Good**

Ease of Use: **Very Good**

The Oakville maps web page is very easy to find, given the user knows where to look. A direct link is provided on the homepage of Oakville's website above the header in somewhat small text among other links such as 'employment', 'council' and 'news & notices'. Searches for Oakville 'data', 'GIS' and 'maps' all return a direct link to the maps webpage both on Google and using the sites search function. On the webpage itself, one of the first links available is one that reads 'support' which provides documents to assist users who may not be familiar with using the map applications. In addition, there is a link to Oakville's Open Data catalogue on the maps webpage so users do not have to look further if they want to download available datasets. Overall the webpage Oakville uses presents access to their data in a simple and intuitive manner. The variety and wealth of accessible data is impressive, with uncommon but very useful datasets being provided including: Committee of Adjustment Applications, Development Applications, and Available Commercial and Industrial Buildings.

The applications themselves may be accessed either through HTML5 or using Silverlight which is a plugin users would have to download. Some integration with Google Maps is provided if Silverlight is used but HTML5 is probably easiest and enough for most users. Almost all of the maps are built within Geocortex, with the exception of two: Active Building and Development Permits, and Active Transportation in Oakville. These two are built in ArcGIS Online. Regardless, each operate with similar, intuitive functionality. Since the maps are all separate from each other, the demand on computer hardware is minimal.

However that separation of map views also removes user capability to turn on/off multiple different layers and compare across the city. For example, users must view two separate maps to find the Zoning and Official Plan designations for a single property. Search functionality for the maps are limited, as search is limited to only addresses and layers contained in the map view, but the search is still capable.

Finally, since hardware and processing requirements were low, the individual applications had no issues running on any of the devices tested. There seemed to be no differences across browsers either. The one issue found with hardware accessibility was that Oakville's website and the respective maps did not have separate user interfaces (UI) when accessed by phone. So while the map loaded quickly even on a phone, the user would have to constantly zoom into and out from the web page to try and navigate the information on a phone.

Utility

List of Maps Provided

+ Air Photo History
+ Active Building and
+ Development Permits
+ Active Transportation
+ Capital Budget
+ Committee of Adjustment Applications
+ Coyote Sightings
+ Development Applications Forestry
+ Greenspace
+ Heritage Properties
+ Industrial and Commercial Property Search
+ Livable Oakville (Official Plan)
+ Oakville Transit Routes
+ Parks and Recreation
+ Probable Ash Tree Locations
+ Topographic Survey
+ Trails and Cycle Ways
+ Weekly Service Requests
+ Zoning

Types of Tools Used

+ Oakville Maps Webpage
+ Oakville Open Data
+ Zoning and Official Plan Schedules

Link between Planning and GIS Data

There is no distinction between 'planning' and 'GIS' specific data that Oakville makes. All of the data is provided with a short description of what the purpose is. Planning and resident specific data (i.e. Official Plan designation and Development Applications) is provided in the same area as GIS data (i.e. Topographic Survey)

Future Developments

None encountered.

Benefits

+ Maps are all very clear about what data they will contain and represent
+ Maps provide a variety of information that is important to people who live in Oakville, such as finding out about a development project in their neighbourhood or a minor variance to a nearby property
+ Providing the maps in separate views reduces demand on computer hardware and internet, the maps load very quickly

Restrictions

+ Providing the maps in separate views reduces ability to compare different datasets across one another, would have to switch between different views multiple times to get information for one feature
+ Search functionality can be limited based on the map
+ Having the building permit and active transportation maps in different applications means there is potential for confusion across users
+ Maps and Oakville's website do not have a UI fit for smaller screens/phones

Interview

Interview Conducted by: Johanna Caesar, Kelly Livingstone
Interview Method: Phone
Interview Length: 25 minutes
Interviewees: Frank Goehner, Duran Wedderburn

Planning and GIS Linkages

The first planning specific application that was provided was the zoning information map around 5 years ago. The development applications map has been a more recent initiative, along with the building permit and committee of adjustment maps. These new maps come along specifically in response to corporate needs. For example, the committee of adjustment group wanted an easier way of providing information to the public, and so that map came along soon after. If a resident wishes to access information on a specific application, they can use the interactive map to explore those features, and upon clicking on the feature, would be redirected to a landing page on Oakville's corporate webpage where they can then explore documents such as meeting minutes and materials provided by the applicant in support of the application.

Municipal Processes

GIS has been around at the Town of Oakville for the last 15-20 years, with their GeoCortex web applications being around for the past 6-7 years. The Community Development Commission (CDC) maintains support for the application and works on quality control in conjunction with the IT department who manages the servers for the applications. For planning specific GIS applications, the CDC will work specifically with the Planning department as well.

The Town began their work within GeoCortex, but have a couple applications in ArcGIS online due to different capabilities and workflows. Certain backend processes that connect to SIRE make using GeoCortex mandatory for some applications. This is because ArcGIS online doesn't have that same functionality. ArcGIS online however, is in general easier for staff to use, and newer sites are being pushed onto this service.

As for updates to the maps, data and geography updates are completed in one process, mostly automatically. For example with maps using point features, locations are automatically pulled from AMANDA and points are generated at night in the backend servers and the map is subsequently updated with that new information. More complex features with geometry are completed manually, but there is still backend integration between the feature that is selected and the information contained in AMANDA. Anything within AMANDA is under the responsibility of the planner to update (i.e. new development application) and then a trigger is sent to a GIS staff who then creates the geometry for that parcel based on the application initially input by the planning staff.

Future Developments

The biggest changes Oakville seems to want to implement for the future, is improving their capability for data analytics. They hope to be able to answer questions that pertain to their data and better understand how planning changes affect their city. Two of the examples brought up were:
How do the built forms that are being constructed coincide with Official Plan designations?
Can we look at where there are the most parking infractions in the City, and observe how does that correspond with the parking regulations contained in the Zoning By-law?

Generally, Oakville hopes to better allow for evidence based decision making, and providing clearer information to the public while allowing them to perform their own research as well.

York Region

Functionality

Cross Device Availability: **Good**

Ease of Access: **Excellent**

Ease of Use: **Very Good**

One of the first links that a user would see when accessing York Region's website is a link redirecting them to 'York Maps', which is another webpage that lists out all of the available links for a user who needs to access any data from York Region. The website is easy to find, and York Region conveniently lists out all of the data available in one place. There were no issues accessing the York.ca homepage or York Maps on any of the devices, including phones, on which the website scaled its UI to fit the smaller, touch interface. Load times were generally fast and the webpages were responsive.

The first link provided at York Maps is their interactive map, which is built on Geocortex. Users can switch between map views under the 'maps+' menu button, and different layers can be turned on and off from there. The map is simple, intuitive, and easy to use, mainly from its benefit of being built within Geocortex. The interactive maps function well on the devices tested, with somewhat slow load times on mobile devices, which is to be expected. The application has all of the common functions one would expect, including measuring tools, select, and search functions. There are a couple less common functions which proved to be useful, including a 'walk score' function which allows a user to select any point on the map and find its walk score. This functionality is still limited however, showing only a score and little other information. Despite this, the search function provided in the application is very good, providing information that residents may desire regarding transportation, community services, and properties. That being said, the data provided by the York Maps interactive site is somewhat limited, with access to some datasets restricted to the internal use only. There is limited publically available planning and development information in the interactive maps.

The open data catalogue provided by York Region is very impressive, with 160 different datasets all publically available. Dataset categories include: spatial data, business and economy, health and public safety, environment, government, recreation, and transportation.

The open data site provides users with a preview of what the dataset will look like before it is accessed. They also have an 'add to cart' function which allows users to queue the various datasets they wish to download, and then 'check out', which downloads all of the datasets at once in the specified format and projection.

Utility

List of Maps Provided

+ Business Directory
+ C-INFO
+ Community Services
+ Cycling Map
+ Land Information
+ Property Viewer
+ Recreation and Culture
+ Source Water Protection

Future Developments

None encountered.

Types of Tools Used

+ York Maps, Interactive Map
+ York Region Open Data
+ York Region Map Catalogue

Link between Planning and GIS Data

Much of the data provided by York Region through web applications is geared towards community information such as parks locations and trail networks. The data that is more specific to certain phenomena is provided through the Open Data portal, likely because access to that data is geared less towards the general public, and more towards individuals who wish to manipulate the data how they want. The distinction in audience is very clear between the different tools York Region provides, and they could make more of an effort to present more complex data in simple ways such that it is accessible to the general public.

Benefits

+ All York Region mapping information is provided in one easily accessible and navigable location.
+ The interactive maps function smoothly on most devices, with simple UI's.
+ 'Walk Score' functionality in the interactive map is unique and interesting, and possibly helpful for users looking for information on a property.
+ Open Data catalogue is incredibly intuitive and comprehensive, with unique features.
+ Open Data catalogue providing a wealth of different data sets.

Restrictions

+ Many of the map views that would provide planning and development information to residents are listed as internal use only, so the public is completely unable to access.
+ Maps can take a very long time to load on less capable hardware and internet speeds.
+ Separation of map views prevents comparisons and analysis to be made between layers in separate views.

Interview

Interview Conducted by: Jelena Mancic, Kelly Livingstone
Interview Method: Skype
Interview Length: 30 minutes
Interviewees: Duncan Rowe

Planning and GIS Linkages

York Region finds that data literacy is difficult to achieve within NGO's and residents groups, so data downloads through Open Data are rare. Their goal is therefore to blend open data with data visualisation using Tableau Public and allow data download as a secondary purpose.

The open data provision is intended to complement themed maps that are provided through York Maps. On the Planning and Development end, there was initially a reluctance to provide planning layers to the public; the planning department felt like the public could unintentionally misuse and misrepresent the provided data by layering unrelated features. By allowing for the three available mapping methods - prepared PDF maps, interactive map, and open data - York could better portray to the public what the intended use of the data is, and therefore hopefully avoid misinterpretation.

Municipal Processes

York Region protects most of their map views from the public, and allows interested groups access through a login system. Consultants under contract receive provisional access, and other governmental agencies like local municipalities and school boards have permanent accounts.

In terms of different planning and GIS related departments at York Region, they have a decentralised business model, meaning each department is expected to have similar capabilities with regard to data and GIS systems. This type of model allows for a greater data stewardship. Furthermore, the region has a back office system that automatically updates information entered into that system overnight. For example, as public works updates road occupancy permits, that goes into the business system, and nightly a spatial representation of that is made and is provided on the interactive map. Updates

Future Developments

York Region is currently undergoing a large initiative to work on their planning approval process - York One - and part of that process is to hopefully allow developers to self serve information on their development application. This process would be less of a public initiative, and more directed at private stakeholders to support them in planning and development approvals. York called this process GDAT (Growth and Development Application Tracking) and noted it to be one of the hardest things for a municipality to implement, mainly due to the dynamic nature of planning. The impetus for change is largely the result of provincial planning legislation (i.e. Growth Plan) that necessitates the delivery of information that is as current as possible. A more streamlined process for development approvals, that would have this GIS and data provision element, could also have the effect of bolstering development in the region.

Waterloo

Functionality

Cross Device Availability: **Excellent**

Ease of Access: **Very Good**

Ease of Use: **Excellent**

The Waterloo "Geomatics/Planning" webpage is relatively easy to access, with various links found available on other related pages directing the user to this page. To find the "Maps & GIS" page one has to access the "Visiting" tab and the "Maps" section and from there find the hyperlink labelled "interactive maps". However, online search engine searches for "Waterloo city map" all return a direct link to the "Maps & GIS" webpage on Google. Overall, the site is simple and allows for users to easily access all maps, interactive or otherwise, on one single webpage. The variety of maps is impressive, though none are relevant to current pending planning applications and are more pertinent to residents of Waterloo.

All of Waterloo's Interactive maps are provided through Geocortex and ESRI. All static maps are provided as PDF files which can be accessed on most devices. The interactive map has several tools but the most user-friendly component would be the "I want to…" tab. This tab shows several options that would assist users to access tools and find information that they may have trouble locating. The interactive map has measuring tools as well as an identify tool for finding information on specific properties. It should be noted that the user can change to a street map base layer or an imagery map base layer at any time. The interactive map also includes a search bar in which users put in an address and the tool would find the zoning for that particular address.

Overall, both the interactive maps and the static maps were easily accessible and were able to run without any noticeable problems. There seemed to be no differences across browsers either. It should be noted that the interactive maps were accessed easily by phone and performed extremely well and intuitively.

Benefits

+ Interactive and static maps are all very clear about what data they will contain and represent.
+ Interactive Map provides a wealth of information, planning related and otherwise
+ Providing the static maps in PDF form allow for access by most devices and also allow for offline viewing if downloaded previously

Restrictions

+ Lack of information regarding current pending planning applications

Utility

List of Maps Provided

- Interactive Maps
  - City of Waterloo Street Atlas Mapbook
  - Zoning Map
  - City of Waterloo Street Index
  - Political Ward Maps
- City of Waterloo Interactive City Map
  - Address and street locator
  - Road, trail and sidewalk closures
  - Active Transportation
  - Development Services
  - District Plans
  - Zoning Map
  - Ward Map
  - Neighborhood Profiles
  - Heritage
  - We Are Waterloo Economic Development Map

Types of Tools Used

- City of Waterloo Interactive City Map
- City of Waterloo Maps and GIS Webpage
- City of Waterloo Open Data Portal

Link between Planning and GIS Data

There is no distinction between 'planning' and 'GIS' specific data that The City of Waterloo makes. All maps, both interactive and static, are provided with a self-explanatory title and short description of what each map entails..

Future Developments

None encountered.

Interview

Interview Conducted by: Johanna Caesar, Aaron Cheng
Interview Method: Phone
Interview Length: 23 minutes
Interviewees: Natalie Stopar, Warren Davison

Planning and GIS Linkages

Waterloo's GIS and Planning department work "quite closely" together. Updates to the zoning by-law are communicated between the Planning and GIS department everytime there is a change. Inquiries to the Planning department regarding zoning usually originates from use of the mapping applications provided by the GIS department.

Municipal Processes

The mapping application runs on GeoCortex, and the GIS department plans on continuing to use the software. Updates from the planning department occur "as required". The Planning department and City staff use a separate mapping application, similar to the publically available option, and when errors are spotted they are reported to the GIS department.

Special Interview Notes

Currently the City creates individual webpages for more significant planning applications with the files and information submitted to the City from the developer.

There are no plans currently to include planning applications into the mapping application.

Future Developments

Future developments include an update in the GEocortex software and to upgrade the existing open data portal. City staff have also expressed an increased desire to utilize information gathered through Google Analytics.

Discussion

Data Provision

Types of Data Provision	Kingston	Barrie	Mississauga	Oakville	York Region	Peterborough	Waterloo	Frontenac County
PDF Map Gallery	✓	✓			✓	✓	✓	✓
Open Data	✓		✓	✓	✓		✓	
Interactive Map	✓	✓	✓	✓	✓	✓	✓	✓
Development Application Map	✓		✓	✓				
Building Permit Map	✓		✓	✓				
Commitee of Adjustment Map				✓				
Development Application Documents Available Online	✓			✓				✓

Table 2: Comparison of Stakeholder Municipalities' Spatial and Planning Data Provision Methods

A main component of municipal spatial data infrastructure is its data provision. It mainly associates with how the municipalities are currently providing data to the public. The table above shows a comparison between the municipalities and provides an inventory summary of the common data components. Among the eight municipalities we investigated, all of them are equipped with interactive mapping platform, this shows that having an interactive map is a trend for municipal planning and GIS departments.

As can be seen in Table 2, five out of eight municipalities provide open data and the remaining three are either in the process of setting one up, or it is an item of high priority on their future development list. Six municipalities provide PDF maps because they realized that a lot of users rely heavily on static maps and some of them found static maps easier to use than interactive map. Kingston, Mississauga and Oakville have the strongest links between Planning and GIS and they are the only three municipalities that provide both a Development" Application map and a Building Permit map, etc., which are planning specific. Committee of Adjustment map is currently only provided by Oakville and Development Application documents are made available online by Kingston, Oakville and Frontenac County.

Municipal Processes

Smaller municipalities typically have a more informal map update process, as they heavily rely on phone call and emailing communication between departments to request map updates. Larger municipalities have integrated systems of automatic updates from internal databases (AMANDA, ACCELLA, MAX), including the automatic creation of point features. This allows non-GIS staff to easily perform updates.

Currently none of the municipalities are formally assessing user access, the ones that are in the preliminary stages to perform evaluations are using Google Analytics and GEO Jobe to monitor user activity in the maps, but they found them not generally helpful. For instance, Google Analytics provides page tracking which measures the number of views of a particular page on the selected website, however it was found to inaccurately track webpage traffic for map applications as it counted changing the viewing window as a separate hit.

Business Drivers

A commonality across interviews was that the creation of mapping tools was largely done to meet internal needs, whether that was requests from staff or by a mayor or councillor. Typically interactive maps were not created explicitly for the public, but in order that the municipality would better be able to navigate the wealth of data that they have. Oakville stated this fact when they explained that their Committee of Adjustment map view was created in response to a request by Planning staff who wanted a better way to see where requests were coming from in the Town. Despite the fact that many municipalities initially created these tools for internal use, they have since realized the value to providing these tools publicly and have made slightly less detailed versions available to the public. Concerns related to privacy and proprietary information have prevented municipalities from providing full access to data. Several municipalities noted that as the public becomes more data literate and engaged with municipalities online, public feedback will increasingly play a role in shaping how these tools are created, what information is published and the publishing format.

Data Stewardship

Data stewardship was an issue more specific to larger municipalities like Mississauga and York Region. With a larger number of staff working with the data, having a system in place to manage the input of that information while maintaining data quality is very important. York Region for example, noted that since they are an upper tier municipality, double entering of records was a constant concern, and they were implementing a new data approvals and management system to coordinate data entry. Smaller municipalities noted that data stewardship was not a concern, since the creation of many map views and inputting of data was either done by a single person or on a more ad-hoc basis.

Future Developments

There were a few commonalities across responses to interview questions that allowed us to better understand possible future trends for spatial data provision in Ontario. For example, the three municipalities who don't currently provide open data - Barrie, Peterborough, and Frontenac County - have plans to provide it in the future.

ArcGIS also appears to be a future standard as a mapping application. For example, Barrie provides much of their municipal information in a dated Rolta OnPoint application, but has a separate section on their website called "web mapping applications" where specific map views are located. These are features such as "Historic Waterfront Locations" which are provided in an ArcGIS online application. Barrie noted that they are currently moving data from OnPoint to GeoCortex, and will continue to provide individual map views in ArcGIS online for the future.

Another future development noted by Mississauga, was 3-D and alternate reality mapping in order to bolster public engagement by bringing people out to public meetings to explore those technologies. Microsoft's Hololens was a specific technology noted by Mr. Cjazka as an exciting application of this possibility. Lastly, Oakville made mention of their desire to implement better tools to allow for data analytics within their GIS systems. Ideally, having improved data analytics allows for a better evaluation of trends in the municipality. Example of such trends brought up by Mr. Wedderburn were: **(1)** evaluating how new construction and development applications coincide with respective land use designations, and **(2)** how the locations of parking infractions coincide with parking regulations contained in the zoning by-law. Having information to perform this type of analysis would allow for better evidence based decision making, and a fostering of a more informed public.

Recommendations

Through careful consideration of the status and future prospects of the studied municipalities, the following recommendations are provided with the intent to improve Cambridge's approach to providing spatial data and information.

1. Create a dedicated interactive map to display development applications

Through conversations with Cambridge, it was clear that allowing residents an easy way of finding information about where and what types of development are occurring was of a high priority. Interviews with municipalities informed us that this is an achievable goal using case management software that is linked to GeoCortex (which will be explained further in our second recommendation). Our first recommendation therefore, is to create an interactive map view that displays all developments occurring in Cambridge as point features in GeoCortex. The map would be searchable by addresses and keywords regarding the development (i.e name of developer), in order to allow for easier navigation. If a user selects a point of interest, the point should open a popup box with details about the development, and can either provide a landing page on the corporate website with additional links to materials regarding the development, or provide those materials as downloadable within the application. Furthermore, the point features associated with development applications should be selectable, and users should be able to export those individual features as shapefiles for use outside of the interactive map.

2. Implement workflows that link case management software and GIS tools

Most of the municipalities that were interviewed mentioned the want or need to expand their systems to an automated system of map updates. Municipalities have found success when integrating AMANDA and GeoCortex to automatically update map information. When a new development is input to AMANDA, location information can be pulled nightly and used to create point features that would be readable in the interactive map. This automated approach would allow planners stewardship over planning specific data.

3. Ensure data accuracy using software such as FME to perform routine automatic audits

Data quality was a concern that was raised by municipalities who currently allow multiple users to edit data. As a way to address this, audits can be performed to ensure certain quality standards are met. Programs such as FME can be used to determine if fields have been left blank or if contradictory information has been input to help assess overall data quality. This process can be automated to run on a routine basis to ensure regular check-ins occur. Submitting audit reports to managers in charge of particular data areas will allow these departments to take full stewardship of their data.

During the processing of data from raw form to map form, duplication was a common issue that occurred. This problem was sprouted from miscommunication throughout municipality departments, particularly from larger cities experienced problems with producing duplication data. With automated systems, this would help reduce the occurrence of multiple versions of data representation.

4. Ensure the City's web page is laid out in a easy-to-navigate manner

Through phase 2 of the project, observations and comparisons were made between the various municipalities and the mapping tools provided. Municipalities with clear and frequent links to the interactive map applications were much easier to access. Currently, to access the City of Cambridge's interactive map, users would most likely go to the "Build, Invest and Grow" tab to access the "Maps" page. In the "Maps" page the link to the interactive map is provided by means of a small hyperlink within text. We recommend that in place of an in-text hyperlink, a large icon linking to the interactive map would serve better by increasing visibility and accommodating users who may have trouble reading.

5. Provide additional incentives to interact with GIS and planning information

Various municipalities currently provide maps and mapping layers related to historical information. Through an interview conducted in Phase 3, York Region has stated that maps such as historical maps generate interest in the community and help to teach the community that planning and mapping information resources exist. These incentives have the potential to draw more users in to explore the other available maps and resources provided by the municipality, given that they are clear and accessible.

The City of Mississauga is currently exploring other tools to attract users to their webpage; one of these tools is Minecraft, an interactive video game centered around free-building. The City of Mississauga is hoping to use Minecraft as a platform to display city information in a format appealing to youth and adults who enjoy exploring information more interactively. We recommend that Cambridge consider using similar technologies and historical mapping in order to attract more users to use future GIS provided by the City.

Appendix 1

List of Interview Questions

Setup

- Record the interview if possible - audio?
  - Let the person being interviewed know that they will be recorded, and that they can opt-out if desired
  - Will use the audio recording to assist the note taking and write up, would be deleted afterwards
- How long are we aiming for each interview to go for?
  - If the interview begins getting too long can we identify high priority questions, and questions that are less important to be answered?

Standard set of Questions

- Business drivers – what stimulated the provision of information
  - How long have your current systems for providing geographic information (mapping tools) to the public been in place?
    - Were there political or financial factors that contributed to the implementation of your mapping tools?
      - Was it a departmental initiative? Pressure from a local councillor? Etc.
  - Who is your primary intended audience?
    - Do you have an anticipated use case for your tools? i.e. do you anticipate more general enquiries for information, specifically for development, detailed analysis, etc.?
  - Why this approach? (Interactive vs. Static, etc. etc.)
    - Technology/software being used
    - Datasets provided
  - Could you please explain your municipality's reasoning for what information is provided through these applications?
    - Is there certain information that cannot be displayed in this format for privacy or security reasons? This is including, but not limited to:
      - Privacy issues
      - Confidentiality issues
      - Third party data ownership issues (e.g., Teranet, MPAC, etc.)
      - Restricted data (zoning, properties ID's, etc.)
- Process definition – how was the process initiated and continued
  - What were some of the driving factors that caused you to implement your mapping tools (specify based on the municipality)
- Governance – who maintains, monitors, updates the information
  - Could you please describe your municipality's organizational structure and how departments are integrated?
    - What is the relationship between the GIS department and the Planning department?
  - Are there any constraints to your current operation?
    - Political, financial, technological etc.

Who, at your organization, is in charge of updating the information in your mapping tools?

How often is the data updated? How much time is needed for these updates?

That could go into the AMANDA auto-update request Cambridge planning was mentioning

Does data automatically update? Who is able to update the information?

Do you currently have anyone who monitors and maintains the mapping tool to ensure users are not having trouble accessing information they need?

Tools deployed

Run through the tools we found, ask if any additional tools are available.

Ask if they consider a specific application to be their "main" tool they anticipate users to access for planning data.

Metrics and results

Does your municipality have a set of standard metrics or goal results for these tools?

If so what are your metrics and how were they defined?

Do the metrics relate back to business drivers?

Are you able to provide us data relating to page views and access method for these mapping tools in the last six months?

Do you currently have a system to receive and take into account feedback from users accessing the mapping tools?

Future plans or additional activities underway

Is your municipality looking to change delivery methods or processes in the near future? Why or why not?

Have you noticed any areas of your current system that could be improved?

Are there any new technological or software innovations coming out that you would like to implement in the future?

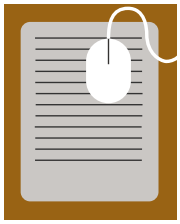
Appendix 2

Workplan and Timeline

PHASE ONE

Consultant Requirements

+ Kick-off meeting with City
+ Finalize and vet the Stakeholder Organizations with the City.



Deliverables

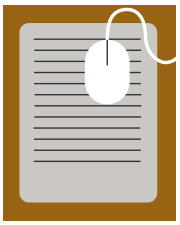
+ Final list of Stakeholder Organizations

The first phase will begin after the City has approved or provided revisions to this proposal. An important next step will be to analyze Cambridge's existing spatial data provision processes and needs. We will then begin gathering information on and identifying possible stakeholders for this project and determine their similarities and differences with Cambridge. We will finalise the list of stakeholders, to be vetted and approved by the City.

PHASE TWO

Consultant Requirements

+ Preliminary Findings Report Presentation and Feedback

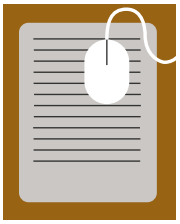


Deliverables

+ Status Report One
+ Preliminary Findings Report

The second phase will begin with an evaluation of each stakeholder's existing online spatial planning data presence. Each stakeholder's tools will be evaluated for ease of access and use, availability of data, types of tools, cross device availability, and for links between planning and GIS information. In general, the goal is to review, categorize, and analyse how each municipal organization provides planning data to the public. The first progress report will be provided during this time. At the conclusion of this research we will submit a Preliminary Findings Report to the City accompanied by a presentation at the University of Waterloo.

PHASE THREE



Deliverables

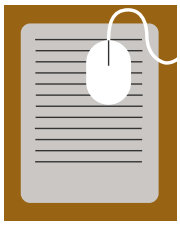
+ Status Report Two

Stakeholders will be contacted during this phase to discuss their business practices and motivations for providing spatial planning data. These interviews will provide insights into the stakeholders' experiences, and their challenges with implementing and working with the spatial tools identified in Phase 2. The interviews will be conducted in the manner preferred by each stakeholder organization and could include in-person, phone or skype interviews. We will analyse interview results in tandem with our own evaluation of each stakeholder's online presence to create an appropriate list of recommendations for the City of Cambridge.

PHASE FOUR

Consultant Requirements

+ Final Recommendations Report Presentation Feedback



Deliverables

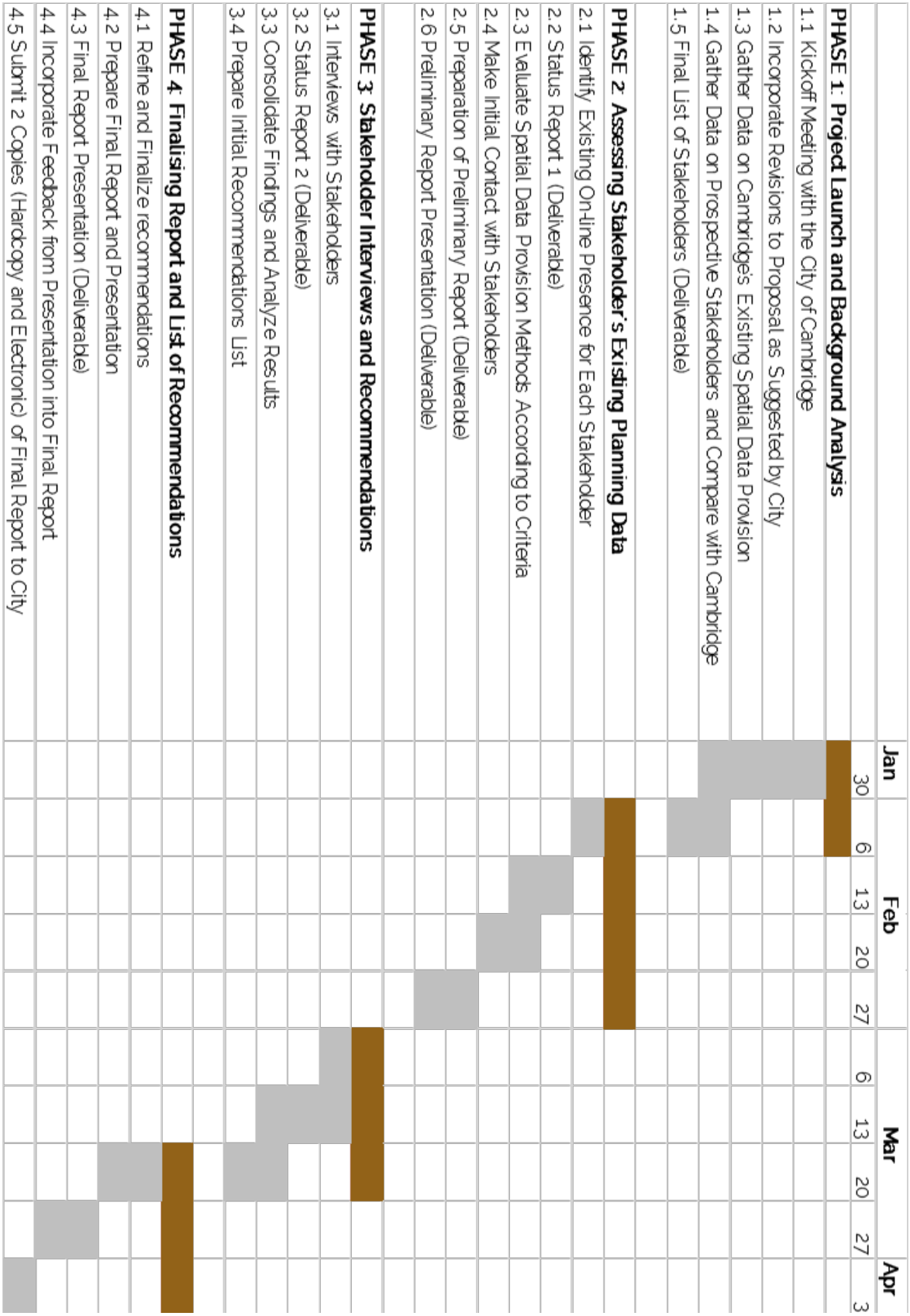
+ Final Report - Presentation

+ Final Report - Electronic Copy and Hardcopy

We will create the final recommendations report and presentation using the research collected from our consultations and evaluation of each stakeholders' tools and processes. Our conclusions will be presented at the University, after which any changes or modifications proposed by the City will be addressed and incorporated into the final report. The final report will be provided to the city one week after the presentation in both electronic and hardcopy.

Timeline

The timeline is provided in the following Gantt chart, and contains each of the main tasks outlined in the work plan.



Appendix 3

Table 2: Comparison of Stakeholder Municipalities' Spatial and Planning Data Provision Methods

Types of Data Provision	Kingston	Barrie	Mississauga	Oakville	York Region	Peterborough	Waterloo	Frontenac County
PDF Map Gallery	✓	✓			✓	✓	✓	✓
Open Data	✓		✓	✓	✓		✓	
Interactive Map	✓	✓	✓	✓	✓	✓	✓	✓
Development Application Map	✓		✓	✓				
Building Permit Map	✓		✓	✓				
Commitee of Adjustment Map				✓				
Development Application Documents Available Online	✓			✓				✓