17 INTELLIGENT TRANSPORTATION SYSTEMS

17.1 General

An Intelligent Transportation System (ITS) is necessary for monitoring the Project's traffic flow and performance. The Project ITS must accurately detect traffic and traffic operational conditions throughout the Project limits, and clearly communicate relevant and useful travel information to the people using the facility.

TxDOT may already be operating an ITS network that will need to connect to the new system provided by the Developer. The Project ITS must be compatible with such in-place system(s) that TxDOT and other agencies (including other Developers) are currently operating. Effective ITS planning and implementation will require significant coordination by the Developer with TxDOT and other Governmental Entities that have roadways within or intersecting the Project.**[NTA – If specific agreements are in place regarding compatibility, make reference to these, in Section 5, if applicable.]**

[Assumes that TxDOT has or will have statewide ITS requirements, versus District-specific requirements. Until such time, the Developer shall coordinate on a regional basis.]

17.2 Design Requirements

The Developer shall provide a complete and operational ITS network throughout the Project that is expandable as capacity is increased along the Project roadways, utilizes hardware and software components consistent and compatible with TxDOT in the manner described in this Section 17.2 and the other affected Governmental Entities, resistant to weather encountered in the Project area, and places components in locations that are not hazardous to people using the facility.

Subject to the specific requirements of this Section 17, the Developer shall determine the number and specific locations of all ITS components.

The Developer shall provide safe ingress/egress areas and structures to accommodate authorized personnel access to ITS components for maintenance and operation acitivities.

17.2.1 ITS Communications Requirements

The Developer shall provide a communications network that has redundant routing capabilities. The communications network shall serve the highway ITS components along the highway elements of the Project. Where necessary, as determined by TxDOT, the Developer shall provide communication node buildings and cabinets to support the communications network.**[NTA – if TxDOT desires to provide equipment at Developers expense, make note of that here.]**

17.2.2 Conduit

The Developer shall determine the type, quantity, and design, of the conduit above and below ground, ground boxes, and all communication cable and electrical conductors to support the ITS system and operations. **[NTA – include testing of elements as part of the Developers QA plan.]**

The Developer shall repair each communication cable or electrical conductor that is severed or otherwise rendered not usable by Work activities.

17.2.3 CCTV Cameras

The Developer shall provide CCTV cameras for incident verification and traffic management.

17.2.3.1 Equipment

The Developer shall provide all necessary CCTV equipment, including cameras, camera controls, cables, and connections.

The Developer shall provide a digital video format and communications protocol at all connections with TxDOT systems**. [NTA – provide guidance regarding local traffic management requirements.]** The format and protocol provided by the Developer shall be compatible with systems in use by TxDOT, and if necessary convertible for use by TxDOT's in-place ITS network.

17.2.3.2 Placement

The Developer shall provide overlapping roadway coverage by CCTV cameras for all highway lanes to provide redundant camera field of view. CCTV cameras shall be placed to enable the Developer or TxDOT to monitor traffic conditions on highway lanes, frontage roads, connecting facilities, and entrance and exit ramps, and messages displayed on any remotely-controlled dynamic message signs in the Project area. To provide a stable video image, the Developer shall mount cameras on dedicated structures unless otherwise Approved by TxDOT.

17.2.3.3 Video Requirements

The Developer shall provide state-of-the-art CCTV cameras that meet the requirements of this Section 17.2.3.3. Should any CCTV cameras fail to meet any of the following criteria, the Developer shall replace such cameras.

- Solid state design with digital signal processing (DSP) for digital zoom
    - for auto/manual long-term integration (exposure) control, with built-in frame buffer
    - for auto-focus; for built-in I.D. generator, with white letters and black outline
- Conformance to a minimum of NTSC video output and EIA-170A standards
- No less than 30 frames per second (fps) color

- Able to produce clear, low-bloom, low-lag video pictures under all conditions, from bright sunlight to nighttime scene illumination of 0.02 foot-candles.
- Maintenance of color quality by a continuous, through-the-lens, automatic, white balance for color temperatures from 2850 degrees Kelvin to greater than 5100 degrees Kelvin, with less than 10 IRE units unbalance
- Aspect ratio of 4:3
- Zero geometric distortion
- Signal to noise distortion of 55 dB with AGC off
- Built-in auto focus and auto iris
- Overexposure protection to prevent permanent damage to cameras when pointed at strong light sources, including the sun, for brief periods of time

17.2.3.4 Operating Requirements

The Developer shall provide cameras with built-in heaters, mounting structure, and related equipment capable of operating within the following weather conditions:

- Wind load of 80 mph **[NTA – revise as necessary for location]** without permanent damage to mechanical and electrical equipment
- Ambient temperature range of -35 degrees Fahrenheit to +130 degrees Fahrenheit
- Relative humidity range not to exceed 95 percent within the temperature range of +40 degrees Fahrenheit to +110 degrees Fahrenheit
- Humidity range of 0 to 100 percent condensing **[look at specs for statewide CCTV to verify requirements]**

17.2.3.5 Control Requirements

The Developer shall provide cameras and related equipment capable of operating with the following pan-tilt unit requirements:

- Vertical movement of + 40 degrees to – 90 degrees
- Horizontal movement of 360 degrees
- Tilt speed of 20 degrees per second
- Pan speed of 100 degrees per second
- Simultaneous pan and tilt
- RS-232 serial communications

17.2.4 Vehicle Detection

The Developer shall provide permanent detection in each highway lane of the Project that measures vehicle classification, vehicular volume, lane occupancy, and speed information on the roadway. The detectors shall be non-intrusive to the roadway users. Spacing for the permanent vehicle detection shall be no greater than 0.75 miles in each highway lane in the Project, or, at a minimum, provide one detector in each highway

lane between interchanges. **[NTA – may need to include ramp monitoring for projects with managed lanes. If Developer is responsible for maintenance of frontage roads, include them as well.]**

The Developer may attach detection units to existing structures with prior concurrence from TxDOT. Where an existing structure is not available, or in lieu of attaching the detection unit to an existing structure, the Developer shall install a mounting pole solely for the vehicle detector. Any mounting poles placed specifically for ITS items shall conform to TxDOT specifications for CCTV mounting poles

17.2.5 Dynamic Message Signs (DMSs)

The Developer shall provide a comprehensive network of electronic DMSs.

The Developer shall position each DMS to allow motorists to safely view the messages being displayed. Locate the DMS to comply with large guide sign spacing.

DMSs shall be used to inform motorist of the availability of alternate routes, and to advise travelers of adverse road conditions and congestion. DMSs shall be placed to provide a driver-friendly sign-viewing angle at each DMS location.

17.2.6 Lane Control Signals

The Developer shall place lane control signals (LCS) over through travel lanes on existing or proposed overhead sign structures. Minimum spacing of LCS shall not exceed 1 mile.

17.3 Construction Requirements

17.3.1 General

The Developer shall notify TxDOT ***30*** days in advance of making connections to the existing TxDOT system.

The Developer shall maintain existing ITS communications functionality during construction.

17.3.2 Salvaging Existing Items

TxDOT reserves the right to require the Developer, at any time to salvage and deliver to a location designated by TxDOT within the District, any TxDOT-owned equipment and materials in an undamaged condition.

17.3.3 Existing ITS Relocation

The Developer shall relocate any existing ITS components, including hubs, satellite buildings, CCTV cameras, DMSs, detection devices, and fiber-links, as required to continue service from the existing components. The Developer shall sequence construction and relocation of existing ITS components, facilities, and systems to prevent lapses in TxDOT's receipt of video or data within the Project area. The existing physical links and the proposed physical links shall be in separate physical conduits.

Before removing existing ITS items and before beginning construction of segments without existing ITS, the Developer shall perform all activities necessary to maintain system operations during construction, including installing new ITS items, relocating or replacing existing ITS items, and connecting such ITS items to the existing network.