APPENDIX C

PRELIMINARY AUTOMATED MOBILITY POLICY FRAMEWORK

PRELIMINARY AUTOMATED MOBILITY POLICY FRAMEWORK FOR SEATTLE

The automaker and transportation technology industries are investing billions of dollars to advance automated vehicle (AV) research and development. The industry envisions bringing the technology to market within the next decade. Automated vehicles have the potential to dramatically reduce traffic deaths and serious injuries, helping us achieve our Vision Zero safety goals. Shared automated fleets could also strengthen connections to and from public transit, and dramatically reduce the personal costs of mobility. But how do we transition to a future with connected and automated vehicles without exacerbating congestion and land use impacts? Automated vehicles will be a reality in Seattle and we must be prepared to extract the best outcomes from their arrival.

Like any other emerging technology, the City of Seattle must shape how automated mobility impacts and benefits our citizens even as the details of the technology are in flux. We will plan for the inevitable emergence of connected and fully automated vehicles with a historical lens. Cities around the country continue to learn tough lessons from overreliance on the automobile. As a new model of automobility is introduced to Seattle, we have a century's worth of experience understanding and managing the impacts of motor vehicles. As automated vehicles arrive in Seattle, we must ask: What do we want our city to look like? To what extent should we use these new technologies to ensure our citizens are included, happier, healthier, safer, and more financially secure?

"New disruptive technology has the potential to remake city streets, and policies must directly address their expected widespread impact on safety, mobility, and land use"
– NACTO, Policy Recommendations for the Future of Automated Vehicles

The following policy framework directs us toward a future with fully automated, shared, connected, and electric mobility, and advances Seattle as a walkable, bikeable, transit-oriented, and innovation friendly city in the future. Our approach balances innovation with setting clear expectations for management and operating parameters. We aim to:

1. Continue prioritizing the needs of people walking, biking, and taking transit and leveraging the growth of our robust transit network
2. Support the development and testing of automated mobility technology, learning from the pilots and partnerships with local and national technology and operating equipment manufacturers (OEMs)
3. Establish clear policy parameters that ensure automated vehicles help achieve the Mayor's five core values and our shared and emerging mobility principles —not counteract them

Building on the National Association of City Transportation Officials' (NACTO) Policy Statement on Automated Vehicles, released in June 2016, Seattle's automated mobility policy framework is organized according to seven policy pillars. While we intend to adopt the policy framework by City Council ordinance, the policy directives highlighted below should be reassessed periodically to mirror, not only the dynamic nature of the automated mobility industry and new advancements in supply and demand side mobility strategies, but also the complex dynamics related to shifting from human-operated vehicles to fully automated vehicles. This is a starting point that will be monitored and updated as the field advances.

What are the ground rules for regulating automated vehicles?

In 2016, the United States Department of Transportation (USDOT) and the National Highway Traffic Safety Administration (NHTSA) establish draft regulatory guidance on federal and state agency roles regarding the manufacture and operation of automated vehicles. USDOT and NHTSA have broad authority to set Federal Motor Vehicle Safety Standards, vehicle design requirements, and cyber security elements. State agencies play a role in licensing drivers and vehicles, setting liability rules, and establishing pilot regulations, among other controls.

But what is the role of local governments? Under the City of Seattle's police powers, we can develop and enforce automated vehicle-specific traffic laws, dedicate right-of-way for automated vehicles, manage and price parking, and establish specific requirements related to levels of automation. We can also manage system impacts and introduce road use pricing schemes to manage demand. Finally, fleet services that are licensed by the City of Seattle could be required to meet basic requirements related to data sharing, equity, and accessibility.

Figure 1: Federal, state, and local regulatory authority over automated vehicles

Federal	State	Local
• Safety standards • Base privacy and data sharing requirements • Cyber security • Equipment and manufacturing standards • Vehicle design • Infrastructure planning and funding • Funding for AV operations • Research funding • Public communication	• Infrastructure planning and funding • Funding for AV operations • Research funding • Human driver licensing • Motor vehicle registration • Insurance and liability regulations • Traffic laws and regulations • Safety inspections • Pilot regulations • Demand and system management for State and Interstate highways	• Demand and system management for local streets • Parking/curbspace • Land use regulation • Curb and road use fee setting • Local transportation financing • Traffic laws and regulations • Data sharing for system planning and real-time operations

PRINCIPLES FOR AUTOMATED MOBILITY

Embracing technology alone will not meet our city's needs. In the end, automated vehicle technology is only one of the future tools that could help us achieve our broader community goals. We leverage innovation to support our transit network and provide ubiquitous mobility for all. We use shared automated vehicle services and other emerging mobility technologies in service of our core values: To become a safe, interconnected, vibrant, affordable, and innovative city.

Leveraging automated mobility to meet our core values requires an intentional, outcome-driven, and anticipatory approach to policy direction. As with any other shared or innovative mobility solution, automated mobility will be driven by the following principles.

Put People First	The public right of way is our most valuable and most flexible public space. Our streets should prioritize access for people, amplifying the role and value of walking, biking, and transit in Seattle. We respect the desire to retain and use privately-owned vehicles; but will continue to manage the transportation system to move people and goods safely and efficiently. Safety is paramount, no matter how you get around Seattle. Our streets should be comfortable and intuitive for our most vulnerable travelers (people walking and biking). Shared, automated, and other new mobility models should not only advance our Vision Zero safety goals, they should also maintain consumer protections.
Design for Customer Dignity and Happiness	Transportation happiness is a key indicator of the 21st Century Seattle Department of Transportation. We will not only simplify and enhance the user experience of public transit and new mobility services, we will continue to promote a diversity of transportation choices. Dignified public transit and new mobility services must accommodate people with mobility impairments, non-traditional schedules, and families that need flexible mobility options.
Advance Race and Social Justice	New mobility, whether shared, public, private, or automated, is a fundamental human need. Everyone needs a barrier-free transportation system and affordable transportation options that are understandable and accessible to all who want to use them. New mobility models should also promote clean transportation and roll back systemic racial and social injustices borne by the transportation system.
Forge a Clean Mobility Future	We are committed to climate action. We will transition our transportation sector to one which furthers our climate goals and builds replicable models for the rest of the world. New mobility services should use clean energy and expand human-powered transportation.
Keep an Even Playing Field	Data infrastructure is foundational to understanding, operating, and planning in a constantly changing transportation system. Partnerships and a fair and flexible regulatory environment will nurture and expand new mobility ideas, companies, jobs, and workforce training.

REGULATION AND PARAMETERS

The following policies establish regulations and operating parameters that standardize automated vehicle behavior to ensure their operations are safe, shared, connected, and electric.

Policy RP1: Enact a "people and transit first" approach to automated mobility ensuring our streets safely move people and goods and prioritize transit, based on the following right-of-way priorities (in order):

1. Modal plan priorities
2. Access for people
3. Access for commerce
4. Activation
5. Greening
6. Minimized storage
7. Minimized zero occupancy vehicles

Policy RP2: Allow a combination of human-driven (SAE Level 0 or 1) and fully automated vehicle operations (SAE Level 4 or 5) within the City of Seattle to eliminate the dangers of partial automation (SAE Level 2 and 3), such as creating a false sense of security, instilling distracted driving, and exacerbating driver error.

Levels of Automation

Automated vehicles—whether they are private vehicles, buses, trains, or freight vehicles—provide different levels of automation or human driven functions depending on the type of task or operating scenario. The Society of Automotive Engineers (SAE International) developed a six-level taxonomy governing the varying degrees and types of vehicle automation and associated levels of human interaction.

SAE LEVEL 0	NO AUTOMATION	At SAE Level 0, the human driver performs all driving tasks across all driving scenarios
SAE LEVEL 1	DRIVER ASSISTANCE	At SAE Level 1, an automated system on the vehicle can complement the human driver's performance of either steering or acceleration/deceleration in some driving scenarios. The human driver is responsible for monitoring the driving environment.
SAE LEVEL 2	PARTIAL AUTOMATION	At SAE Level 2, an automated system on the vehicle can conduct both steering and acceleration/deceleration in some driving scenarios, while the human continues to monitor the driving environment and performs the rest of the driving tasks
SAE LEVEL 3	CONDITIONAL AUTOMATION	At SAE Level 3, an automated system, in some driving scenarios, can conduct all parts of the driving task and can monitor the driving environment. However, the human driver must be ready to take back control when the automated system requests.
SAE LEVEL 4	HIGH AUTOMATION	At SAE Level 4, an automated system can conduct all parts of the driving task and can monitor the driving environment in some driving scenarios. Within these select driving scenarios, the human driver does not need to be ready to take control of the vehicle.
SAE LEVEL 5	FULL AUTOMATION	At SAE Level 5, the automated system can perform all driving tasks in all driving scenarios. Human passengers need not be attentive or even capable of driving the vehicle.

Source: SAE International Standard J3016: Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems

Policy RP3: Hard code the following base operating parameters into connected and automated vehicles:

- Maximum operating speeds for automated vehicles on City arterials non-arterial streets at legal limits to ensure our streets are safe, comfortable, and vibrant.
- Passenger occupancy requirements for non-transit vehicle use of transit lanes.
- Functional classification system for automated vehicles and network of peak period smart lanes dedicated to SAE Level 4 and 5 automated vehicles. This includes, but not limited to:
    - Fully automated vehicle only lanes (no human operation allowed)
    - Full access for automated vehicles with SAE automation Levels 1, 2, 4, and 5
    - Limited access for low-occupancy automated vehicles
    - Zero access for automated or human-operated vehicles
- Time-based access restrictions on geofenced congestion management corridors and districts.
- Transit priority at all intersections along frequent transit corridors.

Policy RP4: Collaborate with federal and state policymakers to ensure SDOT's core local controls and police powers related to automated vehicle regulation are not preempted.

Policy RP5: Establish time-based access restrictions or pricing for geofenced congestion management corridors and districts for certain vehicle types (e.g., automated freight, single-occupant, and zero occupant vehicles during peak travel periods).

Policy RP6: Require shared automated vehicle fleets to use fully electric vehicles.

Policy RP7: Require submission of detailed data from automated owned vehicles, shared fleet services, commercial fleets, freight, and transit to neutral data platforms (including vehicle speeds, crash and near miss reports, average latency of vehicle-to-infrastructure and vehicle-to-vehicle data flows, trip time, trip route, trip origins and destinations, vehicle occupancy, pavement quality, and environmental conditions).

Policy RP8: Protect the privacy of individuals by anonymizing personally identifiable data generated by connected and automated vehicles.

EQUITY AND ACCESSIBILITY

The following policies ensure that automated mobility and other future transportation innovations are designed with a racial and social justice lens, accommodating the wide cross section of Seattleite's abilities and backgrounds.

Policy EA1: Ensure the benefits of automated mobility are equitably distributed across all segments of the community and that the negative impacts of automated mobility are not disproportionately borne on traditionally marginalized communities.

Policy EA2: Ensure shared automated vehicle fleets consider the safety needs of vulnerable populations and loading needs of seniors, families with children, and individuals with mobility impairments.

Policy EA3: Establish equitable performance standards and penalty structures for shared automated vehicle fleet wait time and declined rides as a way to eliminate discriminatory practices.

Policy EA4: Require a percentage of shared automated vehicle fleet vehicles to be ADA-compliant to meet the needs of people with disabilities.

Policy EA5: Identify and require shared automated vehicle fleets to serve markets that are underserved by transit and focus on connecting people to high quality transit spines.

Policy EA6: Acknowledge and mitigate the labor implications of automated mobility, particularly in the for-hire, freight, and public transit industries, among others.

Policy EA7: Conduct a publicly-visible community consultation and outreach process to understand concerns, needs, and opportunities related to the impending automated mobility paradigm.

Policy EA8: Establish a City-owned transportation network company digital platform to incubate smaller shared automated vehicle fleet businesses, mitigating the risk of mobility monopolies in Seattle

PILOTS AND PARTNERSHIPS

The following policies direct SDOT to establish partnerships and pilots that advance automated vehicle testing, particularly new models of mobility service delivery.

Policy PP1: Develop strategic pilot partnerships to test automated vehicle technology in Seattle's climate, hilly terrain, and urban traffic conditions.

Policy PP2: Develop strategic research partnerships to determine needs and effectiveness of physical infrastructure, connected sensor infrastructure, and requirements for personal digital devices.

Policy PP3: Work with our region's transit agencies to ensure automated vehicles support safer transit operations and grow the public transit market.

Policy PP4: Work with our region's transit agencies to pilot new automated transit service delivery models that improve first- and last-mile transit connections and cost effectively serve unproductive geographic markets, while recognizing the impact on labor.

Policy PP5: Leverage research support from the University of Washington to analyze the safety implications of automated vehicle operations and integrate policy and operational recommendations into SDOT's work implementing the Vision Zero Action Plan.

Policy PP6: Partner with shared automated vehicle fleet services and operating equipment manufacturers to develop and promote family-friendly shared automated fleet services.

Policy PP7: Promote changes in urban goods movement by participating in automated freight vehicle pilots that focus on "last 50 feet" delivery challenges, hub-and-spoke delivery models, and aerial and surface drone delivery.

Policy PP8: Work with PSRC and other local cities to update the base assumptions in the activity-based regional travel demand model to reflect ongoing changes to travel time costs, transportation costs, travel options through Mobility as a Service platforms, vehicle shedding and suppression, and transit expansion, among others.

INFRASTRUCTURE AND STREET DESIGN

The following policies establish expectations related to right-of-way allocation, intersection control, transit access, and connected infrastructure under an automated mobility paradigm.

Policy IS1: As vehicle ownership decreases and reliance on shared automated vehicle fleets increases:

- Capitalize on system efficiencies to implement our Transit, Bicycle, and Pedestrian Master Plans.
- Capitalize on opportunities to invest in placemaking features and expand the pedestrian realm.
- Identify and phase in corridors and zones dedicated to transit, walking, biking, and high-occupancy automated vehicles only.

Policy IS2: Establish multimodal level of service (MMLOS) or another vehicular level of service alternative as the default intersection performance measure to ensure efficient person movement, but also safer and more comfortable intersections.

Policy IS3: Work with our region's transit agencies to ensure automated vehicles support safer transit operations and grow the public transit market.

Policy IS4: Maintain intersection traffic control (e.g., signal control, stop control, and traffic calming devices) to ensure comfortable crossings for people walking and biking.

Policy IS5: Consider the loading needs of shared automated fleet services at shared mobility hubs to ensure seamless connections to and from high quality transit.

Policy IS6: Expand SDOT's sensor network to track automated vehicle use, enable vehicle platooning, and ensure safe and efficient automated vehicle operations.

Policy IS7: Partner with the private sector to expand the city's network of Vehicle-to-Infrastructure (V2I)-enabled sensors (e.g., roadside units) on Seattle Department of Transportation and Seattle City Light infrastructure in the public right-of-way.

Policy IS8: Collaborate with operational equipment manufacturers, technologists, and federal AV policymakers to establish outcome-based vehicle form factors that change the way we design and operate streets.

Policy IS9: Develop a citywide network of shared residential streets to be operationalized when Level 4/5 automated vehicles consist of a majority of all personal and shared fleet vehicles licensed in Seattle.

Policy IS10: Expand passenger loading zones citywide to ensure safe and efficient loading operations for shared automated vehicle fleet services.

MOBILITY ECONOMICS

Automated vehicles will have profound implications on the way we fund and manage our transportation system. The economics of automated vehicles will likely compound congestion levels by increasing per capita miles driven and creating new opportunities for zero-occupant travel and enterprise robotaxi services. These scenarios must be acknowledged and mitigated. Likewise, shared automated vehicle fleets as well as electric vehicles will dramatically reduce gas tax and parking revenues, changing our financial approach to managing, operating, and maintaining the public right-of-way. The following policies provide direction on the types of funding mechanisms that could be advanced in the automated mobility paradigm. The policies also establish the pricing and demand management tools necessary to ensure automated vehicles are primarily used for shared mobility trips, limit inefficient trips, and maximize the value of our public transit investments.

Policy ME1: Develop a tiered and dynamic per mile road use pricing mechanism for automated vehicles operating in highly congested areas and corridors of Seattle:

- Tier 1 (elevated surcharge): Zero-occupant automated vehicles
- Tier 2 (base surcharge): Single-occupant automated vehicles
- Tier 3 (reduced surcharge): Automated vehicles using smart lanes with less than three passengers (see Policy RP3)
- Tier 4 (no surcharge): Automated vehicles using smart lanes with three or more passengers (see Policy RP3)
- Tier 5 (additional surcharge on Tiers 1-3): Peak travel period surcharge for all non-public transit vehicles trips with less than three passengers, including freight.

Policy ME2: Incentivize shared automated vehicle trips that provide access to public transit service at shared mobility hubs.

Policy ME3: Integrate shared automated vehicle fleet application programming interfaces (API) into Mobility as a Service platforms to ensure all shared fleet options are available to consumers.

Policy ME4: Continue Commute Trip Reduction and Transportation Demand Management investments that encourage in high-occupancy vehicle trips, particularly those trips that leverage our region's investment in STBD service enhancements and high capacity transit.

Policy ME5: Assess and establish alternatives to parking and state gas tax revenue sources, including, but not limited to, zero- and low-occupancy fees, curb side dwell time fees, per mile road use charges, cordon tolling, and peak period surcharges.

Policy ME6: Provide road use fee discounts or incentives for 3+ passenger occupancy in automated vehicles.

Policy ME7: Monetize and sell SDOT-owned sensor data to be used for data aggregations and connected vehicle optimization.

Policy ME8: Provide road use fee discounts or incentives for automated vehicle trips that combine a mobility and goods delivery function (e.g., fee offsets for deliveries made on behalf of delivery companies).

Policy ME9: Mandate connected vehicle technology in all vehicles and data sharing to establish clear understanding of travel demand and enable financial auditing of fee revenues.

LAND USE AND BUILDING DESIGN

The following policies reaffirm our commitment to building dense, vibrant, and transit-oriented communities. These policies also redirect development and parking standards to reflect new and dynamic relationships between automated vehicles and the built environment.

Policy LB1: Ensure automated vehicles advance our land use goals and capture the value of transit-oriented development.

Policy LB2: Require future development and building standards to be future-compatible, reflecting advances in shared automated mobility and shifts toward e-commerce and new urban goods movement and delivery models.

Policy LB3: Consider the advancement of new passenger and delivery form factors in the design of buildings and public spaces (e.g., smaller vehicles, drone delivery services, and smaller vehicles for last mile deliveries).

Policy LB4: Working with the Seattle Office of Planning and Community Development and Department of Construction and Inspections, update the zoning code to:

- Ensure all new parking is adaptively reusable for retail, distribution, and other uses (including mandating higher floor heights and above-ground parking to enable retrofits).
- Require new parking to be furnished with Level 2 EVSE charging infrastructure.
- Phase out off-street parking requirements as demand for personal vehicles decreases, and redirect these developer cost savings toward affordable housing and transportation demand management incentives.
- Integrate digital kiosks and other smartscaping features into the design of buildings so that residents, tenants, and passersby can gain access to mobility information, community data, and Mobility as a Service platforms.
- Integrate surface street and aerial drone delivery into building design and operations.