

## MEMORANDUM

TO: HRT0 Subcommittee

FROM: Jon Chambers, P.E.

DATE: December 7, 2018

SUBJECT: Hampton Roads Transportation Operations Strategy – Phase II  
Corridors of Regional Significance

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The purpose of this document is to analyze five Corridors of Regional Significance (CORS) to identify the existing conditions and needs along these corridors. Specifically, this analysis looks at the need for high-speed communication upgrades, traffic sensors, and coordinated signal timings. The five corridors examined in this analysis are:

- US 13
- Rt. 143/Jefferson Avenue
- Warwick Boulevard
- US 17
- US 58

The following existing condition information has been compiled from GIS data. For each corridor, the existing system information has been divided into four subsections of needs: high-speed communications, traffic detectors, signal coordination, and Traveler Information Systems. The data gathered has been consolidated into a GIS database and overall map for ease of reference. The following sections provide written explanation of the contents of the maps.

### US 13

US 13 was examined starting in Suffolk to the west at the US 13 and Rt. 32 split, through Chesapeake and Norfolk, ending in Virginia Beach at the Chesapeake Bay Bridge Tunnel approach. Due to the extensive length of this corridor, the operational influences can vary from one end to the other.

On the west end of Suffolk, the operational needs are somewhat internal to the City with traffic influences coming from US 460 and US 58 from the west, railroad crossing impacts, as well as impacts of US58 Business versus the US 58 Bypass.

From Bowers Hill to the Northampton intersection, the corridor can be viewed as a parallel route to I-64 for diversion measures. And from I-64 east, the corridor is the primary means of accessing the

Chesapeake Bay Bridge Tunnel (CBBT), which can be impacted by wind restrictions as well as holiday/summer traffic peaks. However, when coupled with connections to Newtown Road and Independence Boulevard, this eastern portion of the corridor provides a relief valve when the I-64/I-264 interchange is impacted by major incidents. The following subsections discuss the gaps needing to be filled for communications, monitoring, timings, and traveler information along this complete corridor.

### **High-Speed Communications**

There is a gap in the communications route in Suffolk along US 13 spanning from Bowers Hill to the Chesapeake/Virginia Beach line. Additionally, Suffolk has a missing link along the US58 Bypass between US460 and US58 Business, that extends south to Carolina Road. Within these segments there are two short, but expensive, fiber gaps between Norfolk and Virginia Beach at the Elizabeth River crossing between Indian River Rd. and Corporate Blvd, and across the Gilmerton Bridge in Chesapeake.

Routes shown in the associated maps for this memo that show FORS are for fiber optic resource sharing paths that currently or have the potential to be leveraged for recommended deployments.

### **Surveillance and System Monitoring**

There is a gap in the existing detection equipment along US 13 in Chesapeake between I-464 and Bowers Hill. Proposed CCTV cameras and travel time detectors will help coordinate that segment of the corridor with the northeastern portion of Chesapeake as well as with Virginia Beach for managing this parallel route. Equipment that is planned in near-term/programmed projects has been shown as “existing” in the map from on-going projects along US 13/ US 58 in Suffolk. Three to four CCTV cameras are proposed along US 13 in Norfolk, if they are not already planned with the continuous flow intersection improvements at the Norfolk Premium Outlets. Two CCTV cameras are proposed along US 13 in Virginia Beach on Northampton Boulevard and the approach to the Chesapeake Bay Bridge Tunnel to more closely monitor traffic to and from the bridge.

With respect to detector locations shown in the maps for this memo, TOAD sensors are Bluetooth travel time sensors that some agencies in Hampton Roads have already deployed. Traffic Detectors are traditional vehicle sensors that do not track vehicles between points, and primarily monitor threshold changes in the network at each point.

### **Signal Timing and Coordination**

The first segment, from Bowers Hill interchange heading west along the Bypass, is primarily limited access without signalization until it reaches Carolina Road in Suffolk. It is not anticipated to require a specialized timing plan for this segment.

The second segment extends from Bowers Hill heading east through Chesapeake, Virginia Beach, and Norfolk to Northampton Boulevard, and is recommended for incident management diversion timing plans along the corridor and divided by sections of I-64 between interchanges.

The third segment, running east from I-64 to the Chesapeake Bay Bridge Tunnel should have a coordinated timing plan between Norfolk and Virginia Beach to manage major traffic anomalies.

### Traveler Information Systems (TIS)

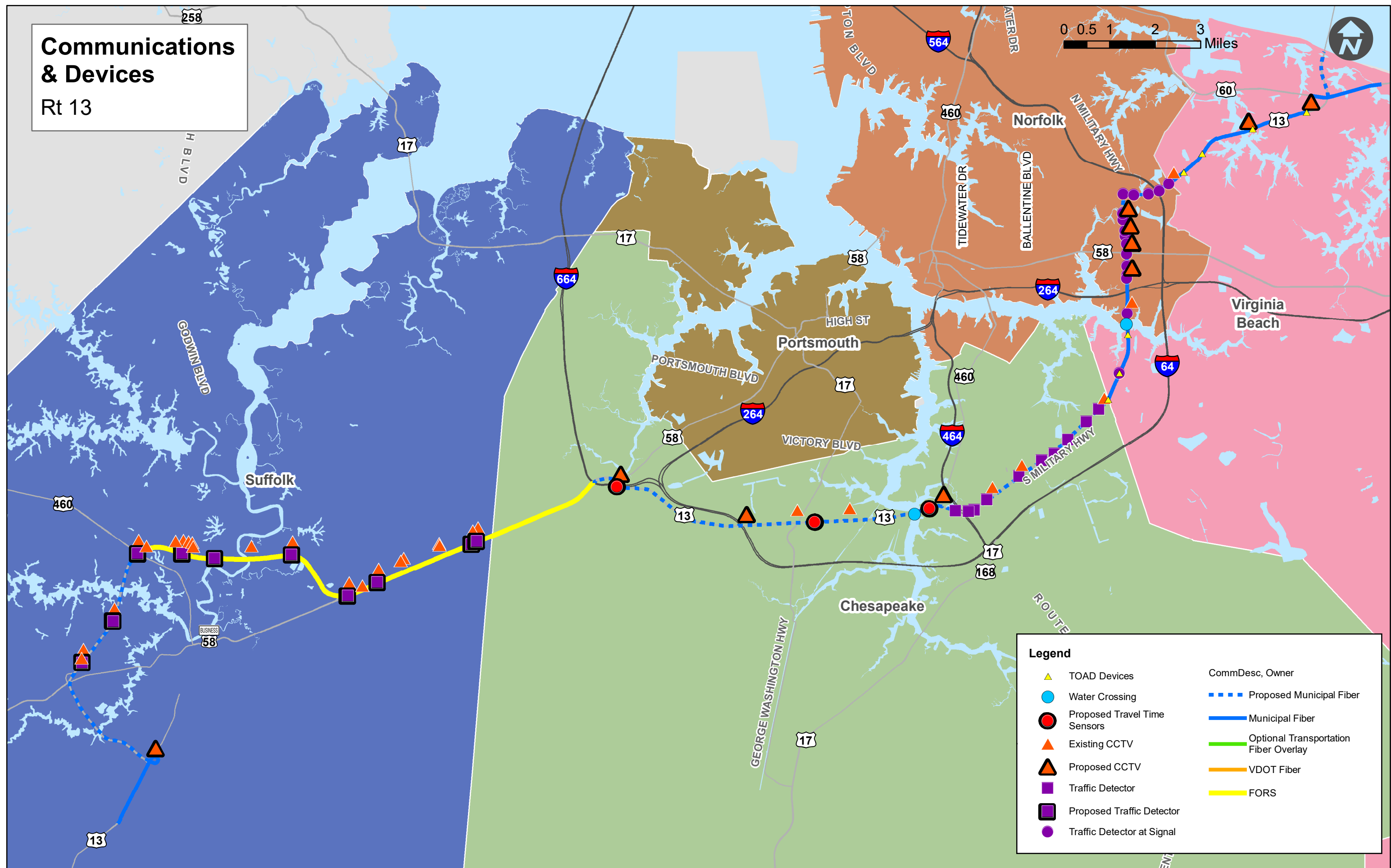
TIS are not shown on the map, but can also be considered for disseminating travel times along the second segment of US 13 versus I-64. In addition to sharing this information in 511, hybrid dedicated dynamic message signs (DDMS) can also be deployed between the I-264 interchange and Bowers Hill. For estimation purposes, 4 DDMS are shown in the probable cost opinion to cover two in each direction.

ERO Quantities – US 13		
Description	Unit	Quantity
Install Fiber Optic Cable (underground)	LF	87,700
Install Directional Drilled Conduit	LF	87,700
Pullboxes	EA	88
Directional Drilled Submarine Conduit	LF	2,700
DDMS	EA	4
CCTV	EA	10
Travel Time Sensor	EA	3
Traffic Detector	EA	10
Incident Signal Timing Plan (per signal)	EA	45

# Communications & Devices

## Rt 13

0 0.5 1 2 3 Miles



### Legend

- |                              |                                       |
|------------------------------|---------------------------------------|
| TOAD Devices                 | <b>CommDesc, Owner</b>                |
| Water Crossing               | Proposed Municipal Fiber              |
| Proposed Travel Time Sensors | Municipal Fiber                       |
| Existing CCTV                | Optional Transportation Fiber Overlay |
| Proposed CCTV                | VDOT Fiber                            |
| Traffic Detector             | FORS                                  |
| Proposed Traffic Detector    |                                       |
| Traffic Detector at Signal   |                                       |

## RT. 143/JEFFERSON AVENUE

Jefferson Avenue was examined in Newport News from I-64 Exit 247 to 25<sup>th</sup> Street near I-664. The segment of Jefferson Avenue that overlaps with US 17 is addressed in a separate section to prevent double-counting. The following subsections discuss the gaps needing to be filled for communications, monitoring, timings, and traveler information along this complete corridor.

### High-Speed Communications

High-speed communications along Jefferson Avenue has a gap along the north end of the corridor. The remainder of the corridor is along existing municipal fiber. A subset of the municipal fiber is currently using non-transportation cables. Those subsets have been labeled as an option to deploy dedicated Transportation Fiber and eliminate the use of others' cables.

### Surveillance and System Monitoring

Five traffic detectors are proposed along Jefferson Avenue to supplement the existing CCTV cameras and existing traffic detectors. The added detectors will improve surveillance and coordination along the corridor. One CCTV camera is proposed at the southern end of the corridor to complete the corridor surveillance. Information collected from these sensors may inform decisions on rerouting traffic from I-64 during incidents or congestion.

### Signal Coordination

Jefferson Avenue serves as a parallel route to I-64 from Yorktown Road to the I-664 interchange depending on the location and severity of the incident. For this exercise, it is recommended to establish incident management timing plans for the length of the corridor in coordination with the overlap with US 17 in the middle, and Rt. 258 to the east for I-64 and I-664 incident diversion strategies.

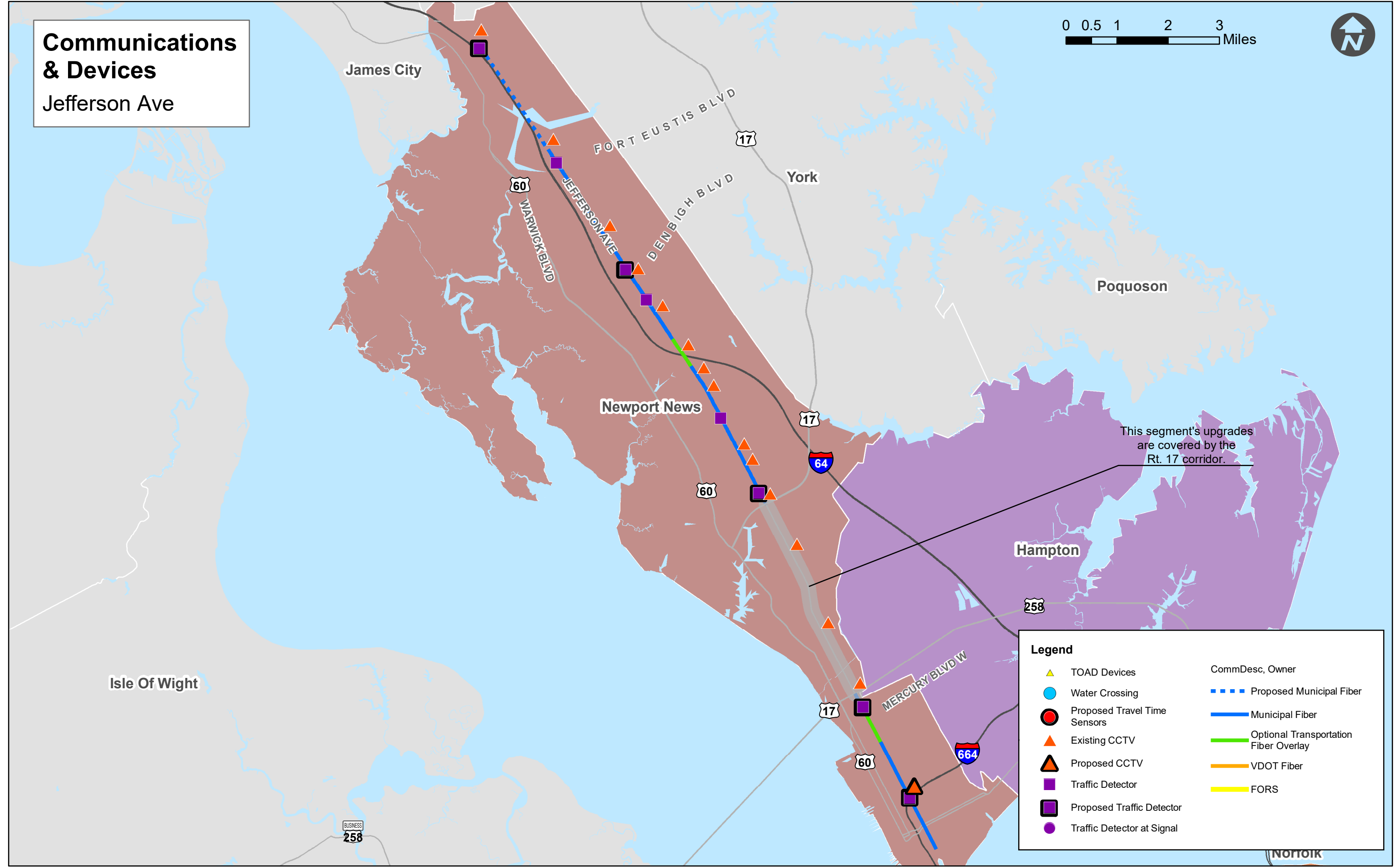
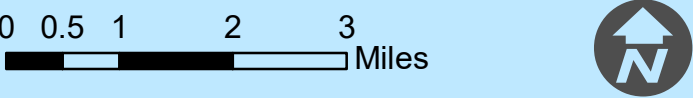
### Traveler Information Systems (TIS)

TIS are not shown on the map, but can also be considered for disseminating travel times along Jefferson Avenue versus Warwick Boulevard or I-64. In addition to sharing this information in 511, hybrid dedicated dynamic message signs (DDMS) can also be deployed along I-64. For estimation purposes, 4 DDMS are shown in the probable cost opinion to cover two in each direction.

ERO Quantities – Jefferson Avenue		
Description	Unit	Quantity
Install Fiber Optic Cable (underground)	LF	13,800
Install Directional Drilled Conduit	LF	13,800
Pullboxes	EA	14
Directional Drilled Submarine Conduit	LF	-
DDMS	EA	4
CCTV	EA	1
Travel Time Sensor	EA	-
Traffic Detector	EA	5
Incident Signal Timing Plan (per signal)	EA	57

# Communications & Devices

## Jefferson Ave



**Legend**

- TOAD Devices
- Water Crossing
- Proposed Travel Time Sensors
- Existing CCTV
- Proposed CCTV
- Traffic Detector
- Proposed Traffic Detector
- Traffic Detector at Signal

**CommDesc, Owner**

- Proposed Municipal Fiber
- Municipal Fiber
- Optional Transportation Fiber Overlay
- VDOT Fiber
- FORS

## WARWICK BOULEVARD

Warwick Boulevard was examined in Newport News from Yorktown Road near I-64 to 25<sup>th</sup> Street near I-664. The following subsections discuss the gaps needing to be filled for communications, monitoring, timings, and traveler information along this complete corridor.

### High-Speed Communications

Along Warwick Boulevard, a gap exists on the northern end of the corridor regarding the high-speed communications. The remainder of the corridor is along existing municipal fiber. A subset of the municipal fiber is currently using non-transportation cables. Those subsets have been labeled as an option to deploy dedicated Transportation Fiber and eliminate the use of others' cables.

### Surveillance and System Monitoring

Five traffic detectors and one CCTV camera are proposed along the Warwick Boulevard corridor. The CCTV is proposed at the southern end of the corridor to accompany an existing traffic detector. Information collected from system monitoring can be used to redirect traffic from parallel routes, Jefferson Avenue and I-64, based on up-to-date conditions.

### Signal Coordination

Warwick Blvd can also serve as a parallel route to I-64 and Jefferson Ave., particularly from Yorktown Road/Jefferson Ave to J.Clyde Morris/Rt.17, depending on the location and severity of the incident. For this exercise, it is recommended to establish incident management timing plans for this subset of the corridor.

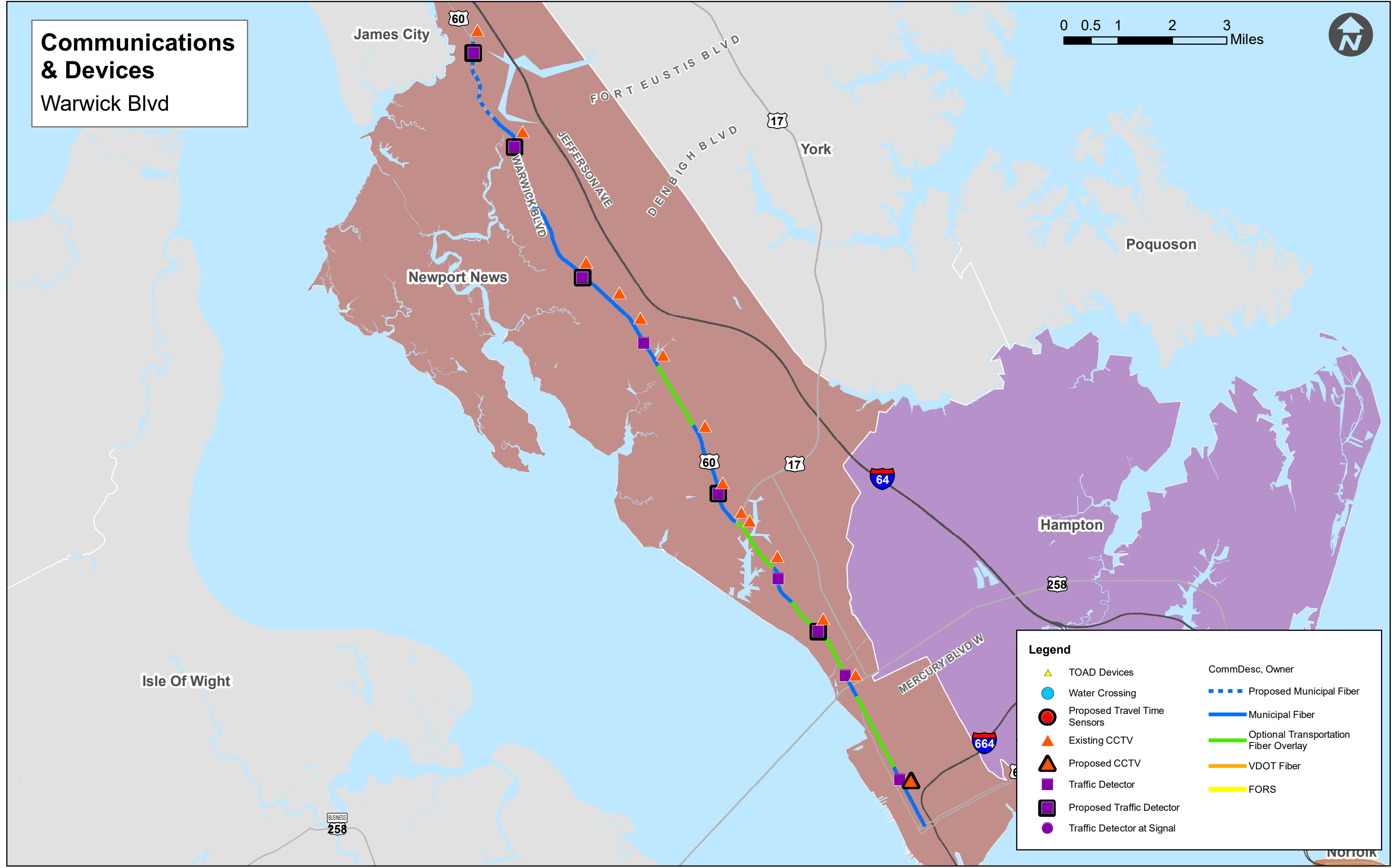
ERO Quantities – Warwick Boulevard		
Description	Unit	Quantity
Install Fiber Optic Cable (underground)	LF	9,000
Install Directional Drilled Conduit	LF	9,000
Pullboxes	EA	9
Directional Drilled Submarine Conduit	LF	-
DDMS	EA	-
CCTV	EA	1
Travel Time Sensor	EA	-
Traffic Detector	EA	5
Incident Signal Timing Plan (per signal)	EA	62



# Communications & Devices

## Warwick Blvd

0 0.5 1 2 3 Miles





## US 17

US 17 was examined from I-664 in Suffolk to the Coleman Bridge in York County, as well as the spur along Rt. 258/Mercury Boulevard to I-64. The following subsections discuss the gaps needing to be filled for communications, monitoring, timings, and traveler information along this complete corridor.

### High-Speed Communications

The northern end of the US 17 corridor is missing high-speed communications, from the Coleman Bridge in the north to Newport News city limits. The spur along Rt. 258/Mercury Boulevard to I-64 also lacks high-speed communications. VDOT fiber, fiber optic resource sharing (FORS) cables, and municipal fiber run along the rest of the corridor.

### Surveillance and System Monitoring

New traffic sensors and CCTV cameras are proposed along this corridor to improve monitoring of the corridor conditions. As previously mentioned along Jefferson Avenue and Warwick Boulevard, traffic may be rerouted between those corridors, US 17, and I-64. Ft. Eustis Boulevard, Denbigh Boulevard, and Victory Boulevard are key cross connectors between US 17 and Rt. 143/Jefferson Avenue, as well as to I-64. Similarly, Mercury Boulevard provides a key connection between I-64 and US 17/Jefferson Avenue in the Hampton and Newport News section of the corridor, where supplemental traffic sensors are recommended. CCTV cameras and traffic sensors are recommended on the southside to monitor the path between the James River Bridge and I-664.

### Signal Coordination

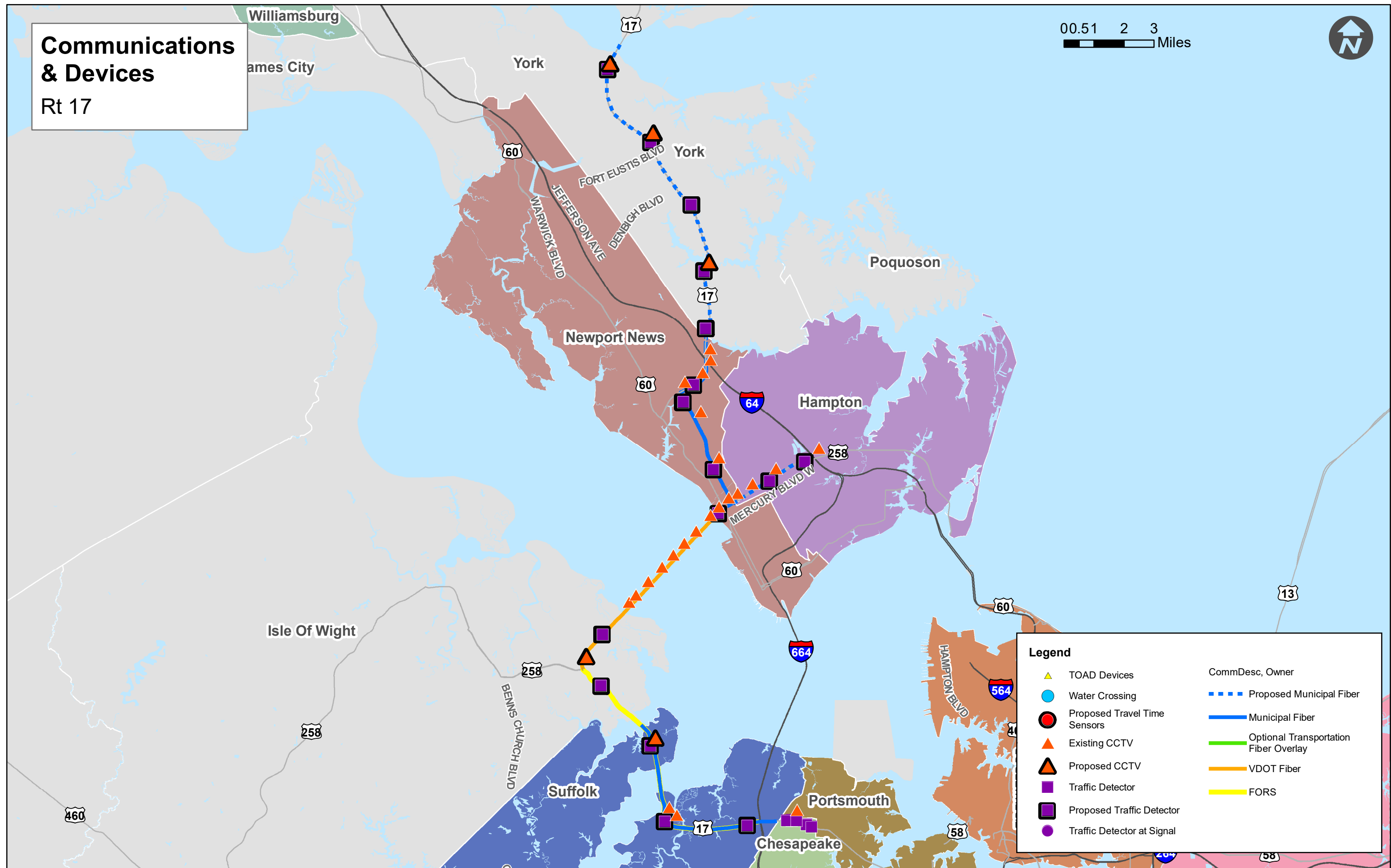
US 17 coupled with Rt. 258/Mercury Blvd serves as a diversion route between I-64 and I-664 on the Peninsula heading towards Suffolk. Additionally, north of Mercury Boulevard, US 17 also serves as a parallel route for I-64 from Exit 255 to the Rt. 258/Mercury Boulevard interchange. For this exercise, it is recommended to establish incident management timing plans from Exit 255 down US 17 to Mercury Boulevard, including Mercury Blvd from Jefferson Avenue to I-64. These timing plans will need to be done in coordination with the overlap with the adjacent Jefferson Avenue corridors. Additionally, the southside portions of the US 17 corridor connecting back to I-664 should have diversion timing plans developed.

ERO Quantities US 17		
Description	Unit	Quantity
Install Fiber Optic Cable (underground)	LF	78,200
Install Directional Drilled Conduit	LF	18,500
Pullboxes	EA	18
Directional Drilled Submarine Conduit	LF	-
DDMS	EA	-
CCTV	EA	5
Travel Time Sensor	EA	-
Traffic Detector	EA	16
Incident Signal Timing Plan (per signal)	EA	35

# Communications & Devices

## Rt 17

00.51 2 3 Miles



## US 58 (VIRGINIA BEACH BOULEVARD/LASKIN ROAD)

US 58 was examined from Tidewater Drive in Norfolk to Birdneck Road in Virginia Beach. The following subsections discuss the gaps needing to be filled for communications, monitoring, timings, and traveler information along this complete corridor.

### High-Speed Communications

There is a gap in the high-speed communications along US 58 from Great Neck Road to Birdneck Road. To bring communications along this section of US 58, a short, but expensive gap must be crossed at Great Neck Creek.

### Surveillance and System Monitoring

The City of Norfolk's existing traffic detection devices was mapped according to the most recent information provided by the city. Travel time detectors are proposed along US 58 in Norfolk to better coordinate with the TOAD Devices currently in place along US 58 in the City of Virginia Beach. The two cities already have extensive CCTV camera coverage along the route including the cross-street connections leading to/from I-264. Camera coverage for Rt.13/Military Hwy. has been shown along the Rt.13 corridor to avoid double-counting.

### Signal Coordination

The City of Virginia Beach has some incident timing plans when incidents along I-264 reroute traffic onto US 58. The City of Norfolk, however, does not have incident detour plans for US 58 from Tidewater Drive to Newtown Road (City of Virginia Beach limits). For this exercise, it is recommended to establish incident management timing plans along this subset of the corridor in Norfolk.

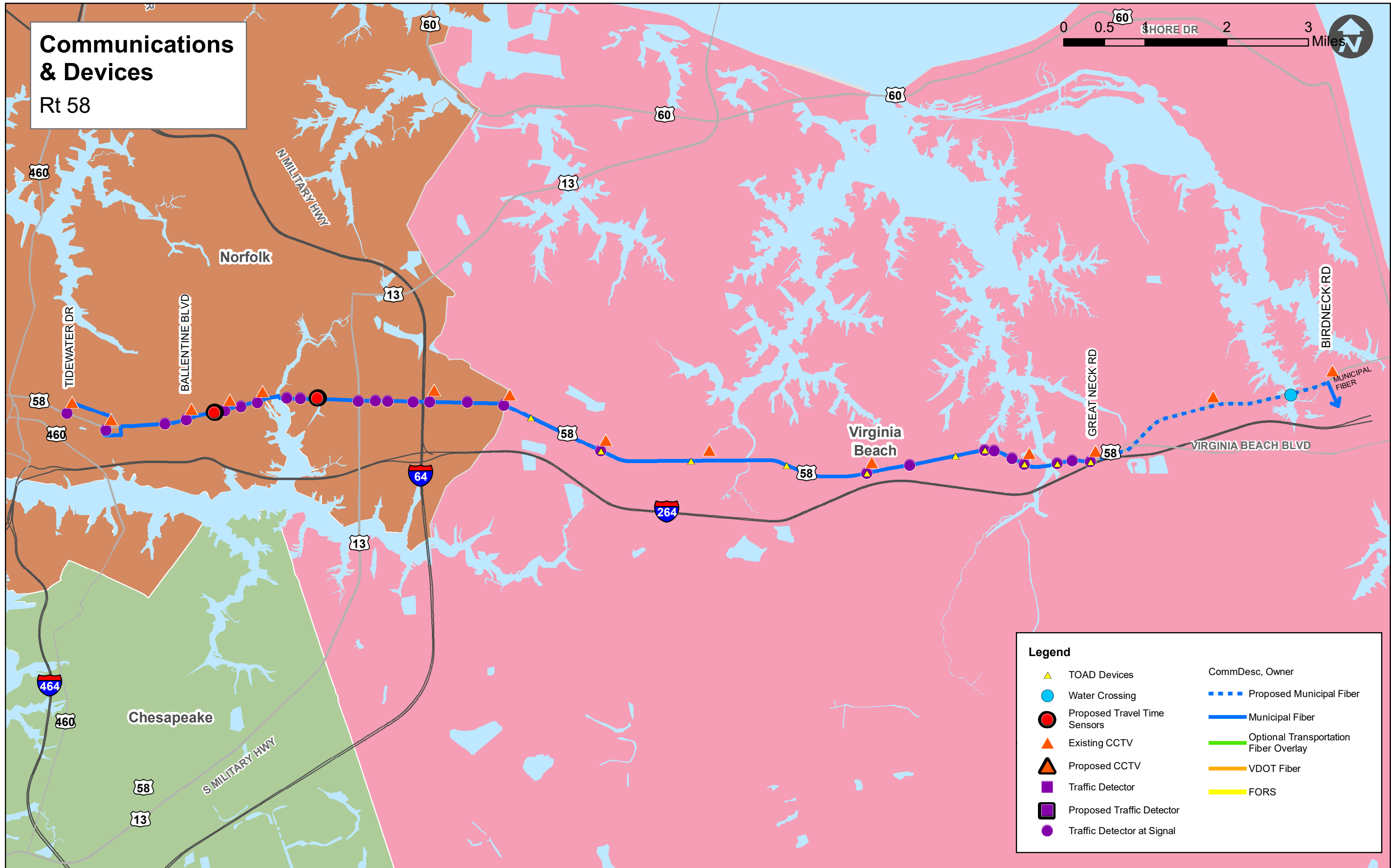
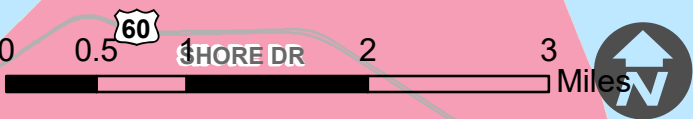
### Traveler Information Systems (TIS)

TIS are not shown on the map, but can also be considered for disseminating travel times along US 58 versus I-264. In addition to sharing this information in 511, hybrid dedicated dynamic message signs (DDMS) can also be deployed along I-264. For estimation purposes, 4 DDMS are shown in the probable cost opinion to cover two in each direction.

ERO Quantities US 58		
Description	Unit	Quantity
Install Fiber Optic Cable (underground)	LF	16,900
Install Directional Drilled Conduit	LF	16,900
Pullboxes	EA	17
Directional Drilled Submarine Conduit	LF	800
DDMS	EA	4
CCTV	EA	-
Travel Time Sensor	EA	2
Traffic Detector	EA	-
Incident Signal Timing Plan (per signal)	EA	22

# Communications & Devices

## Rt 58



**Legend**

TOAD Devices

Water Crossing

Proposed Travel Time Sensors

Existing CCTV

Proposed CCTV

Traffic Detector

Proposed Traffic Detector

Traffic Detector at Signal

CommDesc, Owner

Proposed Municipal Fiber

Municipal Fiber

Optional Transportation Fiber Overlay

VDOT Fiber

FORS

## PROBABLE COST OPINION

Quantities from the corridors have been summed together in the following high level Probable Cost Opinion. The Probable Cost Opinion is subtotaled by corridor, and then summed for a total project cost opinion encompassing all five corridors.

ERO High Level Probable Cost Opinion				
Description	Unit	Quantity	Unit Cost	Item Subtotal
Install Fiber Optic Cable (underground)	LF	205,600	\$ 14.00	\$ 2,878,400.00
Install Directional Drilled Conduit	LF	145,900	\$ 32.00	\$ 4,668,800.00
Pullboxes	EA	147	\$ 1,000.00	\$ 147,000.00
Directional Drilled Submarine Conduit	LF	3,500	\$ 100.00	\$ 350,000.00
DDMS	EA	12	\$ 45,000.00	\$ 540,000.00
CCTV	EA	17	\$ 12,000.00	\$ 204,000.00
Travel Time Sensor	EA	5	\$ 7,500.00	\$ 37,500.00
Traffic Detector	EA	36	\$ 7,500.00	\$ 270,000.00
Incident Signal Timing Plan (per signal)	EA	221	\$ 5,000.00	\$ 1,105,000.00
SUBTOTAL				\$ 10,200,700.00
20% Contingency				\$ 2,040,140.00
US 13 SUBTOTAL				\$ 6,017,640.00
Jefferson Avenue SUBTOTAL				\$ 1,395,960.00
Warwick Blvd SUBTOTAL				\$ 939,000.00
US 17 SUBTOTAL				\$ 2,472,960.00
US 58 SUBTOTAL				\$ 1,415,280.00
<b>Project TOTAL*</b>				<b>\$ 12,240,840.00</b>

\* Design and construction phase support costs will need to be considered separately based on elected services at the time of design. Typical P.E. design costs range between 12-20% depending on the size of the actual package being designed. Construction Phase Support fees have been tracking at approximately 20% of the construction cost over the past five years. Certain water crossings may be able to accommodate bridge conduit hangers, which will then not require submarine cabling systems.