

#### 4.2.5 Private Line Services (L.34.1.4.6, M.2.1.2)

*Qwest's Private Line Service leverages our next-generation optical infrastructure to deliver a highly reliable, proven capability for the support of Agency needs.*

Qwest's Private Line Service (PLS) provides dedicated duplex transmission connectivity between two or more designated Agency end points. Our PLS is managed, fully interoperable, and scalable. Qwest PLS rides the multi-ring Qwest Four-Fiber Bi-directional Line-Switched Ring (4F-BLSR) Synchronous Optical Network (SONET) and Wavelength networks to provide highly reliable transport from subrate DS-0 up through OC-192. Qwest's PLS comprises local access, backbone network, including wavelengths, and appropriate Service Enabling Devices (SEDs). Qwest's PLS seamlessly carries a variety of protocols, including Asynchronous Transfer Mode (ATM), Frame Relay (FR), Internet Protocol (IP), and Ethernet. Qwest delivers these services transparently from end-to-end.

Qwest complies with all of the PLS performance requirements. Qwest's proven performance monitoring and measurement systems, procedures, and evaluation methods enable us to exceed the POP-to-POP and the SDP-to-SDP availability requirements for both Routine and Critical Service levels.

Qwest PLS supports all of the capabilities, features, and interfaces required for Networx PLS service. Qwest's PLS is a low-risk solution for the Government because our existing network is fully capable of supporting all transport requirements today. [REDACTED]

[REDACTED] Qwest's network capacity will easily accommodate the forecasted PLS traffic loads now and in the coming decade. Qwest has more than 40 years of experience providing PLS to numerous Fortune 500 clients and Agencies.

**4.2.5.1 Reserved (L.34.1.4.6 (a))**

**4.2.5.2 Reserved (L.34.1.4.6 (b))**

**4.2.5.3 Satisfaction of PLS Requirements (L34.1.4.6 (c))**

Qwest satisfies all of the specifications for PLS. The following three sub-sections describe how Qwest fully supports the capabilities, features, and interfaces requirements of the RFP.

**4.2.5.3.1 Satisfaction of PLS Capabilities Requirements (L.34.1.4.6 (c), C.2.5.1.1.4)**

**Figure 4.2.5-1** provides a brief description of Qwest’s technical approach to fully meet the Government’s capabilities requirements for PLS. Qwest fully complies with all mandatory stipulated and narrative capabilities requirements for PLS. The text in Figure 4.2.5-1 is intended to provide the technical description required per L.34.1.4.6(c) and does not limit or caveat Qwest’s compliance in any way.

**Figure 4.2.5-1. Qwest Technical Approach to PLS Capabilities**

ID #	Name of Capability	
1	Protocol Transparency	[REDACTED]
2	Data Transparency	[REDACTED]
(a)	DS0	[REDACTED]
(b)	T1	
(c)	Fractional T1	
(d)	T3	
(e)	Fractional T3	
(f)	E1 [Optional]	
(g)	E3 [Optional]	
(h)	SONET OC-1 [Optional]	[REDACTED]
(i)	SONET OC-1 VT [Optional]	[REDACTED]


ID #	Name of Capability	
(j)	SONET OC-3 [Optional]	
(k)	SONET OC-12 [Optional]	
(l)	SONET OC-48 [Optional]	
(m)	SONET OC-192 [Optional]	
(n)	Subrate DS0 [Optional]	
(o)	Analog [Optional]	

Qwest's PLS portfolio provides all required capacity and bandwidths for transport of the Government's voice, video, and data traffic, using and conforming to American National Standards Institute (ANSI)/Telcordia/International Telecommunications Union (ITU) and Internet Engineering Task Force (IETF) standards. To ensure scalability, interoperability, and high availability, Qwest monitors and manages end-to-end PLS solutions. The Qwest SONET BLSR network and the Qwest optical transport network are built on Qwest's standards-based backbone, consisting of domestic and international fiber networks to ensure widely available service. As necessary, Qwest completes PLS solutions using our international and local access suppliers.


Qwest proposes a fully compliant PLS solution that meets all service requirements specified by the Networkx RFP. Qwest personnel have the required technical knowledge and resources—including pre-sales engineering, network planning, provisioning, operations groups, and field support—to engineer and implement an optimal solution for the PLS requirements of Agencies.

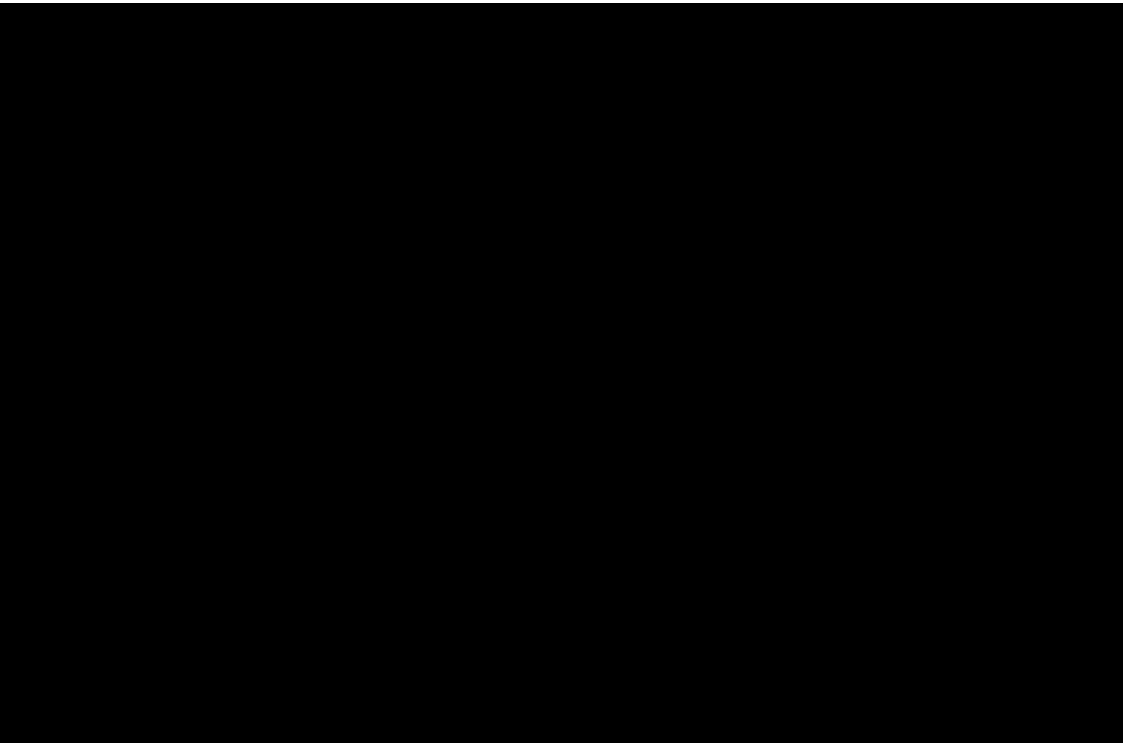
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[Redacted]

 Qwest interfaces with our supplier NOCs to monitor and manage PLS end-to-end to assure our PLS customers of highly reliable and highly available service. Qwest manages at a NOC-to-NOC level with our international suppliers to achieve high levels of availability and reliability.

Qwest's SONET and wavelength networks are extended through a footprint of POPs distributed throughout the U.S. Hundreds of aggregation points expand the network reach to virtually every city in the U.S.

 depicts Qwest's extensive CONUS network. Qwest uses Digital Access and Cross-connect Systems (DACs) and a variety of multiplexers to ensure cost-effective utilization of transport services. We also use these devices to monitor and manage the services. Multiplexing and concatenation are standard features of the network included in the current network deployment, with no modifications required to deliver the specified



service features and requirements. Qwest's PLS is based on and conforms to industry standards, so that service interoperability and interface requirements of the RFP are met.

Qwest's PLS portfolio includes all of the bandwidths specified by the Government, including analog services, PDH, SONET, and SDH services including:

- subrate DS-0
- DS-0
- T-1 (channelized, unchannelized, and fractional T-1)
- T-3 (channelized, unchannelized, and fractional T-3)
- E-1, and E-3 (channelized and unchannelized)
- OC-3 through OC-192 (channelized and concatenated)
- STM-1 through STM-64

Qwest's established relationships with many service providers enable us to offer and implement cost-effective, end-to-end PLS to Agencies in [REDACTED] countries. Our suppliers include Inter-Exchange Carriers (IXCs), Incumbent Local exchange Carriers (ILECs), Competitive Local Exchange Carriers (CLECs), and alternate access providers. [REDACTED]

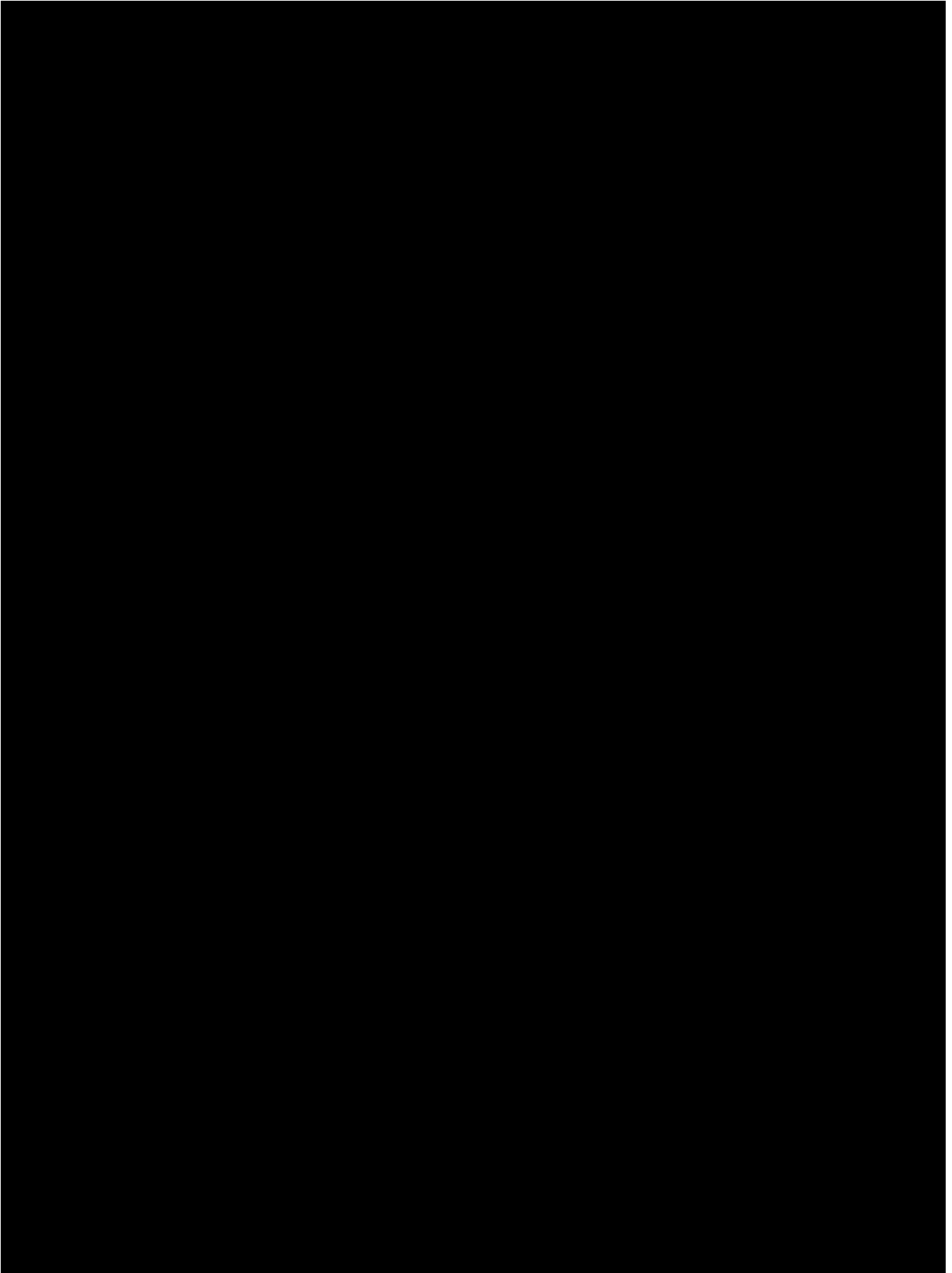
[REDACTED] These relationships allow Qwest to fully meet current and future Network PLS requirements. Qwest's OC-48 through DS-0 services are supported on our SONET BLSR network (see Figure 4.2.5-2.) Qwest's OC-192 offering is supported on our wavelength network. Analog conditioning, subrate DS-0, and low-bit-rate voice services are offered on a DS-0 in combination with the appropriate SED to support the required subrate DS-0 bandwidth. Diversity is a standard Qwest product feature and includes flexibility to avoid locations or routes specified by the Agency. Qwest works with local access providers to

deliver all services below the DS-0 level. Analog conditioning, subrate, and low-bit-rate voice transport are dependent on local availability of those services (usually from the ILEC).

Qwest works with local access providers and other network providers to engineer and implement an end-to-end service. While Qwest is a Global SONET/SDH Service provider, it is also the franchised ILEC in 14 western states. Using these capabilities and relationships, Qwest brings the benefits of broad network connectivity to Agencies for quick provisioning and service upgrades, including increased bandwidth, fast turn-ups, and fast response time. Agencies benefit from a single, seamless solution.

Qwest has many options at our disposal for delivering service internationally, including the last mile through local access relationships, on-net facilities, and custom builds. As previously noted, the company has interconnection agreements and physical connectivity with Postal Telephone and Telegraphs (PTTs), CLECs, ILECs, and fiber providers to deliver outstanding service anywhere Agencies require service.

[REDACTED] show some of Qwest's global network suppliers and routes that allow us to deliver PLS to Agencies worldwide.



**Figure 4.2.5-4 Qwest's Global Supplier Providers**

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Qwest supports all of the capabilities, features, and interfaces required for the Network PLS service. Qwest's PLS network infrastructure enables a broad range of point-to-point and point-to-multi-point transport service technical capabilities and supports all required technical capabilities for PLS. Qwest delivers these services via its nationwide 4F-BLSR SONET network. The SONET network is self-healing, based on ring architecture. [REDACTED]

[REDACTED] Qwest uses DACS capabilities to subdivide larger capacity circuits on our SONET 4F-BLSR network and cross-connects them with local access systems. The DACS equipment provides 100 percent non-blocking matrix switching for cross-connect functionality. [REDACTED]

[REDACTED]

The SONET BLSR network is built on Qwest's domestic [REDACTED] fiber-optic network and Qwest's non-domestic network infrastructure. [REDACTED]

[REDACTED]

Qwest’s Optical Wavelength service supports 2.5 Gig (OC-48) and 10 Gig (OC-192) wavelengths. It was deployed as a “dual-rail” system, which provides a redundant pathway for Qwest to restore service more quickly when needed. As a full-service provider, we were among the first to build our networks over a DWDM infrastructure. We are fully interconnected with AT&T’s, Verizon’s, and BellSouth’s Intra-LATA PLS networks, as well as many CLECs and foreign Postal Telephone and Telegraphs for local access. Internationally, Qwest’s suppliers provide similar functionality to Qwest to provide channelized and unchannelized E-1 and E-3 PLS.

The Qwest Team’s SONET services include, OC3, OC12, and OC-48. Qwest will offer higher speeds as demand develops. Qwest Team’s SDH services include E-1, E-3, and STM-1 through STM-64, available globally.

**4.2.5.3.2 Satisfaction of PLS Feature Requirements (L34.1.4.3(a), C.2.5.1.2)**

**Figure 4.2.5-5** provides a brief description of Qwest’s technical approach to fully meet the Government’s feature requirements for PLS. Qwest fully complies with all mandatory stipulated and narrative feature requirements for PLS. The text in Figure 4.2.5-5 is intended to provide the technical description required per L.34.1.4.3(a) and does not limit or caveat Qwest’s compliance in any way.

**Figure 4.2.5-5. Qwest’s Approach to Satisfaction of PLS Features Requirements**

ID#	Feature	
1	Multi-point Connection [Optional]	[Redacted]

ID#	Feature	
2	Special Routing	[REDACTED]
3	Analog Line Conditioning [Optional]	[REDACTED]
4	Low Bit Rate Voice [Optional]	[REDACTED]
5	7.5 KHz Audio [Optional]	[REDACTED]

**4.2.5.3.3 Satisfaction of PLS Interface Requirements (L34.1.4.3(a), C.2.5.1.3)**

**Figure 4.2.5-6** lists equipment that Qwest deploys as SEDs to fully meet the PLS interface requirements. Qwest fully complies with all mandatory stipulated and narrative interface requirements for PLS. The text in Figure 4.2.5-6 is intended to provide the technical description required per L.34.1.4.3(a) and does not limit or caveat Qwest’s compliance in any way.

**Figure 4.2.5-6. Qwest-Provided PLS Interfaces at SDP**

UNI Type	Interface Type and Standard	Payload Data Rate or Bandwidth	
1	ITU-TSS V.35	Up to 1.92 Megabits Per Second (Mbps)	[REDACTED]
2	EIA RS-449	Up to 1.92 Mbps	[REDACTED]
3	EIA RS-232	Up to 19.2 Kbps	[REDACTED]
4	EIA RS-530	Up to 1.92 Mbps	[REDACTED]
5	T1 (with ESF) [Std: Telcordia SR-TSV-002275; ANSI T1.403]	Up to 1.536 Mbps	[REDACTED]

UNI Type	Interface Type and Standard	Payload Data Rate or Bandwidth	[REDACTED]
6	T3 [Std: Telcordia GR-499 CORE]	Up to 43.008 Mbps	[REDACTED]
7 [Optiona]	E1 [Std: ITU-TSS G.702]	Up to 1.92 Mbps	[REDACTED]
8 [Optiona]	E3 [Std: ITU-TSS G.702]	Up to 30.72 Mbps	[REDACTED]
9 [Optiona]	Optical: SONET OC-1 (Std: ANSI T1.105 and 106)	49.536 Mbps	[REDACTED]
10 [Optiona]	Electrical: SONET STS-1/EC-1 (Std: ANSI T1.105 and 106)	49.536 Mbps	[REDACTED]
11 [Optiona]	SONET OC-3 (Std: ANSI T1.105 and 106)	148.608 Mbps	[REDACTED]
12 [Optiona]	SONET OC-3c (Std: ANSI T1.105 and 106)	148.608 Mbps	[REDACTED]
13 [Optiona]	SONET OC-12 (Std: ANSI T1.105 and 106)	594.432 Mbps	[REDACTED]
14 [Optiona]	SONET OC-12c (Std: ANSI T1.105 and 106)	594.432 Mbps	[REDACTED]
15 [Optiona]	SONET OC-48 (Std: ANSI T1.105 and 106)	2.377728 Gbps	[REDACTED]
16 [Optiona]	SONET OC-48c (Std: ANSI T1.105 and 106)	2.377728 Gbps	[REDACTED]
17 [Optiona]	SONET OC-192 (Std: ANSI T1.105 and 106)	9.510912 Gbps	[REDACTED]
18 [Optiona]	SONET OC-192c (Std: ANSI T1.105 and 106)	9.510912 Gbps	[REDACTED]
19 [Optiona]	RJ-x (e.g. RJ-11/45)	4/7.5 KHz Bandwidth	[REDACTED]

#### 4.2.5.4 PLS Quality of Service (L.34.1.4.6 (d))

Qwest understands [REDACTED] all of the Government's performance metrics, as shown in **Figure 4.2.5-7**. [REDACTED]

[REDACTED]

[REDACTED] Qwest's

definition of performance indicators is comparable to the Government's requirement for PLS.

**Figure 4.2.5-7. Qwest Compliance with Performance Metrics.** Qwest fully meets or exceeds Government-specified performance metrics for PLS.

Key Performance Indicator	Service Level	Performance Standard (Threshold)	Acceptable Quality Level (AQL)	[REDACTED]
Availability (POP to POP) [Optional]	Routine	99.8%	≥ 99.8%	[REDACTED]
	Critical [Optional]	99.98%	≥ 99.98%	[REDACTED]
Availability (SDP to SDP)	Routine	99.4%	≥ 99.4%	[REDACTED]
	Critical [Optional]	99.98%	≥ 99.98%	[REDACTED]
Time to Restore	With Dispatch	8 hours	≤ 8 hours	[REDACTED]
	Without Dispatch	4 hours	≤ 4 hours	[REDACTED]

Qwest’s availability metrics are measured using the same standard formula and definitions of service availability as those described in RFP Section C.2.5.1.4.1, including the revised definition and the calculation methodology for Availability provided by the Government in Section C.2.5.1.4.1. [REDACTED]

[REDACTED] Qwest’s PLS is delivered through the SONET network and therefore takes advantage of the built-in resiliency of that network. [REDACTED]

**4.2.5.5 Qwest’s PLS Exceeds Service Requirements (L.34.1.4.6 (e))**

[REDACTED]

[REDACTED]

[REDACTED]

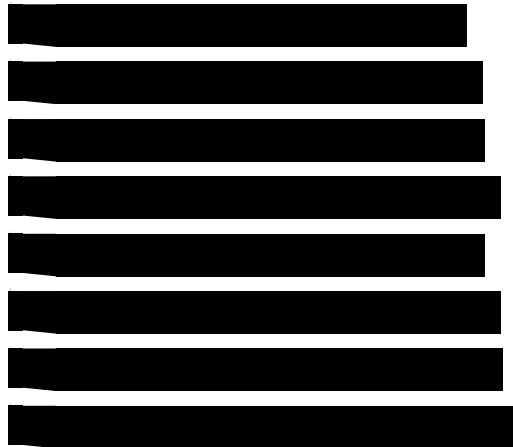
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[Redacted text block containing multiple paragraphs of blacked-out content]



Qwest exceeds the performance metrics for the PLS solution for both Routine and Critical Performance Service Levels. Our robust architecture supports performance metrics higher than required by the Government. In addition, Qwest consistently exceeds requirements for circuit provisioning intervals, enabling Agencies to minimize scheduling risks.

Qwest continuously evaluates new technologies in our laboratories to support new and emerging services and applications. This approach keeps Qwest current with the Agency demands and service requirements. Qwest will work with the Government to identify any emerging service requirements and features. We will submit proposals to add these new solutions to meet Agency requirements.

**4.2.5.6 Experience with PLS Delivery (L.34.1.4.6 (f))**

Qwest has extensive experience delivering PLS as required by the RFP. As summarized in **Figure 4.2.5-8**, Qwest already serves many Government Agencies at the federal, state, and local levels, and also serves thousands of large enterprise customers, including 95 percent of Fortune 500 companies.

**Figure 4.2.5-8. Qwest Experience with Private Line Service Delivery**

Number of Customers	[REDACTED]
Number of years in service	[REDACTED]
Other Federal Government customers	[REDACTED]
Large commercial customers served	[REDACTED]

Qwest’s long legacy of service to Agencies extends beyond the Qwest experience of the past nine years when we were formerly known as US West. We also have experience doing business as Pacific Northwest Bell, Mountain Bell, and Northwestern Bell. [REDACTED]

Qwest is unique in that we are both a local exchange carrier (LEC) and an IXC. This perspective provides unique insight into the purchasing of local access and delivery of service to customers in both market segments. Agencies will benefit from Qwest’s experience by obtaining the most value for every dollar spent on combined local and long haul services.

**4.2.5.7 Characteristics and Performance of Access Arrangements  
(L.34.1.4.6 (g))**

Qwest has numerous access methods to reach our PLS backbone, including ILECs, CLECs, Qwest Local, and Special Access. We have procedures in place to provide real-time monitoring and performance statistics of these methods. We have strict guidelines on how we connect to LECs—dual entrance facilities, OC-48 capacity, and operations agreements.

Qwest realizes that a key differentiator is the ability to ensure robust access not only to the traditional ILECs, but also to the emerging diversity of CLECs. This combination enables Qwest to leverage itself (as an ILEC in 14

states in the western U.S.), the other ILECs, and the CLECs to provide robust access solutions that meet our customers' needs.

To ensure the service quality and reliability of these access services, Qwest applies the same discipline and approach that is used to maintain our own facilities-based portions of the service. [REDACTED]

[REDACTED]

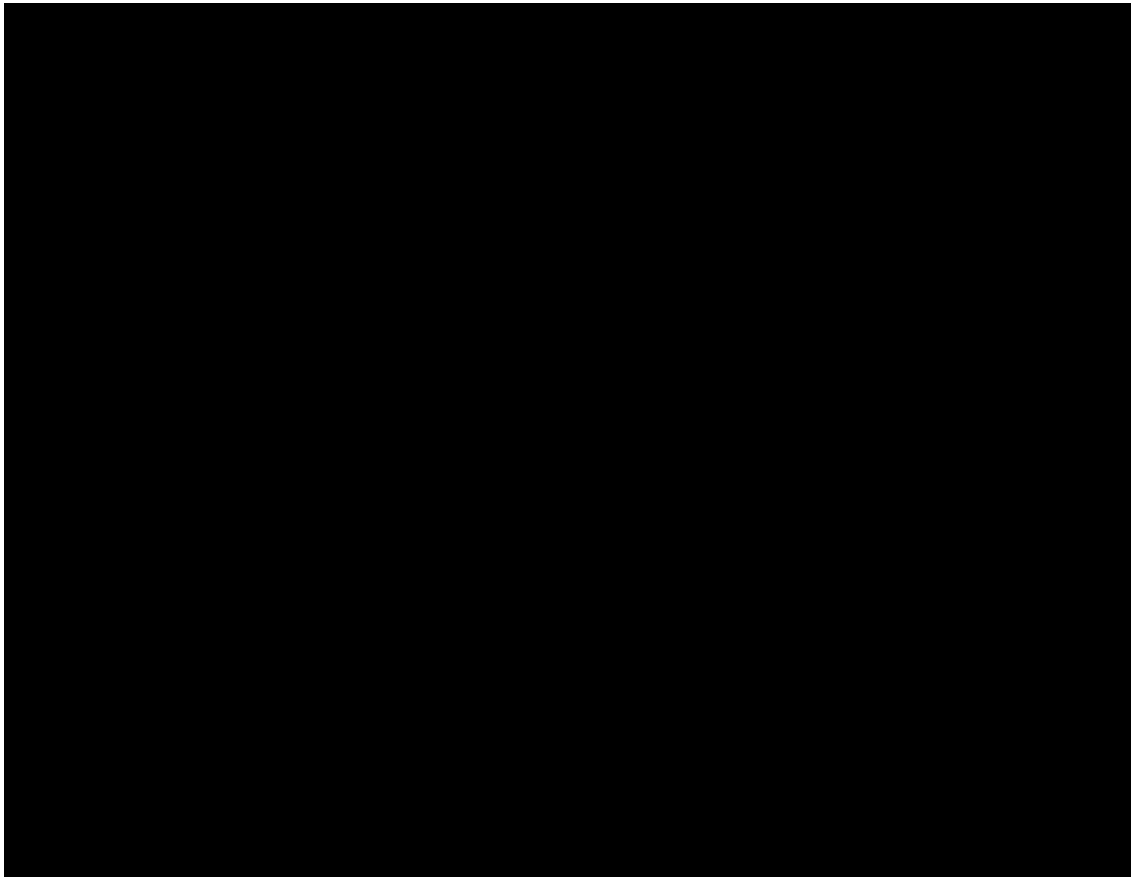
[REDACTED]

[REDACTED] Qwest has the staff and procedures to engineer extremely high-availability access arrangements. [REDACTED]

[REDACTED] shows how Qwest has maintained access delivery excellence for our Government customers over a long interval. Our operational procedures have also enabled a time to repair of less than four hours measured over the past four years.

Agencies should expect the best possible provisioning intervals to get their services up and running. Qwest has a long and excellent track record in on-time delivery service with reliable service delivery intervals. As shown in [REDACTED] Qwest has maintained a best-in-class service delivery interval for our Government customers. Figure 4.2.5-9 represents actual service turn-up from the customer's perspective—including all aspects of





To provide access services, Qwest has a broad variety of agreements with local carriers to ensure flexibility, quality, and reliability. Qwest has strict quality standards for how we connect with other carriers to maintain this high level of performance.

### **Dedicated Access Facilities**

Qwest uses our own and leased access facilities to connect Agency locations to Qwest network services. Qwest uses a variety of technologies—everything from dark fiber to emerging standards such as Worldwide Interoperability for Microwave Access (WiMAX). In each case, Qwest network engineering and planning ensures that the access from our backbone to the

Agency's location meets our standards and provides highest quality and reliable services.

Dedicated Access has the following characteristics:

- Protected and unprotected DS0, FT1, T-1, DS3, OC-3, OC-12, OC-48, OC-192, Gigabit Ethernet, and 10G Ethernet LAN PHY
- Qwest covers every LATA in every state with dedicated access
- Qwest requires all ILECs and CLECs to have diverse entrance facilities into our backbone POPs
- All off-net backhaul providers are also required to provide protected SONET services and meet Qwest POPs with route-diverse entrance facilities
- Qwest access providers and backhaul providers must agree to Qwest's stringent operations requirements for installation, technical performance and trouble management
- Qwest requires that all access arrangements run error-free for up to 72 hours before acceptance
- Bit error rate acceptable standards are
  - DS3 –  $10^{-11}$
  - OC-3/OC-12 –  $10^{-13}$
  - OC-48 –  $10^{-13}$

All Qwest backbone services monitor the availability and condition of our access providers. Qwest transport services, such as Internet Protocol Service (IPS), Asynchronous Transfer Mode Service (ATMS), Frame Relay Service (FRS), Network Based Internet Protocol Virtual Private Network Services (NBIP-VPNS) and others, [REDACTED]

[REDACTED] These trouble tickets are worked by our NOCs. Chronic access problems are easily

identified, and we work with our access providers to redesign or re-engineer these circuits to restore acceptable service levels.

**4.2.5.8 Approach for Monitoring and Measuring PLS KPIs and AQLs  
(L.34.1.4.6 (h))**

[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED] Qwest uses this data in

several ways:

- We compare performance results to the performance thresholds that we set to trigger alarms.

[REDACTED]

[REDACTED]

- Results are calculated and displayed on the network scorecard. Required Key Performance Indicators (KPIs) and Acceptable Quality Level (AQL) measurement can be viewed in the Qwest Control Network Portal.

Qwest monitors on a 24x7x365 basis all NEs of the PLS and SEDs.

This monitoring includes, but is not limited to:

- General NE requirements validation: System turn-up, Element Management System / Network Management System Craft interfaces, security, software management, electrical and mechanical compliance, alarming, safety, systems connectivity, fault management, performance management
- PLS requirements validation: performance monitoring, card replacement, loop-backs, synchronization management, protection

and restoration, alarm reporting, cross-connect functionality (if applicable), multiplexing functionality (including VT1.5, if applicable), and optical interfaces

- Validate Network Equipment Building Systems (NEBS): GR-63-CORE (transportation and storage stress, operating temperature and humidity, heat dissipation, equipment shock, vibration, and acoustic noise) and GR-1089-CORE ( Electrostatic Discharge (ESD), Electromagnetic Interference (EMI), Electromagnetic Compatibility (EMC), electrical safety, corrosion, bonding and grounding)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Data is analyzed, formatted, and sent to operations, engineering, and planning for pro-active network enhancement and capacity planning.

For all services we use [REDACTED] trouble ticketing system.

[REDACTED] a trouble ticketing system that is an industry-leading commercial-off-the-shelf application that we have customized to make more effective for our needs. From this system, we collect many useful metrics that we use internally to evaluate and improve our processes including Time to Restore (TTR). The calculation for TTR uses the same business rules that the Government requires for its services.

Qwest's network performance monitoring and measurement procedures substantiate our delivery of industry-leading network availability, reliability, and the following additional benefits:

- End-to-end service visibility [REDACTED]

[REDACTED]

[REDACTED]

- Integration with trouble ticketing system and repair processes
- Customer-focused Quality of Service (QoS)/AQL management and Web access
- Customization to fit current and future operational needs
- [REDACTED]

[REDACTED]

The technicians respond by eliminating potential sources of trouble in network elements. Qwest proactively identifies potential performance problems and therefore achieves higher availability and faster resolution of network problems.

**4.2.5.9 PLS Support of Time-Sensitive Traffic (L.34.1.4.6 (i))**

Qwest's PLS is a dedicated service that provides fixed bandwidth and a standardized availability [REDACTED]. The service platforms introduce minimal latency and jitter (well within the KPIs required by Networx). As a consequence, it is ideal for supporting time-sensitive traffic as degradations to voice and video quality are minimal. Various SEDs provide different mechanisms for addressing load conditions.

**4.2.5.10 PLS Support for Integrated Access (L.34.1.4.6 (j))**

Qwest's PLS provides a single high-bandwidth interface to the customer. Integrated access for PLS may be implemented through different SEDs or by bundling with another service. Inherent SED capabilities can be leveraged in combination with PLS service features. For example, multi-point connections provide flexibility to route different containers to different service platforms within Qwest or at multiple customer locations.

For PLS access Qwest provides multiplexing on T-1, DS-3, and OC-n dedicated access circuits. As an example, the homogeneous nature of our SONET network allows Qwest to:

[REDACTED]

In all cases, Time Division Multiplexing (TDM) provides fixed and guaranteed performance to each service provided over the dedicated access to the customer's location. The Agency can define the size of access to each network service to match the different performance requirements of their applications.

One drawback of TDM access is that allocation is static and in discrete quantities, such as Nx64 Kbps or T-1 (1.5 Mbps), and changes require circuit provisioning. In general, TDM access also requires additional multiplexing equipment on the customer's site to enable the break-out of the different services. Additional units, such as DSU/CSUs, may be necessary to take advantage of Nx64 Kbps allocation in T-1 circuits.

TDM access is provided throughout the world using both Qwest and Qwest supplier facilities. In Asia, Qwest owns and operates POPs that enable access to all Qwest services. For Guam, Puerto Rico, and the U.S. Virgin Islands, Qwest uses our own leased capacity and a series of suppliers that enable us to provide seamless connectivity to Qwest services. Services to Europe are provided through Qwest-owned capacity across the Atlantic and then through our primary selected suppliers. With an active competitive environment in Europe, Qwest's use of several quality providers enables Qwest to provide high-quality TDM access to all of Qwest's services.

**4.2.5.11 Infrastructure Enhancements and Emerging Services (L.34.1.4.6 (k))**

Qwest has mature processes that enable us to envision, research, evaluate, engineer, deploy, and operate new or emerging services. Driven initially by the Chief Technology Office, headed by the Qwest Chief Technology Officer, Qwest evaluates new products and technologies for incorporation into the Qwest network, in partnership with Qwest Product Management. Qwest can satisfy all mandatory service requirements for PLS without enhancing the network. Some optional services, such as virtual concatenated interface support, may require some modification or enhancement. The processes governing introduction of these and future services are detailed in [REDACTED]

[Redacted]

[Redacted]

[Redacted]

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[REDACTED]

#### **4.2.5.12 Approach for Network Convergence (L.34.1.4.6 (I))**

PLS is based upon standardized interfaces, and as such, readily supports implementing converged and integrated services. PLS is evolving rapidly and will support convergence through the continued adoption of Virtual Concatenation (VCAT), Generic Framing Procedure (GFP) and Link Capacity Adjustment Scheme (LCAS). By incorporating these features and using the technology introduction processes outlined in 4.2.5.11, Qwest will provide cost-effective, flexible, and highly available PLS-based transport for Ethernet, storage area network, and other converged services. Since this is done using the Qwest SONET network, converged customer networks using PLS will continue to enjoy high availability.

In the future, many customers may transition to a more data-oriented network paradigm. The Qwest network is already enabling migration toward a packet-centric infrastructure. As the network evolves, our converged packet-centric network will comprise three domains:

- A physical domain, consisting of optical connectivity
- An IP/MPLS domain, consisting of a converged Layer 2 and 3 cloud
- An application/control domain that consists of an intelligent control plane, and Layer 7 features and functionality

Services will be delivered to Agencies from each of these domains. The primary design goals for migration to packet include enabling high-capacity bandwidth and providing increased self-management capability to the end user to support the delivery of any interface to any location. Qwest's network converges data services with different characteristics to provide maximum commonality based on service requirements such as privacy and QoS.

On our converged network, the Private MPLS-only core network provides data transport for all of our IP services. Layered onto the MPLS core are edge-provided services that provide private MPLS VPNs, Internet services, and Public Switched Telephone Network (PSTN) VoIP backbone bandwidth.

Qwest recognizes that converged customer care and support will be a major challenge that impacts processes, systems, and people. Convergence extends and impacts every facet of the traditional telecommunications value chain.

#### **4.2.5.13 IP-PSTN Interoperability (L.34.1.4.6 (m))**

As described above, PLS channels can be used to access other services such as IPS or VOIPTS where IP and PSTN interoperability would be applicable. Section 3.3.5 further describes our IP-to-PSTN interoperability strategy.

**4.2.5.14 Approach for IPv4 to IPv6 Migration (L.34.1.4.6 (n))**

Qwest is well positioned to migrate our network from IPv4 to IPv6.

[Redacted content]

[Redacted content]

[REDACTED]

[REDACTED]

[REDACTED]

#### **4.2.5.15 Satisfaction of NS/EP Requirements (L.34.1.4.6 o)**

Qwest uses a structured multi-layered approach to supporting National Security and Emergency Preparedness (NS/EP) that is designed to address each required function. Qwest has organizationally and strategically integrated risk management and security to encompass information technology and physical security. Our priorities are to protect our customers from the physical layer up through the entire OSI stack, including all facets of cyber security.

Our approach ensures that Qwest complies with and provides priority for the Government's telecommunications requirements for NS/EP survivability, interoperability, and operational effectiveness during an emergency threat whether caused by natural hazards, manmade disasters, infrastructure failures, or cyber events. [REDACTED]



Specifically, in accordance with RFP Section C.5.2.2.1, *NS/EP Basic Functional Requirements Matrix for Network Services*, Qwest supports the following basic functional requirements for PLS:

- Enhanced Priority Treatment (C.5.2.1(1)) – PLS supporting NS/EP missions are provided preferential treatment over other traffic.
- Secure Networks (C.5.2.1(2)) – PLS supporting NS/EP missions have protection against corruption of, or unauthorized access to, traffic and control including expanded encryption techniques and user authentication as appropriate.
- Non-Traceability (C.5.2.1(3)) – PLS users are able to use NS/EP services without risk of usage being traced (that is, without risk of user or location being identified).
- Restorability (C.5.2.1(4)) – Should a service disruption occur, PLS supporting NS/EP missions are capable of being re-provisioned, repaired, or restored to required service levels on a priority basis.
- International Connectivity (C.5.2.1(5)) – PLS will provide access to and egress from international carriers.
- Interoperability (C.5.2.1(6)) – PLS will interconnect and interoperate with other Government or private facilities, systems, and networks that will be identified after contract award.
- Mobility (C.5.2.1(7)) – The PLS infrastructure supports transportable, re-deployable, or fully mobile voice and data

communications (i.e., Personal Communications Service (PCS), cellular, satellite and High Frequency (HF) radio.

- Nationwide Coverage (C.5.2.1.(8)) – PLS is readily available to support the national security leadership and inter- and intra-Agency emergency operations, wherever they are located.
- Survivability/Endurability (C.5.2.1(9)) – Qwest’s PLS is designed to support surviving users under a broad range of circumstances, from the widespread damage of a natural or man-made disaster up to and including nuclear war.
- Voice Band Service (C.5.2.1(10)) – According to RFP Section C.5.2.2.1, this requirement is not applicable to ATMS.
- Broadband Service (C.5.2.1(11)) – PLS provides broadband service in support of NS/EP missions (e.g., video, imaging, Web access, multimedia).
- Affordability (C.5.2.1(13)) – PLS leverages network capabilities to minimize cost (for example, use of existing infrastructure, commercial off-the-shelf technologies, and services).
- Reliability/Availability (C.5.2.1(14)) – The PLS performs consistently and precisely according to RFP design requirements and specifications and is usable with high confidence.

Details of how Qwest supports all 14 basic functional requirements listed in RFP Section C.5.2.2.1 are provided in Section 3.5.1, *Approach to Satisfy NS/EP Functional Requirements*, in this Technical Volume.

**4.2.5.16 Support for Signaling and Command Links (L.34.1.4.6 p)**

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

**4.2.5.17 Service Assurance in the National Capital Region (L.34.1.4.6 (q))**

As discussed in Section 3.2, *Approach to Ensure Service Quality and Reliability*, Qwest provides network services in the National Capital Region (NCR) with a robust network architecture designed and engineered to support PLS and ensure service continuity in the event of significant facility failures or catastrophic impact. Qwest will continue to engineer critical services to meet each Agency's requirements to eliminate potential single points of failure or overload conditions that may impact their network service performance.

[REDACTED]

[REDACTED] Qwest also provides functionality that enables Government Emergency Telecommunications Service (GETS) priority calling mechanisms.

Qwest will provide full NS/EP Functional Requirements Implementation Plan (FRIP) documentation upon contract award when requested to proceed

with plan delivery. Qwest will update plans, including Part B, addressing our strategy for supporting Agency NCR requirements in accordance with RFP Section C.7.16.

Qwest understands the Government's requirement to assure performance of network services in and around the NCR. Qwest [REDACTED]

[REDACTED]

[REDACTED] Each of these gateways provides complete redundancy to access Qwest nationwide and international network capabilities as well as regional voice and data services. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] shows the logical configuration of the major transport facilities as well as the services provided at each POP.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

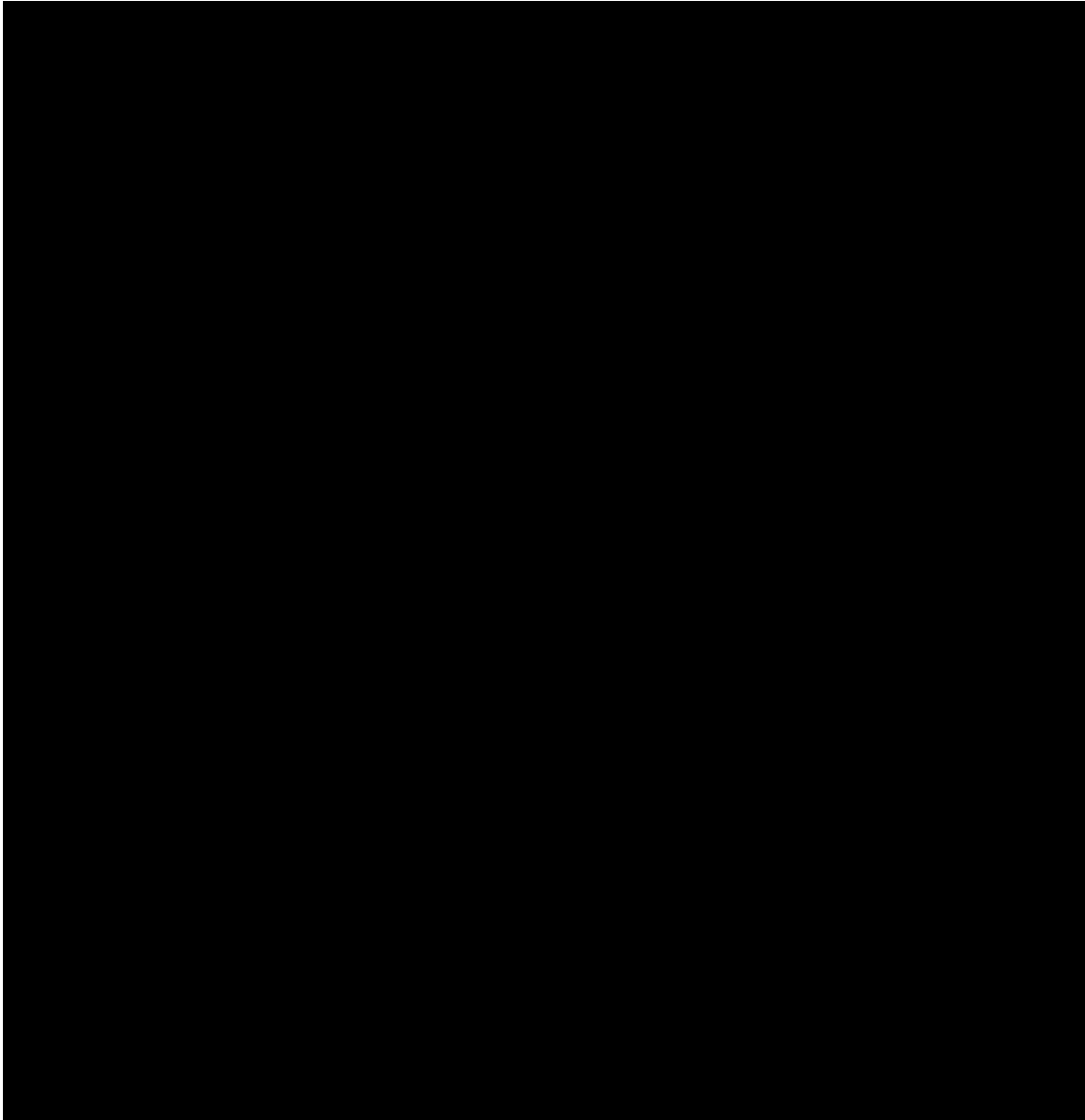
[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]



[Redacted]

[Redacted]

[Redacted] This configuration enables these three locations to participate in the routing of access and backbone traffic, providing significant load-balancing and reconfiguration options in the event of a switch, router, or even a complete

POP failure. In effect, this means that Qwest can completely avoid Washington, D.C. and continue to provide services in an emergency. Qwest has recently acquired OnFiber, a metro SONET and Ethernet provider with yet another diverse network in the NCR. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Qwest procured this infrastructure from an ILEC and numerous CLECs. As presented in Section 3.2.2, *Arrangements with Other Service Providers for Carrying and Exchanging Traffic*, Qwest connects to several major ILEC POP locations through SONET-protected ring networks to ensure multiple access paths to ILEC services including voice termination and fiber access. The use of CLECs, who provide infrastructure that is generally separate from the ILECs, gives another level of resiliency to the architecture because these services would not be affected by an ILEC facility failure.

The route-diverse SONET backbone and access networks that service the NCR enable the transport of services to any Qwest POP nationwide.

[REDACTED]

[REDACTED]

[REDACTED] As with voice services, critical Qwest customers can be dual-homed to ensure extremely high availability of their data services—again protected from any single point of failure in the NCR.

In total, Qwest can dual-home critical customer connections with complete route diversity to all of Qwest's data networking services to have complete resiliency from facility failures in the National Capital Region. Qwest will address the strategy, technical systems and administration, management,

and operation requirements for the NCR in part B of our NS/EP Functional Requirements Implementation Plan (a draft appears as Appendix 2 to this Technical Volume).

**4.2.5.18 Approach to Satisfying Section 508 Requirements (L.34.1.4.6 (r))**

According to RFP Section C.6.4, *Section 508 Provisions Applicable to Technical Requirements*, Section 508 provisions are not applicable to PLS. Qwest has fully described our approach to satisfying Section 508 requirements for applicable, offered services in Section 3.5.4, *Approach for Meeting Section 508 Provisions*, of this Technical Volume.

**4.2.5.19 PLS Impact on Network Architecture L.34.1.4.6 (s))**

The delivery of optional service PLS has little impact on the network architecture of the underlying SONET network. Since the service is mature and there is no change to the network, it is unlikely that any adverse security, quality, reliability, or performance issues will arise. The Qwest PLS network has been operating at a very high level of performance for more than nine years and has all major routes already incorporated into the network as well as capacity to support PLS transport requirements well into the future. The network will continue to evolve as customer needs change.

Security: Qwest is proposing to use dedicated capacity to provision PLS. There is no concept of hacking on a physical layer service, and any tapping into the line would be intrusive and detected immediately.

Quality: Since Qwest's PLS is provisioned on dedicated full-time physical circuits, there is no need for any classes or QoS levels. Each customer circuit has its own dedicated path between two endpoints.

Reliability: PLS service rides the reliable Qwest Four-Fiber BLSR network, [REDACTED] The PLS service benefits from the same network operations center that manages

all Qwest SONET and optical wavelength services, so sparing, alarms, and technicians are all the same and consistently deliver a highly reliable service.

Performance: [REDACTED]  
[REDACTED]  
[REDACTED]  
[REDACTED]

**4.2.5.20 Optimizing the Engineering of PLS (L.34.1.4.6 (t))**

Qwest ensures that our state-of-the-art network is engineered for maximum efficiency and utility. Each DS-3 circuit is engineered with the maximum 28 lower-level DS-1 circuits, and OC-3 and OC-12 circuits contain the maximum number of DS-3 circuits; the timeslots in each OC-48 and OC-192 are programmed to obtain maximum utility from available bandwidth.

Qwest optimizes individual PDH and optical circuits to ensure that the most efficient route is chosen—generally the shortest and most direct route with minimal switching. Circuits are switched between different systems only when absolutely necessary. These practices ensure optimal network efficiency, minimize latency on the customer’s circuit, and minimize points of failure on the Agency’s circuits.

Qwest optimizes its fiber infrastructure to limit signal-degrading factors such as attenuation, dispersion, and reflection. [REDACTED]  
[REDACTED]  
[REDACTED]

[REDACTED] Our optimization methods increase network efficiency and reduce costs for Agencies.

Qwest PLS is optimized through the careful review of the Agency requirements. Engineers analyze system requirements and develop a design to satisfy the requirements using the available infrastructure most effectively.

**4.2.5.21 Vision for Service Internetworking (L.34.1.4.6 (u))**

Qwest anticipates significant advances in PLS over the next several years. While some applications served by PLS will migrate to IP/MPLS transport, many will continue to require the predictable, high availability performance associated with traditional PLS. [REDACTED]

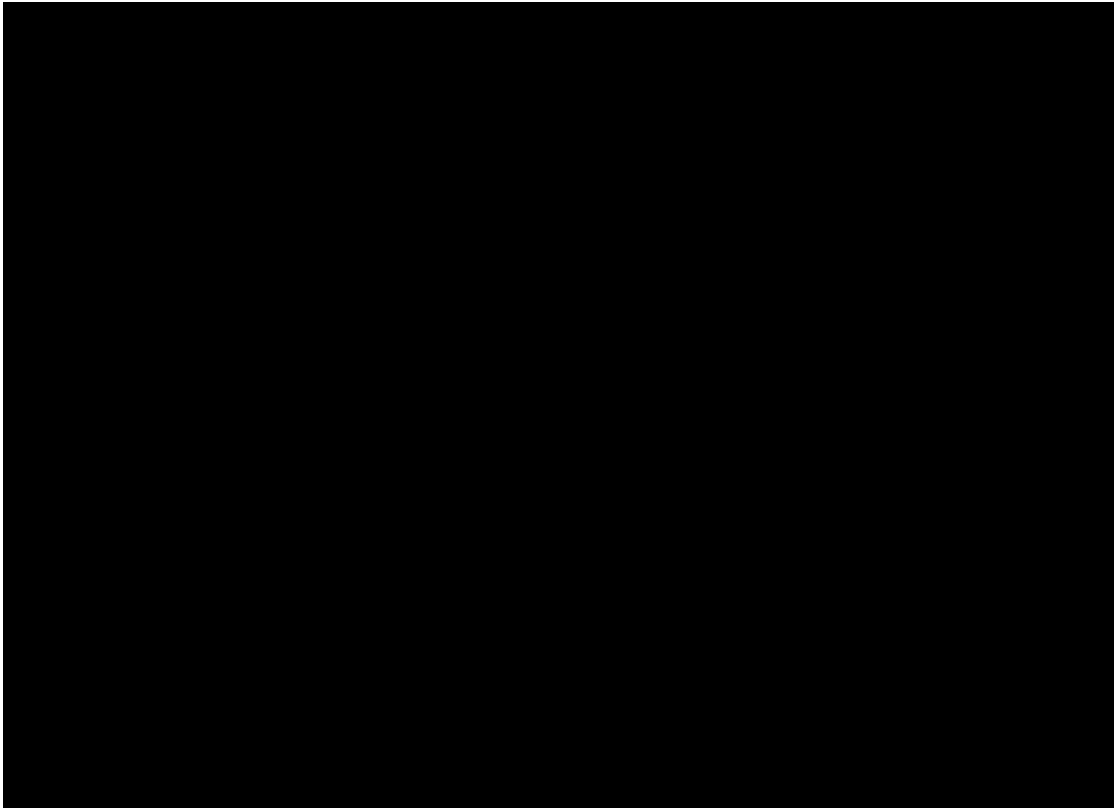
[REDACTED]

[REDACTED] These capabilities will be critical to ensuring interoperability and internetworking, [REDACTED]

[REDACTED]

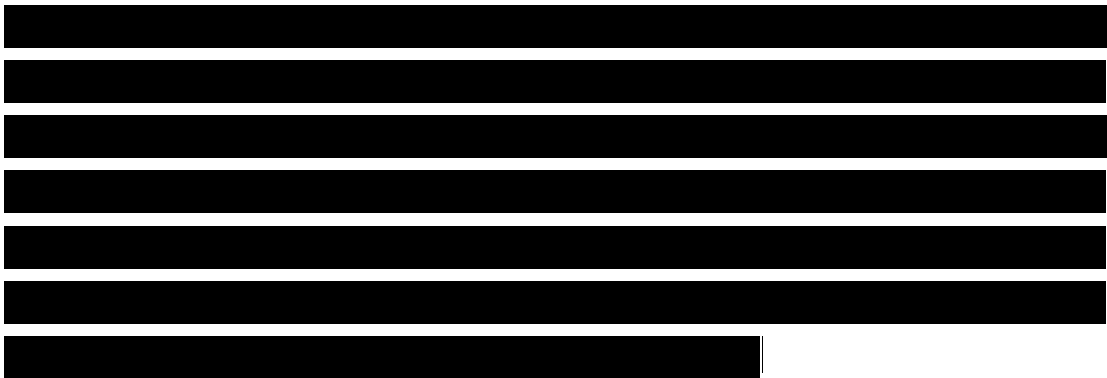
All of these capabilities are based upon ITU standards, ensuring network interoperability and supplier flexibility. [REDACTED]


[REDACTED]



**4.2.5.22 Support for Government Traffic (L.34.1.4.6 (v))**

Qwest has analyzed the traffic data provided by the Government. 



Although Qwest understands that the Government requirements for PLS may increase, Qwest's current infrastructure has more than ample capacity to support the likely volumes of traffic. 



[REDACTED]

[REDACTED] For each fiber route, Qwest has multiple spare ducts to allow implementation of new fibers in the future. We also closely monitor the network's utilization and perform trend analysis to develop growth patterns. The trended growth data is a key driver to initiate new builds and timely capacity augments. [REDACTED]

[REDACTED]

[REDACTED] As a result, Qwest will easily fulfill the Networx Program's requirements for bandwidth to support the Agencies' PLS needs—now and over the coming decade.