

U.S. Department of Transportation

Notice of Funding Opportunity Number DTFH6116RA00002

“Beyond Traffic: The Smart City Challenge”

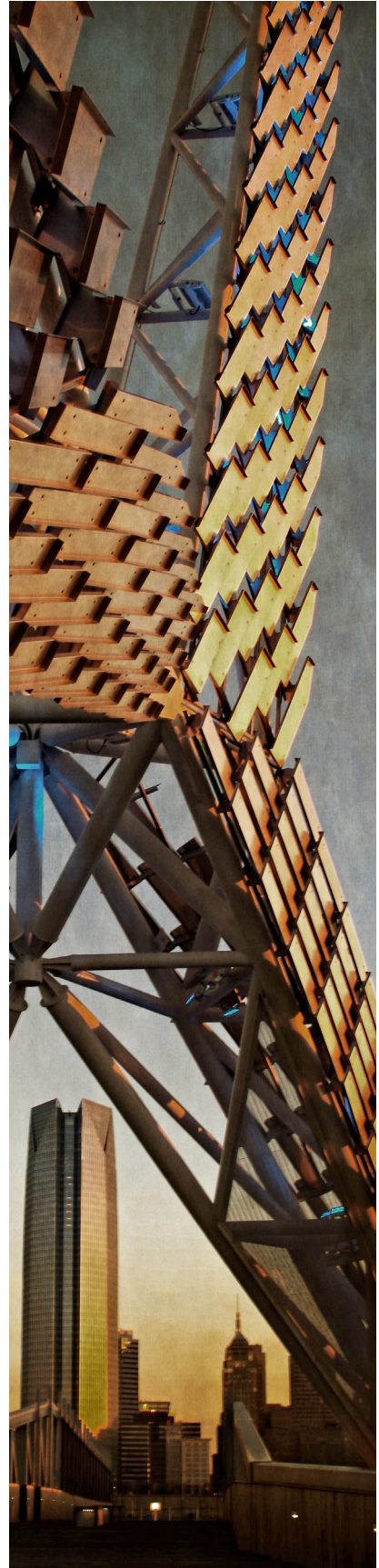


**SMART
OKLAHOMA CITY**

**Submitted by:
Oklahoma City, Oklahoma
February 4, 2016**

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Oklahoma City's Smart City Vision

Through the Smart City Challenge Grant, Oklahoma City shall develop a “Y” shaped “smart zone.” It will expand upon the NW Corridor Concept Plan (Classen Blvd. and Northwest Expressway), and will also extend southward from the Downtown along South Western Avenue to SW 59th; as well as a corridor along 23rd from Classen to Martin Luther King and including the Oklahoma Health Center. The “smart zone” will integrate advanced technologies with advanced mode options, with contemporary land-use, transportation, environmental and public health policies to increase the corridor’s mobility, safety, economic vitality and reduce negative climate change impacts.

Oklahoma City’s application suggests what a Smart Oklahoma City looks like. It has electric buses and in a smart BRT system, self-driving streetcars, user-friendly smart phone apps, sensor-rich environments and more. This will be accomplished with many in-house resources, but also in collaboration with many private sector and other entities. See Vision Narrative 5, in the I7 subsection regarding Strategic Business Models and Partnering Opportunities.

A smart zone shall address the existing challenges, such as:

- Vehicle congestion during a.m. and p.m. peaks;
- Inadequate mobility options and information for older adults and people with disabilities;
- Needed multimodal and sharing economy options;
- Ways to reduce labor costs;

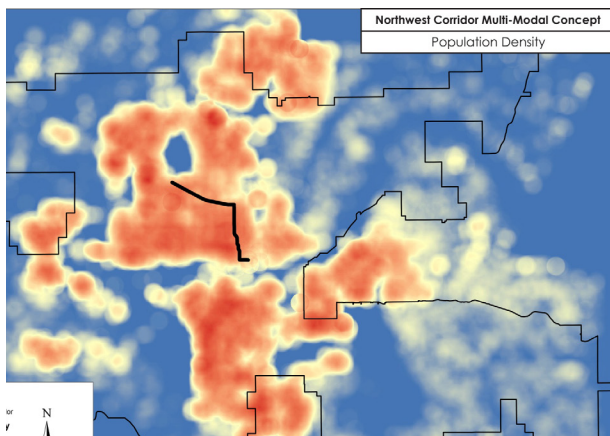
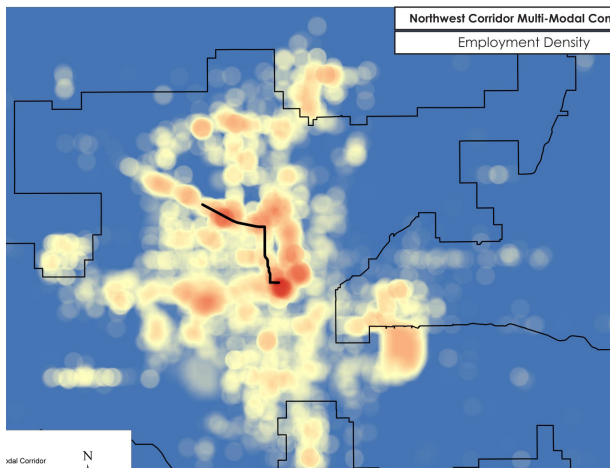
- An economy ready for and needing more technological growth;
- Poor and absent pedestrian and bicycle corridor crossings;
- Strategies to integrate technology to improve quality of life;
- Lack of transit service which is frequent and attractive enough;
- Lack of relatively safe pedestrian and bicycle access to adjacent land uses, facilities, healthcare providers, essential services, etc.;
- Lack of transit oriented development (TOD), and
- Community’s desire for increased healthy lifestyle options and mode options.

In January 2015, the U.S. Department of Transportation selected Oklahoma City as a “Beta Test” city for a proposed transportation policy initiative known as the Public Health and Transportation Corridor Planning Framework. The framework established a method of prioritizing public health considerations in the transportation planning process. The policy framework, as developed in the Northwest Corridor Multimodal Concept Plan, focused on increasing mobility and healthcare access through multimodal public transportation options. The Smart City Challenge Grant will be the catalyst to implement a vast variety of smart technologies within and adjacent to this corridor.

The balance of the Vision Narrative further defines how Oklahoma City will apply various technologies for a successful demonstration project both in the “Beta test” corridor and Downtown, and in the in two

other legs of the 'Y'.

Oklahoma City's program management approach will be a collaborative effort of Oklahoma City's Planning Department, Public Works Department, IT Department, and the City's transit agency (EMBARC). Other stakeholders are interested in playing a part, such as ODOT and the University of Oklahoma; specifically OU's Intelligent Transportation Systems Center and see Vision Narrative 5, in the I7 subsection for more background.



Oklahoma City's Characteristics

Oklahoma City's population characteristics are perfectly aligned with USDOT's preferred characteristics.

- Oklahoma City's 2010 population was 579,999
- Oklahoma City's has a population density of 956.4 persons per square mile, given the fact that OKC is the 5th largest city in land area in the United States (lower 48), this density is not evenly spread out over the City's 606.41 square miles (2010 census).
- In fact, downtown OKC is experiencing significant residential population growth with an estimated downtown residential population of nearly 7,500 and this does not factor in the population increases to be realized when the additional 1,352 under construction or planned residential developments are completed over the next few years. Downtown also supports an employment population of over 55,000 as well.
- Specific to the proposed Demonstration Project, the three connected corridors have over 96,000 jobs, 92,000 residents, three hospitals, the University of Oklahoma Health Science Center, and two universities.
- Oklahoma City represents 46% of the urbanized area's population (579,999/1,252,987).

Public Health & Transportation Corridor Planning Framework





USDOT's Characteristics

Oklahoma City's characteristics align well with the eight USDOT characteristics for a Smart City. The population is 579,999 in a metropolitan area of greater than 1.2 million people, and since 2010 over 40,000 people have moved to the City. While it has a large land area (606.41 square miles), a significant part of the City has a dense urban population typical for a mid-sized American city, and part of that is in the subpart of the City included in the Site Map of the Smart City proposal. A geographically large city it has 8,000 lane miles of streets, has a multimodal public transportation system (EMBARC), and probably has more fire stations (35) and more linear miles of interstate highways than nearly any city in America. This is a City that thinks big and yet addresses the small, fine-grain community needs across its jurisdictional span. The area represents a significant portion (46%) of the overall population of the urbanized area based on the 2010 Census data.

In addition to the eight characteristics, the Smart City outcomes here are also expected to meet the USDOT's three stated characteristics; outcomes of improving safety, enhancing mobility, and addressing climate change. Climate change improvements are best achieved nationwide and locally by fewer or even no vehicle trips, as in the case of having goods delivered or by walking /cycling a short distance to pick them up. Fewer trips in private cars and trucks reduce engine emission and help implicitly meet that Smart City objective by high customer usage of the streetcar and bus rapid transit (BRT) systems which are the core of this proposal. Such connected transit vehicles and the routeside sensors

also improve safety and enhance mobility. The City's vision also fosters integration among the twelve USDOT Smart City elements.

Oklahoma City (OKC) has been on the rise for a long time and has an environment very conducive to demonstrating the proposed strategies, as noted below. Commercial real estate firm CBRE looked to see which cities were growing their technology markets. Last year, no city had a faster rate of growth than Oklahoma City, as it is up 38 percent. This may in part be due to the smart, open people. Travel and Leisure Magazine put OKC on their list as one of the friendliest travel destinations. According to the Brookings Institute, we have one of the lowest rates of income inequality in the country. Also in terms of inclusiveness, New Geography Magazine last year named us as the top ranked city in the country for Veterans. In January, USA Today came out with a list: The 14 places you have to visit in 2016 and Oklahoma City made the list. Entrepreneur Magazine put together a list of the top 25 cities worth moving to if you want to launch a business and OKC was number one on this list.

The City Council has adopted six priorities (<http://www.okc.gov/priorities/>) which are the overarching policy guide for the City, along with planokc. The City Council is very stable, and the Mayor and the City Manager have been in their positions since 2004 and 2000, respectively. There is great stability and productivity among the department heads and key staff. Oklahoma City is a full-service City with nearly 4,700 employees and a total budget of \$ 1.2 billion. The capacity shown by the above and through

the hundreds of millions of dollars carefully expended on the MAPS projects and through City trust authorities is evidence of the continuity of committed leadership and capacity to carry out the Smart City demonstration.

The six priorities stated below also help define the local vision of a Smart City, and the Smart City Challenge relates very closely to # 3 and #5. The priorities are grounded in the lessons of the City's history and the values of inclusiveness, mutual respect and self-reliance.

Having a workforce and business climate that reinforces regional economic strength is also important and so smart Workforce Development and smart infrastructure is priorities in the local vision of a Smart city. Google Fiber announced in fall 2015 that it was seriously considering entering the OKC market. Verizon honored the City with its Smart City award in September 2015.

The following companies have thrived and grown here, along with many others:

- Boeing
- GE
- Dell
- Hertz
- American Fidelity
- Love's Travel Stops
- Hobby Lobby
- INTEGRIS
- Sonic
- LSB
- OU Medical
- PayCom
- Tinker AFB

A national look at the 350 largest metros economies in the country shows we are the 11th most diversified out of 350.

The signs and priorities are all signs and characteristics of Oklahoma City's greatness. However, the City's emphasis on inclusivity, public health, and public education are also very important. To that end, MAPS for kids replaced or

upgraded nearly every school and their tech infrastructure, Citywide. The relatively poor health outcomes in Oklahoma, especially in the lower income urban zip codes, are another challenge and part of why the Smart City area connects to some health campuses and why it reaches into some of the City's more challenged zip codes.

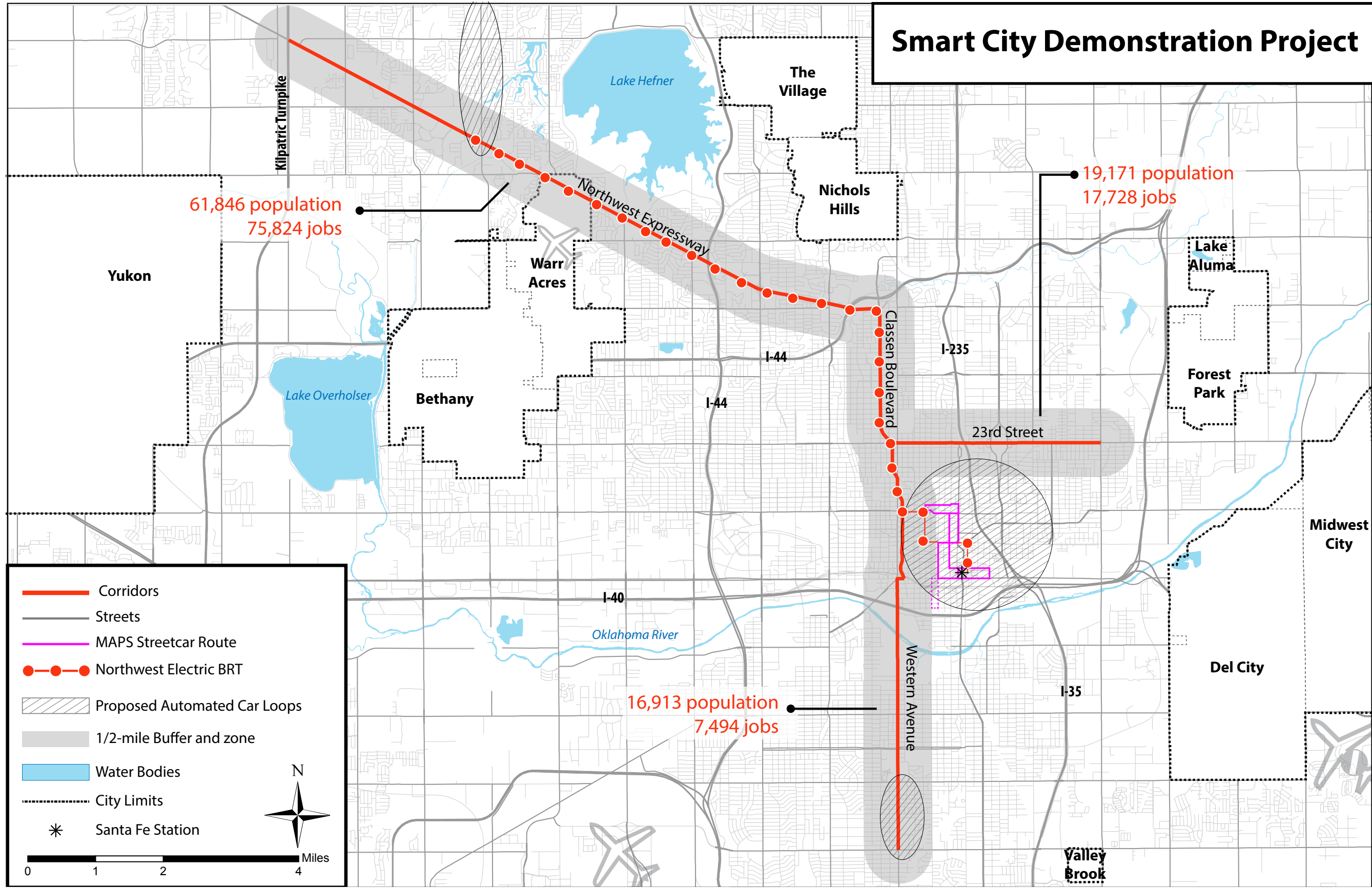
All the above aligns well with the USDOT characteristics for a Smart City. The six Council adopted priorities are:


1. Provide a Safe and Secure Community
2. Maintain Strong Financial Management
3. Develop a Transportation System That Works for All Citizens
4. Promote Thriving Neighborhoods
5. Support High Quality Public Education
6. Enhance Recreation Opportunities and Community Wellness

EMBARC, the City's public transportation agency, has a service area in excess of 200 square miles. EMBARK is part of the Central Oklahoma Transportation and Parking Authority (COTPA). The public transportation system's 21 fixed routes, the ferryboat service, and the Spokies bike share will soon be joined by a six-car \$120+million rail streetcar system to start operation in 2018. Serving downtown including a newly renovation intermodal transportation hub.

In October, 2014 EMBARK launched an open data portal that provides access to static and real-time GTFS feeds by way of individual API-Keys. The API keys provide developers, stakeholders, and the community at-large with transit open data sets. On the private sector side, services like Uber, Lyft, iTN America and car sharing are growing.

Smart City Demonstration Project





Oklahoma City's 12 Vision Elements

Oklahoma City's Smart City Challenge Demonstration Project, NW Corridor, aligns with USDOT's twelve Vision Elements. These are covered over the next eight or so pages and include three Technology Elements (T1 through T3), six Innovative Approaches elements (I4 through I9), and three "Smart" elements (S1-S3). The twelve are as follows, and are summarized in the following table (page 8-9).

	Technology Elements		
	1 Urban Automation	2 Connect Vehicles	3 Infrastructure
Self-driving Streetcar	✓	✓	✓
N.W. Smart BRT	✓	✓	✓
Self-driving shuttle (SDS) car: OU HSC to Santa Fe Station Hub	✓	✓	✓
SD Car: S Okc Housing it 44th/Western Node	✓	✓	✓
Self-driving shuttle (SDS) car: NW Expwy to F Tuttle Career Tech	✓	✓	✓
New Smart Car W.F. progr. at F. Tuttle Career Tech.	✓	✓	
BRT Buses with pavement condition monitors	✓	✓	✓
Transit Collision Avoidance Software	✓	✓	✓
Lane-Clearing Signals to Assist BRT, + TSP			
Lane-Clearing Signals to Assist Streetcar + TSP	✓	✓	✓
Blind Community Sensors	✓	✓	✓
Smart Paratransit Areas	✓	✓	✓
Open-Source Transit, Ped, and other data plus crowdsourcing	✓	✓	✓
New "Oakland Code W.F. Project": R. Ellison Lbry.	✓	✓	
User Friendly M.O.D interface for older adults	✓	✓	✓
Spokies bikeshare interface	✓	✓	✓
Various (see table of potential partners)	✓	✓	✓
Inductive Veh. Charging (COTPA Garages)	✓	✓	✓
Energy Absorbent Roadways	✓	✓	✓
CVRIA integration with the project	✓	✓	✓
DSRC integration with project	✓	✓	✓
Enhanced TOD Policies	✓	✓	✓
Smart City Model Blocks: N.E., S. and Downtown		✓	✓
Smart Affordable Housing			

T1. Urban Automation

“Automated transportation – self-driving vehicles coupled with smart infrastructure, driver assisted automation could reduce fuel use and congestion enabling closer spacing and narrower lanes for vehicles, etc.”

Oklahoma City’s Initiatives

The City of Oklahoma City in 2009 began, and has since completed, integrating all traffic control intersections into a centrally connected, centrally managed ITS system. Each intersection controller is capable of far more automation providing increased value to the citizenry through data collection and dissemination back into the system providing, then distributed via application back to the citizenry.

Possible Demonstration Strategies

- Self-driving (or automated) streetcar as part of MAPS downtown streetcar project. The \$ 120 million Downtown OKC rail streetcar project starts operation in 2018. The self-driving streetcar would be the first in America and would safely reduce labor cost. The technology would be developed jointly by Brookville Equipment Corporation, OKC, and a tech firm (perhaps Google).



- Self-driving buses for a dedicated bus-only lane segment (about a mile or two) of the Northwest Expressway as part of the BRT project . The self-driving

bus technology allows a live experiment for the refinement of the technology, standard operating practices (SOP's), and more.

- Self-Driving Smart Car Loops. The three proposed self-driving smart car loops require the car to “learn” a limited route. Each does a loop-route that is not cost effective to do with a new all-day bus route, and they are in various parts of town. Two loops benefit the schedule adherence of an adjacent bus route, and others help with frail people more in need of a curb-to-curb rip. The three, prospectively, are:
 1. One to Francis Tuttle Career tech to link it to the northwest anchor end of the electric bus BRT
 2. The second starts as a “vet link” linking the Santa Fe hub anchor of the BRT to the Oklahoma Health Center in northeast Oklahoma City with its Veterans Administration (VA) hospital. Once the service has a longer record, it may be opened up beyond Veterans to serve the general population.
 3. A third is a car “loop” near SW 59th and Western that eliminates the slow, circuitous maneuvering of bus Route 13 through a neighborhood for a few older and frail passengers each day. This loop serves two “senior-only” public housing complexes and can get them to the stores and INTEGRIS hospital at SE 44th and Western, as well as to safe stops of the Route 13.

T2. Connected Vehicles

“Use of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications”

Oklahoma City’s Initiatives

Today, V2V can be accomplished by gathering metrics from the current production City infrastructure and providing the information back to drivers through use of an application that is accessed via smart device: phone or tablet. Any information gathered today and then accessed via smart device can be seamlessly incorporated into vehicle technology, Wi-Fi and dash-mounted LCD. The goal would be to enhance existing production infrastructure to gather V2V and V2I information that is then distributed back via application.

Possible Demonstration Strategies

- NW BRT Electric buses that have sensors providing continuous pavement and weather conditions and traffic congestion monitoring
- NW BRT buses and fire and ambulance vehicles with collision avoidance sensors with Dedicated Short Range Communication (DSRC) technology
- NW BRT electric buses that have sensors that “request” the bus to stop due to a request by an on-board or even roadside passenger with a disability
- Enable electric vehicle-charging grid-to-vehicle (G2V) wireless inductive charging technology at designated EMBARK parking garages, and potentially on one lane at a designated NW Expressway intersection.

T3. Intelligent, Sensor-based Infrastructure

“Collect and report real time data regarding traffic, pedestrian, bicyclist, environmental, etc”.

Oklahoma City’s Initiatives

The City’s current ITS system is fully capable of a variety of information gathering sources such as:

- Public Works, Water, and Transit vehicles attached with sensors to assess road conditions, real-time temperatures, provide back current “drive speed”. Additionally, for the purpose of de-icing, plowing, and proactively being prepared to do so. Via this sensor information, “geo-fences” could be transmitted to City and other vehicles to warn motorists and possibly automatically engage traction control in response to the advertised potentially slick surfaces in geo-fenced areas.
- The City and its Public Work’s Department is already committed to traffic signal priority (TSP) for buses in various locations, and for BRT.
- All buses are already equipped with an array of smart technology, such as infrared passenger counters linked to GPS data, on-board voice annunciators, and more.
- Traffic intersections equipped with Wi-Fi detection and algorithm assessment to determine traffic delays/jams.
- In Car “Storm/Tornado” Warnings; a driver listening to music at a high volume in their car may not be fully aware of a pending weather threat. It is possible to broadcast the City of Oklahoma City’s Public Safety Early Warning system through an app based either on a smartphone platform, other device, or in

a smart car. This way a person needs not rely solely on the outdoors ground-based audible siren system.

- Transit bus stop platforms equipped with “call buttons” when activated request the bus to stop. Not activated, the bus need not stop decreasing drive time and emissions
- Aside from these, the city already as number of crosswalks that “flash” to warn motorists once a person walks past the sensors mounted in the bollards, and more.

Possible Demonstration Strategies

- Roadside sensors which detect the NW electric BRT buses and then trigger overhead mast-arm signs (imagine LED signs with green circles and red x’s) to tell motorists to clear out of the BRT lane since a bus is approaching.
- Roadside sensors which detect NW BRT buses and communicate to visually and/or hearing impaired (communicated in a medium preferred by the passenger).
- Traffic signal priority for BRT.

14. Urban Analytics

“Use of analytics to address complex urban challenges (e.g. personal safety and mobility, network efficiency, and environmental sustainability) and/or measure the performance of a transportation network.”

Oklahoma City’s Initiatives

The City’s ITS system can be enhanced to provide way-finding for all modes of transportation (pedestrian, cyclist, transit rider, private automobile, etc.) via an application that could be accessed via smart device, positioning to then be integrated into vehicles equipped with Wi-Fi and dash mounted LCDs.

Possible Demonstration Strategies

- Work with OKC I.T. and private sector to develop systems to better track patterns and carbon footprints of users of any small-party vehicle serving as a taxi, Uber, Lyft, car share (and so forth), to help determine if a new public transit route or other service is needed.
- Work with OKC I.T. and US Fleet tracking to better track paratransit vans and amend the operators’ routing and pick-ups in a dynamic timeframe, especially in ridersheds near the NW BRT.
- Provide open source data so that travelers create apps and gain up-to-date mapped info about pedestrian crossing signals that are absent or out-of-service.
- Provide open source data so that travelers gain even easier access to info on bus detours near where they went to board.

15. User Focused Mobility Services and Choices

“Strategies, initiatives, and services that increase transportation choices and options by supporting and improving mobility for all travelers, such as advanced traveler information systems that provide real-time traffic, transit, parking, and other transportation-related information. Also includes bike share and car share – mobility on demand”

Oklahoma City’s Initiatives

The City’s infrastructure is positioned today to “feed the machine” information required for an informed citizenry. This can be accomplished today via a smart device that can then be integrated into a car with Wi-Fi and dash LCD to inform citizens of such alerts as parking availability, city events and updates on various modes of transportation.

WeGoLook (<https://wegolook.com/>) is an innovative sharing-economy startup from Oklahoma. WeGoLook (<https://wegolook.com/how-it-works>) is part of the sharing economy and started on the concept of, “I had a bad experience on eBay, and how can I fix that to put some eyes on what I am actually buying and reduce my risk as a purchaser?” It can also be seen as a way for people to evaluate various mobility on demand (MOD) approaches and various smart deployments used here and around America.

Possible Demonstration Strategies

- Develop user-friendly strategies, ones that even the less savvy can and will want to learn. These can increase transportation choices and options for aging Americans and persons with disabilities by advanced traveler information systems that provide real-time info about shared rides (Uber, Lyft, etc.), nearby taxis, the local iTN vehicles, EMBARK’s STEP and CMP vans, worker vanpools and more.
- Develop other related Mobility on Demand (MOD) software platforms, such as for bikeshare.

16. Urban Delivery and Logistics

“use of data or deployment technology”

Oklahoma City’s Initiatives

Oklahoma is one of the key cross-roads west of the Mississippi with large volumes of from, to, within, and through urban freight flows. Like any other city, OKC’s economy is largely based on efficient freight logistics for citizens and businesses.

By following the sharing economy concept, it can develop a suite of web and mobile APPs and relevant ICT technologies to

drastically improve the efficiency and cost of urban goods movement, including U-Ship, U-Store, U-Buy, U-Park, and U-Receive, in the Smart zone or in the broader city. Each of these would be based on voluntary and screened matching of individual supply (resources) and demand (needs) perhaps better than UberRUSH.

Possible Demonstration Strategies

- **U-Ship** - So far, the standard urban goods movement is based on delivery by logistics firms on highways. However, there are many privately owned cars, vans, floral delivery vehicles, and other delivery trucks that could participate in shipping goods for households and businesses. The web and mobile APP would allow people/businesses with vacant vehicles to match to people/businesses who need shipping. This would reduce freight traffic and cost. This would virtually allow everyone to be able to SHIP goods for everyone else in the city.
- **U-Store** - Storage and warehousing is an important part of any urban goods movement. U-Store web and mobile APP would match individual and business storage spaces (ranging from room/garage/land to distribution center) for those who need store goods. This would virtually allow everyone to be able to STORE goods for everyone else in the city.
- **U-Buy** - A huge portion of urban traffic is shopping related including to and from local retail stores. This could conceivably be linked to Oklahoma-based “WeGoLook.” On line shopping or e-commerce drastically changes the traditional local retailing. However, U-Buy proposed here could revolutionize the retailing and at the same time reduce

urban traffic. U-Buy web and mobile APP would match local shoppers in retail stores to those living nearby who are not in stores but want to buy goods in real time. The shoppers will buy and deliver goods for to the nearby households. This would virtually allow anyone to be able to BUY goods for some others in the city.

- **U-Park** - One major problem in a city is parking, which may be hard to find and costly. The U-Park web and mobile APP would store all parking spaces in Oklahoma City and match the spaces to those who need in real time. This is based on a sensor-based technologies to monitor all parking spaces with easy maintenance and low cost. This would virtually allow people to be able to locate a suitable PARKING space in advance.
- **U-Receive** - One major problem in urban goods is multiple deliveries due to households/Businesses not in. This U-Receive web and mobile APP will allow households/businesses to sign up their trusted neighbors and match their presence to good delivery. This would guarantee only one delivery to receive goods/packages for every household/business.

The above sharing economy web and mobile application suite, plus proper ICT technologies, can be developed together with the ITS passenger transportation (both auto and public transit) for the same Oklahoma City test site and its performance can be compared with households and businesses not using these application suites to capture the differences and improvements.

Work with OKC I.T. and others to link shopping services to the COTPA STEP van program so that passengers may subscribe to STEP to ride-an-shop, as well as to order-

and-wait for the STEP van delivery of food
 Work with OKC I.T. and others to link prescription pick-up services for older adults and the frail elderly to floral delivery, COTPA STEP van, and iTN programs

17. Strategic Business Models and Partnering Opportunities

“Leveraging creative strategic partnerships that draw in stakeholders”

Oklahoma City’s Initiatives

The City of Oklahoma City builds, and has been recognized for building, the “successful models”. Verizon awarded Oklahoma City its Smart City award on September 1, 2015. Any of the technology partners with which the City of Oklahoma City has engaged to develop the existing Smart City model currently in production have the incentive to fully engage with the City to further develop solutions. Some current examples are:

- **Transit**
Trapeze
- **Fleet Management**
Verizon
RSI
- **Traffic**
Trafficware
- **Parking**
SkiData
- **Road Surface/Atmospherics Monitoring**
WeatherCentury
- **Snow Routing**
CityWorks
Plowing
Treatment for ice

- **Utilities Route Optimization**
SAP
- **Connectivity**
Aruba
Verizon
OneNet
- **Citizen Facing App**
Aruba

some short (under 300') EAR test segments near lower speed areas such as toll booth plaza “rumble” strips zones, and some highway entrance ramps

- **User Friendly Software Interfaces:**
Among the strengths of Dell, Objectstream, the OKC I.T. Department, ODOT, Steer Davies Gleave, and others there is potential for great success.

Possible Demonstration Strategies

For the City of Oklahoma City to work with various companies and the engineering colleges of OU and OSU is the heart of this. Not all of these potential partners have been able to meet with the City yet. Some prospective examples:

- **Self-driving (or automated) streetcar:**
Brookville Equipment Corporation is the firm whose streetcars will be used. Dallas (200 miles south) has had a very positive experience with the Brookville streetcars overall and even with their onboard energy storage devices. The City would partner with them and conceivably with Google or another firm with some proven “self-driving” technology, as well as with some secondary partners such as a university.
- **Energy Absorbing Roadways (EARs):**
OGE (Oklahoma Gas and Electric) and Oklahoma City’s existing relationship with General Electric (GE), and with an University Transportation Center (UTC) would be a way to pilot some Energy Absorbing Roadways (EARs) that actually “generate” electricity from the kinetic energy of passing vehicles. The energy could be used to power some NW BRT stations’ lighting and other power needs. The City could also partner with ODOT, the Oklahoma Turnpike Authority (OTA) via the Oklahoma City Public Works Department to also install

Letters of Commitment Sought/Being Sought by the City of Oklahoma City:

- Association of Central Oklahoma Governments
- Boeing
- Brookville Equipment Corporation
- Clean Cities Coalition (of ACOG)
- Dell
- Devon Energy
- Downtown OKC Inc.
- FedEx
- Francis Tuttle Career Tech
- General Electric (GE)
- Google
- Greater Oklahoma City Chamber of Commerce
- INTEGRIS Health
- Loves Country Stores
- NewView Oklahoma
- Object Stream
- OGE (Oklahoma Gas and Electric)
- Oklahoma City Housing Authority
- Oklahoma City Economic Development Alliance
- Oklahoma Department of Transportation
- Oklahoma Turnpike Authority
- Shiels Obletz Johnson (SOJ)

- Steer, Davies, Gleave
- US Fleet Tracking
- University of Oklahoma Intelligent Transportation Systems Center
- University of Oklahoma, School of Regional and City Planning

18. Smart Grid, Roadway Electrification, and Electric Vehicles

“Leverage the smart grid – a programmable and efficient energy transmission and distribution system”

Oklahoma City’s Initiatives

The City already has a limited deployment of charging stations with the limitation to further expansion being budget.

Possible Demonstration Strategies

- Enable electric vehicle-charging [grid-to-vehicle (G2V) wireless inductive charging technology at a EMBARK garages and perhaps on one lane at some busy NW expressway intersections (Classen at NW 23rd): one allows electric vehicles to charge their batteries wirelessly while the vehicle is parked, and the other while either stopped or in motion along that part of the roadway
- As stated in Element 7 above, work with the engineering colleges of OU and OSU, General Electric (GE), OG&E or with a University Transportation Center (UTC) to pilot some Energy Absorbing Roadways (EARs) that actually generate electricity from passing vehicle for some NW BRT stations
- “Green” street lighting integrated into the ITS

19. Connected, Involved Citizens

“Public outreach and connectivity”

Oklahoma City’s Initiatives

This element speaks to “incentivizing” participation. The key here is “How do Wi-Fi providers accomplish “Opting in” for participation today?” The City has researched and discussed the various ways in which a citizen would have incentive to participate. Once the app is established and available, the value thereof will be easily and quickly grasped. Our biggest “salesman” may well be word-of-mouth. However, vendor participation with discounts, access incentives to events in City owned facilities (Chesapeake, Cox, State Fair), the list goes on and on. The only limitation becomes how extensive the underpinning app needs to be.

Possible Demonstration Strategies

- Create attractive incentives and a staffed agency and an automated “humanlike” software system that tutors the older adult “how” to become a connected, involved citizen to use the new software/systems and about the wide range of mobility options
- Engage and inform citizens along with Google Fiber by deploying hardware, software, and open data platforms in an effort to increase personal mobility.
- Spawn a data exchange for crowdsourced data to provide communication conduits through mobile technologies to connect citizens with city mobility-related entities

S10. Architecture and Standards Unknown (ITS software)

“Use of CVRIA (Connected Vehicle Reference Implementation software), the National ITS Architecture, and published and under development ITS standards. Integration of ITS Systems”

Oklahoma City's Initiatives

Any pre-existing standard, CVRIA, National ITS Architecture, etc must be considered and employed during further enhancement of the City's existing production infrastructure.

Possible Demonstration Strategies

- Work with City ITS, Google Fiber, and local universities to use the National ITS Architecture along with the Connected Vehicle Reference Implementation (CVRIA) to help connect ITS infrastructure and connected vehicle capabilities along with interface information needed for standards selection.
- Use the local architectures in a demonstrate integration of local ITS systems with other systems which comprise a smart Oklahoma City.

S11. Low cost, efficient, secure, and resilient Information and Communications Technology

“Advance information and communications technology (ICT) – also includes the collection of Personal Identifiable Information – implementing this collection is left up to the Smart City to decide if they want PII or not”.

Oklahoma City's Initiatives

Smart data harvesting of information freely available through the air, such as with the ITS controller based WiFi module and currently scheduled as a pilot project at City

intersections.

Possible Demonstration Strategies

- Work with OKC IT and other parties to implement the required Dedicated Short Range Communication(DSRC) technology operating in the 5.9GHz range in any demonstrations of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) applications, to advance information and communications technology (ICT) in accordance with the aims of the USDOT Smart City challenge
- Develop local ICT consisting of unified communications and the integration of telecommunications, computers as well as necessary but affordable enterprise software, storage, and visualization systems, which enable users to access, store, transmit, and manipulate information. All done with an eye to citizens' privacy and security.
- Projects to ensure both physical security of the deployed devices and security for non-DSRC communications will be addressed for self-driving vehicles and other applications.

S12. Smart land use

“strategies and practices that ensure land use is optimized through a combination of planning and innovation deployments...”

Oklahoma City's Initiatives

planOKC, adopted in July of 2015, is the City's new comprehensive plan. planOKC provides long range policy direction for land use, transportation, economic development, housing, public services, and natural and cultural resources. It serves as a guide for elected and public officials by establishing policies and priorities, and providing the

framework for evaluating development proposals. It expresses our community's vision and priorities, and describes, where, how, and in some cases, when development should occur. The plan emphasizes seven themes and focused on sustainable, compact growth scenarios:

- Develop a transportation system that works for everyone.
- Increase housing choice and diversity for all lifestyles.
- Build an urban environment that facilitates health and wellness.
- Develop great places that attract people and catalyze development and innovation.
- Ensure safe, stable, attractive and vibrant neighborhoods.
- Develop efficiently to achieve fiscal sustainability and improve our quality of life.
- Preserve rural character and natural resources.

Possible Demonstration Strategies

- Implement the Transit Oriented Development (TOD) policies and regulations as recommended in planOKC that are located within the Demonstration Project area, as well as planning, zoning, financial, and development incentives for appropriate mixed-use, compact, walkable development for some model blocks near designated NW BRT stops and near designated streetcar stops.
- Beyond just land use patterns and sidewalks and a sense of community and place (placemaking), add technology innovation deployments of fiber, message signs, sensors, illumination, disability friendly hardware/software,

infrared pedestrian and cyclist-counting, and other deployments on and near model blocks to lead to a better connected community to access to employment, groceries, housing, education, socialization, and health services.

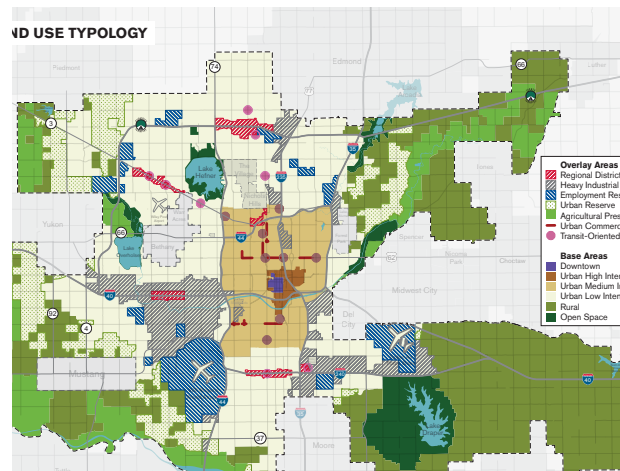


.....
62% of residents support controlling service costs through land use regulations that encourage more efficient growth and development patterns.

- planokc *Citizen Survey* (2013)

REDUCE EMISSIONS

.....
69% of Growth Scenario Workshop participants indicated that the City should guide new development so that it is more compact, walkable, and transit friendly, thereby reducing automobile emissions.





Oklahoma City's Risk Mitigation Plan

In regard to key technical, policy, and institutional risks associated with the deployment vision. In any case, we are confident all risks can be mitigated.

In terms of policy risks, for example, there will be a wide range of traffic laws which will require review and potential amendment in order to prepare the public and minimize risk. These will be necessary in regards to both BRT and streetcar, but also as warnings to motorists about the locations of certain Smart infrastructure located just ahead. Many of these will relate to public safety. The technical risks will need to be developed alongside the technology, vehicle, smartphone, and other private sector vendors.

One institutional concern is proper staffing to accomplish the additional City roles called for in order to manage the \$50m grant. Whether the role of the Planning Department, I.T., EMBARK, or Public Works, each needs to be able to hire more full time staff or contracted staff in order to mitigate the risk.

Any conversation about providing an effective umbrella to citizens requires gathering data, assimilating data and disseminating data in an easily accessible manner to provide the answer of the moment needed by a citizen accessing the app.



Oklahoma City's Partners & Stakeholders

This section outlines team partners, key stakeholders, and demonstration governance processes. It describes existing and future public and/or private partnerships, including university research partnerships.

The City of Oklahoma City will work closely with COTPA as a key partner. COTPA's transit agency "face" is EMBARK, and it will help implement various demonstration strategies. Within the City its Public Works Department, the Planning Department, the Information Technology Department, Transportation and Parking Department, Municipal Counselor, Department of Finance, Public Safety Department, and the MAPS Project Office staff will also play a key role.

Outside key stakeholders include the agencies that were consulted during the preparation of the grant application as well as other companies and agencies. In fact, the City hosted two meetings of potential partners on January 20 and 26 and the University of Oklahoma Center for Intelligent Transportation Systems. Attendance sheets from these are available on request. Some have already provided letters of commitment, and other stakeholders and partners are at varying stages of discussion with the City and COTPA. Aside from major private sector firms with an OKC presence such as General Electric, there would be prospective partnerships for workforce development and social inclusion.

One, for example could be with Francis Tuttle Career tech's Automotive Technology Program so they could perhaps help with

some storage and servicing of the self-driving car loop from BRT to there. Another could be a “Coding School” in the Ralph Ellison Library at 23rd and Martin Luther King Blvd. for teenagers. The potential for partnerships to the public housing complexes for the older adults as has been addressed elsewhere. NewView Oklahoma’s letter shows their role in the blind community and the community at large.

There will be a need for only a modest demonstration project governance process, and the City will establish a Smart City Zone Advisory Board to be staffed by either the Planning Department or in another single department. Only a small governance structure is needed because at 600+ square miles, the City has so many of the metropolitan area’s regional trust authorities, and encompasses all but less than a square mile of the Smart City zone. Also, because Oklahoma City’s City Council and its various appointed bodies already function as an effective well integrated whole. The City has had experience with university research partnerships, such as through the OU Institute of Quality Communities (IOC) and looks forward to working with the Southern Plains Transportation Center.

The Zone’s Advisory Board will be an ad hoc board designed to exist through implementation for at least two years after the close of the grant to help ensure accountability on the various projects implemented. Its more specific structure will be determined further in the Finalist application due in May 2016, but it should contain at least three elected officials, as well as a representative of the Chamber of Commerce and from five private companies, COTPA, at least one nonprofit, ODOT ITS staff, the Southern Plains Transportation Center (USDOT Region VI), the Association of Central Oklahoma Governments (ACOG),

the University of Oklahoma’s ITS center, and also three City staff as ex- officio members. The Board will meet at least six times per year and will be advisory to the City Council.

The prospective list of project supporters and stakeholders is larger than the Advisory Board and has emerged so far to include:

- Association of Central Oklahoma Governments (ACOG)
- Boeing
- Brookville Equipment Corporation
- City of Warr Acres
- Clean Cities Coalition (of ACOG)
- Dell
- Devon Energy
- Downtown OKC Inc.
- Fed Ex
- Francis Tuttle Career Tech
- General Electric (GE)
- Google
- Greater Oklahoma City Chamber of Commerce
- INTEGRIS Health
- Loves Country Stores
- NewView Oklahoma
- Object Stream
- OGE (Oklahoma Gas and Electric)
- Oklahoma City Housing Authority
- Oklahoma City Economic Development Alliance
- Oklahoma City University
- Oklahoma Department of Transportation
- Oklahoma Turnpike Authority
- Shiels Obletz Johnson (SOJ)
- Southern Plains Transportation Center (USDOT Region VI)
- Steer, Davies, Gleave
- US Fleet Tracking
- University of Oklahoma
- College of Architecture, RCPL Division
- University of Oklahoma
- Center for Intelligent Transportation Systems of the School of Electrical and Computer Engineering



Oklahoma City's Existing Conditions

Lane Miles

Oklahoma City is in the top five largest continental United States cities in geographic area and spreads into four counties: Oklahoma, Canadian, Cleveland and Pottawatomie. To accommodate this geographic area, Oklahoma City has 1,273 lane miles of Arterials, 478 lane miles of Freeways, 3,057 lane miles of residential streets and 93 lane miles of streets in downtown Oklahoma City.

Transit Services

The City of Oklahoma City and parts of various suburbs are provided transit services through EMBARK in a service area larger than 200 square miles of the Oklahoma City Urbanized Area (UZA). The Central Oklahoma Transportation and Parking Authority (COTPA) is the transit authority's legal name and through EMBARK it currently operates twenty-one (21) local routes and an express route to/from Norman to the south. Because COTPA is an authority of the City, the ability to work closely with the I.T., Public Works, and other City departments has a good track record. This harmonious relationship is anticipated to continue should COTPA/EMBARK emerge as an independent regional transit authority in 5-10 years.

COTPA employs a fleet of 59 buses for EMBARK, plus 24 paratransit vans, an 8 station bike share program, and three ferry boats. . By mid-2015, as a part of COTPA's 2004 I.T.S. Plan, COTPA had added Wi-Fi to all the buses for use by the customers. Since 2013, EMBARK has used GPS tracking to manage the buses. The EMBARK website features on-line trip

planning for customers.

In October, 2014 EMBARK launched an open data portal that provides access to static and real-time GTFS feeds by way of individual API-Keys. The API keys allow COTPA to know who is accessing data, while providing developers, stakeholders, and the community at-large with transit open data sets. This machine-readable data is accessible, discoverable and usable by the public for entrepreneurship and innovation.

In 2013 COTPA hired the firm of Nelson Nygaard and Associates to evaluate the bus route network and to make recommendations to streamline the fixed route network and help almost all routes maintain a 30 minute frequency. In April 2014 most of the route network changes were made, and ridership has increased 4-9% in year-to-year comparisons by month. In addition, four new night-time fixed routes have been added, as well as nighttime complementary paratransit.

COTPA's transit plans for the future include bus rapid transit (BRT), traffic signal priority (TSP), and a funded modern rail streetcar project. The most likely initial high capacity transit transporting passengers to and from the Downtown is the 8-12 mile Northwest BRT corridor which will use a combination of Classen Boulevard and the Northwest Expressway, as mentioned elsewhere in the Smart City application. COTPA will be responsible for operations of the \$100+ million MAPS3 rail streetcar circulator which will start serving the Downtown in 2018, and this will feature a variety of advanced technologies.

COTPA contracts with a firm called Airport

Express for the operation of some night-time point-deviation routes called Link for EMBARK. The routes serve a designated area and stop at major activity centers on a regular schedule. Passengers call to schedule a pick up at the curb for non-scheduled stops. The three routes meet up on the hour with the four EMBARK night time fixed routes at the Hudson Avenue Transit Center so that timed transfers are possible to and from fixed route buses and other Link routes.

The circa 1930 Santa Fe RR Depot will eventually come on-line to serve as a transit center in addition to the Hudson Avenue Transit Center. The downtown Santa Fe Hub received a \$13.6 million TIGER V grant, and is intended to someday serve the planned regional commuter rail and other modes. In the meantime, it will anchor the northwest BRT corridor, a corridor which gained federal support as one of only two transit corridors in American selected for the USDOT's 2015 Public Health and Transportation Corridor (PHATCP) framework beta test. The Santa Fe Station will be served by the streetcar in 2018, and will be a location for other modes including bike share, car sharing, and more.



Shared Use Mobility Services

The Metropolitan Planning Organization (MPO) known as ACOG is a great partner

in regional transportation planning and also manages the region's carpool/ rideshare program. The service's database matches commuters who are able to share a ride to and from work, school or other destinations. EMBARK has been exploring the start of a smart vanpool program with various private vendors.

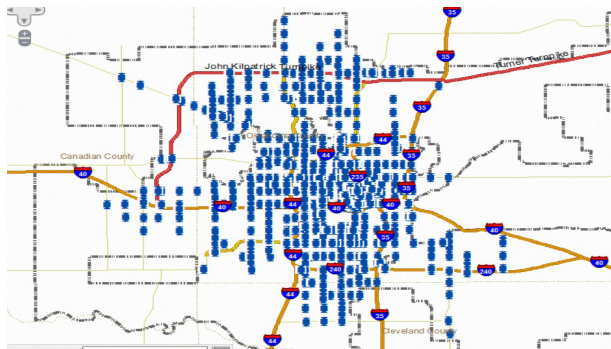
The non-profit ITN Central Oklahoma and RSVP are two shared use services in the local sharing economy. The former is mobility on demand "lite" program (<http://www.itncentraloklahoma.org/>) and is an affiliate of the national network called ITN America. It is less expensive than Uber or Lyft for customers and is a bit more sophisticated than COTPA's partnership with the Retired and Senior Volunteer Program (RSVP) Provide-A-Ride program. Provide-a-Ride originated locally and is a donation-based service utilizing a few dozen older adult volunteers monthly who use their own vehicles and RSVP's insurance to transport frail or elderly persons to and from medical appointments.

Also, in the private sector the transportation sharing economy services like Uber, Lyft, and Enterprise car sharing are growing in this region. These provide much mobility on demand (MOD). The sharing economy, however, is also growing in non-transportation sectors that could play a role in MOD. For example, "WeGoLook is one of the most exciting startups in Oklahoma," according to former State Treasurer Scott Meacham. WeGoLook (<https://wegolook.com/how-it-works>) is part of the sharing economy and started on the concept of, "I had a bad experience on eBay, and how can I fix that to put some eyes on what I am actually buying and reduce my risk as a purchaser?" Once one thinks about the WeGoLook sharing economy model and the nationwide network of "Lookers," one sees it

as way for people to have a resource that no one else has to help evaluate various MOD approaches and various smart deployments used here and around America.



Finally, EMBARK is also responsible for the only municipal bike share program in the region, Spokies. Spokies was assumed by EMBARK in 2014 after having been managed for several years by the downtown business association. In 2016, EMBARK will be replacing the fleet with smarter bikes and a better customer software interface.



ITC and ITS

With regards to Information and Communication Technology (ICT), Oklahoma City utilizes ITC to address congestion management issues with the integrated traffic controls systems that have been implemented at 748 intersections throughout the 600+ square mile city. This application reduces vehicle travel times and minimizes emissions. The OKC Public Works Department's Traffic Design and Engineering Section is involved in planning,

designing, and implementing new traffic control devices and improving existing traffic control devices. The City has a sophisticated control room from which remote control can be achieved when needed. The Data Collection and Planning Section provides staff for the Unified Planning Work Program in cooperation with the Association of Central Oklahoma Governments, the Oklahoma Department of Transportation, and the Central Oklahoma Transportation and Parking Authority.

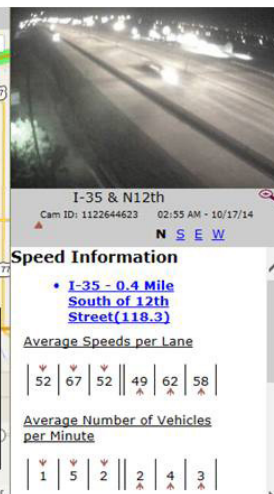
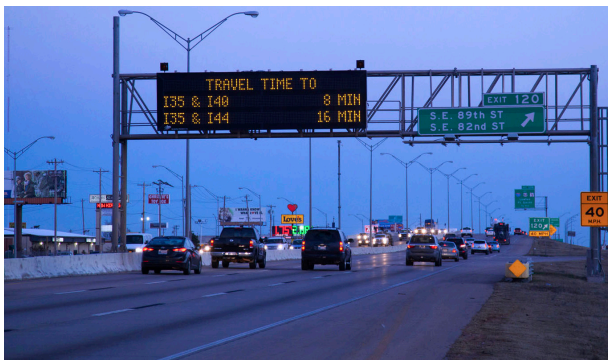
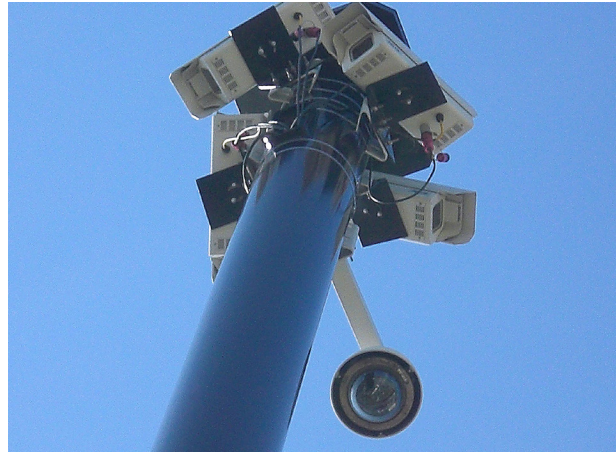
The OU Center for ITS, one of our team members, has collaborated with ODOT to develop and deploy a main TMC that is currently operational and is located off the first floor lobby at ODOT headquarters.

In partnership with ODOT, OU has also developed and implemented the only fully virtual TMC in the United States; it has been operational for years and there are virtual



TMC “ITS consoles” already operational in several locations in OKC. The Oklahoma virtual TMC is documented and has been recognized in a recent (Nov 2014) FHWA Technical Report.

There is also substantial ITS infrastructure on the highways in OKC metro that OU has developed in partnership with ODOT. These are all state-level assets that currently operate independently from the city owned and operated infrastructure. Achieving higher levels of integration and interoperability between state and municipal ITS assets is included in the City's Demonstration Project. The successful integration between ODOT's ITS assets and OKC's ITS assets could obviously generalize to other cities.



Smart Grid Infrastructure

The Central Oklahoma Transportation and Parking Authority (COTPA) manage most of the downtown multi-level parking garages available to the public. Aside from allowing the monthly customers gratis access to EMBARK's Downtown Discover circulator bus, COTPA has already installed stations for electrical vehicle charging in one garage. COTPA and the City have been in preliminary discussions for siting a high energy charger station in the Downtown. COTPA has met with a vendor to explore adding other electric car charging stations in the garages.

There are several electrical vehicle charging stations here as the map below indicates, and usage of electric vehicles should mirror national trends. There are perhaps not as many charging stations as there are fueling sites for compressed natural gas (CNG) automobiles and trucks, but there are enough to serve many electric vehicles. CNG vehicles are very popular with households here due in part to the major oil and gas companies headquartered here such as Devon, Chesapeake, and Continental Resources and yet this shows the local interest in moving beyond the gasoline combustion engine.

In addition, Oklahoma City has built several CNG fueling facilities with public access and is in the process of converting much of the City's automobile, truck and bus fleets to CNG.





Oklahoma City's Data Collection

The City of Oklahoma City in 2009 began, and has since completed, integrating all traffic control intersections into a centrally connected, centrally managed ITS system. The initial intent of this initiative was to reduce drive time and lower emissions. The deployment today encompasses 748 City intersections. The goal of reducing drive times and, subsequently gasoline consumption and reduced emissions, has been accomplished. However, the opportunity to further enhance this goal is available through addition of an adjunct application that removes the human element and makes real intersection-to-intersection automated communication to move cars more rapidly across corridors based on addressing real-time the presence or absence of traffic in the opposing direction.

Each intersection controller is capable of far more automation providing increased value to the citizenry through data collection and dissemination back into the system providing, then distributed via application back to the citizenry. The City is currently engaged in pilot programs to explore the addition of available modules. Specifically pilots underway are in the areas of CCTV and in-vehicle WiFi assessment: regardless of the WiFi presence being on-board vehicle or in-car carried smart phone/tablet.

The City's current production Parking application is capable of "advising" real-time space availability. Lack of funding is an obstacle to exploring more aggressively all that the app is capable of collecting and feeding back into the central system.

The limitation for V2V today is the current availability of the vehicles themselves. It is possible today to enhance existing City

of Oklahoma City production applications to "be ready" for such a time that vehicles "catch up" to what is possible. Today, V2V can be accomplished by gathering metrics from the current production City infrastructure and providing the information back to drivers through use of an application that is accessed via smart device: phone or tablet. Any information gathered today and then accessed via smart device can be seamlessly incorporated into vehicle technology, WiFi and dash-mounted LCD, when the manufactures are proven the value of the information provided. The goal would be to enhance existing production infrastructure to gather V2V and V2I information that is then distributed back via application.

Among the sharing candidates already available for use and growth is the transit passenger data. In October, 2014 EMBARK launched an open data portal that provides access to static and real-time GTFS feeds by way of individual API-Keys. The API keys allow COTPA to know who is accessing data, while providing developers, stakeholders, and the community at-large with transit open data sets. This machine-readable data is accessible, discoverable and usable by the public to fuel entrepreneurship and innovation. This is just one example of the local government commitment to integrating with the sharing economy.

Discussing the concept of a "virtual" dedicated lane for bus traffic, the City's current production ITS system is capable, today, of providing "priority" to emergency dispatched public safety vehicles. This is accomplished by "clearing" intersections

of existing traffic prior to the public safety vehicle arriving through traffic signal priority (TSP). This same, currently production technology is being leveraged now to serve buses at high-priority locations.

The existing production Traffic ITS deployment has many options for detection: radar, CCTV, infrared, thermal, side-sensors, WiFi detection. Some of these are currently in production, in pilot or scheduled for pilot at various City intersections.

The key to success and a key for which the City of Oklahoma City today is already positioned to fully deploy and leverage is data harvesting and data dissemination in a clear, concise, accessible app that easily provides only the single answer of the moment. The key to this is two-fold: gathering information from as many sources as possible then providing back in a clear, cohesive manner just the information a person or group requires merely for the task at hand. It is entirely possible to provide everything listed below via application developed that, today, would be accessed via smart device, positioning to then be integrated into vehicles equipped with Wifi and dash-mounted LCDS.

1. Way-finding from point A to B, for all transportation modes including:
 - Pedestrian
 - Public transit
 - Bicycle
 - Personal vehicle
 - Corporate vehicle
 - Taxi, or sharing economy services
2. Environmental assessment
 - Effective routing
 - Time-based traffic congestion
 - Real-time alternate routing
 - Resources/paths to be more fully

- utilized
 - Planning for future corridors/arteries
- Carbon footprint

3. Again, the City infrastructure is positioned today to input the data required for an informed citizenry. The key will be the application, available today via smart device that can then be incorporated into a car with WiFi and dash LCD.
 - Parking availability
 - Trend
 - Real-time availability
 - City Events
 - Offer many opportunities to again incentivize citizen participation via downloading of the app.
 - Shows/Concerts
 - Games
 - Festivals
 - Dining
 - Transportation
 - Bus stop locations
 - Alternatives for persons of age or disability
 - Information and access to alternative transportation
 - Shared-ride/pool opportunities
 - Bicycles
4. The idea here is for a person, either urban area dwelling or arriving at Will Rogers World Airport or Greyhound Bus station, to immediately have access, via smart device app, access to any information required to make an informed decision about where to go, how to get there and what is available to do.

The key to success is twofold with support staffing being the major issue that needs to

be addressed.

Staffing required to:

1. Engage vendors, pick-up and delivery, for participation
 - Develop the vendors presence for inclusion on the app
2. That accomplished, any citizen who has opted to download the app has full access to any of the available services.

“Incentivizing” participation. The key here is “How do WiFi providers accomplish “opting in” for participation today?” The City has extensively research, discussed and vetted the unlimited ways in which a citizen would have incentive to participate. Once the app is established and available, the value thereof will be easily and quickly grasped. Our biggest “salesman” will be word of mouth. However, vendor participation with discounts, access incentives to events in City owned facilities (Chesapeake, Cox, State Fair), the list goes on and on. The only limitation becomes how extensive the underpinning app needs to be.



Oklahoma City's Existing Standards, Architectures, and Certification Process

The key to this item is the information and metrics to be harvested. The City's primary responsibility to assist architecture and standards developers will be to provide access to the vast amount information and metrics that are being gathered today that establishes a baseline and access to the information after installations are enhanced. In regard to ITS, the City has leaned on partner subject matter experts to assist in making sure existing standards, methodologies and architectures are followed when developing and implementing solutions. To the degree that the City is now looked to as “The Solution” regarding network connectivity and approaches as the model for ITS deployment of the future.



Oklahoma City's Goals & Objectives

The City of Oklahoma City is committed to providing measurable goals and objectives for its vision. The City has had an internal data and performance management system called Leading for Results (LFR) for nearly ten years (<http://data.okc.gov/applications/lfrforcitizens/forms/LFRMetrics>), and is well prepared to add, collect, analyze, and learn from its Smart City measures. The actual measurable goals and objectives will be developed in an early step of preparing the Smart City Challenge Finalist's application due in May 2016.

These will be developed in conjunction with the City's Finance Department and with the Metropolitan Planning Organization (MPO). The MPO, the Association of Central Oklahoma Governments (ACOG), has already been asked to help create the set of targeted performance measures that relate to the primary impact of the proposed deployment and these will be generated and used. ACOG is currently upgrading some regional transportation performance measures and so is a great resource for defining Smart City Challenge measures. As a municipal government, Oklahoma City has been committed to looking strategically at all of our programs, the services they provide and the way they are provided. Oklahoma City uses the LFR performance management to link each department's operations to a strategic business plan, and can create a system for the Smart City zone project. Each department's strategic business plan is updated every other year and is organized into programs with each program having an approved budget and set of performance measures.

In addition, independent evaluation will also be allowed and facilitated to allow validation of the system performance with respect to the targeted measures, to collect or infer needed contextual data, and to allow supplementary evaluation with respect to a broader set of measures of interest to the USDOT. The City of Oklahoma City will support the independent evaluator's access to material and locations, and to the City's staff to conduct evaluation-related experiments, interviews, and surveys.

Oklahoma City's approach for monitoring the impact of the demonstration on mobility, safety, efficiency, sustainability, and climate change will become more elaborate during the Finalist's application as well. In regard to transit and the self-driving car loops, for example, COTPA already has experience measuring for mobility (actual usage/ridership, geo-coded on-off data, vehicle on-time performance, customer complaints, and so forth), and COTPA also measures and acts on safety data. In regard to efficiency, basic measures such as customers per mile, round-trip, and hour will be developed. Measures for sustainability and impacts on air pollution and climate change will be possible.



Oklahoma City's Capacity & Commitment

The City of Oklahoma City (OKC) has the capacity to take on a project of this magnitude as evidenced by its successful management of large local capital programs as well as federal grant administration. In 1993, Oklahoma City voters approved a 1 cent sales tax initiative to fund \$350 million in capital improvements. Based on the initial success of the original Metropolitan Area ProjectS (MAPS) program, voters have approved two more extensions of that capital improvement program. The MAPS for Kids initiative was approved by voters in 2001 and invested \$514 million of sales tax and \$180 million in bond funds in the City's school districts. The MAPS3 program, approved by voters in 2009, is investing \$777 million in capital improvement projects throughout our city.

In addition to the MAPS program, Oklahoma City is successfully managing an \$835 million bond program to invest in local infrastructure. In addition, Oklahoma City has a proven track record of state and federal grant management, whether it is our annual allocation of CDBG funding or through competitive grant programs like the \$13.6 million TIGER grant that was awarded to the City in 2013.

With its executive commitment, Smart City Challenge private sector partners and other stakeholders, it is clear that OKC has the capacity to manage the Smart City grant. The executive commitment has been secured not only in the offices of both the Mayor and City Manager, but with several affected departments' directors. The executive commitment was also secured by the Oklahoma City Council on January

26, 2016. The City Council unanimously approved the resolution authorizing the submittal of an application to the USDOT for a "Beyond Traffic: The Smart City Challenge" Grant. The City has had an internal data and performance management system called Leading for Results (LFR) for nearly ten years, and is well prepared to add, collect, analyze, and learn from Smart City measures.



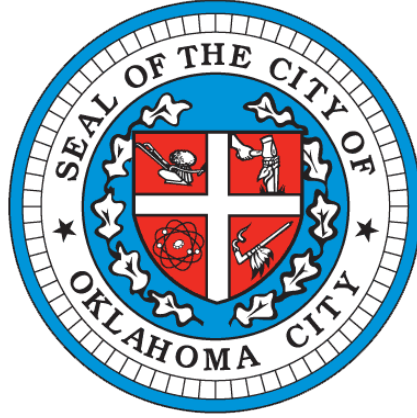
Oklahoma City's Leveraging Opportunities

The City of Oklahoma City is in excellent financial health, as noted in its AAA bond rating from Standard & Poor's and Aaa rating from Moody's Investor Service, which were reaffirmed in January 2016. These ratings put Oklahoma City in an elite group of major American cities with the highest ratings possible. Sound, conservative financial and debt management practices along with Oklahoma City's role as a regional economic center contribute to the City consistently maintaining a high rating.

There are opportunities to leverage Smart City and other Federal resources through cost sharing, in-kind staff assistance, and partnering. Private companies as well as the State DOT are likely to be Smart City Challenge partners who could offer some degree of leverage funds. Further, the City of Oklahoma City maintains a fund balance of at least 15% of its General Fund in operating reserves that can be used as local matching funds.

SMART KLAHOMA CITY





Σ M B A R K