State of Maturity Report

AURORA
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RESEARCH   CONSULTING   SOFTWARE

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Introduction

Background and Objective

Asset management is a sophisticated, coordinated, cross-disciplinary effort that considers the performance, risks, and cost associated with infrastructure over its entire lifecycle. In the municipal context, infrastructure typically includes assets that facilitate transportation services (e.g., roads, sidewalks, traffic signals, etc., as well as bridges and culverts); networks for the treatment and distribution of drinking water, and collection and treatment of both wastewater and storm water; buildings (e.g., community and recreation centres, and administrative facilities, etc.); fleet; and parks and recreation infrastructure (e.g., sports fields and playground structures).

Each Town is unique and is responsible for different types of infrastructure depending on community needs. Despite these differences, asset management approaches remain similar, with a focus on planning for infrastructure needs; acquiring assets to meet those needs; developing operational, maintenance, and rehabilitation procedures; and scheduling asset disposal or replacement. Adopting an asset management approach assists municipalities in optimizing their decision-making processes to deliver the levels of services desired by their communities while minimizing infrastructure lifecycle costs.

The Asset Management Roadmap is a multi-year, collaborative strategy designed by PSD to accelerate and facilitate the development and improvement of municipal asset management programs. Its major components include:

1. State of Maturity Report
2. Corporate Asset Management Policy
3. Condition Assessment Protocols
4. Risk Model Development
5. Lifecycle Activity Model Development
6. Financial Strategies & Budget Scenarios
7. Level of Service Framework Development
8. Robust Strategic Asset Management Plan

Improving asset management practices requires a coordinated, step-by-step approach to the individual components of an asset management program. As a first step, it is important to gauge the current state of practice related to asset management in the Town. This allows for a thorough gap analysis to determine where to focus efforts in developing a holistic and robust asset management program. Before moving forward, it is important to assess where you stand first to optimize your efforts.

In pursuit of advancing its asset management program, the Town of Aurora has retained PSD to implement elements in Phase I of PSD's Asset Management Roadmap. This State of Maturity Report satisfies the first stage of the Roadmap; with the AM Policy developed subsequently to satisfy the second stage of Phase I. Although the Condition Assessment Program is not in scope,

it would be beneficial for the Town of Aurora to consider implementing it as the last stage in Phase I of the Roadmap.

Methodology

The State of Maturity Report (SMR) provides an audit of the existing asset management capacity at the Town within the following key competencies:

1. Organizational Cognisance
2. Organizational Capacity
3. Infrastructure Data and Information
4. Levels of Service Framework
5. Asset Management Strategies
    a. Condition Assessment Protocols
    b. Risk and Criticality Models
    c. Lifecycle Management
6. Financial Strategies

The SMR outlines strategic recommendations to improve performance within the key competencies and achieve a higher level of overall maturity. It will also direct the design, development and implementation of additional components of PSD's Asset Management Roadmap, allowing PSD to identify key areas of focus.

To facilitate the current state of asset management maturity report, PSD Staff applied two methodologies:

Asset Management Self-Assessment Tool

The Asset Management Self-Assessment Tool (AMSAT), delivered in a survey format, consists of a series of questions designed to determine an organization's alignment with asset management best practice and international standards. Municipal Staff from various service areas within The Town of Aurora, including Finance, Engineering Services, Operations, and Parks and Facilities, completed this survey. The results are compiled within the body of this report.

Stakeholder Interviews

In addition to the AMSAT, additional information was gathered through a series of in-depth interviews with Town Staff who are either directly involved in, or support the delivery of, service through an asset class. These discussions are used to clarify the features of the organization's asset management program, along with who is responsible for managing and delivering the activities that comprise the asset management process.

The following Staff from the Town of Aurora participated:

- **Michael Spatafora** – Manager of Facilities & Property
- **Anca Mihail –** Manager of Engineering & Capital Delivery
- **Greg McClenny** – Facilities Supervisor
- **Sara Tienkamp** – Manager of Parks & Fleet

- **Steve Filippelli** – Supervisor of Parks & Fleet
- **Dan Naccarato** – Supervisor of Roads
- **Karen Oreto** – Financial Planning – Capital Projects & AMP
- **Laura Sheardown** – Financial Planning – Cash Flow & Investments
- **Daniel Elliott –** Director of Financial Services
- **Lindsay Hayworth** – Supervisor of Water and Wastewater
- **Jennifer Schoutsen** – GIS Infrastructure Analyst
- **Cory Fagan** – Infrastructure Technologist
- **James Jurrius** – AM Technologist
- **Jason Gaertner** – Manager of Financial Planning

Scope

The scope of this State of Maturity Report includes all departments involved with the management or financing of the following asset infrastructure categories:

- Road network
- Bridges and Culverts
- Water Network
- Sanitary Network
- Stormwater Network
- Buildings and Facilities
- Parks and Recreation

Community Profile

Name: Town of Aurora
Population (2016): 55,445
Growth Rate (2011-2016): 4.2%
Area: 49.9 km^2
Private Dwellings Occupied by Usual Residents (2016): 18,851
Median Total Income of Households (2015): $106,708
Key Industries: Business services, Manufacturing, Medical/Health

The Town of Aurora is located in the Greater Toronto Area (GTA) within the York Region; It was originally incorporated as a village in 1863, but with the advancement of rail and agricultural prosperity, became a town and annexed portions of King and Whitchurch Townships in 1970. The Town of Aurora is a growing community of almost 56,000 residents and offers many local

amenities and economic growth opportunities. The Town hosts exciting events such as the Aurora Art Show, the World's Longest Street Festival, and RibFest. Over the next 20 years, the Town of Aurora is anticipated to add 15,000 people and 12,000 jobs to the community.

Current State of Maturity

In the following table, we summarize The Town of Aurora's proficiency in the six key components of asset management and provide a comparison to the national average of all municipalities that have been surveyed:

Asset Management Component	Proficiency Level	National Average
Organizational Cognisance	Intermediate	Intermediate
Organizational Capacity	Intermediate	Intermediate
Infrastructure Data/Information	Basic	Intermediate
Levels of Service	Intermediate	Basic
Asset Management Strategies	Intermediate	Basic
Financial Strategies	Intermediate	Intermediate

As discussed in greater detail in the sections below, the Town demonstrated proficiency similar to the national average in three of the six key competency areas including organizational cognisance, organizational capacity, and financial strategies. The national average for levels of service and asset management strategies is at a basic proficiency level, which reflects the challenges and opportunities most municipalities face in developing service- and performance-driven, sustainable, asset management programs.

The Town demonstrated lower than average proficiency in the area of infrastructure data and information practices, primarily because of the accuracy of current asset valuation and the state of formal infrastructure condition assessment programs. In contrast, the Town displayed higher than average proficiency where levels of service and asset management strategies are concerned.

The analysis and strategic recommendations developed through this SMR are designed to identify and prioritize areas of improvement to assist the Town in achieving a higher level of overall maturity in future.

Current State of Practice

Organizational Cognisance

Asset Management Component	Proficiency Level	National Average
Leadership Team – Understanding of Asset Management	Intermediate	Intermediate
Council – Understanding of Asset Management	Basic	Intermediate
Leadership Team – Prioritization of Asset Management	Intermediate	Intermediate
Council – Prioritization of Asset Management	Intermediate	Intermediate

Organizational cognisance, within this report, relates to the degree to which asset management is both understood and prioritised by senior management and Council. Effective asset management requires strong leadership and a culture of good asset stewardship throughout an organization. Securing organizational buy-in to the principles and objectives of asset management is foundational to the creation and implementation of a sustainable asset management program. Without buy-in, an asset management program is unlikely to produce desired outcomes and organizational benefits will be limited.

After completion of the AMSAT and subsequent Staff interviews, organizational cognisance for senior management and elected officials was identified at an intermediate level overall. This suggests that there is a fairly high degree of familiarity with and buy-in related to asset management principles and practices within the Town of Aurora, aligning with the proficiency of most municipalities. Consideration of the individual components of organizational cognisance, however, reveals that senior management and Council likely demonstrate different levels of maturity in some areas.

In terms of asset management knowledge and understanding, the Town's senior management demonstrated an intermediate level of organizational cognisance. Among the Staff participating in the discussion, the knowledge base is broad and encompasses a range of infrastructure types including roads and associated transportation assets, storm network assets, and non-linear assets (diverse facilities, land, and parks assets). The group has a strong grasp of foundational asset management concepts and best practices including condition assessment, lifecycle activities for different infrastructure types, and the importance of long-range planning, although there is limited experience in implementing some of these practices. The group of Staff also

believes that prioritization of asset management approaches is important for the long-term economic and environmental sustainability of the community and is looking for ways to advance knowledge of and support for a comprehensive program among Staff, Council, and the public. This commitment to adopting and advancing asset management practices within the Town places senior management at an intermediate level of proficiency in this area, as well.

Elected officials are thought to demonstrate a basic level of asset management understanding, and an intermediate level where prioritization of asset management practices is concerned. Council members are typically less familiar with asset management than are Staff members, as the former are not responsible for directly administering and overseeing activities such as operation and maintenance of infrastructure, completing condition assessments, or considering the risk associated with specific assets. The existence of this kind of knowledge gap can make it more challenging for senior management and Council to communicate effectively. Council has, however, previously approved several major documents and plans that focus on sustainable use of financial and natural resources, such as the Strategic Plan (2011-2031), and an Asset Management & Investment Plan (2017). The Strategic Plan identifies several focus areas and strategic actions as a priority for the community over the upcoming years, and many of these align with and would be supported by implementing a holistic asset management program. This alignment represents an opportunity for Staff and Council members to discuss asset management initiatives, and work together to make asset management a community priority.

While the Town displays a strong culture of good infrastructure stewardship, it is important that municipal Staff continue to work internally, and with elected officials, to expand their knowledge of and commitment to the principles and practices of asset management. Developing a communication plan and ongoing knowledge-sharing program is one way to advance organizational cognisance among both senior management and Council.

Organizational Capacity

Asset Management Component	Proficiency Level	National Average
Human Resources for Asset Management	Intermediate	Intermediate
Staff Knowledge for Asset Management	Intermediate	Intermediate
Cross-functional Team for Asset Management	Intermediate	Intermediate

Organizational capacity refers to the ability of an organization to develop and execute upon the key components of an asset management program. High organizational capacity to undertake asset management includes adequate human resources and Staff knowledge, and a cross-functional team working together towards a mutual goal. A cross-functional team is vital to a sustainable asset management program, as it promotes multi-directional communication

between service areas, allowing them to develop robust recommendations that assist Council in making strategic, well-prioritized infrastructure decisions.

Following the AMSAT and Staff interviews, it was determined that the Town's overall capacity to develop its asset management program is currently at an intermediate level. There is a high level of engagement among the senior management team in development of the Town's asset management program, but a sense that asset management-specific knowledge could be expanded across the organization. Staff specialize in a broad range of municipal services dealing directly with infrastructure, including roads/public works, parks and recreation, and planning and development. In addition, Staff in other services areas such as treasury and finance, information technology, and human resources provide vital expertise and support necessary to resource and implement a comprehensive asset management program.

The development of an asset management program requires not only knowledge of individual service areas and infrastructure types, but an in-depth understanding of how best practices can be implemented in a holistic way across all levels of an organization. Current Staff do not always have the time to cultivate this kind of specialized knowledge and experience as they must continually balance their daily responsibilities with the additional demands of asset management.

It is important that Staff be supported in advancing their knowledge through training and education on asset management best practices. This could include participation in conferences, workshops and webinars provided by leaders and educators in the asset management industry, as time and available funding allow. It could also involve collaborative knowledge-sharing with nearby municipalities that face similar challenges to those the Town of Aurora faces, working together to brainstorm local solutions for local problems. Developing adequate Staff knowledge and expanding on existing capabilities by equipping Staff with current information, will help ensure that Staff are able to promote continuous improvement and development of the Town's asset management program within their own departments, across the organization, and to Council and the public.

Though asset management should be the responsibility of all Staff at the Town, it is challenging for current Staff to develop or advance a robust asset management program while simultaneously balancing other daily activities for which they are explicitly responsible. Staff are engaged and passionate about implementing more effective ways to manage the Town's infrastructure but indicate that it is difficult to prioritize strategic work on this front.

Participants in the AMSAT discussion indicated that there is sufficient asset management work to justify dedicating, at minimum, a half-time position. As Staff and Council take strides to implementing the Strategic Plan and reviewing progress, it would be beneficial to continue discussions about Staffing levels and the scope and expectations of delivering the Town's asset management program. Consideration of funding for an asset management position should be based on how dedicating resources in this way can help the community better achieve its short- and long-term goals. It may also involve discussion about how different municipal services and infrastructure program needs can be prioritized to optimize Staff time and work outcomes. Senior Staff, including those who participated in the AMSAT discussion, meet both formally and

informally to share information and make planning decisions related to project and budget prioritization.

Infrastructure Data / Information

Asset Management Component	Proficiency Level	National Average
Inventory	Intermediate	Advanced
Accounting Compliance	Intermediate	Intermediate
Development of Current Valuation	Basic	Intermediate
Development of Condition Assessment Programs	Basic	Basic

Having comprehensive and reliable data is a critical component of a strong and sustainable asset management program. Accordingly, data collection and management processes and procedures should be implemented to ensure that data is accurate and accessible for planning, structuring and improving asset management practices. Heavily dependent on the accessibility and quality of infrastructure data are asset management plans, that document the current state of infrastructure and outline anticipated future needs and the lifecycle activities and financial strategies required to achieve sustainability.

Currently, the Town houses its inventory data for reporting purposes on the CityWide AM platform. Municipal Staff indicate that the CityWide inventory is fairly comprehensive and accurate for all infrastructure assets and are currently in the process of verifying and reconciling the information that they collect and track within their databases. The Town utilizes a few databases such as CityWide, Maximo, ArcGIS, and excel spreadsheets to collect and track various assets. It would be beneficial to consolidate all these different bases into one.

PSD-recommended attribute data for all asset classes includes fields such as historical cost, current replacement cost, in-service date, and estimated useful life. As housed in CityWide, these fields are comprehensively populated. Other fields, such as those related to location, quantity, and unit of measure, and assessed condition, are less well populated and there are some inconsistencies in available data. In order to move forward, validation of attribute data will be a critical early step in developing a robust and manageable asset management system to maximize analytical capabilities.

The state of the Town's data for each asset class included within the scope of this report is as follows:

Road Network

The Town's road network inventory is stored on PSD's CityWide AM data platform with 202 kilometres of roadway broken into arterial, local, and collector depending on the design class. The data related to these assets is believed to be accurate, but not comprehensive. Most of the key attributes for the road segments are comprehensively populated, including category, in-service date, estimated useful life, and current replacement costs. However, a more accurate inventory of the roads network is stored in the ArcGIS database that Staff are actively trying to align with the CityWide AM database. On an annual basis, Staff update the ArcGIS database with any new additions, expansions, or rehabilitations and then update the CityWide inventory accordingly. An asset reporting policy is currently being developed to address this workflow process. There are 198 kilometres of sidewalk that are broken into individual assets within CityWide AM. The Town of Aurora has 4,796 streetlights that are tracked on a separate GIS layer along with other appurtenances such as guiderails, curb and gutter, and signage. Alongside the ArcGIS database, Staff also use a PMS database to track their quality scoring and condition assessment information for their road assets as well as Maximo to track their work order process. All these databases can and do speak to each other at a high-level, but more manual labour is required to clean up and pair them more accurately with the right IDs; part of the challenge is the different ways the road network is broken up in each database. The data in the PMS system is set up as polygons whereas the ArcGIS database has both linear and polygon road data. Having a more standard segmentation for the roads will help bridge these gaps and standardize the format that all the various databases use.

There are some condition assessment programs, though mostly informal, that are tracked through the PMS system and Maximo. For the road network, an external contractor is hired to conduct condition assessments every 3-5 years and provides an overall Pavement Quality Index (PQI) for each road. The 10-year capital plan is updated according to the results of the assessment and projects are planned out accordingly. The Town also manages a 20-year capital plan and 50-year road reconstruction/rehabilitation plan but note that it is much less reliable. Sidewalks are inspected annually, in compliance with the Minimum Maintenance Standards (MMS), by an external contractor. Signage, curb and gutter, and street light repairs are also tracked and completed on an annual basis to comply with MMS; however, Staff have noted their interest in having a more formal process in place to keep track of all sign replacements and any repairs that are typically left in paper form and not updated on any of the databases.

There are some risk management and project prioritization processes in place, though they are largely informal. Engineering Services staff rely on the condition rating from their inspection program and PMS system as well as Operations Staff expertise to recognize critical condition issues. Depending on the recommendations, projects are prioritized based on funding availability, feasibility, and risk ranking. Staff follow a specific service standard for their road rehabilitation based on the PQI value the roads receive. The PMS system also factors in degradation curves and the historical result of such lifecycle activities on those roads.

Staff also try to optimize the cost of projects by collaborating with underground infrastructure assets and other Right of Way assets. Most sidewalk projects, however, are triggered by the age-based deterioration of the assets and their need of replacement. A more formal risk program needs to be incorporated for these assets. Staff are currently in the process of developing a formal risk program of this nature for the noted asset category. The Town of Aurora Staff track some levels of service metrics for the road network such as PQI for roads and rideability comfort. Some vehicular accidents are also tracked and can influence design speed changes. The development and implementation of a Transportation Master Plan in 2016 has also allowed Staff to look at their current and target levels of service in relation to their road network and the expectations of Public and Council. In future, developing a robust levels of service framework will help Staff optimize investment through informed decision-making processes. This kind of framework should be based on community and technical metrics outlined in the O. Reg. 588/17.

Bridges and Culverts

The Town of Aurora owns and maintains 2 bridges and 788 culverts, but only 35 of these culverts require Ontario Structure Inspection Manual (OSIM) inspections on a biennial basis. Infrastructure data for both bridges and culverts are captured within ArcGIS and CityWide AM with most key attribute data such as historical cost, in-service date, estimated useful life, and location present. As with some other types of municipal infrastructure, bridges are composed of multiple components or elements that may have widely different life spans or expected useful lives (EUL). Individual bridge components also often have substantially different operational, maintenance, and replacement requirements; as a result, it would be beneficial to identify these different components as separate assets for management and investment planning purposes. Currently, Staff rely solely on the recommendations from the OSIM reports to prioritize projects and budget for them accordingly.

There is no formal risk model in place to identify which bridges represent the Town's most critical needs. However, the OSIM reports provide some context that experienced Staff consider when managing their assets, and Staff also consider pairing culvert work with other road network work to optimize the cost of the overall project. This attempt at aligning with road work shifts the priority of certain culverts and helps Staff focus on the right assets to replace and rehabilitate. Smaller culverts such as driveway or entrance culverts are regularly inspected by internal Staff and are prioritized on a project-by-project basis or as a result of complaints.

There is currently no level of service framework in place for the Town's bridge and culvert assets. Most service levels are based on any health and safety dangers or compliance issues that come about from the experienced Staff and OSIM; some complaints are tracked through a Microsoft Dynamics customer service software, but that information is not reported on and does not feed into the work order system that the Town utilizes. As mandated by the O.Reg. 588/17, tracking any loading or dimensional restrictions as well as the average bridge condition index (BCI) on the Town's bridges and structural culverts will enable the Town to maintain a reliable level of service that the Public and Council find acceptable.

Water Network

The Town's water network consists of approximately 220 kilometers of water main, in addition to 1475 hydrants, 2586 valves, 1 booster structure with 3 pumps, and 81 commercial or residential meters. There is also a water booster station and an underground enclosure that houses valves. CityWide AM contains a rudimentary inventory of these assets that is fairly complete according to Staff. However, some water structures appear to be pooled, such as meters and valves, and would benefit from being separated for better management of these assets. The complete inventory is also linked to the GIS system and includes spatial and attribute data. The Town does not own or maintain the water treatment plant; that is managed by the overseeing municipality, City of Toronto that is in charge of it.

For all assets in the water network, recommended CityWide attributes related to condition and lifecycle intervention activities are nearly universally incomplete. Data from direct condition assessments for the linear water network is not available; as do many municipalities, the Town instead relies on age- and material-based predictions of asset condition to estimate infrastructure deterioration rates. There are no formal condition assessments on the water structures, but Staff regularly inspect them on a weekly and monthly maintenance schedule. The Town abides by the Drinking Water Quality Management System (DWQMS) to ensure that they are completing the minimum requirements of inspecting their water network. Nevertheless, populating the CityWide inventory with these inspection results would assist with optimizing operational and maintenance work plans.

The Town has a watermain relining program that they have implemented for over 10 years; pipe segments are identified based on their break history, age, and associated road/subsurface potential work. Due to the aggressive soil terrain that the Town of Aurora is on, pipes are typically ductile or cast iron with cathodic protection. Staff note that a soil study would be beneficial to understand the extent of damage that the soil has on the pipes, and to factor in more cathodic protection where necessary. Hydrants are annually flushed and inspected, with valves being exercised alongside the hydrants. The booster station is currently being by-passed and is not in use, however, it is still being routinely checked to ensure its functionality.

The Town does not have any formal risk or prioritization frameworks in place. Age, pipe material, break history, and detected leaks are used as proxies to estimate the probability of failure for water mains. Operational Staff also track pressure issues and history of service, valve, and hydrant repairs to approximate the associated risk of failure of these assets.

Levels of service are not formally tracked with the purpose of evaluating infrastructure performance. Town Staff do compile information related to watermain breaks and collect data through different databases. Although the Town does not report to initiatives such as the National Water and Wastewater Benchmarking Initiative, Staff submit the data that they track to the Region of York. Staff have identified a need to consolidate all this data, an activity that could be used to develop a formal level of service framework. Furthermore, a hydraulic model has been created of the entire town that will serve to benefit Staff when they are improving

their water infrastructure and building lifecycle activities to extend the service life provided to residents.

Sanitary Network

The Town's sanitary network consists of approximately 193 kilometers of sanitary mains, 143 kilometres of sanitary laterals and includes 2 equalization tanks, 2,722 manholes, 6 pumping stations/structures, and 6 underground enclosures. As is the case with the water network, these assets are captured in CityWide AM, with spatial and attribute information for sewers also contained in georeferenced GIS files.

The wastewater treatment plant is owned and maintained by Durham Region. Some work orders are tracked on Maximo, with the maintenance and repair history tracked within the MS Access database. As with the road, bridge and culvert, and water infrastructure datasets, most of the key attributes for linear sanitary infrastructure are well populated. This includes category, in-service date, replacement cost, and estimated useful life. Attributes for sanitary structures are similarly well populated, apart from current replacement values. For all assets in the sanitary network, other recommended attributes related to condition and lifecycle intervention activities are largely unpopulated. The 'Street From' and 'Street To' fields for assets in the collection system are blank, which makes it difficult to identify specific sewer segments by location from within the CityWide inventory. However, Staff do utilize unique user IDs, known as Import ID in CityWide AM, that correspond to specific segments on the roads network.

Direct condition assessments, in the form of CCTV inspections, are available for a limited number of mains and laterals. The Town has implemented a program to slowly inspect the entire sanitary network within the next few years. Where CCTV has not been completed, the Town relies on age-based predictions of asset condition to estimate sewer deterioration rates. The lift stations and pumping stations are maintained by a contractor on a weekly and monthly basis. There is also a hot-spot sewer flushing program that is performed six times a year to address operational and maintenance issues. There are some risk management processes and levels of service metrics in place, though they are not formally documented. In conjunction with data from CCTV inspections, Staff are working to align subsurface infrastructure needs with road rehabilitation and reconstruction needs. Sewer backups are tracked and shared with the York Region for external benchmarking. Moreover, a hydraulic modelling plan is also planned to factor in several levels of service to ensure that residents are satisfied.

Stormwater Network

The stormwater network includes 174 kilometres of storm sewers, 110 kilometres of storm laterals, 2,732 manholes, 4,930 catch basins, 15 storm equalization tanks, 2 underground enclosures, valves, and 188 headwalls. Staff also manage 53 stormwater management ponds. The Town is also responsible for driveway culverts and several ditches as part of their drainage system. Although CityWide has a fairly accurate inventory, the entire inventory is more up-to-date on the GIS database. Staff try to update both systems to ensure that they align with each other. However, when it comes to drainage collectors, there is more work to do to integrate them into the stormwater network and track them accurately on CityWide. The stormwater management pond inventory is not complete because many of the ponds do not have significant infrastructure associated with them, but they are all captured within GIS with their pertinent attribute data such as type, drainage area, dimensions, installation year, and estimated replacement value. The Town is working alongside York Region to develop a better data model to collect better data on their culverts.

There are some condition assessment programs, though mostly informal. Storm sewers are CCTV inspected on a project-basis or based on complaints; some of the storm network has undergone CCTV inspections, but Staff have recently commenced a program to CCTV the entire network. The Town's goal is to undertake CCTV inspections on approximately 10% of its total storm asset inventory per year. Future capital and inspection plan iterations will be revised in response to CCTV data as it becomes available.

Similar to CCTV, but substantially less costly, are zoom camera inspections. These inspections involve insertion of a zoom lens camera into maintenance holes to get a high-level scan of sewer interiors, which can help Staff identify severe defects such as sewer collapses and target areas that require additional, more detailed inspection. Zoom technology also allows operators to capture GPS coordinates for maintenance holes and validate sewer locations, information that can be used to develop a complete storm network database for upload into CityWide AM. Stormwater management ponds were inspected in 2007 by an engineering consulting company to look at sediment accumulation and to recommend any lifecycle activities. Staff are currently implementing a storm pond remediation (i.e. dredging of sediment) program on a two-year cycle. Also, staff currently perform a semi-annual assessment of and perform routine maintenance on all storm water management ponds. Storm structures such as manholes and catch basins are visually inspected for deficiencies regularly using a collector application. For the Town's underground storm water equalization tanks, there is a program in place to identify any deficiencies proactively. A contractor was also hired in 2017 to assess these assets and provide recommendations on lifecycle activities to perform to extend their service life. Furthermore, Staff make sure that they are compliant with the Lake Simcoe Protection Plan (LSPP) and fulfill all necessary legislative requirements to maintain their stormwater network.

Uploading condition and lifecycle intervention activity data, as it becomes available, will also assist Staff in evaluating the risks, costs, and benefits of different investment alternatives more effectively. No formal risk management or prioritization frameworks have been established to

guide storm infrastructure investment. Staff have developed an internal methodology to manage and maintain their stormwater assets based on subject matter expert input as there are no legal or regulatory requirements in place currently. As an example, a stormwater lining program was developed that tackled any stormwater pipe in very poor soil as a preventative task. Overall, Staff have a good grasp of their trouble areas and assets in critical health, and Council is typically receptive to Staff's recommendations. Having a secure reserve fund for the stormwater network , as is present for the other underground infrastructure assets as well, along with a steady stormwater rate has helped alleviate the stress on tax-based funding and allowed Staff to fund more projects and operating and maintenance (O&M) activities.

As with other infrastructure categories previously considered, there is no formal process in place to document and report on the service provided by storm assets. However, public input and health and safety measures heavily influence the focus of stormwater service deliverables. A Stormwater Assessment Plan was also developed that analyzed and modelled flooding and provided recommendations based on different scenarios. Additionally, metrics from the O.Reg. 588/17 and National Water and Wastewater Benchmarking Initiative could be adopted, as relevant, to expand such a framework to make it more robust.

Buildings & Facilities

The Town maintains comprehensive data for its buildings and facilities in CityWide AM such as the community centre, firehall, library, museum, and many more. Key attribute fields such as category, segment, historical cost, in-service date, estimated useful life, and current replacement cost are populated fairly comprehensively. Many buildings are broken down into their proper components and not many are pooled. These buildings were last appraised in 2008 for insurance purposes and a fair market value appraisal is scheduled for 2019 as well; this information can be uploaded into CityWide AM as it becomes available.

A facilities condition assessment (FCA) was completed last year and details all the necessary replacements and repairs for the next ten years. Staff have incorporated these lifecycle activities into the 10-year capital plan and update it regularly if anything changes. However, the condition assessment rating for each building is not uploaded into the CityWide AM inventory and would be beneficial to track there to assist in analysis and planning efforts.

Most lifecycle activities are performed based on health and safety inspections, accessibility issues, or public complaints. Town Staff follow an Accessibility for Ontarians with Disabilities Act (AODA) plan that identifies and addresses related issues within the community's buildings/facilities. Moreover, the Joint Health and Safety Committee (JHSC) completes monthly inspections and provides their information and recommendations to the Facilities supervisor to act upon. These inspections are tracked through the Maximo work order system. There are no formal risk management models or processes in place to help prioritize facilities capital projects, it is mostly managed in alignment with the FCA that was performed recently. However, internal Staff perform visual inspections on a daily, weekly, or monthly schedule to identify any changes or reactive projects that are not factored in the 10-year plan. There is also a dedicated reserve

fund available for buildings and facilities that supports the recommendations that Staff need to perform.

Levels of service are not formally tracked as part of any comprehensive framework; however, Staff track participation numbers and usage of certain programs that they provide within their facilities. Building a more formal level of service framework will allow Staff to align their project prioritizations to the expectations and needs of the public.

Parks & Recreation

The Town of Aurora is responsible for many park amenities such as 55 soccer fields, 44 playgrounds, 57 kms of trails, 5 splash pads, and many more. The inventory within CityWide is fairly comprehensive and separated into the individual components for the most part. Some features and assets are also tracked within the GIS system. A comprehensive tree inventory is also present and is updated on a 5-year cycle by a third-party contractor. Staff utilize Maximo to plan their playground inspections and other preventative maintenance tasks. Most of the key attribute fields, including category, in-service date, and current replacement costs are available, but

As with the Town's facilities assets, the data structure for park assets could be more effectively structured in some instances. Expanding more summarized asset information into its more detailed asset components, where applicable, would enable more efficient analysis and reporting for all parks and recreation infrastructure going forward. It would also enable Staff to analyze where best to build new park assets as well.

There are condition assessment programs in place, based on the CSA Standards, that Staff abide by on a monthly basis to inspect their parks, playgrounds, trails, and associated infrastructure. Splash pads and washrooms are inspected on a daily and weekly basis due to health and safety regulations. There is also an urban forestry policy that dictates vegetation management as well as tree replacements. Other park assets such as soccer fields and park buildings are visually inspected and have lifecycle activities recommended for. However, adopting more formal condition assessment protocols, and documenting the results against individual assets within CityWide AM, would help Staff compile the information that is required to optimize operational and maintenance work plans as well as to conduct long-term strategic planning.

There are formal risk prioritization and programs in place that Staff consider and abide by. The Town of Aurora has a Trails Master Plan (2011), a Parks and Recreation Master Plan (2016), Parks and Maintenance Standards (2015), Urban Forestry Management Policy (2016) and a Corporate Environmental Action Plan (2018) that identifies many of the risk prioritizations, levels of service and growth opportunities that can be implemented to provide the residents of Aurora with spectacular parks and recreational services. The Town of Aurora has an extensive understanding of the levels of service to provide to their Public and strive to implement the necessary recommendations and changes, where applicable, to sustain Aurora's beautiful natural green space and recreational amenities.

Levels of Service

Asset Management Component	Proficiency Level	National Average
Strategic Plan (Infrastructure Goals)	Intermediate	Intermediate
Current Levels of Service Analysis	Basic	Basic
Legislative and Regulatory Requirements	Intermediate	Intermediate
Levels of Service Framework Development	Basic	Basic

Simply stated, levels of service refer to the way assets perform their intended functions and are based on the quantity and quality of infrastructure such as roads, bridges, and storm sewers. Public expectations and regulatory and technical parameters inform how each community defines its levels of service, as do considerations of risk management and financial affordability. Ideally, service levels should drive asset management strategies, which in turn will drive funding strategies and short- and long-term budgets. This should be reflected by aligning strategic organizational objectives with desired service outcomes, monitoring actual asset performance against key performance indicators, and reporting results to key stakeholders such as Council and the public.

Based on the AMSAT results, the Town is more developed than many municipalities across Canada and is at an intermediate maturity level. This is because the Town of Aurora has developed specific policies and master plans detailing the levels of service they want to target and the preliminary steps they need to take to achieve them. This provides a solid foundation upon which to build a levels of service framework that supports Council's long-term goals and objectives as well as metrics to gauge success.

These documents also identify the roles and responsibilities of various stakeholders, resources required to complete the action, and performance indicators for each strategic objective. The legislated community and technical metrics for core infrastructure articulated in O. Reg. 588/17, and Staff knowledge of other legislative and regulatory requirements related to road maintenance, underground infrastructure management and structure inspections, provides an excellent foundation for Staff and Council to build a robust levels of service framework. Aggregating this into a formal framework will enable the Town to comply with legislation and

provide meaningful information to the community while building support for a sustainable asset management program.

Asset Management Strategies

Asset Management Component	Proficiency Level	National Average
Current and Future Asset Performance	Intermediate	Intermediate
Growth and Demand Planning	Advanced	Basic
Risk Management	Basic	Basic
Prioritization and Program Optimization	Basic	Basic

Asset management strategies should establish a suite of proactive activities to understand, prioritize and optimize infrastructure programs. This helps municipalities manage risk while continuing to provide expected services to the community, at the lowest total cost of ownership over each asset's life. Robust asset management strategies include condition assessment protocols and overall needs assessment, lifecycle management frameworks, and risk management and prioritization techniques. These strategic elements are often considered as asset management plans are developed and should be reviewed and updated on a regular basis.

The Town has systematic condition assessment protocols in place for some of its major asset categories. Informal assessment has been conducted for several assets, including buildings, facilities, and park assets. Formal assessments have been conducted on a small portion of the total asset portfolio, with the primary focus on the road network and legislated structure inspections; these assessments allow Staff to conduct consistent analysis of infrastructure and make informed decisions about appropriate lifecycle activities. Accurate condition data is required to enable advanced forecasting and analysis for risk, lifecycle and financial strategies, and the Town of Aurora has been able to do that through their 10-year capital forecast plan. Working toward establishing formal, organized, and repeatable inspection protocols for all major asset categories will help the Town gain a better understanding of the current state of infrastructure to plan more effectively for the future even more proactively.

The Town does apply a range of lifecycle activities to its roads and bridge and culvert structures. For road assets, Staff complete repair and preventative maintenance activities (e.g., crack sealing, pot hole filling, etc.) depending on the PQI of the roads section. Staff also identify candidate road segments for rehabilitation (e.g., partial or full depth resurfacing) and replacement through the annual capital plan. Lifecycle activities for structures are driven by the OSIM inspection process, and are generally implemented as per the structural engineer's recommendations

Developing more robust condition assessment programs will assist the Town in advancing their lifecycle activity work for all major asset categories, in particular for buildings and facilities and park infrastructure. The building condition assessments and park inspections serve as a great basis to understand the condition the Town's assets are in and prioritize projects according to health and safety standards, accessibility, compliance, and to maintain their targeted service levels. Taking this kind of approach will help the Town optimize operational and maintenance practices, improve long-term capital investment planning, and provide improved service to the community while reducing overall costs and risk.

Municipalities often need to invest in infrastructure for reasons other than poor physical condition. Common causes can include a need to comply with changing regulatory requirements; anticipated increases in service demand due to community growth; operational and maintenance issues that impede proper asset function; and inadequate capacity of assets to perform as designed. Town of Aurora Staff have a strong understanding of regulatory requirements for road network and structure infrastructure and are proactively working to address legislated requirements under O. Reg. 588/17.

Regarding project and program prioritization, there are some network-level risk frameworks or risk matrices in place that determine what assets should be prioritized for field intervention. Needs are identified and brought forward for consideration based on a combination of functional requirements, estimated asset condition, and budget availability. Creating standardized risk matrices will allow the Town to assess all needs across the corporation with the same set of criteria and will help Staff and Council identify truly critical projects more efficiently.

Town of Aurora completed its firstAsset Management Plan (AMP) in 2014.   It is in the process now of undertaking a scheduled review and update of its AMP. With the recent update of the Infrastructure for Jobs and Prosperity Act, 2015, and passage of Ontario Regulation (O. Reg.) 588 Asset Management Planning for Municipal Infrastructure, the Town should re-evaluate its approach to developing an AMP so that it aligns with all new requirements. A comprehensive AMP uses available asset data to develop financial strategies that consider the lifecycle needs of all municipal infrastructure. Furthermore, it will allow the Town to make data-driven decisions to project and optimize long-term funding needs and serve as an essential communication tool with Council and the community.

Financial Strategies

Asset Management Component	Proficiency Level	National Average
Financial Requirements	Basic	Basic
Funding Strategies	Advanced	Intermediate
Investment Strategies	Advanced	Intermediate

Alignment to Strategic Plan	Basic	Basic

Town of Aurora, like many mid-sized communities across Canada, faces significant challenges in achieving fiscal balance on an annual basis. However, the presence of secured reserve funds for various assets as well as rate-based services such as water and storm enable the Town to advance its financial strategies to improve its existing asset inventories, desired levels of service, and projected asset requirements. This allows the Town to identify resources required for sustainable asset management in the short- and long-term, to ensure that available funds are optimized to achieve the greatest community benefit.

The Town currently develops the capital and operating budgets through a collaborative process between Staff and the senior management team. Though there has been some analysis of short-term capital and operating/maintenance infrastructure requirements, it is premised on an incomplete understanding of overall asset condition. Council is responsible for approving the final business plan and has the opportunity to review and revise the budget that is recommended by Staff.

Moving forward, the collection of additional asset attribute data, including assessed condition, will be increasingly important as the Town considers options to achieve sustainability in both short-and long-range financial planning exercises. Collection of accurate, up-to-date condition assessment and other needs data will help optimize capital investment decisions such that they are based on detailed and strategic analysis of present and future needs instead of simply Staff knowledge. The allocation of capital and operating dollars may begin to shift, once Staff and Council have a better idea of needs across the Town's asset portfolio.

As asset information becomes more detailed and robust the short-term budget should be re-visited to make sure critical needs are addressed and to reassess overall capacity and affordability. To optimize the Town's 10-year plan and even 20- and 50-year plan, Staff will need to analyze recommended lifecycle activities, asset management strategies, and level of service considerations; this can be accomplished in incremental phases, to reflect a maturing state of knowledge.

Recommendations

In the following section, we provide an overview of some key strategic recommendations that have been developed based on the Town's current state of maturity. The recommendations are a combination of activities that would be undertaken as part of PSD's Asset Management Roadmap, in addition to other actions that we suggest could be taken on the initiative of the Town.

The impact of each recommendation, and the effort to complete it, are identified at a high-level. This is based on an understanding of the Town's current state of asset management practice,

organizational capacity, and financial condition. Both impact and effort can be classified as high, medium, or low. Where impact is high, and effort is low or medium, this represents a relatively quick win for Town of Aurora Staff and Council in advancing the Town's asset management program. Where impact is high, and effort is also high, delivering on these recommendations will likely require a long-term approach with dedicated Staff and financial resources. Using this matrix, the Town can prioritize efforts to implement recommendations more effectively and efficiently. Depending on how the Town decides its Staff and financial resources are best prioritized, some, all, or none of these recommendations may be implemented, in whole or in part.

Organizational Cognisance

Recommendation	Estimated Impact and Effort
Provide opportunities for senior management and elected officials to attend webinars, educational conferences and workshops to expand their knowledge of asset management principles and practices.	**Impact:** High **Effort:** Low to Medium
Provide training on CityWide Asset Manager for all Staff involved in asset management activities.	**Impact:** Medium **Effort:** Medium
Promote the need for, and the benefits of, improved asset management practices to all current and future Staff and elected officials.	**Impact:** Medium **Effort:** Medium

Organizational Capacity

Recommendation	Estimated Impact and Effort
Continue to advance the Town's asset management program through a balance of internal Staff and industry consultants.	**Impact:** High **Effort:** Medium
Explore Staffing needs required to manage infrastructure effectively, with a focus on leveraging existing Staff knowledge and experience and creating cross-disciplinary in-house experts.	**Impact:** High **Effort:** High
Provide opportunities for key internal Staff to attend webinars, educational conferences and workshops delivered by leaders in the asset management industry.	**Impact:** High **Effort:** Medium
Educate and train key personnel in sustainable asset management practices including database management, condition assessment protocols, and lifecycle activity strategies.	**Impact:** High **Effort:** Medium
Capture and archive experiential Staff knowledge to ensure critical information remains available in future for new Staff members.	**Impact:** High **Effort:** Medium

Infrastructure Data / Information

Recommendation	Estimated Impact and Effort
Consider undertaking a data justification exercise to identify what data is required to effectively manage each asset class going forward.	**Impact:** High **Effort:** High
Consolidate all infrastructure-related data (inventory, condition, needs, prioritized requirements, financial data and GIS data) currently housed in CityWide and various reports, ArcGIS, and Maximo into a centralized asset registry database for the Town.	**Impact:** High **Effort:** High
Provide ongoing training to asset management personnel who will be responsible for collecting and entering data on a routine basis into the main asset registry.	**Impact:** High **Effort:** Medium
Develop and implement a data governance policy that outlines a consistent corporate approach to the maintenance and management of the Town's databases, including data handling procedures, roles and responsibilities.	**Impact:** High **Effort:** Medium
Develop a process for how new assets should be merged between the CityWide AM inventory and the Town's ArcGIS.	**Impact:** Medium **Effort:** Medium
Explore the viability of integrating or linking Maximo and the CRM system to streamline work order and service request processes.	**Impact:** Medium **Effort:** Medium

Levels of Service

Recommendation	Estimated Impact and Effort
Develop detailed level of service frameworks for all asset categories, with both community-oriented and technical performance components, based on O. Reg. 588/17 requirements, industry best practice, Staff input, Council direction, and community consultation.	**Impact:** High **Effort:** High
Develop key performance indicators (KPI) that reflect important organizational objectives to assess whether strategic priorities are being achieved.	**Impact:** High **Effort:** Medium
Consider adopting relevant reporting metrics like those outlined in the National Water and Wastewater Benchmarking Initiative (stormwater), Canada Infrastructure Report Card (all asset categories), and Municipal Benchmarking Network Canada (all asset categories).	**Impact:** High **Effort:** High

Asset Management Strategies

Condition Assessments

Recommendation	Estimated Impact and Effort
Consolidate existing condition information from road patrols, up-to-date reports and studies, informal Staff inspections, and community inquiries/complaints into a single database for ease of tracking, analysing, and reporting on infrastructure condition.	**Impact:** High **Effort:** Medium
Implement routine condition assessment protocols, and work toward gathering assessed condition information for the Town's core infrastructure assets (roads, bridges, culverts, and stormwater management) as well as building assets and park infrastructure. Consider adopting internal condition assessment protocols, carried out by Town Staff, as appropriate for the existing asset portfolio and as resources allow.	**Impact:** High **Effort:** High
Develop inspection protocols for stormwater management assets, including sewers, culverts and ditches, complete with data specifications, to obtain current and accurate condition data to mitigate flooding, environmental damage, and other associated climate change impacts.	**Impact:** High **Effort:** Medium
Consider adopting a Facilities Condition Index system to quantify the condition and investment needs for the Town's building and facilities portfolio.	**Impact:** High **Effort:** Medium
Upload future asset condition assessment data to CityWide AM and update based on new condition assessment results as well as repair, rehabilitation, and/or replacement activities as they are completed.	**Impact:** High **Effort:** Low

Lifecycle Management

Recommendation	Estimated Impact and Effort
Develop lifecycle frameworks for all major infrastructure categories including field intervention activities (operational and maintenance, rehabilitation, and replacement) and trigger points (condition and/or age) at which certain activities should be performed.	**Impact:** High **Effort:** High
Match the lifecycle frameworks to asset-specific deterioration curves and load them into CityWide AM.	**Impact:** High **Effort:** High

Risk Management Frameworks

Recommendation	Estimated Impact and Effort
Develop network-wide risk management frameworks that determine the criticality of infrastructure and quantify the impact of failure against service delivery for all asset categories.	**Impact:** High **Effort:** High

| Develop risk matrices based on probability of failure, the consequence of failure, and any mitigating factors across all asset categories. | **Impact:** High
Effort: High |
| Implement risk management techniques that provide a structured and data-driven approach to project and program prioritization. | **Impact:** High
Effort: Medium |

Asset Management Plan

Recommendation	Estimated Impact and Effort
As additional data is collected, develop an updated asset management plan that includes an analysis of all infrastructure assets and the annual requirements necessary to sustain existing infrastructure while minimizing cost and risk to the community.	**Impact:** High **Effort:** High
Update the asset management plan on a regular basis to include newly acquired assets and to assess the progress of the Town's asset management program. Consider adopting an update schedule that aligns with future compliance requirements for O. Reg. 588/17.	**Impact:** High **Effort:** Medium

Financial Strategies

Recommendation	Estimated Impact and Effort
Support development of Staff knowledge and experience related to grant funding applications.	**Impact:** High **Effort:** Medium
Continue updating the capital forecast plans based on the best information available regarding the actual needs and optimized requirements of the Town's capital assets.	**Impact:** Medium **Effort:** Medium