City of Marysville

February 4, 2016

Secretary Anthony Foxx
U.S. Department of Transportation
Federal Highway Administration
Office of Acquisition and Grants Management
1200 New Jersey Ave., SE
Mail Drop: E62-204
Washington DC 20590
Attention: Sarah Tarpgaard, HCFA-32

Re: Port Huron/Marysville Smart City Challenge Grant Application

Dear Secretary Foxx,

We are pleased to submit this joint application for the U.S. Department of Transportation's *Beyond Traffic: The Smart City Challenge* on behalf of the cities of Port Huron and Marysville, Michigan. The Port Huron/Marysville Smart Cities Collaborative aims to be a leader in Smart City transformations that position similar communities throughout the United States to be more efficient, resilient, and connected.

The cities of Port Huron and Marysville are not world cities. What these cities are, in fact, is "Any Town, USA." From coast to coast, the American landscape is dotted with small- to-medium sized towns that must face the challenges of evolving into smarter cities. Port Huron and Marysville are perfect locations to implement the proposed pilot projects and identify best practices and new knowledge that can be transferred to any community in the U.S.

Our communities provide a real-world environment to test and advance smart innovations at a manageable scale – to tap into the potential of what a Smart City in the United States could be. We strongly urge your support of the Port Huron and Marysville proposal and look forward to participating in this innovative and exciting project.

Sincerely,

James Freed
City Manager
City of Port Huron

Randy Fernandez
City Manager
City of Marysville

1) Vision for the Port Huron/Marysville Smart Cities Collaborative

Introduction

The cities of Port Huron and Marysville, Michigan are rich in history, natural resources, cultural assets, and people. The fifth busiest international border crossing (Blue Water Bridge) in the United States and transportation assets that include deep water ports, mainline rail, airports and major expressways, St. Clair County is a major region for global economic trade. Positioned downstream from the Port of Halifax, and connected by Canadian National (CN) Rail and the 401/I-69 corridor, presenting increased cross-border trade and challenges related to logistics, freight movement, and traffic congestion.

With numerous manufacturing facilities located within a four-hour radius of 25 auto assembly plants, thriving industrial parks, and their proximity to critical logistics infrastructure, Port Huron and Marysville face a number of challenges related to supporting global supply chain trends of the future.

Connected and autonomous technologies present great opportunities to develop and test innovative solutions to address known challenges, create efficiencies, and establish best practices that can be replicated by communities across the nation and beyond.

Overview

Cities across the globe are leading a worldwide paradigm shift in how they use their resources more sustainably and how they leverage data and innovation in making their communities more resilient and livable. With aging infrastructure and public policy that is decades behind, it is imperative that communities across the United States take a proactive approach to implementing innovative solutions to facilitate open government, connected infrastructure, and a sustainable future.

The Port Huron/Marysville Smart Cities Collaborative aims to be a leader in Smart City transformations that position similar communities throughout the United States to be more efficient, resilient, and connected. The cities of Port Huron and Marysville are not world cities. What these cities are, in fact, is "Any Town, USA." From coast to coast, the American landscape is dotted with small- to-medium sized towns that must face the challenges of evolving into smarter cities. Virtually every county in every state has its version of Port Huron and Marysville.

Moreover, these cities are uniquely positioned at the nexus of the nation's fifth largest international border crossing with more than $40 billion in commerce between the U.S. and Canada every year. The size of these communities, combined with its proximity to critical infrastructure, an international border crossing, and a Great Lakes connecting waterway, make the Port Huron/Marysville area the perfect location to implement "smart" initiatives, to develop and test innovative new technology models, and create a road map for replication and scalable implementation for any community across the country. These innovations will be tested and implemented across jurisdictional boundaries, providing boundless opportunities for additional data sharing and collaboration.

Communities today acknowledge the need to create a more resilient economy and environment. In order to protect sensitive environments and critical resources, communities must work together with many partners to better protect and manage resources and to make service delivery more efficient for our citizens.

Vision Statement and Guiding Principles

The Port Huron/Marysville Smart Cities Collaborative has a grand, yet attainable vision:

> *The cities of Port Huron and Marysville will create a resilient and sustainable environment that will enable our citizens, businesses, and institutions to discover, innovate, and prosper in an open and collaborative way, facilitated by efficient government, good urban planning, connected infrastructure and emerging technologies, which integrate to develop knowledge and experiences to share across our communities and beyond.*

The Port Huron/Marysville Smart Cities Collaborative is grounded in eight Strategic Planning Principles:

1. **Improve Livability:** Ensuring our communities provide vibrant, efficient, and enjoyable experiences that create a high quality of life. Further, ensuring our citizens have access to a range of housing and transportation options, recreational amenities, and resources to improve overall health and wellness.
2. **Improve Connectivity:** Enhancing the movement of people and goods by improving our transportation network, implementing smart infrastructure solutions, and ensuring a high degree of digital connectivity in our communities.
3. **Ensure Community Sustainability:** Protecting and preserving our valuable natural resources, cultural amenities, and sensitive environments for future generations, as well as plan for growth and development that promotes fiscal sustainability.
4. **Promote Economic Prosperity:** Diversifying our tax base so our communities are fiscally sound and educating our people to prepare them for 21st century job opportunities. Promoting and supporting sustainable economic development, which includes fostering entrepreneurial growth, facilitating industrial development, revitalizing our downtowns, and creating high-skill, high-wage jobs.
5. **Improve Safety and Security:** Ensuring the ongoing safety and security of our citizens, our critical infrastructure, and community assets.
6. **Develop Community Resilience:** Taking a multi-sector, multi-jurisdictional approach to planning and preparing for change, disruptions, and shocks to our community systems. Increasing our resilience in order to decrease sensitivities to climate change and extreme conditions, reduce exposures to damage and loss, and increase our adaptive capacity.
7. **Foster Open Systems and Innovation:** Embracing a more open and transparent government, supporting open data, and fostering a balance between private and public information.
8. **Support Learning:** Collaborating with community partners to improve educational attainment, individual development, and community engagement within our neighborhoods.

Current Challenges

1) The Blue Water Bridge and the M-25/M-29 corridors experience significant periods of congestion, more idling vehicles, and increased vehicle emissions. Target objectives are to optimize traffic flow and reduce emissions.

2) There are three drawbridges in Port Huron, all of which cause seasonal traffic delays. The drawbridges operate on a timed frequency schedule, causing more congestion, idling vehicles, increased vehicle emissions, and increased bridge operation. Installation of smart infrastructure on the drawbridges could lead to a more efficient flow of traffic, reduce carbon emissions from idling vehicles, and prolong the life of the bridges.

3) This region collects and tracks a significant amount of data from many sources that could be useful to citizens, researchers, developers, urban planners, and transportation engineers. This data, though, often is isolated in various departments, exists in multiple formats, or is not fully exploited. The target objective in addressing this challenge is timely, local, accurate information about the conditions in the community and organizing that data for better analysis.

4) As international border communities, there are inherent homeland security and public safety issues that affect our way of life. The Blue Water Bridge connecting Michigan to Ontario, Canada is one of the busiest border crossings in North America, with a steady stream of truck traffic traversing our communities. Each day, 47 million pounds of hazardous materials are being transported through our communities on I-94 and I-69. The target objective is to utilize sensor technology on existing infrastructure could help officials have a better idea of the materials being carried on a particular truck and provide emergency management professionals and first responders with key data to protect the health, safety, and welfare of the community.

5) Tourism is a huge component of the local economy. In 2015, the Blue Water Convention Center opened adjacent to the Blue Water Bridge in Port Huron, along with a nationally-branded hotel; however, they are not located in the central business district. Community leaders have been seeking ways to better connect visitors at the Convention Center to the downtown. A targeted solution to this challenge to implement a bike share program in downtown Port Huron, as well as potential deployment of electric golf carts or automated urban shuttles that can carry people to and from the CBD.

6) A critical challenge for all communities going forward will be to engage their citizens to find out what they want in a Smart City and to make them informed, well-connected and smart citizens. The concept of a Smart City is relatively foreign to the average citizen. The targeted objective is to reduce any notions that connected and autonomous vehicles, data sharing, and other innovative infrastructure solutions are a threat rather than a community benefit.

7) As waterfront communities, it is imperative that Port Huron and Marysville must aspire to become more resilient communities. Through connectivity, the availability of big data, and automated technology, these communities can develop the necessary tools and

adaptive capacity to build resiliency and mitigate the effects of climate change in a timely and more cost-effective manner.

Proposed Demonstration Project and Implementation Goals

Through the Smart Cities Challenge, we propose to transform Port Huron and Marysville into a living laboratory where our project partners can develop, model, and test the practicality and feasibility of various connected smart infrastructure solutions to improve the quality of life for people in cities and towns across the United States. In particular, we aim to accomplish the following:

1) ***Civic Engagement Pilot Project*:** Through a partnership with the Michigan State University School of Planning, Design, and Construction, we will survey the local population and local businesses about their visions, desires, and expectations of a Smart City. This survey will be tailored to answer to the 12 vision elements of the USDOT priority areas. With the results of this survey pilot, we are informing the full proposal and are also demonstrating the application of multiple vision areas. Keeping the public informed and connected will help in moving the demonstration forward, while creating an environment where civic entrepreneurship and innovation is fostered and fueled. Informed citizens will be more open to engage in connectedness and use the data in creative ways to address transportation challenges. This push towards civic engagement would move towards an open governance platform, through which smart cities communicate.

2) ***V2X Sensor Infrastructure Deployment:*** Sensor deployment on infrastructure assets in Port Huron and Marysville will allow for critical testing and modeling of autonomous and connected vehicle technologies. Working with public and private sector partners and service providers, we will install sensors on traffic signals, drawbridges, light poles, and other optimal locations in order to facilitate data collection and maximize development opportunities. An extensive fiber network managed by the St. Clair County Regional Educational Service Agency (RESA) exists throughout the targeted development zones. There are 25 miles of fiber throughout Port Huron and Marysville. RESA will work with technology vendors to facilitate data capture, storage and IT maintenance. This arrangement will support infrastructure management with support of engineering partners within the municipality system to establish "in house" knowledge and familiarization that can be offered to surrounding municipalities throughout the county and potentially state of Michigan.

3) ***Data Collection/Data Analytics:*** This aspect of the project involves data analyses crossing qualitative and quantitative methods ranging from single case studies to big-data analysis. Professors from the Michigan State University School of Planning, Design, and Construction will use their personal expertise in the area of transport analytics and garner additional support from MSU's statistical and data analytics programs so as to suggest varied ways of collecting, analyzing, storing and sharing data. For example, the team would be able to recommend ways to assess potential benefits of solutions and ways to assess performance measures and their impacts on the priorities of the challenge.

4) ***Open Government/Open Data:*** Making the connected data open is critical to maximizing the realization of the potential that will invite and welcome software engineers and app developers to innovate the defined Smart City Projects. The objective will be to open up development dialogue to widen the brainstorming between citizens and businesses how data can be used to improve their operation and functions. Additionally, Port Huron and Marysville will embrace open government by making data publicly available on their municipal websites. The resulting developments will also be tracked and monitored for analysis. The project team will examine how these developments will contribute to improving speed, efficiency, and engagement that can be used directly to address growth and utilization challenges that communities are expected to face in the future.

5) ***Resiliency Planning Toolbox:*** The project team will partner with Land Information Access Association (LIAA), a non-profit community planning organization, to collaboratively plan for economic and environmental resilience in our sensitive shoreline communities. This project will provide the greater Port Huron/Marysville community with a suite of tools and guidance to collectively build resilience and more efficiently coordinate efforts across jurisdictions. When applied to community planning, resilience thinking results in a community that is more engaged and coordinated at all levels, more nimble and responsive to needs and opportunities, and proactively prepared to weather the unpredictable but inevitable challenges to come. The project will include educational and outreach activities to improve adaptive capacity and public understanding of climate impacts and resilience.

6) ***Bike Share Pilot Project:*** Project partners will test out implementation and operation of a public bike share program in downtown Port Huron, connecting people to key destinations, such as the central business district, the Blue Water Convention Center, the St. Clair River/Bridge to Bay Trail, and St. Clair County Community College.

7) ***Tourist Shuttle Pilot Project:*** The scope of this project will provide autonomous shuttle transportation from the Blue Water Convention Center to the Blue Water Area Transit Hub in Downtown Port Huron. This technology will also be expanded into another pilot project that will develop delivery of goods potential in dense areas.

8) ***Development of a Smart City "Roadmap":*** Again partnering with the Michigan State University School of Planning, Design, and Construction, this will be a pilot project to transfer knowledge and experience to other communities and academic institutions. Being professors at a research institution, the aspect of knowledge transfer is an integral part of the profession. This works for the Smart City Challenge project in two ways: the integration of the latest existing knowledge on smart cities has to become part of the planning efforts and the dissemination of the results of the projects in order to transfer knowledge to other cities to maximize the funding impact. Our partnership can help share results and publicize efforts through academic and professional circles by publishing papers and presenting at professional conferences. As one of the "specific goals" of the Smart City Challenge (NOFO-*Beyond Traffic 2045*), knowledge transfer is critical so that other cities in similar situations can reproduce the same systems and services.

Program Management

Overall program management of the Smart City Challenge will be performed by Ricardo Inc. Ricardo is a global engineering solution, strategic planning and environmental conservation consultancy with a vision for maximizing technological capability to increase efficiency and eliminate waste. Ricardo employs over 2,700 engineers, scientists and consultants around the world with expertise in automotive, transport and security, energy, and resource and waste management. Ricardo's pool of resources and clients includes some of the world's largest and most capable institutions and governmental agencies.

Experiences and Capabilities include:

Transportation and security industries and world class engineering and product development to ensure compliance with global legislative requirements. This includes products ranging from e-bikes, motorcycles and automobiles to large marine propulsion systems. Ricardo also designs and develops engines, transmissions, hybrid and electric systems, through complete special purpose vehicles. Their niche manufacturing and assembly capabilities also deliver finished products to motorsport, aerospace, defense and other high performance industries.

In the Energy sector, Ricardo develops low cost sustainability and engineering solutions for conventional and renewable power generation, energy charging, storage and distribution.

In the Resource Management and Waste Services arena, Ricardo provides environmental consulting focused on air quality, chemical risk, climate change, resource efficiency, water and waste management.

Ricardo will manage the Smart City Initiative with both communities and all Smart City Challenge partners to execute the implementation and documentation of this project.

Port Huron and Marysville will establish a Joint Smart Cities Collaborative Commission to work with Ricardo to execute the goals and vision of the USDOT through this Smart City Challenge grant. This commission will include elected and appointed representatives from city and county departments, industry leading partners, world class national educational institutions, and the general public.

2) Population Profile

City	2010 Population	2010 Land Area Square Miles	2010 Density Persons per Square Mile
Port Huron	30,177	8.08	3,735
Marysville	9,959	7.31	1,362
Total	40,136	15.39	2,608
Port Huron Urbanized Area	87,106	60.44	1,441

Source: 2010 Census

3) Port Huron and Marysville, Michigan: Community Characteristics

Overview

The Cities of Marysville and Port Huron are located about one hour from the city of Detroit in the heart of the US Automotive Industry and members of the Automation Alley Technology Corridor in St Clair County Michigan.

The City of Marysville has about four lineal miles of international water frontage along the St. Clair River. An interchange to I-94, a major freeway, is located approximately one-quarter mile west of the Marysville city limit, allowing convenient and quick access to the highway system and providing a sound modern rural infrastructure.

The most obvious attribute that both cities have is access to and views of the St. Clair River. As noted above, there are about four lineal miles of river frontage in Marysville. Of this, roughly one-third is open to the public. The rest is either used for single-family dwellings or occupied for industrial use. Recognizing the value of its waterfront, Marysville has worked aggressively to stabilize the shoreline, assure public access and provide the amenities necessary to allow the waterfront to function as a park.

The Gratiot corridor is the focus of commercial development within Marysville. Because Gratiot serves as an important highway link, a number of commercial uses have located along Gratiot that derive much of their business from passer-by traffic rather than relying on nearby residents. The positive aspect of this is that Marysville residents have convenient access to more goods and services than would be expected for a community of this population. On the negative side is the need to manage traffic and the inconvenience of traffic jams. The Gratiot corridor presents an ideal location to implement and test V2X technologies, as does M-29 – a state trunkline that runs parallel to the St. Clair River and becomes M-25 in Port Huron to the north.

The City of Port Huron, stretching for seven miles along the shore of the St. Clair River and the base of Lake Huron, is an international border crossing marked by the Blue Water Bridge. Port Huron's stunning waterways and diverse annual events make it a year-round tourist destination. The city is an island, connected to the mainland by a network of drawbridges that contribute to traffic congestion on the city's road system – particularly in the summer months. Port Huron's downtown is a mix of historic buildings and new developments, blending street-level restaurants and shops with upper-level lofts, studios, and apartments.

Transportation Network Conducive to Demonstrating Proposed Strategies

Port Huron and Marysville are home to a number of important components of the regional transportation network, including the international Blue Water Bridge, Interstates I-94 and I-69, and the M-29/M-25 corridor that runs through the central business district and connects Port Huron to Marysville and other communities in Michigan's Thumb.

The international Blue Water Bridge is a critical international transportation gateway linking Commercial Trucking and personal automobile traffic crossing the border of the United States of America and Canada. The initial span was completed in 1938; an additional span was completed in 1997. It is also the fifth busiest crossing between the U.S. and Canada, and the second busiest

truck crossing between the two countries. This gateway remains a critical access point for passenger vehicles and freight traffic between St. Clair County and Canada. On a typical weekday, approximately 10,000 cars and 6,000 trucks use this facility.

CSX Transportation and CN North America Railroad provide Class I rail service to the region. The Class I rail routes provide U.S. freight connections to Canada through the International Railroad Tunnel in Port Huron, as well as service to industrial sites throughout Michigan. In 2012, nearly 233,000 loaded containers and nearly 165,000 empty containers were shipped across the United States-Canadian border. The CN North America's primary line runs east to west through the communities of Port Huron, Emmett, and Capac. The CSX line runs from Marine City through St. Clair, Marysville, and Port Huron.

Port Huron and Marysville also have extensive non-motorized transportation resources that can be integrated into the Smart City program. The 54-mile Bridge to Bay Trail runs through both cities as it connects Port Huron to the southern border of St. Clair County. The Island Loop National Water Trail was the first designated National Water Trail in Michigan. The Island Loop is part of a countywide system of water trails known as the Blueways of St. Clair.

Existing Public Transportation System

The Blue Water Area Transportation Commission (BWATC) provides transit services to several communities within St. Clair County, including the city of Port Huron and the townships of Port Huron, Fort Gratiot and Burtchville. BWATC operates a combination of fixed route, on-demand response and contract services. BWATC currently operates seven regularly scheduled bus routes and a shopper shuttle within the City of Port Huron and Fort Gratiot Township. Although there are fixed stops along each route, the service operates a flag system where necessary to allow bus riders to catch the bus anywhere along route. Headways are generally 45 minutes and all vehicles for the fixed route service are lift or ramp-equipped and are equipped with bicycle racks.

A commuter service runs to Chesterfield Township, a community in northern Macomb County. This service also links up with the Suburban Mobility Authority for Regional Transportation (SMART) buses so commuters can make a connection to their final destination in Southeast Michigan and/or downtown Detroit.

Why Should Port Huron and Marysville be Selected as Smart Cities?

As noted above, these two cities are similar to the majority of communities in America. Based on the 2010 Census, there were 285 cities in the United States that had populations of 100,000 or more. There are roughly 3,144 counties or county equivalents in the U.S., and almost 20,000 incorporated places. The majority of communities in the US have populations below 100,000. All of these places face the same challenges as Port Huron and Marysville in planning for and becoming smart cities. Port Huron and Marysville are perfect locations to implement the proposed pilot projects and identify best practices and new knowledge that can be transferred to any community in the U.S.

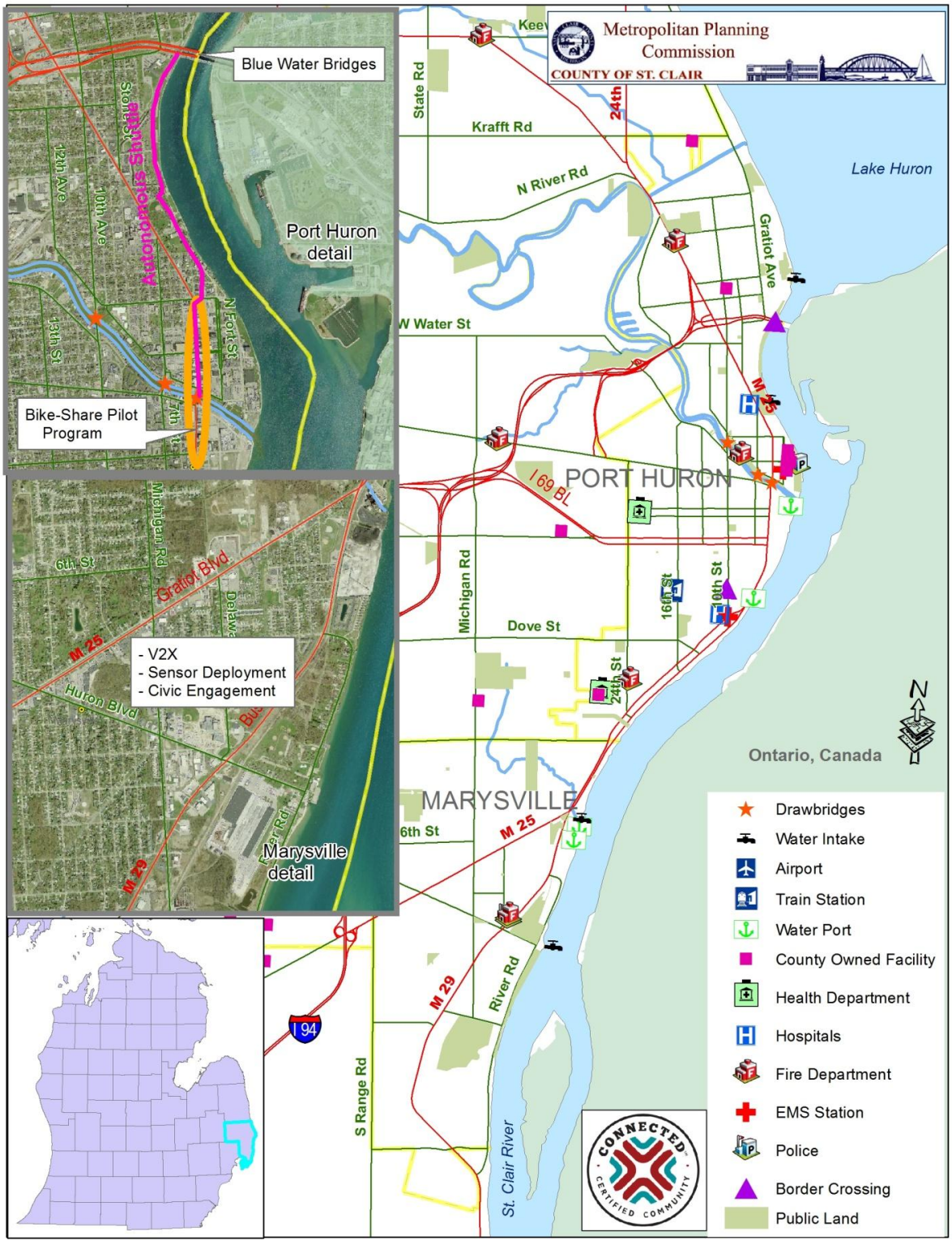
Our communities provide a real-world environment to test and advance smart innovations at a manageable scale – to tap into the potential of what a Smart City in the United States could be.

The majority of Port Huron and Marysville residents fall in the "baby boomer" generation (born 1946-1964). As the baby boomers move into their fifties and sixties in the next decade and their sixties and seventies in the following decade, there will be a significant increase in the already expanding elderly population. Over the next 20 years, the cities plan ahead for an aging community obvious needs will include improved emergency services, availability of health facilities, affordable housing, and transportation validating the "*Beyond Traffic 2045*" that public policies are needed to strengthen the coordination of human service transportation services to meet the needs of older adults and people with disabilities. The proposed Smart City project will specifically identify how Port Huron and Marysville can improve livability for aging residents and other sensitive populations through the implementation of Connected Smart infrastructure.

Port Huron and Marysville, along with numerous other public, private and nonprofit partners, have a long history of working together. Leadership from both cities is committed to supporting the Smart City Challenge and leveraging the gained experience throughout the St Clair County Region. Both communities also work closely with St. Clair County government. Together, this partnership will see the demonstration project through to its completion. Collectively the county is committed to transforming its communities into smart cities and serve as a technology diffusion platform for the Greater State of Michigan. There is a committed and strong believe that the collective efforts possess the greatest potential to accomplish the greatest knowledge and value with the most efficient considerations of cost and timing.

Developing vibrant and resilient communities requires a comprehensive approach, recognizing that critical community systems routinely cross jurisdictional boundaries and the familiar silos of interest. Community resilience is greatest when multiple jurisdictions, sectors and interest groups are communicating, cooperating and coordinating their actions. Resilient communities identify and leverage their strengths while continuously pursuing the identification and cultivation of new strengths. Port Huron and Marysville are coastal communities that will provide strong opportunities to study climate impacts on the environment and the economy. As part of the demonstration project, best practices, lessons learned, and strategic goals can be developed and replicated for other communities and institutions.

4) Preliminary Site Map



5) Alignment with USDOT Vision Elements

Vision Element 1: Urban Automation

A data rich and connected Smart City provides the ideal opportunity to develop deep learning and automation alternatives to promote autonomous functionality, increased safety solutions, improved resource management and maximized energy efficiency in REAL WORLD ENVIRONMENTS.

Connectivity must be secure, stable, and sufficient to support initial automation development phases. A connected automation environment will be established to provide\ the necessary infrastructure to support different sensing technologies that can collect, store, and support transfer of data. Marysville/Port Huron will explore both theoretical and functional considerations of automation.

One early functional automation approach will be developed to address challenges currently faced by tourists that are introduced to the Blue Water Convention Center, which lacks an effective shuttle option to transport tourists/visitors to Downtown Port Huron. Current consideration is a Golf Cart Club Car that has autonomous capability previously used and developed on a college campus to act as a pilot shuttle program to allow tourist to select a destination of interest that they will be transported to as well as the option to define a pick up time that the shuttle will return to pick up the passenger and return to the original point of departure. This case study scenario is also expected to provide further scenarios for additional on demand shuttle interfaces that will be supported through parallel developments of user applications that could be used. It is an initial development program due to its primary dependency on LiDar, which provides great development potential while infrastructure sensing is installed to increase its operational capability throughout the Smart City Project.

There will also be defined connected development zones are to support Autonomous Vehicle Development Testing for Tier 1 Automotive Suppliers and OEM's. The opportunity to take advantage of a PUBLIC connected architecture and to progress through the diligent and demanding development requirements of the automotive industry will support real world testing of V2X technologies and Big Data management into Validation phases. Many automotive resources will be leveraged to maximize infrastructure integrity within the Automation Alley metro Detroit region. Testing within the proposed development zones provide opportunities for these companies to utilize Urban, Rural, and Highway scenarios at less risk than that of larger more congested cities to develop and test L1-L4 Automation on Public Roads. This provides great opportunities to allow companies to utilize the infrastructure openly and according to their schedules and for the communities to gain value through data, exposure to the technology, and experience the future.

A final example of Automation development involves a currently connected interstate highway corridor that is currently connected with V2X infrastructure. There is opportunity to provide additional support from the Smart City Challenge to ongoing development studies involving platooning activities on Class 8 Trucks. The current development model involves a driver-in-lead vehicle and a following vehicle will operate in automated states to increase transport efficiency, energy conservation, safety and utilization/operation factors.

"Cross-elemental" relationships of "Urban Automation" exist in ALL of the other 11 elements to some extent. Supplemental to the functional approaches to Urban Automation, theoretical activities will also be initiated to ensure the value of the data and the potential for contribution is maximized.

Vision Element 2: Connected Vehicles

From safety, cost, energy/fuel conservation, advancement of technology, and traffic efficiency to drivers who are informed of weather, road conditions, construction, and emergencies. Connectivity provides many opportunities to improve on-road, roadside, and planning activities that are all connected by the ability to collect, process, and manage big data. Using Dedicated Short Range Communication, Wi-Fi, and satellite connections to connect vehicles to infrastructure, vehicles, and pedestrians to provide numerous opportunities and expand existing developments from current ongoing Pilot Cities.

Initial efforts to import elements of the progress of other Pilot Cities will be made to evaluate approaches to be taken to establish communication infrastructure to connect.

Objectives of Connectivity

Infrastructure Solutions – Network Requirement Analysis, Installation Procedures, Sensor Positioning Strategies, System Health Monitoring, as well as many other planned aspects of the installation, positioning, monitoring, and maintenance to the foundation of following Smart City Establishments. This will utilize the funding to minimize the financial risks of other communities as they establish their configurations. The ability of this Smart City Collaboration to establish itself as a leader in the diffusion across the country to other "Any Town USA" communities will depend on the competence of the infrastructure to support other municipalities and to function as a viable long term resource leveraging existing infrastructure and the lessons learned and experiences.

Technology Solutions - Exploring different technology solutions at the infrastructure and vehicle levels will be among initial activities to support studies and deep learning that can be used to compare performance characteristics, limitations, quality, durability, and cost effectiveness comparisons. Consideration of acquisition, installation, maintenance, user reliability, processing, data handling, storage, and communication will be among other critical elements of evaluation.

Development Solutions – Supporting connectivity users; OEM, suppliers and software and algorithm developers to take their developments further and extend the capabilities of this technology provide great opportunity to contribute in the GLOBAL arena of the transportation industries of automotive and commercial transit. Automated Driving Levels 1-4 will have the ability to develop existing functionality, verify and validate functional safety analysis, explore HMI technologies at rates and use cases well beyond proving ground and development facility capabilities. The ability of Port Huron and Marysville to support these development "partners" is believed to be offered in a more stable and controlled, although public, environment than larger cities to shorten the development cycles for the users as well as provide the opportunity to explore connectivity variables and data at a much faster and broad rate.

Data Use Case Studies – Specific research opportunities of connected vehicle and infrastructure technology to model and test traffic flow efficiency, safety improvements, homeland security improvements related to commercial freight and transport crossing the Blue Water Bridge, providing additional mobility between downtown Port Huron and Convention Center, improving safety and efficiency of school buses in Marysville, and reducing congestion and emissions from idling vehicles at known choke points (i.e. rail crossings, drawbridges, etc.)

- Development/Initiative targets to engage participating and developing Tier 1 suppliers, development partners and OEM's to support development and use case studies that could mutually benefit their development as well as the evaluation of the data and the potential uses.
- Technologies will integrate high-speed fiber networks, cellular infrastructure, Bluetooth beacons, GPS, and other technologies identified by project partners, OEM's or the general public. The target will not only be to optimize the selection and identify selection criteria, but also to provide comparison data of different connectivity mediums that would be used for future reference and leverage further the following expertise:
    - Expertise in analysis and integration of V2X (including vehicles, infrastructure) technologies
    - Expertise in security and scalability of wireless communication technologies including V2X, Wi-Fi, and cellular systems
    - Expertise in high-assurance system security architectures and secure software development.
    - Experience in specification, design, development, and NSA certification of secure micro digital data links which provides secure communications and interoperability among small ISR sensors, sensor platforms and remote surface terminals.
        - This system is the first of its type that is producible at low cost for widespread use. The over-the-air key management allows designation of specific classes of ground terminals and users to receive and decrypt data.
- Connected vehicles and appropriate information infrastructure could communicate and make pedestrians aware that vehicles have detected their presence.
- Development of User Models that demonstrate how different municipal sectors could benefit from available data sets to consider potential solutions for planned challenges of the future.

Vision Element 3: Intelligent, Sensor-Based Infrastructure

Intelligent, sensor-based infrastructure will be deployed to collect data that will ultimately be used to improve system efficiencies, public safety, and overall mobility. Implications of sensor-based infrastructure utilization include:

- Blue Water Transit Buses – Schedules and timing, vehicle location, passenger load information. Blue Water Transit currently utilizes a Demand Response dispatch software program. It is not tied to automatic vehicle location (AVL) software. In fact, BWAT does not currently have any ITS field equipment deployed.
- Rail – train and crossings V2P
- Automobile – V2V, traffic light optimization, traffic load optimization
- Truck/Freight – I-94/I-69 corridor Dynamic Message Services, ITS deployment in conjunction with existing MDOT Intelligent Transportation Systems.

- Maritime – Water traffic and conditions, boaters, paddlers, freighters. This data could assist first responders, law enforcement and homeland security/border patrol.
- Blue Water Bridge – Traffic load, congestion/wait times, trucking utilization, hazardous materials identification, border security
- Drawbridges – Improve interface between boat and automobile traffic, congestion mitigation, system efficiencies.
- Emergency Management – Police, Fire, Medical response, border patrol, hazardous materials
- St. Clair River – tourism updates, public information, outreach, resiliency, climate information

Utilization of this Data will be focused on:

- Video-based real-time analytics of activities of crowds (pedestrians, vulnerable road users) to support algorithm development of desired use cases in above challenge scenarios.
- Robust, embedded low-power sensor networks to support areas of Energy and Processing Optimization.
- Customization of COTS technologies for monitoring traffic, pedestrians/bicyclists, and environmental variables.
- Use case opportunities of low cost sensors for security, chemical and biological threat detection and how it can be shared with Emergency/Security Agencies (Police, Fire, Hospital, Border Patrol, Homeland Security, etc)
- Development and Research activities to investigate Internet of Things (IoT) theories and practices that improve the collection, processing and availability of the available data to support data user developments to support automation, vehicle performance, user interface, economical, environmental and developer interfaces that migrate to standardized interfaces for defined data sets.

Vision Element 4: Urban Analytics

Data collected from sensors will be analyzed by numerous stakeholder organizations (local, state, and federal) and will be collected and analyzed by the Michigan State University research team to identify advantages and contributions in knowledge transfer phase.

The MSU team's data analyses would include crossing qualitative and quantitative methods ranging from single case studies to big-data analysis. Apart from expertise in the area of transport analytics, the project team would be able to garner support from MSU's statistical and data analytics programs so as to suggest varied ways of collecting, analyzing, storing and sharing data. This analytical capability will allow the project team to generate new insights on network efficiencies, safety and security, and travel patterns. This will allow planners and public officials to have a better understanding of the impact of traffic from Canada, the impact of drawbridges on the transportation network, and the behavior of both drivers and transit riders.

Additional data collected would be used by Land Information Access Association to help develop community resiliency toolbox and community-wide adaptive capacity. In this sense, data collection and analysis would be focused on environmental impacts, climate change impacts, and how those factors affect coastal systems and people.

The City of Marysville currently uses sensors for public safety/fire department uses in emergencies. Existing sensor deployment would be integrated with new technologies. All data derived from sensor deployment will be available to state and federal agencies so that they may measure, test, evaluate, and implement additional innovation.

Development of interfaces and user tools for complex multimodal systems customized for specific user groups to improve overall city efficiency will also be considered for execution of many of the development projects considered.

Vision Element 5: User-Focused Mobility Services and Choices

The Port Huron/Marysville Smart Cities Collaborative is dedicated to improving mobility for all travelers, especially the aging population and persons with disabilities. Program partners will work with Blue Water Area Transit, the Council on Aging, and the developer community to create innovative solutions to providing shared-use mobility options, smart phone applications, bicycling, and other traveler-oriented strategies. A long term vision is to develop a multi-jurisdictional "Electric Avenue" along M-25 and M-29 in Port Huron and Marysville – corridor equipped with EV infrastructure for travelers. Other opportunities to potentially work with students and developers on creating smart phone applications, mobility on demand services, and other tools will be explored.

Vision Element 6: Urban Delivery and Logistics

Port Huron and Marysville provide an ideal location with critical infrastructure to develop innovative solutions supporting the efficient movement of freight through the use of deployed technologies. This infrastructure starts with the Blue Water Bridge which spans the St. Clair River and carries international traffic between Port Huron, Michigan, and Point Edward and Sarnia, Ontario. Located near the I-94 and I-69 interchange, the bridge forms a critical gateway linking Canada and the United States. Almost $70 billion of trade is completed via the Blue Water Bridge. It is the number one entry point for carriers of hazardous, radioactive and flammable materials between St. Clair County and Ontario, Canada, and the number two entry for those same materials in the United States. Additionally, the St. Clair River International Railway Tunnel is 6,125 feet long and has a diameter of 31 feet. The tunnel can accommodate double-stacked container trains, multi-level auto carriers and other large rail cars and payloads. The tunnel significantly reduces transit times for rail traffic that, in the past, had to be barged across the river, as well as for container traffic between Halifax and Chicago and the central U.S.

Here the project team will with OEM's and other partners to utilize robust, embedded low-power sensor networks, sensors for chemical and hazardous threat detection, and other V2X architectures to track logistics, cargo location, and route efficiencies.

Vision Element 7: Strategic Business Models and Partnering

The Port Huron/Marysville Smart Cities Collaborative will work with project partners to leverage creative partnerships that draw in additional stakeholders from the public, private, and non-profit sector. Through its program management capacity, Ricardo Inc. will leverage strategic partnerships with OEM's to maximize outputs through effective cost share models and co-development. Working with partner OEM's and academic institutions will allow the team to

overcome programmatic challenges through the utilization of best practices and the innovations being driven across sectors.

The commitment of the Michigan State University School of Planning, Design, and Construction will bring outstanding resources to the collaborative in terms of urban planning, civic engagement, data analytics, and knowledge transfer.

Draper Labs, originally part of the Massachusetts Institute of Technology (MIT) and now a non-profit company, has a rich history of ground-breaking research and game-changing technology innovation. Draper has a strong relationship with local universities including MIT, Tufts, Harvard, Boston University, and Northeastern.

- Draper Lab Fellows (DLF) program brings in graduate students from local universities to work on projects that are of mutual interest to the student, the university faculty advisor, and to Draper.
- Draper is a supporting member of MIT Energy Initiative's study of 'The Utility of the Future'
- Relationships with subject matter experts concerning privacy for users in big data government projects

There are also numerous opportunities for innovative new partnerships involving St. Clair County Community College and the St. Clair County Regional Educational Services Agency for academic programming focused on smart infrastructure development, advanced mechatronics, and engineering solutions.

Projects implemented through the Smart City Challenge have an immediate connection to the various homeland security initiatives underway in St. Clair County – a federally-designated Virtual City pilot site. The implications for innovation and big data analytics to benefit state and federal agencies, including MDOT, Customs and Border Patrol, and the Department of Homeland Security provide additional partnership opportunities.

Vision Element 8: Smart Grid, Roadway Electrification, and Electric Vehicles

As a Smart City Challenge finalist, Port Huron and Marysville would work to develop a plan for the creation of an "Electric Avenue" along the M-25//M-29 corridor that connects both cities. The vision for the Port Huron/Marysville "Electric Avenue" would be to equip the corridor with electric vehicle charging infrastructure that leverages the smart grid. Developing this corridor as an EV-friendly destination will provide needed infrastructure and resources to drivers of electric vehicles coming into the country or leaving the country via the Blue Water Bridge, as well as our residents who already have or are considering an electric vehicle. Moreover, this would create additional economic development opportunities for both communities

The project team will leverage experience in the optimization of distributed assets across a network with high levels of uncertainty. Experience in this kind of critical analysis has been executed to previously develop architecture for a demonstration of parked electric vehicles as grid-connected storage that incorporates incentives for vehicle owners to connect in the instrumented demonstration area. The objective would be to take initial steps to realize this vision to expand and increase capability.

Potential partners to engage at different stages will be leveraged to manage the tangible outputs as well as the knowledge potential with great consideration of the financial investments required. The objective would be to make as much transportation and energy information available for "deep learning" to realistically support as many industrial applications that initial plan execution would be capable.

Vision Element 9: Connected, Involved Citizens

An essential part of planning is public engagement and meaningful public participation. Researchers from Michigan State University will lend expertise in multiple ways to get the public involved and make them informed, well-connected and smart citizens. Keeping the public informed and connected will help in moving the demonstration forward, while creating an environment where civic entrepreneurship and innovation is fostered and fueled. Informed citizens will be more open to engage in connectedness and use the data in creative ways to address transportation challenges. This push towards civic engagement would move towards an open governance platform, through which smart cities communicate.

Planning interventions are most successful if they have buy-in from the residents and the local business community. As part of our planning efforts, MSU will survey the local population and local businesses about their visions, desires, and expectations of a Smart City. This survey will be tailored to answer to the 12 vision elements of the USDOT priority areas. With the results of this survey pilot, we are informing the full proposal and are also demonstrating the application of multiple vision areas.

Making the connected data open is critical to maximizing the realization of the potential that will invite and welcome software engineers and app developers to innovate the defined Smart City projects. The objective will be to open up development dialogue to widen the brainstorming between citizens and businesses how data can be used to improve their operation and functions.

The resulting developments will also be tracked and monitored for analysis. The team will examine how these developments contribute to improving speed, efficiency, and engagement that can be used directly to address growth and utilization challenges that communities are expected to face in the future. Additional efforts to fully utilize crowdsourcing, social media, and other forms of public input will be explored.

Additionally, we will monitor municipal performance and feedback that can be incorporated into each separate project. The cities will also utilize their official websites to share open data and promote open government. We will create citizen forums to communicate concerns or areas of improvement that captured items can be taken to tech forums for consideration of alternative methods of engagement through technology and software solutions that can be presented and demonstrated to the citizens for evaluation. Project partners will also host 'hackathons' to invite citizens, businesses, developers and coders to work on creating solutions that stabilize and build cyber-security/functional safety into the developing systems as early as possible.

Vision Element 10: Architecture and Standards
With the support of multiple engineering and software development companies, there is a broad background and expertise in systems engineering, modeling and simulation. There is great leadership capability to lead systems development efforts that combine the latest research in physics, electronics, micro-mechanical devices, computer and packaging technologies, and software engineering to provide system solutions in diverse domains.

Conceptualization of new architectures for complex systems, namely systems driven jointly by people and data and physics will be leveraged to advance modeling and simulation to understand the uncertainties at these boundaries.

With deep pools of experience in defining development architecture, Partners have been sought to support the goal to leverage the developments of this initiative to support ongoing studies and alignment requirement of existing and developing specifications and standards to support the progress, development, and realization of the envisioned CVRIA/National ITS Architecture in accordance to ITS standards.

Vision Element 11: Low-Cost, Efficient, Secure, and Resilient Information and Communications Technology (ICT)
ICT activities will be managed with the utmost respect to privacy and security practices. This will be considered and weighed heavily in Infrastructure Component and Architecture choices. ICT Project activities will be conducted in parallel to those contained in Vision Element #10.

The initial collection of data will be limited to specified development needs and system verification. Parallel activity will be managed to monitor the data to ensure that there is no risk or intrusion of Personal Identifiable Information.

A key element of the Project Management Activities must be an understanding of the data being collected and understanding how it is being used in functional developments. Theoretical Research Studies provide much greater latitude to explore alternative data uses, but components of these studies will also be to ensure Privacy is not violated or data compromised.

“Hackathons” have been mentioned as important activities within Element #9, however the challenges posed to compromise the infrastructure and the ability to improve the security of the cyber environment is viewed as critical and a very valuable activity to provide information that can be provided and transferred well beyond this initiative for other Big Data Considerations.

The Wi-Fi Alliance has introduced Wi-Fi HaLow as the designation for products incorporating IEEE 802.11ah technology. Wi-Fi HaLow operates in frequency bands below one gigahertz, offering longer range, lower power connectivity to Wi-Fi certified products. Wi-Fi HaLow will enable a variety of new power-efficient use cases in the connected vehicle, the smart home, and digital healthcare, as well as industrial, retail, agriculture, and Smart City environments.

The establishment of a Wi-Fi HaLow network could enable Port Huron and Marysville to be pilot locations for Google's Project ARA, which is a low-cost modular technology platform. A module that connects an ARA device to the Wi-Fi HaLow network could enable a public

intranet, allowing users to engage city services/systems without cost. Using ARA, a person could summon cars, connect with local businesses, check bus schedules, provide feedback to public officials, and utilize other messaging features. In short, it could connect citizens to crucial community systems.

A multi-partner approach will be taken to increase development participation and minimize risk and comply with any and all auditing requirements. Development Integrity Verification activities will be held regularly and randomly to ensure that developments are protected from Tampering.

Consideration of defensive approaches to prevent tampering or manipulation with any of the signals or infrastructure will be made and part of each project development activity as well as an offensive approach to implement integrity checks to ensure high signal confidence is maintained and made available to development partners. Security measures will be developed and maintained accordingly.

Vision Element 12: Smart Land Use

The cities of Port Huron and Marysville have managed growth and development through smart, comprehensive planning over the span of many decades. While Port Huron is an urban community and Marysville is more of a suburban enclave, both cities have planned and utilized their land, their natural resources, and their infrastructure in order to optimize efficiencies and provide a high quality of life for residents.

Port Huron is the county seat of St. Clair County. An urban community with higher density development, a central business district, and a robust public transit system, the city exhibits many of the tenets of Smart Growth. While Marysville is more suburban in nature, its neighborhoods are generally developed in traditional neighborhood design with a grid street network. While not a CBD like in Port Huron, the Gratiot corridor that cuts through the city from east to west from I-94 to the St. Clair River provides a mix of commercial, office, and service uses for the residential neighborhoods and industrial areas that surround it.

In both communities, citizens have access to employment centers, a range of affordable housing options and housing types, health services, neighborhood schools and parks, and non-motorized facilities such as the Bridge to Bay Trail and other sidewalks and paths. Port Huron's downtown core is highly walkable and public transit is readily accessible through the Blue Water Area Transit Hub that is located right in the heart of the downtown. Together, Port Huron and Marysville are neighboring communities that complement each other and combine to form the perfect test lab for connected and autonomous vehicle and infrastructure deployment and testing.

The *City of Port Huron Master Plan* is based on the following foundations and goals:

<u>Land Use and Neighborhoods:</u>

- Create a balanced land use pattern that offers a mixture of uses in an organized, compatible manner.
- Support Port Huron as a thriving urban core for St. Clair County.
- Continue a strong residential presence and offer unified, traditional, and livable neighborhoods.

- Support development of neighborhoods and housing compatible with existing character.

Commercial Districts and Economic Development:

- Offer a unified system of distinct commercial business nodes.
- Ensure commercial development will promote the city's character.
- Encourage an active, successful downtown that is walkable and livable.
- Increase the desirability of the city for economic development.
- Continue efforts to retain existing businesses.
- Support a strong industrial development presence.
- Strengthen the city's appeal for tourism.
- Attract and retain the younger population to live and work in Port Huron.
- Create new entrepreneurial opportunities and resources.

Transportation and Community Facilities:

- Offer a vehicular transportation system that is integrated with the city's character.
- Integrate a non-motorized pathway and greenway system throughout the city.
- Unify the multiple modes of transportation and offer safe and enjoyable circulation options.
- Offer high-quality and efficient public services to residents and the region.
- Increase the desirability of the city for new residents and businesses.
- Expand and diversify the city's park and recreation system.
- Provide a unified open space system throughout the city.

The *City of Marysville Master Plan* includes the following goals related to land use and development:

Residential Area Goals:

- Provide sidewalks where recommended by the City's adopted *Walkable Community Plan.*
- Promote the construction of housing that appeal to a wide range of tastes and meets the needs of all City residents.
- Encourage cluster housing arrangements that preserve open space and natural features without compromising the quality of housing.
- Work to provide an integrated path system through developing areas of the City as proposed in the City's *Walkable Community Plan*.
- Create a fund for the purchase and assembly of land to provide land configured in a way that will allow for high quality development. This will also allow the City to specify how the land will be developed.
- Require the creation of stub streets within proposed subdivisions to allow for the interconnection of different neighborhoods as they develop.
- Require new developments to connect to existing stub streets.

Commercial and Office Area Goals:

- To create a healthy business environment with a broad range of uses to account for the needs of Marysville residents while assuring compatible land use relationships.

- To create small nodes of commercial facilities that cater to the convenience needs of Marysville residents, on a neighborhood level.
- Promote zoning that provides for compact clustering of convenience-oriented uses.

Industrial Area Goals:

- Utilize zoning, which is designed to attract new, high technology, and low intensity Industrial uses.
- Provide for circulation systems that assure adequate access to emergency vehicles.
- Attempt to cluster uses with similar needs and intensities.

6) Technical, Policy, and Institutional Risks and Mitigation

Self driving cars on public roads, development-level transportation activities, public risk consideration, functional safety unknowns, technology awareness and learning, and public awareness are just some of the risks that must be considered during project plan execution.

The platform of the Port Huron/Marysville submission is PUBLIC project execution. This will require transparency, communication, diligence, and assumption of individual responsibility to the public on behalf of all Smart City partners.

Legal considerations will be made and implemented within the project plan. Educational institutions will support public engagement exercises to implement communication strategies. Regular project meetings will be held face-to-face and in virtual environments to ensure open communication is made to project partners regarding technical status bulletins and user activity planning.

From a public oversight standpoint, St. Clair County would explore the creation of a regional Smart City management office to monitor project activity, coordinate communications, and facilitate further planning.

7) Project Partners and Stakeholders

City of Marysville	Ricardo Inc.	Draper Laboratory
City of Port Huron	Economic Development Alliance of St. Clair County	nuTonomy
Blue Water Area Transit	St. Clair County Regional Educational Services Agency	Dataspeed Inc.
Michigan Department of Transportation	Land Information Access Association	Autoliv
Michigan State University School of Planning, Design, and Construction	St. Clair County Community College	Spirent
St. Clair County	Automation Alley	PTC/ThingWorx
St. Clair County Road Commission		

Project partners will continue to engage with multiple OEM's, academic institutions, and other organizations that may take an interest in participating in the demonstration projects. Additionally, partners will work through USDOT to engage other Smart Cities to share experiences and maximize development potential. Our focus is to create a Smart City environment that will engage OEM's and suppliers to drive innovation and support developmental progress that parallels USDOT's vision of an ideal Smart City model.

8) Existing Transportation Infrastructure

Arterial Miles

The City of Marysville has 13 miles of arterial roads. The City of Port Huron has 10 miles of state 'M' routes, 40 miles of major arterials, and 90 miles of local streets.

Transit Services

Public transportation has been a critical part of the City of Port Huron and surrounding communities since 1866. Beginning in the 1880's, Port Huron was one of the first communities to operate an electric transit system, and during the 1930's, was one of the first communities to operate motor coaches. With the exception of a brief period from 1968 to 1976, Port Huron has operated some form of public transportation for over 135 years. Since 1976, BWATC has continued this tradition by carrying over 15 million passengers in its nearly 70 square mile service area. In 1996, BWATC began operating compressed natural gas (CNG) buses.

BWATC's current fleet consists of 86 buses – all fueled by Compressed Natural Gas (CNG). They also operate the largest CNG fueling station in the State of Michigan and three refueling stations located throughout St. Clair County.

BWATC currently operates seven regularly scheduled bus routes and a shopper shuttle within the City of Port Huron and Fort Gratiot Township. Although there are fixed stops along each route, the service operates a flag system where necessary to allow bus riders to catch the bus anywhere along route. Headways are generally 45 minutes and all vehicles for the fixed route service are lift or ramp-equipped and are equipped with bicycle racks. On-demand services are available for Americans with Disabilities Act (ADA) eligible riders, as well as limited mobility passengers. All vehicles available for this service are lift-equipped.

Demand response, or Dial-A-Ride, services are available Monday-Saturday to residents living in Burtchville, Port Huron, and Fort Gratiot townships and Monday, Wednesday, and Friday in the City of Marysville. During the summer tourist season, BWATC operates a trolley route that highlights the historic and scenic sites of the downtown area. The route lasts approximately an hour and includes several points of interest, historic sites and panoramic views of the Blue Water Bridge and the St. Clair River.

A commuter service runs to Chesterfield Township, a community in northern Macomb County that is home to many suburban office parks, twice a day Monday through Friday. This service also links up with the Suburban Mobility Authority for Regional Transportation (SMART) buses so commuters can make a connection to their final destination in Southeast Michigan and/or

downtown Detroit. This route is called the I-94 Express Route. It has four stops in St. Clair County before reaching its final destination at 23 Mile Road and Gratiot Avenue. Commuters can also take the M-29 Route that will take riders to New Baltimore in Macomb County.

BWATC held a Grand Opening celebration for the new transfer hub on December 11, 2015. The new transfer hub is designed to improve the process of boarding buses downtown to travel along seven routes throughout Port Huron and the surrounding communities.

Intelligent Transportation Systems (ITS)

The Southeast Michigan Transportation Operations Center (SEMTOC) is the hub of ITS technology applications at the Michigan Department of Transportation (MDOT), which has significant ITS infrastructure on the freeways around Port Huron and Marysville and leading up to the Blue Water Bridge. The MI Drive website (www.michigan.gov/drive) is the direct link between SEMTOC and the public. The site is updated in real time with closed circuit TV cameras, dynamic message signs, and Microwave Vehicle Detection Sensors in conjunction with Probe Traffic Detectors. This includes areas along I-94 leading to Marysville, Port Huron, and the Blue Water Bridge.

Additionally, the traffic signals within the Port Huron/Marysville area on MDOT roadways (M-25, M-29) have a variety of detection systems currently installed. MDOT generally uses two types of signal controllers: pre-timed and traffic actuated. The pre-timed system operates under a predetermined schedule or clock that is programmed ahead of time and controls the cycle length.

The traffic actuated version is more modern and relies on vehicle detection devices to allow the signal to self-adjust. These devices range from detection loops in the pavement that use changes in magnetic fields to trigger the sensors, to video detections that use pixilation, microwave or infrared variations to pick up movement.

9) Current Data Collection and Analysis

Current data collection in Marysville and Port Huron includes this includes data relating to urban planning, land use, building use, assets, transport and various local government services. The communities collect and track demographic, economic, and property information from sources such as the U.S. Census Bureau, the Southeast Michigan Council of Governments (SEMCOG), ESRI, St. Clair County, Michigan Department of Transportation, and the U.S. Department of Housing and Urban Development. Additionally, both cities engage in ongoing traffic counts, pavement surface evaluation, and utility utilization.

A great amount of data is shared among communities and with St. Clair County entities. St. Clair County has been designated by the U.S. Department of Homeland Security as a regional pilot site for *"Virtual City"* operational technology evaluations, policies, and standards development with an initial focus on geospatially-enabled collaboration tools for all-hazards and daily decision support.

The St. Clair County pilot intends to demonstrate a single picture to view multiple sources of information related to the security of city and county infrastructure and assets, along with other

data. Templates will be created to allow for reuse and standards development related to common external feeds, connectors, and screen elements for future use in other sites across the nation. Browser accessible, map-based common operating pictures will be deployed to assist first responders with their mission.

Under the Smart City Challenge, the deployment of smart, sensor-based infrastructure could strengthen the implementation of the Virtual City pilot, bringing new data into operations. Overall, the Virtual City project provides a way for law enforcement, emergency response agencies, and key community leaders on both sides of the border to easily share and access information. The project software, called the Blue Water Area RESILIENT (Regional Interoperability Collaboration Network), is an inter-agency portal that consolidates critical emergency management data from many sources in a shared web-based interface. Four Michigan counties, the Michigan State Police, and Lambton, County Ontario are participating in the program, which was initiated under the auspices of the Department of Homeland Security's Science and Technology (S&T) Directorate.

Using RESILIENT, participating agencies are sharing:

- Incident reports and crime data from 911 systems
- Real-time webcam feeds
- Locations and contact data for first responders
- Regionally available resources (hazmat teams, bomb squads, K-9 units)
- Data on potentially vulnerable infrastructure (hospitals, schools, power plants)
- SARA Title III worst-case and most probable release scenarios
- School and other building floor plans, including 360 degree virtual walk through pictures

Existing data frameworks and potential new data that can be collected through sensor-based infrastructure and V2X technologies will create entirely new sets of Big Data. Through data sharing agreements and appropriate public policy, project partners will work with other stakeholders to organize and analyze these new datasets to glean new insights for enhancing the transportation network, improving livability, strengthening community resiliency, and mitigating climate change impacts.

10) Standards, Architectures, and Certification Processes

Port Huron and Marysville will work with public and private sector organizations to ensure existing standards, architectures, and certification processes for intelligent transportation systems and connected vehicle based technologies are utilized. We will also work with other U.S. and global cities to develop a common platform to establish a market for developers to open discussions that could allow projects to contribute to potential unique challenges outside the scope of the Port Huron/Marysville Smart Cities Collaborative.

The overall aim of the Smart Cities Collaborative is to achieve more interoperability, scalability, reusability, platform independence and thus to reduce costs and risks by use of these applications. Working with Michigan State University's School of Planning, Design, and Construction, the team will ensure that these data standards and processes, along with lessons learned, are fully documented and included in the knowledge transfer phase.

We are cognizant of USDOT's participation in the ITS Standards and Architecture Harmonization program and activities focusing on the standards needed to provide connectivity among vehicles, and between vehicles and infrastructure. Harmonization facilitates interoperability among products and systems, which benefits transportation management agencies, vehicle manufacturers, equipment vendors, and other stakeholders. By overcoming institutional and financial barriers to technology harmonization, stakeholders could realize lower life-cycle costs for the acquisition and maintenance of systems.

The project team will stay abreast of efforts within the international standards community to harmonize standards and architecture in order to increase vehicle connectivity.

11) Goals and Objectives

Michael Bloomberg, the former mayor of New York City, once said *"the possibilities for how cities can use that data to improve lives – and improve the way services are provided to citizens – are limitless."* The vision of the Port Huron/Marysville Smart Cities Collaborative is detailed above on page 2 of this application narrative. The common denominator in all of the strategic actions and implementation measures that can help project partners and stakeholders achieve that vision is Big Data. Data can be used as an essential service that provides better inputs affecting the way we live and work. Smart cities will figure out optimal methods of collecting data, analyzing that data, and connecting that data to make impactful changes in the community.

In order to evaluate our success in moving toward and ultimately achieving our vision, the Port Huron/Marysville Smart Cities Collaborative has the following goals and objectives:

<u>Goal 1: Advance Open Government and Open Data</u>

- Objective 1: Treat data as a public utility, such as water, power, gas and transportation.
- Objective 2: Identify innovative ways to analyze and use big data.

<u>Goal 2: Improve safety</u>

- Objective 1: Use connected vehicle technologies and other smart infrastructure to reduce traffic crashes, injuries, and fatalities.
- Objective 2: Utilize smart infrastructure solutions to enhance homeland security and freight transport.

<u>Goal 3: Enhance mobility and connectivity</u>

- Objective 1: Enhance shared-use mobility services in Port Huron and Marysville.
- Objective 2: Use technology and innovation to provide real-time traveler information and emerging mobility services to improve personal mobility for citizens.
- Objective 3: Provide a real-world community setting for OEM's, software developers, application developers, academics, and other stakeholders to test, model, and refine autonomous and connected vehicles.

Goal 4: Mitigate Climate Change Impacts

- Objective 1: Utilize smart infrastructure to reduce greenhouse gas emissions, traffic congestion, and other community systems that may negatively impact air and water quality or threaten sustainability.
- Objective 2: Develop the adaptive capacity of local governments and citizens in becoming more resilient to economic and environmental disruptions.

Goal 5: Educate and engage citizens about Smart City initiatives

- Objective 1: Survey citizens in Port Huron and Marysville to get their thoughts, ideas, and concerns about what a Smart City means to them.
- Objective 2: Educate citizens on the benefits of connected and autonomous vehicles, electric vehicles, open government and human-machine interaction.
- Objective 3: Increase opportunities for crowdsourcing and social media utilization to generate community knowledge, innovation, and increase access.

Goal 6: Facilitate knowledge transfer and replication in other communities

- Objective 1: Develop Smart City Roadmap that other cities can use to plan and implement Smart City initiatives.
- Objective 2: Share experiences with academia and OEM's through presentations, conferences, and information exchanges.
- Objective 3: Develop a Resilient Communities toolbox that integrates Smart City adaptations, ideas for mitigating climate change, and enhancing livability.

The Port Huron/Marysville Collaborative will continually monitor the impacts of the demonstration projects to assess progress and understand how mobility, safety, efficiency, sustainability, and climate change are being affected. Metrics, milestones, and deliverables will be formalized in the phase 2 project plan. Ongoing documentation with project partners will be translated in the final knowledge transfer phase.

12) Capacity for Implementation and Performance Management

The cities of Port Huron and Marysville have a long history of managing and implementing state and federal grant programs. Additionally, a great spirit of cooperation exists between these two cities, neighboring communities, and St. Clair County.

The Port Huron/Marysville Smart Cities Collaborative will manage overall grant activities with the assistance of its quality partnerships. These partnerships include world class systems engineering firms such as Ricardo and Draper Laboratories, a strong connection to higher education from the community college level to world class universities, participation from elemental-specific experts well-versed in the latest smart infrastructure innovations, and lean and responsive local governments.

13) Cost Share, In-Kind Donations, and Partnering

Proximity to the "Hub" of the automotive industry in the Metro Detroit area and to most all of the top Tier 1 global automotive suppliers provides incredible opportunity to establish co-

development activities in any and all of the 12 elements in areas that will produce results and reports that will reach well beyond the seven selected use case challenges of the municipalities.

Consideration of the submitted vision proposal has been based on primarily the USDOT portion of the Grant Funding alone. Although the Vulcan portion of available funding opportunity is also sought, the goal was to ensure that this vision could be funded with as minimal funding and as maximum co-development as possible to progress connectivity technology and data processing learning and realization to develop experience, expertise, and validation supporting concepts and theories that will support evolution of this technology and its capability to contribute to making it easier to face the challenges of the future related to mobility and population trends.

Partnerships with world class engineering solution institutions, Ricardo and Draper Laboratories, along with potential collaboration and co-development opportunities with global Tier 1 supplier and safety leader Autoliv ASP Research and Development are believed to provide consideration for addressing developments that will provide significantly favorable cost/value considerations.

Furthermore, to leverage educational institutions from community college to world class universities, significant opportunity to explore more theoretical initial aspects are believed to provide greater development and results and value.