# Digital Transportation Strategy

Surrey's Path to a User Focused and Data Centric Intelligent Transportation System

July 2022

CITY OF SURREY

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# Executive Summary

A major shift is underway in the world of urban transportation. Digital technologies and the data they generate are making new mobility options possible, enabling more effective transportation system management and helping cities meet their transportation goals.

The proliferation of personal mobile devices has given rise to new mobility options including car-sharing, ride-hailing and shared micro-mobility services like bikes and e-bikes. Advancements in connected sensors and data analytics have enabled enhanced transportation infrastructure monitoring and provided greater insight into the operation and effects of various elements that comprise a transportation system. This digitally-driven evolution of mobility and the possibilities opened by mobile devices hold exciting promise for both cities and the users of their transportation systems and services.

Digital Transportation leverages the torrent of data that each element and user of the system generates to create a full picture of the network. It enables cities to take a holistic, systems approach to building, managing, and maintaining their transportation systems, improves safety, and opens new mobility options for residents and visitors.

The figure below illustrates how the Digital Transportation Strategy (DTS) will put the City in a leadership position by taking a holistic approach that starts with data.

The DTS also supports the five foundational pillars approved by Council for the new Surrey Transportation Plan:

1. Grow the Transportation Network;
2. Prioritize Vision Zero Surrey;
3. Tackle the Climate Crisis;
4. Innovate Through Technology and New Mobility; and
5. Balance Equity.

# Executive Summary (continued)

The Digital Transportation Strategy (DTS) is the City's pioneering five-year plan to embrace this future of transportation. The DTS charts Surrey's path towards a transportation system in which separate elements – sensors, traffic infrastructure, mobility services, personal devices, and conventional modes of transportation – are connected and digitally integrated. It's a plan to shift from car-centric transportation planning and technology-centric ITS, to an approach that prioritizes the user through data integration. The end result will be a safer, smarter, more connected, and greener Surrey.

The DTS lays out a path of learning and adapting the City through 14 actions:

**Digital Transportation integrates conventional infrastructure and traditional agency-centric Intelligent Transportation Systems with new digital technologies, private mobility service providers, and users into one unified transportation system.**

### Short Term (1 to 3 Years)

- Urban Technology Test Lab
- Data Framework
- Digital Parking Management Pilot: Phase 1
- Shared Mobility Pilot: Phase 1
- Transportation Digital Twin: Phase 1
- Study: Remote Sensing and Computer Vision for Maintenance and Asset Collection
- Public-Private Partnerships

### Medium Term (4 to 5 years)

- Digital Safety Technology Tools
- Mobility as a Service (MaaS) Pilot
- Advanced Signal Priority
- Smart Streetlighting
- Study: The State and Path to Intelligent Infrastructure in Surrey
- Digital Parking Management Pilot: Phase 2
- Transportation Digital Twin: Phase 2

## Vision

Surrey is an innovative leader in embracing digital transportation to connect communities with safe, efficient, and zero carbon transportation accessible to all.

# 1 | Introduction

The world is entering a new era of transportation and mobility. A confluence of digital innovation and 21st century challenges is providing the impetus and opportunity for cities to reimagine urban transportation systems, and shift the focus from conventional car-centric plans to new user-focused designs supported by digital technologies. These new designs offer more than just enhanced movement. They promise efficient, multi-modal transportation systems that are safer, greener, and more equitable than has ever been possible before.

Traditionally, city transportation planning has centered on infrastructure and vehicles. Planners considered how roads and installations like traffic signals could be better designed and managed to facilitate transportation.

The recent explosion of new digital technologies has changed this. Data has replaced infrastructure as a critical lever for achieving transportation goals. This ascent of data – and the technologies that generate and collect it – represents a sea change in urban transportation planning and is ushering in the most exciting possibilities for city transportation systems in a century.

Using data and digital technologies, city governments can now take a holistic, systems approach to managing the myriad disconnected pieces that comprise a typical transportation network. Cars, transit, roadways, parking, pedestrians, and private mobility providers can all be brought into one unified system, managed in near real time to provide the best experience for the user, and generate data that enables high-impact improvements and local optimizations.

This digitally-enabled approach also adds new priorities. It requires the expansion of connectivity and adoption of new sensor technology. It entails investments in device and data infrastructure, partnerships with private mobility providers, and new multi-modal mobility options. These foundational investments and actions are key, as they enable planners to harness data and tie together the disparate pieces that comprise a city's entire transportation system.

Embracing this change is crucial for Surrey today. Surrey is among Canada's fastest growing cities and is the region's next metropolitan centre. With 600,000 residents today and an additional 10,000 moving in each year, Surrey is on track to become B.C.'s largest city by 2050.

This growth is a testament to the appeal of this community and the opportunities found here. But fast growth brings challenges. One is ensuring that transportation systems can keep up and meet users' needs. A business-as-usual approach will result in 50% more private motor vehicle trips on Surrey's roads by 2050, that's over 650,000 more car and truck trips every day increasing congestion and GHG emissions. Residents will also demand user-focused tools that they experience elsewhere, and Surrey will find itself behind if action is not taken now. These pressures demand new, smarter solutions. Some of these solutions are found in the adoption of a Digital Transportation approach. The Digital Transportation Strategy (DTS) is the City of Surrey's pioneering five-year plan to embrace this future of transportation and meet the needs of Surrey's growing population.

The Strategy charts Surrey's path towards a transportation system in which separate elements – sensors, traffic infrastructure, mobility services, personal devices, and conventional modes of transportation – are connected and digitally-integrated. It's a plan to shift from car-centric transportation planning to an approach that prioritizes the user.

The DTS builds on Surrey's existing Intelligent Transportation Systems and Traffic Management Centre to leverage data from new and existing sources, optimize service delivery, unlock new funding models, and improve user interactions with the transportation system as they plan, pay, and move.

The DTS also contributes to efforts outlined in other key City plans including the Vision Zero Surrey Safe Mobility Plan, the Climate Change Action Strategy, the Smart Surrey Strategy, and the Surrey Transportation Plan – by creating a safer, smarter, greener, more connected, and more equitable Surrey.

## Supporting Surrey's STP

The DTS directly supports the City's new Surrey Transportation Plan (STP), which charts a path toward a thriving, green, and inclusive city with the following vision:

Connecting a million people and places with safe, inclusive, convenient, and green transportation choices for everyone.

The STP comprises five foundational pillars. The DTS is a key deliverable under Pillar 4: Innovate Through Technology and New Mobility, and directly supports the remaining four pillars.

## Surrey Transportation Plan Pillars


**Grow the Transportation Network:**
Surrey will become a vibrant urban centre of 1 million people.


**Prioritize Vision Zero Surrey:**
Human life is valued above all else in the City's transportation network.

**Tackle the Climate Crisis:**
Tackling the climate crisis requires decisive action on how we get around.

**Innovate through Technology and New Mobility:**
Connected, autonomous, shared, and electric mobility options are available.

**Balance Equity:**
All members of the community should benefit from and have equitable access to the transportation network.

# 2 | New Trends in Transportation

## 2.1 Digital Transportation

Ubiquitous connectivity and personal devices, new sensor technology, mobile applications, cloud computing, and advanced analytics and prediction systems (including machine learning) are combining to provide cities and users with new transportation options. These digital technologies are changing how planners see and think of transportation, how services are delivered, and how users make transportation choices.

Some of these changes have been profound. Consider the emergence of New Mobility – a combination of new technologies and business models that are reshaping the way people move.

New Mobility includes:

- Shared mobility services: Shared mobility is a service model in which users share vehicles or provide transportation services to one another, typically through arrangements made via private, third-party mobile applications. There are two common forms of shared mobility:  ride-hailing and car-sharing.
    - In ride-haling arrangements, private vehicle owners provide on-demand rides to customers for a fee.
    - In car or vehicle-sharing arrangements, motor or micro-mobility vehicles (like bicycles or e-bikes) are booked for use as needed and shared among users.

Shared mobility services require digital transactions and have enabled some people to reduce their fixed transportation-related costs by going car-light (i.e., reducing use of a private vehicle in favour of transit and other modes of transportation) or giving up car ownership entirely.

- Driverless vehicles: Sensor and AI technology have enabled advances in autonomous driving. Fully self-driving vehicles remain in long-term development, but their eventual introduction to city streets will radically change how people move, providing new mobility options to non-drivers, changing parking demand, and likely increasing safety by reducing human error on the road.

- Connected services: The prevalence of smartphones and connected sensors enables cities to gather more transportation-related data than ever before and deliver information to users in near real-time. This allows cities to better understand a transportation system's operation and make more data-driven decisions. It also enables users to plan, book, and pay for transportation services more conveniently, saving them time and supporting more informed choices about how to best combine transportation modes for their trips.

For municipal governments, these innovations have inspired a new approach to transportation planning and management:

## Digital Transportation

Digital Transportation is a user-focused method of building, operating, and maintaining city transportation systems. It integrates conventional infrastructure, existing Intelligent Transportation Systems, new digital technologies, private service providers, and users, and leverages the torrent of data they generate to meet changing user needs, uncover new efficiencies, and make transportation systems safer and more sustainable.

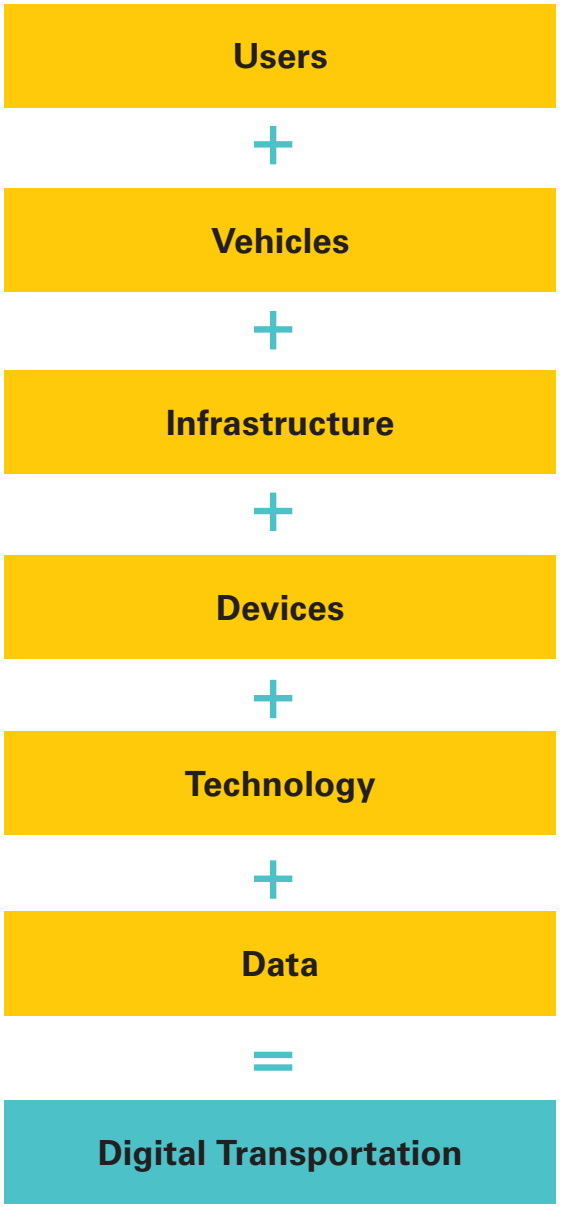
Traditional transportation approaches focus on:

- designing and constructing transportation and operations infrastructure, including roadways, parking, and Intelligent Transportation Systems;
- maintaining that infrastructure in a state of good repair; and
- ensuring transportation services – e.g., transit and parking – are delivered safety and smoothly, including in instances of congestion, emergency, and other incidents.

A Digital Transportation approach includes these, but also focuses on:

- collecting and analyzing data from city and third-party infrastructure and vehicles to generate efficiencies and add value;
- managing the transportation system in real-time to meet user needs and encourage choices that maximize mobility options, safety, and efficiency; and
- facilitating the integration of many transportation service providers through digital means.

This shift and the potential it promises for users and cities is exciting. It also requires preparation. Investments made by cities and transportation authorities today to leverage automation, data, and new mobility options will determine the quality and effectiveness of transportation systems tomorrow.



## 2.2 How Cities Are Responding

Technology has long been a priority for transportation planners. For nearly three decades, cities have integrated innovation through Intelligent Transportation Systems (ITS), which is loosely defined as advanced applications and technical infrastructure that support traffic management. Existing ITS enables roadway monitoring, communication with travellers and road crews, and adjustments to traffic infrastructure (e.g., traffic signals, electronic road signs, and pedestrian crossings) to create a smarter and more coordinated traffic system.

What's new about Digital Transportation is that data and digital integration are the primary drivers of transportation system function and outcomes, and these enable cities to shift transportation planning from vehicles and infrastructure to user needs. In this new approach, ITS becomes but one integrated component among many involved in the dynamic management of an entire transportation system.

Additionally, Digital Transportation involves:

- including technologies outside of traditional traffic infrastructure, and acknowledging that they increasingly play a key role in the transportation network and users' decisions about how they move;
- combining data from City infrastructure with anonymized data from personal and third-party private mobility providers to develop a more complete and granular picture of the entire transportation network; and
- enabling New Mobility options, including those operated by private companies, to factor into land use and transportation system planning and management.

Making the shift to a Digital Transportation approach means transportation teams must now focus heavily on:

- User needs: Designs start with the question: What's best for the transportation system user? Advanced and new data sources will help planners better understand the transportation choices users are already making. This includes a consideration of convenience and ease of use, access to basic amenities and key goods and services, effective and timely communication of crucial information, and the environmental effects of transportation choices.
- Multi-modal transportation: As cities and transportation systems undergo this evolution, the variety of transportation modes is increasing and new travel options are becoming more available and interconnected. More modes, routes, parking options, methods to plan and pay for trips, and ways to combine mode choices will continue to emerge. This provides cities with more possibilities to optimize travel, promote sustainable modes, and reduce reliance on high-polluting vehicles.

- Multiple data sources: Micro-mobility providers, ride-hailing services, transit, parking and curb management are generating vast amounts of new data. Collecting, integrating, and analyzing the data from these disparate sources is a priority for cities seeking to enhance decision-making and increase efficiency, safety, responsiveness, and communication with people as they move.
- New transportation business models: The variety and volume of new data is unlocking new opportunities to fund transportation services through dynamic pricing, partner with private innovators to address challenges, commercialize new intellectual property such as traffic prediction algorithms, and contribute to the achievement of other city agency policy goals, including those related to climate change, sustainability, and land use.

Capitalizing on opportunities in these priority areas requires actions and investments related to five elements of Digital Transportation infrastructure:

- Instrumentation: These are the sensors that gather anonymized data from the City, users' devices, vehicles, and connected infrastructure.
- Connectivity: These are the communication protocols that allow data and analysis to be shared among vehicles, devices, and infrastructure.
- Data & analytics: This refers to the information collected by sensors and the software systems that process and analyze it.
- Decision support systems: These are the systems that visualize insights, enable the City to manage its transportation network, and help users make informed decisions about modes, routes, and payments.
- Partnerships: strong collaboration with mobility service providers, innovators, and other stakeholders is critical to understanding their business models, regulatory needs and data generation.

Investments in a Digital Transportation approach position cities for the future, put users first, and set the stage for new and exciting solutions to modern urban planning challenges. Section 4 outlines the specific actions the City is proposing to take over the next five years.

# 3 | Surrey's Digital Transportation Strategy

## 3.1 Starting with a Strong Foundation

Four foundational elements are core to the success of Surrey's Digital Transportation Strategy: the Traffic Management Centre, connected sensors, the digital communication network, and maintenance and modernization. This foundation will enable the smooth adoption, integration, and scaling of new digital technologies and data.

### Surrey's Traffic Management Centre

As part of the Smart Surrey Strategy, the City created the Traffic Management Centre (TMC). The TMC is more than just traffic management, it is the City's data centre and staff interface with the transportation network. From this hub, City staff remotely manage field equipment (such as traffic signals) and monitor real-time traffic information (from over 500 traffic cameras, traffic counters, and pedestrian thermal sensors).

The TMC is the most advanced municipal centre of its kind in B.C., using traffic data and applications to quickly respond to congestion, delays, collisions, and emergencies. During busy weekday traffic hours, the TMC routinely responds to collision alerts within one minute and quickly acts to reduce resulting safety and congestion impacts. In a typical year, TMC staff intervene making 600 live signal timing changes to reduce congestion impacts caused by collisions, construction, maintenance activity, stalled vehicles, and other issues. In the DTS, the TMC will maintain its role as the nerve centre of Surrey's transportation network.

### Did you know?

**Surrey's Traffic Management Centre responds to over 2,000 traffic collision alerts every year.**

### Connected sensors

Connected sensors Digital Transportation depends on a network of internet-connected traffic equipment, cameras, and sensors in the field that communicate with each other and the City to support traffic monitoring, maintenance, and planning. Connected sensors provide the data that enables the dynamism of the Digital Transportation approach. They can provide alerts when traffic speeds fall below target thresholds, and send data that supports rapid notification and responses to issues that affect road safety and travel reliability.

### Digital communication network

City-owned and private telecommunication infrastructure carries data between sensors, field equipment, computer servers, and the Traffic Management Centre. The communication network is essential to integrating thousands of ITS-related components in Surrey. Currently, much of the network is made up of physical infrastructure like cable. To support a Digital Transportation approach, the network will increasingly shift to secure, cloud-based services, which can enhance collaboration, scalability, security, and data analysis. The City's communication network also involves data sharing agreements with the Provincial Ministry of Transportation and Infrastructure and Federal Canada – US border control agencies.

### Maintenance & modernization

Maintaining transportation infrastructure in a state of good repair is a priority for all municipalities. In the DTS, maintenance and support for day-to-day operations extends from conventional traffic infrastructure to include new computing, digital, and data storage infrastructure. Adequate funding is needed to support this expanded infrastructure and ensure that modern replacements are made when new standards or best practices are established. Work is ongoing to support the appropriate level of funding.

## 3.2 Surrey's Transportation Future

With a strong foundation in place, the DTS will enable the City to take a systems approach to managing Surrey's transportation network and services. This involves incorporating its existing ITS investments, digitizing information from existing sensors (e.g., cameras, traffic counters), and integrating new mobility options, novel sources of data, cloud-based services, and advanced analytics capabilities. It also involves installing new connected sensors and devices in existing infrastructure, exploring new partnerships with third-party mobility providers, and adopting new advanced analytics systems that will provide a clearer picture of how to combine infrastructure and services to best serve Surrey's residents. Through ongoing investments in upgrades of existing infrastructure, the Strategy also ensures that fundamental services continue and will be able to meet the needs of the City's growing population.

Investments identified in the DTS will result in a safer, more reliable, and more connected transportation experience for Surrey residents. The City will continue to efficiently manage motor vehicle traffic and in addition, all road users will experience the flexibility in accessing the many transportation choices available through the seamless integration of actions, insight, and payments. They will have greater access, convenience, and satisfaction as they move. They will also have more agency when it comes to their transportation choices. In a car-centric world, trips revolve around only one option, a motor vehicle. In a transportation system designed with a Digital Transportation approach, the new set of options and choices are opened up with a new way of thinking about travel. When high-quality travel options that don't rely on a car are available and accessible, users can design their trips around another focal point: their values.

It becomes easier for people to gain the financial benefits of going car-free or car-light and to be more environmentally friendly and choose more sustainable modes that minimize environmental impact.

Better information for users leads to more deliberate choices, reflecting not only their travel preferences, but their individual priorities and broader ideals for the city and society. Special events, first responder incident times and disaster management will also be improved.

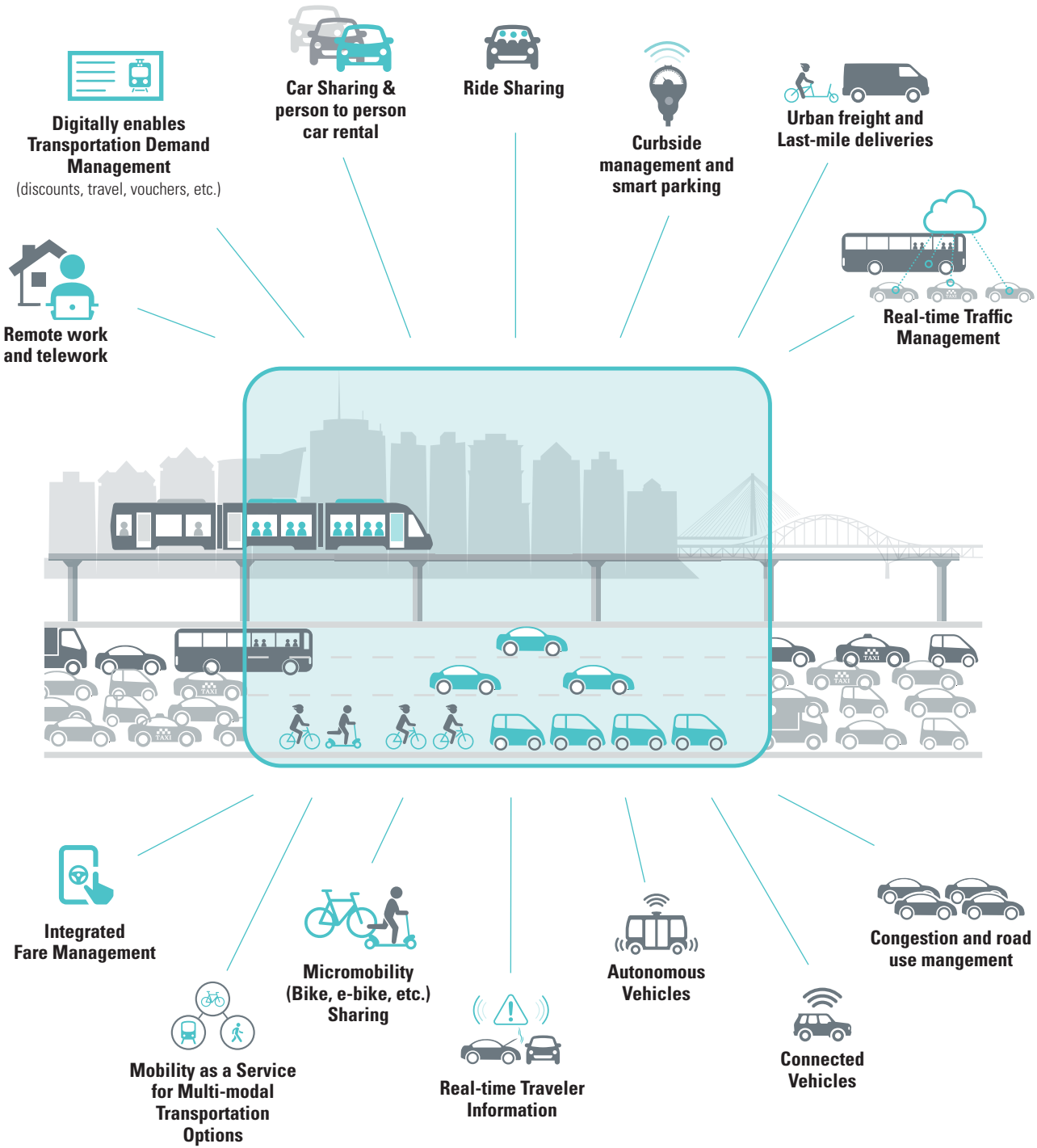
The City has developed a Vision and identified key Outcomes that are in alignment with other City Strategies and support specific Actions for the next five years. It's a reimagination of transportation for the 21st century, and one that Surrey can lead.

Figure 3

**Emerging Urban Transportation Ecosystem**

Connected sensors and digital communication will support increased transportation choices such as shared mobility services, transit, and last-mile solutions. Access to the right choice at the right time through digital transactions will help manage road congestion and enable people to reduce their transportation costs by going car-light.

Sensor and AI technology will support advances in autonomous driving and traffic management. The eventual introduction of fully self-driving vehicles will radically change how people move, provide new mobility options to non-drivers, change parking demand, and increase safety by reducing human error on the road. Data will also be used for real-time and predictive traffic analytics and pricing tools for traffic and curb space management.




*Graph inspired by City of Surrey Intelligent Transportation System (ITS) Strategy Review, created by Deloitte.*

## 3.3 DTS Vision

Surrey is an innovative leader in embracing digital transportation to connect communities with safe, efficient, and zero carbon transportation accessible to all.

## 3.4 Outcomes

The DTS will create a safer, smarter, more connected, and greener Surrey.

**Safer:** Safer means a reduction in the number of people killed and seriously injured while using Surrey's transportation network. New sources of data and advanced analytics capabilities will support the City's efforts related to the Vision Zero target of zero people killed or seriously injured in traffic accidents.

**Smarter:** Smarter means growing the City's capacity to collect valuable data, uncover insights, and use that intelligence to better manage the city and communicate with residents and businesses about transportation choices. Smarter also means protecting the privacy of individuals and being trustworthy stewards of public data. De-identification, strong encryption, and robust security protocols are integral to handling all data – today and in the future. To protect personal information all the proposed Actions will include a formal Privacy Impact Assessment to identify, evaluate and minimize privacy risks and the City will follow all Provincial and Federal laws. Richer data and new digital capacity can also help the City build partnerships with private sector innovators, academia, and other government agencies to explore new technologies and improve day-to-day operations.

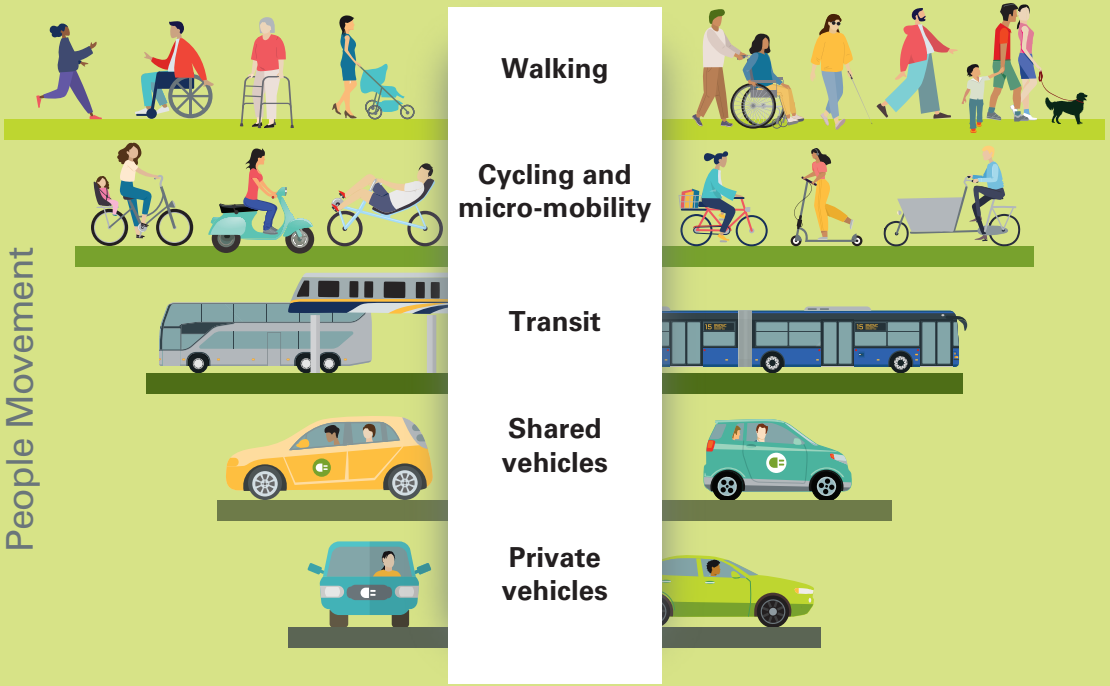
**Connected:** Connected communities are those in which travel to services, amenities, and recreation is affordable and accessible through safe walking and cycling networks, abundant and high-quality transit, and available on-demand services. Surrey's Transportation Plan will support the creation of "15-minute neighbourhoods": communities in which people can meet most, if not all, of their daily needs close to home and within that travel timeframe. Through data and digital technologies that connect people to expanded transportation choices and provide more efficient travel, Surrey can move closer to this goal.

**Greener:** Surrey's Climate Change Action Strategy articulates a vision for a safe, zero-carbon transportation system. The DTS will facilitate the shift to zero-emission vehicles, walking, rolling, transit, and ridesharing. This is key to the City's role in driving down greenhouse gas emissions from transportation and providing increased transparency of the environmental costs of the transportation network.

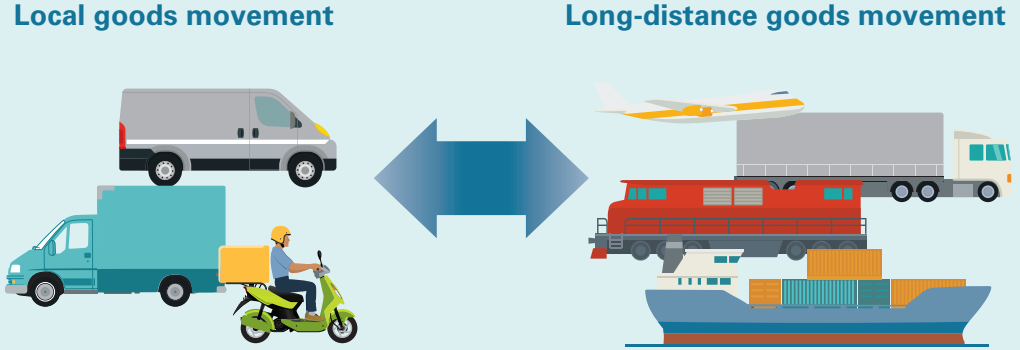
# Transportation Modal Hierarchy

## Pathway to net zero by 2050

People Movement




Goods Movement



## 3.5 Alignment with Other City Strategies

By harnessing technologies that create a safer, smarter, more connected, and greener transportation network, Surrey's DTS aligns with other City plans that contribute to developing a thriving, greener, and more inclusive Surrey. The DTS supports the following City strategies.

### Vision Zero Surrey Safe Mobility Plan

Surrey residents have the right to travel safely. No loss of life on the roads is acceptable. The Vision Zero Surrey Safe Mobility Plan 2019-2023 targets a minimum 15% reduction (per 100,000 population) over five years in the rate of people killed and seriously injured in Surrey traffic collisions. Through the use of the Safe Systems Approach, the Vision Zero Surrey Safe Mobility Plan works with cross-sectoral partners to ensure that regulations, policies, and programs are designed and delivered in a targeted manner using data and evidence of what works to eliminate severe injury and death on Surrey's roads.

### Climate Change Action Strategy

In response to the climate crisis, Surrey City Council declared a climate emergency and adopted bold targets to reduce the community's carbon pollution to net zero and eliminate corporate emissions before 2050. The Climate Change Action Strategy (CCAS) will set a course to reach these targets and improve Surrey's resilience to climate change impacts. Today, Surrey's passenger and commercial vehicles contribute 46% of the city's carbon pollution, making it the single largest polluting category. Safe Zero Carbon Transportation is one of the five components of the draft CCAS framework approved by Council.

### Smart Surrey Strategy

The Smart Surrey Strategy supports sustainable economic development and high quality of life by leveraging innovation and technological advancements in decision-making, strategies, and investment to improve services and increase the effectiveness of City resources amidst rapid growth and increasing demands.

### Surrey Transportation Plan

The new Surrey Transportation Plan charts a path for significant improvements in transportation choices between now and 2050. Data from digital technologies will inform decision-making and contribute to achieving three key STP targets:

1. **Safety:** Zero serious injuries and deaths by 2050, aligning with the Vision Zero Surrey Safe Mobility Plan
2. **Climate:** Net zero greenhouse gases from transportation by 2050, aligning with the City's Climate Emergency declaration and the draft Climate Change Action Strategy
3. **Mode share:** 50% mode share for walk, bicycle, and transit trips, aligning with Metro's 2050, TransLink's T2050, and the Province's Clean B.C. Road Map for maximizing equity in the transportation network, minimizing congestion, and ensuring that the number of motor vehicles on the road in 2050 is equal or less to that of 2017.

### City Financial Plans

Funding for the collection, security, storage, analysis, and updating of data needed to implement the DTS will come from the City's Engineering Department.

- **10-Year Servicing Plan:** The 10-Year Servicing Plan establishes the City's engineering capital expenditure plan for the construction of engineering infrastructure that will service existing neighbourhoods and support new growth across the City. This includes Capital and Rehabilitation forecasting and funding.

## 3.6 Key Partners

The Digital Transportation Strategy represents a new approach that cannot be accomplished by any one City department alone. Partnerships between City departments and external stakeholders will be key to the DTS' success. Partnerships are likely to include the following groups:

### City of Surrey internal partners

#### Engineering Department

- Transportation Division
- Engineering Operations
- Data Analytics Reporting Team
- Sustainability and Energy Services

#### Corporate Services

- Bylaws
- Information Technology

#### Investment & Intergovernmental Relations

- Economic Development Office

#### Parks, Recreation and Culture

#### Planning & Development

### External partners

- TransLink
- Ministry of Transportation and Infrastructure
- B.C.'s academic community
- Telecom companies
- Surrey Police Service
- Surrey Fire Service
- ICBC Ministry of Jobs, Economic Recovery and Innovation
- Provincial Health Services Agency
- Vendors, private sector innovators, and external consultants
- ITS Canada

# 4 | Five-Year Actions

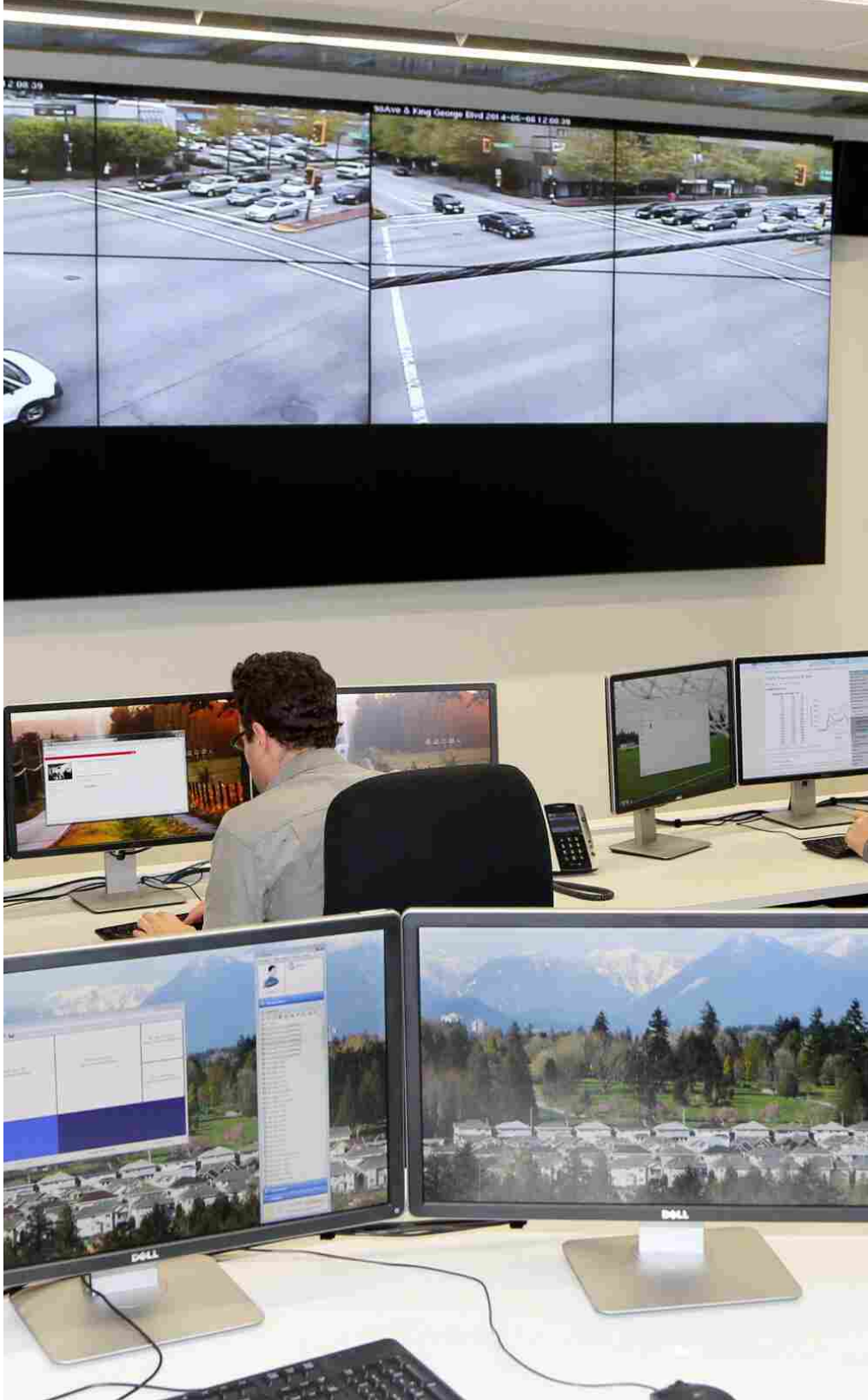
The City is proposing 14 specific actions over the next five years that will grow our understanding and leadership in Digital Transportation and support the DTS' vision and outcomes. The process of building our Digital capacity is illustrated on the right:

The Digital Transportation Strategy has been designed keeping in mind knowing that many of the solutions are still evolving and will need to be explored and confirmed. Building blocks to begin the Digital Transportation Strategy include gathering, analyzing and storing the data, testing, the use of data, working with partners and stakeholders to deliver digital solutions for transportation, the processes to integrate the various technologies, and finally the governance of the digital ecosystem.

The actions are designed to be complementary and towards building capacity as a City, and have been grouped into short (years 1 to 3) and medium (years 4 to 5) term based on when they are initiated.

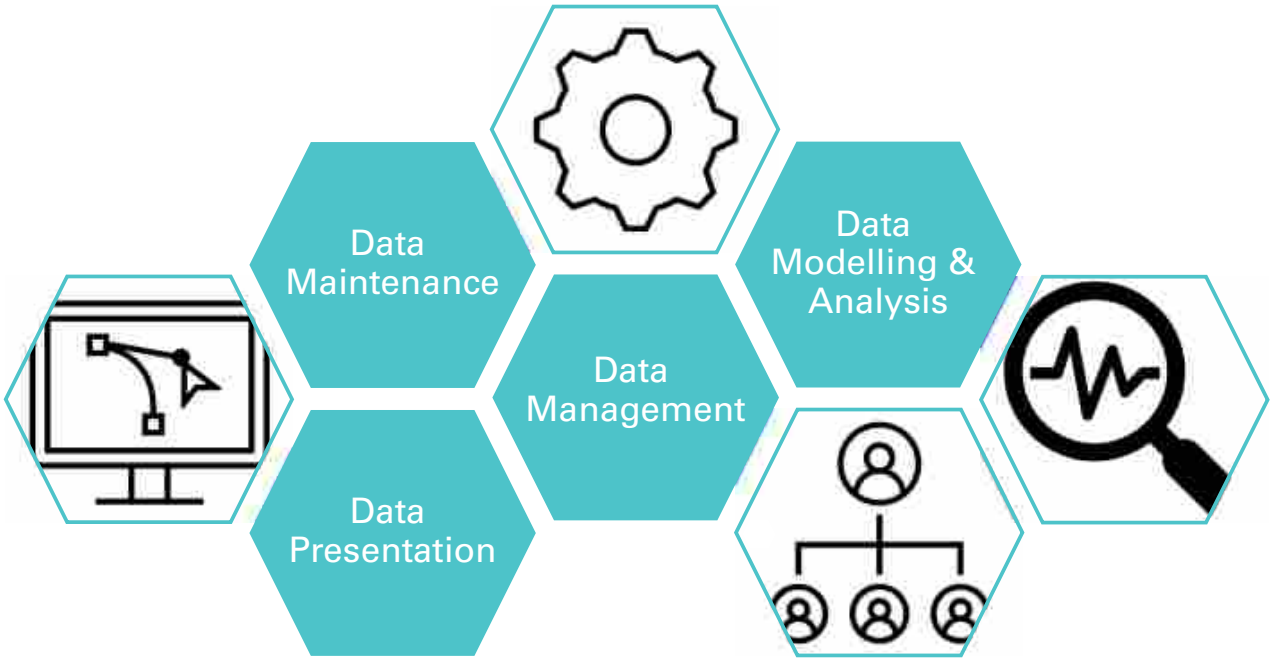
## 1. Urban Technology Test Lab

In the Urban Technology Test Lab, the City will partner with transportation technology developers from the private sector and research institutions will collaborate to research, develop, and test new ITS technology solutions before they are applied and scaled in production. The Lab will be a nexus for transportation-focused collaboration with researchers from Surrey's post-secondary institutions (SFU, UBC, and Kwantlen Polytechnic), will leverage the City's substantial investment in the Traffic Management Centre, and will attract federal and provincial research and industry funding for innovation. The program will provide technology developers with the critical proving ground to field test and adjust their products, potentially under a City product certification process. Sample technologies include urban delivery drones (aerial and road-based) and sensors that modify crosswalk and intersection signals based on the presence of cyclists and pedestrians.



## 2. Data Framework

Data is the food for the Digital Transportation Strategy. It is critical to develop a transportation Data Framework to align the City's data with the DTS goals and advance the innovation and digitalization of transportation systems for transportation network users. The Data Framework will assess how the City of Surrey compares best practices in transportation data and analytics, define targets for the City's data and analytics program, and most importantly, guide the governance, security, and privacy protection of the data. The Data Framework will also guide data interoperability practices, enabling multiple systems to efficiently communicate and populate the Digital Twin Phase 1 (Action Item below). Finally, it will document the usefulness and lifespan of existing data, identify new data sources needed, remove limited value data, and develop processes to collect data for successful DTS delivery.



## 3. Digital Parking Management Pilot: Phase 1

On-street parking meters or ("pay stations") have been a traditional form of collecting parking fees for over 100 years. The widespread public adoption of smartphone-based payment apps, and digitalization of service delivery, provides the opportunity to reduce dependency on pay stations as the primary means of payment, with multiple benefits. A pilot digital conversion project in the Gateway North on-street pay parking zone will replace some parking pay stations with curbside QR code signage that allows customers to pay via a smartphone in place of the pay station. The pilot will include data management and protocols that will be part of the transportation data framework, and operational and public reaction metrics will be assessed to determine if the process can be scaled across other pay parking zones in the City.

## 4. Shared Mobility Pilot: Phase 1

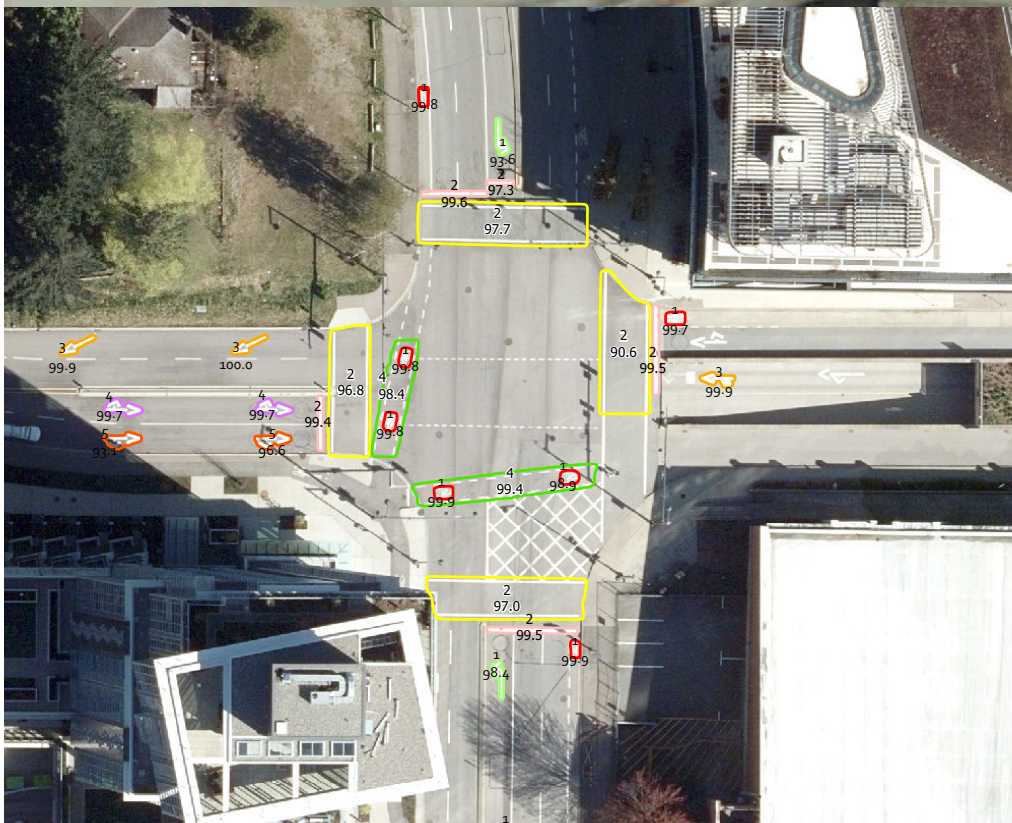
An Urban Technology Test Lab pilot project involving one or more established bike or e-bike providers will provide the City with the opportunity to gather data on the public acceptance, safety, and support of sustainability policy objectives and travel patterns. It will also enable the City to explore shared mobility on a point-to-point basis as a mode shift tool for specific travellers (e.g., for individual corporate tenants in the City Centre or the Health Care District) and will engage corporate and institutional stakeholders regarding client-specific expansion of the program. Telematics software will provide data related to user uptake, origins and destinations, and user preferences to support the Data Framework action for transportation planning and program expansion and modification. This one year pilot (with potential for expansion) will be conducted under specific terms and conditions related to safety and compliance with bylaws and provincial regulations.

## 5. Transportation Digital Twin: Phase 1

A digital twin is a virtual representation of a real-world object or system, the relationships between its components as well as rules that defines and affects them. The City will establish a foundational digital twin of key transportation system infrastructure and components and will explore data analytics tools to better understand the movements, interactions, and assets that make up Surrey's transportation system. Establishing this foundation will involve implementing a platform and processes to aggregate, analyze, and visualize data from many sources, including but not limited to hard infrastructure, public transportation, parking, the Traffic Management Centre, shared mobility operators, and others, and define protocols and workflows to keep the data up to date.

## 6. Study: Remote Sensing and Computer Vision for Maintenance and Asset Collection

This study will explore the use of remote sensing products and computer vision techniques to automate the collection of pavement marking assets and assess asset condition. Existing vehicle assist technologies utilize pavement markings and future full vehicle automation will require a higher maintenance standard than today. Computer vision is a field of artificial intelligence that aims to extract information from digital images and automate tasks that typically require human vision. Remote sensing is the collection of data relating to physical objects or areas from afar. Remote sensing products include orthophoto imagery and LiDAR (light detection and ranging) and this data can be integrated into geographic information systems such as COSMOS.



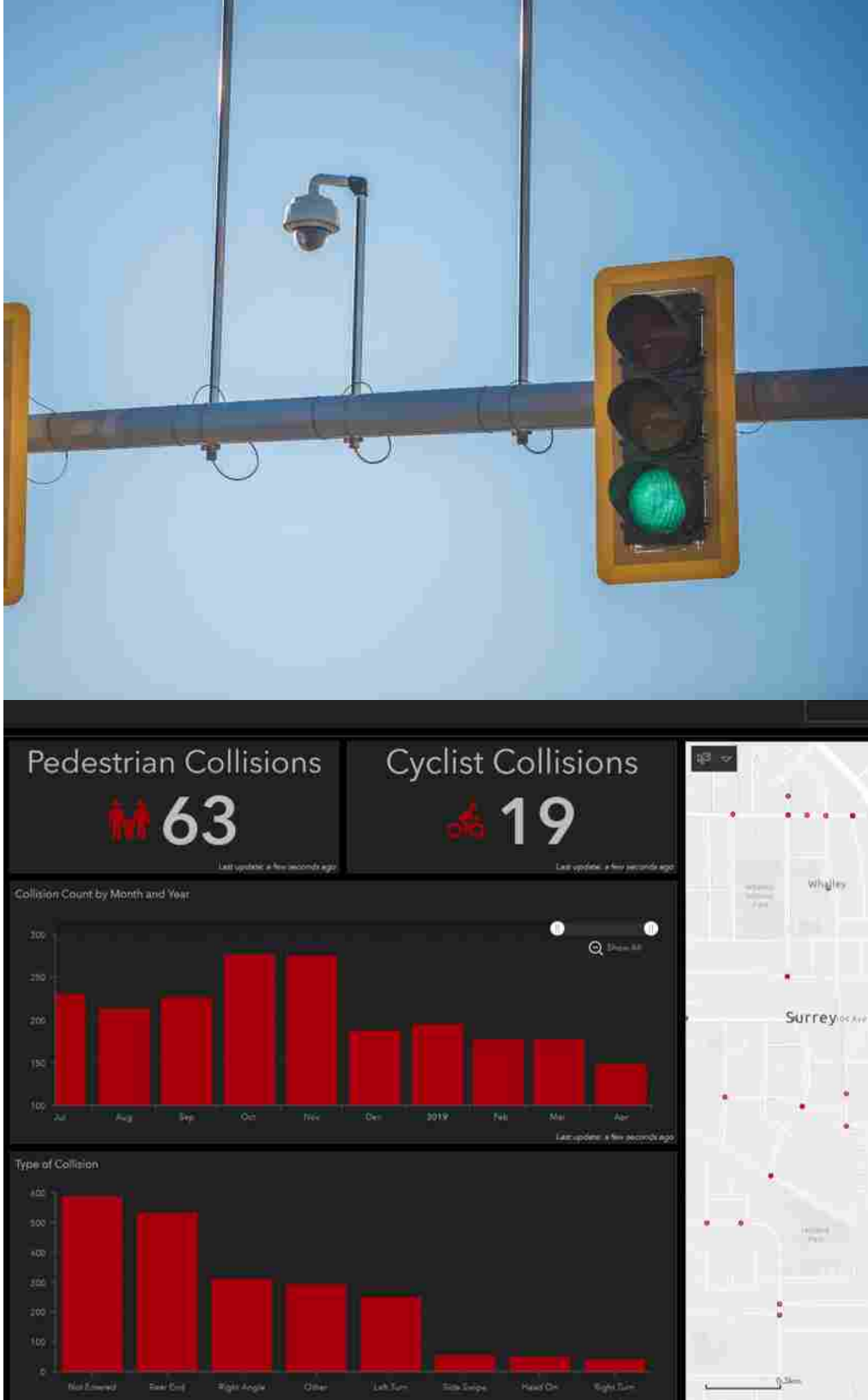
## 7. Public-Private Partnerships

Data and intellectual property are major assets in today's economy. The effectiveness with which city governments can collect, clean, and analyze data using advanced models, including machine learning, will determine the value they receive for their digital technology investments. The City of Surrey will explore public-private partnership opportunities to create revenue-generating models and responsibly commercialize data, along with the algorithms, processes, and systems it develops and uses. This will provide an opportunity to increase revenue for the City, which may offset a portion of the costs involved in the development and deployment of new mobility solutions.

## 8. Digital Safety Technology Tools

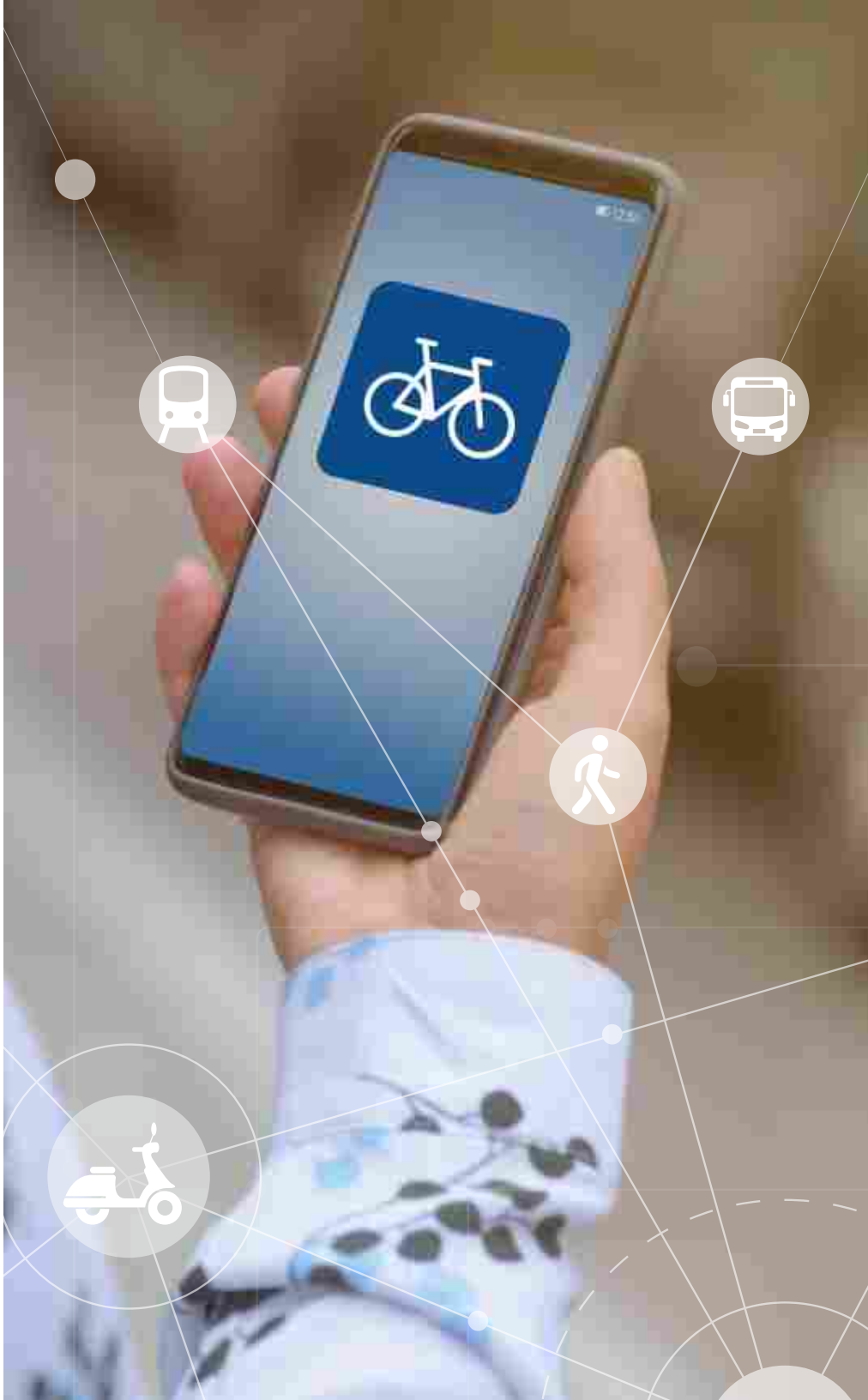
Determining the technology mix that can best enhance road safety. This project involves the development of a project team to scope, explore, and plan safety-related digital transportation projects. This team will integrate the digital twin, various data sets (including from traffic cameras and cyclist and pedestrian detection sensors), and real-time analytics to inform policies, designs, responses, and decision-making that can prevent death and injury due to collisions. The project will incorporate data related to vehicle, cyclist, and pedestrian collisions and volumes, vehicle speeds, traffic signal locations, and road design elements. It will also include the development of a robust framework for road safety data, which includes the integration of third-party datasets.

To predict the likelihood, severity, and types of collisions, the project will include an in-service road safety review using drones and the use of near-miss technology on an existing inventory of intersection footage to capture collisions as they occur. It will then analyze that data using a collision prediction AI model. These predictions can inform digital twin visualizations of collision types at various intersections to identify road safety improvement opportunities. Project outcomes will inform recommendations for interventions that can mitigate or avoid incidents at intersections, reduce incident response time, and improve signal operations in response to roadway and weather hazards.



## 9. Mobility as a Service (MaaS) Pilot

This pilot will advance digital channels for users to plan, book, integrate and pay for a diverse array of mobility services from a single app or website. The core principle of MaaS is to allow users to chose and combine mobility solutions based on their needs, and offer a unified platform for payment, planning, and booking of mobility services (e.g. transit, parking, bike-share, care-share, ride-hailing, etc.). This pilot will need cooperation with TransLink and other mobility service providers and include upgrades to the existing regional fare collection systems to an account-based system that will enable MaaS through digital transportation applications.



## 10. Advanced Signal Priority

Upgraded real-time vehicle positioning systems will enable the City to provide GPS-based traffic signal priority to transit vehicles. Advanced transportation controller and sensor technology will improve service for those who walk, roll, or use transit. This can encourage further shifts toward these travel modes, all of which require less road space to support. Done at scale, this mode shift to more sustainable transportation options can translate into lower greenhouse gas emission and fewer dollars spent on road construction.

## 11. Smart Streetlighting

Digital technology – including smart nodes and wireless communication – can make Surrey's streetlights smarter. Smart Streetlighting can perform automated dimming or brightening depending on road usage, and automated reporting of outages to City staff enabling quicker response times. With over 32,000 streetlights in Surrey illuminating roads, sidewalks, and pathways, smarter and more efficient use can deliver notable annual energy cost savings for the City.

## 12. Study: The State and Path to Intelligent Infrastructure in Surrey

Intelligent infrastructure combines hard infrastructure (such as pavement, bridges, and sidewalks) with digital infrastructure (such as connected sensors) to provide data that supports monitoring, decision-making, and proactive responses as usage and condition change. The objective of this study is to evaluate the current state of Surrey's infrastructure from a digital perspective, explore the role of sensors in hard infrastructure, examine data collection and predictive analytics options for maintenance and replacement, and assess the viability of other digital technologies. It will include a cost-benefit analysis of retrofitting select systems with sensors and will explore initial digital standards for hard infrastructure. Results will provide the City with a clear understanding of the current status and will inform future planning

## 13. Digital Parking Management Pilot: Phase 2

A pilot project using real-time data from sensors and cameras to digitally manage parking in the City Centre will inform future dynamic pricing options for parking. The pilot will uncover ways to enhance convenience by providing drivers with parking space availability information in real time via a smartphone app or in-vehicle navigation system. It will also help to maximize parking efficiency and revenue by matching users with available spaces and applying utilization data to dynamic pricing models (i.e., price adjustments according to demand). This will contribute to sustainability through reduced driver "trolling" for available parking spaces, and the data will give transportation planners context when considering developer requests for parking variances.

## 14. Transportation Digital Twin: Phase 2

A more advanced phase from the learnings and developments of the Transportation Digital Twin Phase 1 will enable the City to find new efficiencies and opportunities, integrate various datasets, to answer different types of questions such as, historic record of an asset or system, performance monitoring, and testing or predicting future or scenarios. In this phase the City will continue to evolve the digital twin of key transportation system infrastructure and components and will apply analytics and machine learning systems to derive information from established transportation system. This can help the City understand, control, and predict and perform scenario modelling based on the data that is transformed through the processes implemented in phase 1.

# 5 | Summary of Actions

## Short Term

Urban Technology Test Lab

Data Framework

Digital Parking Management Pilot: Phase 1

Shared Mobility Pilot: Phase 1

Transportation Digital Twin: Phase 1

Study: Remote Sensing and Computer Vision for Maintenance and Asset Collection

Public-Private Partnerships

## Medium Term

Digital Safety Technology Tools

Mobility as a Service (MaaS) Pilot

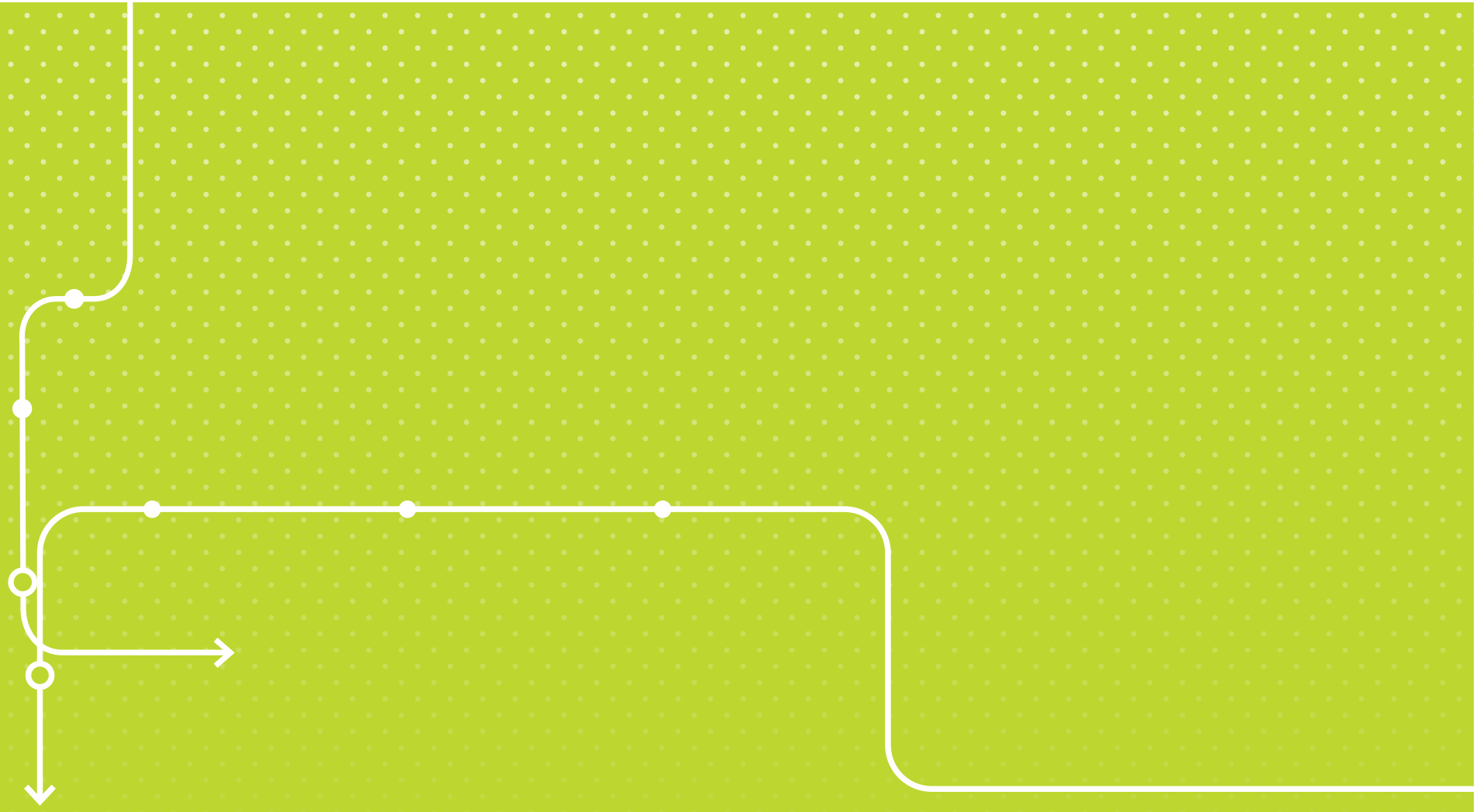
Advanced Signal Priority

Smart Streetlighting

Study: The State and Path to Intelligent Infrastructure in Surrey

Digital Parking Management Pilot: Phase 2

Transportation Digital Twin: Phase 2



**CITY OF SURREY**
13450 104 Avenue
Surrey, British Columbia  V3T 1V8

surrey.ca

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