

Municipal Parking Asset Management Plan



Version No. 1

June 2021

Contents

- 1. Executive Summary 4
 - 1.1. Purpose 4
 - 1.2. State of the Infrastructure 4
 - 1.3. Level of Service 5
 - 1.4. Asset Management Strategy 5
 - 1.5. Failure Prediction and Risk Management..... 6
 - 1.6. Long-Term Need 6
 - 1.7. Future Demand..... 6
 - 1.8. Climate Change..... 7
 - 1.9. Next Steps 7
- 2. Introduction 8
- 3. State of the Infrastructure 9
 - 3.1. Asset Data Inventory 9
 - 3.2. Asset Valuation..... 9
 - 3.3. Estimated Asset Value 9
 - 3.4. Asset Useful Life..... 9
 - 3.5. Asset Condition Assessment 9
 - 3.6. Current Asset Condition 10
- 4. Levels of Service 11
 - 4.1. Community and Strategic Level of Service..... 11
 - 4.2. Asset Level of Service 12
- 5. Asset Management Strategy 13
 - 5.1. Maintain or Adjust Level of Service 13
 - 5.2. Lifecycle Management Plan 13
- 6. Failure Prediction and Risk Management 14
 - 6.1. Failure Prediction..... 14
 - 6.2. Probability of Failure (PoF) 14
 - 6.3. Consequence of Failure (CoF) 14
 - 6.4. Risk Assessment and Exposure 16
 - 6.5. Risk Response 16
- 7. Long-Term Needs..... 18
 - 7.1. Infrastructure Reinvestment Financing Strategy 19
 - 7.2. Sustainability Strategy 20

7.3. Next Steps	20
8. Future Demand.....	21
8.1. Demand Drivers.....	21
8.2. Demand Forecasts and Impact on Assets.....	21
8.3. Demand Management Plan.....	22
9. Climate Change	25
10. Improvement Opportunity.....	28
Appendix A – Municipal Parking Asset Condition	1
Appendix B – Municipal Parking Risk Exposure	2
Appendix C – Municipal Parking Risk Exposure and Condition Ranking.....	4

Figures

Figure 1: Municipal Parking Risk Exposure	16
Figure 2: 60-Year Capital Need Summary	18

Tables

Table 1: Municipal Parking Asset Inventory	9
Table 2: Municipal Parking Inventory Value.....	9
Table 3: Municipal Parking Average Condition	10
Table 4: Municipal Parking Condition	10
Table 5: Parking Level of Service	11
Table 6: Asset (Technical) Level of Service.....	12
Table 7: Probability of Failure (PoF) Municipal Parking.....	14
Table 8: Municipal Parking Criticality and Consequences of Failure	15
Table 9: Failure Prediction	15
Table 10: 60-Year Average Annual Reinvestment Requirement	19
Table 11: Funding Gap (Capital).....	19
Table 12: Next Steps	20
Table 13: Demand Drivers, Projections, Impact on Services and Management Plan.....	23
Table 14: Climate Change Scenarios and Impact on Services.....	27

1. Executive Summary

1.1. Purpose

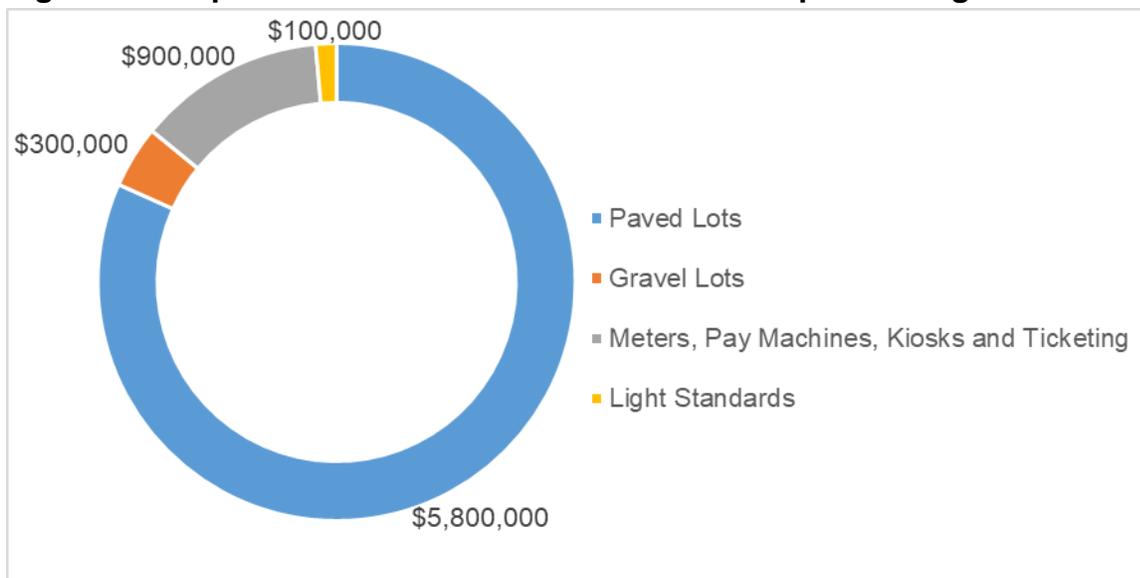
Asset management is the systematic and coordinated activities and practices of an organization to optimally and sustainably deliver on its service objectives through cost-effective life-cycle management of assets.

This asset management plan details information about municipal parking infrastructure assets including the actions required to provide the existing level of service in a cost effective manner while outlining the associated risks of asset ownership. The plan defines the existing services provided, how the services are provided and what funds are required to maintain the services over a 60-year planning period.

1.2. State of the Infrastructure

The scope of the project encompasses the municipal parking infrastructure owned and operated by the City of Greater Sudbury. The replacement value of municipal parking assets that are included in the plan are summarized in Figure E1.

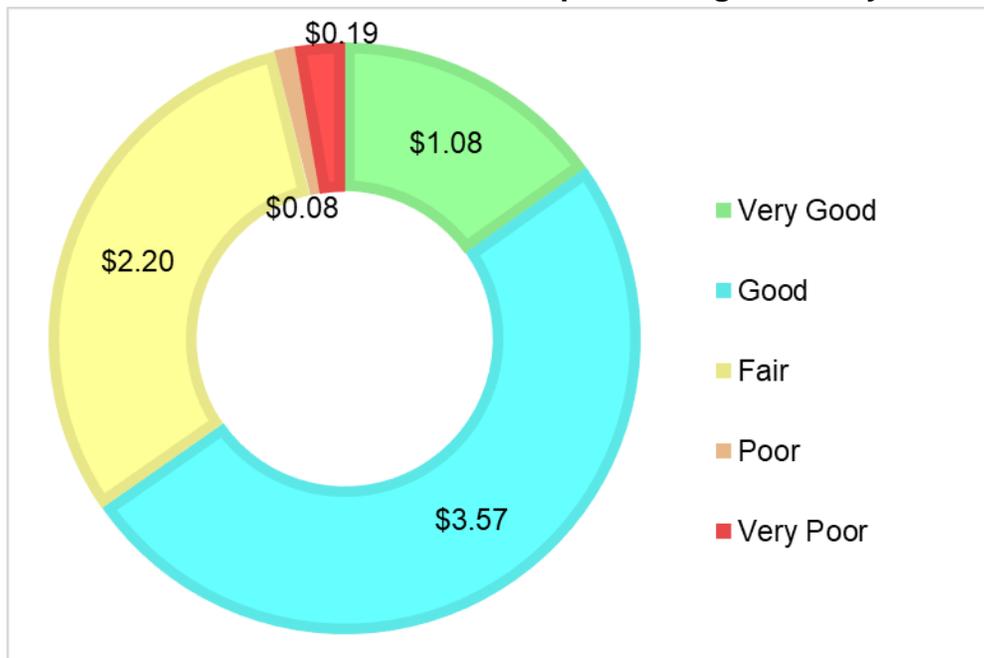
Figure E1: Replacement Value Distribution of Municipal Parking Assets



The municipal parking assets have a replacement value of \$7,100,000.

The data analyzed to develop the plan is integrated from the City's Tangible Capital Asset Database and on-site condition inspections. The details behind the development of conditions and inspection frameworks are attached in Appendix A. Figure E2 outlines the replacement value and condition of the municipal parking inventory.

Figure E2: Condition and Valuation of Municipal Parking Inventory in Millions



1.3. Level of Service

A service level is a direction or requirement for a particular service area against which performance may be measured. For assets, technical data like performance specifications inform service levels.

There are 3 tiers of service level that are discussed in the plan, namely:

- **Community:** Qualitative descriptions that define the community, stakeholder and individual expectations.
- **Strategic:** These include qualitative and quantitative measures that describe what is being provided to the community. Examples of how this can be defined can include reliability, legislative compliance, quantity, quality and safety.
- **Asset (Technical):** An asset level of service is a quantitative measure that defines the performance expectations for a given asset in order to produce the desired levels of service. These services are measured and can include asset condition, responsiveness, expenditure, and asset value.

1.4. Asset Management Strategy

The life cycle intervention strategies for paved municipal parking lots discussed within this report include: resurfacing, minor reconstruction, reconstruction and maintenance activities such as inspection, pot-hole repair, frost heave repair, localized ponding/settlement repair and line painting.

Granular surface parking lots are graded every spring and periodically receive a new surface coating of Granular A.

Parking meters may be renewed by swapping out the interior of the parking meter. Meters and pay machines are disposed and replaced at actual end of life. The City has been updating parking technology, for instance 27 Pay By Plate machines have recently been installed for on-street parking.

1.5. Failure Prediction and Risk Management

A risk framework was developed and each individual asset is assigned a risk score based on a calculated probability and consequence of failure.

The probability of failure is an estimate of the likelihood of an asset is to not meeting its service expectations. The consequence of failure is an estimate of the effect on outcomes if an asset actually fails.

1.6. Long-Term Need

Table E1 details the 60-year average annual reinvestment requirement (AAR_{60}) by asset class. The AAR_{60} represents the estimated annual amount of capital the City requires to reinvest in the parking inventory. Investment was analyzed on a 60 year period to capture the 60 year theoretical useful life of municipal lots. The 60-year annual average reinvestment requirement for all municipal parking assets is \$0.19M.

Table E1: 60-Year Average Annual Reinvestment Requirement	
Asset Class	AAR_{60}
Municipal Parking Lots	101,300
Meters, Pay Machines, Kiosks and Ticketing	91,500
Street Lights	2,100
Total AAR_{60} =	194,900

1.7. Future Demand

All of the City’s municipal parking infrastructure is located in the Downtown area. The most significant future demand driver for municipal parking is the planned construction projects that will reshape the City’s Downtown.

To address post construction target utilization of the Downtown area, there are a number of options that the City is considering to accommodate the increase in parking demand including:

- Development of a parking structure to accommodate an 85 – 90% utilization rate;
- Transportation Demand Management (TDM) that includes additional incentives for community members. For example: Transit Pass Programs, Emergency Ride Home, Bikeshare and Carshare Programs, Ridematching and Bicycle Parking;
- Investigate shared parking agreements with private entities;

- Surface parking expansion outside the Downtown core, for example Dufferin Street Road Allowance;
- Incentives to increase parking in the Downtown core periphery lots, for example Energy Court (Lot 11).

1.8. Climate Change

In September 2020, Council approved the Community Energy Emissions Plan (CEEP) that is the long-term plan to reduce carbon emissions and pollution in Greater Sudbury. The CEEP is a response to the City of Greater Sudbury Council’s Climate Emergency declaration in May 2019. The CEEP outlines 18 goals that need to be met to attain the City’s target of becoming a net-zero GHG emission community by 2050. For further information with respect to the Community Energy Emissions Plan, please visit: <https://www.greatersudbury.ca/live/environment-and-sustainability1/net-zero-2050/>.

The City is beginning to monitor the effects of climate change on its infrastructure assets. Global Climate Models for the Greater Sudbury geographic area are reviewed and discussed.

1.9. Next Steps

Table E2 identifies the next steps that emerged during the development of the asset management plan.

Table E2: Next Steps		
Section	Category	Action Item
Level of Service	Asset Level of Service	<ul style="list-style-type: none"> • Identify customer expectations associated with planned construction projects • Develop target service levels for Council review
Asset Management Strategy	Lifecycle Management Plan	<ul style="list-style-type: none"> • Review and refine strategies as necessary
Failure Prediction Risk Management	Risk Assessment and Exposure	<ul style="list-style-type: none"> • Monitor and refine the deterioration model for municipal parking lots as necessary
Long-Term Needs	Funding Sources	<ul style="list-style-type: none"> • Develop a sustainability strategy to achieve target levels of service for Council review, discussion and approval. • Determine funding source for infrastructure need.

2. Introduction

The City of Greater Sudbury recognizes the need to ensure that downtown land uses remain supported by an effective transportation infrastructure network. The Downtown Master Plan anticipates that the planned intensification of the downtown will be supported through incremental investments in active transportation infrastructure and parking.

The Downtown parking system provides two types of parking opportunities, permit and pay parking. Permit parking allows users to purchase monthly passes, while pay parking allows users to purchase parking time on demand on an hourly basis.

City owned assets that are managed by Security and By-Law Services include municipal parking lots, parking meters, parking ticket systems and pay and display machines.

Paid municipal parking spaces are provided across the City's downtown core. The number of paid parking spaces managed per 100,000 population is 1,291 spaces/100k. The average hourly rate for on-street parking is \$1.30, the second smallest value reported to MBNCAN with the 2019 Data Call.

The City owns and operates the municipal parking lot 7 located at the YMCA Center for Life. Part of the municipal parking lot runs underneath the Center for Life building structure. The City owns only the parking parcel and does not own the building structure. Therefore, the City owned municipal parking lot at the Center for Life is included within the asset management plan.

The Beech Street Municipal Parking Lot 12 is leased by the City. As a result, the condition of the parking lot surface and replacement cost for Lot 12 are not included within the asset management plan.

Furthermore, the City owns and operates 438 curbside parking spaces that form an integral part of the road structure. Therefore the curbside spaces are included within the roads and transportation asset management plan.

3. State of the Infrastructure

3.1. Asset Data Inventory

Parking inventories are stored within the tangible capital asset database and spreadsheets. The City's parking inventory is summarized in Table 1 below.

Table 1: Municipal Parking Asset Inventory	
Asset Type	Quantity
Paved Municipal Parking Lots	10
Gravel Municipal Parking Lots	2
Meters, Pay Machines, Kiosks and Ticketing	230
Light Standards	19

The parking asset inventory is updated annually.

3.2. Asset Valuation

Asset valuation is determined in either one of two ways; historical cost inflated to current year dollars or where assets have attributes that evolve, costs are reviewed to incorporate legislation, recent purchases and current market demand. For example, evolving efficiencies and technology, or a significant rebate program from a senior level of government can lead to an increase in purchase price over a short duration and an increase in market demand.

3.3. Estimated Asset Value

A summary of the City's municipal parking inventory value is provided in Table 2.

Table 2: Municipal Parking Inventory Value	
Asset Type	Replacement Cost
Paved Municipal Parking Lots including Lot 13 (TDS) and ramps	\$5,800,000
Gravel Municipal Parking Lots	\$300,000
Meters, Pay Machines, Kiosks and Ticketing	\$900,000
Light Standards	\$100,000
Grand Total	\$7,100,000

The estimated replacement value of the City's parking assets is \$7.1M. This value represents 0.07% of the replacement value of the City's total asset inventory.

3.4. Asset Useful Life

For the development of this asset management plan, the theoretical useful life of a paved and gravel parking lot is 60 years.

Pay and display ticket machines have a theoretical useful life of 10 years while parking meters have a theoretical useful life of 20 years as the meters are periodically reconstructed by swapping out the interior components.

3.5. Asset Condition Assessment

For further details on the methodology behind the assigned conditions to the municipal parking assets, please refer to Appendix A.

3.6. Current Asset Condition

The average condition of the City's municipal parking assets are provided in Table 3 below.

Asset Type	Average Condition
Paved Municipal Parking Lots	68 - Good
Gravel Municipal Parking Lots	50 - Fair
Meters, Pay Machines, Kiosks and Ticketing	61 - Good
Light Standards	74 - Good

The following Table 4 provides a condition breakdown for municipal parking infrastructure.

Condition	Parking Lots	Meters and Pay Machines	Light Standards	Total	%
Very Good	2	25	10	37	14.2%
Good	6	194	7	207	79.3%
Fair	4	2	0	6	2.3%
Poor	0	3	2	5	1.9%
Very Poor	0	6	0	6	2.3%
Totals	12	230	19	261	100%

4. Levels of Service

4.1. Community and Strategic Level of Service

Community and strategic levels of service are provided in Table 5.

Table 5: Parking Level of Service	
Service	Level of Service
Parking	Customer: <ul style="list-style-type: none">• Municipal parking lots are safe, convenient and in good repair• Municipal parking in the downtown core is available• Parking lots are accessible year round and during all weather conditions
	Strategic: <ul style="list-style-type: none">• Administer and maintain 438 on-street parking spaces and 13 municipal parking lots for a total of approximately 2,140 parking spaces in the City's downtown. The City owns 12 of the 13 aforementioned lots and 1 municipal parking lot is leased.• Provide quality infrastructure to meet the community's parking requirements

4.2. Asset Level of Service

Asset (technical) levels of service are provided in the following Table 6.

	Asset Class	Existing	Implication	Target
Security and By-Law Services	Parking Lots	Paved parking lot condition rating = B (Good)	Rehabilitation activities to maintain SoGR	Maintain paved parking lots at a condition rating = TBD
		Gravel parking lot annual surfacing expenditure = \$2,820	Rehabilitation activities to maintain SoGR	Maintain gravel parking lot annual surfacing expenditure = TBD
		Total number of parking spaces within municipal lots = 1721	Performance through availability	Maintain total number of parking spaces within municipal lots = TBD
		Parking lot light pole condition rating = B (Good)	Rehabilitation activities to maintain SoGR	Maintain parking lot light poles at a condition rating = TBD
		Number of municipal parking lots with illumination = 6 including TDS Parking Garage	Performance through security	Maintain number of municipal parking lots with illumination = TBD
	Curbside Parking	Total number of municipal curbside metered spaces = 438	Performance through availability	Maintain total number of curbside metered spaces = TBD
	Parking Meters, Pay Machines, Kiosks and Ticketing	Parking equipment is at a condition rating = B (Good)	Replace parking equipment at end of life to maintain SoGR	Maintain parking equipment at a condition rating = TBD

5. Asset Management Strategy

5.1. Maintain or Adjust Level of Service

The current average parking lot condition is good. In order to maintain this performance, continued infrastructure investment is required.

5.2. Lifecycle Management Plan

Parking lot maintenance activities include inspection, pot-hole repair, frost heave repair, localized ponding/settlement repair and line painting.

The opportunity for a paved municipal parking lot rehabilitation project is explored with adjacent road reconstruction projects whenever possible. The rehabilitation could include:

1. Resurfacing is the removal and replacement of the top lift of asphalt. This is the most common type of municipal parking lot treatment.
2. Minor reconstruction is the removal of surface and base layers of asphalt where two layers are present.
3. Full reconstruction is the complete removal and replacement of the entire pavement structure including the granular base material. A municipal parking lot would have to experience extreme asphalt degradation and frost heave to require such a treatment.

Granular surface parking lots are graded every spring and periodically receive a new surface coating of Granular A. The trigger for a Granular A topping is visible granular loss due and contamination from the soils below the granular surface.

Parking meters may be renewed by swapping out the interior of the parking meter. The City has also been replacing parking meters with pay by plate technology.

6. Failure Prediction and Risk Management

Risk management is a major component of asset life-cycle management. The City’s risk management goals involve identifying, understanding and managing the potential for infrastructure assets to meet planned service objectives.

Risk assessment is applied to prioritize and optimize capital spending and decision making. The City evaluates both the Probability of Failure (PoF) and the Consequence of Failure (CoF) when prioritizing for the capital budget. This helps clarify and build a shared understanding about the risk associated with a decision to not engage in a project.

6.1. Failure Prediction

Failure prediction is performed to assess the potential for an asset to deliver an expected level of service over time. Current and historical condition and performance data is analyzed to determine the current position of an asset within its life-cycle. This information informs a judgment about how much remaining service life is available. For this asset management plan, the remaining life of municipal parking assets have been determined by condition.

6.2. Probability of Failure (PoF)

The probability of failure is an estimate of the likelihood of an asset is to not meeting its service expectations. The PoF for municipal parking assets has been derived from asset condition. Table 7 demonstrates the rationale to determine the PoF of municipal parking assets.

Table 7: Probability of Failure (PoF) Municipal Parking			
Asset Condition translates to → Likelihood and PoF			
Condition		Likelihood	PoF
F (Very Poor)	Less than 20	Almost Certain: 80% of Greater	P5
D (Poor)	20 - 39	Likely: 60 – 79%	P4
C (Fair)	40 - 59	Possible: 40 – 59%	P3
B (Good)	60 - 79	Unlikely: 20 – 39%	P2
A (Very Good)	80 - 100	Rare: Less than 20%	P1

6.3. Consequence of Failure (CoF)

The consequence of failure is an estimate of the effect on outcomes if an asset actually fails. The consequences of failure could range from a service interruption to a catastrophic result depending on the asset criticality. The municipal parking criticality and consequence of failure is detailed in Table 8. The CoF has been developed to adhere to the Corporate Impact and Likelihood Criteria for Enterprise Risk Management recommended by the City’s Auditor General. The City also has planned mitigation already in place to maintain service objectives should an asset fail. The availability and quantity of mitigation or redundancy was considered with the development of the CoF.

Table 8: Municipal Parking Criticality and Consequences of Failure					
Asset Criticality Criteria translates to → Consequences of Failure					
Critically	Score	Criteria	Impact	CoF	Assets
Critical	5	<ul style="list-style-type: none"> • Life safety or essential service • Legislated • Significant financial loss 	Severe	C5	• None
Essential	4	<ul style="list-style-type: none"> • Threatens delivery of public transportation or sanitation service level • Serious Injury or legal judgement • Financial loss 	Major	C4	• None
Strategic	3	<ul style="list-style-type: none"> • Threatens the integrity of defined service level • Injury • Moderate financial loss • Negative economic impact resulting in lost revenue for local business 	Moderate	C3	<ul style="list-style-type: none"> • Municipal Parking Lots • Light Standards
Enhancement	2	<ul style="list-style-type: none"> • Simplifies the delivery of defined service level • Reportable injury • Inefficient process leading to financial loss 	Minor	C2	<ul style="list-style-type: none"> • Pay and Display Stations • Parking Meters • Parking Ticket System
Deferrable	1	<ul style="list-style-type: none"> • Service target can be 90% achieved without a particular asset 	Insignificant	C1	• None

Municipal parking assets are assessed for risk annually when they are prioritized as part of the capital budget. Items that are reviewed are discussed in Table 9.

Table 9: Failure Prediction			
Service or Asset at Risk	What Can Happen	Risk Rating	Failure Mode
Municipal Parking Lots	<ul style="list-style-type: none"> • Parking surface failure • Economic impact on public and private industry 	Medium	Condition
Meters, Pay Machines, Kiosks and Ticketing	<ul style="list-style-type: none"> • Isolated or system outage • Economic impact on City through loss of revenue • Unable to enforce parking by-law 	Low	Condition
Light Standards	<ul style="list-style-type: none"> • Isolated or system outage • Safety Concerns • Potential for crime and vandalism 	Medium	Condition

6.4. Risk Assessment and Exposure

The probability and consequences of failure allow the corporation to focus on assets that have the greatest impact on service delivery. The following formula demonstrates the PoF and CoF are multiplied to determine risk exposure.

$$\text{Risk Exposure} = \text{Probability of Failure} \times \text{Consequence of Failure}$$

The risk exposure for all of the City’s municipal parking assets has been mapped in the risk matrix provided in Figure 1. For additional details such as the specific municipal parking assets and where they fit in the risk map, please refer to Appendix B and Appendix C.

Figure 1: Municipal Parking Risk Exposure

Consequence	C5	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	Where: Critical Significant Medium Low
	C4	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
	C3	12 Assets \$789,225	13 Assets \$3,495,822	4 Assets \$1,896,959	2 Assets \$12,000	0 Assets \$0	
	C2	25 Assets \$288,897	194 Assets \$77,286	2 Assets \$302,867	3 Assets \$69,293	6 Assets \$188,443	
	C1	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
		P1	P2	P3	P4	P5	
		Probability					

6.5. Risk Response

The City has implemented a modernization of the municipal parking system to include alternate methods of payment while continually reviewing parking inventory to ensure that parking is appropriate for utilization.

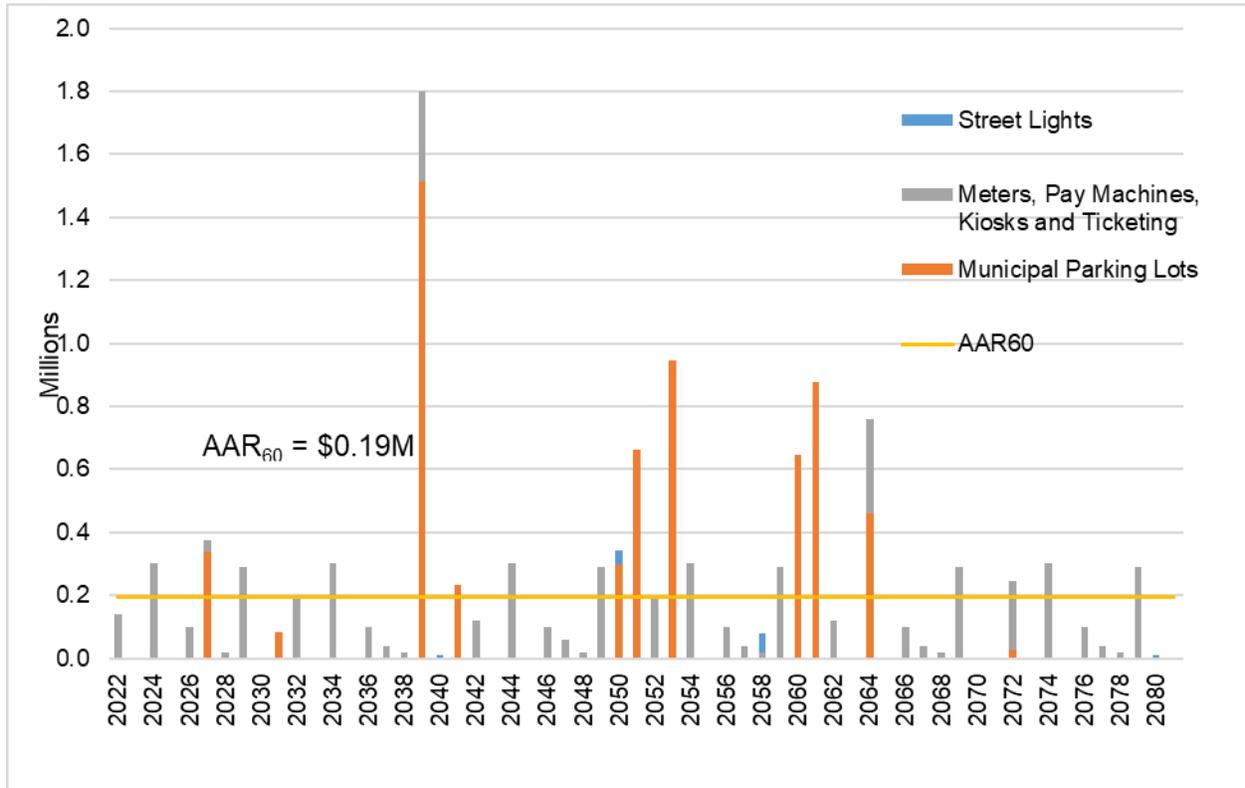
- Pay by Plate payment methods (pay by cellphone app) to replace parking meters and pay stations;
- Digital parking permits with license plate recognition to replace display tags for monthly parking permits;
- Integration of HotSpot technology to provide an alternative to the conventional pay stations. HotSpot tap pay system is an app installed on a user’s cell phone that works in conjunction with Google Pay or Apple Pay systems;
- Modernization will help track peak parking usage at various locations and times of day. The information is used to plan for maintenance and potential lighting improvements. This applies to municipal lots and curbside spaces.

- To maintain user satisfaction, the City does not issue tickets if a payment system has failed.

7. Long-Term Needs

Figure 2 provides the 60-year average capital reinvestment need for municipal parking assets. This represents the estimated amount of capital the City requires to reinvest in the parking inventory. The 60-year annual average reinvestment requirement (AAR₆₀) for all municipal parking assets is \$0.19M.

Figure 2: 60-Year Capital Need Summary



60-Year Capital Need Assumptions

The long-term needs for parking assets is based on the following assumptions:

- Replacements are with a similar function, utility and quantity;
- 60-year average annual reinvestment requirement does not consider service expansion or reduction;
- Risk exposure equivalency of 20 or higher is considered to be immediate need in the year 2022;
- Parking assets are scheduled for replacement at end of life;
- Calculated in 2020 Canadian Dollars.

The 60-Year Capital Need analysis is based on lifecycle management strategies for various municipal parking asset types and condition assessment data. For this plan, the lifecycle analysis represents the investment needed to rehabilitate and replace assets; the cost of operational maintenance, for example snow removal was not included. Operational maintenance costs will be included in future updates to the asset management plan as part of full lifecycle cost analysis.

Table 10 details the 60-year average annual reinvestment requirement by asset class.

Asset Class	AAR₆₀
Municipal Parking Lots	101,300
Meters, Pay Machines, Kiosks and Ticketing	91,500
Street Lights	2,100
Total AAR₆₀ =	194,900

7.1. Infrastructure Reinvestment Financing Strategy

State of good repair (SoGR) is the condition that an asset is able to operate at a full level of performance. To maintain the City’s infrastructure assets in a state of good repair, capital work is financed through tax supported capital reserve and utility rate supported capital reserve. The Municipal Parking Asset Management Plan in conjunction with the annual capital budget proposes and prioritizes the City’s infrastructure investment requirements according to their respective financing sources.

The 60-year average annual reinvestment requirement is compared to historical expenditure from a period of 5 years to demonstrate the financial risk associated with asset ownership known as a funding gap. The funding gap is the unfunded value of infrastructure renewal needs that require attention as of the current year. Table 11 demonstrates the municipal parking funding gap. Although Table 11 demonstrates a funding gap for municipal parking, it is not reflective of the annual revenue generated by parking within the downtown core, some of which may be diverted to address additional capital need as it arises on a year to year basis.

Asset Class	Municipal Parking
5-Yr Expenditure (Mean)	\$107,000
AAR ₆₀	\$194,900
Funding Gap	\$87,900
5-Yr Revenue (Mean)	(1,738,032)
Actual Funding Gap	\$0

7.2. Sustainability Strategy

The existing level of service for municipal parking drive the reinvestment forecasts in the asset management plan. Levels of service are based on regulation, standards, and Council approved service levels. Following the asset management roadmap, Council will be provided with the opportunity to determine level of service targets to manage infrastructure within the City's capacity to renew and maintain assets, and accept the associated risk.

7.3. Next Steps

Ensuing Council approval of the Municipal Parking Asset Management Plan, target level of service options will be prepared for Council review, discussion and approval. The target level of service framework may require additional key performance indicators and will be the main driver of the sustainability strategy.

Section	Category	Action Item
Level of Service	Asset Level of Service	<ul style="list-style-type: none">• Identify customer expectations associated with planned construction projects• Develop target service levels for Council review
Asset Management Strategy	Lifecycle Management Plan	<ul style="list-style-type: none">• Review and refine strategies as necessary
Failure Prediction Risk Management	Risk Assessment and Exposure	<ul style="list-style-type: none">• Monitor and refine the deterioration model for municipal parking lots as necessary
Long-Term Needs	Funding Sources	<ul style="list-style-type: none">• Develop a sustainability strategy to achieve target levels of service for Council review, discussion and approval.• Determine funding source for infrastructure need.

8. Future Demand

8.1. Demand Drivers

Drivers affecting demand include parameters such as population, legislation, demographics, seasonal factors, technological advancement, economic and environmental awareness.

8.2. Demand Forecasts and Impact on Assets

The present position and projections for demand drivers that may impact future service delivery and use of assets were identified and documented in Table 13. The present position and projection statistics are from the City of Greater Sudbury Outlook for Growth to 2046 that was developed in March 2018 and The City of Greater Sudbury Downtown Parking Study completed in November 2018.

Parking systems are considered “effectively full” at an occupancy of approximately 85-90%, depending on lot size and other characteristics.

The 2018 parking capacity assessment was completed considering a parking utilization target of 85%. Under 2018 conditions, the following system wide occupancies were estimated:

- Municipal off-street: 74% utilization;
- Municipal on-street: 71% utilization; and
- Private off-street: 79% utilization.

Currently, two new development are planned for Downtown Sudbury. The Places Des Arts, currently under development and The Junction, a City led development consisting of a Library, an Arts Gallery, and a Convention Centre with a hotel component. The new developments are planned to be located in such a manner that they have or will replace the following three municipal lots:

- Larch Street Lot (has already been decommissioned for The Places Des Arts development and 59 spaces lost);
- Sudbury Arena Lot (currently operational with the potential for 81 spaces lost);
- Minto Street Lot (currently operational with the potential for 165 spaces lost).

To develop post construction alternatives, an interactive process was adopted to analyze:

- Additional parking generated by the occupancy and anticipated event requirements of a convention centre for The Place Des Arts and The Junction during peak and off peak hours;
- Existing parking lot closures including a redistribution of parking within an acceptable walking distance of 300 – 400 m;

- Available municipal on-street parking; and
- Available private off-street parking.

To achieve a post construction target utilization of 85%, an additional 500 spaces are required. To achieve a post construction target utilization of 90%, an additional 315 spaces are required to accommodate the existing and additional parking requirements of Place Des Arts and The Junction.

8.3. Demand Management Plan

The City will regulate the demand on assets through a combination of managing existing assets, upgrading of existing assets and providing new assets to meet demand. Opportunities identified for demand management are provided in Table 13. Further opportunities will be developed in future revisions of the asset management plan.

To address the post construction target utilization of the Downtown area, there are a number of options that the City is considering to accommodate the increase in parking demand including:

- Development of a parking structure to accommodate an 85 – 90% utilization rate;
- Transportation Demand Management (TDM) that includes additional incentives for community members. For example: Transit Pass Programs, Emergency Ride Home, Bikeshare and Carshare Programs, Ridematching and Bicycle Parking;
- Investigate shared parking agreements with private entities;
- Surface parking expansion outside the Downtown core, for example Dufferin Street Road Allowance;
- Incentives to increase parking in the Downtown core periphery lots, for example Energy Court (Lot 11).

Table 13: Demand Drivers, Projections, Impact on Services and Management Plan

Demand Driver	Present Position	Projection	Impact on Services	Demand Management Plan
Population	City of Greater Sudbury Population: 166,130	Population (2046): • Low: 165,090 • Mid-Range: 172,990 (Reference Scenario) • High: 181,290	The City's population is anticipated to remain relatively constant. This will minimize the impact on municipal parking assets.	The City will continue to monitor population. Should the population deviate from the expected constant, the data will be analyzed to formulate an appropriate plan.
Legislation	Parking lots are being constructed to meet legislative requirements.	Additional legislative requirements are anticipated. For example implementation and enforcement for an accessible Ontario by 2025.	Replacement cost of municipal parking assets may increase with evolving legislation. For example, accessibility space requirements and along sidewalks and walkways.	The replacement value of municipal parking assets is monitored annually to reflect market demand resulting from legislation and latest technology.
Demographic	Households: 69,152	Households (2046): • Low: 72,890 • Mid-Range: 75,250 (Reference Scenario) • High: 77,590	The anticipated increase in housing will be monitored against the services provided by municipal parking assets.	With an increase in housing, the City will monitor the municipal parking service requirements of the Downtown area.
Aging Population	Median Age from 2016 Canada Census: 43.2	Anticipated increase in median age of population	The anticipated increase in median age of population will be monitored against services provided by municipal parking assets.	The City will monitor aging population trends and the impact on parking assets.

Table 13: Demand Drivers, Projections, Impact on Services and Management Plan

Demand Driver	Present Position	Projection	Impact on Services	Demand Management Plan
Seasonal Factors	Drastic shifts in temperature and precipitation from summer to winter months	Drastic shifts in temperature and precipitation from summer to winter months are expected to continue for the foreseeable future.	The shifts in temperature and precipitation will be monitored against the condition and life-cycle requirements of municipal parking assets.	Municipal parking lots will be monitored for their durability to withstand the freeze thaw associated with shifts in temperature and precipitation.
Technological Advancement	The City monitors available technology to improve the level of service provided by municipal parking assets.	The need for additional investment in technology is anticipated.	New technologies are expected to continue to evolve with the service provided.	The City will continue to monitor and implement technological improvements as needed. For example, the City has recently rolled out its new pay by plate system.
Economic	Jobs: 79,440	Jobs (2046): <ul style="list-style-type: none"> • Modest: 81,230 • Mid-Range: 85,750 (Reference Scenario) • High: 90,460 	The City's employment is expected to grow with the minor projected increase in population. Impact on municipal parking need will continue to be monitored.	The City will continue to monitor employment. Should the employment deviate from the expected constant, the data will be analyzed to formulate an appropriate plan.
Environmental Awareness	Through legislation and the City's own actions, the City has demonstrated that it recognizes the need for environmental and climate protection.	In recent years, environmental awareness has received considerably more attention. This is expected to continue. Environmental awareness is anticipated to result in additional legislative requirements and stricter best practices.	The City is considering the possibility of incorporating electric vehicle charging stations into its municipal parking infrastructure.	A City fleet policy will be developed to cover the procurement of electric vehicles or vehicles that operate with alternative fuels. This policy may drive additional need for electric vehicle charging stations.

9. Climate Change

In September 2020, Council approved the Community Energy Emissions Plan (CEEP) that is the long-term plan to reduce carbon emissions and pollution in Greater Sudbury. The CEEP is a response to the City of Greater Sudbury Council's Climate Emergency declaration in May 2019. The CEEP outlines 18 goals that need to be met to attain the City's target of becoming a net-zero GHG emission community by 2050. For further information with respect to the Community Energy Emissions Plan, please visit:

<https://www.greatersudbury.ca/live/environment-and-sustainability1/net-zero-2050/>.

Global climate models for the Greater Sudbury geographic area are available through various online resources, namely:

- [Climatedata.ca](https://climatedata.ca/), undertaken with the support of Environment and Climate Change Canada;
- [Climateatlas.ca](https://climateatlas.ca/), undertaken with the support of Environment and Climate Change Canada, Public Health Agency of Canada, and Health Canada.

The City is beginning to monitor the effects of climate change on its infrastructure assets. The data provided in the aforementioned websites suggest that it is a possibility that there will be an increase in precipitation and an overall increase in mean temperature for the municipality. The climate projection scenarios from climateatlas.ca suggest that the increase in mean temperature within the area will result in a decrease of freeze-thaw days, additional summer days, more very hot days and additional tropical nights.

For context, when reading the data and analytics from either of the information sources, RCP means Representative Concentration Pathway which is a greenhouse gas concentration trajectory. The greenhouse gas concentration trajectory is not to be confused with current emissions, although emissions impact the atmospheric concentrations.

[Climatedata.ca](https://climatedata.ca/) analyzes the RCP2.6, RCP4.5 and RCP8.5, while climateatlas.ca analyzes RCP4.5 and RCP8.5. RCP scenario definitions are provided below:

RCP 2.6: This pathway is very stringent because it would require that carbon dioxide (CO₂) emissions were significantly declining in 2020 and achieve zero emissions by 2100. The pathway also requires methane gas (CH₄) emissions be halved by 2020 and sulphur dioxide (SO₂) emissions to decline to approximately 10% of the SO₂ emission level from 1980. This scenario requires negative CO₂ emissions equivalent to a minimum of 2 Gigatons/year every year from natural sources such as trees to keep the global temperature rise below 2°C by the year 2100.

RCP 4.5: This pathway is intermediate because global emissions would peak by 2040. CO₂ emissions must reduce to half of the 2050 levels by 2100, CH₄ emissions must decline by 75% in the decade leading to the year 2050, and SO₂ emissions must decline by 80% of the SO₂ emission level from 1980. Similar to RCP 2.6, this scenario requires negative CO₂ emissions

equivalent to a minimum of 2 Gigatons/year every year from natural sources to keep the global temperature rise between 2°C and 3°C by the year 2100. Many plant and animal species will not be able to adapt to the effects of RCP 4.5 or higher.

RCP 8.5: This pathway is business as usual. Emission will continue to rise on the current global pace throughout the 21st century.

Global Climate Models depict how the climate is likely to change in the future. As no single climate model is correct, the asset management plan consider the effect of Low Carbon (RCP 4.5) and High Carbon (RCP 8.5) on the municipal parking assets. The two scenarios are appropriate as RCP 4.5 assumes a drastic and sustained reduction of emissions in the coming decades, while RCP 8.5 represents the current global pace; emission of very large amounts of carbon dioxide from the burning of fossil fuels.

The following Table 14 provides the results of several Global Climate Models for the City of Greater Sudbury geographic area with high and low carbon emission scenarios and the anticipated impact on municipal parking assets. It is important to note that the anticipated impact is of climate change on infrastructure, not the potential impact of infrastructure contribution to climate change. Also, the climate projections suggest the variable outcomes are possibilities and not absolute certainty.

Table 14: Climate Change Scenarios and Impact on Services

Variable	Current Mean	RCP	2021 - 2050	2051 - 2080	Anticipated Impact
			Mean	Mean	
Precipitation (mm)	848	High 8.5	904	938	The increase in precipitation may increase the risk of flooding or washout and may increase stress on pavement structure. An increase in precipitation will likely lead to an increased need for gravel parking lot maintenance.
		Low 4.5	890	924	
Mean Temperature	4.3°C	High 8.5 Low 4.5	6.5°C 6.3°C	8.8°C 7.3°C	No specific impact.
Tropical Nights (+20°C)	1	High 8.5	5	17	No specific impact.
		Low 4.5	4	7	
Very Cold Days (-30°C)	5	High 8.5	1	0	The decrease in very cold days may help reduce the frost penetration depth.
		Low 4.5	2	1	
Very Hot Days (+30°C)	6	High 8.5	18	39	No specific impact.
		Low 4.5	16	24	
Frost-Free Season (days)	137	High 8.5	163	184	The decrease in frost days will likely reduce the stress on pavement structure.
		Low 4.5	157	168	
Freeze Thaw Cycles	68	High 8.5	64.2	61.5	The decrease in freeze-thaw cycles will likely ease pressure on the pavement structure.
		Low 4.5	65.4	64.3	
Mild Winter Days (-5°C)	120.1	High 8.5	103.6	84.2	The decrease in mild winter days will reduce winter maintenance activity.
		Low 4.5	104.5	96.6	
Summer Days (+25°C)	42.9	High 8.5	68.9	93.8	No specific impact.
		Low 4.5	65.2	77.4	
Winter Days (-15°C)	58.4	High 8.5	42	24.8	The decrease in mild winter days will reduce winter maintenance activity.

10. Improvement Opportunity

The City will take the following steps towards sustainability:

- Maintain full compliance with legislation;
- Environmentally sustainable initiatives;
- Monitor asset life-cycles for scheduled replacements;
- Advance technologies.

Appendix A – Municipal Parking Asset Condition

Municipal parking assets have been assigned conditions as detailed in following Table A1 and Figure A1.

Condition	Service Life Consumption	Condition Score
Very Good	0% to 20%	80 to 100
Good	21% to 40%	60 to 79
Fair	41% to 60%	40 to 59
Poor	61% to 80%	20 to 39
Very Poor	>81%	0 to 19

Figure A1: Municipal Parking Lot Inspection Form

Lot Name:		Lot Number:		Reviewer:			
Example							
No. of Barrier Free Spaces:		Total No. of Spaces		Date:		Surface Type:	
2		25				<input checked="" type="checkbox"/> ASPHALT <input type="checkbox"/> GRAN A	
Asphalt				Asphalt			
Crack Density:	No. of Spaces with Cracks			Crack Severity:	Crack Width	No. of Spaces	
Very Good	0 to 19%	0	0%	Very Good	<3 mm	10	0.06
Good	20 to 39%			Good	3 mm to 10 mm	0	0.00
Fair	40 to 59%			Fair	11 mm to 15 mm	5	0.40
Poor	60 to 79%			Poor	16 mm to 20 mm	10	1.25
Very Poor	80 to 100%			Very Poor	> 20 mm	0	0.00
						0.341	
Asphalt				Asphalt			
Frost Heave or Rutting:	ΔDepth or ΔHeight	No. of Spaces		Pot Holes:	Pot Hole Depth	Area m²	No. of Spaces
Very Good	<12 mm	5	0.03	Very Good	< 25 mm	< 0.1	0
Good	13 mm to 25 mm	5	0.18	Good	25 mm to 50 mm	0.1 - 0.2	10
Fair	25 mm to 40 mm	5	0.40	Fair	51 mm to 75 mm	0.2 - 0.3	10
Poor	40 mm to 50 mm	5	0.63	Poor	76 mm to 100 mm	0.3 - 0.4	5
Very Poor	> 50 mm	5	0.95	Very Poor	> 100 mm	> 0.4	0
		0.4355				0.36	
Pavement Condition Index for Municipal Parking Lots							
Crack Density	95	95	Where:	Very Good	81 to 100		
Crack Severity	65	65		Good	61 to 80		
Frost Heave or Rutting	55	55		Fair	41 to 60		
Pot Holes	60	60		Poor	21 to 40		
Asphalt Condition	69			Very Poor	0 to 20		

Appendix B – Municipal Parking Risk Exposure

Municipal parking risk exposure is detailed in following Figure B1 through Figure B3.

Figure B1: Municipal Parking Lots

Consequence	C5	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	Where: Critical Significant Medium Low
	C4	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
	C3	2 Assets \$729,225	6 Assets \$3,453,822	4 Assets \$1,896,959	0 Assets \$0	0 Assets \$0	
	C2	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
	C1	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
		P1	P2	P3	P4	P5	
		Probability					

Figure B2: Meters, Pay Machines, Kiosks and Ticketing

Consequence	C5	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	Where: Critical Significant Medium Low
	C4	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
	C3	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
	C2	25 Assets \$288,897	194 Assets \$77,286	2 Assets \$302,867	3 Assets \$69,293	6 Assets \$188,443	
	C1	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
		P1	P2	P3	P4	P5	
		Probability					

Figure B3: Light Standards

Consequence	C5	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	Where: Critical Significant Medium Low
	C4	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
	C3	10 Assets \$60,000	7 Assets \$42,000	0 Assets \$0	2 Assets \$12,000	0 Assets \$0	
	C2	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	Assets \$0	
	C1	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	0 Assets \$0	
		P1	P2	P3	P4	P5	
		Probability					

Appendix C – Municipal Parking Risk Exposure and Condition Ranking

Intentionally Blank

Appendix C: Municipal Parking Risk Exposure and Condition Ranking

Asset ID	TCA ID	Name	Asset Class	Quantity	Condition	Criticality	Risk Exposure
		Sudbury Arena	Light Standards	1	30	3	12
		Sudbury Arena	Light Standards	1	30	3	12
C0575	536	Pay and Display Machines Lc	Pay and Meters	1	0	2	10
C0576	537	Pay and Display Machines Lc	Pay and Meters	1	0	2	10
C0634	556	CP RAIL PARKING KIOSK	Pay and Meters	1	0	2	10
	557	Pay and Display Machines Lc	Pay and Meters	1	0	2	10
	21799	Parking Ticket System	Pay and Meters	1	0	2	10
Lot #4	22602	Pay and Display Machine Lot	Pay and Meters	1	10	2	10
	555	Energy Court	Municipal Lot	1	46	3	9
	8767	Minto Street	Municipal Lot	1	48	3	9
	20271	Shaughnessy Street Lot B	Municipal Lot	1	50	3	9
		Elgin Street/CP (Market Squa	Municipal Lot	1	50	3	9
Lot #1	20268	Pay & Display Machine - Lot	Pay and Meters	1	20	2	8
Lot #10	20269	Pay & Display Machine - Lot	Pay and Meters	1	20	2	8
Lot #??	20270	Pay & Display Machine - Lot	Pay and Meters	1	20	2	8
	21965	Parking Ticket System	Pay and Meters	0	20	2	8
C0533	20873	TDS Automated Parking Sys	Pay and Meters	1	40	2	6
C0533	20874	YMCA Automated Parking S)	Pay and Meters	1	40	2	6
	8770	Shaughnessy St. West Side	Municipal Lot	1	60	3	6
	8765	Sudbury Arena	Municipal Lot	1	60	3	6
		Energy Court	Light Standards	1	65	3	6
		Energy Court	Light Standards	1	65	3	6
		Energy Court	Light Standards	1	65	3	6
		Energy Court	Light Standards	1	65	3	6
		Energy Court	Light Standards	1	65	3	6
		Energy Court	Light Standards	1	65	3	6
		Energy Court	Light Standards	1	65	3	6
	8769	Shaughnessy St. East Side	Municipal Lot	1	66	3	6
	8766	Larch @ Lisgar	Municipal Lot	1	73	3	6
	8774	Elgin at Larch Street Lot	Municipal Lot	1	74	3	6
		Tom Davies Square	Municipal Lot	1	75	3	6
	20267	Parking Meters	Pay and Meters	194	60	2	4
	8776	Medina Lane	Municipal Lot	1	86	3	3
	578	Centre for Life Complex	Municipal Lot	1	88	3	3
		Shaughnessy St. East Side	Light Standards	1	90	3	3
		Shaughnessy St. East Side	Light Standards	1	90	3	3
		Shaughnessy St. East Side	Light Standards	1	90	3	3
		Shaughnessy St. East Side	Light Standards	1	90	3	3
		Shaughnessy St. East Side	Light Standards	1	90	3	3
		Shaughnessy St. West Side	Light Standards	1	90	3	3
		Minto Street	Light Standards	1	90	3	3
		Minto Street	Light Standards	1	90	3	3
		Minto Street	Light Standards	1	90	3	3
		Minto Street	Light Standards	1	90	3	3
	23108	On Street Pay by Plate Solar	Pay and Meters	25	90	2	2