HIGH – SPEED BANDWIDTH/NETWORK CAPACITY

<u>Data Call Request Area:</u> Extensive high speed network capacity is important: [Considerations to evaluate this criterion include: Does the installation and local community have "state of the art" cabling? Is it fiber or cable and considered secure? Is the location's existing network capacity sufficient for consolidation? Does the network have the capacity for additional growth? Is sufficient network diversity (NIPRnet, SIPRnet, JWICs, NSAnet, etc.) available at the location? What is the level of effort required to provide access to required facilities?]

OVERVIEW

The City of Hampton, Langley Air Force Base (AFB), NASA Langley Research Center (LaRC), and dozens of federal, commercial, and industrial installations across the Hampton Roads region all enjoy a robust, reliable, and scalable set of communications solutions provided by large-scale telecommunications providers. These communication systems use the latest in wiring infrastructure plant technology, utilizing state-of-the-art fiber and routing equipment. Because the local and regional communications systems provide connectivity to very large Department of Defense users, such systems are considered extremely secure.

There are over 650,000 miles of fiber optic cable in Hampton Roads. Much of this fiber is also dark, allowing for additional capacity and scalability as new technologies emerge to take advantage of the latest in fiber optic multiplexing techniques.

The data call asks specific questions which are highlighted below. Further detail is available in the identified subsequent sections:

- **Does the installation and local community have "state of the art" cabling?** Yes. Many of the cable installations are recent, with additional build-outs and enhancements occurring as necessary to ensure redundancy as well as longevity [*See Infrastructure*].
- **Is it fiber or cable and considered secure?** Secure fiber exists on Langley AFB as well as off-base, including at proposed sites at NASA LaRC and Hampton Roads Center North Campus, as well as other locations within the Hampton area. [*See Security*]
- **Is the location's existing network capacity sufficient for consolidation?** Yes. A range of high-bandwidth solutions are available. [*See Network Capacity*]
- **Does the network have the capacity for additional growth?** Yes. Utilizing multiplexing technology, capacities approaching the terabit range are possible.

Existing 10Gb circuits are already in place, and dark fiber exists on and off Langley AFB. [*See Network Capacity*]

- **Is sufficient network diversity (NIPRnet, SIPRnet, JWICs, NSAnet, etc.) available at the location?** Yes. All of the above stated network access exists throughout the Langley AFB campus; additional wide area network access for other highly classified programs is also in place. [*See Network Diversity*]
- **What is the level of effort required to provide access to required facilities?** No level of effort is required. Available access exists today and can be expanded as required. [*See Readiness*]

INFRASTRUCTURE

The City of Hampton and the Hampton Roads region is home to one of the most advanced communications networks in the country. Two primary communications providers, Cox Communications and Verizon Communications, offer robust connectivity solutions that are state-of-the-art, secure, reliable and scalable. Additionally, other providers have infrastructure in Hampton Roads, offering a mix of dedicated fiber systems, wireless, satellite, infrared and other emerging communications technologies.

Hampton Roads Communications Companies (Partial List)

Alltel Communications	Cox Communications
AT & T	E & E Enterprises Global
Boeing Satellite Systems	Lucent Technologies
Cavalier Telephone	Remarque Manufacturing Corp
Charter Communications	Satellite Communications
Cingular Wireless	Sprint Nextel
Colonial Telecommunication	Systems East Inc
Continental Visinet Broad Inc	Verizon Communications

Hampton Roads has hundreds of thousands of miles of installed state-of-the-art fiber. Cox Communications and Verizon Communications are both in the process of installing even more fiber as part of two of the largest fiber upgrades in the country. Verizon is installing their FiOS product for residential service, which provides fiber service all the way to the premise (FTTP), and Cox is installing EON, another fiber plant extension promising extended service features and additional bandwidth capacity.

Langley AFB also has an extensive state of the art fiber network designed for maximum growth potential and capable of supporting a 10 year future capabilities expansion into the terabit bandwidth range. More information regarding Langley Air Force Base's network infrastructure and diversity is detailed in the sections entitled *Network Capacity* and *Network Diversity*.

Together, Langley AFB, Hampton and the greater Hampton Roads region offers an electronic transportation system that offers the latest in optical technology, is secure, and is ready today to support extensive capacity expansion.

SECURITY

Communications systems in Hampton Roads are resilient, battled hardened systems featuring redundancy at multiple levels, backup/recovery, and continuity functions. All wiring centers are equipped with battery and generator backup power systems, fire suppression systems, and require key card access for entry by authorized personnel only. Wiring center external doors are equipped with floodgates to minimize the risk of flooding during high water situations.

Several wiring centers are located strategically in Hampton and the adjoining area, providing fiber capacity for numerous diverse path services and supplying high levels of reliability in the most severe of disaster situations. Wiring centers are continually monitored and an alert notification system ensures that problems are proactively solved before they impact customers. Diagnostic reports are continually monitored and evaluated for system improvements and may be made available to customers as well.

Cox Communications and Verizon Communications both have emergency preparedness plans, and maintain complete sets of spare equipment and cards for rapid recovery from failures regardless of cause. In severe circumstances, both are large enough to bring in resources from other parts of the country to support restoration efforts. Cox and Verizon also offer commitment guarantees. Both have a track record of low down-time and reliability even during bad weather events. Generally the area is designated as flood zone X (low to moderate risk, the area is determined to be outside the 1% and 0.2% annual chance floodplains and does not require flood insurance).

Cox and Verizon also offer priority circuit services to the security needs of required customers (military installations, first responders, hospitals, etc.), insuring heightened restoration efforts during severe circumstances. Critical secure communications circuits can also be rehomed to an alternate location in severe event scenarios where staff must re-locate from existing facilities.

NETWORK CAPACITY

Cox and Verizon both offer extensive network capacity in Hampton Roads, featuring multiple 10Gb OC-192 circuits utilizing advanced switching, routing and wave division multiplexing technology. Networks are continuously upgraded and expanded and utilize the latest in optical and hybrid technologies to advance the upper limits of broadband throughput. Residents, industry, and academia all enjoy high-speed connections as demand for bandwidth has increased. Much of the available network capacity has been

the result of installation of new fiber in fiber-to-the-premise expansions in recent years, and the availability of dark fiber.

Both Cox and Verizon have extensive dark fiber for additional expansion across Hampton Roads. Because of the availability of dark fiber, the last two Defense Information System Agency modernization upgrades did not require the laying of any new fiber cabling. Langley AFB was also the first base in the Air Force with truly diverse wide area gateways and network transmission paths into the Defense Information System Network.

In 2004, General Dynamics (GD), under the Combat Information Transport System (CITS) Program Office, finished a complete $11 million modernization of the Langley AFB infrastructure, providing a fully meshed, diverse routed network supporting all mission operations at Langley AFB. This network also supports the wide area diversity that was completed in the same time frame and is now host to the CITS GD Block 30 contract, which makes Langley AFB one of a handful of internet gateways for all Air Force traffic.

Langley AFB has a state-of-the-art network designed for maximum growth potential capable of supporting a 10 year future capabilities expansion. Other features include:

- An all fiber, synchronous optical network (SONET) dense wavelength division multiplexing (DWDM) 10Gb / OC-192 fully redundant network backbone infrastructure allowing for growth potential up to 10Tb / OC-768.
- Network diversity platforms (NIPRnet, SIPRnet, JWICS) are available and provide critical mission oriented services to ACC Headquarters, 1st Fighter Wing, 480th Intel Wing, ACC A3 Operation Support Center (OSC) and the Integrated Network Operations and Security Center – East (INOSC-E).
- Langley AFB facilities are all CITS fiber Gigabit uplinked with redundant links for all core one mission requirements.

NETWORK DIVERSITY

Specific to Langley AFB and other Department of Defense installations in Hampton Roads, network connectivity is diverse, secure and high-capacity. Dedicated connectivity exists with all Air Force Distributed Common Ground System weapon system locations; Defense Intelligence Agency; National Security Agency; Central Intelligence Agency; National Geospatial Agency; and other sensitive locations. Because much of the networking configuration and access is classified, a full break down of the network is not possible; however the following network connectivity is currently in place:

Network	External Connectivity	Langley AFB Campus
JWICs	Two Gig-E circuits for data One 45Mb circuit for	Gig-E circuits

	video/DTVC/VOIP	
SIPRnet	One 30Mb circuit to be upgraded to 100Mb late FY08	Bldg 23 – two Gig-E circuits Remainder of Langley – 100Mb
NIPRnet	One 33Mb and one 57Mb load balanced circuits	100Mb circuits
NSAnet	One 45Mb circuit	100Mb circuits
Other	Circuits supporting JWICs and SIPRnet connectivity to other network – Gig-E	Within other network, bandwidth adjusted base on demand (from 4Mb to OC-192 speeds)

Additionally, there are numerous satellite communication centers, including those at Langley AFB, Joint Forces Command (Norfolk and Suffolk sites), and the Naval Support Activity Norfolk, Northwest Annex.

The National Lambda Rail (NLR) also connects in Hampton Roads, routing adjacent to Langley AFB and directly to NASA LaRC. Providing 10GB advanced experimentation network services to NASA LaRC, Thomas Jefferson National Accelerator Facility, the Virginia Modeling Analysis and Simulation Center, and regional universities; the NLR connects research institutions from across the globe. The primary interconnect is in McLean, Virginia, where the Hampton Roads regional network, also known as E-LITE, connects to the Mid-Atlantic Terascale Partnership, advanced through Virginia Tech and other leading Virginia and Maryland universities. The NLR supports advanced terascale computing, is the first trans-continent Ethernet network, and utilizes DWDM.

READINESS

Cox and Verizon both have track records of responsive service, durability and sustained growth and scalability, offering OC-192 SONET services and multiple 10Gb circuits utilizing the most advanced wave division multiplexing technology. Depending on the Air Force's specific needs, multiple 10Gb circuits could be installed through simple installation of appropriate multiplexers in the appropriate wiring centers. Depending on total scope of need, such installations could take place in as little as two weeks. The City of Hampton will work with the Air Force and local providers to expedite any service installations required.

Several candidate sites – on base, behind the gate at NASA LaRC, or outside the gate in Hampton Roads Center – North Campus, have been examined and can offer stated circuit speeds in short order (less than two weeks). Such locations are pre-wired or are close enough in proximity to available fiber to enable quick startups. Nearby wiring centers ensure diverse multiple circuit paths and full OC-192 capability and WDM capability.

SUMMARY

In short, the Hampton location is fully network ready. All potential candidate sites – of which there are many both inside and outside the gate in Hampton – offer extensive high speed network connectivity, feature a vast state-of-the-art fiber cabling system, secure and protected infrastructure, scalable for increased capacity and consolidation activities and growth, includes access to the complete diverse range of needed networks and is ready immediately.

See Appendix B-1 for map of fiber optic infrastructure in Virginia. And see Appendix B-2 for supplemental information about Cox Communications and Verizon Communications.