LIVE FROM **AUSTIN, TEXAS:**

The Smart City Challenge

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EXECUTIVE SUMMARY

Austin is America's fastest-growing major city. Since 2010, the population has grown by more than 100 people per day. Our city has twice as many people as it did 30 years ago, and the urbanized area now spreads into five counties.

That growth is sustained by one of America's most vital metropolitan economies. Austin is one of only a few cities that actually gained jobs during the recession beginning in 2008. Much of that economic energy is driven by innovation in technology and by the creative industries who've made Austin an international destination for art, music, film, food, media and culture.

But obviously that prosperity and vitality is not being shared equally by everyone. The Martin Prosperity Institute at the University of Toronto identified Austin as the most economically segregated major metro area in America. Traditionally marginalized communities of color in working-class neighborhoods are being displaced by gentrifying pressures and high housing costs, as those neighborhoods become boutique and trendy hotspots. Meanwhile, outlying suburbs are developing their own concentrations of poverty, in areas where there are few services to meet the needs of the underserved.

Working families at all income levels are feeling some of these pressures. Middle-income tradespeople, mid-level professionals, and employees in public service — such as the thousands of Austinites who work for the State of Texas and University of Texas — are finding themselves living further and further away from their jobs Downtown, on campus and at the Capitol Complex in the urban core. Even the highly educated workforce for which Austin is famous finds itself impacted by the scarcity of reasonably priced family housing near its increasingly urbanized workplaces.

All these factors conspire to plague Austin with some of the worst mobility challenges in America. But they also create the urgency that we feel will energize and empower our Smart City effort. Our vision is to make Austin a Smart City that builds on our history of innovative and successful public and private collaborations, the open and flexible regulatory environment, our ongoing investments in comprehensive planning for complete, compact and connected communities, and most of all the diversity and creativity of our people.

By bringing 21st-century mobility to life in Central Texas, we aim to accomplish goals in 10 years what many cities have had 100 years to accomplish. We can and will deliver on Austin's own community values of equity, economic opportunity, and environmental stewardship (the "three Es"), inform and provide testable hypotheses and proven pilots for the other Smart City finalists, and build a foundation for Texas-wide partnerships for better urban mobility.

Our Smart City vision includes a variety of pilots and programs that continue on Austin's current track record of adopting innovative technology, including:

Pilots, Places and Services for People

- Transit access hubs, known as **Smart Stations,** that bring together a wide variety of mobility services, along with opportunities for other services useful to travelers, and can serve as centers for the deployment of autonomous and connected vehicles, urban freight logistics, and electric fleets. Pilot locations include Austin's airport, Downtown Austin, the low-income and transit-dependent community around Rundberg Lane, and Austin's suburban city of Pflugerville.
- **Connected Corridors** that link the Smart Stations, with new transit services (including a deployment of electric bus rapid transit), dedicated transit lanes and signal priority, better facilities for active transportation, and a sensor-rich environment that allows for rapid deployment of V2V and V2I connected-vehicle technology. Our Riverside Drive Smart Corridor pilot is a major arterial with high transit use and a significant lower-income population that links Downtown and the Austin airport.
- A **Mobility Marketplace** that connects travelers to their best packaged mobility options and provides an ecosystem for the development of new mobility services, with integrated payment options (including options for the unbanked) real-time travel information via app or kiosk, and a mobility analytics platform being developed in partnership with USDOT's federal partners at Sidewalk Labs. To ensure that a technology-based marketplace is accessible across the digital divide, this pilot also includes a human-driven outreach component — Smart Ambassadors who will work on the neighborhood level to educate and help people take advantage of the marketplace.
- All three of the above pilots are integrated into a set of **Ladders of Opportunity Initiatives** that use Smart Stations, Connected Corridors and the Mobility Marketplace to improve access to jobs, education, healthcare, healthy food, and other areas of need. These include

partnerships with Central Health's network of CommUnityCare safety-net clinics, with Austin Community College (both as a major destination and as the region's largest workforce developer), with the Restore Rundberg community-development and crime-prevention initiative, and with Google Fiber and the Housing Authority of the City of Austin, which are collaborators on a nationally recognized digital inclusion effort with the City and with nonprofit partners.

Deploying Tomorrow's Vehicles

- A **connected and automated vehicle** program that builds on work being done already in Austin, with Google X self-driving cars already on the streets and manufacturers such as General Motors, NXP, Siemens and Cirrus Logic innovating in the connected-vehicle space. The Smart City initiative will include both a closed-loop test environment at Austin's airport and options for open testing on the Riverside Connected Corridor, and a prototype autonomous shuttle from the airport to the nearby Smart Station, exposing thousands of early-adopting Austin travelers and technology pros to the CV/AV environment.

- A large-scale **fleet electrification** program under the aegis of Austin Energy, which has already achieved milestones in electric vehicle adoption and powers its entire charging network with 100% renewable energy. Targets for quick uptake of vehicles include the city's taxi and ride-hailing fleet, delivery vehicles, the city's own fleet, and electric transit vehicles.

Infrastructure, Data and Analytics: The Mobility Innovation Center

Our core "back of the house" programs that will support the Smart City pilots include:

- Our **"One System"** regional operations and management concept, integrating and enhancing travel management operations between the City of Austin, Capital Metro, Central Texas Regional Mobility Authority (a toll road operator), the Texas Department of Transportation, and other communities, including the deployment of Integrated Corridor Management along Interstate 35 (already planned by TxDOT).

- A network of rich **intelligent sensors** that will feed more and better data to transportation agencies and help tackle a variety of persistent challenges facing local operations managers, public safety agencies, and planners.

- A two-way open data portal, known as the **Data Rodeo,** which will integrate and curate data from public, private and non-profit sources, including data providers beyond the transportation sector, and make data available to enable research and education as well as support application and tool developers.

- An **Urban Analytics and Policy Research** platform that plays an integrated role in performance management, metrics and evaluation for the entire Smart City effort.

All of these efforts will be supported by ongoing stakeholder engagement with both partners and users and rapid assessment and documentation of both successes and failures, guided by a governance structure that brings together local agencies and non-profit partners in a consortium model, with executive-level authority residing within the City organization.

Achieving USDOT's Expected Smart City Outcomes

"Austin is a beacon of sustainability, social equity, and economic opportunity; where diversity and creativity are celebrated; where community needs and values are recognized; where leadership comes from its citizens, and where the necessities of life are affordable and accessible to all. Austin' greatest asset is its people: Passionate about our city, committed to its improvement, and determined to see this vision become a reality." – Imagine Austin Comprehensive Plan, 2012

At a policy and organizational level, Austin's own community goals — for example, as expressed in our Imagine Austin Comprehensive Plan — mirror USDOT's Smart City outcomes and as such have influenced the development of Austin's Smart City vision:

- **Improving Safety –** Austin is a Vision Zero community that, after a record year for auto fatalities in 2015, is committed to improving travel safety. Connected-vehicle (V2V/V2I) technology, pedestrian/bicycle detection, intelligent sensor deployment to support more effective incident management, Smart Station services that provide travelers with a variety of safe choices, and other components of Austin's Smart City vision all will create a safer travel environment.

- **Enhance Mobility –** Austin is already at the forefront of innovation of new mobility services and information tools, including (as just announced May 23), a new non-profit model for TNC service, that are built on by the Smart City vision. Smart Stations, Connected Corridors and the Mobility Marketplace promise better options for both personal and freight mobility. By incorporating human-centered outreach with the Smart Ambassador program and by siting these pilots in areas of need, Austin's Smart City vision will provide a broad spectrum of diverse residents with new and better ways to meet their travel needs.

- **Enhance Ladders of Opportunity –** Austin's Ladders of Opportunity Initiatives build on already successful efforts by public, private and community partners to accomplish such goals as improving access to health-care, developing a next-generation workforce, revital-izing areas of concentrated poverty into complete and safe communities, and overcoming the digital divide. By adding a transportation component to these efforts, we feel we are directly fulfilling the USDOT vision. In addition, the development and deployment of Smart City technologies will create economic opportunities and jobs for a wider spectrum of Austin workers and companies.

- **Address Climate Change:** Austin's own Climate Pro-tection Plan establishes goals for greenhouse-gas reductions that have informed Austin Energy's work on the fleet electrification program in the Smart City vision. Because the municipal utility has a large and growing renewables portfolio, electric fleets in Austin can be powered without simply shifting the city's carbon foot-print from the transportation network to the power grid. The Smart Station, Connected Corridor and Mobility Marketplace pilots also focus on providing people with more climate-friendly alternatives to driving alone — whether transit, active transportation, shared rides or future autonomous vehicles.

Creating A Smart Ecosystem

Austin's Smart City vision grew organically and brings together dozens of participating agencies, community groups, private-sector firms, and academic institutions. This ecosystem of partners reflects the people and cul-ture of Austin; each brings unique offerings and creates unique value. But all are focused on ensuring that initial investments made with the Smart City Challenge grant are documented with sound metrics and research, rep-licable and scalable and sustainable, can generate value over the long term, and most of all make a useful differ-ence in people's lives.

The potential for improved quality of life that's enabled by a Smart City must promote equal economic potential: with all genders; across all racial and ethnic backgrounds; among all socio-economic classes; and across all pub-lic institutions and commercial sectors of the economy. Achieving these outcomes requires engaging our com-munity. We will bring together stakeholders of every kind to enable the community as a whole to serve the under-served and enfranchise the disenfranchised.

In the end, these innovative transportation services will be part of the lives of every single person living, working or visiting Austin. With success, they'll also more quickly become part of the lives of residents of dozens of other US cities because of the work done in Austin with the Smart City investment — delivering the best possible return on that investment to USDOT.

ANNOTATED SITE MAP

GEORGETOWN

ROUND ROCK

PFLUGERVILLE
SMART STATION

ROMC

RUNDBERG
SMART STATION

E

MOPAC

183

A

D

UT-CTR

I-35

M STATION

B

C

DOWNTOWN
SMART STATION

I-35 ICM
CORRIDOR

RIVERSIDE CONNECTED
CORRIDOR

71

290

ABIA SMART
STATION

BUDA

KYLE

SAN MARCOS

LEGEND

★ **UT-Center for Transportation Research**
"One System" Open Data Portal
Connecting TMC's Data

⭕ **Current TMC Operations**
A CTECC - Combined Transportation and
Emergency Communications Center
(TxDOT+CMTA TMC)
B ATD - Traffic Managment Center
C APD - Traffic Operations Center
D CTRMA - Express Lane Operations Center
E CMTA - Rail Operations

Future Data Connections in "One System" Portal

✪ **ROMC**
"One System" - Regional Operations Management
Center (Proposed Site: UT Pickle Research Center)

I-35 Integrated Corridor Management
Connected Sensors, Cameras, DMSs

Riverside Connected Vehicle Corridor
Electric BRT, Mobileye, Pedestrian/Bicycle Detection
Technology, CV Monitoring
24 eBRT Stops

Airport - Autonomous Vehicle Pilots (ABIA)
Autonomous Buses on Airport Environs
Super Fast 150Kw 12-port Charging Bay for Electric
Taxi Fleet

Smart Stations/Connected Traveler/Packaged Mobility
Rundberg
M Station
Pflugerville
Airport
Downtown

VOLUME 1: VISION A SMART AUSTIN

Austin is home to hundreds of thousands of smart people, thousands of innovative businesses, more startups and patents than any other city in Texas, top-flight research institutions, pathfinding new technologies … and some of the worst mobility and equity challenges in America. Austin's hyper-growth over the past decade has brought economic vitality coupled with a number of challenges, including long commutes, unaffordable close-in housing, and the suburbanization of poverty. We bear the unwelcome distinction of being the most economically segregated urban area in the nation. We really have no other choice but to become a Smart City to tackle these challenges head-on with the best tools possible.

Our vision is to make Austin a Smart City that builds on our history of innovative public and private collaborations to bring 21st-century mobility to life in Central Texas. This will meet the urgent need for safe and affordable travel throughout our fast-growing urban area, deliver on Austin's own community values of equity, prosperity, and environmental stewardship, inform and provide a model for other cities facing the same challenges, and build a foundation for a Texas-wide partnership for better urban mobility.

Our Smart City approach builds and activates **an ecosystem of accessibility** that translates "mobility" directly into opportunities:

- Access to services via a mobility marketplace that works hand-in-hand with Connected Travelers to create safe, complete, door-to-door connections to jobs, housing, educational opportunities, healthy communities, and more, and to help all travelers make better, more informed choices.

- Access to places that not only bring together mobility services and modes but also intelligent land uses, future employment centers, and complete and connected neighborhoods.

- Access to technologies that deliver the real value in a Smart City — safe, clean and efficient travel made possible with tools from intelligent sensors, to automated and connected vehicles, to fully electrified and de-carbonized fleets.

- Access to information through coordinated and optimized two-way data management, a solid policy framework informed through data analytics, workforce development to support a new economy, and a Connected Traveler initiative that helps service providers better understand traveler needs.

Using the US DOT's Beyond Traffic Vision Elements as a touchstone, Austin has refined and integrated its Smart City component initiatives to help spur the growth of our accessibility ecosystem while also seeking the best ways to achieve the essential outcomes of greater safety, improved mobility, cleaner transportation to combat climate change, and the creation of meaningful ladders of opportunity.

This ecosystem is already emerging; as we've refined our Smart City Challenge vision, we've identified a broad set of public and private collaborators, answered key strategic and tactical questions and, most importantly, taken a "user-first" approach to ensuring our solutions are designed to meet the needs of all people and communities. Building on Austin's existing accomplishments in entrepreneurship, early adoption of technology and creative real-world problem solving, we want our Smart City to be the best place to realize the greatest return on public and private investments in 21st century mobility, including the DOT's Smart City Challenge grant.

TECHNOLOGY ELEMENTS (Highest Priority)

Vision Element #1 Urban Automation

Vision Element #2 Connected Vehicles

Vision Element #3 Intelligent Sensor-Based Infrastructure

INNOVATIVE APPROACHES TO URBAN TRANSPORTATION ELEMENTS (High Priority)

Vision Element #4 User-Focused Mobility Services and Choices

Vision Element #5 Urban Analytics

Vision Element #6 Urban Delivery and Logistics

Vision Element #7 Strategic Business Models & Partnering

Vision Element #8 Smart Grid, Roadway Electrification, & EVs

Vision Element #9 Connected, Involved Citizens

SMART CITY ELEMENTS (Priority)

Vision Element #10 Architecture and Standards

Vision Element #11 Low-Cost, Efficient Secure & Resilient ICT

Vision Element #12 Smart Land Use

- **Mobility Innovation Center (MIC)** – Governance model that develops, deploys, and evaluates the pilots and programs associated with Austin's Smart City effort
- **Smart Stations** – Strategically selected locations that create places of social, economic, and technological activity
- **Connected Corridors** – Links between the Smart Stations that are instrumented with sensors and other communications technology to enable V2V, V2I, and V2X applications
- **Next Generation Vehicles** – Emerging technologies that employ connected, automated, and alternative energy features
- **Data Rodeo** – A data management system that enables travelers, public agencies, and Smart City partners to archive, analyze, and access meaningful data and decision-making tools
- **Regional Operations Management Center (ROMC)** – A transportation center that unifies multiple stakeholders, including ATD, TxDOT, CTRMA, CapMetro, and others to monitor and manage multimodal transportation operations
- **Partner Engagement** – Partnership development programs that engage employers, industry leaders, and entrepreneurs for the benefit of the traveling public
- **Community Engagement** – Outreach, education, and training programs that empower people to use mobility to access opportunities
- **Sustainability** – Scalability and commercialization efforts that disseminate lessons learned and replication methods

This suite of pilots, programs and plans is tailored to meet real-world challenges facing Austin, America's fastest-growing major city:

- **Mobility** – In order to meet the diverse needs of Austin's growing population, it is critical to provide a range

of transportation services to all communities. In particular, 15% of Austin's population live in a transit desert, neighborhoods that have no or limited access to public transit. As a result, transit dependent groups – such as the elderly, young, low-income, disabled, no vehicle households, and other underserved communities – have limited opportunities to access healthcare, education, or healthy food.

- **Affordability –** It is important to consider the interrelationship between land use, utilities, and transportation and their joint impacts on a household budget. Between 1998 and 2008, the percentage of all single-family homes in Austin considered affordable declined from 42% to 28%. During that time, historic neighborhoods fell into disrepair, residents relocated to Austin's suburbs, and historically working-class communities

underwent gentrification. With new investment, it is critical to balance revitalization with the preservation of a community's heritage and culture.

- **Historic Barriers –** Like many cities, Austin exhibits racial divides that have been perpetuated by planning, infrastructure, and socioeconomic policies. In 1928, the Koch and Fowler city plan proposed the creation of a "Negro District" – making it the only part of the city where African-Americans could access schools and other public services. In 1935, the federal government launched a New Deal program; however it excluded most minority communities through redlining – the practice of denying or charging more for goods and services in certain neighborhoods. Consequently, minority residents could not access government-backed mortgages, restricting their ability to build home equity and reinforcing segregationist boundaries. In the early 1960s, the I-35 highway was built through the low-income neighborhoods, dividing the city into West and East Austin. The region's racial divides have become increasingly acute for its minority populations, which struggle with higher poverty rates, more isolated neighborhoods, lower educational attainment, and lower employment levels. If this pattern remains unaddressed, it represents a lost economic opportunity and allows poverty to continue its generational spread.
- **Safety –** Hundred of people are in accidents each year on Austin roadways. Austin is now committed to becoming a leading Vision Zero City.
- **Sustainability –** In order to address the environmental concerns, Austin is dedicated to reducing its greenhouse gas emissions. A skilled workforce is also essential to remaining competitive in today's global economy. Economic growth and prosperity cannot be sustained by population growth alone; it is imperative to develop the talent and potential of everyone. In 2010, 13.5% of all families with children residing in the Capital Area lived below the federal poverty level. As the region's

population continues to grow and further diversify, disparity in educational attainment, if not addressed, poses a threat to the social and economic fabric of the region. In an economy that embraces higher levels of skills, a growing number of individuals will be unable to compete in the labor force for high-skill, high-wage jobs

Our approach to developing our Smart City pilots and programs has been guided by governing principles including the following:

• A commitment to open data that is available to everyone

• Avoiding proprietary systems with a goal of making all components of the system open-source, expandable and interoperable

• An adherence to standards to allow replicability in data-gathering, data-reporting, software and hardware development

• A commitment to new innovative and creative government regulation, developed with private businesses in new economies with emerging economic models and platforms, that provides for structures that are as innovative and creative as the businesses to be regulated and does so in ways that do not impede private innovation without requiring governments to abdicate their required role in public interests such as safety. Austin is facilitating Google's current testing of autonomous cars on our streets, was the locale of Daimler's North American launch of Car2Go, and is developing a third-party cross-platform validator badge, known as Thumbs Up, to drive volunteer fingerprinting of TNC drivers

• High expectations of private partners who need to have some skin in the game

• Policy leadership to accelerate adoption of new technologies, while protecting residents from unnecessary risk or dangers

Among significant changes from the components presented in the NOFO1 submittal:

1. We have aligned our Smart Stations, along with packaged mobility services and the Connected Traveler initiative, directly with areas of high need, in collaboration with community partners including Central Health (operator of CommUnityCare safety-net clinics), the Housing Authority of the City of Austin, and Austin Community College, among others.

2. The development of a Connected Corridor along Riverside Drive, linking Downtown Austin and the airport. This busy corridor, which also traverses high-need neighborhoods and provides for ladders of opportunity, will be the test bed for deploying a number of Smart City pilot opportunities, including electric bus rapid transit and safety features such as connected vehicle applications and bicycle and pedestrian detection..

3. The emergence of the Mobility Marketplace concept to allow for open innovation of services to support packaged mobility and the Connected Traveler and to make the best use of the data resources available through the Data Rodeo (our two-way open-data portal), the Mobility Innovation Center, and our private sector partners.

AUSTIN'S POLICY LANDSCAPE: AN OPEN MARKET FOR TRANSPORTATION NETWORK COMPANIES (TNC)

Almost uniquely so among major cities in the world, Austin now offers an open market for Transportation Network Company (TNC) solutions – the only such city meaningfully and competitively available for innovation and evolution of TNC systems. Recently, the duopoly of Lyft and Uber left town after losing a ballot referendum [about the fingerprinting of drivers]. The newly created open market already has sparked an exciting mix of new participants and business models.

As part of the Smart Cities Challenge, Austin offers to be the test ground for next generation of TNC innovators. New TNCs are coming to town: operations have been announced by GetMe, Fasten, Fare, zTrip, Hailacab, Wingz, RideAustin, and others are making inquiries. New TNC models and concepts are being introduced. Among the new market entrants are ones that have announced an intention or a willingness to consider providing:

- Open Data. Making publicly available not only the operational and economic data but also the travel and demand data that the established TNC industry has not been willing to provide cities based on claims of proprietorship.
- TNC Platform integration with the community's mass transit options – first and last mile for transit and light rail.
- TNC Platform integration with single user mobility option platforms (transit, bike, pedestrian, and other ground transportation modes and services.
- Non-Profit Status. Exploring whether non-profit or city infrastructure and public utilities of the future might not only consist of roads and pipes built in rights of way but platforms existing in the cloud.
- Living Wages for drivers.
- Digital divide solutions. Ability for passengers to pay

without credit cards. And there is discussion of providing public kiosks from which to hail a ride without needing a personal computer or a cellular device.

- No surge pricing. Or surge price optional for different service levels.
- Local charity profit participation in revenue.
- Locally Desired Safety Provisions or Choices. Support for and participation in a community's decision to have fingerprint background checked TNC drivers.
- Willingness to engage with government to develop the appropriate intersection of new economic models with the government's duty and responsibility in areas such as public safety.

The new entrants into the TNC market are entering with capital commitments (note: of varying degrees). At least one, Ride Austin, has already invested over $4 million in new product development specifically for the Austin launch and has raised at least $10 million to commence and sustain operations and achieve required market liquidity. The City of Austin welcomes all TNCs into the market and sees this capital commitment as being similar to those of other of our partners in the Smart City Challenge

It should be noted that the current Austin TNC ordinance does not provide any regulatory penalty or sanction for any TNC operating in the City with non-fingerprint background checked drivers. Rather, the ordinance sets forth the community goal and expectation that, over time, almost all of the percentage of TNC driver miles or hours will be with fingerprint background-checked drivers. The ordinance is silent as to the mechanism and responsibility for achieving these benchmarks. Unfortunately, Uber and Lyft declined to participate in a community conversation on these issues to help develop new forward looking

government structures, choosing instead to initiate an election (which they lost) and then to leave town. The invitation for Uber and Lyft to operate in Austin and to join in the community conversation remains open, even while the City is welcoming new innovation and models, as described above

At scale, TNCs are critical to the success of Austin's mobility future as we actively seek to create a user-focused mobility-as-a-service model in Austin. Austin will continue to lead on policy development and balance with regards to new mobility technologies. Our goal is to minimize the negative impact to our residents when new disrupted technologies are introduced. Austin proposes to work with our local and national partners to find viable solutions to the sharing economy regulation dilemma. With our partners at Capital Factory, we are exploring new application-based technology that could make biometric data collection seamless and convenient — technology that could result in a transferrable and scalable solution to this issue worldwide.

OUR VISION FOR AUSTIN: THE OPPORTUNITY CITY

How will the Austin Smart City initiatives help real people move up the ladder? To craft our Ladders of Opportunity approach, we have been working with a diverse group of community advisors and public, private, philanthropic partners to develop innovative projects To ensure we can launch rapidly, and produce real data-driven results in three years, Austin will leverage powerful equity initiatives in our community that already have proven momentum helping real people get a leg up on the ladder of opportunity – through education, jobs, housing, healthcare and lifestyles, and more. Now we'll be adding a powerful new transportation layer as well.

Our Smart City initiative will use Smart Stations, Connected Travelers, the Mobility Marketplace and other initiatives to pilot effective ways to measurably help disadvantaged people and communities travel – safely, affordably, and conveniently. We will test and measure new initiatives that help targeted groups of people in need, to access good jobs, schools, homes, medical care, shopping areas, and other critical destinations, and keep the costs of transportation affordable.

Community Advancement Network (CAN) – a coalition of public-sector, community and faith-based organizations who collaborate to improve health-human services, workforce, housing, and other supportive services needed as ladders of opportunity in Central Texas – will be our lead partner to convene, connect, and inform community partners for this effort. Through CAN, we will reinvent the model for involving diverse, low-income people of ages in transportation investment decisions, in a way that is meaningful to them and truly improves their lives. We will engage the many Austin and Central Texas professional and groups already reinventing outreach and civic engagement, an area of great interest and innovation in Austin. Many local community partners have provided let-

ters of commitment detailing their roles and goals; these are included in Volume II of this submittal.

Ladders of Opportunity Mobility Strategies

- Beta-test innovative strategies for improving travel options and tools for specific test groups of disadvantaged people; measure results and implement the strategies that prove successful.
- Test new first-and-last mile services – including on-demand shuttles – to help people conveniently reach existing major transit route stops/stations, when they live/work beyond walking distance.
- Provide more efficient, affordable and accessible mobility options that harness the latest advances in on-demand, shared use mobility.
- Improve on existing paratransit options. Include access for the disabled.
- Smartphone interface and hailing will accommodate people who lack traditional banking and credit card systems. Phone-in and info kiosk options will be tested as alternate to smartphones.

Outreach and Education Strategies

- Ambassador Program: Recruiting peer "connectors" from our ethnically and culturally diverse pilot areas to provide person-to-person assistance and training on accessing new tools and options
- Smart Trips Program: Individualized support to help people/families take trips other than by car
- Multilingual: Programs, information, and public communications in both Spanish and English. Where feasible, include other languages and/or graphic tools that are minimally language-based
- Community Partners: Each of our community partners will conduct outreach with the populations

they serve, to help inform people in need of these new mobility options and get them to try them.

Ladders of Opportunity Initiatives — Phase 1

1. Restore Rundberg revitalization area

Rundberg is very diverse, very low-income area, where over 50% of children eat with the help of food stamps and 64% of residents speak Spanish or another non-English language (e.g. Arabic, Burmese, Vietnamese, Chinese). We will use the multifaceted "Restore Rundberg" outreach networks that have already been established for anti-crime, safety, health, and other linked place-based initiatives in the Rundberg Lane area in the past four years, begun with a USDOJ grant.

A Smart Station and new travel options and tools will help residents connect to transit to access jobs, workforce training, healthcare and healthy lives. Rundberg residents

will help pilot initiatives for health clinic patients, public housing residents, and Austin Community College students.

The Rundberg area has major transit stops that connect to employment centers. However, many people live in 'transit deserts' more than a half mile away from the transit stops. Our Connected Traveler solution will pilot new first-last mile services to get people to these transit stops, including safer biking and walking routes. This will build upon the personalized Smart Trips travel planning support already piloted in the area by the city's Active Transportation team.

A Rundberg community health assessment identified a 'lack of bus services to access grocery stores, healthcare providers, and workplaces," and challenges "getting to and from health care facilities for many members of the community." It also identified specific transportation improvements such as an on-demand circulator, better connections to transit, and more frequent transit.

2. Access to CommUnityCare Clinics

In 2014, nearly 100,000 uninsured/low-income patients needed to travel to more than 350,000 appointments at over 20 CommUnityCare locations (the Federally Qualified Health Centers system serving Travis County). We will pilot new Connected Traveler/Packaged Mobility options and tools that help patients travel more conveniently to the clinic locations — without needing to drive alone.

Austin is making a tremendous investment in new healthcare facilities. Austinites voted to raise their property tax rate in 2014, increasing funding for Central Health and the new Dell Medical School. In early 2016, Austin opened three new state-of-the-art public healthcare clinics. These projects were achieved with extensive community support, including participation and funding from nonprofits, agencies, and local philanthropic foundations.

Six clinics are proposed for the pilot program. All have a large patient base, poor existing transit connections, and/or have other identified travel barriers. All Austin locations are within the "Eastern Crescent" of underserved communities. The six clinics serve individuals and families who are low-income, and face educational, workforce readiness, health and safety barriers to opportunity. The pilot will focus on the first-last mile and shuttle connections to these clinics. The Mobility Marketplace will provide data for prioritizing rollout of shuttle connections based on metrics, help engage users through the Smart Ambassador program to ensure they are aware of and able to access the program, and complementing this approach with targeted subsidies.

3. Austin Community College Workforce Training and Mobility Options

We will develop new education programs to prepare Central Texans for good jobs that will emerge in conjunction with the new transportation technologies being piloted, including electric and automated/connected vehicles. With specific groups of Austin Community College (ACC) students, we will pilot new online transportation options, tools, and personal training that make more convenient and affordable to get to class and stay in school.

ACC is the primary provider of workforce training in Central Texas. To prepare Central Texans who are interested in a vocational career or to begin their college studies, the College works closely with area employers to identify workforce gaps and pathways.

The college is redeveloping the defunct Highland Mall on Airport Boulevard — a corridor that has already been studied for transportation improvements — into an innovative learning campus that will likewise feature a mix of uses and services. The campus is surrounded by largely working-class neighborhoods, on the edge of tradition-

ally underserved northeast Austin. Rackspace, a large IT company, recently agreed co-locate at Highland Campus. As part of this agreement, ACC students will have internships with the company. The Smart City career track can be integrated into ACC/City of Austin participation in the White House TechHire Initiative. As a TechHire community, the College and City will build on its proven track record of creating pathways to tech-industry jobs.

ACC will also offer a new Smart City, Smart Student travel information and training program for its students. This will encourage them to use apps and other tools to utilize transportation options other than driving alone to campus. As part of this project, ACC Highland and the City also are discussing innovative parking solutions to help serve the larger area. This includes potentially becoming the pilot site for Austin's first automated parking facility.

4. Public Housing Residents

We will provide residents of public housting, who are in the process of receiving free Google Fiber service, with training on how to use online transportation options and tools; in order to help them travel to work, school, job training, healthcare visits, etc. Communities near a Smart Station will also receive training and support to use those packaged mobility services. We will provide personalized Smart Trips planning to adults, on how to take regular daily trips by transit, walking, and by bicycle.

The Housing Authority of the City of Austin (HACA) has been nationally recognized by the U.S. Department of Housing and Urban Development (HUD) and the Obama administration for its exemplary digital inclusion program, Unlocking the Connection. This HACA program in 2014 launched a first-in-the-nation program to help low-income public housing residents access basic broadband, digital literacy training, devices, and other essential programs and services through the internet.

Currently, HACA estimates that about 40% of its residents have a working computer or smart phone. When Google Fiber selected Austin as their second U.S. city for high-speed home service, they became a key partner and have committed to providing free basic Internet for every HACA household. In addition to using this capability to improve youth educational outcomes and access to online learning and job training for adults, HACA is also working to help residents make more cost-effective, higher quality transportation decisions through a "Transportation Self-Sufficiency" initiative.

Five HACA properties are anticipated to have Google Fiber installed by the end of 2016, and about 80% of the residents have registered for the service. Several other HACA properties already have existing high-speed Internet access. Once the Rundberg Smart Station is operational, we can extend the pilot to the three HACA properties nearby, where Google Fiber will be installed by 2017, and to other properties as resources allow.

Ladders of Opportunity Initiatives — Phase 2

As new Smart Stations become operational, and as the City plans for smart land use and new multimodal investments, we will create new opportunities to diversify our portfolio of Ladders of Opportunity Initiatives including:

1. Pflugerville Smart Station

The diverse residents of Pflugerville, especially those living on the community's less prosperous west side are car-dependent, as Pflugerville is not connected to the region's transit system, too far from Austin for biking and walking trips into the urban core, and not well-served by Austin car-sharing and bike-sharing companies. As the cost of living in Austin has gone up, more residents have moved to Pflugerville, thus exacerbating the challenge they face to get to jobs and services without good mobility options.

The Pflugerville Smart Station is our exurban/far suburban/regional mobility hub model for USDOT, for an area that is a "transit desert." It can include Capital Metro or CARTS vans for residents to form vanpools with their neighbors, and/or a private shuttle service (e.g. Bridj) would connect residents to the Tech Ridge Park and Ride, where commuters can catch transit to Downtown Austin.

Pflugerville needs new solutions: In a 2012 Citizen Survey, only 31% of residents said their transportation needs were being met, according to the city's 2015 Master Transportation Plan.

2. M Station and MLK Station Area Development

The M Station apartment complex, developed by nonprofit Foundation Communities and serving residents at less than 50% of MFI is an anchor of the MLK MetroRail station area. This concept looks at a transitional approach to pilot mobility solutions for M Station residents and other neighbors in this traditionally disadvantaged part of East Austin, allowing residents to live conveniently and affordably car-free. Potential solutions include data-driven and app-based carsharing, bikesharing, and ride-hailing services, as well as on-demand shuttles and future connected/automated vehicles.

As is true across east Austin, housing costs have risen as the area attracts new investment, homebuyers and developments. The low-income African-American population, historically the heart of the community, has dropped by about half. To create new affordable housing in the neighborhood, the MLK model includes new affordable rental housing by partner organizations (Foundation Communities, LifeWorks), new attainable homes (Chestnut Commons, by Momark Development), and the preservation of homes and long-time residents through a partnership with Habitat for Humanity.

REMOVING THE I-35 BARRIER

Transportation and land planning can provide both access and barriers. As with many other cities, parts of Austin, particularly the Eastern Crescent, continue to suffer from past transportation decisions. Interstate Highway 35 was built over 50 years ago and has been a physical, racial and economic dividing line in Austin. I-35 is more than an ugly piece of transportation infrastructure; it is a cultural and economic scar, dividing West Austin from East Austin, where past segregation efforts placed people of color. For many years, community leaders have hoped to eradicate this barrier to help people achieve equitable access to healthcare, education and jobs.

Source: AutoDesk InfraWorks

The most recent effort to study I-35 began in 2008 with the My35 grassroots and stakeholder-driven award-winning planning effort. The My35 recommendation in 2011 incorporated non-traditional mobility solutions and recommended further study. That same year, the City of Austin started a study in partnership with TxDOT to look at bottlenecks and other targeted interim improvement solutions for a focused area in the urban core. When Texas began a $300 million statewide mobility planning initiative in 2013, the findings from the city's study became the basis for what is the Mobility35 program today.

The traditional solution of adding multiple lanes for single-occupancy vehicles would have resulted in large-scale right-of-way and community impacts, including significant business and residential relocations and further impacts to community assets including a major university, local churches, historic cemeteries, and other valued assets. The grass-roots solution offered by Mobility35 is a targeted increase of capacity within the existing right of way, with dynamically tolled express lanes offering a reliable option for auto vehicles and a reliable route and free use for bus transit and emergency vehicles. Both by necessity and community desire, Mobility35 includes a

substantial bicycle and pedestrian commitment in the form of a shared-use path on both sides of the roadway and improved east-west connections for these modes at every crossing.

The program is a 10-year capital upgrade to this 50-year old corridor that includes not just pavement but also a complete ITS overhaul and upgrade, addressing gaps in the camera and ITS monitoring systems and completing the backbone of and ITS network. Recognizing this potential, the Texas Transportation Commission recently allocated $10M of its statewide Congestion Relief Initiative for operations improvements in the Austin area.

The Mobility35 program has continued the proactive stakeholder-oriented approach. As part of this effort, former Austin mayor and current State Senator Kirk Watson led the I-35 Downtown Stakeholder Working group, which worked to recommend solutions regarding improvements on I-35 as it passes through Downtown (roughly from Lady Bird Lake to Martin Luther King Boulevard). This effort considered alternative designs, including those developed in the community that would lower or depress the main lines of I-35 to reduce the physical barrier.
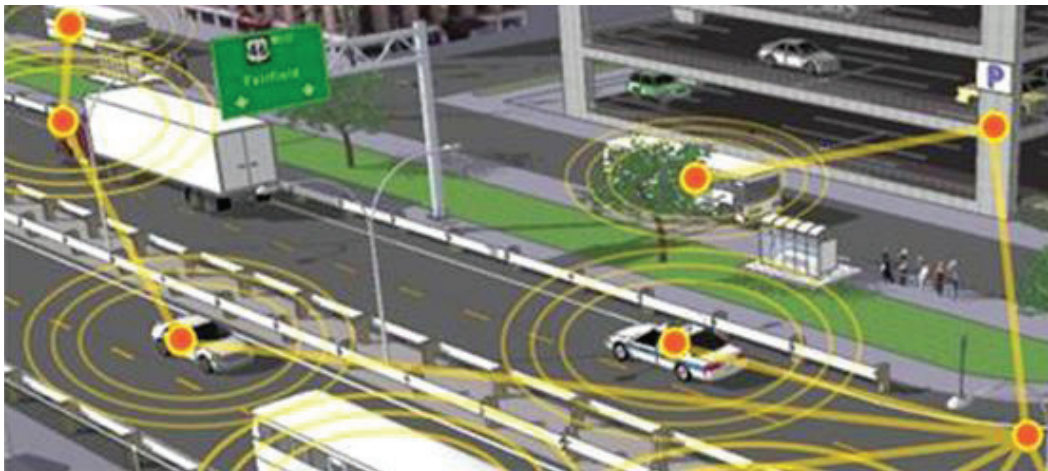
CONNECTED AND AUTOMATED VEHICLES

Connected and Automated vehicles will change the face of transportation and mobility in the 21st century and beyond. Austin's Smart City team is committed to safely deploying consumer-facing connected and automated vehicle technologies to address significant safety and mobility challenges our city is facing, to impact environmental stewardship, and to provide access to transportation options previously not available or not convenient.

The rapid evolution and introduction of connected and automated vehicle technology will feed a hungry early-adopter community found in tech-friendly Austin. Our citizens will embrace the opportunity to ride in self-driving vehicles from the airport, experience life-saving safety applications in their vehicles, and be first-in-the-nation to beta test the newest mobility applications. But it's more than just satisfying the Millennials and their connected society as the norm. Austin envisions a future in which automated vehicles also reach into underserved neighborhoods to bring citizens to Smart Stations and connect them with the services and opportunities they desperately need, including transit, healthcare, education, and jobs. Our approach to deployment of CV/AV technology recognizes there are different solutions for different needs, and we can leverage this technology to provide services that various segments of the city need.

Austin will pilot a number of connected and automated vehicle projects to serve a variety of end users:
• Job seekers – Citizens who need access to transit options to bring them to interviews and places of employment during the workweek.
• Medical Access – Citizens who need convenient, cost-effective transportation to medical appointments.
• First/Last mile commuters – Citizens who need options to get to/from Smart Stations.

• Air travelers – Citizens and visitors who need intermediate connections to transit options at proposed Smart Stations.
• Business professionals – Workers who need alternatives to driving their single-occupancy vehicle to and around downtown.

Deploying connected and automated vehicles to serve these users will provide benefits and create opportunities:

• **Improved safety –** According to the NHTSA National Motor Vehicle Crash Causation Survey, approximately 94% of all automobile accidents are caused by human error. Autonomous vehicles do not get tired, distracted, or otherwise impaired; they make quicker and better decisions; and they do not break the rules of the road. Similarly, connected vehicle technologies are estimated to be able to address over 80 percent of crashes.

• **Improved mobility –** Many available transit services in Austin do not sufficiently penetrate the neighborhoods that need them the most. Connected and automated vehicles can reach areas of the community that are not well served by other modes of transportation. This will connect people to the services and opportunities they need. By minimizing the lags due to driver reaction and providing data for more efficient traffic operations, connected and automated vehicles can improve mobility through reduced congestion.

• **Improved productivity –** The average Austinite wasted over 50 additional travel hours sitting in congested traffic. With the car doing the driving, travelers will be able to recoup this time to catch up on work or simply unwind before arriving home – thus improving health and family time.

• **Lowered operational costs –** Many current modes of transportation, including owning a personal vehicle, can be cost-prohibitive. In addition to the purchase price, recurring costs such as fuel, maintenance, and insurance can drive many to rely on the aforementioned ineffective transit options, or to simply limit their sphere of opportunity. Avoiding the purchase, and removing or reducing the other individual costs can potentially remove these barriers, and broaden available opportunities.

• **Education –** Connected and automated vehicle technology will require a specially trained workforce to maintain and repair the vehicles that use it. With Austin leading adoption of this technology, this will present opportunities to base education and training operations in the region, including vocational programs at Austin Community College, technology related degrees at Huston-Tillotson University, and advanced engineering programs at the University of Texas at Austin and Texas A&M University.

• **Economy/Jobs –** The presence of this skilled workforce could encourage companies to bring their business to Austin, where they can pull talent directly from these resources. At least one AV shuttle company we have talked to has expressed an interest in building one of their "microfactories" in or near Austin to manufacture their shuttles

The Austin team proposes to showcase these benefits in a number of real-world settings that directly improve the quality of life for those who live in Austin, those working in Austin, and those visiting Austin:

• **Automated Airport Circulator –** Transporting arriving passengers to a number of travel options near ABIA, including the local Smart Station where other mobility options will be present to assist them in continuing on to their ultimate destination. This will present automated vehicle technology to a large audience, including the early adopters and innovators that are a crucial part of the Austin culture, and help break down barriers by increasing access to other mobility opportunities.

• **Smart Corridor –** a six-mile stretch of a major arterial connector (Riverside Drive) that will serve as a laboratory for many Smart City pilot projects. A number of safety, mobility, and environmental applications will be considered; a number of approaches to connectivity and automation will be utilized (V2V, V2I, V2X); and a number of communication mediums will be employed (DSRC, 4G/LTE, WiFi).

• **Automated Transit Vehicle –** we will work with our partnering electric bus providers to develop and deploy a full-sized automated and connected transit bus.

• **Autonomous First/Last Mile Connectors –** Will radiate into surrounding neighborhoods to bring commuters to Smart Stations, connecting them with other transit options and a va*riety of connected & automated transportation services.*

Austin understands that some of these connected and automated vehicle demonstrations are technically difficult, equivalent to a moon shot, and may not be achievable within the three years envisioned as part of the grant. However, we are committed to move the state-of-the-art in a positive direction in terms of using existing and evolving connected and automated technologies in an open urban street environment. We believe that Austin is the only place where new automated and connected technologies can be deployed at scale in an effort to solve real and existing challenges.

REDUCING OUR CARBON FOOTPRINT: A VISION FOR ELECTRIC FLEETS

Austin is the ideal place to demonstrate to the nation and the world how electric vehicles can scale quickly, support grid reliability, and bring value to owners all while being powered by renewable energy to maximize green house gas (GHG) savings.

Significantly reducing GHG emissions in the transportation sector is a critical component of Austin's Smart City transportation program, Climate Protection Plan, Austin Energy Generation Plan, and the focus of the Smart City Challenge. It is important that transportation electrification does not just transfer GHG inventory to the electricity sector. As such, an important component of our strategy is a continued decarbonization of the electric grid and continue the nation leading program in that Austin Energy powers all public charging infrastructure with 100% renewable energy from Texas' growing wind and solar resources through its green-e certified GreenChoice program.

For the transportation sector to maximize the benefits of Austin's low-carbon grid and 100% renewable Green-Choice program, we must scale electric vehicles and electric vehicle miles traveled (eVMT) quickly and aggressively. By targeting high mileage mobility service vehicles and removing key barriers to consumer adoption, the Smart City grant will enable Austin to electrify up to 5% of its total VMT in 5 years, and a significant portion of that within the three-year grant duration.

This combination of accelerated eVMT growth and fossil fuel free energy equates to maximum GHG reductions. The business models, strategies, and tactics used will be scalable and repeatable for other cities such that we see massive CO_2 reduction from the transportation sector as a whole. In addition, this program will improve air quality, keep millions of energy dollars in the local economy, and be a key "tipping point" project in Austin's trajectory to achieve its carbon Net ZERO 2050 Plan.

PROMOTING SCALING, REPLICABILITY, COMMERCIALIZATION & INCUBATION

Austin's entrepreneurial spirit and commitment to innovation differentiates it from other communities. Austin will leverage the Smart Cities Challenge demonstration to support and inspire entrepreneurs who are developing the next generation of solutions to transportation and mobility challenges.

Globally, almost 3 billion people will transition from poverty to the middle class over the next 35 years. Most of these people will choose to live in cities. The urbanization associated with this demographic shift will place unprecedented strain on urban infrastructure and on the environment. Technology must advance in order to ensure that this transition happens sustainably.

Locally, the trajectory of Central Texas over the past decade stands as a phenomenal case study in the challenges associated with rapid economic and population growth. Austin's hypergrowth has positioned it as an exceptional laboratory for developing technologies and business models that will allow cities to decrease traffic congestion, improve affordability, and preserve quality of life in a wide range of communities. Austin will leverage its entrepreneurial ecosystem, vibrant tech community, and collaborative public sector to create and support a dense network of distinctive opportunities for innovation in transportation and mobility. The projects proposed in the Smart Cities Challenge proposal will serve as demonstration projects for existing technologies and will also create a dynamic, accessible platform for future innovation to occur.

Austin's entrepreneurship and commercialization infrastructure will be embedded in the Smart Cities Challenge demonstration projects at every level of the value chain for the duration of the grant cycle.

Austin will create a dynamic, accessible playground/laboratory/sandbox for innovators to develop, test, and deploy novel solutions to transportation and mobility. Entrepreneurs and researchers—both from Austin and outside of Austin—will have privileged access to the pilot programs and program data generated through these initiatives. The Smart Cities team will also actively engage the broader entrepreneurial community to source innovative solutions to challenges or problems that are identified in the demonstration projects. Novel procurement mechanisms, such as challenges and prizes, will be utilized to rapidly source up-and-coming solutions to transportation and mobility challenges. Entrepreneurs from outside of Austin will also be engaged through a dense network of partners (both existing and new) to leverage the resources, data, pilot programs, and institutional support in Austin.

PACKAGED MOBILITY AND CONNECTED TRAVELER ACCESS & EQUITY

Imagine three Austinites who need reliable and affordable mobility options:

- Mackenzie, a recent college graduate who just moved to Austin for a new job opportunity, wants to access mobility options that allow her to live a car-free lifestyle.
- Monica, a disabled resident, is unable to drive and needs a reliable way to travel so she can access job opportunities.
- Javier, owner of a small but fast-growing business, wants both to provide commuting services to his existing employees and expand his pool of potential new hires by allowing qualified candidates without access to affordable mobility to commute to work for him.

As with many members of the Austin community, Mackenzie, Monica, and Javier don't know much about the different mobility options available to them, how those options compare, how to access and purchase services, and whether they qualify for any subsidies. The "Mobility Marketplace," where our Packaged Mobility and Connected Traveler projects meet, solves this by providing information to Mackenzie, Monica, and Javier about available mobility services and benefits and a platform to directly connect with and access service from providers. Once they identify the services they want, they can then purchase and manage them through the Mobility Marketplace.

Imagine Mackenzie selecting a "Gold Transit Package" that includes a number of rides via TNC (with a monthly mileage limit), B-Cycle, and public transit. Each month the payment "card" she uses—a digital passbook that she keeps on her smartphone—is automatically reloaded. She's able to track her usage and adjust the number of rides in her package each month to better fit her behavior and preferences. She opts into customized push notifica-tions that keep her up to speed on all the latest mobility services and she's able to indicate her interest in adopting services that don't yet exist, allowing service providers to understand her needs. She sleeps or catches up on email most mornings on her way to work because she doesn't have to drive and her Gold Transit Package costs her a fraction of what it would have cost to own a car and park it in downtown Austin, where, like more than 100,000 of her fellow Austin residents, Mackenzie commutes each morning. That lower cost leaves her with more spending money to support Austin's local economy.

Imagine Monica, whose disability leaves her unable to drive and with limited mobility options, accessing a similar package to allow her to expand her job opportunities, but at a lower cost due to a targeted subsidy program. Being a little less tech-savvy and a bit less interested in keeping up with all the latest technology, Monica relies on her community "Smart ambassador" to bring her up to speed, via regular community gatherings, on her options and how to access them. Her Smart ambassador also provides instruction on accessing the Mobility Market-place website where she can browse her options.

Imagine Javier finally being able to offer affordable and reliable commuting benefits to his employees. For years he has heard from qualified Austin residents who would like to work for him but lack reliable mobility options for doing so. For years his employees have lost valuable time sitting in traffic on their way to work and he has reim-bursed his employees' parking costs. Imagine him visiting a website where he can input some simple information about his current costs and where his employees live, and it lays out some of the economics of his current situation, revealing that he can actually save money by providing a version of the "Gold Transit Package" to his employees at little or no cost to them.

Imagine mobility app and service providers, integrated payment providers, and mobility aggregators being able to see the types of packaged mobility services that would most benefit Mackenzie, Monica, and Javier, and imagine that "demand insight" allowing them to join forces to deliver those packages and create a seamless, integrated user experience.

The Mobility Marketplace, complemented by the Smart ambassadors program, will provide the critical connection between user demand for services and the service providers that can provide them to make these solutions possible.

Many Austinites lack realistic alternatives to the single occupancy, personally owned vehicle. 15% of our citizens live in transit deserts. In addition, most of the same areas lack viable alternative services. This is not just a transportation problem; it's an equity problem. Austinites who do not own a vehicle are faced with limited access to services that others take for granted.

As described in the following pages, the Smart Stations will reimagine the concept of a park-and-ride. Serving as critically important, connective nodes throughout Austin for neighborhoods that lack adequate mobility services and other basic needs. Each Smart Station will provide an array of options that are meant to serve a diversity of needs. By developing these nodes, the City of Austin also intends to create an attractive environment for commercial investment and development.

Imagine a park-and-ride where neighbors meet to commute into work on an electrified bus rapid transit route or form a facilitated shared vanpool, pick up their groceries from an on-site locker on their way home, that is a Smart Station, connected by the Mobility Marketplace.

VOLUME 1A - TECHNICAL APPROACH

USER-FOCUSED MOBILITY

Each Smart City initiative has a key role in bringing our accessibility ecosystem to life and achieving the vital outcomes of safety, mobility, climate protection and opportunity. User-focused mobility solutions enable citizens to make smart transportation decisions by providing the convenience, speed, and choice necessary to make informed decisions. A cornerstone of Austin's vision for user-focused mobility-on-demand is the concept of a mobility subscription – the idea that users will be able to purchase a package of mobility options including public transit, bike and car sharing, ridesharing, as well as services to enable a car-free lifestyle i.e., grocery delivery.

As automated and connected vehicles become ubiquitous, the options for mobility services will continue to increase. Incentives could be provided for households that make choices benefiting the transportation network, such as telecommuting. Removing the need for a personal automobile, the mobility subscription also provides a ladder of opportunity for low-income households that are disproportionately burdened by transportation costs.

Physical Infrastructure

The first step is to build out Austin's physical infrastructure. An all-ages, all-abilities bicycle network will provide safe, accessible active transportation routes, and it has already been set into motion by the city. As a part of the Smart City vision, this network will be elevated to become an interactive transportation experience through enhanced data collection, wayfinding, and placemaking along the network. Expanding Austin's bike share program will integrate bicycling more closely with other transportation systems.

Digital infrastructure

Digital infrastructure will complement the physical and provide the basis for a user-focused experience on the transportation network. The City of Austin will partner with local, private-sector innovators to develop a mobile technology platform that unifies public and private mobility choices. Austin-based Moovel has already taken first steps to integrate multi-modal planning, choice, and payment into one mobile application, and Capital Metro's mobile application is advancing in a similar direction. Other existing technologies will also facilitate the use of a mobility subscription. Austin plans to enable RFID cards from employers and educators to access the many modes included in the subscriptions. This will also allow the city to expand the user base by thousands of users at a time as new clients are added.

Smart Stations

Austin's physical and digital transportation assets will meet in Smart Stations. These hubs are envisioned as great public spaces where users can connect to many transportation options, co-working spaces, and other travel amenities such as showers and lockers. Using dynamic parking pricing, the limited automotive space at these hubs will be prioritized for car sharing, vanpooling, and rideshare or automated vehicle pick-up and drop-off. Designed to make travel sustainable and easy, these Smart Stations would be a national model for connecting people and places.

Our concept for user-focused mobility is informed by a variety of potential use cases, such as:

- **Low Car Households -** Many families in the Eastern Crescent (the far eastern edge of Austin, stretching from near Pflugerville south to near the airport) are low-car households, owning one or fewer cars, and struggle to balance transportation needs. Austin plans to offer Eastern Crescent Families an affordable packaged mobility service through the mobility marketplace and training through the Smart Ambassador program that can support the activities of the entire family.

- **Professionals -** Over one million passengers travel through Austin-Bergstrom International Airport every month; many of them are professionals traveling for work to attend conferences or connect with Austin's booming tech industry. Upon arrival, a visitor could take an automated shuttle from the terminal to the ABIA Smart Station where she could then travel by electric bus rapid transit (e-BRT) along Riverside Corridor into Downtown. With seamless WiFi connectivity throughout the route allowing her to stay up to date on email communications and newsfeeds. As an early adopter, we would as for her feedback on her experience for a discounted return trip and would be encouraged to share information on emerging technologies with coworkers.

- **Connected Corridor –** The Riverside Drive corridor represents one of the most productive corridors in terms of transit ridership, connecting affordable and subsidized housing to employment opportunities in downtown and education opportunities with the corridor. At the eastern terminus of this corridor sits the Austin Bergstrom International Airport (ABIA) and the location for the City's proposed closed-loop testing platform for connected and automated vehicles. To improve and expand connections from affordable residential densities along the corridor to employment and

educational opportunities located at its ends, the City in cooperation with Capital Metro will implement an Electric Bus Rapid Transit (EBRT) in this corridor, consistent with adopted community plans. The service will feature 10-minute transit headways and support the investments in transit-oriented development now under construction in this corridor. The City will implement advanced bicycle and pedestrian detection at intersections to allow transit and cyclists to coexist safely along the corridor. Mobileye technology will also be installed on buses in order to provide full 360-degree detection and monitor the roadways. DSRC communications could transmit information to other connected vehicles on the roadway in order to expand monitoring capabilities throughout the corridor. Should an incident occur, the proper communications will be relayed in order to dispatch EMS and provide emergency vehicle preemption to improve response times. Additionally, the City of Austin will pursue a mobility bond in November 2016 to include $40 Million in physical improvements to the Riverside Corridor, expanding bicycle facilities and intersection technologies necessary to allow the BRT to operate on the inside lanes of this multi-lane arterial. The investments will establish the future cross-section of the roadway and place critical pedestrian and cycle infrastructure at the edge of right-of-way to protect the corridor for future development.
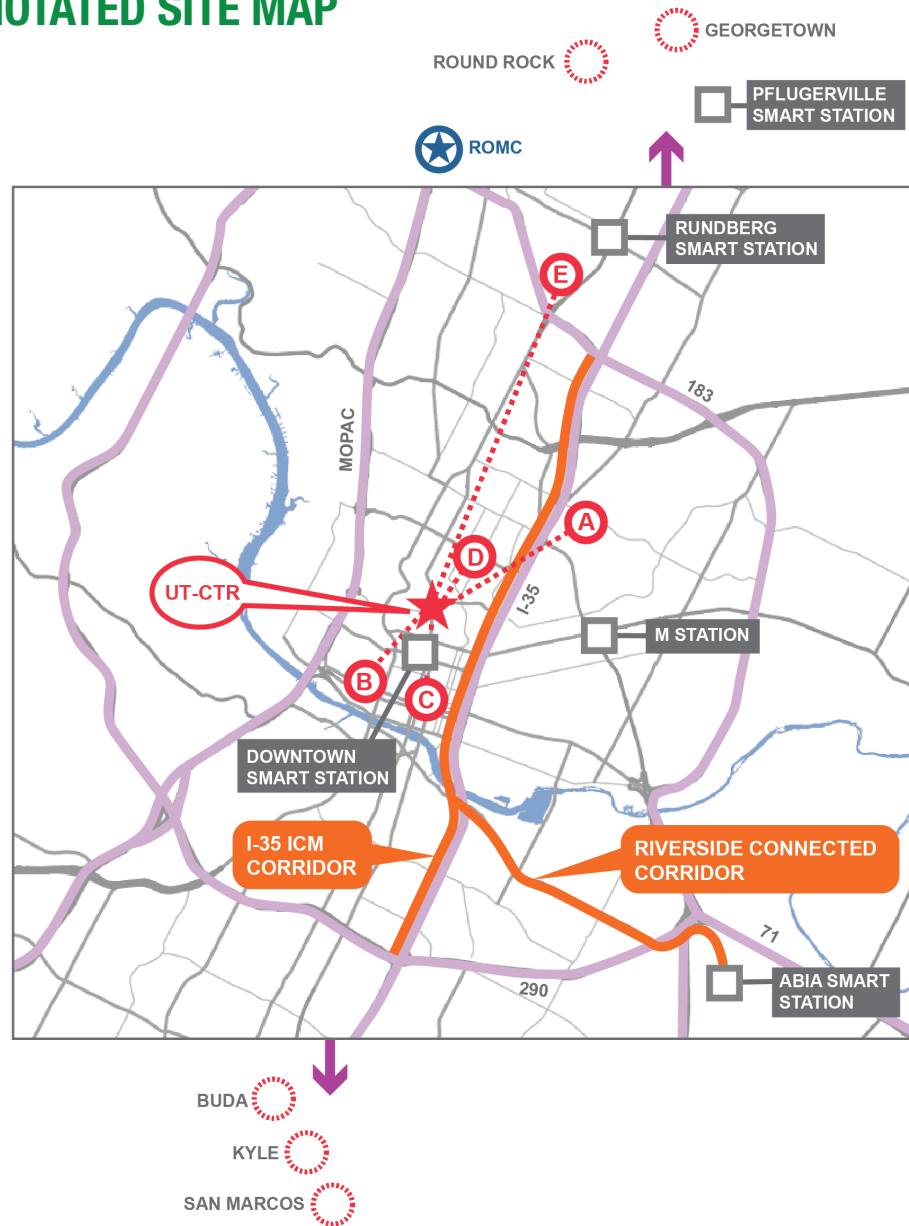
- **Early Adopters (Market Test Environment) –** Early adopters are critical to the diffusion of innovation. In particular, ABIA serves as the perfect marketing ground to engage tech-savvy professionals, risk-taking entrepreneurs, and forward-thinking trendsetters. Furthermore, the early adopter community will become a group of Smart City ambassadors, who will champion the technologies and influence adoption by non-technical users. Deployment of automated, connected and electric technologies at the airport will give government

operators and private companies the confidence to introduce these technologies in a future open-roadway testing environment. At the airport, the deployment allows us to solve an immediate over-crowding issue on the land-side terminal platforms. A future deployment of connected and automated vehicles in a first- and last-mile service regime would allow us to not only provide ladders of opportunity by securing access for underserved populations, but it would also directly test the theory that people will adopt these new technologies with little or no added incentives.

- **Traffic Operators -** Traffic operators monitor the roadways, vehicles, and environment in order to provide travelers with a safe, efficient, and reliable transportation experience. Based upon the situation, traffic operators can adjust signal timing, dispatch EMS or HERO response teams, enable freight and transit priority, and communicate vital information to travelers. The Internet of Things (IoT) holds tremendous potential for improving traffic flow and strengthening communications with all travelers.

- **Urban Delivery and Logistics -** With the increase of e-commerce, Austinites are ordering more and more goods online in addition to traditional freight. Delivery drivers struggle to navigate the city, avoid congestion, and fulfill their orders within a specified time window. An additional challenge is missed delivery attempts that require drivers to make additional trips in order to complete their job. By increasing communications between urban delivery fleets and the City of Austin, real-time information may be shared in order to optimize routes, find available parking, and enable shared use of vehicles, e.g., identifying available drivers and vehicles, such as commuter shuttles, that can serve a combined urban delivery function while providing personal mobility trips or a dedicated delivery function during off-peak hours.

- **Suburban Commuters -** The average resident in Pflugerville, who works in Downtown Austin often faces a variety of weekly frustrations including unexpected traffic delays, higher fuel consumption, and loss of valuable time that could be better spent with friends or family. Austin plans to offer commuters an affordable Packaged Mobility Service through the mobility marketplace. A Pflugerville resident will now be able to walk to the nearest Smart Station, form a vanpool and commute with coworkers and neighbors into Downtown. On the way home, the commuter could order groceries online from the supermarket or a local urban farm so that they would be ready to pick-up at the Station upon arrival. To assist in getting home, the commuter could hail a ride from a TNC provider in order to complete the last mile.

- **R&D Community (Beta Test Environment) –** Before technologies may be considered ready for mainstream commercial use, technologies must be demonstrated in a controlled test environment and achieve acceptable levels of safety, usability, and quality. The ABIA Station offers a controlled access corridor for pilot demonstrations of next generation vehicles on two available courses. One course is a "tech-track" where only vehicles equipped with connected and automated capabilities may operate. The other is a "mixed-track" where all vehicles are permitted to operate. Once vehicles are deemed "trusted" operators may apply for testing on other City roadways. The ABIA Station offers a range of V2I capabilities and allows OEMs to understand how vehicles will interact with each other.

ANNOTATED SITE MAP

LEGEND

★ **UT-Center for Transportation Research**
  "One System" Open Data Portal
  Connecting TMC's Data

○ **Current TMC Operations**
  A CTECC - Combined Transportation and
      Emergency Communications Center
      (TxDOT+CMTA TMC)
  B ATD - Traffic Managment Center
  C APD - Traffic Operations Center
  D CTRMA - Express Lane Operations Center
  E CMTA - Rail Operations

⊙ Future Data Connections in "One System" Portal

★ **ROMC**
  "One System" - Regional Operations Management
  Center (Proposed Site: UT Pickle Research Center)

I-35 Integrated Corridor Management
  Connected Sensors, Cameras, DMSs

Riverside Connected Vehicle Corridor
  Electric BRT, Mobileye, Pedestrian/Bicycle Detection
  Technology, CV Monitoring
  24 eBRT Stops

Airport - Autonomous Vehicle Pilots (ABIA)
  Autonomous Buses on Airport Environs
  Super Fast 150Kw 12-port Charging Bay for Electric
  Taxi Fleet

Smart Stations/Connected Traveler/Packaged Mobility
  Rundberg
  M Station
  Pflugerville
  Airport
  Downtown

CONNECTED TRAVELERS AND THE MOBILITY MARKETPLACE

The Mobility Marketplace will connect users (demand) to mobility service and tool providers (supply). It will serve two customer categories: individual users and "channels" that serve many users, e.g., employers, retail businesses, tourism and travel industries, health care providers, trade organizations, schools, and community Smart Ambassadors who can help facilitate better access to new mobility options to their fellow community members, particularly those who are unbanked or separated from tech-enabled mobility options by the digital divide.

The Marketplace would also target elderly and disabled travelers by centralizing information on—and identifying opportunities to improve or augment—services already available in Austin such as Drive a Senior and CapMetro's Metro Access program. Yet additional channels may arise as we proceed with Smart City implementation and we will nimbly engage them.

There is tremendous leverage and scaling potential in engaging user channels for two reasons: first, they offer an efficient means of delivery of mobility options to many users at once. Secondly, behavioral science has repeatedly shown that people will be inclined to change their behavior if they observe behavior change among a peer group. Channels embody such peer groups and offer a means of serving them. Additionally, the Marketplace is a scalable model that can be adopted by any city. The Marketplace will have an online and mobile application interface. It will be designed to allow open access to third parties to develop additional functionalities to those described as follows.

Function 1: Mobility Analytics: A robust suite of tools that will quantify a user's baseline mobility performance and present recommendations for alternative travel behavior that optimizes user-prioritized metrics and preferences. The Mobility Analytics Platform will include the following:

- Metrics Selection and Prioritization: Users and channels can select and prioritize key metrics that are most important for them in a set of mobility services. Example metrics that would be tracked through the marketplace include:
  - » Cost ($/mile);
  - » Travel time per day;
  - » Carbon footprint (g CO_2/day);
  - » Jobs accessed within a set commute time.
- Performance Baselining: Users and channels will provide simple inputs that will enable the platform to assess performance in terms of selected metrics. Example user inputs would be home neighborhood and common destinations, including work. Example channel inputs, e.g., by an employer, include number of employees driving to work by singly occupied vehicle and parking costs.
- Mobility Recommendations: Users and channels will receive an initial, automated recommendation for the optimal set of mobility services and benefits for their travel needs, based on selected metrics.
- Scenario Analysis: Users and channels can manually modify the initial recommendation or explore alternative mobility options for their daily commute or travel needs, then see the impact of those options on selected metrics.
- Monitoring and Evaluation: Users and channels will be able to continuously monitor and evaluate their current services and compare them to new or emerging services with respect to selected metrics.

Function 2: Mobility Transactions: A set of functions that facilitate Marketplace transactions and service access that will include the following:

- Transactions: Users and channels can complete transactions with mobility service providers to purchase services, including accessing subsidized benefit programs.
- Access: Users and channels can access instructional videos and tutorials on use of transit services, as well as scheduled transit demonstration events planned through the SMART ambassadors program
- New Mobility Services Crowdsourcing: Users and channels can post requests or even pre-pay for specific services that may differ from advertised services. To encourage these requests, case studies and examples of available mobility services in other global markets will be made available to users and channels.

Function 3: Mobility Pilots Launchpad: An initially manual but increasingly automated means of allowing mobility service and tool providers to roll out new services and tools based on user demand and City-driven metrics.

- The City will be able to actively encourage and incentivize (e.g., through targeted subsidies) new pilot services and tools based on prioritized metrics Carbon footprint and population-weighted access to jobs.
- Providers will benefit from "demand insight" to target travelers with greatest need in launching new pilots
- Providers will be able to understand and complement existing subsidy programs to roll out their services

One service potentially launched through the Marketplace is a calendar-driven mobility solution. When booking a calendar appointment the application would prompt him with travel options based on selected metrics. The app could provide turn-by-turn multimodal navigation and adjust its prompts based on user preferences and needs.

Approach to Delivery: Mobility Marketplace

To maximize participation, the Marketplace will engage travelers (demand) and mobility service and tool providers (supply) through well-established marketing approaches, including both 'pull' and 'push' strategies. 'Pull' refers to voluntary engagement in the marketplace by users and channels. 'Push' refers to active outreach and recruitment targeting expanded participation in the Marketplace.

Demand (Users and Channels)

Pull: Individual travelers and channels that join the Marketplace voluntarily can directly engage with the Mobility Analytics and Transactions functions to assess, choose among, and purchase mobility services and tools.

Push: Recognizing that few users or channels are currently aware of the benefits or availability of mobility services, we will field a 3-person engagement team to actively recruit Marketplace demand. To demonstrate the value, we will utilize the Mobility Analytics Function to illustrate the impact on prioritized metrics of improving existing—or introducing new—mobility services.

We will initially focus on two key user segments. Through our Smart Ambassador Program, which will build on Capital Metro's existing Smart Trips Austin program, we will prioritize unbanked users and those separated from traditional channels by the digital divide. We will also prioritize employers, allowing the Marketplace to quickly reach a critical mass that will achieve scale and efficiency.

As a means of quickly scaling the Marketplace throughout and ultimately beyond Austin, including to multicultural or isolated communities, this strategy will be coupled with information dissemination in several languages through traditional and social media marketing outlets.

Supply (Mobility Tool and Service Providers)

Key service and tool suppliers include public and private mobility services (e.g., public transportation authorities and agencies, shuttle providers, transportation networking companies, car- and bike-share), traveler tools, integrated payment services, and services that currently do not exist (e.g., driverless taxis).
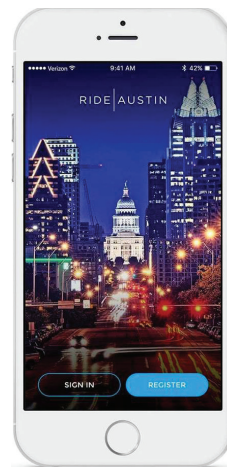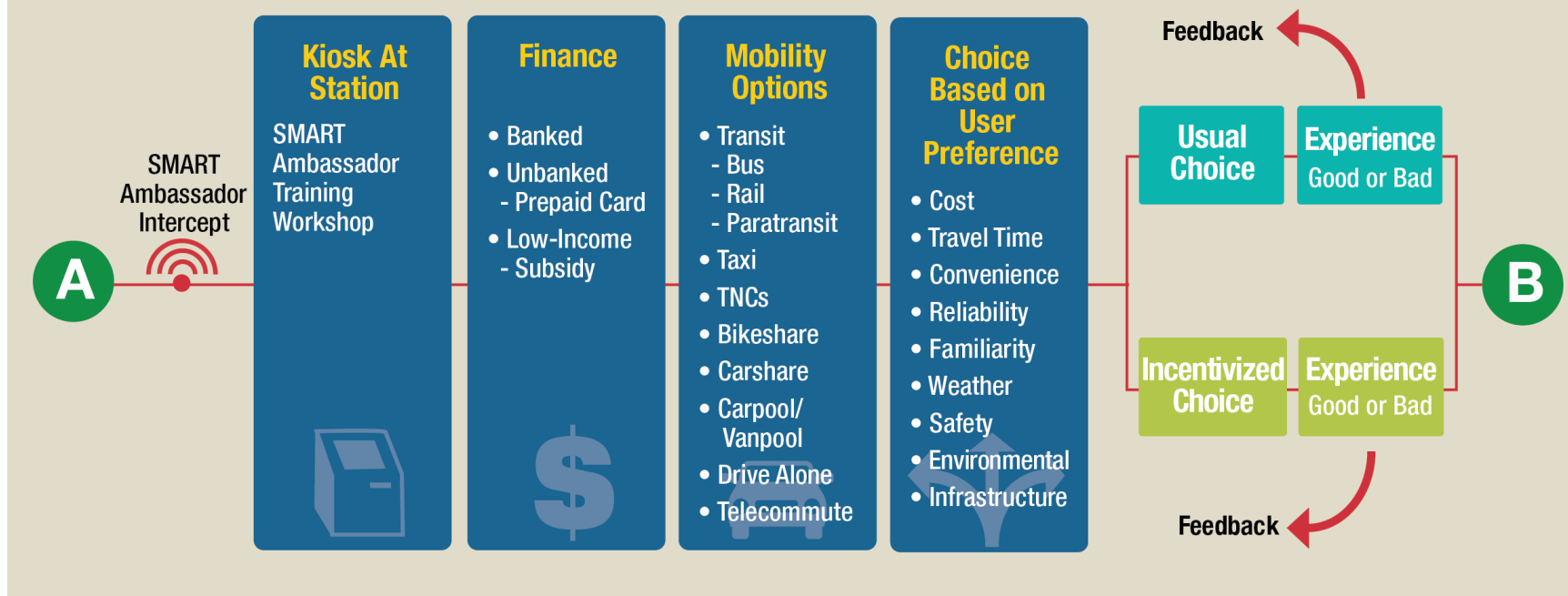
Pull: For providers who voluntarily join the Marketplace and would like to advertise their services, we will develop a standardized provider onboarding process.

Push: Recognizing that not all mobility service and tool providers will see the value of participating in the Marketplace, we will actively recruit providers. We will use the Mobility Analytics Platform to illustrate the impact on selected metrics and the business value to providers of participating in the Marketplace.

Delivery Activities

1. Pilot Launches: Through the Mobility Pilots Launchpad function, we will launch new mobility service pilots based on user need and potential to maximize impact with respect to emissions [g CO2/mi] and access [population-weighted access to jobs]. We will then assess the success of the pilots based on user- and City-selected metrics and scale, refine, or retire them.

2. Platform Development: We have begun co-developing, with Sidewalk Labs, a core set of tools and a service access portal comprising the Mobility Analytics function. In the first year of the grant term, we will continue this co-development process to complete the Mobility Analytics function. We will then roll out a first edition of the Mobility Transactions function.

3. Targeted Subsidies: Because the Marketplace offers an ideal means of targeting transit subsidies to implementation of services that would benefit users with greatest need, we have begun co-developing, with Capital Metro, a way to optimize subsidy performance with respect to selected metrics. For example, funding from Urbanized Area Formula Program (5307), Advanced Transportation and Congestion Management Technologies Deployment Program, or other appropriate sources can be directed to first/last mile service in underserved areas based on metrics-based impact analysis from the Mobility Analytics platform. Capital Metro and the City of Austin will continue to work with FTA to design a performance- and need-based subsidy allocation program that will be deployed and demonstrated through the Marketplace.

4. Provider Engagement (Supply – Tools): We will continue to engage mobility tool and platform providers (in addition to those who have already indicated interest in the Marketplace, including RideAmigos, Civic Resource Group, Cubic, Swiftly, moovel, RideTap, Hacon, Vizalytics, Via, and Xerox) to make their offerings available to users and channels via the marketplace and/or develop additional tools and functionalities for it.

5. Provider Engagement (Supply – Services): We will continue to engage mobility service providers who have committed to or indicated interest in the Marketplace (including CapMetro, Bridj, SPLT, GoCarma, BlissTransit, SuperShuttle, WeDriveU, Chariot, Uber, Lyft, GetMe, Rocket Electrics, RideLeads, Metropia, Hacon, Bytemark, Austin B-Cycle, Zipcar, Car2Go, Local Motors, Roadie, and CARTS) to make their offerings available to users and channels via the marketplace and/or develop additional tools and functionalities for it.

USER JOURNEY

(A) SMART Ambassador Intercept

Kiosk At Station
SMART Ambassador Training Workshop

Finance
- Banked
- Unbanked
  - Prepaid Card
- Low-Income
  - Subsidy

Mobility Options
- Transit
  - Bus
  - Rail
  - Paratransit
- Taxi
- TNCs
- Bikeshare
- Carshare
- Carpool/Vanpool
- Drive Alone
- Telecommute

Choice Based on User Preference
- Cost
- Travel Time
- Convenience
- Reliability
- Familiarity
- Weather
- Safety
- Environmental
- Infrastructure

Feedback

Usual Choice — **Experience** Good or Bad

Incentivized Choice — **Experience** Good or Bad

Feedback

(B)

6. Customer Engagement (Demand): We will build demand for the Mobility Marketplace by expanding existing efforts of Movability Austin and Rocky Mountain Institute to engage channels, starting with Austin employers. This will establish a pipeline of service requests to launch new mobility services and tools with interested employers. We will then engage additional users and channels, prioritizing engagement based on potential to impact City-selected metrics. We will also launch our Smart Ambassadors program to engage unbanked, undocumented, digitally-divided, multicultural and isolated users and communities.

7. Scaling: Through a series of annual workshops in which we refine the Mobility Marketplace based on external input and develop implementation roadmaps and action plans, we will introduce or expand the Marketplace among first the six other finalist cities in the Smart City Challenge, then all 77 applicant cities, then cities globally, selected based on interest and need.

URBAN DELIVERY

The Urban Delivery Exchange will consist of a website set up to accommodate voluntary ("pull") engagement with the marketplace by providers and users. We will also pursue active community engagement through out Smart ambassadors program to ensure potential delivery service users, particularly those residing in areas of Austin that could benefit from them most, including areas of Austin lacking easy access to food, medicine, and other critical goods and services, are aware of the options available to them.

Approach to Urban Delivery

1. Website Development: We will establish the Urban Delivery Exchange with input from our partners Wal-Mart, Peloton, UPS, Roadie, and GetMe, then make adjustments based on continuous monitoring and evaluation from users.
2. Customer Engagement (Demand): We will include information on urban delivery options in our outreach efforts with the Smart ambassadors program.

SMART STATIONS & CONNECTED CORRIDORS

Infrastructure is the physical manifestation of the Smart City and the interface with the community. The two major infrastructure components of our Smart City proposal – Smart Stations and Connected Corridors – work together in order to build an integrated, intelligent transportation network. Smart Stations are embedded within communities of need in order to provide neighborhoods with access to places of opportunity. Connected Corridors link the Smart Stations to one another in order to provide people with a range of mobility services between key access points.

Smart Stations are designed to serve three purposes:

- **Provide customers with access to travel choices –** Stations provide travelers with choice and convenience. By bringing together automated and connected services; electric vehicle access; public transit; transportation network companies; taxis; car and bike share services in a "one-stop-shop", travelers would have the flexibility to select from a variety of modes to fulfill the complete trip based upon cost, time, and environmental preferences.
- **Provide travel amenities –** Stations not only help people get from Point A to Point B but also deliver valuable services. Located on site are food trailers for the morning cup of joe or lunch on the go. Lockers provide a place for packages and groceries bought online to be delivered curbside to be picked up on the return trip. In future stages, other retail services may be offered on-site or by concierge.
- **Engage citizens through outreach and education –** Located at each of the Stations are Smart Ambassadors who offer introductions and training to new technologies and mobility services. In order to facilitate consumer adoption, it will be critical for the City to

bridge the digital divide by demonstrating the technologies to the elderly, young families, and underserved communities. Austin will do this by partnering with diverse community organizations such as Huston-Til-lotson University (Austin's HBCU), Austin Community College, and the Austin Independent School District, as well as organizations serving Austin's disabled and elderly population, including ARCIL, ATCIC, AGE, and the Mary Lee Foundation, to identify multi-lingual and culturally astute candidates for the Smart Ambassador corps. Smart Ambassadors will be set up to serve communities with greatest need and will not be geographically limited only to Smart station locations. They will serve as a feedback mechanism to engage with citizens to understand their needs and how the City of Austin can best serve its growing population.

Connected Corridors are designed to serve three purposes:

- **Improve safety –** The City of Austin is dedicated to becoming a leading Vision Zero city and is committed to reducing the number of traffic-related incidents. Applications within the Riverside Corridor are focused on improving safety, particularly in the areas of advanced bicycle and pedestrian detection. In conjunction, incident management programs will monitor near misses as well as crashes in order to take the necessary actions, including emergency vehicle preemption, to reduce response times and save lives.
- **Build Ladders of Opportunity by Enhancing Mobility —** The Riverside Corridor, located in south and southeast Austin, is a traditional corridor of affordable housing. It is largely characterized by communities of color and university students. However, it is quickly urbanizing and in many places gentrifying. The proposed Riverside Connected Corridor Smart City improvements include a dedicated lane for electric bus rapid transit (e-BRT), freight delivery opportunities,

and connected vehicle and infrastructure technologies. Transit priority will transform the efficiency of the roadway in order to reduce travel times for all vehicles. The plan is consistent with the neighborhood corridor plan, developed in collaboration with local residents and adopted by both the local neighborhood organizations and the Austin City Council. Within the corridor there are opportunities for access to food, access to community college training opportunities, access to affordable housing, and access to jobs and universities.

- **Serve as a beta test site for connected, electric, and automated vehicle technologies –** Instrumented with sensors and communications technology, the Riverside Corridor and ABIA Controlled Access Roads will advance the research and development of next generation technologies. One of our proposed target transit stations is located adjacent to Austin Bergstrom International Airport (ABIA). We have partnered with Chargepoint Technologies to deploy a first of its kind Electric Vehicle Refueling Station. This station would be capable of recharging up to 12 electric vehicles within 10 minutes and operates at 3-times the charge rate of currently deployed DC Fast stations. Proving that our industry partners are ready to build a rapid prototyping environment where vehicles, sensors, and other technologies may be piloted, evaluated, and further developed. Beta testers will offer feedback in order to improve the customer experience, providing the necessary insights to bring the technologies to market.

Pilot Connected Corridor: Riverside Drive

The East Riverside Corridor is a 6-mile long auto-centric corridor with three lanes of fast moving traffic in each direction. The corridor connects Downtown Austin to the Southeast Austin suburbs and the Austin-Bergstrom International Airport, and is undergoing a period of redevelopment with higher density and mixed use front-

age. Commuter traffic, through-travelers, commercial vehicles, and unfamiliar visitors make this a corridor with major challenges but also major opportunities — as a connection point to/from the airport, as an economically evolving corridor, and as a commuter route for large numbers of citizens moving about.

As a part of our Smart City effort we are proposing enhancements that represent an opportunity to design a pilot Smart Connected Corridor.

We will convert the outside lanes to prioritize non-self-driving travel, which will significantly improve mobility and safety for these modes. The proposal is to designate an outside transit/bike priority lane to support electrified bus rapid transit during the timeframe of this grant. A combination of quick-action tools, likely including dedicated transit lanes, protected bicycle lanes, transit queue jumps, and/or shared bus/bike lanes, would be used.

The City is proposing a $40 million general obligation bond investment in reconstruction of the Riverside corridor. The bond is likely to go before voters in the fall of 2016 and will be used to construct the final sidewalk and bike lane configuration and signalization, allowing the transit lane to be positioned in its preferred and permanent center-running location. Proposed changes would be pending the completion of a detailed traffic studies and public process. Funding exists for the proposed interim corridor modifications.

The e-BRT service would feature 100% electric-powered buses running in dedicated lanes along the Riverside corridor with attractive stations featuring wi-fi, real-time bus arrival information and other features providing safety and convenience. Service would operate every 10 minutes or better in the peak periods and every 15 minutes or better throughout the majority of each day. In

partnership with the bus manufacturer, we expect to be able to begin piloting automated bus operations with this electric bus fleet in the corridor by 2018.

While the East Riverside Corridor is transforming, it still has a high poverty rate (58% of children qualify for free/reduced lunch), is predominately Hispanic/Latino, and its numerous older apartment complexes are popular residences for low-income and first-generation college students. The second part of our Smart Corridor effort is to provide an enhanced suite of Connected Traveler and Mobility Marketplace services, including education and outreach on using the new e-BRT line, and access to real-time information to help all segments of the community make informed travel decisions.

The community is pursuing development of an Afford-able Housing Strike Fund (separate from our grant proposal) exceeding $50 million to preserve and subsidize the maintenance of affordable housing stock in transit corridors. With this fund, the City will be able to preserve affordable neighborhoods, even as we make dramatic improvements to public infrastructure. From past experience, we know that when public investments are made without appropriate policy and funding, the neighborhood surrounding the investment will naturally gentrify.

The third component of the East Riverside Smart Corridor effort is to capitalize on the opportunity to serve as a laboratory for many Smart City pilot projects, such as connected and automated vehicle (C/AV) applications and deployment. A number of safety, mobility, and environmental applications will be considered, including the use of connectivity to better enable safe and efficient movement through intersections, improve pedestrian detection and awareness, enhance bus transit operation, and evaluate other current and upcoming C/AV applications. This corridor will be sensor-rich to provide data to operate and assess the pilots' performance on

safety, operations, and climate change. Extensive public outreach will help us measure the effectiveness of various tools in enabling ladders of opportunity and broader awareness of transportation options.

At the end of the Riverside Corridor lies the Austin Bergstrom International Airport (ABIA), which provides valuable employment opportunities as well as a secured roadway network that will be used in piloting automated transit deployment. We are partnered with NAVYA, Local Motors, and BYD to develop and deploy other automated vehicle technologies within the protected roadway environment of ABIA. The purpose of choosing the ABIA location for initial piloting is four-fold:

1. The Austin airport presents a simplified network of urban streets to test the deployment of automated transit pods. The test site will allow Austin to investigate issues related to deployment of an automated service (not just individual automated vehicles) — for example, if people will feel comfortable using the automated vehicle if an ambassador or technician is not onboard.

2. The Austin airport serves a high number of early adopters, inventors and leaders of the community. By placing new mobility technologies such as connected and automated vehicles, Connected Traveler and Mobility Marketplace offerings, and electric vehicles at-scale, Austin will expose the innovators and job creators to these new technologies.

3. Early deployment of automated and connected vehicles in a service regime will provide operational experience and knowledge for a secondary deployment at other transit stations to address the first/last mile connectivity in neighborhoods where ladders of opportunity through accessibility can be created.

4. By connecting the Riverside Corridor (including downtown employment centers) with the Austin airport and Del Valle community further to the east, residents will have greater access and improved mobility to work, food opportunities, and education.

Approach to Delivery: Riverside Connected Corridor

The Riverside Drive connected vehicle test bed will serve as the City of Austin's corridor for developing and deploying V2V and V2I smart connected-vehicle (CV) arterial applications. This corridor has a total of 16 intersections operated by 14 traffic signal controllers.

As part of the Smart City grant, the City of Austin will do a full-scale deployment of DSRC and other connected-vehicle technologies in the corridor to servicespromise safety, mobility and environmental benefits. The Riverside Corridor team will be closely integrated with the Data Rodeo and ROMC in order to understand and leverage the wealth of information enabled when CV communications, such as DSRC, Wi-Fi, Bluetooth, and cellular technologies, become prevalent in the transportation operations data stream. A significant element of the Smart City proposal involves learning, documenting and transferring knowledge to adapt the city's operational strategies to accommodate these vehicles and the robust data they may provide. The ultimate goal is an evolutionary, city-wide roll-out of technologies piloted in this corridor.

Within this corridor, connected vehicle technologies will be integrated with conventional traffic sensor technology to support robust intelligent traffic signal applications that are (DSRC) market-penetration agnostic. The applications to be tested in this corridor include multi-modal intelligent traffic signal operations, connected vehicle transit signal priority, and pedestrian mobility and safety applications. The following provides a brief description of these projects.

The team has performed a preliminary needs assessment based upon a traffic and safety analysis performed by the city. The preliminary results indicate needs in the following areas:

- Reduce morning peak hour queues
- Reduce pedestrian conflicts and improve pedestrian safety
- Provide signal priority to electric Bus Rapid Transit (e-BRT) and freight, improve trip times and safety
- Improve signal coordination and traffic progression
- Reduce crashes, injuries and traveler delays

The signal system of the future utilizes both movement based upon information from connected vehicles as well as traditional traffic-sensor data and other traffic information to optimize flow along the arterial network. The integration of roadside and vehicle ITS sensors with DSRC and other CV data streams enable robust, market-penetration-agnostic connected vehicle applications (with both infrastructure and vehicles devices that behave as proxies for unequipped vehicles).

The Smart City team proposes to showcase these benefits in a number of real-world settings. Planned projects include:

- Installation of enabling roadside infrastructure and intersection applications — including installation of traffic signal controllers at sixteen intersections on Riverside Drive. This work will leverage lessons learned and applications developed by industry, including the MMITS CV Pooled Fund Study and the USDOT CV Pilots. It will also evolve into a system that provides low market-penetration benefits for V2V applications within the corridor. CV data will be integrated into Integrated Corridor Management and other decision-support systems to enable advanced traveler information and incident management, including reliever routes.
- Robust connected-vehicle signal operations upgrade

Quantity	Entity	Vehicle Type	Device Type	Comm Technology	Application Type
2000	TXDOT	Fleet and other vehicles	ARD and VAD	DSRC	V2V/V2ISafety, mobility and environmental
2000	CTRMA	Fleet and consumer	VAD	DSRC	None – enables V2V/V2I mobility, safety and cloud services
TBD (<100)	Capital Metro	Transit	ARD	DSRC	V2V/V2I mobility and safety
TBD (<100)	Commercial	Articulated and straight unit trucks	ARD, VAD	DSRC, cellular	V2V/V2I mobility, safety, environmental (eco-signal) and other cloud services
TBD (<100)	Light Vehicle	Private vehicles	ARD	Cellular	Safety, Mobility and environmental

— This is the development, testing and deployment associated with integrating conventional ITS sensor data (camera and/or radar) into the connected-vehicle signal logic to emulate CV data for unequipped vehicles. The project will also investigate emulating and broadcasting Basic Safety Messages for vehicles that are unequipped with DSRC units to provide greater benefits for V2V safety applications in the years prior to near/full market penetration.

- Equipping light and commercial vehicle fleets — This project involves the installation of DRSC and other CV technologies on public agency, commercial fleet, transit vehicles and privately owned vehicles. The COA will work with TXDOT, CTRMA, private businesses such as Peloton, Dell and others, and private owners to equip a minimum of 4,000 vehicles during the grant period, with expectations that the number will grow to 10,000. The equipment will include a mixture of Vehicle Awareness Devices (VAD, e.g., BSM emitters), Aftermarket/Retrofit Devices with partners such as partner VW/Audi and others, and OEM vehicles, such as equipped 2017 production Cadillac CTS vehicles in the region. The

specific breakdown of device types and applications by vehicle type will be determined during the planning phase. Our current estimate is shown on the table on this page.

- Consumer Connected Vehicle Program – Aims to quickly connecting consumer vehicles for the primary purpose of promoting safe, environmentally friendly driving behaviors. With this program, vehicle owners transmit data regarding their vehicle's operation and are subsequently scored and could earn rewards (e.g. merchandise, parking perks, etc.) on the basis of their driving habits. The program is powered by Intel edge hardware that easily plugs into the vehicle's OBD-II port beneath the driver-side dash—no professional installation required.

Each of these deployments will require close coordination with the relevant stakeholders and partners. Austin will team with automated vehicle technology developers and providers to acquire the platforms necessary for the aforementioned pilot programs. The team has held discussions with a number of these providers, including

Google X, Local Motors, Nissan, GM, Daimler, Peloton, BYD, and Proterra, among others. The city has received commitments from several vendors to provide vehicles and support as an in-kind contribution for the program. For the remaining systems and services required, the team will develop and issue an appropriate request for proposal for procurement purposes.

The Riverside connected vehicle corridor will include a number of tasks across multiple phases of evolutionary and new technology deployments.

Task 1: Design/Planning — Under this task, the team will develop a complete project management plan including management and safety plans for the CV corridor. The team will engage USDOT and other stakeholders in the development of ConOps for the various applications, system architecture documents, and system/device requirements. The team will develop individual planning documents for experimental design, subject recruitment, device requirements including device technical, interface, data and security requirements, vendor requirements for certification/ongoing compliance and updates, and evaluation.

Task 2: Testing and Certification — The city will work with partners to ensure that the devices, vehicles and technologies comply with the requirements specified with the planning phase. Suppliers will be expected to provide evidence of self-certification. The city will offer access to USDOT-approved certification services though Southwest Research Institute (SwRI) and Omni-Air. For products that don't meet certification or are early in development, the city will also offer access to connected vehicle expertise, services and controlled test facilities though partners at the Texas A&M Transportation Institute (TTI) and SwRI.

Task 3: Deployment and Evaluation on Riverside Corridor. The corridor serve as a living laboratory for the team

integrate and assess technologies and collect data and perform relevant analyses to determine if the pilots are achieving the desired outcomes on the small scale. This task includes installation, integration, operations, maintenance and system upgrades for infrastructure and vehicles.

Task 4: Deployment in other corridors — Depending on the results of Phase III, individual technologies will be advanced to the full deployment phase, where restrictions and limitations will be removed, and the systems opened up to a less controlled deployment environment. This scaling will allow the technologies to migrate to some of the other proposed Smart Stations and Connected Corridors, reaching additional parts of the community.

Approach to Delivery: Connected and Automated Vehicles

The Smart City team proposes to showcase a diverse suite of benefits in a number of real-world settings that directly address the needs of all segments of Austin's population. In all cases we will utilize the standards that have been developed by USDOT surrounding C/AV and interoperability in previous efforts to derive a path forward for our program. Our pilots include:

- **Automated Airport Circulator —** Will transport arrivals to a number of travel options near ABIA, including the local Smart Station. This will present automated vehicle technology to a large audience, including the early adopters and innovators that are a crucial part of the Austin culture. The team will select and deploy a number of automated "pods" and mini-buses that can accommodate up to twelve passengers at a time. The shuttles will traverse a dedicated, pre-determined route at relatively slow speeds (approximately 15 mph)stopping at parking lots, rental car centers, local hotels, and the nearby ABIA Smart Station. Autonomous systems with V2X capabilities will leverage infrastructure sen-

sors and DSRC roadside units to increase situational awareness for improved safety and mobility.

- **Autonomous First/Last Mile Connectors —** Will radiate into surrounding neighborhoods to bring commuters to and from Smart Stations, connecting them with other transit options and a variety of services. These vehicles will be a mix of similar automated "pods" and mini-shuttles, as well as automated light-duty passenger vehicles being developed by automotive OEMs and automated vehicle technology companies.

- **Connected Riverside Corridor —** Will provide a focal point for saturation of DSRC equipment for analyses of CV-enabled safety and mobility applications:
  - » Intersection Movement Assist (IMA) — warn driver if unsafe to enter intersection
  - » Transit Signal Priority (TSP) — interface with signal controllers to request priority for transit vehicles
  - » Emergency Vehicle Preemption — interface with signal controllers to request priority for emergency vehicles
  - » Incident Scene Work Zone Alerts — provides warnings to drivers about incidents or work zones they are approaching, as well as recommendations to slow down or change lanes.

Each of these deployments will require close coordination with the relevant stakeholders and partners. For connected vehicle projects, and particularly along the East Riverside Smart Corridor, Austin will team with a number of partners to help provide state-of-the-art DSRC roadside units (RSU's), on board units (OBU's), relevant backhaul communications, and (most importantly) the systems integration knowledge and experience needed to develop a system that can communicate useful data two-way with vehicles and the infrastructure. The city has received commitments from Siemens (traffic controller upgrades), Savari and Moovee Innovations (RSU's and OBU's), AT&T (backhaul communications), HERE (map content), Volkswagen/Audi and UPS (vehicle-oriented applications),

and more. All components of the connected vehicle ecostructure have been either committed by partners or will be procured by the City of Austin in pursuit of seeing these demonstrations through.

For automated vehicle projects, Austin will team with technology developers and providers to acquire the platforms necessary for the aforementioned pilot programs. The team has held discussions with a number of these providers, including Google X, Local Motors, Nissan, GM, Daimler, Peloton, BYD, and Proterra, among others. The city has received commitments from several manufacturers to provide vehicles and support as an in-kind contribution for the program. For the remaining systems and services required, the team will develop and issue an appropriate request for proposal for procurement purposes.

The deployments will be carried out in a multi-phase approach:

- **Phase I: Design/Planning –** For each of the pilots, the Austin team will identify and work with one or more technology or service partners, who will provide the connected vehicle technology, automated vehicles, and engineering services, themselves. The team will work with the partner to understand the limitations of their respective technologies. The team will subsequently work with the relevant stakeholders (ABIA, Capitol Metro, Travis County, etc.) to identify the appropriate setting to deploy the vehicles, when ready. The team will develop a comprehensive safety plan to ensure the vehicles are deployed in a safe manner. The team will coordinate with US DOT personnel to ensure the proper standards, guidelines, and protocols are being utilized so as to gain knowledge from these pilots for future deployments.
- **Phase II: Testing –** This phase will involve closed-course testing of the connected and automated vehicle

technologies at one of our partner organization's test facilities (Southwest Research Institute). The team will perform this testing in coordination with the technology partner to verify that the systems are safe to deploy in the relevant real-world setting.

- **Phase III: Initial/Small-scale Deployment –** The initial pilot deployments will take place at the Austin-Bergstrom International Airport (ABIA) and the nearby Smart Station, and in dedicated lanes along the proposed Riverside Corridor. This environment will present a limited access, partially controlled deployment environment, and will serve as a "living laboratory", where the team can begin to collect data and perform relevant analyses to determine if the pilots are achieving the desired outcomes on the small scale. This is also the time when installation, operations, and maintenance schemes are tested – assuming large fleets will eventually include CV technology means planning and preparation for the installation and maintenance of in-vehicle devices, which is markedly different than roadside devices.
- **Phase IV: Full/Open Deployment (Scale up) –** Depending on the results of Phase III, individual technologies will be advanced to the full deployment phase, where restrictions and limitations will be removed, and the systems opened up to a less controlled deployment environment. This scaling will allow the technologies to migrate to some of the other proposed Smart Stations and Connected Corridors, reaching additional parts of the community.

The scheduling of the phases will very much depend on the availability and provision of the required automated vehicle technologies, but will generally occur as follows:

- **Phase I:** To begin immediately upon contract award, and to take place over approximately six months.
- **Phase II:** To begin upon completion of Phase I, and to take place over approximately six to nine months.

- **Phase III:** To begin on a case-by-case basis, depending on the outcomes of Phase II, and to generally and subsequently take place over approximately nine to twelve months.
- **Phase IV:** To begin on a case-by-case basis, depending on the outcomes of Phase III, and to generally and subsequently take place over approximately twelve months.

While carefully carrying out this deployment strategy, the team will employee several "best practices" for automated vehicle testing, including NHTSA's 2013 "Recommendations Concerning State Activities Related to Self-driving Vehicles" and forthcoming best-practice guidance on establishing principles of safe operation for fully automated vehicles. The Austin Smart Cities Team does not believe there are any federal regulator issues, and there are no know state or local policy impediments to testing.

Approach to Delivery: Smart Stations

The following is the sequencing of events for Smart Stations and Connected Corridors, including the pilots to serve our Ladders of Opportunity initiatives:

- Initiate a Smart Station at ABIA
  - » Partner with ABIA to confirm a site for the Smart Station near SH71, complete environmental process as dictated by FAA
  - » Construct necessary improvements using financing not tied to the Smart City grant
  - » Attract and locate mobility services at Smart Station (TNCs, car-sharing, etc.)
  - » Locate travel amenities at Smart Station (e.g. food trailers)
  - » Locate informational resources at Smart Station (kiosk with trip planning and travel time information, Smart Ambassadors)

- Establish service in the Riverside Corridor and ABIA
- Initiate a Smart Station at Pflugerville
  - » Partner with the City of Pflugerville and Developer to select a site and allocate space for Smart Station
  - » Repeat applicable steps above
- Initiate Smart Station at MLK
  - » Partner with Developer to select a site and allocate space for MLK Smart Station
  - » Repeat applicable steps above
  - » Pilot an automated vehicle first/last mile service at MLK
- Designate the ABIA internal roadway system a Connected Corridor for purposes of automated transit deployment demonstration
  - » Instrument the internal roadway system with sensors (loops, weather, cameras, etc.)
  - » Install communications technology
  - » Procure transit shuttle pods (12 vehicles) necessary for providing start-up sustainable service. Seek headways of no more than 5 minutes. Austin has identified at least three manufacturers capable of providing transit pod technology as part of a competitive procurement process who can deliver within 6 months of initial selection. Operational by year two.
  - » Partner with OEMs in order to test other C/AV shuttle or similar vehicle services in the corridor, operational by year two.
- Establish a Downtown Station to serve as a destination for shared shuttle services
  - » Working with Capital Metro, identify an on-street (or off-street) destination location to use as a distribution hub for the downtown employment. Vans used as shared vanpools would meet up with a private transit driver at the downtown station. The private transit driver would distribute all

passengers to their downtown location and then use the van for mid-day services such as downtown employment shuttle, health care access mobility, or food delivery.

  - » Establish partnerships with transportation network companies and mobility services
  - » Partnering with UPS, establish freight lockers at all stations (downtown and at the residential station) to allow for package and grocery delivery
  - » Informational Resources (kiosk)
- Initiate conversion of Riverside Corridor into a SMART Connected Corridor
  - » Working with Capital Metro as a partner, the City will dedicate a transit and bicycle lane within the corridor. The lane will result in a complete street operational solution for the corridor.
  - » Pursue debt financing for station and corridor improvements to move towards a permanent corridor configuration
  - » Implement transit priority throughout the corridor, based on measurable performance goals for on-time-service, ridership, and average throughput for transit
  - » Instrument corridor with sensors (loops, weather, cameras, transit priority, Bluetooth detectors, boarding sensors, etc.)
  - » Install communications technology
  - » Upgrade controller firmware
  - » Increase bandwidth
  - » Install Mobileye and connect with data platform
  - » Partner with CapMetro and BYD in order to pilot the e-BRT service at scale Service would begin in year two, commensurate with the start of automated transit pod service at ABIA.
  - » Conduct advanced bike/ped detection
  - » Establish an incident management plan

- Launch Rundberg Connected Traveler Initiative + Smart Ambassador Program
  - » Partner to create a Connected Traveler App with Payment Platform
  - » Create Packaged Mobility Services supported by App + Payment Platform
  - » Hire team of Smart Ambassadors
  - » SMART Ambassadors to engage with community
- Launch HACA/Google Fiber Connected Traveler program
  - » Deploy Connected Traveler App with Payment Platform
  - » Create Packaged Mobility Services supported by App + Payment Platform
  - » Hire team of Smart Ambassadors
- Launch Highland/ACC Connected Traveler Initiative + SMART Ambassador Program
  - » SMART Ambassadors to engage with community
- Launch CommUnityCare clinic program
  - » Deploy a Connected Traveler App with Payment Platform
  - » Create Packaged Mobility Services supported by App + Payment Platform
- Integrate ICM projects (I-35, etc.)
- Establish Smart Station at Highland/ACC
  - » Partner with nearby senior living communities
  - » Pilot an automated vehicle first/last mile service
  - » Mobility Services (TNCs, car-sharing, etc.)
  - » Travel Amenities (food trailers, city resource trailers, lockers)
- Informational Resources (kiosk, Smart Ambassadors)

THE MOBILITY INNOVATION CENTER

Supporting the integration of the Regional Operations and Management Concept, Intelligent Sensors, Data Rodeo, and Urban Analytics by creating an overall decision making capability that promotes learning and scaling opportunities.

A common challenge for the Austin region, shared with many other regions around the country, is the fractured, siloed nature of transportation management – freeways are managed separately from arterial street networks, and those are managed separately from transit and other modes of surface transportation. However, from the traveler's viewpoint, these separately operated surface transportation systems are perceived as one. Within the Austin region, some traffic management centers are connected, with limited system-to-system coordination amongst agencies with regard to incident and congestion manage-
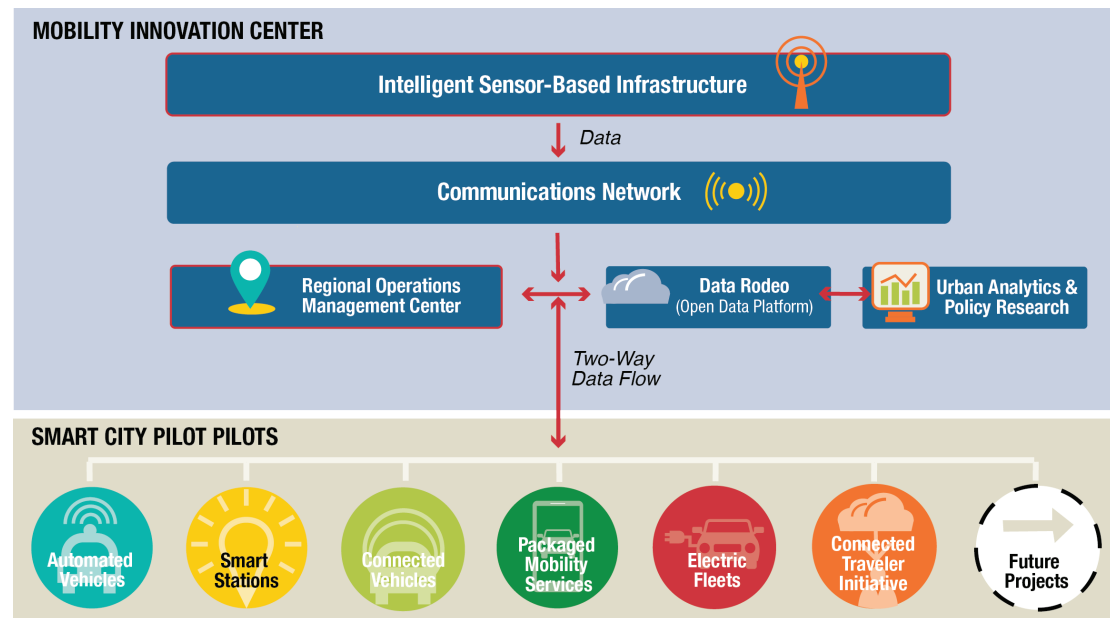
ment. As opportunities for deeper, more integrated connectivity amongst agencies are realized, together we can accomplish better multi-agency coordinated responses to incidents and recurring congestion, manage traffic and transit operations as one, share sensor data shared collectively across agencies to respond to conditions, understand challenges and measure outcomes of strategies.
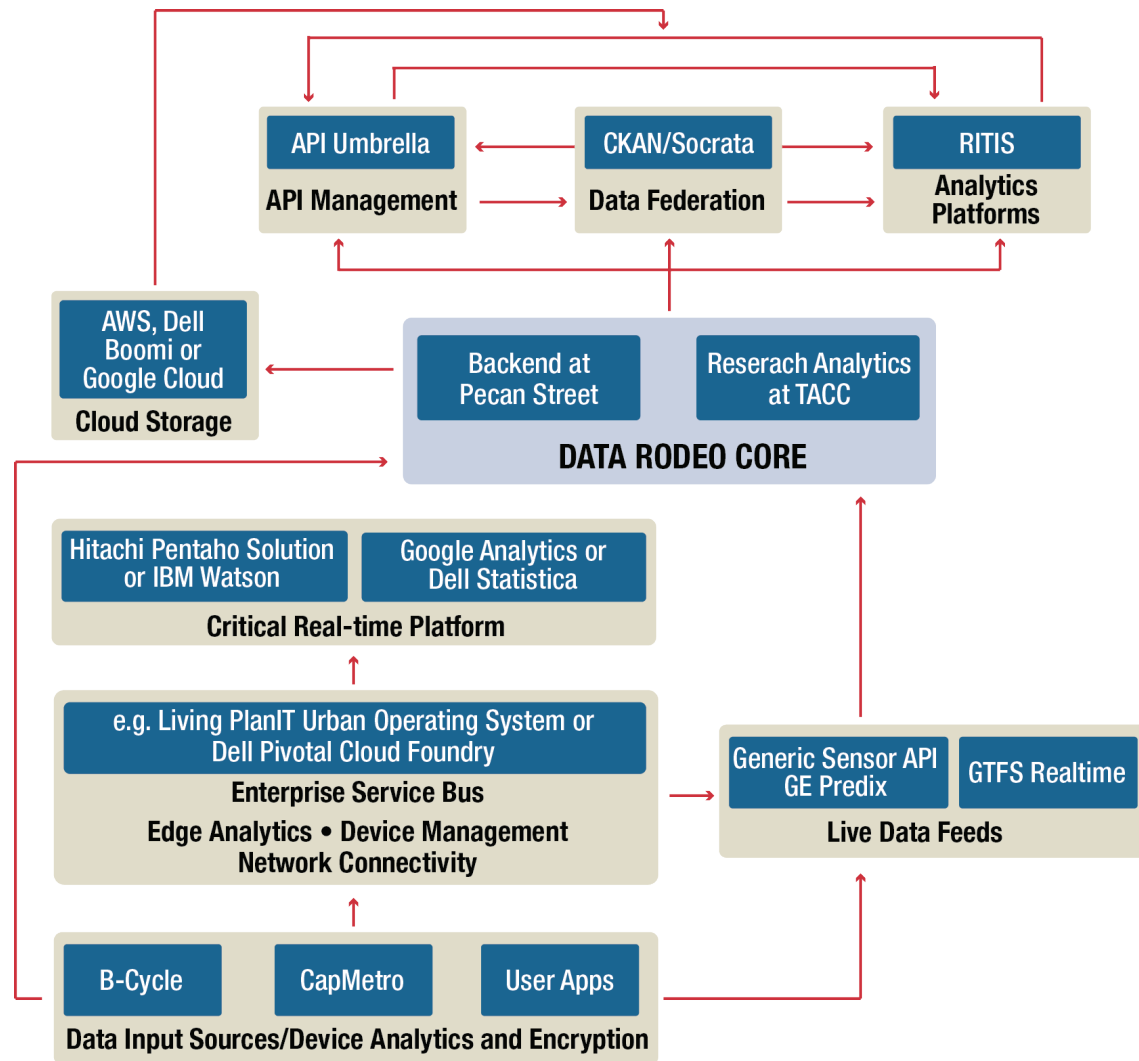
Through regional collaboration, Austin is pursuing a One System vision. A One System approach leverages the expertise and resources within each entity to create an operational approach whose sum is much greater than the individual parts. This shifts the paradigm to proactively improving safety and mobility of all users regardless of facility and mode of travel, while improving efficiency and coordinated emergency response.

As part of our Smart City proposal, Austin will launch interrelated projects that move the region toward a One System approach: (1) Regional Operations Management Center (ROMC) and (2) Intelligent Sensor-Based Infrastructure.

The same approach to coordinating operations characterizes the Data Rodeo, our two-way data portal that forms a key component of the Mobility Innovation Center. Right now, there are various disconnected data sources in the public and private spheres, disparate tools and technologies for working with and analyzing transportation data, and a wide-ranging community of researchers, hobbyists and entrepreneurs whose members are working in relative isolation. Through the Data Rodeo, we aim to bring these resources together to enable the broader transportation community to take advantage of the latent potential of this dynamic ecosystem.

The mission of the initiative is to foster interagency collaboration, promote synergy between the public, private and academic sectors, and to engage with the Austin community with a focus on high-impact applications. To fulfill this mission the Data Rodeo is focused on three overarching implementation objectives: data archiving, data analysis and data accessibility, with an ultimate goal of creating real-time access to data.

API Umbrella	CKAN/Socrata	RITIS
API Management	**Data Federation**	**Analytics Platforms**

AWS, Dell Boomi or Google Cloud
Cloud Storage

Backend at Pecan Street	Reserach Analytics at TACC
DATA RODEO CORE	

Hitachi Pentaho Solution or IBM Watson	Google Analytics or Dell Statistica
Critical Real-time Platform	

e.g. Living PlanIT Urban Operating System or Dell Pivotal Cloud Foundry
Enterprise Service Bus
Edge Analytics • Device Management Network Connectivity

Generic Sensor API GE Predix	GTFS Realtime
Live Data Feeds	

B-Cycle	CapMetro	User Apps
Data Input Sources/Device Analytics and Encryption		

Data Archive

The core of the initiative is to bring together all available transportation data into a single framework. Data will be backed up, version-controlled and curated using secure, open and standards compliant technology. We plan to allow for flexible privacy settings and in particular to support HIPAA compliant storage options. The goal for the platform is to provide a single point of access for all regional transportation data and other data types needed for the smart city pilots.

Data Analysis

A key feature of the Data Rodeo will be the implementation of an analysis and development environment in order to help both researchers and software engineers jump-start their projects by leveraging our data and computational resources. Our first target objective will be traffic modeling and visualization, but then we will expand and add additional functionality in collaboration with the wider community.

Data Access

Arguably the most important part of the initiative will be to make data access easy and convenient. Public data will be made available via a number of open APIs and interchange formats both for public agencies and for developers in private industry. We will collaborate with the academic and open-source communities to develop a variety of proof-of-concept applications and educational resources in order spur rapid adoption and build momentum.
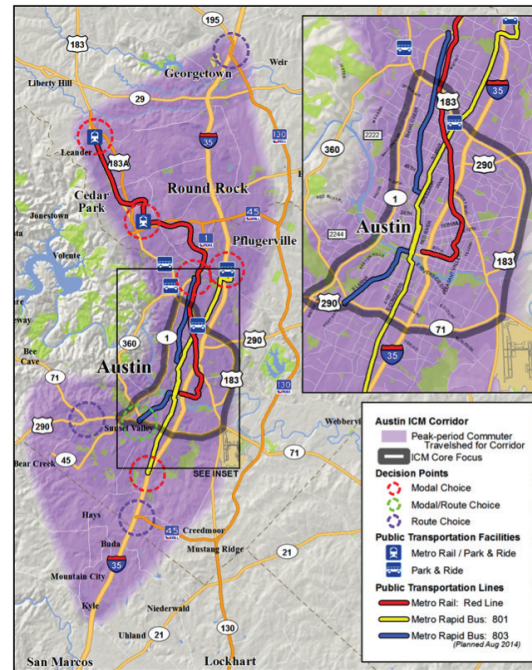
Approach to Delivery: Regional Operations and Management Center and Intelligent Sensors

1. One System: Advance the Integrated Corridor Management (ICM) Analysis, Modeling and Simulation; Scenario Planning on I-35 through downtown Austin.

The Austin Smart City team sees an advantage in leveraging past and ongoing investments in ICM Planning in order to kick-start Smart City deployments. These activities have welded and galvanized bonds between all regional transportation agencies. TxDOT's vision of the ICM is to provide a foundation project by which the Austin Smart City team can launch into One System planning for the region. Given the anticipated reconstruction of I-35 through downtown to commence in 2019/2020, the region's transportation agencies need a user-focused system to manage mobility and safety during and after reconstruction. The project area of the ICM Corridor consists of the primary freeway, frontage roads, arterial streets within approximately 2 miles of the freeway, and transit routes along I-35 between US 183 and US 290/SH 71. Note that all of our Smart City projects are within the peak period travelshed. Smart City funding will be used to complete the analysis, modeling, and simulation phase and begin the development of system requirements by conducting scenario planning using the One System approach with the region's transportation agencies. The team will then leverage these outcomes for inclusion in the Smart City deployments.

The One System approach also entails a combined and coordinated public communications approach among the transportation agencies to provide one consistent, reliable voice of data and information to the traveling public. This one voice will coordinate resources to manage, web, social and traditional media communications and public outreach and feedback. TxDOT's traffic management center (TMC) will be the primary facility housing ICM operations with the City's TMC integrated.

2. Develop Smart City System Agreements (Lead: City of Austin)

Agreements are the foundation to achieve the One System vision and ensure transparency and will serve as templates for other regions pursuing similar visions. They will contain negotiated terms, conditions and obligations and stakeholder engagement plans for the parties involved. Agreements to be developed and executed:

- One System Vision, Operating Concept, and Objectives
- Common ROMC Vision, ability to add other partners (e.g., physically, virtually, subscription service)
- Data Sharing (e.g., ITS, CV, AV, EV, healthcare, social services, etc.)

- Multiple Use Agreements to share infrastructure (e.g., communications network)
- Purchasing and Maintenance Agreements to standardize equipment (e.g., sensors, communications equipment) and share resources.

3. Integrate Shared Infrastructure (Lead: TxDOT)

Integration of infrastructure elements facilitates data sharing and shared management operations under the 'One System' vision. The Systems Engineering process will be applied to implement infrastructure sharing projects during the Smart City project:
- video sharing
- dynamic message signs (DMSs) sharing
- communication network sharing.

Video sharing and role-based camera control and DMS's will be integrated across the City, TxDOT, Capital Metro and CTRMA surveillance networks to enable an operator to have one list of all cameras to access for situational awareness. Communication networks will be connected to reduce individual agency costs, expand coverage, and increase reliability by providing network redundancy.

4. Support Smart City Pilot Projects

Certain Smart City pilot projects require ongoing field monitoring and other services from the ROMC. These services are listed in the accompanying table for each Smart City project. The City of Austin's TMC will deliver these services.

Smart City Project	ROMC Services
Smart Stations	- Monitor security at stations - Monitor movement of vehicles in real-time - AVs at AIBA - Vans (Pflugerville-CBD, off-peak usage) 2-way comm. with vehicle cabin - Dispatch services to vehicles (maint., first responders) - Manage info displayed on DMSs - Monitor station performance via dashboard - Monitor package deliveries via dashboard (locker utilization - are more lockers needed)
Mobility Marketplace/ Connected Traveler	Supply multimodal operational data (via Data Rodeo) Provide traveler information
Connected Vehicles	- Provide communications to CV field equipment - Integrate CV equipment with other roadside equipment
Autonomous Vehicles	- Monitor movement of vehicles in real-time 2-way communication to on-board staff - Dispatch services to AVs (maintenance, first responders)
Electric Fleets	- Monitor charging station availability - Facilitate turnover at charging stations
Data Rodeo	Supply multimodal operational data

Intelligent Sensor System

Sensor data is the foundation for a Smart City. They provide robust data to more efficiently and safely operate and maintain the mobility network. Sensors increase transparency allowing transportation agencies to know how the city is operating in real-time and where enhancements can be made. Sensor data enables travelers to make more informed decisions and provide connected vehicles with real-time information needed for guidance and optimized travel.

Ultimately, sensors provide the data that end users (e.g., travelers, entrepreneurs, transportation agencies) use to make decisions that affect individual and community outcomes (mobility, safety, climate change, ladders of opportunity).

The Smart City Challenge enables the region to accelerate expansion of its mobile and fixed sensor network while more closely integrating multi-agency sensor equipment and networks. An overview of sensor types and communication networks for the Smart City project are shown below. An asterisk (*) indicates a new sensor

or communications network that will be enabled through the Smart City project. The remaining sensors and communication networks are currently in operation.

The Riverside Smart Corridor will serve as a laboratory for many Smart City pilot projects and, therefore, will be sensor rich to provide data to operate and assess the pilots' performance on safety, operations, climate change, and ladders of opportunity. New sensor-based applications that will be piloted through the Smart City project are highlighted in the following table.

Approach to Delivery: Data Rodeo

Governance Tasks
1) Develop Data Rodeo Governance Structure
A governance structure must be developed to ensure that all participating agencies can come to a consensus on the way in which the Data Rodeo is developed and how the data is managed. Several leading private companies are providing assistance to facilitate consensus, standards and architect solutions.

2) Establish Data Standards Working Group
To allow for interoperability among the diverse array of datasets needed to create a smart city, we must work toward data standards. The Data Standards Working Group will interface with the various consortia working in this area. Members will include people involved directly in the Austin Smart City Challenge, and across the country. Leveraging existing networks such as the MetroLab Network and the new national peer network of urban chief data officers. To the extent feasible, the standards developed will extend existing open standards such as those used by the OpenStreetMap (OSM)

Application	Description	Sensors
Intelligent Sensor Projects (standalone)		
Near-Miss Crash Analysis	The frequency of near-miss crashes and red light running events will be captured at 16 signals using sensor-based detection and analytics to support Vision Zero engineering and enforcement initiatives. Incorporating data from the CV pilot and Mobileye system will be explored.	• Video/radar detection
Roadway Weather Information System (RWIS)	RWISs will be deployed at the Riverside bridges over I-35 and SH 71. Austin's climate routinely has the region on the border of freezing roadway conditions often making a decision to close schools, etc. unclear. This data will support the decision making process.	• Roadway weather sensors
Private Sector Operational Data	Data and an analytics platform will be acquired through a private sector vendor to support before/after analyses and to develop tools to improve system operations throughout the City.	• Data sourced through private sector vendor
Pavement and Markings Performance Monitoring	Mobileye's on-board collision avoidance system to be deployed on Capital metro's buses also provides data to assess pavement and markings quality. Passively collecting this data on a continuous basis has the potential to save agency resources and lead to more timely maintenance.	• Mobileye's on-board system
Kiosks	Sidewalk Labs' Link Kiosks will be installed to address the digital divide. Twenty kiosks will be placed around the region with a focus on under-served communities.	• Link Kiosks
Intelligent Sensor Deployments in Other Pilots		
Connected Vehicle (CV) Pilot	CV pilot focuses on improving safety and providing transit signal priority in the Riverside corridor. Fleet penetration of DSRC onboard units (OBUs) is a focus. Sixteen signals will be equipped with DSRC roadside units (RSUs). BSM emulation from traditional traffic sensing solutions. Nine V2I CV Applications will be deployed.	• DSRC OBUs • DSRC RSUs • BSM emulation
Next Generation Emergency Vehicle Preemption (EVP) (CV Pilot)	New EVP system integrates emergency vehicle GPS location and route through a center-to-center connection to preempt signals. This approach is expected to reduce response times and equipment maintenance needs.	• GPS location
Pedestrian Sensing (CV and AV Pilots)	Pedestrian presence detection will be deployed to monitor crosswalk activity. This data and real-time pedestrian signal timing data will be made available to the CV and AV pilots to improve safety.	• Pedestrian detection
Food Lockers (Smart Station Pilot)	Food lockers will be installed at the AIBA Smart Station to address the area's food desert.	• Locker sensors: availability, capacity utilization, temperature

Project. (OSM is an international community-driven initiative where people contribute and maintain open map data of a wide variety of types. It is supported by the not-for-profit OpenStreetMap Foundation.)

3) Develop Data Management Plan
Working with stakeholders a plan will detail what types of data will be produced, what policies for access and sharing are needed, and how the Data Rodeo will ensure appropriate protections of privacy, confidentiality, intellectual property, and other rights and requirements. Each of these aspects of the plan is discussed in more detail in the Data Management section of this submittal.

Pilot Data Readiness

1. Develop schedule to ensure priority data (for pilots) is incorporated into Data Rodeo.

   For each pilot that will be conducted through this smart city challenge grant, a detailed list will be created outlining the data needed, data sources and schedule for incorporating the data, and how the data will be managed, to ensure the pilot is a success.

2. Test data input, output, and analysis using available and synthetic data.

   Once data needs are determined (see previous step), the data rodeo system must be tested to ensure that the system can accommodate the data in the desired way. For data that is readily available, it may be directly incorporated. For data that is not readily available, test data sets will be developed to test the system functionality.

3. Develop Extract, Transform, Load (ETL) processes for interoperability.

   While we are working toward common data standards, not all available data will adhere to the standards. ETL processes will be developed to translate data between its existing format and the standard.

4. Develop Application Programming Interfaces (APIs). APIs will be developed to take data, which has been transformed into the common standard, and make it accessible for outside use, and allow for querying across datasets to develop performance metrics and create new information.

URBAN ANALYTICS AND POLICY RESEARCH (UAPR)

A key feature of the Data Rodeo will be the implementation of an analysis and development environment to help both researchers and software engineers jump-start their projects, leveraging computational resources. The analytical capabilities enabled by the Smart City deployment will support the public agencies in optimizing service delivery as well as powering performance measurement and policy research.

Real-Time and Predictive Urban Analytics
Urban analytics are at the core of Smart Cities. The real-time analytics capabilities for the Austin Smart City program support the immediate interaction by a range of users with live events, incidents, and weather situations in ways that provide visualization, situational awareness, and immediate decision making. Predictive analytics that anticipate conditions offer an additional level of functionality. The analytics support for the pilot deployments are essential to testing the full capabilities of the demonstration.

Performance Measurement and Policy Research
The Austin Smart City Performance Management Plan will define the goals, questions or hypotheses, data requirements, and analytical tools needed to effectively evaluate performance of the pilot deployments and MIC capabilities.

In addition, the UAPR area will provide capabilities for policy and behavioral research analytics. The success and scalability of a new accessibility ecosystem will require changes in the current public policy framework. Austin's recent experience with TNC regulations has demonstrated the need for informed policy development. Evolving travel behavior characteristics – both measured and predicted – will play a key role in policy development. Policy research is defined broadly as data analysis that identifies and informs potential changes at the local, state and federal levels, in areas such as:

- Legislation
- Regulations
- Administrative processes
- Institutional and governance arrangements
- Procurement, public-private partnerships, and data monetization
- Investment or reallocation of public resources

The capabilities within this element of the program will provide expertise in analyzing and fusing multiple data sets – transportation and non-transportation, public and private - to create new knowledge and understanding that informs policy development. Examples include consumer acceptance of new mobility services, travel behavior changes, travel needs and accessibility for underserved communities, and travel costs.

Approach to Delivery – Urban Analytics and Policy Research

Building from the Data Rodeo, the Austin Smart City team will develop and/or acquire the tools that can enable data mining, advanced analytics, and predictive modeling capabilities in support of program goals. seeking to leverage existing public and private tools first. This analytical capacity will support

- real-time data analysis and visualizations to optimize performance of transportation services across modes, and
- exploration of archived data for planning, performance reporting, and data-driven decision making.

Task 1. Develop the Performance Management Plan and the Evaluation Support Plan which will define the goals, questions or hypotheses, data requirements, and analytical tools needed to effectively evaluate performance of the pilot deployments and MIC capabilities.

Task 2. Define needs and requirements for real-time analytics needs to support pilot deployments for real-time visualization, decision support systems, and predictive analytics, in alignment with the goals of pilot deployments.

Task 3. Define public policy research needs. The team will use a Delphi process to identify key public policy questions, related hypotheses, and associated data and analytical requirements to conduct supporting policy research. The use of non-transportation data sets, and the tools to fuse disparate data sets, will be of particular interest to analysis of accessibility for underserved communities.

Task 4. Examine experiences and best practices from existing transportation analytics platforms and open source applications. The objective of this task is to identify gaps between the analytics needs defined in Tasks
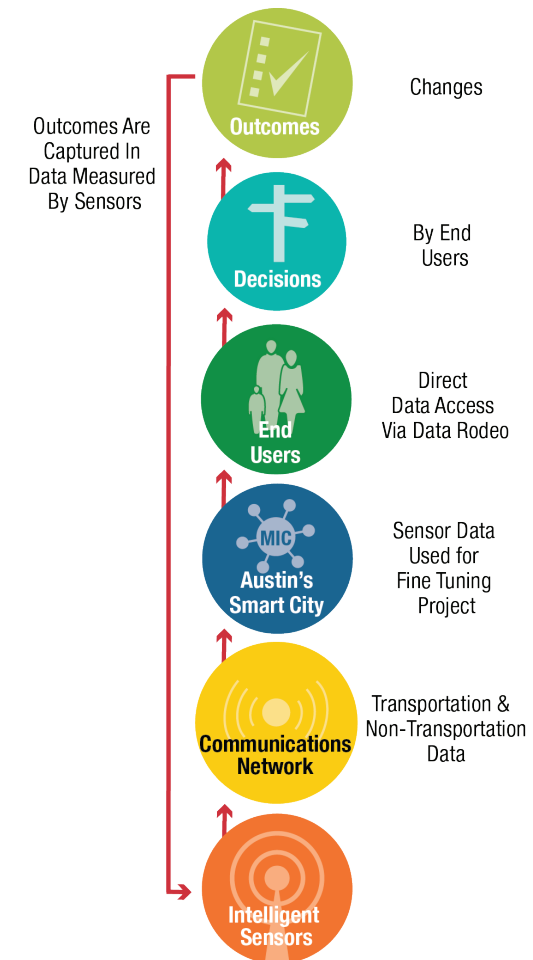
1, 2 and 3 and the tools available in the public or private realm that are transportable to Austin's implementation. The team will undertake a literature review and targeted interviews with organizations, both public and private, that host existing transportation analytics platforms. For example, the Regional Integrated Transportation Information System (RITIS) at the University of Maryland has developed a comprehensive suite of analytical tools, including real-time visualizations and probe data analytics, which may be portable to the Austin initiative and allow for rapid deployment. The USDOT Prototype Open Source Application Development Portal (OSADP) includes software solutions for a range of ITS applications. Additionally, private companies that have provided letters of commitment for analytics support at no cost to the project include Transport Foundry, Hitachi, Cubic, GRIDSMART, Vizalytics, and many others. Of specific interest are questions related to how vendor solutions would interface with the Austin Smart City data environment and structure and how they would add value.

Task 5. Prepare a strategy for implementing analytics capabilities, defining 1, 3, and 5-year development and implementation plans. Develop a strategy for deploying public and private resources to meet the analytics needs of the Smart City, including performance measurement, real-time operational support, and public policy analyses. The team will define resource needs and leveraging opportunities, particularly research support through university UTC programs and TTI's Policy Research Center. The execution strategy for the out years will incorporate a sustainability plan for continued analytics capabilities beyond the period of performance of the grant.

Task 6. Execute the analytics implementation strategy with activities such as::

- Collect baseline, pre-deployment data
- Provide support and assistance to USDOT's independent evaluator

- Support analytics capabilities for real-time applications, performance metrics, and policy research, conducted both in-house (UT-CTR, TTI, and SwRI) and by private partners (as assessed in Task 4)
- Collect post-deployment data
- Conduct performance analysis and develop reporting

Outcomes Are Captured In Data Measured By Sensors

Outcomes — Changes

Decisions — By End Users

End Users — Direct Data Access Via Data Rodeo

MIC Austin's Smart City — Sensor Data Used for Fine Tuning Project

Communications Network — Transportation & Non-Transportation Data

Intelligent Sensors

VEHICLE FLEET ELECTRIFICATION

The rapid development of mass market electric vehicles presents an opportunity to change our transportation paradigm in beneficial and potentially harmful ways. Understanding the manner in which our infrastructure is ready to handle the electrification of the fleet is a critical part of our strategy to leverage the USDOT and Vulcan Foundation monies throughout the grant period.

Strategy Part 1: Target high-mileage, best ROI vehicles

The core of Austin's strategy to greatly proliferate electric vehicles and eVMT is to target high mileage, mobility service vehicles. These vehicles include taxis, municipal vehicles, TNC vehicles, certain corporate fleet vehicles, and public transit vehicles (including buses). There are four key reasons we are primarily targeting high-mileage, mobility service vehicles:

- Maximum leverage to replace gasoline/diesel vehicles quickly: Displacing one high mileage gasoline vehicle is the equivalent of replacing up to 10 personally owned gas vehicles.
- Compelling economics to benefit drivers, consumers, and allow scaling: At high mileage, electric vehicles make pure economic sense over internal combustion vehicles due to lower total cost of ownership (TCO) from lower fuel and maintenance costs.
- High visibility to Austinites and visitors: Taxis, TNCs, the municipal fleet, and public transit vehicles are highly visible and serve many people per day. They give millions of rides combined per year, so when we electrify these fleet vehicles we essentially have created the world's largest EV "ride and drive." supporting efforts towards consumer adoption.
- Paved path for rapid scaling of eVMT in Austin and beyond: Mobility as a Service (MaaS) is growing rapidly

and we must ensure that the vehicles providing these services are electric by ramping up infrastructure, friendly policies, and business models in parallel.

We believe we get the most value for our effort and per grant-dollar by primarily targeting high-mileage fleets. However, personally owned vehicles will still be the primary mobility method of most Americans and we must engage in high-leverage efforts to enable and increase personal electric vehicle adoption. Therefore, as part of our holistic EV strategy, we also have plans to target personal vehicles as well. This includes education/awareness campaigns, public and workplace EVSE programs, direct engagement/incentives with auto dealers, and bulk purchase leverage with carmakers.

Strategy Part 2: Ensure eVMT are low-carbon: Power EVs with renewable energy

A key element of our plan is to ensure we do not just shift CO_2e from transportation to electricity generation. As such, we propose to continue to power all public and fleet stations by Austin Energy's GreenChoice™ program, green-e certified renewable energy credits.

- To further increase benefits of mass EV adoption, we propose to launch the Vulcan Foundation Residential EV+Solar Grid Integration Pilot to demonstrate the benefits and feasibility of EVs providing value to the electric grid. This will be part of Austin Energy's larger Austin SHINES project. Austin SHINES is a $12.8M project that leverages funding by a competitive grant from the US Department of Energy SunShot initiative ($4.3M) and a State of Texas Innovation Grant ($1M) to integrate distributed energy resource at the residential, commercial, and grid scale with a focus on PV Solar and battery storage. Key metrics of SHINES is affordability and scale.

Use EVs to increase renewable penetration on the entire grid

- Austin Energy's has a goal of 55% renewables (and over 80% non carbon) by 2020. Increasing renewables mix above 50% and beyond is a technical challenge due to the non-dispatchable nature of solar and wind.
- As part of the Smart City project, we will test smart charging and other methods to incentivize off peak charging in order to ensure that EVs benefit a renewable grid and don't add to peak demand.

Strategy 3: Scaling solutions to maximize impact

Austin is developing a comprehensive scaling strategy characterized by five elements:

- Development of a roadmap and playbook for other cities to follow based on lessons learned from the program
- Deployment and vetting of new financing and business models to allow the private sector to proliferate EVs rapidly
- Collaboration with the other six finalist cities and other major US and international cities
- A city liaison program provides a mechanism for other city representatives to come to Austin to learn and scale to their city
- Auto Dealers are a critical bottleneck in the deployment of consumer electric vehicles. We have an innovative plan to incent dealers and salespeople to gain expertise and sell electric vehicles. This model will scale to other cities and greatly increase personal electric vehicles sales.

Approach to Delivery: Electric Fleets

Enabled by the Smart City grant from USDOT and Vulcan, the city will undertake eight interrelated electric vehicles efforts that have both immediate CO_2 reduction, and long-term catalytic effects for eVMT proliferation. In addition, our efforts will incorporate V2X technologies like DSRC in hundreds of vehicles and will enable the mobility service economy to grow and reduce costs. We will leverage existing resources and programs as well as the Vulcan Smart City funding to launch, manage, and ensure success of these efforts. Each project targets critical barriers and addresses one or more of USDOT's 12 Vision Elements and Vulcan's five Elements.

Integrating Electric Vehicles into the existing DOE SHINES grant

Leverage Vulcan funding to include EVs in an existing Austin Energy/DOE funded program, Austin SHINES, to investigate potential for EVs to provide grid services and mitigate the variability of renewable energy generation. SHINES is a $12 million, 39 month project that started Feb 1, 2016 and works well with a proposed 3 year Smart City Challenge timeline. Austin Energy's partners include The University of Texas, Pecan Street Research and the US Department of Energy Sunshot/SHINES program.

Austin SHINES will integrate PV Solar, battery storage, and smart controls at a residential, commercial, and grid scale. Adding EVs to the residential storage solution is an incredible opportunity to leverage two key technologies; PV Solar and residential-scale energy storage.

As part of the project, Pecan Street's lab, and the SHINES project such as high penetrations of rooftop solar, electric vehicles, and residential energy storage. Pecan Street will acquire commercially available V2G equipment and install it in their lab and in one or two homes that are connected to heavily monitored distribution transformers

and substations in Mueller.. The proven systems will then be deployed to residential structures in the Mueller neighborhood.

Since SHINES partners already monitors grid assets, PV array production, disaggregated home energy use, energy storage charging/discharging, and EV charging, they will be able to conduct a comprehensive before-and-after comparison of how V2G impacts the distribution system and the homeowners lifestyle.

The goal is a sustainable business model that allows consumers to share in the value proposition of using an EV beyond just transportation thus driving EV sales. Business cases for the utility and grid operator are also validated to demonstrate a "win-win" business model that can be replicated in other energy markets. High EV adoption has tremendous potential as a distributed storage asset that could eliminate renewable spillage/shortfalls and help make technically feasibly an 80-100% renewable grid.

Electrifying Taxis: ABIA Airport Concession Project

The City of Austin is in the process of transforming taxi regulations, including turning airport taxi service into a concession whereby taxi companies will bid to become the sole airport taxi provider. In return for the concession, the city can dictate certain parameters of the service, including vehicle type.

If awarded the Smart City grant, Austin proposes to require that all taxis operating in the as part of the airport concession will be required to be electric vehicles. This is an extremely aggressive and impactful move that will convert 300 high-mileage gasoline vehicles into electric vehicles in less than 3 years.

We face several barriers to implementation including refueling time and EV charging ubiquity, vehicle range, vehicle capital cost, and availability of new EVs like Chevy Bolt. We have a solid plan to mitigate these barriers. We will partner with ChargePoint to deploy their latest fast-

charging technology at the airport. Their new system can charge dozens of taxis simultaneously at powers that are 3 times faster than most "fast chargers" on the market today.

In addition, we will provide the taxi company with financing aid to ensure that they can procure the electric vehicles. In addition, we will partner with General Motors to procure 100 of the first Chevy Bolts produced so that Austin will have the world's first mass deployment of long-range, lower-cost electric vehicles like the Bolt.

Electrifying TNC vehicles: Enabling new business models

Transportation Network Companies (TNCs) have deployed thousands of vehicles on their networks in Austin alone. Many of these vehicles drive similar mileage to taxis, many times more per year than a typical vehicle.

Electric vehicles make pure economic sense for many TNC vehicle usage cases. Innovative companies have begun taking advantage of this economic advantage by procuring electric vehicles and making them available to rent by TNC drivers. This aggregates the once disaggregated TNC fleet and allows drivers without personal vehicles to participate in the sharing economy. We will use a portion of the grant funding to enable these new businesses to launch and thrive in Austin and scale to other US and global cities quickly.

We will partner with Evercar, a company that rents EVs to TNC drivers for $5 per hour currently operating in Los Angeles, to enable their business model to launch and flourish in Austin. Evercar solves two of our barriers by aggregating a fleet of TNC vehicles and purchasing the EVs to mitigate capital cost barriers to drivers.

As with the taxis, we will partner with ChargePoint and GM to provide advanced EVSE and access to long-range electric vehicles respectively.

Innovative EV financing

The City of Austin proposes to create a financing program for electric vehicles that uses city funds, backed by Vulcan grant funding, to mitigate the increased capital cost of EVs and ultimately generate returns economically due to the lower operating cost of EVs. Essentially, the city will pay for the batteries in the EVs so that fleet operators can buy an EV for the same cost as a gasoline or diesel vehicle and then pay "rent" on the batteries to the city. This "rent" will be lower than what they previously paid for gasoline or diesel, so the operators save money and the city makes a reasonable rate of return on its loan. If successful, this will give other cities a precedent to electrify high mileage vehicles.

Primary Use Cases: Buses and Taxis:

Electric Buses: Capital Metro will purchase between 8 and 16 electric buses at an approximate premium of $300,000 per bus for electric powertrain versus diesel. The City of Austin will loan Capital Metro $300,000 per bus to cover the additional capital cost of an electric powertrain at an approximate interest rate of 3% for a duration of 12 years (the warrantee life of the buses). Capital Metro will then owe the city $357,604 per bus, to be repaid monthly over 12 years, or $2483 per month. The city will make a reasonable 3% return and Capital Metro will actually save money, as the diesel cost per bus would be $2610 per month at EIA's projected diesel cost of $2.90/gallon and electric fuel will cost just $4.17 per month due to Austin Energy's Plugin Everywhere program. Vulcan funds will be used as a "backstop" to de-risk the investment for the city and provide downside protection in the event of low diesel price, OEM bankruptcy, or other unforeseeable downsides.

Taxis: The taxi company that is awarded the Airport concession will be required to upgrade its fleet of 300 vehicles to be fully electric. Each vehicle will cost roughly $20,000 each more than a comparable gasoline sedan. The city will loan the taxi company $20,000 per vehicle at an approximate interest rate of 3% for 4 years (the low end of Taxi service life). The taxi company will pay the city $443 per month to "rent" the battery while saving $520 per month in avoided gasoline cost ($2.50 per gallon). Electric fuel will cost just $4.17 per month due to Austin Energy's Plugin Everywhere program. Vulcan funds will be used as a "backstop" to de-risk the investment for the city and provide downside protection in the event of low gasoline price, OEM bankruptcy, or other unforeseeable downsides.

Increasing EV sales: Outreach and Incentivization

This is a multi-pronged strategy to engage various, key stakeholders to increase the adoption of electric vehicles. Specific programs of outreach, incentives, and engagement include:

- Public Awareness Campaign. Expand messaging content, media types, and exposure of Austin Energy's existing and award-winning "Charge Forth" campaign.. Since 2011, Austin has seen a 100-300% annual growth rate in EV adoption supported by the "Charge-Forth" campaign and affordable/innovative utility programs to include a flat fee of $4.17/month for unlimited fill-ups at public charging stations.
- Auto Dealership Incentives/Outreach. A key barrier is lack of incentives and training for auto dealer sales staff to sell EVs to customers looking to buy a new vehicle. We will help remove this barrier by setting up an incentive program for sales staff for attending training, demonstrating proficiency in EV benefits/programs, and provide incentives to promote EV sales.
- Train TNC/EV Taxi Ambassadors. A major push of our electrification efforts is to support the purchase and infrastructure of electric vehicles for TNC and Taxi drivers. Training these new EV drivers is an excellent opportunity to create conversations between drivers and their passengers on the benefits and real-world experiences of driving an EV.

- Industry and Community Outreach. The University of Texas Austin Technology Incubator has agreed to launch a specific transportation incubator vertical. We wish to support this organizational founding to increase the impact of our messaging, host events, leverage their existing network, and help vet the most promising start-ups to participate in this overall effort.
- Fleet Owners: As part of the Vulcan funding, we will develop materials and assistance for fleets to go electric. This will include cost analysis support with partnership with the Electrification Coalition as well as promotion in targeted events.

Electrifying the Municipal Fleet:

City Council has already passed a resolution to direct City Fleet Services to move to 100% adoption of alternative fueled vehicles. As recently as May 2016, City Council passed an ordinance to have a specific EV adoption plan in place to take advantage of the recent development of new EV technologies. To further amplify the benefits of EVs, all city facilities (and public charging) are backed by Austin Energy's 100% renewable energy program, GreenChoice™.

Learning, Scaling, and Playbook Development

As part of the grant, Austin will fund and staff a project to monitor, evaluate, report, and record information and lessons from the other projects. This information will be used to evaluate success, report to USDOT and Vulcan, and create a "playbook" for other cities. This project will also serve as a "city liaison" to other US and global cities, both learning best practices and sharing insights from Austin's efforts.

Electric Public Transit

Described in detail above, we will deploy electric public transit vehicles as part of our smart corridor effort.

SCALING SOLUTIONS AND TRANSFERRING KNOWLEDGE

Austin is committed to an open, collaborative relationship with every city that strives to be a Smart City. As we learned on our travels with the Secretary to Scandinavia, innovative policies and use of technologies and partners can be found everywhere. If we can learn from other cities and share what we learn through the deployment of Smart City concepts and policies, then the future that we all seek can truly be achieved

Austin has proven collaboration works. In June 2016, Austin will host a Smart City Conference, bringing together worldwide leadership on Smart technologies in the energy, transportation, and government sectors. In addition, the City is a host to the world-famous SXSW Interactive Conference. Mayor Steve Adler has been instrumental in getting commitments from the conference to include a government track that allows mayors and leaders from around the world to come to Austin to collaborate and learn about SMART advancements. As part of our SMART proposal and in coordination with our research partners, we will continue to host an annual SMART City Conference and will advocate for on-going interest through SXSW who has agreed to partner with the City of Austin as part of our proposal. The partnership will assure that the conference remains focused on SMART technologies.

In addition to these established collaboration tools, Austin proposes the following new elements as part of our Smart City proposal:

- Smart Cities Buy/Purchase List: As part of our deployment plan, we will develop a partnership with the USDOT to launch a Smart Cities Buy List. Our partner, the Texas Transportation Institute, has previously tested the market with a national request for information that will be incorporated in the procurement process. Most importantly, we propose that any city that partners with the USDOT on Smart Cities would have access to our national two-step procurement process. The first step would consist of a nation-wide request for information (RFI). Companies responding to that solicitation would receive guaranteed notice from any government partner choosing to use the list to initiate procurement. Government partners gain ma readily available list of companies and products to use in planning for a procurement process. Austin will select commodity providers from the RFI. Once a firm has been competitively selected, then government partners, through their association with the USDOT could have access to those companies selected for contracting with the City of Austin. Austin has successfully used this technique when we modernized our SMART parking management system, purchasing new parking stations by tapping a contract already held by the City of Seattle. It is a common practice in the Transit industry.

- Council of Smart Cities (first proposed by Denver and Portland as part of their proposals): Austin will assemble a council of SMART Cities to include the other six SMART City finalists and additional representation from small cities. We propose quarterly briefings via Google Chrome Video Conferencing facilitated by our partner Google X. In addition, Austin would continue to host an annual SMART City meeting with the Council of Smart Cities meeting to share strategies, define problems of joint interest, and opportunities for cooperation.

- Teleconferences/webinars for larger community of SMART Cities group (70+ cities): through our partnership with the Texas Research Triangle (UT Center for Transportation Research, ATM Texas Transportation Institute, and Southwest Research Foundation) we will offer professional development opportunities for City staffs to learn about SMART Cities outcomes and findings. We will use the City's network facilitated through the National Association of City Transportation Officials (NACTO,) for communication and solicitation of participants.

- Smart Mobility Venture Capital Fund: Austin will facilitate and encourage the creation of a SMART City Venture Capital Fund to focus on emerging mobility technologies. Working with our partners at Capital Factor and the Technology Incubator, we will develop investment strategies to help spur the research, development, and commercialization of new technologies. This model will be agnostic to the location of the technology, and seek to expand new mobility models world-wide.

- Texas Learning and Scaling Network: To support Austin's bid for the Smart Cities Challenge and to fill a critical gap in statewide collaboration toward advancement of automated, electrified mobility-on-demand strategies, a statewide consortium supported by TXDOT, the Central Texas Regional Mobility Authority, DART, the Regional Transportation Council, Tarrant County, the city of Houston, and VIA has been formed. The consortium will focus on learning from and knowledge transfer to other Texas cities, establish Texas as a center of AV-CV demonstrations and deployments, make Texas an epicenter of innovation for mobility on demand, and provide a coordinated and combined mechanism for harnessing private and philanthropic funding.

As we collaborate with other cities, we will also remember to collaborate with our communities that make up Austin, especially those communities that might not have easy access to the technological future. We have formed a partnership with Huston-Tillotson University to innovate on how best to reach our entire community – especially those in our communities of color or impoverished neigh-

borhoods. Through thoughtful collaboration, we will create new ladders of opportunity and strengthen those that already exist.

In an effort to maximize the effectiveness of scaling in this dynamic, entrepreneurial, multi-stakeholder environment of transforming our mobility system, there are many influential factors to acknowledge, understand, and comprehend in the design/implementation:

- No city intends to sit on the sidelines waiting for successful solutions to be proved out in the winning city and then disseminated for replication.
- Scaling will not be a "plug-and-crank" replication activity. While much of the basic technology and concepts must be directly transferrable, successful scaling is realized at the solutions level, with unique requirements to understand and then the ability for adaptation, customization, and tailoring.
- In this dynamic and entrepreneurial environment, catalyzing and cultivating broad based innovation in a spirit of "co-opetition" across the full national/global spectrum of public and private players will be highly beneficial - we can all learn from each other.
- Scaling from well-served/developed markets to underserved markets almost always presents challenges, so we should invert the normal and start with the underserved.

Approach to Delivery: Scaling, Replicability, Commercialization and Incubation

- Launch Transportation/Mobility vertical at Austin Technology Incubator
  - » The Austin Technology Incubator (ATI), the startup incubator of The University of Texas at Austin, is the longest-established venture incubator in the nation (founded 1989). ATI works with both university-derived and non-university-derived start-

ups, preparing them to compete in the markets for risk capital.
  - » ATI-Transportation/Mobility will:
    - » Promote innovative solutions to transportation/mobility in the entrepreneurship community and generate new startups in this industry,
    - » identify and vet transportation/mobility technology companies sourced through ATI's local, regional, national, and international networks of partners,
    - » leverage the expertise of ATI's 350+ member mentor network on behalf of selected companies,
    - » design and deploy pilot programs with strategic partners,
    - » and prepare incubated companies for success in the capital markets ("get them funded").
  - » ATI is embedded in both the university and the community. It has longstanding, successful partnerships with both the City of Austin and Austin Energy that have delivered significant ROI for public-sector partners.
- Provide beta grants for transportation/mobility startups to test/demonstrate transportation and mobility technologies in Austin (modeled after existing Austin Energy program)
- Support acceleration programs at Capital Factory focused on transportation/mobility technologies.
  - » Capital Factory hosts an accelerator program designed to attract, test, fund, and distribute innovative new Smart City businesses. These businesses will help enhance the Smart Stations, Urban Analytics, Connected Traveler, and Packaged Mobility initiatives while inherently providing ladders of opportunity for the Austin community.

- Host an annual technical conference on transportation/mobility technologies, business models, and deployment strategies.
  - » Host an annual technical conference in the region (1-2 day, technical focus) to engage talent in the industry to attract cutting-edge researchers and solutions to the region.
- Procure technologies through challenges and prizes.
  - » City of Austin as "first customer" for startups, small businesses.
  - » Source innovative solutions through rapid, nimble procurement processes throughout the grant cycle that are responsive to specific needs/challenges of the project as they are identified.
- Leverage SXSW, SXSW Eco Startup Showcase, Defense Innovation Summit, and other conferences to identify new technologies and entrepreneurs in transportation/mobility.
  - » Startup pitch events are a fantastic "pipeline" for incubators and accelerators and energize the startup community in an industry.
  - » Emphasize transportation/mobility startups and solutions at technical and policy conferences hosted in the region.
- Attract leading talent in transportation/mobility to Austin through an Entrepreneur in Residence (EIR) program.
  - » Recruit all-star industry talent from the transportation, mobility, and venture capital industries to Austin to mentor students, startups, community leaders and stakeholders.

- Recruit transportation/mobility-focused VCs, other funders to Austin.
  - » Engage the national funding community in the lessons learned and best practice findings of the pilot programs, demonstration projects, and startup activity surrounding the Smart Cities demonstration projects.
  - » Monitor trends in transportation/mobility VC and reach out to new or increasingly active VC or corporate venture funds in the industry.
- Problem-centered "Hackathons"
  - » Leverage data from the MIC, Data Rodeo, Smart Stations, and other pilot and demonstration projects to inspire local entrepreneurs to "hack" new solutions.
  - » Specific challenges or solutions gaps should be identified and shared with the entrepreneurship community in order to source innovations around specific roadblocks to implementation or deployment that are documented in real-world testing environments.
- Host an Statewide Transportation/Mobility Forums
  - » Host 4 regional programs across the state to train aspiring entrepreneurs in an immersiveprogram focused on transportation/mobility innovation.
  - » Provide access to Data Rodeo, other data resources from pilots.
  - » Pitch problems that need solutions to the entrepreneurs. This could include technical problems, deployment or business model challenges, and as well as social justice/ladders of opportunity challenges as areas ripe for innovation.
- Paid internships at incubators, accelerators, & startups
  - » Engage talent throughout the region in value-added internships associated with DOT Smart Cities activities housed at incubators ATI/Capital Factory
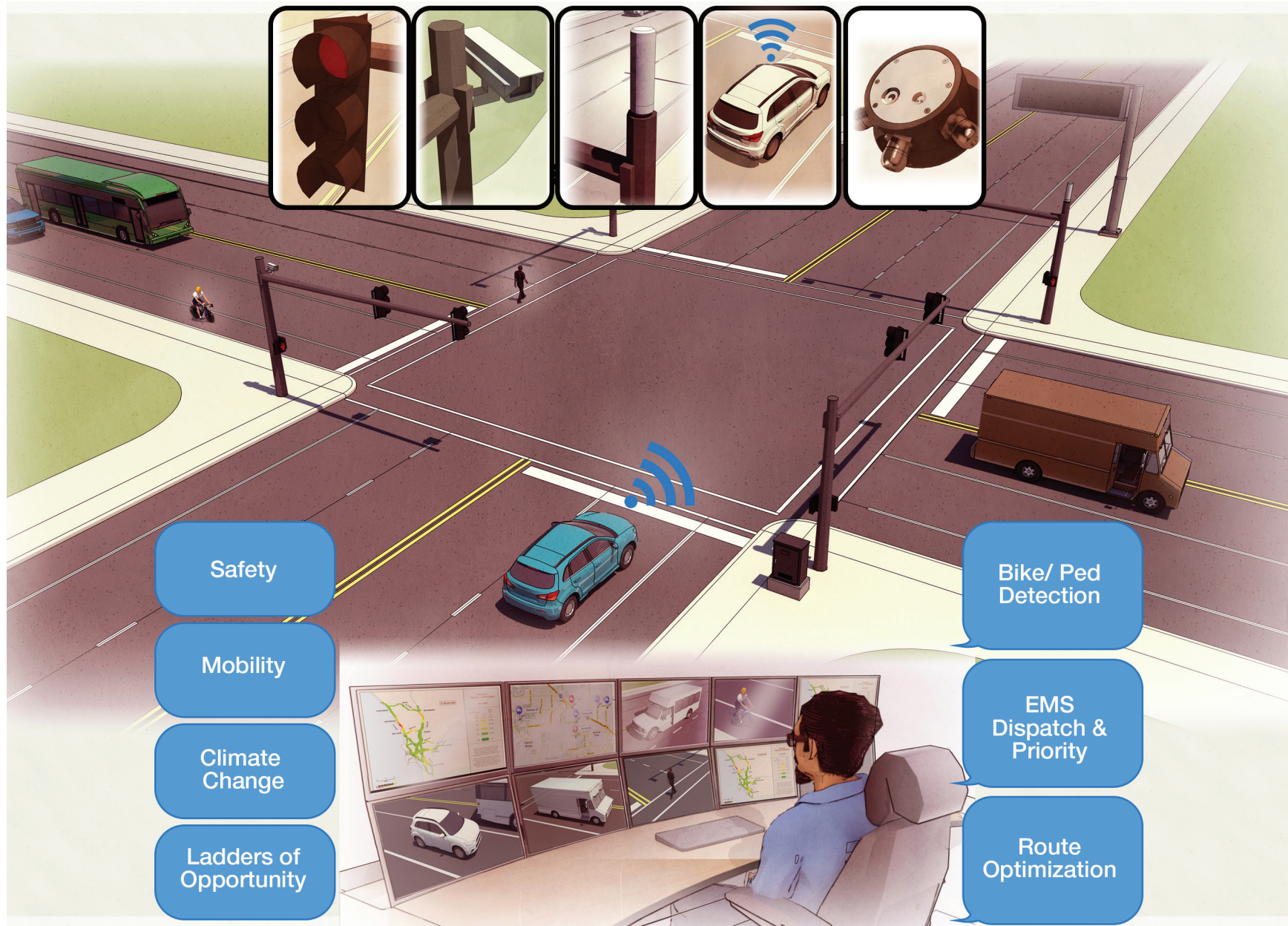
VOLUME 1B: DATA MANAGEMENT

INFORMATION AND CYBER SECURITY

The Austin Smart City Challenge team recognizes the importance of information and cyber security. Our approach relies on the goals established by the National Highway Traffic Safety Administration's goals for cyber and information security. Our approach has identified three categories that must be addressed; Personally Identifiable Information (PII), Enterprise Security and Vehicle Communications (V2V, V2I).

PII

Austin's protection of PII has public and internal parts.

- **For the public:** Austin is a leader in open governance and open data. We place over 400 City data sets on our existing open data portal.   Those data sets are governed by published Open Data Licensing and Open Data Terms of Use documents that facilitate and protect usage of City data.
- **Internally:** Austin's practice of protecting PII internally is informed by federal guidelines, guidance from the Texas Comptroller of Public Accounts and the laws of the State of Texas. Policy is administered out of the City of Austin's Controller's Office in accordance with City of Austin Administrative Bulletin 15-04: Personally Identifiable Information.

Enterprise Security: Austin's high technology status includes a focus on information security for our existing public data and information systems. Austin recently hired a Chief Information Security Officer (CISO), a new position with responsibility for all aspects of security across the City and who will work with the Austin Smart City team. Austin's security practices are based on the standards and best practices of the NIST Cybersecurity and Risk Management Frameworks. Austin coordinates security activities with other regional agencies through partici-

pation in government and industry organizations such as InfraGard, the Texas CISO Council, and the Cloud Security Alliance (CSA).

V2V, V2I

Austin recognizes the importance of physical security, communication security and device access control while realizing that system level and end user needs may vary somewhat based upon device type, data flows and applications. For communication security and privacy, we will leverage the established USDOT Security Credential Management System (SCMS) and comply with the USDOT recommended industry standards (e.g. SAE J2735/2945, IEEE 1609.2-1609.4 and IEEE 802.11p) for DSRC devices communications. We will ensure that security for all non-DSRC based V2X and IOT devices comply with relevant industry standards and best practices.

For physical security and privacy protection, we plan to ensure adequate conformance with Federal Information Processing Standards (FIPS), specifically FIPS 140-1 and 140-2 for cryptographic modules and their physical and operational security.   Additionally, we will require our partners and their suppliers to adequately protect devices, including the integration of hardware security modules (HSM) for the storage of, and the processing involving cryptographic security as a means of mitigating attacks, especially for safety critical processes and systems.   Any HSM and encrypted storage considerations will extend beyond connected, automated, electrified V2X devices to include backend systems and our offsite data repositories.

We will develop and implement a system-wide device access control plan and policies to govern access, software updates, authentication, and security credential storage. We will include planned and concentrated pen-

etration testing (e.g., white hat hacking) to identify and correct potential vulnerabilities, DSRC spectrum utilization and DSRC interference testing to inform the public and private sectors.

DATA MANAGEMENT PLANNING WITHIN THE DATA RODEO

A first priority upon award of the grant is to work with stakeholders to craft a data management plan. The plan will contain details on what types of data will be produced, what policies for access and sharing are needed, and how the Data Rodeo will ensure appropriate protections of privacy, confidentiality, intellectual property, and other rights and requirements. Each of these aspects of the plan is discussed in more detail below.

What types of data will be produced?

The types of data produced include technical types (machine readable - row-column, geo-spatial (gis), video, audio, telecommunication streams) and user-focused types (reports, visualizations, row-column, searchable in familiar ways (Google for our repository). Data will be provided in database format and also graphically to make more user friendly (via portal); provide ability to review trends in the data, as well as real-time conditions. Secondary data will also be included, which includes data products created by using the data provided, as well as standards documents, inventories of standards and services, guides and best practices documents. More details on the exact types of data to be incorporated is discussed in the sections describing the pilot projects.

Policies for Access and Data Sharing

MOUs and data-sharing agreements will be necessary to share data between agencies and with any third partyThe

policies will address ownership (definition and assignment), and tiers of access (public sector entities, private sector, regular public); private sector access may be on a subscription basis and private-sector data may be made available as part of a sharing agreement. Policies that incentivize data sharing among transportation providers and adherence to minimum data requirements could drive or accelerate adoption of and adherence to those requirements, such as:

- Policies for data collected on public property and/or with public property
- Security policy
- Performance (Throughput, Response, Availability, Disaster)

- Uses of public data, uses of private data
- "Traceability" for some data (PII or near-PII)

How to ensure appropriate protections of privacy?

The team will work with all data providers to ensure data is anonymized at the source, before it enters the Data Rodeo. A security policy will be developed that will ensure all security of all data systems with an emphasis on removing all personally identifiable information (PII). All data that may contain PII will be stored on servers (e.g., at UT's Texas Advanced Computing Center, Amazon Web Services) that comply with the U.S. Health Insurance Portability and Accountability Act (HIPAA). Adherence to (and in some cases definition of) privacy requirements

associated with PII, with a focus on lack of traceability, will be a key enabler of effective use and sharing of data.

How to ensure appropriate protections of intellectual property (IP)?

Individual agencies will retain data ownerships and IP unless otherwise agreed upon. Starting with definition of data minimum requirements that answer the question: "What is the content and quality of data required?" will help private data providers concerned about IP understand whether they will be required to provide IP-sensitive information. If users require IP-sensitive information, incentives may be required to encourage private transit providers to make that information available in the portal.

How to ensure appropriate protections of confidentiality?

Beyond the PII issues discussed above, the portal will ensure appropriate security/firewalling between systems. Also, a review will be conducted on how data may be used to ensure Ethical Use of Data.
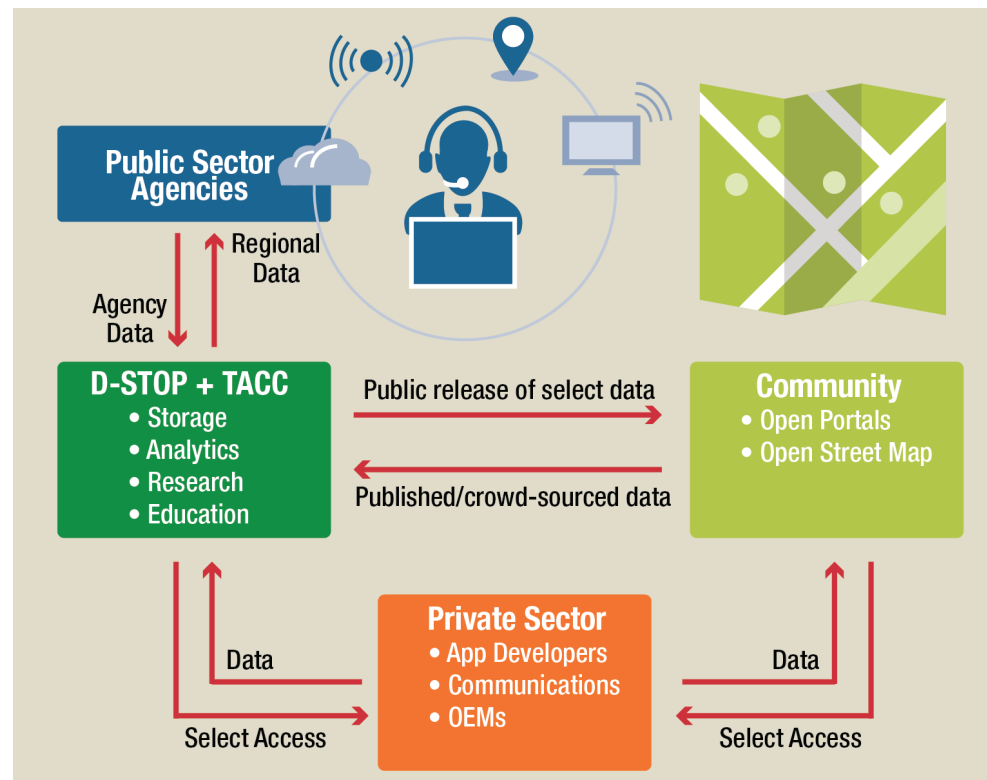
EXISTING AND POTENTIAL OPPORTUNITIES FOR DATA COLLECTION

Challenges:

- How do we measure the shift from SOV travel to transit, shared mobility or alternate travel?
- How might we get higher utilization from existing mobility resources using existing data or collecting new data?
- How might we ensure seamless integrated transfer between modes, including one-stop trip booking & payment?
- How do we use private data to understand and measure mobility?
- How do we use private data to improve safety?
- How might we get more local data professionals involved?

- How might we use data and performance measures to change the stigma around non-SOV travel?

Active and Non-SOV Transportation:

Bike and Pedestrian Counts:

Existing:

- Short term (temporary) tube counters for seasonal counts
- Counters use Bluetooth/GSM, but only to transmit data, not collection
- Permanent counters use inductive loops and can record directionality
- Pedestrian counters using infrared on posts
- All permanent counters and some temporary counters transmit data automatically to our Eco-Visio website

Potential:

- Expansion of existing counter technology to more permanent locations
- Make count data available to public on online GIS
- Coordinate with car collection and Trails data collection as much as possible to have a common system of count collection

- Live IP cameras with automatic bike and ped detection are the most promising option

Survey Data:

Existing:

- NHTS
  - » The current NHTS survey gives data on purpose of trips, mode used, households, etc, but the
  - » The Texas Add-On adds many more surveys, but t a couple thousand Austin surveys will not include enough samples to show bike and ped travel patterns
- TxDOT/CAMPO survey program
  - » Every ~5 years, there are household, workplace, and travel time surveys completed for the CAMPO area, yetcurrently there no bike and ped specific questions

Potential:

- Coordinate with CAMPO and TxDOT before their next set of surveys to include bike and ped questions, particularly for central Austin

Origin-Destination Data:

Existing:

- CAMPO has zone to zone O-D estimates in their model, but without detailed bike and ped data from NHTS or TxDOT survey program, they are rough estimates

Potential:

- Various agencies (including TxDOT) are transitioning to using Bluetooth and GPS phone data for collecting O-D data for vehicles, which should be possible for bikes and peds
- B-Cycle in at least a few other cities (Denver and Fort

Worth for example) have GPS built into the bikes. If brought to Austin, this could provide GPS O-D data, although the travel patterns would likely be very similar to what the check-in/check-out at the kiosks show. The addition would be more important for wayfinding and bike tracking. Analyzing routes taken in context of existing bike lanes we can find gaps where demand exists

- AirSage collects anonymized wireless cell data (15 billion mobile locations daily) and is used pretty extensively by agencies for O-D and speed data.

Parking Data:

Existing:

- ParkMe and ParkingPanda are searchable for Austin for parking garages
- The City's ParkMe map (http://austintexas.gov/page/parking-spots-downtown) shows the "percent full" of metered parking near the capital and part of downtown.

Potential:

- Use Parking garage with fixed meter pricing as the cheaper alternative with capacity that would fill first. The garage dynamic parking could be based on in/out monitoring, time of day, seasonal, traffic counts, etc.

Crash Data:

Existing:

- Crash data is received from TxDOT's crash reporting and analysis application, CRIS, which is separate from the APD database.
- Pedestrian and bicycle accidents reporting is completely manual and there are many accident reports without clarity about the crash location vehicle type involved.
- New annual crash data requires a new data request.

Potential:

- Coordination with TxDOT or APD to create a more automated method of obtaining and geocoding crash data for use in reporting and tracking progress.

Overall Data Accessibility:

Existing: Currently, each of the above data sources are collected, stored, and distributed in their own separate ways.

Potential: Collection, storage, and distribution of data could be centralized to one "data warehouse" through the University of Texas Center for Transportation Research for the City of Austin, CAMPO, TxDOT, and maybe others.

Connected Traveler and the Mobility Marketplace Data:

- Ridership
- Time of arrival and departure
- Travel times for transit and pool vehicles
- On-time performance of transit
- Vehicle location and routing
- Availability of travel spots (is a seat open at specific time)
- Info on service orders (package delivery)
- Travel club membership (needed for shared vanpool program)

Automated and Connected Vehicles Data:

The proposed automated and connected vehicle pilots can potentially provide an immense amount of data that can be categorized as follows:

- Pose Data – Data representing where a vehicle is, and where it has been. This could come from AV state estimation systems and/or from CV basic safety messages (BSM). This could include self-assessed accuracy/precision of the pose data, to correlate geographic regions where accuracy is degraded.

- Perception Data – Data representing how the automated vehicle views the surrounding environment. This could simply include perceived objects of interest, such as pedestrians or other vehicles; or other on-board sensor data related to the road structure
- Navigation Data – Data representing where the automated vehicle is going. This could potentially include information about routing decisions, such as reasons for changing routes (congestion or incidents leading to a increased anticipated travel time).
- Event Data – Data representing AV and CV events "of interest":
  » AV crashes/impacts or near crashes/impacts,
  » AV/CV hardware or software faults or errors,
  » AV safety-related manual control take-overs (i.e. vehicle perception system did not see object, vehicle navigation system traversing too close to object, etc.),
  » CV events – emergency electronic brake warnings (EEBL), forward collision warnings (FCW), intersection movement assist (IMA) warnings, blind spot warnings (BSW)/lane change warnings (LCW), etc.
  » Mobility Data – Data could include AV pickup and drop-off locations and times, miles traveled in automated mode, estimated and actual travel times.

Non-Transportation Data Sources:

In connection with the deployment of Smart Stations, Connected Traveler and the Mobility Marketplace to support our Ladders of Opportunity initiatives, the Smart City team will be working with many public-sector and community partners working outside the transportation space. These include:

- Austin Police Department and its community policing work on Restore Rundberg
- Central Health and CommUnityCare, both for utilization

data and for information on health outcomes

- Google Fiber and the Housing Authority of the City of Austin, Austin Pathways and Austin Free-Net
- Austin Independent School District and other local districts (e.g., Pflugerville ISD)
- Austin Community College
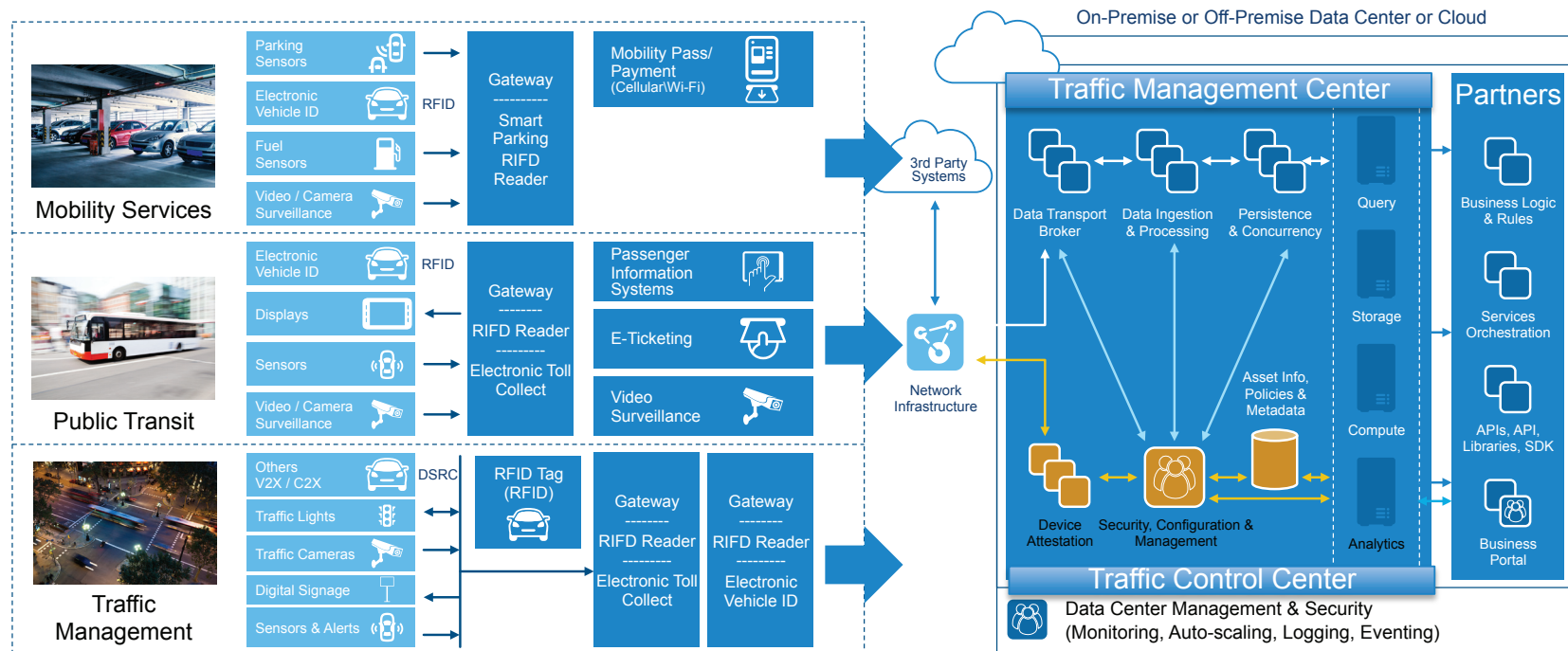- UT Dell Medical School and LBJ School of Public Affairs

We will also be working with public- and private-sector partners to gather and maintain useful operational data on weather, an important consideration in a community that has been prone to destructive weather events (floods, wildfires).

Source: Central Health

Urban Transportation
Logical Architecture

VOLUME 1C: PROGRAM MANAGEMENT

The leadership team will utilize a number of traditional tools such as a Program Management Plan (PMP), and an Outreach Plan plus unique tools like a Partner and User Database.Close alignment with US DOT project managers, including the independent reviewer, and regular collaboration among stakeholder champions will ensure that our program not only achieves the goals we establish but leverages the incredible amount of knowledge, experience, and opportunity associated with conducting the nation's first large-scale Smart City operation.

PROGRAM MANAGEMENT PLAN

The Program Management Plan (PMP) is the primary tool used by the team to ensure the program stays on track, follows a systematic approach, and meets obligations of the US DOT Contracting Officer (CO). The Austin Smart City team will base the PMP on proven project management principles. The PMP development will be led by Austin Transportation Department (ATD) staff with input from a variety of partners identified within our proposal. The PMP will be written and executed by individuals that are well-versed in the Project Management Institute framework. The Austin Smart City Core Team will deliver a draft PMP within 60 days of contract award and use it as a guide during the kickoff meeting.

The draft PMP will contain:
- Statements of goals, objectives and expected outcomes
- The project scope of work
- A work breakdown structure (WBS) and detailed schedule in MS-Project format showing how the work will be accomplished. Begin and end dates for each task will be provided. Draft and final deliverable dates will be indicated.

- A management plan including an organization chart and staffing plan matrix indicating responsibility for each task shown on the WBS.
- A communications strategy describing interfaces with US DOT modal administrations, partner organizations, and other external stakeholders
- A risk register describing potential risks, the associated assessments of likelihood of occurrence and severity of effect, and mitigation measures that will be taken
- Provisions for quality reviews
- An integration work plan that is continuously maintained by program leadership to ensure the system and operational designs are supporting the key performance indicators and key objectives of the program
- Tables for the high-level KPIs and their associated objectives. These KPIs will be supported by creating lower-level KPIs to ensure these overall targets are met.

The draft PMP will be distributed to US DOT staff prior to the kickoff meeting.

For some elements of the Smart City Challenge effort, it will be ideal to follow a traditional concept development phase, followed by design and engineering, and concluded by deployment and operation. In those instances, document control and traceability, from initial concept development through requirements definition, are critical. This traceability will be carried forward as the system is designed, built, integrated, tested, operated and maintained.

Because many of the strategies and tools we will deploy as part of the Smart City Challenge are evolving quickly during a time of technological revolution, a Change Management Plan and process will be developed to manage changing requirements over time. Clear lines of commu-

nication are necessary between single points of contact at ATD and the USDOT for important decisions. But many of the discussions won't be major decisions, therefore a "hierarchy" relationship matrix will be developed to align technical and outreach resources on the project team with USDOT resources for knowledge sharing.

Not all components of the Smart City program are conducive to a rigid project management process, and in those instances it is incumbent upon the Austin team to work closely with the partners delivering a tool or service to make sure that a clear understanding of risks and mitigation strategies are prepared. Risks exist both of an organizational and technical nature. Risks will be identified, prioritized, managed, and tracked on a regular basis and mitigated when and where appropriate. Every effort will be made to minimize risks as will be explained in the Risk

Management Plan (RMP) developed for the Smart City effort. The infrastructure projects will be organized into manageable phases, and for each phase a risk assessment will be performed.

The Austin team will maintain an overall risk register that begins with those risks identified and presented at the Kickoff Meeting with USDOT, but more importantly serves as a tool for later components of the Smart City program to evolve and be included as they come online. The Austin team will regularly discuss collaborative ways to mitigate risks with the impacted partners.

In addition to the foregoing, the culture and climate of the work plan will be for specific work tasks to succeed or fail rapidly, and in case of failure to pivot and move forward. Due to the complexity of the program and the concurrent work and integration required, classic hierarchal PM processes must be able to adapt to the multidimensional work across all fronts. Delays and failures in predecessor tasks or enabling technologies will be addressed at the integration/PM level if required. While clear system acceptance processes will be followed, the City's program approach is collaborative with partners contributing significant system level work and agreement to work collaboratively across the points of integration.

KICKOFF MEETING WITH USDOT

The Core Team will work with the USDOT Contracting Officer (CO) to schedule the Kickoff Meeting at USDOT Headquarters or locally at Austin Transportation Department headquarters. An agenda will be prepared and distributed to those invited to the meeting along with the draft PMP. A webinar will be arranged for others to participate remotely, including other local or federal staff at the discretion of USDOT.The Core Team will deliver a PowerPoint presentation that will provide an overview of the PMP as outlined above.

The presentation will describe the different levels of stakeholders we intend to engage, methods for reaching them, and most importantly our approach for maintaining the many complex and evolving relationships necessary to achieve our vision and goals. The presentation will be prepared with the objective of fully engaging those participants who have not had an opportunity to fully review and understand the project scope. The meeting will be conducted with the intent of garnering feedback on our proposed approach and any issues or concerns that the project team might have.

Our goal is to make sure that everyone involved is aligned with regard to project expectations including scope, schedule, and deliverables. We understand that some elements of the project can and will evolve, but our goal for this initial meeting is to set the stage and do our best to stick with a stated direction so that everyone can contribute equally.

Minutes of the kickoff meeting focusing on action items will be prepared and submitted along with a revised version of the PMP reflecting any changes to any of the items discussed and agreed to at the meeting.

STAKEHOLDER AND COMMUNITY ENGAGEMENT

The City of Austin will lead the charge for implementation of the vision in partnership with our Smart City team, which consists of local public agencies that plan, build, operate and maintain the regional transportation system. This team has been and will continue to conduct regular meetings not only plot the course of our effort, but to develop this proposal and consider parallel efforts independent of the Smart City Challenge.

Community engagement is a requirement of Austin's Smart City project. Understanding user needs and priorities ensures the most important needs are designed into the project. User feedback is also needed post-deployment to ensure the project is meeting user expectations.

- Infrastructure projects: user (traveler) engagement will be part of the I-35 ICM project.
- Engagement tools: in-person and electronic surveys
- Awareness via web, e-mail subscriptions, social media, press releases, etc.
- Councils, boards, commissions should also be part of outreach
- Consider developing an annual report card for overall and individual SC initiatives

Our proposal moves us Beyond Traffic to achieve a future of new transportation possibilities. In an extremely short period of time, Austin's Smart City Challenge effort has garnered the interest and support from many of the world's most innovative and powerful companies in the mobility space. We have been able to foster an immediate spirit of collaboration and momentum, as demonstrated by our April 27 workshop inviting any and all to bring their ideas and interest to the table in pursuit of achieving our vision. Attended by more than 150 representatives of nearly 85 companies and organizations, this workshop was a testament to private companies and academic institutions interested in the Smart City program.

Moving forward, we will maintain a partner database that allows us to welcome and engage current and future

participants, tracking their skills, experience, and in-kind offerings. Some will have skin in the game immediately, while others have interest but aren't ready at this stage of their development or the program's development. The database will allow us to track the current status of partner agreements, manage contacts for both technical input and marketing, identify any infrastructure needs the Austin team will need to consider, related research underway, and the potential and/or realized benefits to the citizens of Austin that this partner is helping us deliver. Maintaining this database will allow the team to constantly be aware of opportunities and leverage investments acting as force multipliers of the USDOT Smart City Challenge endowment.

The other stakeholders of importance are the end users—citizens, visitors, and businesses. We will develop and maintain a user database that allows us to welcome and engage a number of organizations that will be critical in helping us with outreach, engagement, and, most importantly, feedback necessary to help us constantly improve our efforts. While individual persons can be included in the user database, a majority of the entries will be focused on community organizations, employers and business organizations, church groups, and any other grouping that might provide a channel to engagement.

Outreach for Connected Traveler/Smart Stations/ Packaged Mobility: Smart Ambassadors

Although transportation has created historic barriers between communities, transportation can also serve as a link to unify communities. Packaged mobility services offer a suite of transportation and delivery options that are designed to meet the diverse transportation needs of all individuals. Driven by user preferences, an individual may customize his or her selections in order to make informed decisions based upon personal preferences.
The City of Austin will create a network of Smart Ambassadors: grassroots outreach practitioners and activists

from the community and early adopters that live in the community they will be serving. The team will provide learning opportunities to the community and report any technological or cultural gaps in the system along with real life lessons learned.

SMART Ambassadors Program Goals:

- To master developed technologies
- To provide feedback to the technology developers (language preference, readability, usability, needs addressed, comments from the community, etc.)
- To assess community needs such as access to technology, transportation and goods delivery needs, specific situation analysis, financial challenges, etc.
- To demonstrate the use of technologies and mobility and delivery options available in the community
- To encourage participation and recruit other Ambassadors
- To celebrate victories and milestones with communities
- To connect communities to opportunities through transportation planning

Promotional Activities:

- Community media, sponsored events, social media

Incentives:

- Public recognition to thank volunteers for helping make a difference in the community
- Awards to volunteers based on their achievements
- News releases about the Smart Ambassador program
- Color-coding volunteers name tags to indicate achievements (hours, months, years of service)
- Pin representing the Smart Ambassador program
- Certificate presented by the Mayor to outstanding volunteers
- Access to technologies and ability to give feedback about improvements

Outreach and Feedback for the Data Rodeo

For the Data Rodeo to be successful, it must meet the needs of the partners in the public sector, private sector, and broader community. Below are some specific steps that will enable both outreach and obtaining feedback to improve the systems.

Workshops with agency staff

Inter-agency collaboration can be greatly enhanced by bringing data together into the Data Rodeo, which serves as a single point of access. For agencies to participate, it must be easy for them to use. We are already working with the Capital Area Metropolitan Planning Organization and its member agencies to pilot the Data Rodeo for the region's active transportation data and plans. Through this effort, processes are being developed to bring the region's data together with minimal extra effort by agency staff. The Data Rodeo is designed to input most common data types and allows for creation of data through direct editing as well.

Workshops with private sector

Workshops will be held with our private sector partners to engage them in the process of building the Data Rodeo to figure out the best ways to create win-win situations where the private sector can access City data and then feed back added value into the Rodeo. Copenhagen's City Data Exchange is being examined as a model.

Host hackathons

Our partner OpenAustin has agreed to facilitate hackathons whereby data in the Data Rodeo will be leveraged to answer important questions or create tools that meet a pressing need. We also envision hosting virtual hackathons to engage the developer community beyond Austin, and partnering with other cities working on similar goals.

Outreach to start-up communities to create ladders of opportunity

An important goal of the Data Rodeo is to provide Information Equity. By opening up data, we are enabling small businesses to start around creating value from the data. When data sets are not open then the few companies that own the data have an unfair advantage. We will reach out to the start-up communities (e.g., Capital Factory, Austin Technology Incubator) and find opportunities to educate entrepreneurs about the available data and obtain feedback on how to improve the availability of the data to reduce barriers to entry to business.

Workshops with equity groups to develop mechanisms for reaching across barriers

Specific plans will be crafted to engage various language communities (e.g., there are 30 languages spoken in the Rundberg neighborhood alone), the elderly, blind, and visually impaired, and other groups identified as needing targeted outreach. It will be important to engage representatives from each of these communities early in the process so they can act as liaisons to the communities to create the necessary feedback loops.

Outreach for Automated, Connected, and Electric Vehicles

On-site staff will provide information on the AV/CV and electric vehicle technologies deployed to users at Smart Stations and Corridors. We will also continue to engage fleet operators of transit, freight, and TNC vehicles to ensure they are aware of the economic benefits and implementation options of electrification and automation. We will also host seminars on AV/CV pilots at regional universities, including information for potential job seekers on what types of job opportunities these technologies will create.

REPORTING

The communications plan will include monthly and annual reporting. Monthly progress reports will document progress on deliverables, accomplishments, anticipated activities, schedule updates, and cost to complete. The risk register will also be updated and a risk report will detail mitigation activities and risk status.

Easy access to work products and deliverables for team members will be very important. We have already established and are using a document sharing and collaboration website using ProjectSolve, an easy-to-use group-sharing website offered by WSP | Parsons Brinckerhoff. ProjectSolve allows members access to documents in-progress, and includes strict version-control tools to make sure any changes are tracked carefully. The USDOT, members of the Austin team, and other key federal or local stakeholders will be invited to this collaboration site to allow access to work products and deliverables from any location at any time.

SYSTEM REQUIREMENTS

The Smart City team will develop a System Requirements Specification (SyRS) Document based on the Smart City ConOps prepared for the individual pilots and programs. We are very familiar with this process and use it routinely for ITS projects. The identification and inclusion of stakeholders is important to developing good system requirements. The Austin Regional ITS Architecture (2015) will be referenced as well in determining requirements, espe-

cially to ensure that interrelated stakeholders interests are all-inclusive. A Requirements Traceability and Verification Matrix will be developed to trace requirements back to needs defined in the ConOps and provide a documentation process for verification. The matrix will be further expanded to provide forward traceability to design specifications, verification/test plans, operations, and evaluation activities.

SAFETY

The Austin Smart City team recognizes that Safety is a core mission of USDOT, and that the Smart Cities program should promote safety in all aspects of the pilots and day-to-day operations. With this in mind, we will develop a Program Safety Plan that illustrates the necessary steps a pilot must follow in order to demonstrate the ability to provide a safe environment from closed testing environments, to small scale open demonstrations, and finally to full scale public facing implementation. The Program Safety Plan will be flexible enough to work in conjunction with the variety of the proposed projects, from public outreach and engagement to full scale automated vehicle testing and deployment. We will also produce a quarterly safety audit to ensure that program staff are aware of revisions, issues that have arisen, and mitigation strategies.

METRICS AND EVALUATION

Each of our pilots and programs will be designed, implemented and evaluated with a set of hypotheses and evaluation criteria, including indices of success or failure. The Austin Smart City team has adopted a "rapid prototyping" approach that will make nimble adjustments to pilot projects based on performance with respect to metrics. These metrics will be available to both pilot and program developers and US DOT.

Performance Measurement Hypotheses: Overall Goals and Metrics

The Austin Smart City pilots seek to demonstrate the effects that transportation-enabled technologies have on improving safety, enhancing mobility, enhancing ladders of opportunity, and addressing climate change.

The metrics we will measure and track for monitoring and evaluating project performance with respect to these four outcomes are listed below. Each of these metrics will require a baseline against which to measure progress toward the Smart City outcomes. The Data Rodeo, in conjunction with the urban analytics function, will provide the data required to establish these baselines as well as the continuous data collection required to execute monitoring and evaluation.

Improving Safety

- Accident frequency and causes
- "Near miss" frequency and causes
- Emergency and incident response time
- Bicycle and pedestrian accident frequency and causes

Enhancing Mobility

- For each mobility service, community by community
  » Point-to-point travel time
  » Cost per mile
  » Overall ridership
  » Reliability: average and actual vs. advertised wait time
- Overall miles traveled by mode, community by community
- User satisfaction with available mobility services
- Traffic flow (volume/speed)

Enhancing Ladders of Opportunity

- Population-weighted access to jobs, community by community
- Access to schools, community by community
- Access to healthcare, community by community
- Missed healthcare appointments, clinic by clinic
- Training courses offered at area colleges on Smart City technical areas and associated attendance and completion rates
- Percentage of residents exposed to a Smart City ambassador and satisfaction rating, community by community

Addressing Climate Change

- Grams of CO_2 emitted per passenger mile traveled for transit vehicles and services as a whole
- Electric vehicle miles traveled

The following questions form the overall basis of our performance measurement approach:

- Can the metrics be reliably measured?
- Can we expect measurable results in a 3-year timeframe?

- Are there targets that can be defined?
- What data will be needed and from what sources?
- What will be needed as baseline data and when?
- What exogenous factors do we need to consider?

The following questions form the basis of our hypothesis-driven performance measurement approach.

Overarching Questions:

- Have jobs been created through the Smart City deployment?
- Have those jobs been filled by local residents?
- How many new training courses are offered at area colleges for Smart City technical jobs?
- What City revenues can be tied to smart city development (for understanding and planning for sustainability)?

Project-Specific Questions:

Smart Stations and Ladders of Opportunity
For each Smart Station:

- Is there a decrease in overall travel time, per-mile cost, and grams of CO_2 emitted per passenger mile and an increase in non-SOV miles traveled for residents living within a quarter mile of the Smart Station and residents passing through the Smart Station?
- Does the Smart Station facilitate greater access to health care services for residents living within a mile of it?
- Are bicycle/pedestrian accidents reduced and can we link the reduction to the Smart technology?

For Healthcare clinics:

- Is there a reduction in missed appointments that can be attributed to enhanced mobility?

For Austin Community College:

- Is there an increase in the number of college courses offered in Smart City technical areas? Is there an increase in associated attendance and completion rate?

For East Riverside Smart Corridor:

- Is there a decrease in overall travel time, a decrease in per-mile cost, an increase in overall ridership, an increase in non-SOV vehicle miles traveled, and a decrease in grams of CO2 emitted per passenger mile for residents living within a quarter mile of Riverside Drive?

- Is emergency and incident response time improved in the Riverside smart corridor?

- Does new e-BRT service on Riverside create a mode shift to transit?

- Does CV-enabled bus rapid transit (BRT) improve fuel economy for transit fleets?

Mobility Marketplace

- Is there a decrease in overall travel time, per-mile cost, and grams of CO2 emitted per passenger mile and an increase in non-SOV miles traveled that can be attributed to the Marketplace?

- Do packaged mobility services increase use of non-SOV miles traveled among our disadvantaged communities and student populations?

- Is there an increase in population-weighted access to jobs that can be attributed to the Marketplace?

- Is there an increase in access to schools that can be attributed to the Marketplace?

- Does first/last mile service increase alternate mode share?

- Has the Smart City demonstration led to commercialization of new products or services?

Automated and Connected Vehicles

- Is there a decrease in overall travel time, per-mile cost and grams of CO2 emitted per passenger mile and an increase in non-SOV miles traveled attributable specifically to automated and connected vehicles deployed as new mobility services or at Smart Stations?

- Is there a reduction in near misses, accidents, and red light running for corridors and stations where automated and connected vehicles are deployed?

- Is there an increase in population-weighted access to jobs attributable specifically to automated and connected vehicle deployment?

- Does DSRC-enabled transit signal priority result in decreased travel time, improved reliability, and increased ridership?

Electric Fleets

- What is the adoption rate of EV vehicles?

- How many electric vehicle miles traveled have resulted from EV deployment?

	CITY-CONTROLLED ELECTRIC VEHICLE DEPLOYMENT PLAN									
	YEAR 1			**YEAR 2**			**YEAR 3 (STRETCH GOAL)**			
Project	**Electric Vehicles Deployed (#)**	**eVMT (x1000 miles)**	**CO2 Reduction (kilotonne/year)**	**Electric Vehicles Deployed (#)**	**eVMT (x1000 miles)**	**CO2 Reduction (kilotonne/year)**	**Electric Vehicles Deployed (#)**	**eVMT (x1000 miles)**	**CO2 Reduction (kilotonne/year)**	**Main Vulcan Element**
1. Grid	Supporting Effort			Supporting Effort			Supporting Effort			1
2. Fleet	50	900	0.324	150	2700	0.972	300	5400	1.944	2
3. Taxi	100	7000	2.52	300	21000	7.56	500	35000	12.6	2
4. TNC	100	5000	1.8	300	15000	5.4	500	25000	9	3
5. Consumer	See project section for estimates of increased consumer adoption of EVs due to SCC program									4
6. Finance	Supporting Effort			Supporting Effort			Supporting Effort			5
Assumptions: Vehicles displaced had 25mpg. 9kg CO2/gal emitted by IECs. 18K mi/yr fleet, 50K mi/yr TNC, 70K mi/yr taxi										

Platform-Specific Questions:

MIC: ROMC and Intelligent Sensors

	ROMC Projects

1	**Deploy ICM on I-35**
	Questions to be answered:
	    1. Are incident delays and emissions reduced?
	    2. Does timely data to travelers affect congestion levels and alternate paths to avoid delays?
	    3. Are secondary collision reduced?
	    4. Does ICM improve operational efficiency during non-incident conditions?
	    5. Are ICM activities producing more benefits than costs?
	Success:
	    1. Delays and emissions decreased
	    2. Secondary crash rates are reduced
	    3. Average daily delay on freeway and frontage roads decreased
	    4. ICM benefits > costs; mature ICM has benefit/cost ratio > 10
	Metrics/output measures:
	    1. Incident delays, emissions (source: decision support system (DSS) to be created)
	    2. Incident frequency (source: APD, TxDOT); volumes (source: TxDOT)
	    3. Travel times (source: private sector data)
	    4. ICM benefits (source: DSS); costs (source: agencies)

2	**Develop Smart City System Agreements**
	Questions to be answered:
	    1. Do the agreements lead to sharing data and infrastructure?
	Success:
	    1. Agreements signed/executed; data and infrastructure actually shared
	Metrics/output measures:
	    1. Number of executed agreements; instances of sharing (source: agencies)

3	**Integrate Shared Infrastructure**
	Questions to be answered:
	    1. What cost savings resulted from integrating infrastructure?
	Success:
	    1. Actual shared project cost are less that estimated cost if not shared
	Metrics/output measures:
	    1. Actual shared project cost; estimated cost if not shared (source: agencies)

4	**Support Smart City Projects** Not included

	Intelligent Sensor Projects

1	**Near-Miss Crash Analysis**
	Questions to be answered:
	  1. Does the system accurately measure near misses and red light running violations?
	  2. Does the information provided by the project result in actions that reduce near misses and red light running?
	Success:
	  1. System accurately measures (a) near misses and (b) red light violations
	  2. Engineers and law enforcement take actions based on the data; crashes reduced; red light running events reduced
	Metrics/output measures:
	  1. System and actual (via video) data comparisons (source: system, video)
	  2. Engineer treatments implemented (source: ATD); enforcement assignments (source: APD); crashes (source: APD); red light running events (source: video)

2	Roadway Weather Information System (RWIS)
	Questions to be answered:
	  1. Does bridge temperature data help the decision making process?
	  2. Does this data reduce crash rates during ice events?
	Success:
	  1. Decision makers find information highly valuable to decision making process
	  2. Crashes rates during ice events are reduced
	Metrics/output measures:
	  1. Surveys of decision makers (source: ATD)
	  2. Crash data (source: APD)

3	**Private Sector Operational Data**
	Questions to be answered:
	  1. What is the cost savings resulting from using private sector data compared to the agency purchasing, operating, and maintaining equipment?
	Success:
	  1. Private sector data costs are less than agency-owned equipment
	Metrics/output measures:
	  1. Private sector data costs (source: agency); life cycle costs for equipment deploy over same coverage area (source: agency)Discernable pictures of (a) license plates and (b) driver (source: APD)

	Intelligent Sensor Projects (continued)

4	**Pavement and Markings Performance Monitoring (Mobileye)**
	Questions to be answered:
	  1. Does the system produce accurate information about (a) pavement and (b) markings quality?
	Success:
	  1. System produces accurate information; agency uses data from system for developing maintenance plans
	Metrics/output measures:
	  1. System and actual field data measurement comparisons (source: system, agency); demonstration of how agency uses data in maintenance programs

5	**Kiosks**
	Questions to be answered:
	  1. How frequently are the kiosks being used?
	  2. Do the kiosks increase access to (a) transportation services; (b) jobs?
	  3. How often do the kiosks require maintenance for (a) vandalism; (b) equipment failures?
	Success:
	  1. Citizens who don't have access to smartphones use kiosks to gain access to information and services
	  2. Citizens use kiosks to access transportation services and job advertisements
	  3. Equipment life cycle is > 3 years (note: ~equating to life of business computer) or maintenance costs are less than advertising revenue
	Metrics/output measures:
	  1. Surveys (source: kiosk user interface); Wi-Fi usage
	  2. Surveys (source: kiosk user interface); application usage stats
	  3. Maintenance records (source: ATD)

VOLUME 1D: STAFFING PLAN

The Austin Smart City Team is comprised of an exceptional combination of agencies, partners, and companies with the resources, skills, and experience to deliver a successful Smart City demonstration project to the USDOT. Under the City of Austin's leadership, this dynamic team will cooperatively leverage each member's talents to achieve our Smart City vision while validating outcomes and applications for replication throughout the nation. The following sections outline our project delivery approach consisting of: (1) the Austin Smart City Consortium – agency leadership, governance, and continuity during and after the project period; and (2) Staffing Plan – daily operational roles and leadership responsibilities for each pilot and focus area.

CONSORTIUM

To provide continuity independent of political cycles, an Austin Smart City Consortium will be established with a Joint Executive Team (JET) and dedicated full-time staff to oversee implementing the Smart City project. This structure provides stability, expanded capacity, nimbleness, and continuity not only for the three-year USDOT Challenge period but beyond, to carry on implementing future projects. Our many stable, established partners will ensure both continuity and capacity. Austin is investing in this for the long haul and has already started down the path towards a new smart mobility system.

Our Smart City Consortium provides the MIC's oversight structure and is the mechanism that will assure the implementation and maintenance of our interconnected project elements. The figure on this page demonstrates how we envision the institutional framework to deliver a successful Smart City program. The City and its partners recognize that the ambitious scale and timeline of the

Smart City Challenge will require a dedicated team with the capacity to focus exclusively on the Challenge and its outcomes. Therefore, an Austin Smart City Consortium, under the auspices of the City of Austin, is envisioned to provide the oversight, structure, and support necessary to assure the transformation of Austin into a Smart City. The Consortium includes the following bodies:

Joint Executive Team (JET), led by the City of Austin City Manager: Provides technical program oversight; assures adherence to grant policies; sets policy; assists with resolving escalated issues; and makes recommendations to the participating governing bodies. Team members will include:
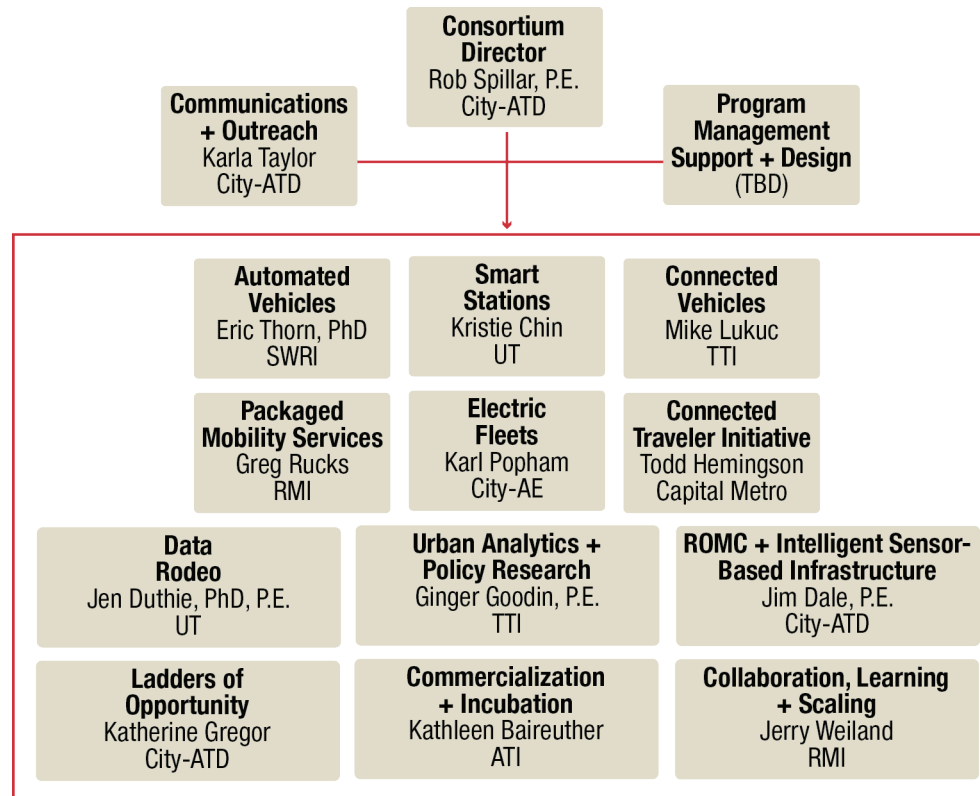
City of Austin, Capital Metro, TxDOT, CTRMA, Travis County, and CAMPO, UT, TTI, SwRI, and Austin CityUP. The City Manager, as the chief executive for the City of Austin will serve as the fiduciary point of contact for the USDOT and will be responsible for the grant.

Advisory Board: Provides project oversight and performance monitoring; approves draft deliverables to submit to USDOT; and facilitates partnerships. Board composition includes Departmental Executives from the Core Team.

Consortium Director: Manages the Smart City project; reports to the city manager as chair of the JET; manages private sector involvement; and serves as the point of contact to USDOT. Rob Spillar, P.E., Director, Austin Transportation Department will be assigned this role and serve as the full-time Consortium Executive Director. The Director and the overall Smart City program will be supported by an experienced program management firm (e.g., reporting, budgeting, performance management, compliance, etc.) including a premiere data management firm to support the data infrastructure needs of our partners.

TEAM ORGANIZATION

Consortium Director
Rob Spillar, P.E.
City-ATD

Communications + Outreach
Karla Taylor
City-ATD

Program Management Support + Design
(TBD)

Automated Vehicles
Eric Thorn, PhD
SWRI

Smart Stations
Kristie Chin
UT

Connected Vehicles
Mike Lukuc
TTI

Packaged Mobility Services
Greg Rucks
RMI

Electric Fleets
Karl Popham
City-AE

Connected Traveler Initiative
Todd Hemingson
Capital Metro

Data Rodeo
Jen Duthie, PhD, P.E.
UT

Urban Analytics + Policy Research
Ginger Goodin, P.E.
TTI

ROMC + Intelligent Sensor-Based Infrastructure
Jim Dale, P.E.
City-ATD

Ladders of Opportunity
Katherine Gregor
City-ATD

Commercialization + Incubation
Kathleen Baireuther
ATI

Collaboration, Learning + Scaling
Jerry Weiland
RMI

STAFFING PLAN

	Baer, Joshua (CF)	Baireuther, Kathleen (ATI)	Barchas, Isaac (ATI)	Bouisseau, Jay (Austin CityUP)	Chin, Kristie (UT)	Craig, Brian (City-ATD)	Dale, Jim (City-ATD)	Duthie, Jen (UT)	Esquibel, Matthew (City-CTM)	Flores, Yvette (TxDOT)	Goodin, Ginger (TTI)	Greenberg, Sherri (UT)	Gregor, Katherine (City-ATD)	Hemingson, Todd (Capital Metro)	Lehr, Ted (City-CTM)	Lukuc, Mike (TTI)	Popham, Karl (City-AE)	Reilly, Tim (CTRMA)	Rucks, Greg (RMI)	Spillar, Rob (City-ATD)	Taylor, Karla (City-ATD)	Thorn, Eric (SWRI)	Turner, Robert (City-CTM)	Walker, Jon (RMI)	Weiland, Jerry (RMI)
Smart City Pilots																									
Connected Vehicles																●						○			
Packaged Mobility Services														○					●						
Electric Fleets																	●								○
Automated Vehicles																○						●			
Smart Stations					●																				
Connected Traveler Initiative														●											
Regional Operations Management Center						○	●			○							○						○		
Intelligent Sensor-Based Infrastructure						○	●			○					○	○	○						○		
Urban Analytics & Policy Research								○			●	○													
Data Rodeo							●	○			○			●											
Ladders of Opportunity												○	●												
Commercialization	○	●	○																						
Collaboration, Learning & Scaling	○	○	○	○																					●
Grant Administration																									
Consortium Director																				●					
Strategic Partnerships + Communication																					●				

| LEGEND	
●	Pilot Lead Staff
○	Pilot Key Support Staff
City-ATD	Austin Transportation Dept.
City-AE	Austin Energy
City-CTM	Austin Communications and Technology Management
City-F	Austin Fleet
ATI	Austin Technology Incubator
CF	Capital Factory
CTRMA	Central Texas Regional Mobility Authority
RMI	Rocky Mountain Institute
SWRI	Southwest Research Institute
TxDOT	Texas Department of Transportation
TTI	Texas A&M Transportation Institute
UT	University of Texas

VOLUME 1E: CAPACITY AND CAPABILITY

Austin has the drive, commitment, and capacity to successfully deliver its Smart City vision. The City and Austin's public- and private-sector leadership are excited and highly motivated to use the Smart City Challenge opportunity to tackle Austin's transportation issues. Here are some examples of ongoing initiatives that will leverage the Smart City effort.

ACTIVE TRANSPORTATION

- Austin has installed an average of 30+ miles per year of new and improved bicycle lanes for the last 5 years including a total of 44 miles of buffered and protected bicycle lanes. This work is largely coordinated with street resurfacing.
- Austin's most recent Bicycle Master Plan adopted in 2014 calls for a $150 million all ages and abilities bicycle network that is designed to capture short trip travel demand and bring regional mobility benefits to Austin including a forecasted 7% reduction of vehicle trips to the downtown area.
- Austin is currently working on an update to the Sidewalk Master Plan which includes innovative approaches to increasing walkability through aggressive vegetation control on existing sidewalks, exploring the idea of shared streets, a data-driven maintenance program and expanding financing tools.
- Austin will be finalizing a Pedestrian Safety Action Plan using data prepared by the Texas Transportation Institute.
- We are in the process of obtaining a cutting-edge crowd-sourced bicycle network analytics tool that uses smart phones to passively collect trip information by mode, focusing on creating bicycle network use maps with user stress information over time.
- Austin's Safe Routes to School program provides school engagement and education for elementary school students throughout Austin, including customized bicycle and pedestrian route maps for schools, HUB devices that count kids bicycling to school, pedestrian safety education and crossing guards.
- Austin's Vision Zero Task Force is wrapping up their work and has resulted in significant public and multi-agency support. To support the effort, five plus staff will be hired across multiple city departments including a Vision Zero Program Manager and Pedestrian Coordinator.
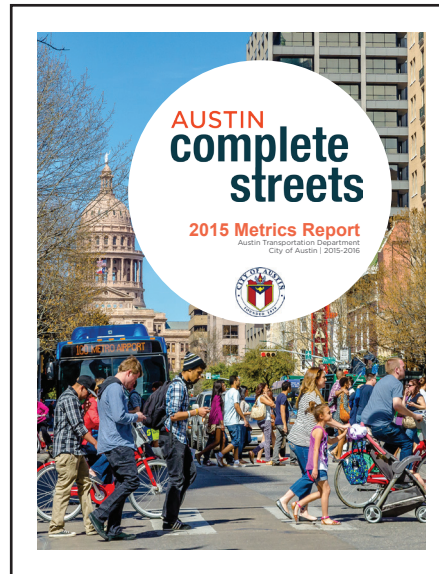
SMART LAND USE

The significant growth Austin has seen has required the city to rethink how it uses its land. New mobility services, enhanced data integration, or electric vehicles will not on their own solve these challenges. We must create walkable and bikeable urban environments that enable our citizens to eat, sleep, work, and play without requiring vehicle ownership or lengthy, sprawl-inducing commutes. In order to do so, we must optimize and reclaim land that has—and continues to be—allocated for road expansions and parking facilities that tend to induce more use of vehicles, thereby worsening congestion and increasing emissions.

Significant opportunities exist in property redevelopment, infill, and transit oriented development, to cultivate stronger, less car-dependent and more equitable communities. In the past year, the City of Austin has made use of Envision Tomorrow (see below) to quantify the economic value of parcel-level developments and to measure their impact on nearby traffic. The City would like to bolster the use of this tool to do the following:

- Measure the impacts of key corridor redevelopment on the broader transportation system
- Prioritize areas for transit oriented development
- Prioritize corridors for redevelopment and affordable housing

In 2012, the Austin City Council passed Imagine Austin, a comprehensive 30-year plan to address these changes by growing into a compact and connected city. The City of Austin is currently drafting the code to implement Imagine Austin's principles, known as CodeNEXT, which will be finalized and implemented in 2017.

- First comprehensive code revision in 30 years
- Form-based codes will bring an end to persistence of single-use zoning
- Significant overhaul of transportation chapter
- Will set the stage for innovation in land use, facilitate smart development, encourage increased transit ridership

The rapid growth of Austin has added new housing, new jobs, and, of course, more cars. As a result developers, continue to build parking facilities that take up valu-
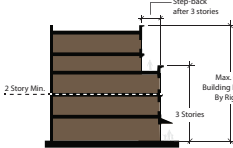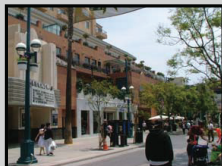
able land that, otherwise, could be used for housing or commercial space. The City of Austin sought to stifle the growth of parking facilities by removing downtown minimum parking requirements in 2012, but the measure had little effect, because lenders remains unwilling to invest in developments without a significant amount of parking. This is due, in large part, to a lack of data on parking utilization that would ideally optimize where and how much parking is constructed. A comprehensive plan for parking has not been conducted in eight years. In that time, Austin has changed dramatically.

To address this challenge, the Downtown Austin Alliance and Nelson Nygaard are conducting a study of existing parking utilization. The end result of this effort will be to craft a plan for an improved parking management system enabled by new enforcement, regulatory, and pricing policies. Just as important, though, will be the use of technology that can reduce vehicle-miles-traveled associated with searching for parking :

- Apps that enable real-time discovery and reservation of parking spaces
- Highly visible, digital wayfinding signs that communicate parking availability to drivers

Although this study concentrates only on the central business district, it will provide a valuable template for tackling parking in other areas, where parking minimums currently exist.

Figure 1-9: Corridor Mixed Use (CMU)
Summary of CMU Subdistrict Development Standards

CORRIDOR MIXED USE (CMU) SUBDISTRICT

Corridor Mixed Use is the highest density district designation within the East Riverside Corridor and will typically be expressed as residential or office uses over commercial ground floor uses, such as retail or office. The ground floors of these buildings are envisioned to be primarily retail or office while upper floors may be office and/or residential. Mixed use development is key within this subdistrict because it will help to create a walkable environment with a variety of land uses located in a compact area.

Lot Size	Floor to Area Ratio (FAR)
Minimum Lot Size: 2,500 sf **Minimum Lot Width:** 20'	**Maximum Floor-to-Area Ratio (FAR) by Right:** 2:1 **Desired minimum FAR:** 60% of maximum FAR by right. Note: Additional building height may be granted in exchange for the provision of public benefits. Maximum FAR waived with a development bonus. Development bonus criteria and standards are detailed in Article 6.

Minimum Setbacks

Front and Street Side Yard*:
No ground-level front yard or side yard setbacks are required. Instead, development must meet the building placement standards in Section 4.3.

Interior Side Yard: 0'
Rear Yard: 0'

Upper-Story Building Facade Street-Side Step-backs:
The building facade at the fourth story and above must be stepped back a minimum of 10 feet from the ground-level building facade line.

* If the street right-of-way is less than 60 feet in width, see Section 4.3.3.C.

Building Height

Maximum Building Height:
60 feet maximum w/ a minumum of 2 stories.

Maximum Building Height with Development Bonus:
See Figure 1-8.

Compatibility

See Section 4.2.4 for compatibility standards.

ABOVE:
Typical minimum stories, height limit, and step back requirements for buildings within the Corridor Mixed Use (CMU) Subdistrict.*

*Max. Building Height with a Density Bonus is established on Figure 1-8.

Building Placement

Building placement determined by Roadway type and Active Edge Designation.

*See Fig. 1-3 for Roadway Type designation and Section 4.3 for design requirements.

Maximum Impervious Cover

Impervious Cover:
90% or Maximum Allowed by LDC 25-8.

ABOVE & BELOW:
Examples of development similar to that allowed in the Corridor Mixed Use Subdistrict.

Corridor Mixed Use (CMU) Land Use Summary*

Land Use	
Residential, attached	Permitted
Residential, detached	Not Permitted
Smaller-scale Retail (less than 50,000 sq. ft.)	Permitted
General Retail	Permitted
Office	Permitted
Warehousing & Light Manufacturing	Not Permitted
Education / Religion	Permitted
Hospitality (hotels/motels)	Permitted
Civic Uses (public)	Permitted

*The table above provides a summary only of land uses permitted within the Corridor Mixed Use Subdistrict. See Section 2.3.3. for a complete list of permitted land uses.

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ENVISION TOMORROW

Developed through the HUD Sustainable Communities Regional Planning Grant (as part of a partnership with USDOT and EPA) the Austin region received in 2010, Envision Tomorrow (ET) is an open-source scenario-modeling tool that allows users to develop urban buildout scenarios, from the scale of a region down to an individual building site. These scenarios are associated with data that drive a range of indicators about site performance related to ecological, economic, and social impacts, such as

- Safety: traffic accidents (injury); traffic accidents (fatal)
- Mobility: transit trips per unit; daily walk trips per unit; transportation costs per household;
- household affordability and family disposable income (housing+transportation+energy)
- Efficiency: daily vehicle trips; daily walk trips per unit; daily transit trips per unit; daily VMT
- Sustainability: daily VMT/daily VMT per capita; transit trips per unit; daily walk trips per unit; transportation costs per household; household affordability and family disposable income (housing+transportation+energy)
- Climate: water quality pollutant load reductions; transportation carbon emissions; other transportation emissions
- Equity: household affordability and family disposable income (housing+transportation+energy); jobs-housing balance; housing distribution by income; workforce housing model; balanced housing model

Envision Tomorrow relies on travel behavior algorithms based in current, peer-reviewed analysis. The Smart Stations proposed in Austin's Smart City vision may be modeled initially as transit-oriented developments centered on transit stations. This would show the impact of reducing sprawl by tying Smart Stations to compact land use planning, with resulting improvements in transportation system safety and reductions in climate change emissions. ET has the capacity to provide analysis on net new taxes and also increase in family disposable income

specific to geographic areas. ET's robust suite of tools related to housing and transportation affordability and access would also help evaluate the impact of Smart Station in creating ladders of opportunity for Austin's disadvantaged communities. Additional real-time data through sensors would be an asset to the outcomes. Austin hopes to have the opportunity to utilize this important impact measurement tool, created through federal investment, on this important investment in Smart City technology and thereby leverage the investment in the development of ET.

AUSTIN ECONOMIC DEVELOPMENT INITIATIVES

Workforce & Educational Development: In response to the growing inequality in Austin, the city's Economic Development Department (EDD) supports educational development for children and improves workforce opportunities targeted to children from minority and low-to-moderate income families. Resources are also allocated towards lifting working adults out of poverty and into living-wage careers through education.

Connecting people to capital and place: The EDD's work program focuses on linking people to the resources they need to thrive in Austin's dynamic economy. This includes assisting entrepreneurs to obtain the necessary capital they need to grow their businesses and create jobs.
Redevelopment: The EDD invests in creating vibrant activity centers and other strategic areas through wise infrastructure investment, organizing healthy commercial districts that meet the surrounding neighborhood's market needs and incentivizing catalytic mixed-use real estate investment that provides for the public good.

MOBILITY MARKETPLACE, SMART STATIONS, LADDERS OF OPPORTUNITY

The chances for success of these user-focused mobility options is enhanced by the fact that many of them leverage successful efforts already under way. These include:

Movability Austin: Partnering with Employers and Services
Austin already has strong relationships with our largest employers to participate in efforts to shift their employees' commuting behaviors, including investing in packaged services of the kind to be made be making widely available through the Mobility Marketplace. Services such as Car2go, zipcar, V-Rides (via Capital Metro) and Austin B-Cycle were pioneered here, are setting national records for usage and continue to grow. More shuttle services operate in and around Downtown Austin per capita than any other city in the US.

Movability Austin, the Downtown Austin transportation management association, has built on its employer relationships with 30 companies who have received consulting assistance to develop mobility implementation plans for their 70,000 employees. These companies have committed significant resources including: redesign of work spaces to allow hoteling, upgrading IT for telework, purchasing transit passes and distributing them to employees at discounted rates, investment in last-mile services

and parking cashout. Austin's Smart City efforts are driving build interest from even more companies.

Rocky Mountain Institute (RMI)

In a critical first step toward building the Mobility Marketplace now proposed through this grant application, in 2016, Movability partnered with Rocky Mountain Institute to develop a packaged commuting service including 1) a shared shuttle connecting commuters to public transit and 2) a package of on-demand mobility services. Austin downtown employers Whole Foods, Cirrus Logic, and GSD&M have committed to purchasing this packaged commuting service and making it available to their employees.

In September 2015, RMI became our on-the-ground community partner when it chose Austin as its lead partner for a new mobility transformation initiative focused on electrified, automated mobility as s service (or "packaged mobility"). RMI brings decades of experience in facilitation, program management, entrepreneurship, transportation research, and public and private sector collaborative relationships and has already committed six full-time employees to Austin over the next several years. RMI has further committed to leveraging its philanthropic and fee-for-service support bases to bring a matching contribution of additional capacity worth several million dollars to the Austin effort should it win the grant

Smart Trips: Personal Mobility Training and Education

Smart Trips Austin is a program that aims to increase trips taken by foot, bike, bus or shared car. The City of Austin and Capital Metropolitan Transportation Authority (Capital Metro) are working together to encourage Austinites to consider more sustainable options for getting around town.

Ladders of Opportunity: Community and Equity Partners

As noted earlier in this submittal, our Ladders of Opportunity initiatives are designed to add transportation access and equity to existing success stories in community revitalization, crime prevention, improving access to health care and health outcomes, increasing workforce opportunities and access to education, and providing complete communities where housing, services, and employment are tied together by transportation. These include the Spirit of East Austin community engagement initiative in the Eastern Crescent, the Housing Authority of the City of Austin's national model program for digital inclusion, and the participation of Google Fiber in creating digital access to neighborhoods on the wrong side of the digital divide. The letters of commitment in this submittal reflect participation by dozens of community and equity partners whose participation in the Smart City effort broaden its scope and impact far beyond transportation in itself.

Austin B-Cycle

Austin B-Cycle, which is one the nation's most successful bike-sharing programs, will work with the Smart City team integrate e-bikes into the current Austin B-cycle service area to test market viability of e-bikes in bike share and their effect on increasing ridership..Results would determine the viability of a full e-bike deployment with charging stations in an expansion neighborhood including Ladder of Opportunity areas in the Smart City Challenge grant.

In addition to participating in bike-sharing installations at Smart Stations and along the Riverside Drive Connected Corridor, Austin B-Cycle looks to transition our entire operations maintenance and balancing fleet to electric vehicles as new operations vehicles are added and old vehicles retire. Austin B-Cycle will allow access to rider travel information and station status (number of bikes) in real time. Austin B-Cycle will install live GPS tracking units on all bikes in the fleet to provide real time location, direction, and speed of bike share bikes and partner with North American Bike Share Association to develop data standards, system architecture, demand modeling, and

bike share industry best practices for sharing of live data. Austin B-Cycle will actively participate in the development of the Mobility Marketplace so that bike share is an available service in a mobility package. We will pilot and validate new pricing products and bike checkout access to meet the needs of travelers. Austin B-Cycle will provide API access to any third party developer looking to add Austin B-Cycle system access to their package offering.
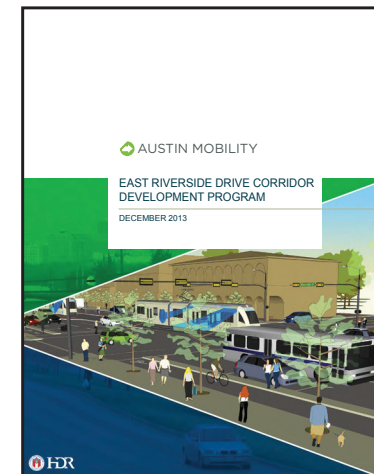
AUTOMATED AND CONNECTED VEHICLES & CONNECTED CORRIDORS

The culture of innovation in Austin makes it the ideal city in the U.S. to introduce these technologies in a very public way, to begin to understand the implications based on real-world deployments. Some of the ongoing efforts that position Austin well include:

- Public automated vehicle testing - Google X has been on the ground in Austin since the summer of 2015, testing its automated vehicles on public roads, and is committed to partnering with the team to align its efforts with solving the city's mobility and access challenges. It is also important to note that Texas does not have any legislation on the books governing testing

or deployment of automated vehicles on public roads. While the team sees this as being a significant advantage, it will take the steps to ensure Austin does not truly become the "wild west" of automated vehicles.

- Research partner expertise – The new "Texas Research Triangle," comprised of the University of Texas Center for Transportation Research (UT CTR), Texas A&M Transportation Institute (TTI), and Southwest Research Institute (SwRI), brings immense expertise and background in both basic and applied research related to automated and connected vehicles. UT and TTI have a broad portfolio of planning and policy-related programs investigating the implications of deploying automated and connected vehicle technologies. SwRI has tested, certified, developed, and deployed automated and connected vehicle technologies for the DOD, automotive and commercial truck OEMs and suppliers, and a number of State DOTs.

Focusing the pilot deployment around the proposed Smart Stations and along the proposed Upon completion of the grant program, Austin intends to ramp up deployment, rather than down. Austin envisions additional deployments further into the neighborhoods surrounding the numerous Smart Stations and Smart Corridors. As the grant program is being executed, the team will simultaneously hold engagement meetings with additional partner cities near Austin and beyond:

- Smart City – Austin ->Round Rock, Georgetown, San Marcos
- Smart Region – Austin -> College Station, Temple, Waco
- Smart State – Austin -> San Antonio, Houston, Dallas, El Paso, Laredo, etc.

ROMC, SENSOR DATA & INFRASTRUCTURE

The One System vision has been alive in the region for some time and has led us to take the natural next step to becoming a Smart City. Past and present initiatives include:

- Formation of the region's Combined Transportation, Emergency, and Communications Center (CTECC) in 2003. CTECC brought together transportation and emergency responders under one roof to leverage resources and improve service delivery. Its multi-agency governance model (City of Austin, TxDOT, Capital Metro, Travis County) is a best practice that has been successful at managing CTECC for more than a decade.
- Deployment of the region's first Bus Rapid Transit (BRT) line – MetroRapid – in 2014 requiring close coordination between Capital Metro and the City to deliver a successful project to the community.
- Creation and updates to the Austin Regional ITS Architecture under TxDOT's leadership since 1996. The Architecture has been updated in a cross-agency collaborative manner multiple times with the most recent in 2015.
- Successful pursuit as a region of a USDOT integrated corridor management (ICM) deployment grant that began in 2014. ICM embodies a One System approach.
- Establishment of the City of Austin's Open Data Initiative 2.0 — "with the development of new technologies and an increasingly connected and engaged population, a growing expectation is being placed on government leaders to promote transparency, citizen participation, and collaboration".
- Establishment of a contract with the UT Center for Transportation Research to develop a roadmap for increasing the openness of transportation data to the public, businesses, entrepreneurs, non-profits, and agencies.

The Smart City project provides the foundational elements that scale towards operating transportation throughout the region as One System. I-35 ICM provides an initial project by which the Austin Smart City team can launch into One System planning and implementation for the region. The Smart City System Agreements and Integrated Shared Infrastructure project set the tone to achieve the One System vision for operations as well as sharing data and infrastructure (e.g., sensor data, communication networks) across agencies. Together, these projects establish the foundation to facilitate regional scaling.

Replicating Austin's successful outcomes in other urban areas is a key measure of success for the Smart City project. The Austin team has taken steps to foster replicability through project design and knowledge transfer activities (e.g., webinars, conference presentations, technical papers, social media, etc.) that share lessons learned (what worked and didn't). ROMC projects like the I-35 ICM will add to the body of knowledge developed through proven ICM deployments in other parts of the country (e.g., San Diego, Dallas). The USDOT has also been instrumental in developing and supporting tools, like the Systems Engineering process, that foster replicability and success..

The One System approach is designed to leverage resources across agencies to enable us to do more together than independently. For example, the ROMC projects share infrastructure, like communications networks (fiber) and video, instead of each agency expending similar funds for redundant infrastructure. These business model changes not only maximize the value of limited public funds, they demonstrate our efficient use of resources to elected officials that control the sustainability of transportation funding.

DATA RODEO AND URBAN ANALYTICS

The Austin team has extensive experience building and managing large-scale data portals and discovery environments.

Texas Advanced Computing Center

The University of Texas' Texas Advanced Computing Center leads the development of the Cyverse web portal for bioinfomatics that provides users with the ability to work with data within its web-based portal or from within many programming languages, leveraging its AGAVE API layers which provide simple to use RESTful APIs in languages such as R, Python, and Matlab. Users are able to discover public data, upload their own data and control access to the data. Data can be collected and sent to applications within the system for further analysis or processing including many visualization layers tuned to address specific problems.

The power of this environment is being leveraged in many other TACC based portals including the Design-Safe-CI efforts for natural hazards civil engineering data and model results, as well as the Virtual Drug Discovery portal VDJServer for modeling and analyzing the uptake of drugs by proteins.

The TACC lead for the Austin Smart City efforts is Dr. Niall Gaffney who was responsible for development and support for the data archive for the Hubble Space Telescope project. This project involved collecting streamed data from remote sensors, preserving data, processing data, protecting data access policies, and creating value added data products from 20 years of data.

University Transportation Center for Data-Supported Transportation Operations and Planning

The University of Texas at Austin is home to the Tier 1 University Transportation Center for Data-Supported Transportation Operations and Planning (D-STOP). Dr. Jen Duthie is the D-STOP lead for the Austin Smart City efforts and she is also the lead for the ongoing D-STOP project focused on creating a data discovery environment for transportation data. It is through this project, and Dr. Duthie's work with regional transportation agencies, that the Data Rodeo concept was born. D-STOP faculty also specialize in several areas that will directly benefit the Austin smart cities data efforts including novel ways for storing big data, machine learning algorithms to extract the most useful information from the data, and travel behavior models for using the data to predict future conditions.

Texas A&M Transportation Institute

The other UTC offers national-level expertise in performance measurement, USDOT Independent Evaluator for UPA/CRD, Dallas ICM evaluation, extensive use of private sector data in congestion/mobility performance analysis. Also skilled at technology policy research and finding ways to leverage opportunities to create better outcomes.

Replicability and Scalability Through Enabling Research

Efforts will be made to engage researchers both locally and nationally. We are hosting a series of webinars to educate researchers about the data available, potential use cases, and obtain feedback on how to make the Data Rodeo better meet their needs. The two-way nature of the Data Rodeo will be emphasized, whereby any data, tools, or other value created from the Data Rodeo information will be fed back into the Rodeo for others to build off of. The University of Texas at Austin's University Transportation Center (UTC) on Data-Supported Transportation Operations and Planning will lead the outreach efforts to other UTCs across the country. Additionally, we will leverage our membership in the MetroLab Network to engage other university researchers working on smart city efforts and bring them into the Data Rodeo.

All university-based research that involves human subjects or their information must go through an IRB process. Steps will be made to expedite the IRB process including submitting general descriptions of the research planned when the contract is awarded to obtain concept approval. This initial step will let the IRB know of the type of research to be done and give them an opportunity to raise any concerns before the study is planned in detail. As the research planning process progresses, this initial protocol will be modified to include all of the details of the study including how participants will be recruited and rewarded, instructions they will receive, and descriptions of the study procedures and safety processes in place to protect them and their data. We will also arrange for all researchers involved with human subjects data to receive the required nationally accredited training. Copies of the submitted final protocol and approvals will be provided to USDOT.

The Data Rodeo presents a unique opportunity for educators to bring large-scale real-world data into the classroom. We will work with our partners at the Austin Independent School District and our local colleges and universities (including Austin Community College, The University of Texas at Austin, Huston-Tillotson University) to educate teachers how to access and use the data, and also obtain their feedback on how to make the Rodeo more useful to them.

CAPACITY BUILDING: CREATING SOCIAL & ECONOMIC VALUE

Community Partnership: Austin CityUP

As Austin builds its smart infrastructure, services and living community, it must engage its community in discussions to create, sustain, deliver and share the value that arises. We will partner with a local nonprofit, Austin CityUP, a consortium of companies, organizations, and

individuals who collaborate on activities that advance Austin through digital technologies, data collection, analytics, and modeling.

The Austin Smart City team believes we need the private sector to help our team function and continue to develop as a smart city. The dialogue and collaboration with Austin CityUP will provide the ongoing connection between public-, private- and nonprofit sectors in the Austin area., initially focused on the following:

- Establishing a 'safe harbor' for open dialogue on prioritizing problems to be addressed, solutions available, outcomes to be delivered, and relevant technologies
- Ensuring Austin Smart City investments are made to leverage our grant funding, our partner contributions and other initiatives.
- Developing a plan for financial sustainment for our Austin Smart City Investments.
- Providing opportunities for piloting or prototyping innovative transportation and mobility solutions and providing environments to build concepts and test hypotheses
- Facilitating public-private sector dialogue and collaboration to solve other problems facing Central Texans.

Austin CityUP will work with the City and its Smart City partners to establish competencies centered on research, partnering, prototyping, innovation incubation, open data platforms, talent development, and outside expertise. Through facilitated discussions, meet-ups and focused workgroups Austin CityUP has the processes in place for government representatives to discuss an idea/initiative that may address a problem faced by Austin area residents. Under the auspices of Austin CityUP, these discussions will assist in developing proof of concept efforts, solution refinement and demonstration of a viable solution.

Community Partnership: Austin Technology Incubator

ATI is among the most successful incubators in the nation and has been recognized by the Kauffman Foundation for its track record. Over the past 7 years, roughly 90% of ATI companies have received investment, totaling over $837 million dollars. Over the same time period, ATI companies have accumulated total book value of $1.5-2 billion. ATI alumni have contributed almost $1 billion and over 6,500 jobs to Central Texas; each public $1 invested in ATI has yielded $66 of economic activity.

ATI's Clean Energy Incubator (ATI-CEI) has been recognized by the U.S. Department of Energy as one of the three "best practices" energy/cleantech incubators in the country. ATI is a node in the DOE's National Incubator Initiative for Clean Energy (NIICE) and acts as a hub of

university-based clean energy incubation programs in the Southwest. ATI's Energy & Cleantech companies have raised more than $200 million in investor capital (including one IPO). These companies have generated more than $85 million in economic impact.

The City of Austin and Austin Energy have a longstanding partnership with ATI. The Austin Energy Beta-Test program is a nationally distinctive best practice developed by Austin Energy in collaboration with ATI-CEI. Through this program, Austin Energy provides expertise, test access, and translational funding to vetted clean energy technology solutions that could impact Austin EnergTo-date, 16 grants have been awarded to ATI companies in the Clean Energy Incubator (CEI) and awardees have raised more than $43 million in follow-on funding. Beta-grant awardees have raised an additional $109 in outside funding for each beta-grant dollar contributed and created over 105 direct jobs to-date.

South Central Waterfront Illustrative Vision Plan

ELECTRIC FLEETS

Austin is the ideal place to demonstrate to the nation and the world how electric vehicles can scale quickly, support grid reliability, and bring value to owners all while being powered by renewable energy to maximize green house gas (GHG) savings.

Significantly reducing GHG emissions in the transportation sector is a critical component of Austin's Smart City transportation program, Climate Protection Plan, Austin Energy Generation Plan, and the focus of the Smart City Challenge. It is important that transportation electrification does not just transfer GHG inventory to the electricity sector, and as such an important component of our strategy is a continued decarbonization of the electric grid and continue to power all public charging infrastructure with 100% renewable energy from Texas' growing wind and solar resources through Austin Energy's green-e certified GreenChoice program.

For the transportation sector to maximize the benefits of Austin's low-carbon grid and 100% renewable Green-Choice program, we must scale electric vehicles and electric vehicle miles traveled (eVMT) quickly and aggressively. By targeting high mileage mobility service vehicles and removing key barriers to consumer adoption, the Vulcan grant will enable Austin to electrify up to 5% of its total VMT in 5 years, and a significant portion of that within the three-year grant duration.

This combination of accelerated eVMT growth and fossil fuel free energy equates to maximum GHG reductions. The business models, strategies, and tactics used will be scalable and repeatable for other cities such that we see massive CO2 reduction from the transportation sector as a whole. In addition, this program will improve air quality, keep millions of energy dollars in the local economy, and be a key "tipping point" project in Austin's trajectory to achieve its carbon Net ZERO 2050 Plan.

CONCLUSION

The vision for 21st century mobility in Austin includes ensuring initial investments are sustainable, value generating and creating new revenue streams over the long term. The potential for improved quality of life that's enabled by a Smart Austin must promote equal economic potential: with all genders; across all racial and ethnic backgrounds; among all socio-economic classes; and across all public institutions and commercial sectors of the economy.

Achieving these outcomes requires engaging our community. We will bring together stakeholders of every kind – citizens, businesses, city officials, technology developers, universities and entrepreneurs – to enable the community as a whole to serve the underserved and enfranchise the dis-enfranchised. In the end, these innovative transportation services will touch every single person living, working or visiting Austin. They will also result in innovative business models that can monetize and create new resources to sustainably fund ongoing Smart improvements to Austin as well as incent the private and other non-government sectors to invest in projects and products for Smart Cities.

"Austin has a collaborative approach, a can-do attitude and solution-driven, consensus-oriented leaders who are eager to work to improve our city rather than limit it."
GERARDO INTERIANO, External Affairs, Google.

"As one of the largest employers in the area, we want to work with the City to identify where advanced technologies and innovative solutions can be implemented to improve the lives of Central Texas citizens, especially in underserved areas. We have a special interest in mobility systems that provide opportunities for the most talented and diverse workforce throughout the Austin metro area."
MICHAEL DELL, Chairman and CEO, Dell Inc.

"An innovative, collaborative , enabling environment like that of Austin, Texas is critical to ensuring the successful introduction of the vehicles and services that will shape our much improved mobility system of tomorrow."
MARCUS WELZ, Chief Executive Officer, Siemens