TEL8: The Development of a Transportation Video Conference Network

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PREFACE

TEL8 was created in 1994 to support the development of a telecommunications system dedicated to improving and enhancing transportation in the Federal Highway Administration (FHWA) Region 8. The telecommunications network established a partnership among the region's six state Departments of Transportation (DOT) and the four Mountain-Plains Consortium (MPC) universities. The TEL8 system included video conference facilities at each of the original ten sites and a satellite-base transmission medium connecting the network. The TEL8 elected a board of directors to govern the system and established a network control center to manage the administrative, technical and programming functions of the network. Initial programming activities on the network included graduate transportation classes, the DOT information series InfoX, national transportation conferences and other transportation-related events.

The network undertook a major reconfiguration of its telecommunications technology in 1997-98 and established a terrestrial-based video conference system. Included in the new system was a video conference bridge sited at the network control center. Moreover, the new system stimulated expanded TEL8 programming and training leading to the appointment of a half-time TEL8 program director. The TEL8 programming director is responsible for the development and acquisition of all TEL8 programming, training, and video conferences. As well, the program director coordinates graduate classes and training with the MPC executive director and chairs the TEL8 programming committee. The new system also encouraged the initiation of several programming activities including an expanded DOT information seminar series (TransX) and additional leadership and organizational

management classes. In addition, TEL8 developed a new cost structure and refined its organizational structure during the technological reconfiguration.

TEL8 currently has over 30 sites affiliated with its network including video conferencing facilities at the DOT district level in several states. Programming and system utilization has grown as well.

This document reports on the development of TEL8 and its efforts to establish a transportation video conference network. As such, it incorporates material originally reported in the TEL8 annual reports and the TEL8 Pooled Fund study reports to the Federal Highway Administration.

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INTRODUCTION

TEL8 is a video conference network in the north-central and mountain states dedicated to improving and enhancing transportation systems in the Federal Highway Administration (FHWA) Region 8. Established in 1994, the video conference and telecommunications network created a partnership among the region's six state Departments of Transportation (DOT) and the four Mountain-Plains Consortium (MPC) transportation research universities. The TEL8 system includes video conference facilities at each TEL8 site and, originally, a satellite-base trans-mission medium connecting the network. TEL8 elects a board of directors to govern the system and establishes a network control center to manage the administrative, technical and programming functions of the network. Initial programming activities on the network included graduate transportation classes, the DOT information series InfoX, national transportation conferences and other transportation-related events. In 1997-98 the network undertook a major reconfiguration of its telecommunications technology and developed a terrestrial-based transmission medium for its video conference system.

TEL8's highest priority is the quality of programming on the network. MPC short courses and MPC-X are among recent additions to TEL8 programming, each initiated to meet technical training needs or research dissemination requirements. Programming performance measures have been developed and utilized as a means of evaluating the efficacy of network programming, and the programming committee, responsible for network programming, assumes great visibility in the organization. Additional programming efforts continued to be identified and researched by TEL8.

Recent network initiatives include expanded TEL8 programming, significant network expansion at the DOT district level, and assistance in the development of other video conference networks

dedicated to transportation. Furthermore, organizational efforts have been made to strengthen the DOT/MPC partnership while identifying the need for additional initiatives in this area. TEL8 has also modified its cost structure in support of programming and training, and applied its organizational structure to accommodate DOT district-level expansion. With expansion, TEL8 now has 30 sites in its network, a significant increase from the original ten.

TEL8 VISION

TEL8 was developed to serve the transportation interests of the region. As such, it employs video conference technology throughout its network providing telecommunications capabilities dedicated to the region's transportation systems. TEL8 defined and adopted its vision as:

> *To be a leader in the United States in distance learning and communications by utilizing cutting-edge technology and maximizing the capability of that technology by providing superior customer-driven programming that adds maximum value to the TEL8 clientele.*

The TEL8 mission is:

> *To contribute to quality transportation in Region 8 through a distance learning and teleconferencing network that serves the participating DOT's and universities by enhancing communications, education, technology transfer, and research.*

TEL8 also established several goals or objectives at its inception. These were defined to more specifically guide TEL8 activities. TEL8 goals are:

- Enhance communications among the participating state DOT's, universities, FHWA , and

other national and regional organizations.

- Improve the access to, and the quality and quantity of, inter- and intrastate education to all participating DOTs and universities.
- Focus the development and prioritization of the use of TEL8 on (1) interstate transportation teleconferencing, (2) interstate transportation education, and (3) intrastate transportation education.
- Assure that the system responds to the priority needs of participating departments of transportation on a pilot basis in the short term and an established strategic direction in the long term.
- Maximize the cost effectiveness and efficient use of communications time and resources available to the system.
- Research and demonstrate applications that improve the effectiveness and efficiency of distance communications and learning.
- Facilitate the improvement of transportation emergency communications and management among the participating states.

Article II of the TEL8 bylaws provides more detail on the purpose and objective of the network. As stated in Article II, the purpose of the network is to 'improve the United States transportation environment through better communication, research, technology transfer, and education.' Nine specific organizational objectives are listed in Article II. The TEL8 Bylaws are found in Appendix A.

TEL8 ORGANIZATIONAL STRUCTURE

Organizational Overview

TEL8 is a Federal Highway Administration (FHWA) Region 8 transportation telecommunications system located in the north-central and mountain states. Ten sites originally participated in the system including six state departments of transportation (DOTs) in North Dakota, South Dakota, Montana, Wyoming, Colorado, and Utah; and the four Mountain-Plains Consortium (MPC) universities consisting of North Dakota State University, University of Wyoming, Colorado State University, and Utah State University.

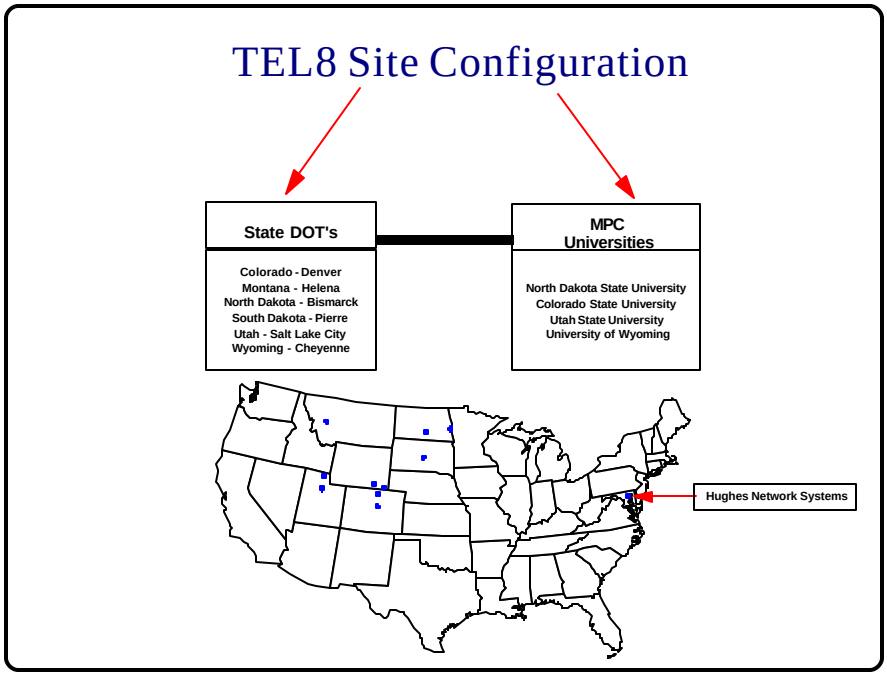

Figure 1. Original TEL8 Network Configuration

The TEL8 organization was established through the TEL8 Pooled Fund Study and funds provided to the Mountain-Plains Consortium through a grant from the University Transportation Centers Program of the U.S. Department of Transportation. Each state's department of transportation contributes funding to the TEL8 Pooled Fund Study.

TEL8 is organized and governed by a Board of Directors with a board representative from each of the original, major TEL8 sites. The Board governs and operates under the authority of the organizational bylaws, the Transportation Telecommunications Network Region VIII Bylaws, developed and adopted by the organizing TEL8 entities.

The Board officers consist of a President, Vice-President and a Secretary-Treasurer. The president calls Board meetings as required with an annual face-to-face Board meeting held at a central location. Additionally, standing committees are appointed by the Board and have responsibilities in the programming, finance and technology areas.

An Executive Director is appointed by the Board and is responsible for carrying out the administrative functions and operational objectives of the TEL8 as directed and approved by the Board. Additional staff responsible for administering the day-to-day operations of TEL8 include a program director, an administrative assistant and a telecommunications technician.

Board of Directors

The TEL8 Board of Directors governs all aspects of the organization. As required by the TEL8 bylaws, the Board is established in such a manner that the state DOTs have principal charge and responsibility for the establishment and management of the TEL8 network. Historically, the President

of the Board of Directors is a DOT representative ensuring that the DOTs have principal charge of TEL8 as directed by the bylaws.

Each Board member is selected by their organization and serves at the pleasure of that organization. Board members from the MPC are also members of the MPC executive committee. The Federal Highway Administration (FHWA) appointed a representative to the Board during the first several years of TEL8, however, the FHWA representative currently maintains a liaison status with the TEL8 Board.

Administrative Staff

The Board of Directors appoints an Executive Director who serves at the pleasure of the Board. The Executive Director is responsible for carrying out the functions and purposes of the network including managerial oversight of the administrative staff. Article IX of the bylaws details the duties of the Executive Director. TEL8 currently financial supports the Executive Director on a limited basis.

The programming director's position was created in 1997 and is a half-time position supported by TEL8. The program director is located at the network control center at North Dakota State University to facilitate the coordination of TEL8 operations. The program director is responsible for developing, marketing, acquiring and managing programming and training. Moreover, the program director chairs the TEL8 programming committee, the committee responsible for planning and initiating TEL8 programming and training.

The TEL8 administrative assistant position has been integral to TEL8's success since the network's inception. The position was formalized in 1998 with TEL8 initiating financial support for these responsibilities. The administrative assistant's responsibilities include maintaining financial and accounting records, executing all network and fund accounting, initiating and recording all official network correspondence, participating in the resolution of network issues,
and other administrative duties.

The telecommunications technician is responsible of all network-supported technology. The technician maintains the TEL8 bridge, the privately-tariffed transmission network, and site-specific codec technology. Moreover, all TEL8 sites' video conference technology are supported by the technician. The telecommunications technician has been financially supported by TEL8 on a half-time basis since TEL8's inception

Each TEL8 location also continues to designate a local technician responsible for supporting that site's technology. In addition, the administrative staff provides limited technical support for the entire network. However, new terrestrial-based technology installed in 1997-98 has improved the technological performance of the system and reduced the need for technological support at individual sites.

An associate director position existed during 1995-96 but the executive director has assumed those responsibilities.

TEL8 Committee Structure

TEL8 committees are appointed by the Board of Directors and include the: 1) Programming Committee; 2) Finance Committee; and 3) Technical Committee. Each is presented below.

Programming Committee

The programming committee is chaired by the program director and is responsible for developing, initiating, and acquiring TEL8 programming. The committee includes representatives from the DOTs and a MPC liaison, each assigned the responsibility of representing their organization in the coordination, facilitation, and implementation of viable educational and training programs over the system. As well, the programming committee develops and presents to the board an annual budget addressing the financial requirements of TEL8 programming.

The committee members work within specialty areas in developing and presenting the InfoX program series, the TransX series, MPCX programming, developing and administering surveys, and initiating pertinent mini-courses within the program's budget. Committee members also handle registration, payment, and advertisement of courses to participants and distribute instructional materials. The committee's achievements include a web site containing scheduling and information, annual programming of InfoX,TransX and MPCX topics, initiating presentation of NHI courses over Te18, developing guidelines for distance learning programming, and promotion and registration of graduate courses.

Finance Committee

The finance committee was established in 1998 with the following charge:

- Prepare and recommend annual budget for the TEL 8 Network to the Board of Directors for approval
- Negotiate the annual financial commitment of the member universities and DOT's to provide their funding support of the Network
- Plan and coordinate the continuation of the pooled fund study which supports the participation of the departments and the funding provided by the member universities.
- Review the funding and billing procedure managed by the TEL 8 Network Staff and verify their continued use or recommend appropriate adjustments.
- Receive reports, monitor and report the financial affairs of the Network to the Board of Directors.
- Assist the TEL8 staff in the identification and resolution of budging and funding and billing problems.
- Conduct periodic (annual) audits and prepare reports for the Board of Directors.

In addition, the finance committee has identified and addressed several issues including: 1) TEL 8 revenues; 2) fiscal year definition; 3) local TEL 8 site cost recovery; 4) programming budget; 5) program director's funding support; 6) TEL 8 bridge rental costs; and account management and simplification.

The committee is chaired by the vice president and includes members from the DOTs, the MPC universities and the administrative staff.

Technical Committee

The technical committee is chaired by the TEL8 technician and, under the original satellite-based technology, required each TEL8 site to designate a local TEL8 technician to support that site. The TEL8 telecommunications technician coordinated efforts with the local technicians to ensure system reliability. The switch to a terrestrial-based network modified the committee's responsibilities to include 1) assess current TEL8 technology , 2) evaluate potential TEL8 technology and 3) monitor emerging video conference systems and technology.

Major committee accomplishments include the installation of the original satellite-based network and the major reconfiguration of the system's technology to a terrestrial-based transmission medium.

DOTs and MPC Partnership

The partnership between the state DOTs and the MPC universities in TEL8 is one of the primary strengths of the network. These two organizations have different but very complementary roles in improving the nation's transportation systems and the development of the TEL8 network brought them together within a formal structure. The partnership provides new opportunities for synergy between the two groups and, as well, provides shared education, training and research programs.

One of TEL8's major challenges is to realize the full potential of this partnership. Several of TEL8's programming initiatives attempt to bring these organizations together. Examples of these efforts include MPC graduate classes and the DOT's invitation for MPC participation in the InfoX program

series, a series of seminars devoted to sharing the experiences of practical DOT training and transportation-related applications.

TEL8 Network Expansion

Nine major TEL8 sites currently participate in the network including the state DOTs of North Dakota, South Dakota, Montana, Wyoming, and Utah; and the four MPC universities consisting of North Dakota State University, University of Wyoming, Colorado State University, and University of Utah. These TEL8 sites are illustrated in Figure 2. With DOT district expansion, TEL8 now has 30 sites in its network, a significant increase from the original ten.

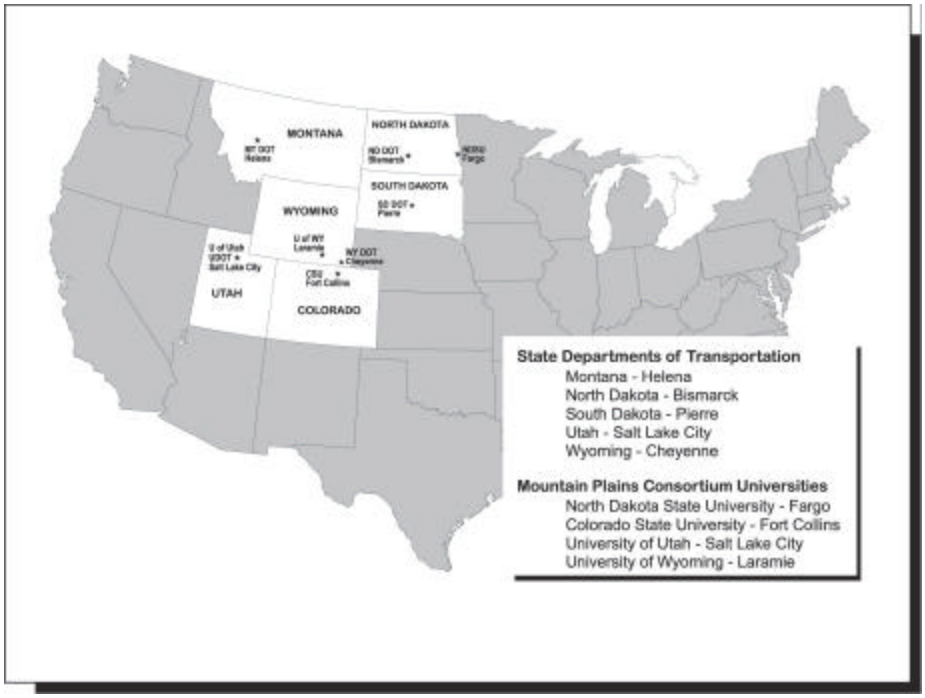

Figure 2. 2002 TEL8 Network Site Configuration

DOT District Site Expansion

Many TEL8 DOTs have expanded their video conferencing into their local district locations. DOT district site expansion continued and accelerated during 2000-2002. Utah DOT and Wyoming DOT had established video conference sites at several of their districts by 2000. These two DOTs added more district sites during 2000-2002, and South Dakota DOT initiated and developed video conference sites at numerous district locations in 2002. Additionally, North Dakota continues to test video conference capabilities at one of their district locations. The current configuration of DOT district sites includes:

South Dakota DOT

- Aberdeen
- Belle Fouche
- Custer
- Huron
- Mitchell
- Mobridge
- Pierre Region
- Rapid City
- Sioux Falls
- Watertown
- Yankton

Utah DOT

- Cedar
- Ogden
- Orem
- Price
- Richfield

Wyoming DOT

- Basin
- Casper
- Cheyenne
- Rock Springs
- Sheridan

TEL8 staff facilitated the development of all the DOT district sites and these sites participate in all scheduled TEL8 programming activities. The growth in the number of TEL8 sites, including the DOT district sites, is illustrated in Figure 3.

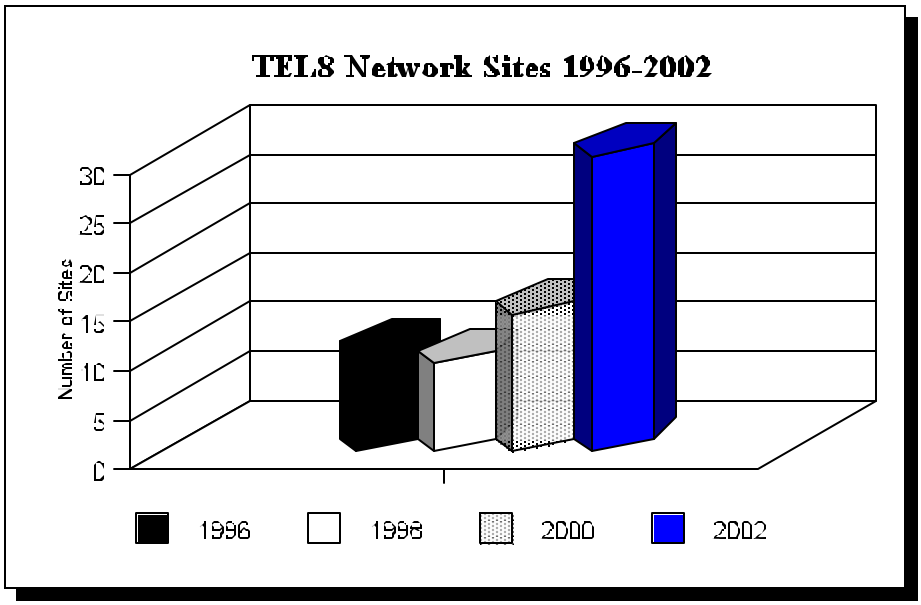

Figure 3. TEL8 Network Sites, 1996-2002

TEL8 DOT districts have become an important part of the TEL8 network. The TEL8 DOT districts increased their participation in the system as measured by their video conference bridge activity in each of the last three years. A comparison of DOT district video conference bridge activity of the last three years is shown in Figure 4.

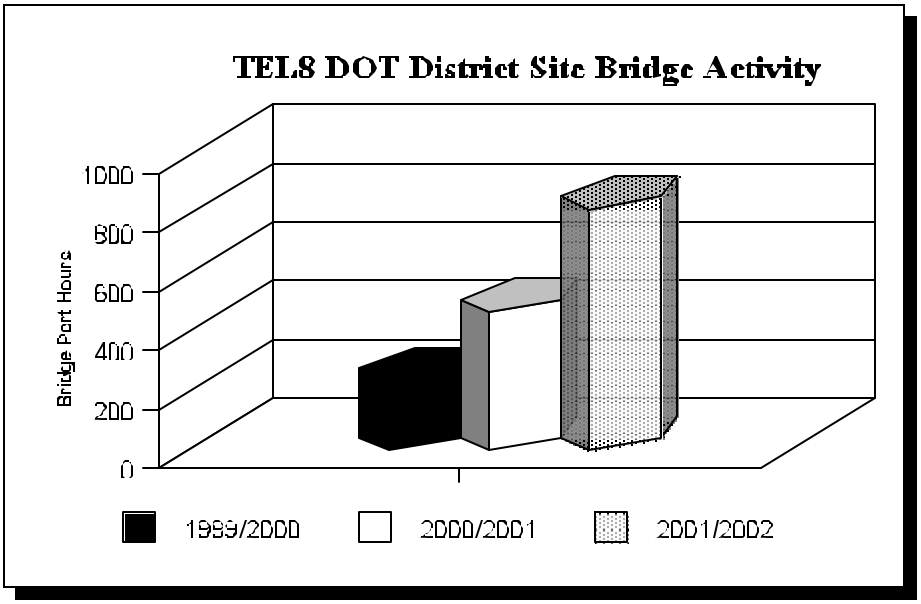

Figure 4. TEL8 DOT District Video Conference Bridge Activity

TEL8 Cost Structure

TEL8's extensive technological reconfiguration in1998 required the defining of a new cost structure and paradigm. The original satellite system was more cost effective at the time the network was established when compared to the land-based technologies and provided low-cost, 24 hours-a-day, seven days a week video conference capability. The costs for the original system was not dependent upon the usage of the system by any individual TEL8 site. In contrast, the new terrestrial

system, now cost-effective when compared to the original satellite vendor, has costs associated with an individual site's usage of the system as well as system-wide costs. TEL8 developed a new cost structure to meet the requirements of the new system. The current cost structure has been defined as:

Shared Costs (divided equally among all TEL8 sites as a system):

- Access into the AT&T Network
- Bridge purchase and operation
- TEL8 Technician/Bridge Administrator
- Program Director (DOT support)
- Administrative Staff

Shared Costs (two different levels of cost, one for DOT's and one for MPC)

- TEL8 Training Program

Individual Site Costs:

- Line usage charges (including NDSU portion of bridged TEL8 events)
- Video conference room equipment
- In-room audio-visual equipment

The shared cost of access into the AT&T network dictates that every TEL8 site has the same cost of access into the TEL8 telecommunications system. This policy ensures that all sites are connected into the system equally in terms of cost and, from an organizational standpoint, enables all sites to participate as equals in the telecommunications system. Such a policy mirrors the cost structure first developed by TEL8 for the satellite system and means that no particular site becomes disadvantaged because of their geographical location.

TEL8 costs increased significantly during 2000-2002 as shown in Figure 5. This increase is mainly due to the increased use of the system as measured by the transmission costs shown in Figure 6. The measured use of the network is also described in the TEL8 programming section of this report.

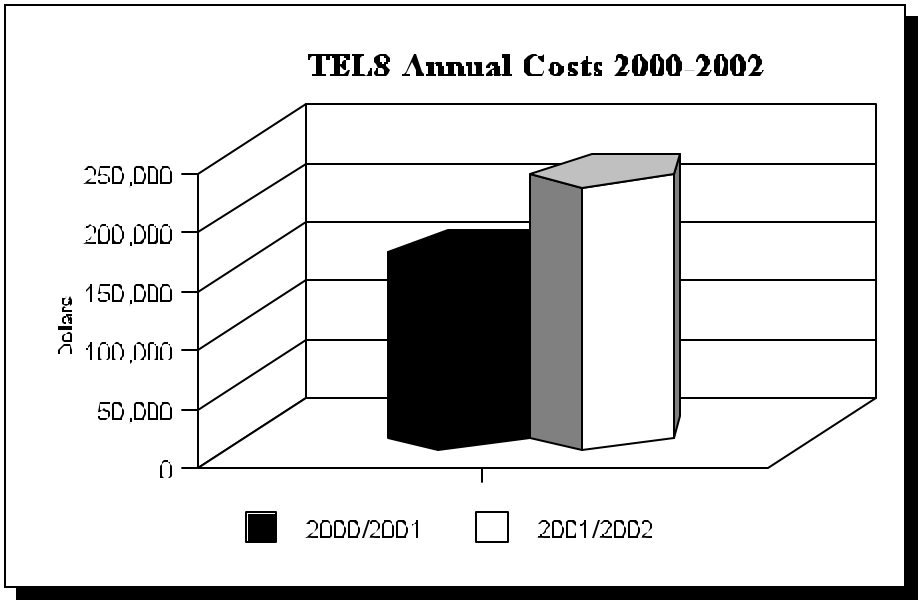

Figure 5. TEL8 Annual Costs 2000-2002

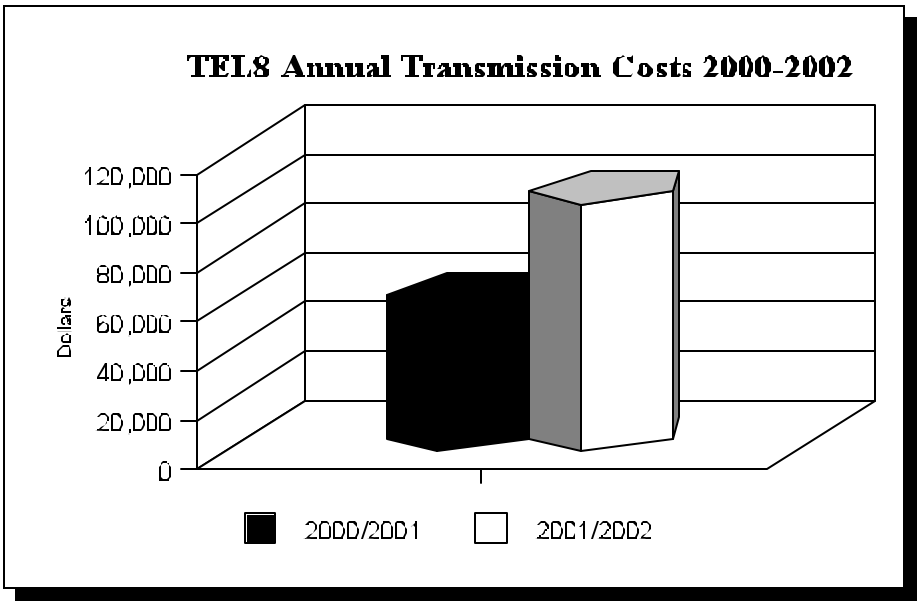

Figure 6. TEL8 Annual Transmission Costs 2000-2002

TEL8 System Evaluation

TEL8 performs annual evaluations to assess its effectiveness and to determine if the vision and mission detailed in the introduction is being realized. For example, the 1997 TEL8 annual meeting formally assessed the TEL8 system as part of a strategic planning process to identify and recommend any needed changes to improve the system. A survey of TEL8 personnel revealed the following strengths and weaknesses of the system:

Strengths

- Education: Students at various sites able to pursue graduate degrees
- Communication link with regional DOTs readily available
- Concept is basically sound; particularly for universities
- Universities use the system for expanding the offering and selection of classes; universities gain students
- Programming recognized as key issue; programming director appointed
- Centralized Network Control Center
- Overall, the technology is stable
- Educators at the MPC Universities have accepted the system
- People are willing (want) to make TEL8 a success
- Administrative leadership (director, executive director)

Weaknesses

- System should be more user-friendly
- System has had some technical problems

- TEL8 would benefit with increased involvement by the Board; a more active Board would help see that the goals, objectives, and vision of the organization are fully realized
- No system standard for site configuration
- Organization has two major groups (DOTs & Univ.); TEL8 hasn't taken complete advantage of the opportunities or challenges presented with the two groups
- Some turnover of DOT board members
- Service and support from HNS
- Top management at the DOTs seem indifferent to the potential of the system
- There has not been a proactive effort at providing programming, but this seems to be changing
- Technical resources have not been adequately provided at all the sites to support the system
- Board has been ineffectual

The strengths and weaknesses identified in 1997 were reviewed, discussed and synthesized into a series of prioritized goals for improving TEL8. The following is the prioritized list of strategic objectives:

1. Increase/improve programming
2. Improve quantity use of system
3. Improve quality use of system

4. Improve technical functionality of system
5. Improve direction/management of system
6. Improve technical support at sites
7. Increase internal/external marketing
8. Improve budget and revenue support
9. Increase state/university top level support
10. Continue/increase sale of surplus capacity
11. Improve connectivity of TEL8 and state systems
12. Increase federal/state/local/university membership

Additionally, TEL8 annually reviews and establishes operating objectives for the upcoming year. Selected operational objectives for 1999/2000 are reported below.

- Evaluate the need for technical upgrades/enhancements of the PictureTel teleconferencing system and continue necessary operational support.
- Evaluate the planned use of the 'bridge' which supports the Picture-Tel system and identify the potential for making bridge services available to support other non-Tel8 users.
- Prepare a prioritized programming plan to guide education, training, and conferencing uses of the network.
- Develop and implement an evaluation process to assure the programming conducted by the Network responds to the objectives and plans approved by the Board of Directors.

- Prepare a strategy and initiate efforts to increase the coordination and shared use of training resources.
- Initiate an effort to plan and invite expansion of the membership of the Tel8 Network.
- Evaluate the funding and billing structure of the Network, and finalize or adjust it to assure the most effective and efficient operations, and the continued stability of the organization.
- Develop and begin implementation of a performance measuring strategy to monitor and report the operations, technical, programming and financial performance of the Network.

TEL8 Partners and Associates

Several outside entities have had or have significant associations with TEL8. These other states, organizations, and educational networks were/are interested in available TEL8 satellite space segment, TEL8 bridging and/or current TEL8 programming. The joint activities with these organizations include:

West Virginia Television Network (WVTN)

The WVTN purchased unused satellite space segment and contracted with TEL8 to schedule and manage that space segment during the TEL8 satellite years. WVTN utilizes the available evening hours of the TEL8 satellite time for providing classes over their twelve site community college system. In addition, WVTN has two mobile satellite units available for TEL8 use, making available special

remote video conferences including TRB and other transportation conferences. Revenues from WVTN were used to support the TEL8 program director.

VSAT Tri-Schools

This organization of high schools in western North Dakota purchased TEL8 space segment and have it managed through the TEL8 Network Control Center. VSAT Tri-Schools uses the available early morning hours of TEL8 satellite time for providing classes over their three-site system. Revenues from the VSAT Tri-Schools were used to support the TEL8 program director.

Other Organizations

The development in 1996 of a satellite-terrestrial gateway provided opportunities for developing video conference capabilities with other organizations interested in transportation. These organizations include the United States Department of Transportation, the United States Department of Agriculture, and other transportation related agencies. The current TEL8 terrestrial-based network provides connectivity to any video conference site in the world.

Mid-Continent Transportation Knowledge Network

TEL8 facilitated and supported efforts to establish the Mid-Continent Knowledge Network. This network includes universities from Manitoba to Texas with the potential membership of a Mexican transportation institute. The network, currently seeking developmental funding, modeled TEL8's operational and technological paradigm in support of its research and communications strategies.

TEL8/WASHTO-X

The successful TEL8 programming initiatives, InfoX and TransX, stimulated the development of WASHTO-X. WASHTO-X was created to deliver video conference programming modeled on TEL8 to several WASHTO states. TEL8 facilities and resources supported the initiation of the new program and remain a resource for WASHTO-X. The TEL8 board of directors considered the WASHTO-X program and identified potential TEL8 benefits and issues including: 1) expanded TEL8 exposure; 2) new areas of expertise identified and utilized; 3) development of a parallel organization; 4) funding resources; and 5) increased programming responsibilities for TEL8 sites.

WASHTO-X started its programming during the summer of 2002 with a monthly informational exchange modeled on TEL8's InfoX. TEL8 staff and its resources assisted WASHTO-X in initiating its program including providing operational guidance.

TEL8 PROGRAMMING

Initial Programming and Evaluation

TEL8 programming has been a high priority since the network's inception. Examples of the initial programming offered over TEL8 include NHI courses, MPC graduate classes, MPC research seminars, InfoX (DOT seminar series), TEL8 Board of Directors meetings, TEL8 technicians' meetings and technical committee meetings. Several conferences were specifically developed for TEL8 and delivered over the system including a Low Volume Roads Conference and a Rural FBO Conference. Moreover, the 1996 Transportation Research Board (TRB) annual meeting was broadcast back to TEL8.

The following data reflects events occurring between 9/14/95 and 12/31/95:

Table 1. TEL8 Network Activity September 14 - December 31, 1995		
Event Type	**Minutes**	**% of Total**
Interstate Class	6,780	50.9
Intra-State Class	0	0.0
Interstate Meeting	2,190	16.4
Intra-State Meeting	1,380	10.4
Interstate Seminar	960	7.2
Intra-State Seminar	0	0.0
Testing	1,470	11.0
Other	60	0.0
Non-TEL8	480	3.6
Total Minutes	13,320	

1995 TEL8 Programming Evaluation

The 1995 TEL8 programming was evaluated to determine the benefits attributed to programming in two areas — program value and program savings.

Program value is the value provided to an organization by the TEL8 programming. For example, an organization may receive programming, information, or training through the TEL8 system it would not necessarily receive otherwise. A specific example is the InfoX series. Program savings would be the costs saved by using the system, and would include travel costs to a conference telecast over TEL8.

The 1995 TEL8 programming evaluated included: 1) InfoX, 2) TRB, 3) MPC graduate classes, 4) Low Volume Roads Conference, 5) NHI course, 6) monthly DOT meetings, and 7) other. A survey asking TEL8 sites to assess the value and savings these programs contributed to their organizations was sent to each TEL8 site.

Program Value

All ten TEL8 sites responded to the program value section of the survey. The number of sites indicating each type of programming that added value to their organization is tabulated in Figure 7.

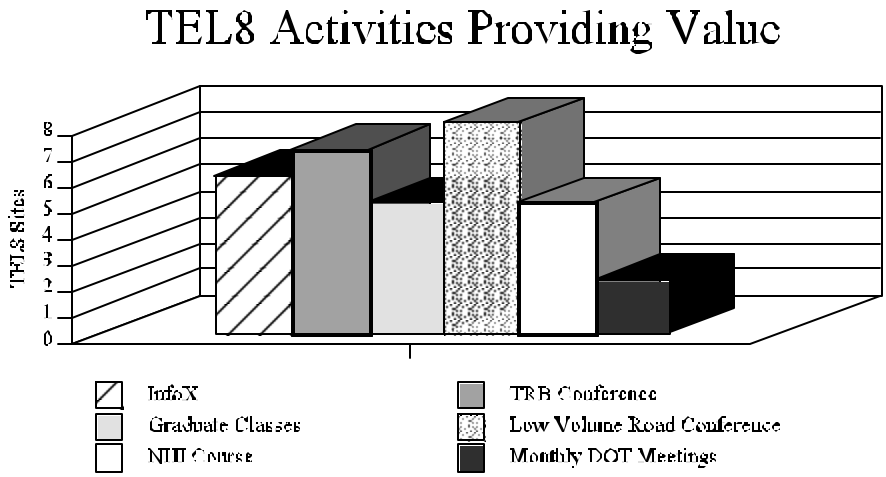

Figure 7. TEL8 Activities Providing Value - 1995 Programming Evaluation

Other activities listed as providing value included:

- Teleconference meetings between DOT's and universities
- Research meetings among DOT's and universities
- T^2 conferencing
- Facilitating T^2 training and regional directors meetings
- Five-state conference with lobbyist
- NHS orientation — Law Changes
- Avalanche Control Discussion
- NHTSA meeting series
- MPC planning sessions

Responses to the question asking what contributions or benefits has TEL8 provided to your organization included:

- Enhanced training opportunities
- Potential for reduced travel for state meetings
- Potential for reduced training costs by sharing NHI expenses with other states
- Opportunities for faculty and graduate student research to be seen and discussed
- A strengthened relationship with DOT and universities
- Facilities understanding of DOT needs for graduate education and research
- The exchange of ideas, methods, and procedures within highly specialized topics; considered especially valuable
- An increase in the value with use each year as more projects and activities

take place

- Significant recognition with department, college, and university
- Dramatic increase in the frequency and timeliness of meetings for planning and organizing events
- Visibility on regional and national levels
- Open conversations with other DOT's
- That InfoX will be a great exchange of information
- Access to information and meetings that wouldn't be available to some because of travel limitations
- An increased opportunity for DOT employees to receive training, and facilitate the exchange of information between DOT and other states
- Support of an off-campus graduate program
- Exposing on-campus students to more research findings
- More options provided to all students
- Improved MPC planning process

The last question in the program value section asked each site to estimate a dollar value TEL8 programming had provided. Four sites provided an estimate totaling $63,566. In addition, one site noted that the value provided to graduate students receiving advanced degrees, not otherwise available to them, would amount to a benefit in the millions of dollars to those students' potential earning power.

Program Savings

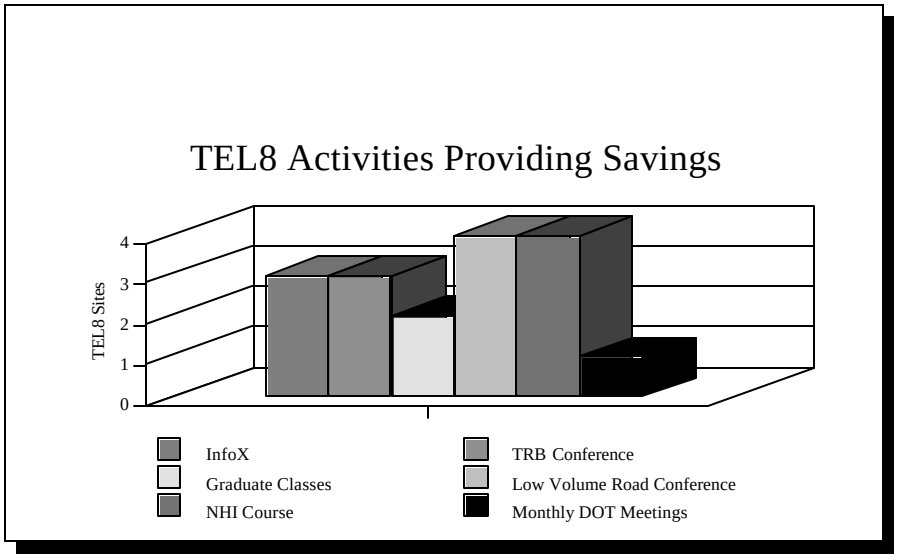

Figure 8. TEL8 Activities Providing Savings - 1995 Programming Evaluation

All ten TEL8 sites responded to the program savings part of the survey and the number of sites indicating each type of programming providing savings to their organization is tabulated in Figure 8.

Other activities listed as providing value included:

- Teleconference meetings with DOT and MPC
- Exchange of technical information among universities
- Organizational meetings
- MPC time and travel savings

Six sites provided an estimated savings amounting to $136,695. Figure 9 illustrates the estimated value and savings TEL8 programming has provided. The graph does not include the

estimated millions of dollars in value provided to graduate students' potential earning power noted by one respondent to the survey.

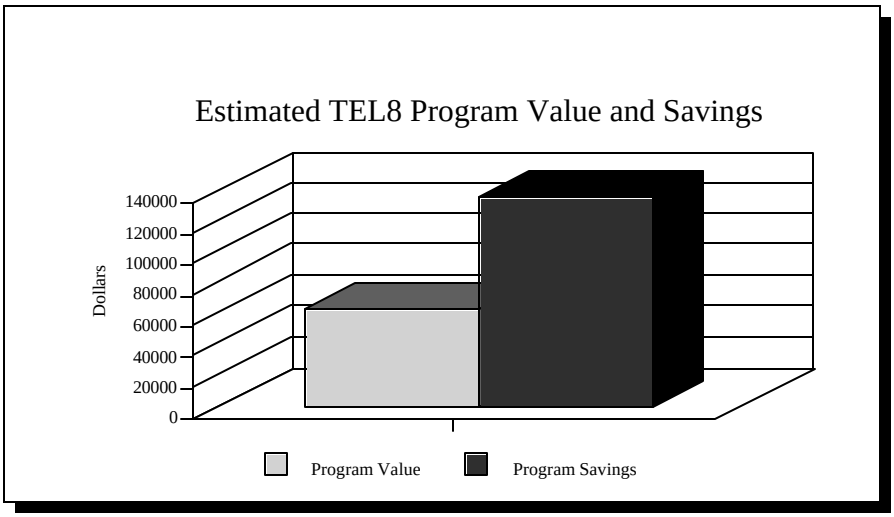

Figure 9. Estimated TEL8 Program Value and Savings - 1995 Programming Evaluation

Several TEL8 sites included general comments which provided additional information about TEL8 programming. These comments include the following:

- It's hard to put a number on savings. We had a NHI course that would have cost us $3,000 but we got it free from another TEL8 site.
- TEL8 is an experimental test bed for trying out new ideas about distance learning and research collaboration.
- In nearly all cases, the people who attended meetings and sessions would not have been sent out of state, and would have been unable to participate. TEL8 provides a valuable means to still expose staff to new ideas and gain from sharing experience in their field. Generally for less than one-fourth of the cost to send one person, we can have several participants.

- The system usage is just now starting to increase. It will be a highly valuable tool in our DOT's future.
- People got to participate in some things that they wouldn't get to.
- Employees who normally attend TRB (or other meetings) attended in person anyway. If TEL8 did not exist, employees who participate through TEL8 would simply not participate.

1996 MPC Transportation Program Graduate Courses Offered

A total of five graduate courses were offered over the TEL8 system during the 1996 program year.

Spring Semester:

Traffic Engineering

Instructor:	Dr. Amiy Varma
Host:	North Dakota State University - Fargo, ND
Additional Sites:	ND Department of Transportation - Bismarck, ND
No. of Students:	18 - 13 NDDOT (7 auditing class); 5 NDSU

Logistics and Distribution Management

Instructor:	Dr. Frank Dooley
Host:	North Dakota State University - Fargo, ND
Additional Sites:	ND Department of Transportation - Bismarck, ND
No. of Students:	11 - 3 NDDOT; 8 NDSU

Fall Semester:

Rural and Non-Metropolitan Transportation

Instructor:	Dr. Denver Tolliver
Host:	North Dakota State University - Fargo, ND
Additional Sites:	ND Department of Transportation - Bismarck, ND
No. of Students:	8 - 5 NDDOT; 2 NDSU; 1 CDOT

Environmental Management and Regulations

Instructor:	Dr. Darwin Sorenson
Host:	Utah State University - Logan, UT
Additional Sites:	North Dakota State University - Fargo, ND
No. of Students:	12 - 8 UTDOT; 2 USU; 2 NDSU

Geotechnical Engineering for Transportation and Infrastructure

Instructor:	Dr. Tom Siller
Host:	Colorado State University - Fort Collins, CO
Additional Sites:	ND Department of Transportation - Bismarck, ND
	University of Wyoming - Laramie, WY
No. of Students:	15 - 5 CSU; 2 UWY; 7 NDDOT; 1 USU

1996 TEL8 Programming Evaluation

The 1996 TEL8 programming evaluated included: 1) InfoX, 2) TRB, 3) AASHTO, 4) Graduate Classes, 5) Seminars and Conferences, 6) NHI course, 7) Monthly DOT Meetings, and 8)

Other. A survey asking TEL8 sites to assess the value and savings these programs contributed to their organizations was sent to each TEL8 site.

Program Value

Figure 10 illustrates the TEL8 activities providing value. The percentage of those TEL8 sites responding to the survey indicating each type of programming that added value to their organization is displayed in the graph.

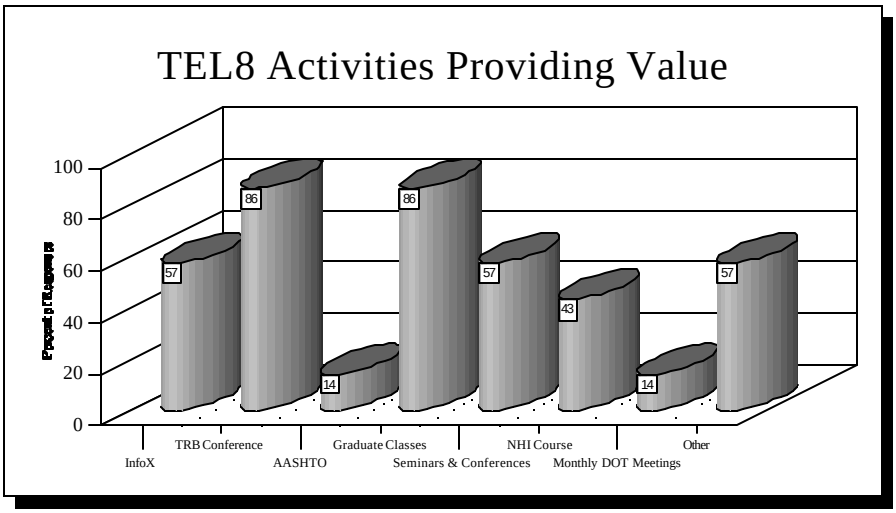

Figure 10. TEL8 Activities Providing Value - 1996 TEL8 Programming Evaluation

Other activities listed as providing value included:

- Connect with FHWA (Washington, DC) for meeting traffic modeling expert
- Technicians Meetings
- Implementation Committee Meetings

- Preliminary Field Review with Field Office
- Four-state meeting explaining multi-state infrastructure bank
- Research Dissemination
- Interview Consultants and Architects
- Four-state CEO meeting

Responses to the question asking what contributions or benefits has TEL8 provided to your organization included:

- InfoX has been of the greatest value.
- TRB sessions were good but there was a very low number of attendees.
- InfoX sessions have been very popular with our employees.
- Unfortunately very little. Almost no participation in TRB or AASHTO.
- We have had great success presenting NHI courses to our staff at two locations.
- We have had only one graduate course. We do not get information from the university coordinators on what is available. Graduate fee structure needs to be looked at.
- Communication with states like our own.
- Leveraged training.
- Expansion of graduate curriculum offerings.
- Knowledge from a wider professional base.
- Learning opportunities for external constituencies (training).

The last question in the program value section asked each site to estimate a dollar value TEL8 programming had provided. Those sites that responded to this question provided an estimate totaling $153,500.

Program Savings

The TEL8 programming activities providing savings were the InfoX, TRB, graduate classes, seminars and conferences, and NHI courses. Those sites that responded to the estimated savings question provided an estimate totaling $183,500. Other activities providing savings included:

- Meetings of T^2 center directors.
- Local travel to DOT.
- Meetings of MPC executive committee.

Figure 11 illustrates the estimated value and savings TEL8 programming has provided. Several sites responding to the survey did not provide dollar estimates of TEL8 program value and savings.

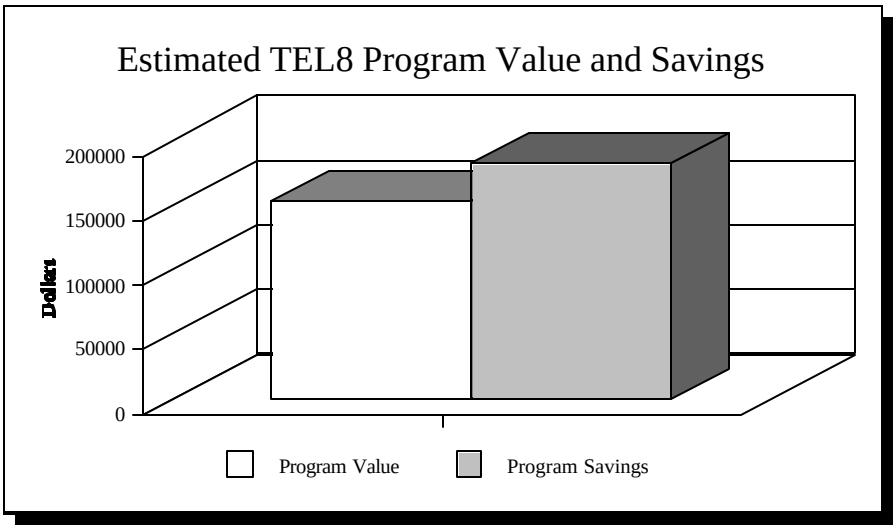

Figure 11. Estimated TEL8 Program Value and Savings - 1996 TEL8 Programming Evaluation

Several TEL8 sites included general comments. These comments include the following:

- Hard to value. "Real Value is in future system"
- We haven't had anything of great value that people would have gone to out of state
- Just not having 15 people travel to D.C. for TRB is a major savings. We estimate with a new system we can expand & pay for it with the savings from not traveling in state.
- TEL8 also saves each site the difference between per site annual operating costs versus downlinks if we did not have fully dedicated time.

TEL8 Special Event Programming 1995-98

Several significant national events have been broadcast by TEL8 . A significant milestone was accomplished with the video conferencing of the 1996 and 1997 Transportation Research Board (TRB) sessions from Washington, D.C., back to the TEL8 sites. The 1997 TRB programming was telecast to six additional states via a TEL8 satellite-terrestrial gateway. The gateway enabled terrestrial-based video conference systems to receive TEL8 satellite programming.

Other national events telecast by TEL8 and described below included an ISTEA re-authorization hearing from Helena, Montana; the 1996 AASHTO Annual Meeting from Buffalo, New York; and a transportation-education national conference from Knoxville, Tennessee. Secretary Pèna

and Secretary Slater were some of the notable transportation officials who made presentations during TEL8 special events.

Transportation Research Board Annual Meeting

The Transportation Research Board (TRB) and the TEL8 telecommunications network collaborated to provide video conference programming of selected TRB annual meeting sessions to parts of the western United States. The first TRB/TEL8 video conference, in 1996, brought interactive TRB video conferences to the TEL8 system and included 11 program sessions in the Design, Construction, Geotechnical, and Materials categories. All of the sessions were transmitted from the Washington Sheraton in Washington, D.C., and telecast to seven remote TEL8 sites. The West Virginia Telecommunications Network (WVTN) provided a mobile satellite unit that linked into the TEL8 space segment with over 300 transportation professionals participating in the video conferences. The 1996 TRB video conference sessions were interactive which allowed the remote sites to participate in a question and answer session. The remote site Q&A was conducted after the question and answer session was completed with the on-site audience.

The 1997 TRB/TEL8 video conference delivery project was a continuation and expansion of the 1996 effort. The 1997 TRB video conference project expanded the number of states receiving the video conference sessions to include 12 western states and doubled the available programming to include two tracks of programming sessions. The video conference transmission medium was a satellite telecommunications system directly linked to TEL8 and to other western states through a satellite-

terrestrial gateway. In addition to the TEL8 sites, the western states participating included Arizona, California, Kansas, Nebraska, Nevada, and Washington (Figure 12). The number of remote sites in these states totaled 31 while a total of 35 sessions were delivered to DOT participants.

Figure 12. States participating in the teleconference delivery of the 1997 TRB Annual Meeting Video conference Sessions

The TRB sessions selected for the video conference were chosen after a survey was circulated to the TEL8 and western states soliciting their preferences for TRB video conference programming. The survey presented each state the programming categories at the TRB annual meeting and asked the states to rank their priorities for receiving programming. The survey results were used by TRB to select the video conference program schedule and are illustrated in the table below. The WVTN provided

two mobile satellite units that linked into the TEL8 satellite space segment and the satellite-terrestrial gateway. The sessions were delivered in broadcast mode only with the remote sites participating in the question and answer session via telephone.

Table 2. TEL8 and Western States TRB Programming Priority	
Session Theme	***State Priority (1 = low, 7 = high)***
Materials and Construction	6.8
Maintenance	6.5
Operations and Safety	5.8
Design	5.5
Planning, Administration and Environment	5.3
Freight Transportation	5.0
Energy and Environment	4.6
Intermodal Transportation	4.5
Finance	3.8
Public Transit	3.6
Aviation	3.5
Rail	3.0
Marine Transportation	1.8

The TRB/TEL8 video conference was delivered January 12-16, 1997 to the 12 participating states including each state's Department of Transportation and several transportation research universities. There were approximately 400 participants at the 31 remote sites. The 1997 TRB/TEL8 video conference doubled the number of western states receiving TRB programming and increased the number of video conference participants by one-third. The attendance at TEL8 sites decreased from 311 in 1996 to 147 in 1997.

AASHTO

The American Association of State Highway and Transportation Officials invited TEL8 to participate in their 1996 annual meeting in Buffalo, New York. The sessions telecast included the Highway Subcommittee on Design chaired by Thomas Warne of Utah Department of Transportation and which involved Federal Highway Administrator Rodney Slater. The West Virginia Television Network's mobile satellite unit was utilized to provide the satellite transmission link.

ISTEA Hearing

The ISTEA Reauthorization Missoula Regional Forum sponsored by the U.S. Department of Transportation was telecast over the TEL8 system in August of 1996. The forum, chaired by Secretary of Transportation Federico Pena and Senator Max Baucus of Montana, heard testimony from regional transportation officials including participants from the six TEL8 DOTs via TEL8. TEL8 participants included DOT CEOs and other transportation policy officials.

Transportation Education Conference

The U.S. Department of Transportation hosted a national conference on meeting the demand for transportation professionals in the next century. TEL8 telecast the conference that focused on the need to prepare transportation professionals to design and operate the complex transportation systems of the future. The TEL8 participation included interaction with Mortimer Downey, Deputy Secretary of Transportation.

TEL8 Re-Dedication

TEL8 re-dedicated its system July 14, 1998. Associate Deputy Secretary of Transportation John Horsley gave the keynote address from the United States Department of Transportation in Washington, D.C. as part of the video conference re-dedication. (Mr. Horsley participated in an earlier TEL8 video conference, a five-state congressional hearing with Secretary of Transportation Pena originating from Missoula, Montana.) The re-dedication noted the technological reconfiguration of the system and highlighted:

- The importance of utilizing partnerships and technology to further the advancement of national, regional and local transportation systems.
- The pooling of resources among DOT's and universities in a symbiotic relationship dedicated to serving the region's transportation interests.
- The development of regional programming and training activities to meet the needs of transportation professionals, researchers and students.
- The employment of communication technology to more effectively administer transportation organizations.
- The utilization of a state-of-the-art video conference system to pool resources, develop new regional relationships, maximize educational and training opportunities, and provide communication facilities.

Mr. Horsley particularly noted the role of organizations like TEL8 in developing transportation policy.

Aviation Teleconference `98

The Second Annual Aviation Teleconference entitled Aviation Teleconference ’98, telecast by TEL8 addressed the topic of “Fixed-Base Operators and Air Service Access.” This video conference included 12 locations across 8 states and the District of Columbia utilizing the bridge cascading functionality of the TEL8 bridge (Figure 13). Bridge cascading functionality provides connectivity into other video conference bridges and greatly expands TEL8's telecommunications potential. Non-TEL8 participants were located in Nebraska, Minnesota, Wisconsin and Washington, DC. Several Minnesota sites were included in the video conference.

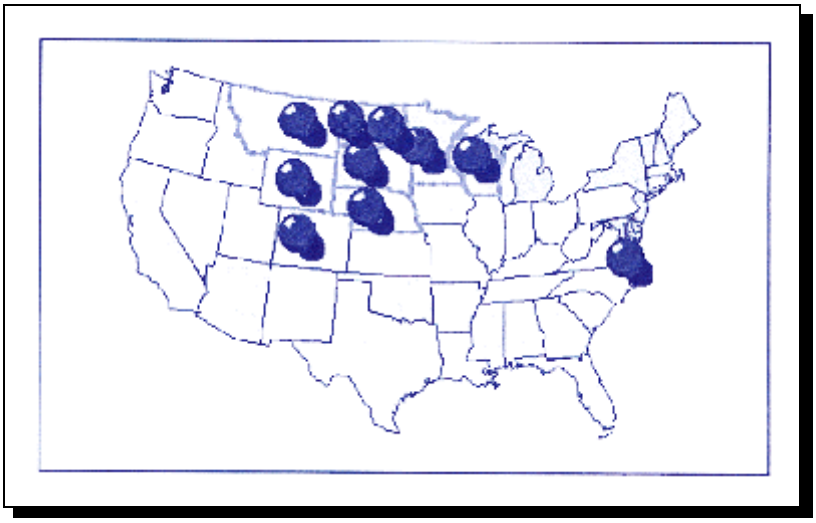

Figure 13. Aviation Teleconference ‘98 Site Locations

Aviation Teleconference `98 brought together over 50 aviation professionals including fixed-based operators, airport managers, regulators, aircraft technologists and other aviation specialists from around the country. It provided an excellent forum for the development and discussion of policies directly impacting rural aviation. Furthermore, the conference provided a vehicle for collaboration among the region's and nation's senior aviation officials.

The Board of Directors formalized TEL8 programming through the appointment of a TEL8 program director during 1997. The program director is responsible for the initiation, development and acquisition of a structured, extensive TEL8 training program. Moreover, the program director is a liaison with those involved at all TEL8 sites who are responsible for training and programming at their respective sites. The first formal TEL8 training program was approved by the Board of Directors in early 1998 with the financial support for the program allocated across all sites. Costs for providing the training program were estimated at $37,800 and were allocated among all TEL8 sites with the DOTs assuming a larger proportion of the costs.

1998 TEL8 Programming and Training

The 1998 TEL8 programming and training schedule included:

- Two Asphalt Pavement Courses
- Rural Transit Coordination Seminar
- Rural Transportation Management Course
- Several NHI Courses
- Leadership Development Institute for Transportation Series
- Several Workshops including DOT personnel
- FranklinCovey Courses
- Three Intelligent Transportation Systems Short Course

The adoption of a formal, system-wide programming schedule financially supported by TEL8 as a whole was an important organizational milestone and contributed significantly to the evolution and

growth of the system. The schedule also included the InfoX seminar series, graduate level transportation classes, implementation committee meetings, and other activities. Additional programming and training beyond the formal schedule will include DOT information exchanges and ad hoc meetings.

A total of three MPC graduate courses were offered via the TEL8 system during the 1998 program year.

Rural Logistics and Distribution Management -Spring Semester, 1998

Instructor(s): Frank Dooley, NDSU

Host(s): North Dakota State University

Addnl Sites: University, University of Wyoming; Wyoming Dept of Transp ortation

# of Students: 15 - 2 UWY; 1 WYDOT; 12 NDSU

Statewide Transportation Planning - Spring Semester, 1998

Instructor(s): Ayman Smadi, NDSU

Host(s): North Dakota State University

Addnl Sites: ND Dept of Transportation

# of Students: 5 - 2 NDDOT; 3 NDSU

Transportation Planning - Fall Semester, 1998

Instructor(s): Dr. Amiy Varma, NDSU and Dr. Eugene Wilson, UWY

Host(s): North Dakota State University/University of Wyoming

Addnl Sites: ND Dept of Transportation; University of Wyoming; Utah State University; Utah Dept of Transportation; South Dakota Dept of Transportation

# of Students: 12 - 1 NDDOT; 3 NDSU; 2 UWY; 3 USU; 1 UDOT; 2 SDDOT

1999 TEL8 Programming and Training

TEL8's 1999 training and programming schedule included:

• InfoX A 1999 InfoX program coordinator was appointed and the following programs were scheduled for 1999.

Jan	Pavement Management	MTDOT
Feb	Traffic Data/Weigh-in-Motion	NDDOT
Mar	New Products Evaluation	UDOT
Apr	Small Airport Management	MTDOT
May	Quality Assurance	MTDOT
Jun	Avalanche Detection	UDOT
Jun	Employee Safety	MTDOT
Jul	Equipment Management and Retrofit	UDOT
Aug	Finance	UDOT
Aug	Innovative Contracting	MTDOT
Sep	Crack Sealing	NDDOT
Oct	Rest Area Maintenance	WYDOT
Nov	Project Analysis/Selection	MTDOT

• TransX	This new program was initiated in 1999. Its focus is providing information and training to specific professional groups inside the DOT's.
• NHI Courses	TEL8 surveyed the DOT's to identify information needs and coordinate NHI efforts to develop training to meet those needs. TEL8 will also assist the NHI in any modifications required of existing NHI courses for video conference and TEL8 delivery.
• FranklinCovey	The TEL8 FranklinCovey trainer has completed her training and will be presenting several Covey courses over the network.
• Grad. courses	Graduate Classes offered for the spring semester 1999 include: Geotechnical Engineering Intermediate Timber Structures Additional classes are planned for the fall.
• Short courses	The TEL8 MPC partners took under consideration the redesigning of graduate courses into short courses to meet the needs of the DOT's and for the video conference format.

2000-2002 Tel8 Programming and Training

The FY2000 programming and training schedule was approved by the board in 1999. Costs for providing the training program were estimated at $45,380 and were allocated among all Tel8 sites with the DOT's assuming a larger proportion of the costs.

The FY2000 Tel8 training schedule included:

- Monthly InfoX and TransX Events
- 4 Leadership Development Institute Workshop
- 3 FranklinCovey Seven Habits Workshops
- 5 FranklinCovey What Matters Most Workshops
- 1 NHI Course (SuperPave)
- MPC Courses and Special Events
- TransX

TransX has expanded rapidly and now includes the following focus areas that meet twice a year on a rotating basis: Finance, Maintenance, Intelligent Transportation Systems, Motor Carrier Operations, Transportation Research, Human Resources.

TEL8's highest priority during 2000-2002 was the quality of programming on the network. MPC short courses and MPC-X were new additions to TEL8 programming, each developed to meet technical training needs or research dissemination requirements. Program-ming performance measures were established as a means of evaluating the efficacy of network programming and the programming committee, responsible for network programming, assumed greater visibility in the organization. Additional programming efforts were identified and are being researched by TEL8.

The programming committee's goals for 2000-2002 included: 1) increase technical training offered, 2) increase offerings from existing sources, 3) increase MPC offerings – graduate and short-courses, 4) solidify data process, 5) provide help for new presenters, 6) encourage participation in MPC programming, and 7) implement weekly newsletter.

Progress was made on all of the above goals during 2000-2002. Additional goals and future issues include 1) addressing bridge capacity issues, 2) reducing the number of cancelled events, and 3) improve timeliness of posting event agendas.

The TEL8 website continued to contributes significantly to the growth in use and ease of managing the system for everyone involved. The Web schedule included the InfoX, TransX, and MPC-X seminar series, graduate level transportation classes, leadership workshops, programming committee meetings, and many other activities.

The formal 2001-2002 schedule featured the following events:

- Leadership Development Institute Workshops (8)
- MPC Short Courses (1)
- Seven Habits Workshops (3)
- What Matters Most Workshops (5)
- InfoX Sessions (11)
- TransX Sessions (10)
- Graduate Classes (4)
- MPC-X Sessions (7)

Additional programming and training beyond the formal schedule includes DOT information exchanges and ad hoc meetings.

2000-2002 Programming Performance Measures

The TEL8 board of directors, in conjunction with the programming committee, developed a series of performance measures designed to capture the impact and efficacy of TEL8 programming. These performance measures were administered by the individual TEL8 sites under the direction of the program director and the programming committee. As such, the reported values for these performance measures *understate* the numbers of individuals TEL8 reaches because of the difficulty involved at some TEL8 sites in measuring all participants. However, the reported values are instructive even though all TEL8 participants are not measured.

- Number of People Served

  2000-2001: 1,049

  2001-2002: 1,112

- Hours of Programming Offered

  2000-2001: 407

  2001-2002: 451

- People-hours on the system

  2000-2001: 6,012

  2001-2002: 7,123

- Number of Events Offered

  2000-2001: 71

  2001-2002: 96

- Staff Level Reached

  2000-2001 Engineer: 377

2001-2002 Engineer: 237

2000-2001 Executive: 18

2001-2002 Executive: 4

2000-2001 Management: 179

2001-2002 Management: 122

2000-2001 Staff: 239

2001-2002 Staff::287

2000-2001 Other: 4

2001-2002 Other:462

- Number (or Percent) of New Participants

  2000-2001 197 (19.6%)

  2001-2002 117 (10.5%)

- Perceived Value to Job

  2000-2001 1.62 on a scale of 1 to 3 (1 = excellent, 2 = good, 3 = poor)

  2001-2002 1.61 on a scale of 1 to 3 (1 = excellent, 2 = good, 3 = poor)

The number of people-hours (one people-hour is one person spending one hour on the system) during 2000-2002 is illustrated in Figure 14.

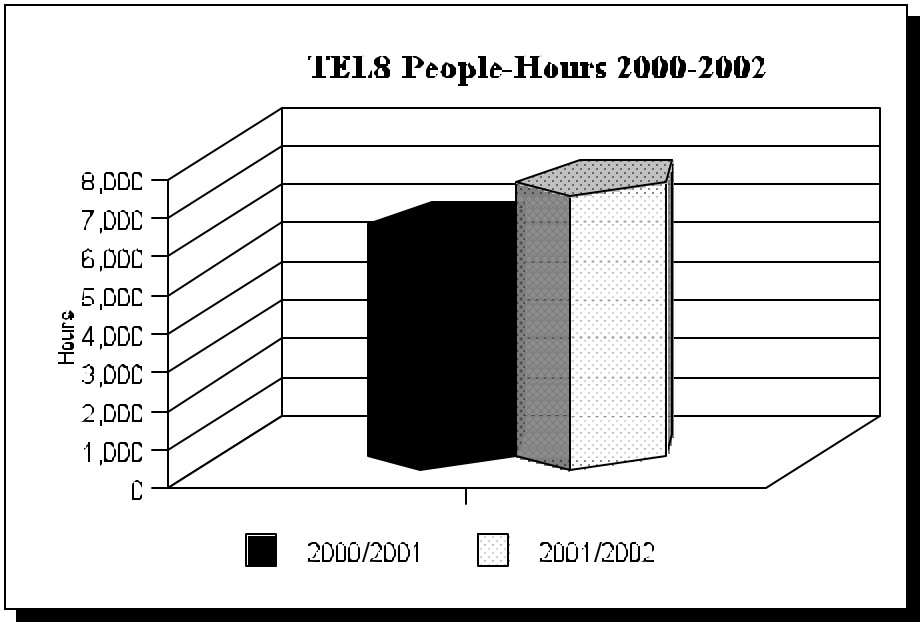

Figure 14. TEL8 People-Hours, 2000-2002

TEL8 Special Event Programming 2000-02

Several significant national and international events were supported by TEL8 during 2000-2002. Two of these events are listed below while additional special programming included facilitating special maritime insurance classes between the University of Connecticut and North Dakota State University.

North American Freight Transportation Issues and Trends: A Midcontinent Perspective

This Midcontinent Knowledge Transportation Network conference included universities from the United States and Canada. The conference exchanged research on NAFTA-related transportation issues and trends with the operational and technical support of TEL8.

6th Annual Fields on Wheels Conference

This international video conference originated from the Transport Institute at the University of Manitoba with the participation of North Dakota State University (NDSU) via the TEL8 network. Conference participants included presentations from NDSU utilizing TEL8's facilities as well as technical support from TEL8.

Proposed FY2003 TEL8 Programming and Training

The TEL8 program director, with the approval of the board of directors, proposed specific programming activities for 2002-2003:

- InfoX: InfoX continues with the DOTs sharing responsibility for hosting these sessions. Program topics are areas of special interest are varied and abundant with 11 scheduled for the coming year.
- TransX: Growth in TransX has slowed and now has eight groups meeting semi-annually. The following focus areas are involved: Finance, Maintenance, Intelligent Transportation Systems (ITS), Motor Carrier Operations, Transportation Research, Human Resources, Planning, and E-Commerce.
- MPC-X: MPC-X is an effort to share information about proposed, current, or recently completed MPC research among the TEL8 members, both universities and DOTs.
- FranklinCovey: FranklinCovey workshops are now a regular part of the TEL8 offering. Both the *Seven Habits of Highly Effective People* and *What Matters Most* enjoy continued support.

- Graduate Courses: Graduate courses continue to be offered with one planned for Fall 2002 and the Spring 2003 schedule yet to be determined.
- MPC Short Courses: MPC has developed several proposals for short courses and two will be offered this fiscal year. A new process for proposals, selection, and budgeting was implemented to better fit the TEL8 fiscal year.
- Website: The website will continue to be a primary source of information regarding TEL8 scheduling and event information.
- Newsletter: A weekly newsletter is used to remind site coordinators, and others, about upcoming events and deadlines.

TEL8 TECHNOLOGY

Satellite-Based Network Topology

The TEL8 telecommunications network was originally established as a Hughes Very Small Aperture (VSAT) satellite-based system. Each TEL8 site purchased satellite uplink and downlink transmission equipment allowing two-way interactive video conferences among all sites (Figure 15). Additionally, each site developed a video conference room or room capability incorporating audio and video conference technology. A major piece of video conference equipment, the codec, utilized CLI technology, a leading codec manufacturer at the time.

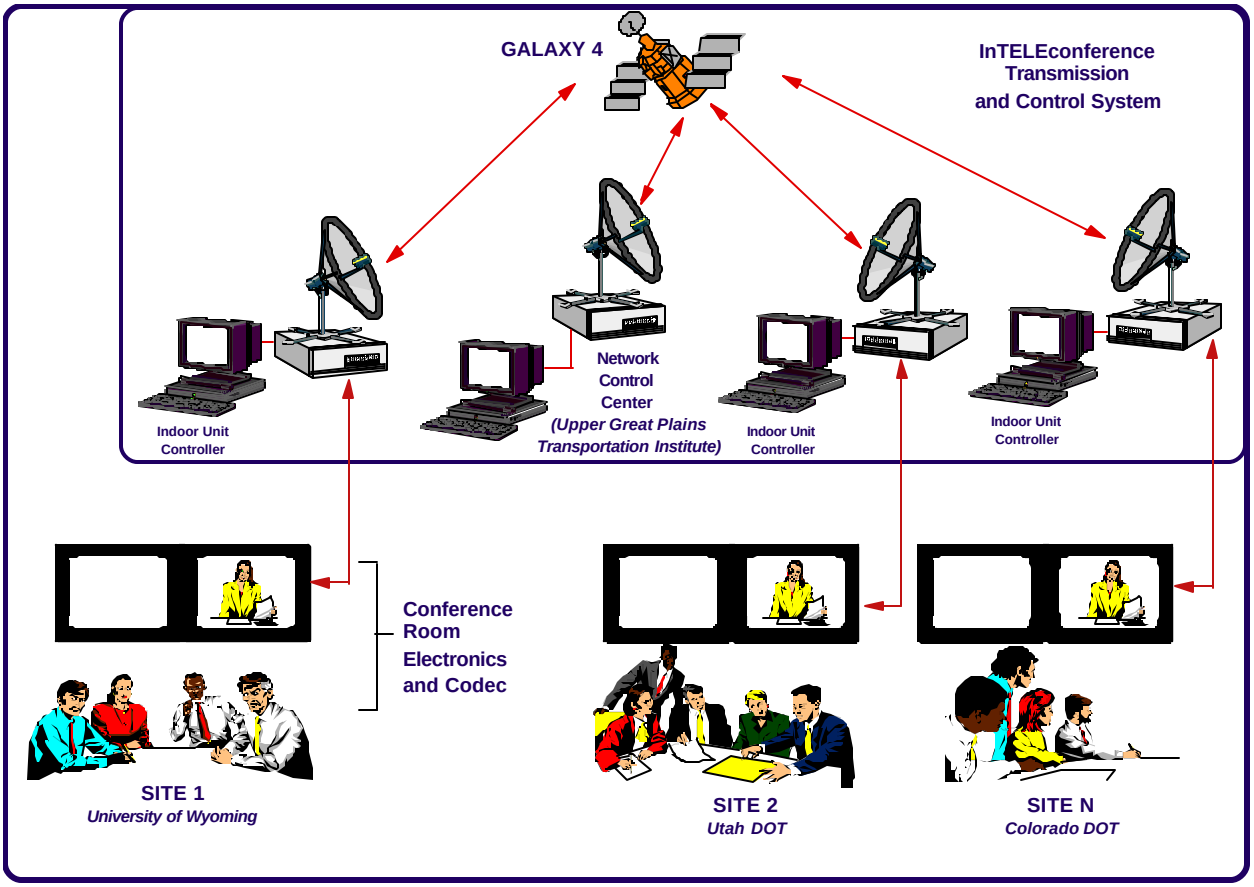

Figure 15. TEL8 Site Equipment Configuration for Satellite-Based Network

A Network Control Center (NCC) was established at the NDSU site. The NCC is responsible for daily operations of the system including the satellite connectivity for all sites, the satellite space segment scheduling of video conferences and the maintenance and support of all satellite-related technology at all sites across the system. The NCC is staffed by the TEL8 telecommunications technician and other administrative staff as necessary.

The VSAT transmission medium proved to be efficient and adequate but not elegant for TEL8. VSAT was more cost effective at the time the network was established when compared to the land-based technologies. It provided low-cost 24 hours a day, seven days a week video conference

capability and afforded a first opportunity for many TEL8 users to be exposed to videoconferencing. However, as video conference technology evolved, other transmission mediums developed additional functionality, particularly full-duplex audio, that made them attractive to TEL8.

Satellite-Based Network Enhancements

Several TEL8 video conference rooms were re-engineered. Enhancements were made in the audio portion of the room and video and AMX control portions.

Audio Enhancements

Several TEL8 sites installed more sophisticated microphones, which offer a tighter, more controlled polar pickup pattern. This alleviated potential feedback issues and provided more gain from each microphone. Another enhancement was the addition of a different microphone mixer which, in conjunction with an automatic gain control device, brought greater control over the audio sources.

Video Enhancements

An additional VCR was installed at the NDSU site to record TEL8 video conferences. A "MADDEN PAD" graphics tablet also was installed. Several sites installed scan converters to allow utilization of a laptop or desktop PC as a video source.

AMX TouchControl Panels

Two TEL8 sites installed AMX TouchControl panels that allow for greater control of a video conference, audio conference or presentation. This enhancement allows control switching of the secondary visible site, selection of video sources, control of both VCR's, control of the slide to video projector, control of the CODEC for graphics and incoming audio, and control of a microphone mixer for volume and audio muting.

Southwestern Bell Gateway

A major engineering effort came to fruition in 1996 with the development of a satellite-terrestrial gateway. This system engineering enhancement was fueled by the Transportation Research Board's desire to broaden the distance audience for it's 1996 Annual Meeting utilizing TEL8. The Southwestern Bell Gateway allowed TEL8 sites to conference with any terrestrial site that has ISDN dial out capabilities.

Satellite-Based Network Transmission Costs

Hughes Network Systems Maintenance Contract

TEL8's maintenance service contract with Hughes Network Systems covered the video conference equipment providing network connectivity through the satellite transmission medium. Maintenance costs ranged from $175/month/site to $200/month/site while TEL8 used the satellite for network connectivity. The maintenance contract provided service coverage of eight hours per day, five days per week - local time. The original annual maintenance service contract for TEL8 as a whole was $28,800.

Satellite Space Segment

TEL8's space segment was located on Galaxy 4, Transponder 10. This satellite is located at 99˚ 00' West longitude. Six percent of this transponder was leased at a cost of $1,152/site/month. The original annual satellite lease for TEL8 as a whole was $138,240.

Satellite Space Segment Utilization

Selected Satellite Use Report

The following numbers represent system wide conference activity including events originating from West Virginia Telecommunications Network, VSAT Tri-School Consortium and TEL8 from January 1, 1996 to December 31, 1996.

0 Off Net Conferences for 0 minutes

30 Broadcast Conferences for 139 hours 54 minutes

336 Two-Way Conferences for 255 hours 28 minutes

1 N-Way Conferences for 1 minute

407 2+N-Way Conferences for 587 hours 37 minutes

262 2+N-Way Conferences had 3 stations

51 2+N-Way Conferences had 4 stations

25 2+N-Way Conferences had 5 stations

27 2+N-Way Conferences had 6 stations

25 2+N-Way Conferences had 7 stations

10 2+N-Way Conferences had 8 stations

7 2+N-Way Conferences had 9 stations

TOTAL = 774 Conferences for 983 hours 0 minutes

Broadcast were 3.9% by conference type and 14.2% by duration time.

Two-Way were 43.4% by conference type and 26.0% by duration time.

N-Way were 0.1% by conference type and 0.0% by duration time.

2+N-Way were 52.6% by conference type and 59.8% by duration time.

Selected Satellite Utilization Report for TEL8 Sponsored Events

April 1996

Two-Way Conference hours:	6 hours 9 minutes
Two + N-Way Conference hours:	7 hours 51 minutes

Total:	14 hours 0 minutes

May 1996

Broadcast Conferences:	1 hour 2 minutes
Two-Way Conferences:	18 hours 1 minute
Two + N-Way Conferences:	18 hours 51 minutes
Total:	37 hours 54 minutes

June 1996

Broadcast Conferences:	0 hours 19 minutes
Two-Way Conferences:	7 hours 16 minutes
Two + N-Way Conferences:	51 hours 56 minutes
Total:	59 hours 31 minutes

July 1996

Broadcast Conferences:	3 hours 0 minutes
Two-Way Conferences:	9 hours 16 minutes
Two + N-Way Conferences:	43 hours 57 minutes
Total:	56 hours 13 minutes

August 1996

Broadcast Conferences:	3 hours 2 minutes
Two-Way Conferences:	18 hours 50 minutes
Two + N-Way Conferences:	34 hours 30 minutes
Total:	56 hours 22 minutes

September 1996

Two-Way Conferences:	4 hours 4 minutes
Two + N-Way Conferences:	42 hours 24 minutes

Total:	46 hours 28 minutes
October 1996	
Broadcast Conferences:	9 hours 38 minutes
Two-Way Conferences:	5 hours 9 minutes
Two + N-Way Conferences:	55 hours 59 minutes
Total:	70 hours 46 minutes
November 1996	
Broadcast Conferences:	0 hours 6 minutes
Two-Way Conferences:	4 hours 55 minutes
Two + N-Way Conferences:	46 hours 26 minutes
Total:	51 hours 27 minutes
December 1996	
Two-Way Conferences:	21 hours 2 minutes
Two + N-Way Conferences:	31 hours 56 minutes
Total:	52 hours 58 minutes
Report Total :	*560 hours 5 minutes*
Average use per month:	*46 hours*

Network Technology Evaluation

The 1997 annual meeting strategic planning process and two years of experience with the original technological configuration, including the satellite transmission medium and the CLI codec, coupled with the rapid evolution of video conference technology, revealed the need for major

improvements to the system. Improvements identified as necessary were improved codec video conference functionality, increased transmission medium functionality and connectivity, and an enhanced video conference environment for TEL8 users. A Request For Proposal (RFP) committee was formed to develop and assess potential solutions to implement these improvements.

The RFP committee developed a technical document which formed a subsequent RFP issued in May of 1997. The RFP asked for solutions to improve TEL8 technology, functionality, and capability in the following areas:

- Transmission Medium
- Codec Technology
- System Integration/Configuration

The Board of Directors voted for network improvements with a significant investment in enhancing TEL8 video conference technology. In addition, the Board stressed that while improved technology will greatly improve the system, additional resources needed to be allocated to programming, the highest priority strategic objective.

Second Generation TEL8 Network Technology

TEL8 undertook a major reconfiguration of its video conference technology and network technology in 1998. Initially planned and designed during 1997, the technological reconfiguration was part of an overall enhancement of TEL8's telecommunications capability. The entire system switched from a satellite-based transmission medium to a terrestrial-based T1 private network. The switch allowed for enhanced video conference functionality and provided increased connectivity to all parts of

the world. In addition, TEL8 acquired new codec technology and installed a network video conference bridge which allows a cost effective mechanism for video conferencing among all network sites and with other video conference locations worldwide. The system reconfiguration includes:

- Network Reconfiguration - New land-based network
- Video conference equipment upgrade - New codec technology
- Video conference bridge Installation - TEL8 bridge

Network Reconfiguration

TEL8 switched to a terrestrial transmission medium from a satellite-based medium for the following reasons:

- Full duplex audio, as currently developed in a terrestrial medium, was not available in the satellite-based technology. Full duplex audio provides the best interactive voice communications possible in a video conference setting.
- TEL8 connectivity outside of TEL8 using the old satellite technology was cumbersome. The establishment of a satellite-terrestrial gateway during 1996 had only provided limited connectivity.

The original satellite transmission medium had illustrated the need for a more elegant system in terms of ease-of-use and site switching. Additionally, the lack of full duplex audio hindered voice communication among users and became a major quality issue. Moreover, the satellite system was a closed system preventing easy access to other telecommunication sites outside of TEL8. Video conference communications outside the satellite network proved difficult or required extensive

resources. The other avenue of outside connectivity involved the use of a mobile satellite unit which was used for several successful national events but required significant coordination and scheduling resources. Within this context, the switch to a terrestrial transmission medium was completed in the spring of 1998 for all sites. One TEL8 site required additional AT&T facilities preparation and came online during the second quarter of 1998. The satellite-based system was utilized during the early months of 1998 to facilitate the transition period from satellite to terrestrial.

The components of the new TEL8 terrestrial system include:

- An AT&T Pri Network
- IMUX at ISDN Bri sites
- T1 Base Units at ISDN Pri sites
- A TEL8 Video conference Bridge
- Bridge Network Access
- A TEL8 Technician and Bridge Administrator

The AT&T private T1 Network consists of Primary Rate ISDN over T1 lines inside a private network. The network has an exclusive tariff filed for TEL8 including “on-network to on-network” and “on-network to off-network” rates. The network is fully capable of connecting to any standards-based video conference system in the world. Furthermore, the new network provided increased quality and functionality when compared to the original satellite-based transmission medium. The IMUX and T1 Base Units are video conference transmission components required at each TEL8 site. The TEL8 satellite technician assumed the responsibilities for supporting the new terrestrial network and the new TEL8 bridge described below.

TEL8 Video Conference Equipment Upgrade

TEL8's enhancements also included new codec technology. The existing CLI codec technology required significant resources to update and improve its functionality to state-of-the-art video conferencing. The new codecs provide improved video quality, increased user and system functionality and voice-activated camera switching. The new codec technology also allows the network to operate at established industry video conference standards and at different bandwidths. These new features provide greater flexibility in connecting to other video conference systems as well as providing video conference participants an easier and more user-friendly environment.

The installation of the new codec technology includes:

- PictureTel S4200 Codecs
- PictureTel World Carts at several sites for increased mobility
- Remote Access Modems for improved remote diagnostics
- 30 Frames-per-second codec technology standards
- AMX video conference room integration at two sites

The installation and configuration of the new codec technology was completed during the first quarter of 1998.

TEL8 Video Conference Bridge Installation

A comparative cost analysis of the potential transmission mediums indicated that TEL8 would benefit from purchasing and operating its own video conference bridge. A bridge is required for video

conferences involving more than two sites, a configuration predominantly utilized by TEL8. A PictureTel Montage 570A bridge was installed at North Dakota State University (NDSU), the Network Control Center under the satellite-based transmission medium. The TEL8 telecommunications technician received bridge training and has been certified as the TEL8 bridge administrator.

The bridge has an 11 port capacity, generally available continuously. However, additional port capacity is available at reduced bandwiths. During 1998, video conferences with up to 13 locations, including several non-TEL8 sites, were supported by the TEL8 bridge. Furthermore, TEL8 has cascaded with other video conference bridges substantially increasing the potential for videoconference connectivity. In summary, the TEL8 bridge provides:

- Cost-effective network connectivity
- Increased non-TEL8 connectivity
- TEL8 expansion economies of scale
- Continuous video conference capability

TEL8 supports a bridge administrator/system technician responsible for TEL8 bridge operations and overall system reliability. The bridge administrator/system technician maintains the bridge at NDSU (the network control center) and provides technical support for the system.

TEL8 bridge activity has increased significantly as illustrated in Figure 16.

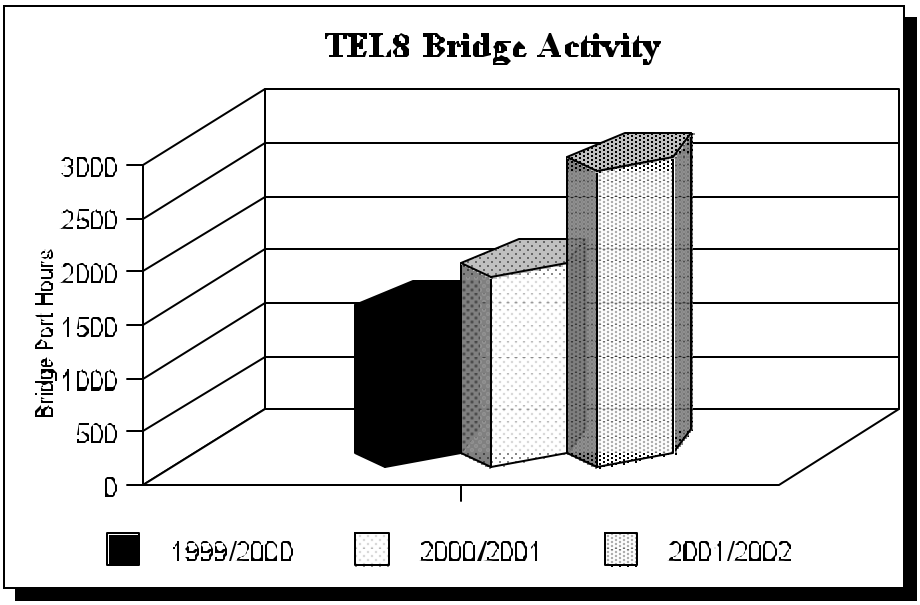

Figure 16. TEL8 Bridge Activity 1999/2000 - 2001/2002

2000-2002 Technology Overview

The TEL8 network technology performed normally during 2000-2002. A detailed technical system report for 2001-2002 is found at the end of this section.

Several technological evaluations were performed during 2000-2002. These included 1) Access Grid technology, 2) multi-site codecs, 3) transmission medium, and 4) bridge capacity expansion.

Access Grid Technology

The TEL8 staff evaluated an Access Grid installed at North Dakota State University. Utilizing the I2 internet connection among selected universities, an Access Grid installation provides continuous, multi-site access and visibility to all videoconference participants. The Access Grid technology may be

an alternative videoconference paradigm for a future TEL8 configuration if system financial resources are available.

Multi-Site Codecs

Multi-site codec technology was assessed by a TEL8 board member and the TEL8 technician. This codec technology acts as a bridging mechanism and provides a multi-site videoconference connection within the codec. Additional bridging capacity in the network may require the application of selected multi-site codec technology.

Transmission Medium Evaluation

An initial examination, on a very preliminary basis, was made of the H.323 Internet Protocol transmission medium. The H.323 Internet Protocol may offer economies if current quality of service and congestion issues are addressed. The undertaking of more formal assessment is under review.

Bridge Expansion/Capacity

The marked increase in TEL8 sites requires evaluating the resources necessary to support the system, particularly the videoconference bridge. TEL8 currently has bridging capacity to connect 11 sites together with full duplex audio at 384k bits per second (kbps) and 30 frames per second (fps). Because of technology changes, TEL8's MCU port capacity can no longer be increased. The following options are under annual review and would allow TEL8 to expand the bridge beyond the current limitation of 11 ports.

Bridge expansion options:

- Purchase new bridge
- Replace current NDSU codec with multipoint capability codec
- Use 3rd party bridging service as needed
- Use Utah state Bridge as needed

The latest bridge capacity review resulted in the adoption of the last option, and the adoption of a management approach to bridge capacity and utilization rather than any current increase in bridge capabilities. That management policy was described in the bridge use policy section.

Detailed System Technology Review 2001-2002

The TEL8 technical report for 2001-2002 included a detailed assessment of the following network components:

- Network

  The network component of TEL8 continues to operate normally. Occasionally there is a network anomaly that causes one site or another to drop out temporarily during a conference.

- Bridge

  The bridge component of TEL8 continues to operate normally. During the prior twelve months there have been no failures of any component related to the bridge.

- Site by Site: CODEC and Peripheral Equipment

  CSU, Fort Collins, CO: No hardware failures reported.

NDSU, Fargo, ND: NDSU reported a failure of their IMUX.

U of UT, Salt Lake City, UT: No hardware failures reported.

U of WY, Laramie, WY: University of Wyoming reported two failures of theirc camera.

NDDOT, Bismarck, ND: No hardware failures reported.

MTDOT, Helena, MT: No hardware failures reported.

SDDOT, Pierre, SD: Pierre reported a failure of their IMUX.

SDDOT, Aberdeen District: No hardware failures reported.

SDDOT, Belle Fourche District: No hardware failures reported.

SDDOT, Custer District: No hardware failures reported.

SDDOT, Huron District: No hardware failures reported.

SDDOT, Mitchell District: No hardware failures reported.

SDDOT, Mobridge District: No hardware failures reported.

SDDOT, Pierre Region: No hardware failures reported.

SDDOT, Rapid City District: Rapid City reported 1 failure of their codec.

SDDOT, Sioux Falls District: No hardware failures reported.

SDDOT, Watertown District: No hardware failures reported.

SDDOT, Yankton District: No hardware failures reported.

UTDOT, Salt Lake City Complex: No hardware failures reported.

UTDOT, Cedar District: No hardware failures reported.

UTDOT, Ogden District: No hardware failures reported.

UTDOT, Orem District: No hardware failures reported.

UTDOT, Price District: No hardware failures reported.

UTDOT, Richfield District: Reported one failure of their camera and one instance of their IMUX losing its program.

WYDOT, Cheyenne: Reported one failure of their camera.

WYDOT, Basin District: Experienced eight failures of their codec.

WYDOT, Casper District: Reported three failures of their camera.

WYDOT, Laramie District: No hardware failures reported.

WYDOT, Rock Springs District: No hardware failures reported.

WYDOT, Sheridan District: No hardware failures reported.

CONCLUSIONS

TEL8 has demonstrated the value of a telecommunications network dedicated to transportation. The TEL8 system delivers transportation-related resources, programming and training to a region-wide audience located in distant geographic areas of the north-central and mountain states. The pooling of resources by these states in establishing the network brought new opportunities for cooperation, education, outreach, extension of training opportunities, and the maximizing of training and research funds. The sharing of human resources across the network exposed more transportation professionals to existing expertise in the region and nationwide. As well, TEL8 provides a new medium for addressing the problems and issues shared by the transportation systems in the region and illustrates a new paradigm for developing solutions to those problems.

The partnership between DOTs and universities is one of the highlights of TEL8 and proves to be a valuable resource for the network, affording invaluable opportunities to the system. The formalization of this relationship inside the TEL8 focused each group on the requirements, opportunities and issues of the other. Both groups have benefitted from the partnership and are addressing several challenges in an effort to take full advantage of this relationship. These issues are being examined and include university credits for courses, DOT employee time for education, initiating and acquiring technical training, and university courses tailored to meet DOT needs.

The quality and quantity of the programming in the system remains the primary challenge to TEL8. A strong emphasis on developing and acquiring programming for the system's clientele has been established. The creation of a programming director position during 1997 is an effort to meet that challenge and the role of the program director will be paramount in the success of TEL8. Additionally, the videoconference technology deployed by any system must not inhibit the utilization and development of programming. Early TEL8 experience demonstrated that the original technological configuration of the system was not elegant and prevented the maximization of the network.

Recent programming initiatives included MPC short courses and the MPC-X. These new programs, one which was begun to meet identified DOT needs, were specifically designed to increase technical training in the system. Additional programming efforts realized increased training to DOT district sites.

Communication with the users of the system is necessary to make it relevant to the solutions or opportunities they seek. This may be realized through traditional means but should

include training in using the system so these users will be active in letting their organizations learn of the network's potential. As well, special emphasis on the user-friendliness of the system and reducing system complexity through system-wide technical integration is recommended.

TEL8 also demonstrates the feasibility and value for other transportation agencies to access the TEL8 network. The TRB and AASHTO special events brought those organizations to a new audience of transportation professionals and displayed the efficiency of an organized, video conference network. The ISTEA hearings with Secretary Pèna showed the effectiveness of the network by allowing the Secretary the opportunity to interact with the CEOs from six state DOTs. Furthermore, individual state DOTs have learned through the TEL8 experience the advantages of developing intrastate video conference facilities within their own organizations and have initiated programs to do so.

DOT district expansion added to the geographical scope of the organization and expanded access to TEL8 programming and video conferencing. Moreover, this expansion increased the expertise available to the network and highlighted the efficacy of technology transfer via a video conference system. Existing Tel8 resources managed the expansion but current system technological resources need to be monitored with this expansion.

The TEL8 network, during 2000-2002, was used as a model for two other incipient networks. WASHTO-X, involving several western states, started video conference programming modeled after the TEL8 InfoX and TransX programs. During the summer of 2002 WASHTO-X, with the assistance of TEL8, initiated a once-a-month video conference program. Additionally the Mid-Continent Transportation Knowledge network brought together universities in the United States and Canada utilizing TEL8 resources.

Finally, the importance of developing an organization that emphasizes programming and programming partnerships over system organization or network technology must again be noted. The continuing success of TEL8 will depend upon the success of its programming. While organizational structure and appropriate technology is necessary in establishing a network, neither will dictate the success of the network.

APPENDIX A

TEL8 TRANSPORTATION TELECOMMUNICATIONS NETWORK BYLAWS

ARTICLE I

Membership

Current Members: The name of this organization shall be *Tel8*. The members of Tel8 are:

- Montana Department of Transportation
- South Dakota Department of Transportation
- North Dakota Department of Transportation
- Utah Department of Transportation
- Wyoming Department of Transportation
- Colorado State University
- North Dakota State University
- University of Utah
- University of Wyoming

Membership: Members in Tel8 participate in the events of their choosing and enjoy the privileges and responsibilities of being partners in the management of the system. Members will abide by these bylaws and fulfill their financial commitments to Tel8. They provide their own on-site equipment, make arrangements for internal technical support, and must ensure reasonably available and adequately sized room space. Membership means participation as part of the Tel8 Board of Directors, participation in Tel8 programming on a regular basis, and participation as members of committees as required. Application for membership should be made in writing to the Executive Director for consideration by the Board of Directors. Acceptance of new membership requires the approval of 2/3 of the members of the Board of Directors. If the application for membership is denied or if the applicant withdraws before consideration, Tel8 will refund funds received from the applicant except for bridge and line services already used.

Withdrawal from Membership: Members may withdraw their membership from Tel8 by informing the Executive Director in writing. Withdrawing members retain their financial obligation to Tel8 until the end of the fiscal year in which they withdraw. Members may temporarily withdraw due to financial or other constraints, then return to membership within 12 months without further administrative action necessary. Members who withdraw for greater than twelve months must reapply as described in the paragraph above. The Executive Director will inform the Board of all withdrawals from membership and reinstatements following temporary withdrawals.

Removal of Membership: The Board of Directors may revoke any membership by 2/3 vote of all members of the Board. Removed members retain their financial obligation to Tel8 until all debts are cleared.

ARTICLE II

Purpose of Network

The purpose of the network is to improve the United States transportation environment through better communication, research, technology transfer, and education. The objectives for which the network is organized and for which it shall be perpetuated are:

(1) To research and illustrate applications that may be applied on a regional transportation telecommunications network to improve the efficiency and effectiveness of transportation professionals.

(2) To facilitate and improve transportation-related communications among state DOTs.

- Improve statewide and regional transportation activities.
- Facilitate more discussion and coordinate development of regional and national transportation policy.
- Facilitate sharing of expertise among state DOTs.

(3) To facilitate FHWA communications.

- Increase, improve, and coordinate communications between FHWA and state DOTs in the region.
- Facilitate and improve FHWA training of state employees.
- Better communicate data transmission between division offices and FHWA offices.

(4) To enhance FHWA, state DOT, and local transportation officials' communications.

- Continuing education.
- Allow integration of multiple group training for select interests.
- Promote sequenced and segregated training presentations.
- Extend opportunities for education, training, and professional development to local governments.

(5) To improve and promote transportation technology transfer by LTAP centers.

- Deliver technology transfer courses regionwide.

- Promote periodic technology transfer news programming regionwide.
- Promote sharing of expertise among technology transfer centers.

(6) To enhance research communications.

- Improve dissemination of research results in a real time mode.
- Improve research collaboration (e.g. joint proposals, projects) among FHWA, DOT, and university personnel.
- Improve coordination and facilitation of pooled funding of projects among states.
- Increase sharing of research findings and techniques.

(7) To increase partnerships among state DOTs, MPC universities, and other universities.

- Allow universities to expand non-resident education programs.
- Improve availability of workshops, seminars, and shortcourses.
- Improve availability of specialized university expertise and information.
- Allow DOT professionals to provide practical experience to university students via guest lectures.
- Facilitate job interviews by DOTs of students in a timely manner.

(8) To facilitate improved university-to-university communications.

- Enhance graduate education programs.
- Allow coordination of expertise and courses for transportation clientele.

(9) To improve emergency communications and facilitate discussion of critical, urgent, and unscheduled problems and issues.

- Improve communications for regional and natural disasters.
- Improve positions of common regional interest on legislative or other transportation activities.

ARTICLE III

Purpose of Management Group

The network installation and operations shall be managed by a steering group hereinafter referred to as the Board, empowered with the following purpose:

(1) To develop a policy for the establishment and operation of a regional telecommunications network.

- Approve priorities for use of the system.
- Resolve conflicts.
- Establish procedures on use of the system.
- Review status of operations on an as needed basis.
- Approve expenditure of monies for installation of equipment.
- Establish standards for the system.
- Recommend use of system to broaden its effectiveness and use.
- Promote programming on the network.
- Address other issues pertinent to the establishment and operations of the system.
- Approve an annual work program that shall be the basis for managing and funding the network.

(2) To promote use of the Tel8 network.

(3) To meet the intent of "Article II - Purpose of Network."

(4) Select and appoint an Executive Director to serve at the pleasure of the Board.

ARTICLE IV

Board Membership

The Board shall be established in such a manner that the state DOTs have principal charge and responsibility for the establishment and management of the Tel8 network. Each member shall serve at the pleasure of the organization they represent.

Member Jurisdictions

Section 1: The member jurisdictions of the Board shall be composed of the following agencies:

- State DOTs:
  - Wyoming Department of Transportation
  - Utah Department of Transportation
  - South Dakota Department of Transportation
  - North Dakota Department of Transportation
  - Montana Department of Transportation

(b) Universities:

- University of Utah
- Colorado State University
- University of Wyoming
- North Dakota State University

Board Representative of Members

Section 2:

(a) State DOTs - shall be the CAO or a designated representative

(b) MPC Universities - shall be the Mountain-Plains Consortium executive committee member, or a designated representative, at the four MPC universities, as previously approved by each university's administrators

- If a Board member is unable to attend a meeting of the Board, they may designate a representative to serve as a substitute for them at that meeting. The representative shall have the right to vote for the Board member.

Associate Members

Section 3: Such members shall consist of persons who may, from time to time, be asked by the Board to participate. Such members shall not be voting members.

Additional Members

Section 4: Additional members may be permanently added to the Board as full members of Tel8 by a 2/3 vote of the Board. Terms and conditions to be determined by the Board.

ARTICLE V

Officers

Section 1: The officers of this Board shall consist of the President, Vice President, and Secretary/Treasurer. These officers shall be elected by the member jurisdictions of the Board. Terms for these offices shall be for two (2) years. The president must have been a Board member for at least one (1) year before entering office.

Section 2: Interim vacancies in the offices shall be filled accordingly:

- President - position to be assumed by Vice President.
- Vice President - position to be filled by Board.
- Secretary/Treasurer - position to be appointed by President.

All vacancies filled for balance of original term of office.

Section 3: Election of officers shall be held at the Annual Meeting of the Board.

ARTICLE VI
Duties of Officers

President

Section 1: The President shall carry out the following duties:

(a) Call and preside at all meetings of the Board;
(b) Make reports to Board on status of network operations;
(c) Maintain liaison between Board and Executive Director of Tel8 network.

Vice President

Section 2: The Vice President shall carry out the following duties:

(a) Carry out duties of the President during absence or incapacity, death, resignation, or removal of President;
(b) Assist the President in any manner pertaining to the network or Board whenever and to the extent requested.

Secretary/Treasurer

Section 3: The Secretary/Treasurer shall carry out the following duties:

(a) Keep a record of the meetings of the Board;
(b) Be responsible for the mailing of all notices and correspondence of the Board and perform such duties as the President or the Board may prescribe;
(c) Convene and preside over meetings of the Board in the absence of the President and Vice President;
(d) Shall have custody of any funds of the Board;
(e) Report directly to the President and Board at least annually, or more often if directed,

on financial status of network account.

(f) The Secretary/Treasurer may delegate to the Executive Director any of these functions except those directed by the Board;

Authorization of Committee Structure

Section 4: The President, Vice President, and Secretary/Treasurer shall constitute the Executive Committee. The Executive Committee, as well as the Board, shall establish committees as deemed necessary to accomplish the mission of Tel8.

ARTICLE VII

Meetings of the Board

Section 1: The Board shall meet at least twice each calendar year - one meeting to be considered the Annual Meeting of the Board and the other meeting or meetings at such time and place as the President may direct.

Section 2: A 2/3 majority of the Board members shall constitute a quorum for the transaction of business.

Section 3: The university members of the Board shall not have more than four (4) votes.

Section 4: The Board shall also meet on a written call signed by four members thereof and filed with the President, Secretary/Treasurer, or Executive Director not less than fifteen (15) days prior to the date such meeting is called.

Section 5: The rules of parliamentary procedure, as set forth in Robert's Rules of Order, shall govern Board meetings.

Section 6: The Board may vote by mail, electronically transmitted ballot, or by video telecommunications if the President determines that an issue must be resolved without delay, between meetings of the Board. The distribution and counting of ballots shall be the responsibility of the President, or the Executive Director if so directed by the President.

ARTICLE VIII

Executive Director

There shall be an Executive Director who shall be appointed by and serve at the pleasure of the Board. This person is not a member of the Board and has no vote.

ARTICLE IX

Duties of Executive Director

Section 1: The Executive Director shall carry out the following duties:

(a) Convene and preside over meetings of the Board in the absence of the President, Vice President, and Secretary/Treasurer until the Board shall elect one of their members to serve as President Pro Tempore;
(b) With approval of the Board, carry out functions and purposes of the network, and keep adequate records of its financial and other affairs;
(c) Make, keep, and maintain proper and adequate records of all receipts and disbursements of Board and network funds;
(d) Make final authorization for payment of all duly authenticated and authorized items of expenditures to be paid out of funds for the network;
(e) Prepare annual report on the network pursuant to the direction of the President and the Board;
(f) At the direction of the Secretary/Treasurer, makes, keeps, and maintains proper and adequate records of all Board meetings, transactions, and actions.
(g) Establish and maintain liaison and cooperation with Federal agencies and other supporting and cooperating organizations;
(h) Report to Board whenever, and to the extent, required by them;
(i) Perform such other duties as are assigned from time to time by the Board.

Section 2: In the event that the Executive Director is unable to perform the duties prescribed in these Bylaws, by reason of illness, disability, or absence, such duties shall be performed by a person appointed by the president, or the president's designee, until the return of the Executive Director or until the vacancy in the office of the Executive Director has been filled.

ARTICLE X

Fiscal and Operational Management

All fiscal, operational, and policy issues of Tel8 are ultimately the responsibility of the Board of Directors.

ARTICLE XI

Suspension of Bylaws

With the exception of Article XII, the Bylaws of the Board may be suspended during any regular meeting of the Board by a two-thirds majority of the member jurisdictions attending the meeting, provided that a quorum is present.

ARTICLE XII

Amendments to Bylaws

Section 1: The Bylaws may be amended at any meeting of the Board provided that thirty (30) days prior to the meeting written notice of any proposed amendments, or the text thereof, is filed with the President, the Secretary/Treasurer, and the Executive Director. Proposed amendments shall be submitted by the Executive Director to member jurisdictions at least fifteen (15) days prior to the meeting. Should the Board determine that any proposed amendment must be resolved without delay, the Board will instruct the Executive Director to require a vote by mail, electronically transmitted ballot, or by telecommunications provided the notification requirements have been met. The results of ballot shall be filed by Executive Director or the Secretary/Treasurer as a part of the record of the Board.

Section 2: A vote of two-thirds of member jurisdictions shall be required to amend the Bylaws.

ARTICLE XIII

Dissolution

Dissolution of the Board and network organization may occur with a two-thirds vote of all Tel8 network member institutions.

ARTICLE XIV

Addendum

Addendum #1: The Executive Director will have the authority to contract with other parties on a demand-price basis which does not conflict with goals and objectives of members, their clientele, and the pooled fund study. No agreements are to be longer than six (6) months. (Adopted 2/15/96)

Addendum #2: The principal purpose of leasing time will be for the expansion and enhancement of the existing Tel8 system. (Adopted 2/15/96)

Amended - November 23, 1998
Amended - August 17, 2001