CONNECTED VEHICLE PILOT DEPLOYMENT PROGRAM

Kate Hartman, ITS JPO, USDOT
Robert Rausch, TransCore ITS
Deepak Gopalakrishna, ICF
Bob Frey, THEA and Steve Novosad, HNTB
Session Agenda

• Overview of the Connected Vehicle Pilot Deployment Program
  - Kate Hartman, Program Manager, USDOT

• Challenges to large scale Connected Vehicle Deployment in the Urban Environment, New York City’s Connected Vehicle Project: 8,000 vehicles, 400 Roadside Units, 12 Safety Applications
  - Robert Rausch, TransCore ITS

• Improving Safety and Freight Operations in Rural Corridors using Connected Vehicle Technology: Update from Wyoming CV Pilot
  - Deepak Gopalakrishna, ICF International Inc.

• Vehicle to infrastructure Deployment in Tampa – The Need for Coordination between Automakers and Infrastructure Owners
  - Bob Frey, Tampa Hillsborough Expressway Authority; Stephen Novosad, HNTB Corp.

• Moderated Discussion
  - Kate Hartman, Program Manager, USDOT
CONNECTED VEHICLE PILOT
Deployment Program

Kate Hartman, Program Manager

ITS Joint Program Office

U.S. Department of Transportation
CV PILOT DEPLOYMENT PROGRAM GOALS

- Spur Early CV Tech Deployment
  - Wirelessly Connected Vehicles
- Measure Deployment Benefits
  - Safety
  - Mobility
  - Environment
- Resolve Deployment Issues
  - Technical
  - Institutional
  - Financial
### THE THREE PILOT SITES

- **WYDOT**
  - Reduce the number and severity of adverse weather-related incidents in the I-80 Corridor in order to improve safety and reduce incident-related delays.
  - Focused on the needs of commercial vehicle operators in the State of Wyoming.

- **New York City DOT**
  - Improve safety and mobility of travelers in New York City through connected vehicle technologies.
  - Vehicle to vehicle (V2V) technology installed in up to 8,000 vehicles in Midtown Manhattan, and vehicle to infrastructure (V2I) technology installed along high-accident rate arterials in Manhattan and Central Brooklyn.

- **Tampa (THEA)**
  - Alleviate congestion and improve safety during morning commuting hours.
  - Deploy a variety of connected vehicle technologies on and in the vicinity of reversible express lanes and three major arterials in downtown Tampa to solve the transportation challenges.
CV PILOT DEPLOYMENT SCHEDULE

Connected Vehicle Pilot Deployment (up to 50 months)

- **Phase 1: Concept Development (COMPLETE)**
  - Creates the foundational plan to enable further design and deployment
  - **Progress Gate: Is the concept ready for deployment?**

- **Phase 2: Design/Deploy/Test (CURRENT PHASE- began September 1, 2016)**
  - Detailed design and deployment followed by testing to ensure deployment functions as intended (both technically and institutionally)
  - **Progress Gate: Does the system function as planned?**

- **Phase 3: Maintain/Operate**
  - Focus is on assessing the performance of the deployed system
  - Post Pilot Operations (CV tech integrated into operational practice)
Challenges to Large Scale Connected Vehicle Deployment in the Urban Environment
8,000 vehicles, 400 Roadside Units, 12 Safety Applications

New York City DOT

Robert Rausch, P.E. - TransCore ITS
TODAY’S AGENDA

- CV Technology
  - How It Works – In 3 Minutes
- Overview Of The New York Project
- Challenges Encountered
Connected Vehicle Technology

The Fundamentals --- Applied for NYC
V2V DSRC CONCEPT
Vehicle-to-Vehicle (V2V) Safety Applications

Vehicles Broadcast information about their location, heading, speed, and path history:

**Basic Safety Message (BSM)**

Vehicles receive the data – determine immediate threats – alert driver – who then takes evasive actions

**Note:** *Intersections receive the data – measure traffic conditions, optimize signal timing*

*Security Mechanism establishes a “trusted environment”*  
*Messages can be authenticated and encrypted as necessary*
I2V/V2I CONCEPT
**MAP Message**

**Intersection Geometric Information**
- Stop Bar
- Lanes
- Permitted Movements

**SPaT Message**

**Signal Timing Information**
- Time when it turns Yellow
- Time when it turns Red
- Time when it turns Green

**Vehicle Information**
- Location
- Heading
- Speed
- Path History

**BSM Message**

**Vehicles** receive the data – determine immediate threats – alert driver

**Infrastructure-to-Vehicle (I2V) messages for additional Safety Applications (RLVW)**

**Intersections** receive the BSM – measure traffic conditions, optimize signal timing

**Other Messages:**
- **TIM** – *(Traveler Information Message)* in-vehicle signage
- Basic Infrastructure Message (BIM)
- Priority request/Status (SRM/SSM)
- Pedestrian (Personal) Safety message (PSM)
- Vehicle Event Message

**Location Correction (RTCM)**
DSRC
DEDICATED SHORT RANGE COMMUNICATIONS

Key Benefits:
• 802.11p technology similar to 802.11a
• Low latency communication (<< 50ms)
• High data transfer rates (3 – 27 Mbps)
• Typically 300M and 360 °
• Up to 1000 M for emergency vehicles

Service Channel
Download Application software and operational parameters

Service Channel
Uploading Mobility, operations, & performance logs

Emergency Vehicles
>Not in NYC<
New York City

Project Overview
NYC Project Goals

- New York City is aggressively pursuing “Vision Zero”
  
  "Traffic Death and Injury on City streets is not acceptable”

  Vision Zero Goal: to eliminate traffic deaths by 2024

- Use CV technology as a new tool to achieve this goal

- The project will evaluate the safety benefits and challenges of implementing CV technology with a significant number of vehicles in the dense urban environment.
OVERALL PROJECT CONCEPT

Source: NYCDOT
After Market Safety Device (ASD)

GPS

DSRC (2 channel)

Vehicle CAN of J Bus

After Market Safety Device (ASD)

POWER

GPS

DSRC (2 channel)

Alerts, warnings, driver information
Verify Proper Operation

Typical Vehicle

Typical Roadside

Traffic Controller

NYCWIN

City Owned Network (Fiber or citynet)

Optional Traffic Controller

Source: NYCDOT
CV DEPLOYMENT EQUIPMENT - VEHICLES

- Up to 8,000 fleet vehicles with Aftermarket Safety Devices (ASDs):
  - ~5,850 Taxis (Yellow Cabs)
  - ~1,250 MTA Buses
  - ~ 500 Sanitation & DOT vehicles
  - ~ 400 UPS vehicles

- Pedestrian PIDs ~100 units
  - Visually Impaired
- PED in Crosswalk ~10 int.

Source: USDOT
CV DEPLOYMENT EQUIPMENT – INFRASTRUCTURE

- Roadside Units (RSU) at ~353 Locations
  - ~202 Manhattan Ave
  - ~ 79 Manhattan Cross
  - ~ 28 on Flatbush Ave
  - ~ 8 on FDR
  - ~ 36 Support locations (airports, river crossings, terminal facilities)

Source: USDOT
LOCATIONS (MANHATTAN, BROOKLYN)

V2V applications work wherever equipped vehicles encounter one another.

V2I applications work where infrastructure is installed (highlighted streets).

The CV project leverages the City’s transportation investments.

Source: NYCDOT
Vehicle-to-Vehicle (V2V) Safety Applications

- Vehicle Turning Right in Front of Bus Warning (VTRW)
- Forward Collision Warning (FCW)
- Emergency Electronic Brake Light (EEBL)
- Blind Spot Warning (BSW)
- Lane Change Warning/Assist (LCA)
- Intersection Movement Assist (IMA)

V2V applications based on existing demonstrations and prior developments and documentation
Vehicle-to-Infrastructure (V2I) Safety Applications

- Red Light Violation Warning (RLVW)
- Speed Compliance (SPD-COMP)
- Curve Speed Compliance (CSPD-COM)
- Speed Compliance/Work Zone (SPDCOMPWZ)
- Oversize Vehicle Compliance (OVC)
  - Prohibited Facilities (Parkways)
  - Over Height
- Emergency Communications and Evacuation Information (Using the traveler information features) (EVACINFO)

V2I applications based on existing demonstrations and/or modifications to prior developments and documentation
CV APPLICATIONS - 3

Other Applications

- Mobile [Visually Impaired] Ped Signal System PED-SIG
- Pedestrian in Signalized Intersection Warning PEDINXWALK
- CV Data for Intelligent Traffic Signal System I-SIGCVDAT

Operations, Maintenance, and Performance Analysis

- RF Monitoring RFMON
- OTA Firmware Update FRMWUPD
- Parameter Up/Down Loading PARMLD
- Traffic data collection TDC
- Event History Recording EVTRECORD
- Event History Up Load EVTCOLLECT

Roadway segment travel times

To Meet USDOT Evaluation Requirements
OUR APPROACH

- Focus on “proven” **Safety Applications** - BAA stressed that R&D has shown the benefits:
  - Pilot Deployment will evaluate the benefits on a much larger scale – dense urban situation
- **Leverage “existing” safety applications** (demonstrated)
  - Manage (*Tune*) the CV applications for NYC
  - Adjust operation for the congested traffic environment of NYC
- Modify several existing applications to encourage speed **compliance**
  - Note that the City reduced city-wide speed from 30 MPH to 25 MPH
- Contract pedestrian applications development
- Leverage existing **standards**, existing infrastructure, and knowledge base
- Use the **Systems Engineering Process** to:
  - Develop operations and maintenance applications
  - Develop data collection applications [for benefits analysis]
  - Develop benefit evaluation applications
Challenges - Everywhere

- **Stakeholder privacy** concerns vs. USDOT desire for broad evaluation data
- Stakeholder requirements to avoid **distracting “cockpit”** displays
- **Density** of Roadside DSRC Transponders (RSU)
  - ~76 M for short blocks
  - ~200 M for the long blocks (between avenues)
- **Bandwidth limitations** of the wireless backhaul (RSU to TMC) – *it is IPV4 only*
- Ongoing **maintenance and support** (in-vehicle and infrastructure) of the large scale deployment (8,000+ Vehicles and >350 RSUs)

**ONLY DSRC Communications!**

- SCMS for all applications & DSRC Over-the-air (OTA) certificate distribution
- OTA [DSRC] data collection – bandwidth limited
- OTA [DSRC] software updates
- OTA [DSRC] parameter management
- Location accuracy in the urban canyons *(both relative V2V and absolute V2I)*
- Tests, trials, and consideration of alternative sources
**MAINTENANCE SUPPORT**

- Added applications to track DSRC performance
  - V2V – when and where do vehicles see each other?
  - V2I – general sense of effective communications radius ASD
  - I2V – general sense of effective communications radius RSU
- Positioned RSU’s at *fleet* “barns” and airports
  - Update parameters & firmware and retrieve performance data
- SCMS – certificates are only for 1 week
  - Until misbehavior detection and Certificate Revocation List (CRL) distribution is in production
- Purchasing RF test equipment to help track performance and interference!
CHALLENGE: PERFORMANCE METRICS & EVALUATION METHODS
WHILE PRESERVING PRIVACY

Identified the safety needs from ConOps

Identified the safety applications to be implemented

Developed Questions for Evaluation

Identified Performance Measurement Metrics ~47

Reduce Vehicle to Vehicle Crashes

- FCW
- EEBL
- BSW
- LCW
- IMA
- RLVW
- VTRW

- Do the number of reportable crashes decrease
- Do the number and severity of red light violations decrease
- Do the number of bus / right turn vehicle crashes decrease

Data collection:
Everything that “occurred” immediately before and after the alert

- Fatality crash counts
- Injury crash counts
- Property damage only crash counts
- Time to Collision
- Red light violation counts
- Red light violation related crash counts
- Driver actions and/or impact of actions in response to issued warnings
- Bus and right turn related crash counts
- Number of warnings generated
- Right-turning related related conflicts
EXAMPLE OF EVENT LOGGING

CVApp \textsubscript{X} (Safety App)

EvtRcdApp

- BSM\textsubscript{HV}
- BSM\textsubscript{TV}
- BSM\textsubscript{RVn}
- SPaT: Closest RSU
- MAP: Closest RSU

Control Parameter

EvtRcd Parameter

StartUp Parameter

Appliuts

SpdThreshold

Event Logging Diagram:

- EvtRcd
- Begin Record
- End Record
- Begin Trigger
- End Trigger

Legend:

- HV – Host Vehicle
- TV – Target Vehicle
- RV – Remote Vehicle
- n – Vehicle 1...n

All of the data collected during \( T_3 \) is transferred to the event record, and after the trigger the data is collected and added to the record until \( T_4 \) expires.

Time Before

Time After
Obfuscation of ASD Action Logs for Privacy

- Obfuscation process to scrub precise time and location data
  - Relative details retained
  - Non-obfuscated data will be destroyed following the obfuscation process
DEPLOYMENT APPROACH

- **Turn-key ASD and RSU equipment ~400**
- **Multiple stage delivery ~8,000**
  - Prototypes (8 week development and 12 week install/test)
  - Award to 2 ASD Bidders (~1/2 each) and 1 RSU Bidder
  - Initial order (first 1000 production units)
  - Bulk order (remaining production units)

- **Concept:** Verify the hardware platform early and use OTA updates (firmware, parameters) to verify the applications

- Installation time for fleets this large takes time (estimate from other’s experience and measure actuals)
How to push software updates to 8,000 in-service vehicles quickly over DSRC
  - Not WiFi and Not LTE/4G
Developed Scheme to support both broadcast and unicast updates
ASD's read Wave Service Announcements from Control Channel
Directed to Service Channel if RSU supports Updates
RSU broadcasts available updates
  - Some updates broadcast (continuous) some available by unicast
  - Vehicles initiate update using unicast or broadcast streams

Efficient Channel Use
Privacy is maintained
OUR TEAM

- NYCDOT: single prime contractor for NYC CVPD Phase 2 and 3
- Key staff
  - Project Management Lead: Mohamad Talas, Ph.D., P.E., P.T.O.E.
  - Site Deployment Lead: Robert G. Rausch, P.E.
  - Systems Engineering Lead: David A. Benevelli, P.E.

Stakeholders
Fleet Owners and Users

Project Team

[Logos of various stakeholders and project team members]
WHERE ARE WE NOW?

- Phase 2 – 20 Month Deployment
  - Started September 1, 2016
  - Official Kick Off September 23, 2016
  - Twenty (20) Months (**16 left**)!
    - Developing architecture, data management plan, detailed designs, procurement documents, etc.

- Phase 3 Evaluation
  - Starts April 2018

As we proceed – USDOT and the Project Teams are sharing ideas, challenges, workshops, and the NY team is aggressively participating in the standards development program!
THANK YOU

Bob Rausch, P.E.
TransCore ITS
Robert.Rausch@TransCore.com
Improving Safety and Freight Operations in Rural Corridors using Connected Vehicle Technology
Update from Wyoming CV Pilot

Deepak Gopalakrishna, ICF
**Wyoming’s I-80 Corridor**

**Heavy Freight Traffic**
- Major E/W Freight corridor
- Freight over half of annual traffic

**Severe Weather Conditions**
- Elev. Over 6000 ft
- Heavy winds, heavy snow and fog
- Severe blowing snow and low visibility

**Adverse Impacts on Truckers**
- Higher than normal incident rates
- Multi-vehicle crashes
- Fatalities

Source: WYDOT (Dec 17, 2015)
SCOPE OF THE PROBLEM

**654 incidents** involving commercial vehicles occurred on I-80 since project kick-off

- **1,600+ crashes**
- **1,923 vehicles**
- **$865.3M Societal Impact**
The need for actionable information is growing

- Estimated Firms Subscribed to WYDOT’s CVOP: 150 (Sept 2015)
- Downloads of WYDOT 511 App*: 0 (Sept 2015)
- Downloads since Feb 2016 when app was released:
  - Aug 2016: 800
  - As of 2022: 26,443

WYDOT’s Commercial Vehicle Operator Portal (CVOP)

CVOP Users by Location: [Map Image]
PILOT OBJECTIVES

Road Weather Condition Input
1. Improve road weather condition reports received into the TMC

TMC Information Dissemination
1. Improve ability of the TMC to generate wide area alerts and advisories
2. Efficiently manage closures, restrictions and speed limits
3. Effectively disseminate and receive messages from TMC to en-route vehicles
4. Improve information to commercial vehicle fleet managers

Vehicle/Roadside Alerts & Advisories
1. Effectively transmit and receive V2V messages to reduce incidents and their severity
2. Enhance emergency notifications of a crash

Outcomes
1. Improve speed adherence and reduce speed variation
2. Reduce vehicle crashes
PILOT ELEMENTS

CV Environment
- 75 Roadside Units on I-80
- 400 Vehicles with DSRC Connectivity

V2V Applications
- Forward Collision Warning
- Distress Notification

V2I Applications
- Situational Awareness
- Spot Weather
- Work Zone Warning

WYDOT’s CV Pilot System

Vehicle System

Wyoming CV System

Roadside Infrastructure

Back office system

External Interfaces
VEHICLE SYSTEM

All vehicles that are part of the vehicle system will have:

- Ability to share information via DSRC with connected devices (vehicles and RSUs)
- Ability to broadcast Basic Safety Message Part I
- Ability to receive Traveler Information Messages (TIM)
- Human-Machine Interface (HMI) to communicate alerts and advisories to driver

Vehicle Sub-Systems
1. WYDOT Fleets
2. Integrated Trucks
3. Retrofit Vehicles
4. Basic Vehicles

On-board Vehicle Technologies
- OBU with DSRC only
- OBU with DSRC and Satellite Receiver
- Human Machine Interface
- CAN Bus Integration (selected vehicles)
- Environmental Sensors (selected vehicles)
CV APPLICATIONS OVERVIEW

On-Board Applications
• Applications available to equipped vehicles

TMC Ops Applications
• Support for WYDOT Traveler Information and Traffic Management
The pilot will develop five on-board applications that will provide road condition information to the drivers of equipped vehicles.

- **Forward Collision Warning (FCW)**
- **Infrastructure-to-Vehicle (I2V) Situational Awareness (SA)**
- **Work Zone Warning (WZW)**
- **Spot Weather Impact Warning (SWIW)**
- **Distress Notification (DN)**
Project Status
## Current Status

<table>
<thead>
<tr>
<th>Component</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Final System Architecture</strong></td>
<td>Submitted to U.S DOT</td>
</tr>
<tr>
<td><strong>Ongoing System Design</strong></td>
<td>Working on System Design Document</td>
</tr>
<tr>
<td><strong>Ongoing Equipment Bench Testing</strong></td>
<td>4 OBUs are up and running, 2 RSUs are running, Android HMI up and running</td>
</tr>
<tr>
<td><strong>Integration of CV Pilot Elements with TMC</strong></td>
<td>Progress on TMDD Interface, participant tracking application, 511 app updates, location for the 75 RSUs identified, Pikalert® instance activate</td>
</tr>
<tr>
<td><strong>Procurement</strong></td>
<td>Working on procurement of all on-board devices and RSUs</td>
</tr>
</tbody>
</table>
NEXT STEPS AND ACTIVITIES

- Operational Readiness Testing in early 2018
- System Operations and Maintenance starting May 2018 for 18 months
- Post-Pilot Transition Planning
- Support for performance measurement and evaluation (throughout)
- Standards support (throughout)
- Stakeholder outreach (throughout)
Lessons Learned
IMPLEMENTING CV TECHNOLOGY IN A RURAL CORRIDOR

- Clearly defining the State role versus private roles especially with long-term operations in mind
- Need multiple ways of reaching on-road drivers.
- Limited alternate routes. If we miss a decision point, travelers can be stuck for hours
- Leverage existing State-owned fleets as much as possible
- Engage the local community and stakeholder groups early
IMPLEMENTING CV TECHNOLOGY FOR TRUCKS

- Standards are currently focused on light-duty vehicles
- Limited in-cab space for human-machine interface
- Varying makes, model years of participating fleet make CAN integration difficult
- Application development so far has mostly been for light-duty vehicles. Algorithms for trucks-specific instances still a work in progress
- Limited opportunity to take trucks out of revenue service for updates, repairs, installs
- Large geographic footprint means that applications will largely not work when outside Wyoming
ENGAGING THE TRUCKING COMMUNITY

Formalized agreements with private partners take time.

Balancing data collection with privacy

Working with varying capabilities between firms

Taking advantage of existing or planned driver technology in trucks
Vehicle to infrastructure Deployment in Tampa – The Need for Coordination between Automakers and Infrastructure Owners

Bob Frey, Tampa Hillsborough Expressway Authority
Stephen Novosad, HNTB Corp.
AGENDA

- THEA CV Pilot Overview
- An Infrastructure Owner’s Perspective
- How Infrastructure Owners See Automakers
- The Need for Collaboration
FOCUSED PILOT DEPLOYMENT AREA

Study Area
CONNECTED VEHICLE APPLICATION

V2I SAFETY
End of Ramp Deceleration Warning (ERDW)
Wrong Way CHWV (WWRT)
Pedestrian in Signalled Crosswalk (PED-X)
Mobile Accessible Pedestrian Signal (MDT-500)

V2I SAFETY
Emergency Electronic Brakes Light (EEBL)
Forward Collision Warning (FCW)
Intersection Movement Alert (IMA)
Vehicle Turning Right in Front of Traveling Vehicle (VTRTV)

V2I MOBILITY
Intelligent Traffic Signal System (ITS-S)
Travel Signal Priority (TSP)

V2I AGENCY DATA
Proba Data Enabled Traffic Monitoring (PDEM)
PARTICIPANTS: BY THE NUMBERS

1,500 Privately Owned Vehicles

500+ Pedestrian Smartphones (Android devices only)

10 TECO Line Streetcar Trolleys

10 Hillsborough Area Regional Transit (HART) buses
On-Board Units (OBUs)
A rear view mirror for passenger vehicles and tablet display for transit vehicles

Road Side Units (RSUs)
Mounted on existing structures throughout the deployment area
Forward Collision Warning (FCW)
Emergency Electronic Brake Light (EEBL)
End of Ramp Deceleration Warning (ERDW)
Wrong-way Entry

Intelligent Signal System (I-SIG)

Intersection Movement Assist (IMA)
Mobile Accessible Pedestrian Signal System (PED-SIG)

Pedestrian in a Crosswalk Vehicle Warning (PED-X)

FCW

IMA
TRANSIT SIGNAL PRIORITY
Vehicle Turning Right in Front of Transit Vehicle (VTRFTV)

I-SIG
PED-SIG
PED-X
SYSTEM FLOW
Data, data everywhere and only a bit is useful...

What data is useful?
- Operations Data
- Traffic Incident Management

Volume of Data
- Can we handle it?
- Can we afford it?

What data would be useful if available?
- Decision Support Systems
<table>
<thead>
<tr>
<th>Service</th>
<th>Expected</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPaT</td>
<td>Total for 8 RSUs = 6,912,000 messages per day</td>
<td>Total for 8 RSUs = 28,821,437 messages per day</td>
</tr>
<tr>
<td>MAP</td>
<td>Total for 7 RSUs = 691,200 messages per day</td>
<td>Total for 7 RSUs = 2,510,384 messages per day</td>
</tr>
<tr>
<td>TIM</td>
<td>Total for 3 RSUs = 259,200 messages per day</td>
<td>Total for 3 RSUs = 227,766 messages per day</td>
</tr>
<tr>
<td>BSM</td>
<td>Total for 26 RSUs = 6,516,458 messages per day</td>
<td>Total for 26 RSUs = 16,740,785 messages per day</td>
</tr>
</tbody>
</table>

Storage Size (total file storage + database size per month)

- **Files**: 4.6 TB
- **Database**: 13.8 TB
- **Total**: 18.4 TB
How Much Data?

70 billion connected devices (2050)

2.8 trillion sensors (2019)

Autonomous Vehicles (L2)
- 80+ processors
- 200+ sensors
- 100M+ lines of code (GM)

2,500,000,000,000,000,000
2.5 Quintillion bytes EVERY DAY
How Infrastructure Owners See OEMs

- No previous relationship
- OEMs focus on Safety and Marketability
- Vehicle Detection
OPERATIONS DATA

Brakes
Head Lamps
Traction Control
Turn Signal
Wipers
Hazards
Location Speed Direction
THE NEED FOR COLLABORATION

- It’s a new world
- Software replacing hardware/devices
- Security/privacy
- Vehicle connectivity
- Vehicles as part of Decision Support System
- Other device connectivity
- Automated vehicles
We Need Each Other
Robert M. Frey, AICP
Planning Director, Tampa Hillsborough Expressway Authority
Project Manager, Tampa Connected Vehicle Pilot Deployment Program
1104 E. Twiggs St.
Ste. 300
Tampa, FL 33602
(813) 272-6740
bobf@tampa-xway.com

Steve Novosad
HNTB
Systems Engineering Lead, Tampa Connected Vehicle Pilot
201 N. Franklin St.
Ste. 1200
Tampa, FL 33602
snovosad@hntb.com

TampaCVpilot.com
/TampaCVpilot
@Tampa_CV
@TampaCV
Join us for the *Getting Ready for Deployment* Series

- Discover more about the CV Pilot Sites
- Learn the Essential Steps to CV Deployment
- Engage in Technical Discussion

Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
Twitter: [@ITSJPODirector](https://twitter.com/ITSJPODirector)
Facebook: [https://www.facebook.com/USDOTResearch](https://www.facebook.com/USDOTResearch)

Contact for CV Pilots Program:
Kate Hartman, Program Manager
Kate.hartman@dot.gov

Contact for Pilot Sites:
- Kate Hartman, WYDOT Site AOR
  Kate.Hartman@dot.gov
- Jonathan Walker, NYCDOT Site AOR
  Jonathan.b.Walker@dot.gov
- Govind Vadakpat, THEA Site AOR
  G.Vadakpat@dot.gov