ASSESSING HIGH-SPEED INTERNET ACCESS

IN THE STATE OF IOWA

A Joint Report of the

Iowa Utilities Board

And

Iowa Department of Economic Development

Submitted to the Legislative Oversight Committee of the Legislative Council in Compliance with Senate file 2433

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1.0 INTRODUCTION

Prior to 1994, traffic over the Internet was largely text-based information with E-mail being the most popular. Following 1995, Internet usage grew to include graphical imaging. Graphical images generally consist of a large number of bits. Internet speeds are commonly measured in kilobits per second (1,000 bits per second) or megabits per second (1,000 kilobits per second). In order to transfer large graphical files in satisfactory conditions and speeds, new high-speed access technologies were needed. Although the majority of residential Internet users continue to access the Internet through traditional low-speed analog modems,[1] new high-speed technologies have developed and are currently available in many parts of the country. The availability of these technologies in rural areas of the United States (U.S.) has sparked statewide and national debates, particularly given the Federal Communications Commission's (FCC's) charge under the 1996 Telecommunications Act (the Act). The Act codifies goals pertaining to high-speed Internet access as follows:

> Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high-cost areas, should have access to telecommunications and information services, including interexchange services and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas.[2]

In 2000, the Iowa General Assembly passed legislation requiring the Iowa Utilities Board (IUB) and the Iowa Department of Economic Development (IDED) to submit a joint report with recommendations to ensure access to high-speed Internet services in rural Iowa. Senate File 2433 (S.F. 2433) states:

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[1] According to a staff report to William Kennard, Chairman, FCC, entitled "Broadband Today," in January 1999, 65 percent of Internet users were still using analog dial-up modems with an average speed of access of 33 Kbps.

[2] Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat 56, (1996 Act), Section 254 (b)(3).

> The department of economic development and the Iowa utilities board shall jointly develop a written report with recommendations to ensure that high speed broadband internet access is available to rural areas of the state where such access is not currently available. The written report shall be submitted to the legislative oversight committee of the legislative council by no later than October 1, 2000.

In response to this legislative mandate, the IUB and IDED submit this report.

The term "broadband," as used in S.F. 2433, has taken on several different industry meanings in the last several months. To avoid confusion, this report defines "high-speed" as technology capable of providing access services with over 200 kilobits per second (Kbps) in at least one direction -- either from consumer to provider (upstream) or from provider to consumer (downstream). This definition is consistent with the FCC's definition of high-speed Internet access.[3]

The report also focuses on the following phrase included in S.F. 2433: "where such access is not currently available." Available access to high-speed services must first be assessed before appropriate recommendations can be made. For this reason, the IUB and the IDED decided the IUB staff should conduct a survey of all potential providers of high-speed Internet access in Iowa. In deciding to conduct the survey, the IDED and the IUB recognized that none of the groups currently evaluating the issue of rural access to high-speed Internet technologies had good data on the current availability of these technologies in Iowa.

The conclusions and recommendations included in Section 2.0 of this report reflect the results of the IUB staff survey (see Section 4.0) and the work conducted by several Iowa-based groups on this issue. Notably, the work of the 2010 Communications Task Force is considered, as well as the work of Rich Varn and Bob Tibor in their report: "The Digital State: Advanced

[3] The definition is not comparable with the FCC's definition of advanced services, which requires capability of supporting speeds in excess of 200 Kbps in both directions.

Telecommunications Services in Iowa" (Tibor/Varn Report). The recommendations also consider several other recent studies or reports on high-speed Internet access. (See Section 5.0). For a description of the various high-speed technologies surveyed in this report, please see Section 3.0.

2.0 CONCLUSIONS AND RECOMMENDATIONS

In July 2000, the IUB staff surveyed all telecommunications companies likely to offer high-speed Internet access in Iowa. These companies included incumbent local exchange carriers (ILECS), competitive local exchange carriers (CLECs), cable providers offering telecommunications services, fixed wireless providers, and satellite companies. The survey did not address access to the Internet through cellular telephones. The following conclusions and recommendations were reached based on industry responses to the IUB staff survey and a review of other high-speed Internet access studies. (See Sections 4.0 and 5.0).

Conclusions

Based on the results from the IUB staff survey, this report concludes:

- deployment of high-speed Internet access technologies in Iowa appears to be reasonable based on industry representations;

  Thirty-one percent of surveyed communities currently have high-speed Internet access. According to current deployment schedules, 77 percent of surveyed communities will have high-speed Internet access within the next 12 months.

- no major geographic digital divide will exist in Iowa **if industry deployment projections are realized**;

  Industry projections indicate that 78 percent of rural communities and 75 percent of non-rural communities will have high-speed Internet access within the next 12 months.[4]

- current access to xDSL services is more likely in rural communities served by a small ILEC than in rural communities served by a large ILEC;[5]

  No rural communities served by a large ILEC currently have access to xDSL technology. Twenty-nine percent of rural communities served by a small ILEC have access to xDSL technology.[6]

[4] Rural is defined as communities with less than 2,500 residents not served by a rural exchange.
[5] A large ILEC is defined as serving 15,000 or more access lines or customers in Iowa. All large ILECs are regulated by the IUB.
[6] This result is consistent with the conclusions reached in the National Telephone Cooperative Association report entitled "Who Will Service Rural America?" (See Section 5.0).

- near-term deployment schedules for xDSL technologies are very aggressive for both large and small ILECs;

  Fifty-three percent of rural communities and 50 percent of non-rural communities served by large ILECs will have access within 12 months. Eighty percent of rural communities and 74 percent of non-rural communities served by small ILECs will have access within the next 12 months.

- cable modem access to high-speed services is more readily available to non-rural communities;

- wireless access to high-speed services is equally available to both rural and non-rural communities;

- near-term deployment schedules for wireless access to high-speed services are aggressive with 82 additional rural communities and 26 additional non-rural communities having access within the next 12 months;

- demand for high-speed Internet access is considered "low" in most exchanges by most respondents;[7]

- competition in the provisioning of high-speed Internet access is minimal with most communities served by only one provider; and

- **the affordability of high-speed Internet access technologies, particularly for low-income Iowans, remains questionable.**

  Survey results were not sufficient to gauge the affordability of high-speed Internet access. Further study is required to assess affordability and customer demand for high-speed data services. Available Internet applications for high-speed technologies may not be sufficient to attract widespread customer demand.

State policies that increase both demand and competition for new technologies should result in lower, more affordable prices for high-speed Internet access. Higher demand lowers prices for new technologies, because high capital infrastructure costs are spread over a larger group of customers. Higher demand also encourages competition for high-speed Internet access, which ultimately results in prices equal to the least possible cost of the technology.

[7] "Low demand" is defined as ten or fewer customer inquiries.

Recommendations

Results from the IUB staff survey indicate the deployment of high-speed Internet access for both rural and non-rural communities in Iowa is reasonable.[8] If deployment plans, indicated by the survey results, are realized within the next 12 months, no state-sponsored program is necessary to ensure most Iowa communities have high-speed Internet access. The IUB staff will conduct an additional assessment in the summer 2001 to determine whether deployment schedules have been realized.

In addition, the IUB staff will conduct two case studies before year-end 2000 to study the application of wireless technology in meeting deployment goals for rural Iowa, particularly in unincorporated areas of the state where on-farm and agribusiness applications are rapidly evolving. These case studies will look at two fixed wireless companies currently offering high-speed Internet access in Iowa: PrairieiNet and Mahaska Communications Group. Iowa's topography, as well as the height of installed infrastructure (such as grain elevators), make regions of Iowa ideal for fixed wireless technology. The case studies will be submitted to the Legislative Oversight Committee of the Legislative Council no later than February 1, 2001.

Survey results indicate that demand and competition for high-speed Internet access are low in many parts of the state. Any state policy concerning high-speed Internet access should concentrate on demand-side strategies that enhance, rather than interfere with, market activity. The Tibor/Varn Report defines demand-side strategies as "policy options designed to stimulate market demand for advanced telecommunications services, and create greater opportunities for service providers to secure a necessary return on investment

[8] Community access does not mean access to every household within the community or every household in unincorporated areas of the state. Access is limited by the capabilities of the various technologies surveyed.

and reduce the risk of deploying advanced telecommunications services."[9] Properly implemented demand-enhancing strategies should lower costs and increase competition for high-speed services.

The Tibor/Varn Report listed several strategies that could be used to increase demand and competition for high-speed Internet access. (See Section 5.0). One of these strategies would provide financial resources for community capacity building. The IDED is currently funding three assessment pilot projects that help communities work with service providers in their area to understand their existing telecommunications infrastructure and how to meet their telecommunications needs.

[9] Tibor/Varn Report, p. 8.

3.0 OVERVIEW OF HIGH-SPEED TECHNOLOGIES

This section explains the technologies currently available to provide high-speed Internet access as defined in this report.

Digital Subscriber Line

Digital Subscriber Line (DSL) is a technology for bringing high-bandwidth connectivity to homes and small businesses over ordinary copper telephone wires. With the addition of certain electronics at the LEC's central office, a subscriber's twisted pair of copper wires used to provide voice services can be transformed to provide high-speed data service. If the customer chooses to receive voice service over the same line, the signal can be separated so that some bandwidth is used to transmit an analog signal and some bandwidth is used to transmit a digital signal. Splitting the bandwidth, at one time, required a costly visit to the customer's premise. However, new splitterless DSL, which uses remote splitting from the central office and avoids an installation visit, is becoming the standard.

xDSL refers to the family of DSL technologies. ADSL is the most common form of DSL used by residential and small business customers. ADSL refers to asymmetric DSL. Asymmetric means that speeds in the downstream direction are greater than speeds in the upstream direction. Downstream speeds for ADSL are commonly greater than 200 Kbps. Upstream speeds are often limited to 128 Kbps. Attachment A to this report provides additional characteristics of ADSL and other DSL offerings.

ILECs may provide ADSL over the same telephone line used to provide voice service. ADSL does not tie-up a subscriber's telephone line (as is the case with analog modems) because the data signal is carried on a higher frequency. As such, the customer's Internet connection is always on. xDSL services are also

dedicated. In other words, the Internet connection is not shared with other end-users in your neighborhood, as is the case with cable modem technology. Unfortunately, xDSL signals degrade beyond 18,000 feet from the carrier's central office on 26-gauge copper wire. xDSL services with higher speeds than ADSL degrade over shorter distances. (See Attachment A).

CLECs may also provide xDSL over the customer's primary line through a technique called line sharing. On November 18, 1999, the FCC adopted rules directing ILECs to share their telephone lines with providers of high-speed Internet access and other data services. Line sharing enables CLECs to provide DSL-based services over the same telephone lines simultaneously used by ILECs to provide basic telephone service. Line sharing allows customers to receive data services from either their ILEC or a CLEC without foregoing the traditional voice services from their provide of choice.

According to the FCC's Second Report, 0.3 million of the 1.8 million residential and small business subscribers of high-speed services subscribed to ADSL.[10] Prices for low-end ADSL service typically range from $39.95 to $49.95 per month. Faster ADSL services range from $99.95 to $179.95 per month. Installation fees range from free to $99.95.[11] Installation fees are closely related to the need for a technician to visit the subscriber's home. If a technician's visit is not necessary, installation may be free with a service contract. Free installation may also be used for promotional purposes.

Cable Modem

Cable companies may upgrade their networks to provide high-speed Internet access. To deliver data services over the cable network, cable operators using a two-way broadband architecture typically allocate one television channel for

[10] FCC, "Deployment of Advanced Telecommunications Capability: Second Report," August 2000, Paragraph 71.

downstream traffic and one channel for upstream traffic. Cable operators using a one-way broadband network typically allocate one television channel for downstream traffic, while the upstream path is provided over a telephone line. Most cable operators now offer two-way service with the majority of the bandwidth allocated to downstream. An upgraded cable system can theoretically provide maximum downstream speeds of 27 Mbps and maximum upstream speeds of 10 Mbps.[12] In practice, the speeds are much lower – from several Kbps to 1.5 Mbps – primarily because of the shared architecture of cable networks.

Unlike xDSL, cable modems are a shared, not dedicated, access technology. The total available bandwidth is shared among users in a neighborhood as if they were on a local area network (LAN). The speed to any given user drops as the number of simultaneous active users increases. The sharing is done through a cable modem termination system (CMTS) which communicates through allotted channels with cable modems located in subscribers' homes to create a virtual LAN connection. The shared architecture of cable systems also creates security concerns requiring operators to install network security systems.

In addition to the CMTS and customer cable modems, operators must also build an end-to-end Internet Protocol (IP) networking infrastructure in each community. This includes Internet backbone connectivity, routers, servers, network management tools, and billing systems.

Cable modem is currently the most popular form of high-speed service, particularly to residential and small business customers. The FCC, in its second report, note that cable modems serve 51 percent of high-speed service.[13] Cable modems serve 78 percent of the residential and small business market.[14] This

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[11] *Id.* at Paragraph 36.
[12] *Id.* at Paragraph 33.
[13] *Id.* at Paragraph 96.
[14] *Id.* at Paragraph 71.

represents 1.4 million of the high-speed lines in service at year-end 1999. Cable modem ready systems are estimated to serve as many as 27 million customers.[15]

Cable modem technology has an "always-on" Internet connection and offers higher speeds than xDSL service.[16] Cable networks also have an advantage in serving residential and small business customers because, once the network is upgraded, service is available to all homes passed by the upgraded infrastructure. xDSL services are limited by customer line quality and distance. Wireless technologies often have "line of sight" requirements.

A comprehensive business package for cable modem service that includes installation and several authorized users could cost as much as $700 a month. A small business package could cost as little as $40 a month. The price paid by businesses is highly dependent on the subscribed speed. The maximum price for 4 Mbps of downstream speed for commercial customers is $450 per month. The minimum price for 512 Kbps downstream speed $39.95. A non-packaged commercial service is priced, on average, at $63 per month.[17]

Installation costs for residential customers range from $20 to $150 according to information obtained in the IUB staff survey. This installation costs may be waived for promotional purposes. Monthly residential service rates range from $30 to $60 depending on whether the customer also purchases cable television from the provider. Modem lease rates average around $12.50 per month.

[15] NTIA/RUS Study, "Advanced Telecommunications in Rural America – The Challenge of Bringing Broadband Service to All Americans," April 2000, p. 9.
[16] The "always on" Internet connection does not interfere with cable television reception.
[17] The pricing information obtained through the survey was minimal. As such, these average prices should only be considered loose approximations of actual prices.

Fixed Wireless

Fixed wireless companies are using their existing microwave networks to transmit high-speed Internet services. In a fixed wireless system, the provider generally attaches a radio transmitter/receiver (transceiver) to the customer's premises that communicates with the provider's central antenna site. The central antenna site acts as the gateway into the public switched telephone network or the Internet for high-speed services.

Fixed wireless providers avoid the high costs and delays associated with laying fiber or upgrading cable networks. As such, fixed wireless companies may be able to enter a market more quickly and at lower cost than a wireline provider. However, the technology comes with deployment challenges including line-of-sight requirements between the transceiver and the central antenna site and obstacles hindering reception, such as terrain, vegetation, buildings, and weather. Fixed wireless technologies may also require access to spectrum. Some wireless providers operating today obtained free spectrum, while others purchased spectrum through FCC auctions. The FCC has garnered $24 billion in spectrum auctions with spectrum for high-speed terrestrial services receiving bids of over $1.2 billion.[18]

The FCC's broadband survey concluded that wireless high-speed Internet access is still in the early stages of development, with wireless service representing fewer than 50,000 subscribers. Almost all of the reported wireless subscribers are residential or small business consumers.[19] The FCC notes industry estimates of wireless subscribers far exceed those found in the FCC survey, possibly due to limited FCC reporting requirements. For example, the FCC survey did not capture companies providing wireless service in unlicensed frequency bands.

[18] FCC, "Deployment of Advanced Telecommunications Capability: Second Report," August 2000, Paragraph 48.

This section details three types of fixed wireless technology: 1) spread spectrum unlicensed wireless, 2) multipoint multichannel distribution system (MMDS), and 3) local multipoint distribution system (LMDS).

Spread Spectrum Unlicensed Wireless: New wireless companies in Iowa offering high-speed Internet access are transmitting in unlicensed bands and, as such, are not required to purchase spectrum or obtain a FCC license. Specifically, these bands include 902-928 MegaHertz, 2,4-2.483 GigaHertz(GHz), and 5.725-5.875 GHz. Because there is no licensing requirement, the potential exists for interference from other applications. For this reason, spread spectrum technology is often used to protect the integrity of the data signal. Spread spectrum takes an input signal, mixes it with FM noise, and "spreads" the signal over a broad frequency range. A large number of transmissions can be supported over a given range of frequencies, with each transmission comprising a packet stream and with each packet in a stream being distinguished by an ID contained with the packet header. Spread spectrum is highly secure.[20]

Multipoint Multichannel Distribution System: MMDS is a fixed wireless service that delivers data via point-to-multipoint microwave radio signals. MMDS holds promise for rural areas, because it can operate at a radius of up to 35 miles under the best circumstances (i.e., 3,848 square miles).[21] The practical range may be reduced by line-of-sight requirements. For example, over flat ground with no intervening hills or buildings, a 25-mile range can be created with both antennas at 75 feet above the ground. To keep the customer antenna height at a reasonable 33 feet height, a 500-foot tower is needed.[22] A new tower can cost between $200,000 and $1 million. Base station and data access equipment

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[19] *Id.* at Paragraph 107.
[20] Newton's Telecom Dictionary, Harry Newton, Miller Freeman Inc. 1999, p. 431.
[21] NTIA/RUS Study, "Advanced Telecommunications in Rural America – The Challenge of Bringing Broadband Service to All Americans," April 2000, p. 26.

costs are about $200,000 to $400,000.[23] Given these costs, MMDS development will likely occur in rural areas surrounding a non-rural town or a cluster of rural towns that can be served from one site.

The FCC approved MMDS for two-way data service in September 1998. The service has tested at speeds as high as 1-Mpbs downstream and 128 Kbps upstream. This fits within the definition of high-speed used in this report. Companies such as Nucentrix Broadband Networks, Sprint, and MCIWorldCom have deployed MMDS in several areas.

Currently, 39 MMDS operating licenses have been granted to 11 fixed wireless companies in Iowa by the FCC's Mass Media Bureau. An additional 24 conditional licenses have been issued to 7 fixed wireless companies. The conditional license stipulates that the company must begin installing fixed wireless infrastructure within a specified amount of time or the conditional license will be terminated.

Local Multipoint Distribution System: LMDS is another fixed wireless technology capable of providing high-speed services. The FCC auctioned off LMDS spectrum for two-way data service in 1998 and 1999. In Iowa, 16 fixed wireless companies have been granted 39 LMDS operating licenses by the FCC's Wireless Telecommunications Division. Licensees are required to build out the service within ten years of winning the license. On June 30, 2000, the FCC allowed the LMDS eligibility restriction to sunset. The LMDS eligibility restriction was adopted in 1997 and prohibited ILECs and incumbent cable companies from having an attributable interest in the LMDS "A" block license that overlaps with 10 percent or more of the population in their service areas. The FCC found that allowing the restriction to expire may improve the availability of LMDS services, particularly in rural areas.

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[22] *Id.* at p. 15.
[23] *Id.* at page 26.

Satellite Systems

Satellite systems have unlimited coverage and can offer high-speed access to virtually any part of the U.S. Satellite may be the best method for serving remote regions and locations where telecommunications infrastructure are of low quality or nonexistent. There are several satellite providers that are constructing systems and plan to start offering two-way high-speed satellite services by 2001. The transmissions for these broadband satellite systems would be sent and received using two-way antennas. In other words, both the downstream and upstream transmissions would be provided through the satellites.

The best-known satellite system currently offering general Internet access to residences in North America is DirecPC. DirecPC offers downstream service at $200 for the start-up charge and a $30 monthly fee.[24] DirecPC reports that remote customers are assured a clear satellite signal so long as a clear line of sight to the southern sky is maintained. Installation kits are available at local retailers across the country. Although DirecPC currently offers high-speed Internet access, it is a one-way system that utilizes the satellites for downstream transmissions and the existing telephone lines for upstream transmissions. Upstream speeds are limited to 33.3 Kbps.

Other High-Speed Technologies

Although earlier generation technologies, such as integrated services digital network (ISDN) and 56 Kbps analog modems, are capable of providing speeds greater than the 33 Kbps available through a standard analog modem, these technologies are not surveyed, because they fail to meet the “high-speed”

[24] NTIA/RUS Study, “Advanced Telecommunications in Rural America – The Challenge of Bringing Broadband Service to All Americans,” April 2000, p. 16.

definition used in the report.[25] In addition, high-priced technologies providing exceptionally high data speeds, such as T-carrier and fiber to homes/businesses, were considered uneconomic for residential and small business customers and, therefore, are not considered in this report.[26] This subsection provides brief descriptions of these other technologies.

Integrated Services Digital Network: ISDN is a digital-based technology that operates with a 144 Kbps bi-directional payload rate. The 144 Kbps rate is divided into two 64 Kbps (B) channels and one 16 Kbps (D) channel. The B channels can be used for two separate voice calls, two 64 Kbps data calls, a separate voice and data call, or a combined 128 Kbps data call. The distance limit for ISDN is 18,000 feet on standard copper twisted pair. The maximum downstream speed for ISDN is 128 Kbps. As such, it does not fall under this report's definition of high-speed.

In addition to lower speeds, ISDN technologies are switched services meaning that both ends of the transmission must support ISDN. xDSL is a point-to-point access service and, as such, only requires support on one end of the transmission. ISDN also requires external electrical power. xDSL carriers electrical power on the line and, therefore, is available during electrical outages.

56 Kbps Analog Modems: Fifty-six Kbps analog modems can achieve maximum downstream transmission speeds of 56 Kbps. Upstream speeds typically range from 28.8 to 33.3 Kbps. In order to realize maximum speeds, 56 Kbps analog modems must be installed at both the carrier and subscriber sites.

[25] The State of Iowa has not developed its own definition of "high-speed" or "advanced services." In deference to policymakers satisfied with speeds available through lower level technologies, the survey results delineate the number of communities with lower-speed technologies greater than 100 Kbps.

[26] One carrier in Iowa provides fiber to homes and businesses. The communities served by this carrier are included in the IUB survey results.

Fiber to Homes and Businesses: Although fiber optic cable (fiber) is typically used for backbone networks and the nation's long distance phone network, it may also be extended to the home or curb. The information carrying capacity of fiber is millions of times that of copper wire or coaxial cable. Fiber can carry signals at bit rates thousands of times higher than xDSL or cable modem services for over a hundred miles without degrading. Fiber to the home or curb, however, is very expensive. For a typical home or business the cost of terminal equipment alone was about $1,500 in 1997, which is significantly higher than upgrading a cable or telephone network.[27]

***T-Carrier Systems*:** The T-carrier system, introduced in the 1960s, was the first successful system that supported digitized voice transmission. The original transmission rate (1.544 Mbps) in the T-1 line is in common use today in Internet service provider (ISP) connections to the Internet. ISPs also commonly use the T-3 line, providing 44.736 Mbps. A fractional T-1 line is also available where some portion of the unused line is rented. The monthly charge for T-1 service can range from $450 to $2000. Installation costs can range from $750 to $5500, depending on the transmission speed desired.[28] Any facilities-based LEC can provide a customer T-1 service today on demand.

[27] NTIA/RUS Study, "Advanced Telecommunications in Rural America – The Challenge of Bringing Broadband Service to All Americans," April 2000, p. 14.
[28] FCC, "Deployment of Advanced Telecommunications Capability: Second Report," August 2000, Paragraph 41.

4.0 IOWA UTILITIES BOARD STAFF SURVEY

The IUB staff completed a point-in-time, community-by-community, statewide assessment of current and near-term high-speed Internet access in Iowa. The following conclusions can be drawn from the survey results:

- Deployment of high-speed technologies in rural and non-rural communities is increasing at a similar rate:[29]
  - ⇒ 28% of rural communities currently have high-speed Internet access;
  - ⇒ 78% of rural communities will have access within 12 months of the survey;
  - ⇒ 42% of non-rural communities currently have high-speed Internet access;
  - ⇒ 75% of non-rural communities will have access within 12 months of the survey.

- Access to xDSL technology is more dependent on the size of the ILEC serving the community than on the size of the community:[30]
  - ⇒ 0% of rural communities served by large ILECs currently have access to xDSL technologies;[31]
  - ⇒ 29% of rural communities served by small ILECs currently have access to xDSL technologies;
  - ⇒ 17% of non-rural communities served by large ILECs currently have access to xDSL technologies;
  - ⇒ 53% of non-rural communities served by small ILECs currently have access to xDSL technologies.

- xDSL near-term deployment schedules are very aggressive:
  - ⇒ 456 additional rural communities within 12 months of the survey;
  - ⇒ 84 additional non-rural communities within 12 months of the survey.

- Access to cable modem technology is more prevalent in non-rural communities:
  - ⇒ 1% of rural communities currently have access to cable modem technology;
  - ⇒ 16% of non-rural communities currently have access to cable modem technology;
  - ⇒ 3% of rural communities will have access to cable modem technology within 12 months of the survey;

[29] Rural is defined as a community with fewer than 2,500 residents not served by an urban exchange.
[30] This is consistent with the conclusions reached in the National Telephone Cooperative Association report entitled "Who Will Service Rural America?" (See Section 5.0).
[31] Large ILECs serve 15,000 or more access lines or customers in Iowa.

⇒ 18% of non-rural communities will have access to cable modem technology within 12 months of the survey.

- Access to wireless technology in rural communities is similar to that in non-rural communities:
  - ⇒ 14% of rural communities currently have access to wireless high-speed technology;
  - ⇒ 16% of non-rural communities currently have access to wireless high-speed technology;
  - ⇒ 23% of rural communities will have access to wireless high-speed technology within 12 months of the survey;
  - ⇒ 26% of non-rural communities will have access to wireless high-speed technology within 12 months of the survey;

- The demand of high-speed Internet access is "low" in most communities with "low" defined as fewer than 10 customer inquiries.
- Competition in the provision of high-speed Internet access is minimal.

The following subsections detail the survey design, distribution, response rate, and results.

Survey Design

Survey instruments were designed for the following providers: LECs, wireless (including satellite) companies, and cable operators. The LEC survey was designed for both ILECs and CLECs. All three surveys requested information that could be used to assess high-speed Internet access on a community-by-community basis. In addition, the surveys requested information on downstream speeds available through the applicable technologies and the level of demand for these services. Three demand levels were defined: low (less than 10 inquiries), medium (between 10 and 50 inquiries), or high (over 50 inquiries). Future deployment was also surveyed with respondents asked to identify exchanges and communities in which they planned to deploy high-speed services within the next 12 months. Finally, price schedules were requested. Copies of the surveys are included as Attachment B to this report.

The LEC survey requires additional explanation. This survey only requested information on the availability of xDSL services. Although ISDN may be considered a broadband service, it does not fall under this report's definition of high-speed. T-carrier systems were also not surveyed, because they are not economical or practical for residential and small business users. In addition, staff was informed that any facilities-based LEC could provide T-1 service on demand. As such, T-1 technology deployment is not an issue. At least one respondent offered fiber to the home and was included in the compilation of survey results.[32]

The LEC survey was also designed to acknowledge the incremental nature of xDSL deployment. xDSL platform capacity may be added to a central office on an incremental basis. The survey referred to platform capacity as the number of lines "**readily**" equipped to provide xDSL. The entire platform capacity may not be needed to serve initial demands. As demand increases, additional platform capacity may be activated through the addition of certain electronics. The survey referred to the amount of activated platform capacity as the number of lines "**currently**" equipped to provide xDSL. Currently equipped lines are not the same as subscribed lines. The LEC survey did not ask for current subscription levels.

Survey Distribution and Response

The intent of the distribution plan was to survey every LEC, wireless, satellite, and cable company providing telecommunications service in the state of Iowa. Surveys were sent to all certified ILECs and CLECs serving any access lines in Iowa during the year 1999. The IUB does not certify nor retain records on cable and wireless companies providing service in the state. As such, distribution lists had to be constructed from various service lists and industry contacts. Surveys were sent to all identified wireless and satellite companies. Cable surveys were

[32] Hawarden Municipal Utility constructed a fiber optic system capable of providing voice, cable television, Internet access, and high-speed data transfer. Hawarden's fiber optic system totally

sent to cable companies associated with a telecommunications company and large cable companies currently upgrading their national networks to provide cable modem service. Electronic versions of the surveys were also available on the IUB web site. Several "non-traditional" providers of telecommunications services (which were not formally surveyed) responded by accessing the surveys off the IUB web site.

The following table summarizes the survey response rate:

Table 1				
Survey Response				
	ILECs[33]	**CLECs**	**Wireless**	**Cable**
# of Surveys Sent	159	33	57	72
# of Surveys Received	145	25	39	60
Response Rate	91%	75%	68%	83%

The ILEC and CLEC surveys represent over 98 percent of Iowa's exchanges serving more than 99 percent of Iowa's access lines.

Survey Results

Attachment C to this report provides a list of all communities in Iowa that currently have access to high-speed Internet access through one of the surveyed technologies or will have access within 12 months of the survey. Of the 1,145 communities represented by the survey responses, 357 currently have high-speed Internet access through some type of technology. Eight hundred and seventy-nine of the 1,145 communities surveyed are rural, with rural defined as communities with fewer than 2,500 inhabitants that are **not** served by an urban

bypasses the copper wire system owned by Heartland Telephone Company.

[33] The high response rate for the ILECs was, in part, due to the follow-up conducted by the Independent Telephone Association.

exchange.[34] Of these 879 rural communities, 246 currently have high-speed internet access.[35] Given current deployment schedules, an additional 439 rural communities will have Internet access within twelve months of the survey.[36] This information is summarized in the following table.

Table 2				
# of Communities With Access to High-Speed Technologies				
	Rural (879 Communities)		**Non-Rural (266 Communities)**	
	Currently Available	Within 12 Months*	Currently Available	Within 12 Months*
# of Communities with High-Speed Internet Access	246	685	111	200
Percent of Rural/Non-Rural Communities Surveyed	28%	78%	42%	75%

*This column includes lines currently available.

Most rural and non-rural communities only have one provider of high-speed Internet access as illustrated in the following table:

Table 3		
# of Providers in Communities with High-Speed Internet Access		
# of Providers	**Rural**	**Non-Rural**
1	223	70
2	22	32
3	0	9
4	1	0

[34] This rural definition is a variation of the Census Bureau's definition of rural. The Census Bureau's definition includes all towns with fewer than 2,500 inhabitants as well as areas outside of towns, including farmland, ranch land, and wilderness. The Census Bureau's definition of rural may include suburban developments that are close to an urban area. Inclusion of these suburban communities may provide misleading results. As such, this report only defines communities as rural if they are **not** served by an urban exchange. Population data were acquired from the 1990 census estimated to 1998 figures.

[35] Fifteen additional communities currently have access to the Internet at speeds greater than 100 Kbps but less than 200 Kbps.

[36] Thirteen additional communities will have access to the Internet within the next 12 months at speeds greater than 100 Kbps but less than 200 Kbps.

Tables 2 and 3 represent all of the surveyed technologies. The following subsections provide results by technology.

xDSL: Table 4 summarizes the xDSL access information received from the small and large ILECs. The survey requested information by exchange. The exchange information was then translated into rural and non-rural communities. A large ILEC is defined as any carrier serving 15,000 or more access lines or customers. Large ILECs serve over 58 percent of Iowa's exchanges and over 80 percent of the state's access lines. All large carriers are regulated by the IUB under Iowa statute.

Table 4

Communities Currently With Access to xDSL Technologies

ILEC	Rural Communities			Non-Rural Communities		
	Served	High-Speed Available	% of High-Speed Available	Served	High-Speed Available	% of High-Speed Available
Large ILEC*	476	0	0%	247	43	17%
Small ILEC	403	118	29%	19	10	53%

*Large ILECs include Qwest (f.k.a. U S West), Frontier Communications, and Iowa Telecommunications Services (f.k.a. GTE Communications).

In addition to the communities enumerated in the above table, 9 additional rural communities have access to xDSL technologies through a CLEC and 14 additional non-rural communities have access to xDSL technologies through a CLEC.

Table 5						
Communities With Access to xDSL Technologies within the Next 12 Months						
ILEC	**Rural Communities**			**Non-Rural Communities**		
Size	Served	High-Speed Available	% of High-Speed Available	Served	High-Speed Available	% of High-Speed Available
Large ILEC*	476	253	53%	247	123	50%
Small ILEC	403	321	80%	19	14	74%

*Large ILECs include Qwest (f.k.a. U S West), Frontier Communications, and Iowa Telecommunications Services (f.k.a. GTE Communications).

In addition to the communities enumerated in the above table, 5 additional rural communities currently have or will have access to xDSL technologies through a CLEC within the next 12 months. Thirty-nine additional non-rural communities currently have or will have access to xDSL technologies through a CLEC within the next 12 months.

Community access to xDSL service does not mean that every access line is equipped to provide xDSL. As mentioned above, xDSL is provided on an incremental basis with platform capacity added to a central office capable of equipping a portion of the access lines served from that central office (i.e., readily equipped lines). Cards are then added to the platform to currently equip (or activate) a portion of the platform capacity. The incremental nature of xDSL technology is illustrated in the following table. While 16 percent of Qwest's (f.k.a. U S West) wire centers are readily equipped to provide xDSL service, only 0.5 percent of Qwest's total access lines are currently equipped to provide the service.

Table 6				
Percentage of Access Lines Currently and Readily Equipped to Provide xDSL Service for Large ILECs (numbers rounded to nearest %)				
	Qwest	**Frontier**	**ITS**	**Total**
# of Access Lines Surveyed	1,216,250	60,349	319,650	1,596,249
# of Exchanges/Wire Centers Surveyed	146	37	296	479
% of Access Lines Currently Equipped	0.5%	0%	0%	0.4%
% of Exch./W.C. Currently Equipped	14%	0%	0%	4%
% of Access Lines Readily Equipped	1%	5%	0%	1%
% of Exch./W.C. Readily Equipped	14%	11%	0%	5%
% of Exch./W.C. Expected to Have xDSL within the Next 12 Months	21%	38%	20%	21%

Notes: Large ILECs include Qwest (f.k.a. U S West), Frontier Communications, and Iowa Telecommunications Services (f.k.a. GTE Communications). Qwest filed information by wire center. A wire center may include one or more exchanges.

For CLECs, the percentage of surveyed access lines currently equipped is less than 1 percent. The percentage of surveyed CLEC access lines readily equipped is 5 percent. Responses from the small ILECs to these survey questions were inconsistent and, therefore, could not be properly assessed.

It can be assumed that ILECs and CLECs will equip central offices and activate access lines to meet demand. As such, these results confirm survey responses indicating demand for high-speed Internet access is low at this time.

Cable Modem: Table 7 shows the number of rural and non-rural communities with current and near-term access to cable modem high-speed service from operators responding to the survey.

Table 7		
Access to Cable Modem by Community Type		
	Rural Communities	**Non-Rural Communities**
# of Communities Currently with Access	8	43
# of Households Currently with Access	3,130	550,341
# of Communities with Near-Term Access	22	49

Cable modem appears to be the one technology surveyed that is more accessible to non-rural communities.

Wireless Technologies (including Satellite): The following table shows the number of rural and non-rural communities having current and near-term access to wireless high-speed access from either fixed wireless or satellite companies.

Table 8		
Access to Wireless Service by Community Type		
	Rural Communities	**Non-Rural Communities**
# of Communities Currently With Access	124	43
# of Communities With Near-Term Access	206	69

Wireless is the technology of choice for rural communities. In fact, unsolicited survey responses for non-traditional telecommunications providers indicated considerable near-term accessibility to high-speed Internet access from fixed wireless companies using unlicensed spectrum. In addition, DirecPC offers downstream high-speed Internet access anywhere in the state.

5.0 REVIEW OF OTHER HIGH-SPEED INTERNET ACCESS STUDIES

This section provides a limited review of current studies on the deployment of high-speed Internet access in Iowa and the U.S. Reports reviewed in this section include:

- Governor's Strategic Planning Council, "Draft of the 'Booklet' Version of the 2010 Report, Volume 1 as Passed by the Council," June 26, 2000. Referred to as the 2010 Draft Report.
- Robert Tibor and Richard Varn, "The Digital State: Advanced Telecommunications Services in Iowa," July 2000. Referred to as the Tibor/Varn Report.
- Federal Communications Commission – "Deployment of Advanced Telecommunications Capability: Second Report" [August 2000]. Referred to as the FCC's Second Report.
- United States Department of Commerce, National Telecommunications and Information Administration (NTIA), United States Department of Agriculture (USDA), Rural Development, Rural Utilities Service (RUS), "Advanced Telecommunications in Rural America – The Challenge of Bringing Broadband Service to All Americans," [April 2000]. Referred to as the NTIA/RUS study.
- National Exchange Carrier Association (NECA) Rural Broadband Cost Study: Summary of Results, Victor Glass, Ph.D – Project Manager, [Spring 2000]. Referred to as the NECA Study.
- Rural Iowa Independent Telephone Association (RIITA) Broadband Deployment Survey for the State of Iowa, Judy Pletcher – Contact, [January 2000]. Referred to as the RIITA Survey
- National Telephone Cooperative Association (NTCA), "Who Will Serve Rural America?," Dale Lehman, [July 2000]. Referred to as the NTCA Report

2010 Draft Report

Goal 2 of the 2010 Draft Report addresses access to advanced telecommunications services. Goal 2, in part, reads as follows:

> By 2005, all Iowans will have access to advanced telecommunications services, as defined in Section 706(c) of the Telecommunications Act of 1996, that is appropriate to their needs at affordable, nationally competitive prices. (page 8).[37]

[37] Section 706(c) of the Telecommunications Act defines advanced services as "high speed, switched broadband telecommunications capability that enables users to originate and receive

In order to achieve this goal, the report recommends the following key action steps:

- Have the IUB, in consultation with the Department of Technology, convene all interested parties to develop and jointly implement a comprehensive statewide strategic and action plan to give all Iowa businesses and communities access to advanced telecommunications services by 2003 and all Iowans access to advanced telecommunications service by 2005 at least possible cost. Subparts to this action step include:
  - ⇒ encourage private sector investment at competitive rates whenever possible;
  - ⇒ permit the Iowa Communications Network (ICN) to lease facilities at market rates;
  - ⇒ help communities to assess their demand for advanced services and to draft requests for proposal; and
  - ⇒ permit the ICN to extend its facilities and provide services at nationally competitive rates if no provider is willing to provide the services requested in the RFP provided that:
    i. the community contributes to the cost of investment;
    ii. customer contracts are in-place prescribing a level of service and a defined timeframe; and
    iii. the ICN agrees to sell its local access facilities to private industry when the market demands.

- Rebate the telecommunications sales tax on purchases of advanced telecommunications equipment for use in rural communities.

- Increase demand for electronic goods and services and lower the cost of advanced telecommunications services by providing lifelong training in the use of advanced telecommunications equipment and expanding electronic access to business, educational, and governmental services.

Tibor/Varn Report

Robert Tibor, the State of Iowa's Science and Technology Advisor, and Richard Varn, the State's Chief Information Officer, with the assistance of Enterprise Iowa, assessed Iowa's "digital divide" and developed strategic policy options based on input received from telecommunications providers, consumers, businesses, and other telecommunications stakeholders. The report is premised

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high quality voice, data, graphics, and video telecommunications using any technology. The FCC

on the belief that to be competitive in today's economy, Iowa must engage in a comprehensive effort to deploy advanced telecommunications services nationwide. (page 1). The report indicates that participants basically agreed with the following goal:

> Provide all Iowans with affordable access to advanced telecommunications services. Providing advanced telecommunications services will result in a more competitive infrastructure for economic growth and for a high quality of life. (page 3).

Four primary issues are identified as affecting Iowa's ability to provide advanced telecommunications services to all Iowans: public investment, regulation, existing state assets (primarily the ICN), and level of service. In identifying these areas, the report makes the following findings:

- Evidence shows that the digital divide has a greater impact on individuals who have lower incomes, are less well educated, or who are older.
- Telecommunications providers say the demand for advanced telecommunications services is not sufficient to justify deployment.
- Consumers and businesses believe the demand exists.
- Many consumers and businesses may not understand the benefits of advanced telecommunications services.
- Distrust exists between competing telecommunications providers and the State of Iowa primarily due to the ICN and increased competition among providers.
- Private providers indicate the uncertain future of the ICN creates a significant barrier to private investment in advanced telecommunications services.
- Municipal telecommunications utilities add to the environment of distrust.
- No consistent, ongoing, assessment of deployment of advanced telecommunications services in the State of Iowa is available.
- An education and training program in the advantages of advanced telecommunications services should be part of the State's overall strategic initiative.
- An effective assessment process must be statewide and ongoing to ensure full deployment.
- State offered incentive programs should strive to be competitively neutral.
- Until the term advanced telecommunications services is more clearly defined, it is not possible to develop cost estimates for state incentive programs.

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has interpreted this statute to mean transmission speeds of at least 200 Kbps in both directions.

Based on these findings, the report evaluates the following policy options designed to stimulate the supply of advanced telecommunications services:

- Provide Direct Financial Incentives to Service Providers – Under this option, the state would administer a new financial assistance program enabling private service providers to deploy advanced telecommunications services in defined geographic or service areas.
- Provide Indirect Financial Incentives (Tax Credits) to Service Providers – Under this option, the state would provide investment tax credits to encourage expansion or accelerate deployment of advanced telecommunications in Iowa.
- Provide Direct or Indirect Financial Resources for Iowa's Technology Infrastructure – Under this option, the state would attempt to reduce deployment costs through various initiatives such as creating a Network Access Point (NAP) in Iowa. A NAP is a junction where providers hand call traffic off to one another.
- Provide Direct Financial Incentives to Communities – This option would allow counties, groups of communities, or other geographic configurations to apply for financial assistance for investments in advanced telecommunications services.
- Provide Direct Financial Incentives to Consumers – No specifics on this option are provided.
- Deregulate Telecommunications Providers – Regulated providers strongly believe that Iowa's regulatory structure inhibits investment in advanced telecommunications services.
- Expand Universal Service Fund to include Advanced Telecommunications Services - The IUB is currently examining policy options to support basic telecommunications services through a state universal service fund.
- Expand Authorized Uses and Users of the ICN – The ICN can technically provide advanced telecommunications services in Iowa, but it is not authorized to do so except under limited circumstances.
- Lease Available ICN Backbone Capacity – Under this option, the backbone capacity of the ICN which reaches all of Iowa's 99 counties would be leased at market rates to companies wanting to provide advanced telecommunications services.
- Promote the Development of Municipal Utility Services – Under this option, the state could provide training, technical assistance, and community modeling to assist municipal utility staff and community leaders in creating a municipal telecommunications utility.
- Limit Expansion of the ICN – Private providers suggest that limiting the expansion of the ICN, through a long-term business plan, would encourage private investment in advanced telecommunications services.
- Limit Expansion of Municipal Utility Services – Private providers suggest that limiting expansion of municipal utility services will encourage private investment in advanced telecommunications services.

The Tibor/Varn report also analyzes various demand side strategies including:

- Financial Resources for Community Capacity Building – Under this option, the state would provide communities with appropriate resources to help them complete telecommunications infrastructure assessments and develop plans to address identified gaps.
- Financial Resources for Technology Demonstration – As technologies change, the state may want to provide financial assistance for demonstrations of these new technologies.
- Financial Resources for Business Capacity Building – The state of Iowa could provide funds for training in e-commerce for Iowa businesses.
- Financial Resources for Business Collaboration – Under this option, the state would implement a buyer's consortium, which offers advanced telecommunications services at reduced cost to businesses.
- Providing Resources for Individualized Educational Instruction – The state could determine strategies ensuring every student have access to the Internet at home.

FCC's Second Report

The FCC's Second Report on advanced telecommunications capability seeks to answer four questions:

1) What is advanced telecommunications capability?[38]

   The FCC defined advanced telecommunications capability as "infrastructure capable of delivering a speed in excess of 200 Kbps in both upstream (customer-to-provider) and downstream (provider-to-customer) directions." The FCC defines "high-speed" as those services capable of delivering transmission speeds in excess of 200 Kbps in at least one direction. Many of the broadband services available to Iowa consumers meet the FCC's high-speed definition but do not meet the FCC's advanced services definition because of inadequate upstream speeds.

[38] Section 706(b) of the 1996 Telecommunications Act defines advanced telecommunications capability as "high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data, graphics, and video telecommunications using any technology."

2) Is advanced telecommunications capability being deployed to all Americans?

The FCC, through a broadband Internet access survey, found:

a. approximately 1.8 million residential and small business subscribers to high-speed services at year-end 1999;[39]
b. approximately 1 million of the 1.8 million residential customers subscribe to services that meet the FCC's definition of advanced services;
c. residential subscription of advanced services has increased three-fold from the previous year;
d. approximately 1 million high-speed lines provide service to large business and institutional customers;
e. at least one high-speed subscriber in 59 percent of the country's zip codes with 91 percent of the population living in those zip codes; and
f. population density is highly correlated with the availability of advanced services.

3) Is overall deployment reasonable and timely?

The FCC concludes the deployment of advanced telecommunications capability is proceeding in a reasonable and timely fashion based on the following findings:

a. access to backbone functionality is adequate;[40]
b. extensive middle-mile facilities exist;[41]
c. the broad geographic distribution of subscribers to high-speed services demonstrates the wide availability of middle-mile facilities;
d. deployment of last-mile facilities to support advanced services is expanding rapidly; [42]

[39] The FCC defines residential customers to include small business.
[40] Backbone is defined as the long-distance, high-capacity, high-speed transmission path for transporting massive quantities of data.
[41] Middle-mile facilities provide relatively fast, large-capacity connections between the backbone and the last mile.
[42] The last mile is the link between the middle mile and the last 100 feet to the end-user's terminal, which may include cable modem service, xDSL service, terrestrial wireless service, or satellite service.

e. certain categories of Americans are particularly vulnerable to not having access to advanced services including low-income consumers, Indians, persons with disabilities, and those living in the U.S. territories;
f. 52 percent of schools have high-speed connections to the Internet; and
g. infrastructure supporting the last 100 feet is adequate.[43]

4) What actions by the FCC will accelerate deployment?

The FCC is statutorily committed to ensuring that advanced services become available to all Americans. In order to advance compliance with its statutory mandate, the FCC stated it would consider:

a. collocation rules providing competitive access to LEC remote terminals;
b. streamlining the equipment approval process for customer premises equipment with advanced services capability;
c. appropriate mechanisms to ensure broadband access for customers who do not have access as a result of market forces;
d. sharing of school and library facilities to improve access or deployment in surrounding communities;
e. allowing access by multiple ISPs to cable companies' infrastructure for the delivery of advanced services;
f. more ways to make licensed and unlicensed spectrum available for broadband services; and
g. increasing data collection and dissemination practices in order to monitor more closely the deployment of advanced telecommunications capability.

The FCC findings were primarily based on its first systematic, nationwide survey of subscription to high-speed services ("FCC's broadband survey"). The FCC required reporting by any facilities-based firm that provided 250 or more high-speed service lines (or wireless channels) in a given state. Many of Iowa's independent telephone companies would not fall under these reporting

[43] The last 100 feet is the link between the last mile and the end-user's terminal.

requirements and, as such, would not be included in the survey results.[44] This may explain some of the differences between the IUB survey results and the following results reported by the FCC for Iowa:

Percentage of Zip Codes with High-Speed Service as of 12/31/99*				
	Number of Providers			
	Zero	One-Three	Four	Five or More
Iowa	71%	28%	1%	0%

*Percentages include all zip codes with one subscriber of high-speed service.

Number of High-Speed Providers by Technology as of 12/31/99				
	ADSL	Cable Coax	Other*	All High-Speed (Unduplicated)
Iowa	1-3	4	4	6

*Providers using other traditional wireline, optical carrier, satellite, and fixed wireless technologies.

High-Speed Lines by Technology as of 12/31/99				
	ADSL	Cable Coax	Other*	All High Speed
Iowa	1-49,999	14,027	1-49,999	19,258

*Providers using other traditional wireline, optical carrier, satellite, and fixed wireless technologies.

The FCC report also includes five case studies for the following communities:

- ⇒ Los Angeles, California
- ⇒ Waltham, Massachusetts
- ⇒ Muscatine, Iowa
- ⇒ Miller, South Dakota
- ⇒ Wilsondale, West Virginia

The case studies for Waltham, Massachusetts and Muscatine, Iowa are particularly relevant to this report. Waltham is a town of 58,000 people benefiting from competition for advanced services from LECs, cable operators, and wireless companies. Waltham's city officials believe that a critical factor in their success

[44]According to the book, Having All the Right Connections – Telecommunications and Rural Viability [Korsching, Hippie, and Abbott], Iowa has 150 small, locally owned, independent telephone companies.

was the City's decision to hire a telecommunications consultant to seek out cable television and data access competitors for the city.

The FCC characterizes Muscatine as a mid-size town with a population of approximately 23,000 with a median household income of $38,840. This compares to a median household income of $33,436 estimated for Iowa. The city of Muscatine is also the facility site for several Fortune 1000 companies including Monsanto, Hon Industries, Inc. and Bandag, Inc. Muscatine has three terrestrial, facilities-based, high-speed service providers for residential customers: Muscatine Power and Water (the incumbent utility), Qwest (the ILEC) in association with a local Internet service provider, and AT&T Cable Services. The FCC attributes this degree of advanced deployment to Iowa's legal environment, which allows municipal entry into the provision of high-speed services.

Muscatine Power and Water's (MP&W's) telecommunications network consists of a hybrid fiber coax system with 125 homes per node. The network can deliver a maximum of 4 Mbps downstream and 1 Mbps upstream speeds. MP&W connects to the Internet background through NetIns, a division of Iowa Network Services. MP&W passes approximately 9,400 city homes. One thousand four hundred homes subscribe to MP&W's high-speed Internet service (a 15 percent penetration rate).

Muscatine Information Services, in conjunction with Qwest, offers high-speed service in Muscatine at speeds ranging from 256 Kbps to 7 Mbps. This DSL service is available to customers that meet line quality criteria and live within 15,000 feet of Qwest's central office.

AT&T@Home delivers high-speed cable modem access directly to the personal computer at speeds of 3 Mbps downstream and 128 Kbps upstream. This service is available anywhere within Muscatine's city limits.

MP&W started offering high-speed Internet access through cable modem in 1999. This access encouraged demand for the service that was sufficient to attract other suppliers including Qwest and AT&T. In the case of Muscatine, increased customer demand spurred competition for high-speed Internet access. Quoting from the FCC's Second Report:

> If municipal provision of high-speed infrastructure encourages growth and establishes the demand for high-speed services, other providers such as cable and telephone may then find a sufficient client base to begin to offer their own services."[45]

The Muscatine case demonstrates, for emerging technologies, the immediate supply (made possible through municipal investment) may encourage demand, which will ultimately encourage competitive entry.

NTIA/RUS Study

The NTIA and the RUS did not conduct a formal survey for their report "Advanced Telecommunications in Rural American – The Challenge of Bringing Broadband Service to All American." The study, instead, compiles information from several sources, including interviews with numerous communications providers, to construct an overview of high-speed deployment in the U.S.

Based on this research and industry discussions, the report concludes:

- Rural areas are currently lagging far behind urban areas in broadband availability.

[45] FCC, "Deployment of Advanced Telecommunications Capability: Second Report," August 2000, Paragraph 151.

- Deployment in rural towns (populations fewer than 2,500) is more likely to occur than in remote areas outside of towns.
- Cable modem and xDSL are being deployed at a high rate in urban areas;
- Regional Bell Operating Companies (RBOCs) are providing xDSL service primarily in cities with populations above 25,000.
- 56 percent of all cities with populations exceeding 100,000 had xDSL available.
- Less than 5 percent of cities with populations less than 10,000 had xDSL available.
- The primary reason for the slower deployment rate in rural areas is economic;
- Advanced services in rural areas are likely to be provided through new technologies that are in the early states of deployment including:
  - ⇒ Satellite broadband service.
  - ⇒ Wireless broadband services including multipoint-multichannel distribution system fixed service capabilities.
  - ⇒ Third generation mobile wireless services providing data rates as high as 2 Mbps.
- Policymakers should promote competition where possible to lower prices, provide choice, and encourage technological advances.

Based on these conclusions, the report recommends:

- The continued support and expansion of government programs (such as the E-rate program) that ensure access to new technologies including broadband services; and
- The FCC consider a definition of universal service and new funding that would ensure rural residents access to telecommunications services comparable to those in urban areas.

NECA Study

NECA completed two studies in order to determine the cost of upgrading rural LEC member networks belonging to NECA's Common Line Pool.[46] A detailed engineering study was conducted of a sample of pool members in the process of upgrading their networks. In addition, NECA surveyed a sample of other companies to determine the percentage of lines that would not be upgraded by 2002. Based on these two studies, the NECA study concludes:

[46] The exchanges of rural companies in NECA's Common Line pool cover 35 percent of the land area of the 48 contiguous states plus Hawaii but serve just under 6 percent of 1990 households according to the NECA Study, page 3.

- 3,333,290 rural lines (or 35 percent of the Common Line Pool) will **not** be upgraded by 2002.
- The total cost of upgrading these 3.3 million lines is $10.9 billion.
- The estimated cost of upgrading lines directly surrounding a central or remote dial office is $0.809 billion.[47]
- The estimated cost of upgrading lines located 18,000 feet beyond a central or remote office, but within 18,000 feet of a digital loop carrier (DLC) terminal, is $4.505 billion.[48]
- The estimated cost of upgrading lines for isolated subscribers (those living in areas where distance, sparse population, or terrain make it uneconomical to upgrade lines through DLC) is $9,328/line.[49]
- Cable costs are by far the largest cost of network upgrades.
- Digital loop carriers comprise 24.9 percent of the costs outside the central office area.
- Upgrade costs differ considerably between rural telephone carriers because of population density, network quality, and age:
  - ⇒ NECA rural LECs serve 4.95 households per square mile compared to 5.95 households per square mile for all rural LECs and 52.34 households per square mile for non-rural LECs.
  - ⇒ 62 percent of the serving territory of all NECA rural exchanges serve fewer than two households per square mile.
  - ⇒ Upgrade costs per line decrease, on average, as lines per exchange increase and distance from the central dial office decrease.
  - ⇒ The maximum cost of upgrading a line in an isolated area is $114,785 compared to the maximum cost of $7,293 in an area close to a central office.

RIITA Survey

RIITA conducted a survey of 138 independent telephone companies (ITCs) operating in the state of Iowa. One hundred eight companies responded to the survey. The survey found:

- 20 percent of the ITCs currently deploy broadband with 39.5 percent planning to deploy within one year.
- 87 percent of the ITCs support Internet service modem speeds of 56 Kbps.
- Broadband technologies currently deployed or planning to be deployed within the next 3 years include:
  - ⇒ 72 percent xDSL
  - ⇒ 11 percent hybrid fiber/coax

[47] 1,639,283 lines at a cost of $495/line.
[48] 1,093,051 lines at a cost of $4,121/line.
[49] 600,957 lines at a cost of $9,328/line.

  - ⇒ 12.5 percent cable modems
  - ⇒ 8 percent wireless (LMDS, MMDS, etc.)
- 31 percent of ITCs have invested $100,000 or more in broadband technology.
- 59 percent of ITCs project only 1 to 10 percent of their customer base will subscribe to broadband technology.
- 54 percent of ITCs report lack of customer demand obstructs deployment.
- 82 percent of ITCs currently deploy broadband because of customer demand.

NTCA Report

The NTCA report addresses the geographic dimension of telecommunications services and focuses on the importance of small telecommunications carriers in rural areas. The report does not conduct its own study but rather highlights points in the NTIA/RUS study (cited above) and a recent market access survey conducted by NECA.[50] Based on these studies, the NTCA report concludes:

- It is unlikely large phone companies will furnish state-of-the-art technologies throughout rural America.
- Regional Bell Operating Companies (RBOC) are failing to deploy DSL in rural areas, while embracing the technology for large urban areas:
  - ⇒ DSL deployment falls steadily as town populations fall, until reaching none of the 9,993 towns with populations less than 1,000 served by RBOCs.
  - ⇒ DSL has been deployed by RBOCs in 100 percent of the towns with populations of 1 million and above.
- Small companies are deploying DSL in rural areas:
  - ⇒ 14 percent (or 153) of the NECA pool companies have deployed DSL.
  - ⇒ 25 of the 153 companies serve fewer than 1,000 access lines and 63 companies serve between 1,000 and 5,000 access lines.
- Small rural telephone companies have done a better job of providing universal telephone service than large companies serving rural areas.
- Divestiture of rural serving areas by large companies is an industry trend.
- Continuation of financial support to small rural carriers coupled with regulatory forbearance continues to be essential to these carriers' survival. This support includes:
  - ⇒ high-cost loop support;

[50] National Exchange Carrier Association, "Access Market Survey of NECA's Traffic Sensitive Pool Members, Keeping America Connected: The Broadband Challenge," p. 15 (December 1999).

⇒ switching support;
⇒ long-term support;
⇒ low-interest loans to small companies; and
⇒ access charges set above cost.

GLOSSARY OF TERMS[51]

Access Line – A telephone line reaching from the telephone company central office to a point usually on the customer's premises. Beyond this point, the line is considered inside wiring.

Analog – Comes from the work "analogous," which means "similar to." In telephone transmission, the signal being transmitted – voice, video, or image – is "analogous" to the original signal. Analog signals – In telecommunications, analog means telephone transmission and/or switching which is not digital.

Analog Modem – Analog modems comprise equipment which converts digital signals to analog signals and vice versa. Modems are used to send digital data signals over the public switched telephone network (PSTN). Although the carrier switches (central offices and tandem offices) are typically digital, as is the backbone transmission network (e.g., T-carrier), the local loop always is analog unless the subscriber orders a more costly digital loop (e.g., T-1, ISDN, or xDSL).

Backbone – The part of the communications network that carries the heaviest traffic. The backbone is also that part of a network that joins LANs either inside a building or across a city or the country. The backbone serves as the communications highway for LAN-to-LAN traffic.

Bandwidth – In telecommunications, bandwidth is the width of a communications channel. In analog communications, bandwidth is typically measured in Hertz – cycles per second. In digital communications, bandwidth is typically measured in bits per second (bps).

Broadband – A nebulous term that refers to technologies that can enable network connections in excess of the "dial-up" 56 Kbps rate limit of the traditional twister-pair copper wire telephone line.

Central Office – For purposes of this report, central office means a telephone company building where subscribers' lines are joined to switching equipment for connecting other subscribers to each other, locally and long distance.

Coaxial Cable - A cable compose of an insulated central conducting wire wrapped in another cylindrical conducting wire. The whole thing is usually wrapped in another insulating layer and an outer protective layer. A coaxial cable has great capacity to carry great quantities of information. It is typically used to carry high-speed data and in providing cable television.

[51]The primary source used for compiling this glossary was Newton's Telecom Dictionary, Harry Newton, Miller Freeman, Inc., February 1999.

GLOSSARY OF TERMS CONTINUED

Competitive Local Exchange Carrier (CLEC) – A term coined for the deregulated, competitive telecommunications environment envisioned by the Telecommunications Act of 1996. CLECs compete on a selective basis for local exchange service, as well as long distance, Internet access, and entertainment. CLECs build or rebuild their own local loops, wired or wireless. They also lease local loops from the ILECs (Incumbent LEC) at wholesale rates for resale to end-users. CLECs include, among others, cellular/PCS providers, ISPs, CATV providers, and LMDS operators.

Digital – In telecommunications, in recording, or in computing, digital is the use of a binary code to represent information. Digital transmission has two major benefits over analog transmission. First, digital is a much cleaner sound, because the signal can be reproduced precisely. Second, the electronic circuitry needed to handle digital transmissions is getting cheaper and more powerful.

Digital Loop Carrier (DLC) – Network transmission equipment used to provide pair gain on a local loop. For purposes of this report, DLC implies deployment of high-bandwidth fiber optic facilities from the Central Office Termination to the Remote Termination. The final leg of the local loop remains embedded twisted-pair. The system can be characterized as a hybrid local loop system and offers clear economic advantages to fiber to the home and fiber to the curb. Minimum speeds through fiber distribution facilities is typically 51.84 Mbps.

Exchange – For purposes of this report, an exchange is a geographic area established by a common communications carrier for the administration and pricing of telecommunication services in a specific area that usually includes a city, town, or village. An exchange consists of one or more central offices and their associated facilities.

Incumbent Local Exchange Carrier (ILEC) – For purposes of this report, an ILEC is the facilities-based company or its successor providing wireline telephone service in a particular exchange prior to the Telecommunications Act of 1996.

Independent Telephone Company – A telephone company that is not affiliated with one of the “Bell” telephone companies. There are about 1,400 independent phone companies. They service more than half of the geographic areas of the U.S., but ITCs only service about 15 percent of the telephones.

GLOSSARY OF TERMS CONTINUED

Last Mile – "Last mile" is an imprecise term that typically means the link – usually twisted pair – between an end-user and the telephone company central office. Local, long-distance, and Internet are provided over this link. The vast majority of local loops are actually a little over two miles in length. Generally provisioned with twisted-pair cable plant intended to support voice-grade analog service, the "last-mile" is the source of much difficulty for high-speed data services.

Local Loop – The physical connection from the subscriber's premise to the carrier's point of presence. The local loop can be provided over any suitable transmission medium, included twisted pair, fiber optic, coax, or microwave.

Point of Presence – A physical place where a carrier has a presence for network access. A point of presence generally is in the form of a switch or a router.

Regional Bell Operating Company (RBOC) – One of the seven (now four) RBOCs set up after divestiture, each of which own two or more Bell Operating Companies (BOC). The RBOCs were carved out of the old AT&T/Bell System by Judge Harold Greene when he signed-off on the divestiture of the RBOCs from AT&T at the end of 1984. U S West (n.k.a. Qwest) is the RBOC serving Iowa. The Telecommunications Act of 1996 restricted RBOCs from offering interLATA long-distance service until they meet the Section 271 requirements of the Act. The 271 requirements essentially require open access on the RBOC's local telecommunications infrastructure.

Wire Center – The location where the telephone company terminates subscriber outside cable plant (i.e., their local lines) with the necessary testing facilities to maintain them. A wire center may have one or several central offices, also called public exchanges or simply switches. A customer could get telephone service from on, several or all these switches without paying extra. They would all be the customer's local switch. A wire center may include one or more exchanges.

LIST OF ACRONYMS

ADSL – Asymmetric Digital Subscriber Line

Bps – Bits Per Second

CDSL – Consumer Digital Subscriber Line

CLEC – Competitive Local Exchange Carrier

CMTS – Cable Modem Termination System

DLC – Digital Loop Carrier

DSL – Digital Subscriber Line

FCC – Federal Communications Commission

FM – Frequency Modulation

GHz – Gigahertz

HDSL – High bit-rate Digital Subscriber Line

ICN – Iowa Communications Network

IDED – Iowa Department of Economic Development

IDSL – ISDN Digital Subscriber Line

ILEC – Independent Local Exchange Carrier

IP – Internet Protocol

ISDN – Integrated Services Digital Network

ISP – Internet Service Provider

ITC – Independent Telephone Company

IUB – Iowa Utilities Board

Kbps – Thousand Bits Per Second

LAN – Local Area Network

LEC – Local Exchange Carrier

LMDS – Local Multipoint Distribution System

Mbps – Million Bits Per Second

MHz – MegaHertz

MIS – Muscatine Information Services

MMDS – Multipoint Multichannel Distribution System

MP&W – Muscatine Power and Water Company

NAP – Network Access Point

LIST OF ACRONYMS CONTINUED

NECA – National Exchange Carrier Association

NTCA – National Telephone Cooperative Association

NTIA – National Telecommunications and Information Administration

RADSL – Rate-Adaptive Digital Subscriber Line

RBOC – Regional Bell Operating Company

RFP – Request for Proposal

RIITA – Rural Iowa Independent Telephone Association

RUS – Rural Utilities Service

SDSL – Symmetric Digital Subscriber Line

UDSL – Unidirectional Digital Subscriber Line

USDA – United States Department of Agriculture

VDSL – Very high Digital Subscriber Line

xDSL – Family of Digital Subscriber Line Services

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ATTACHMENT A
Types and Characteristics of DSL Services

DSL Type	Description	Data Rate Downstream; Upstream	Distance Limit	Application
IDSL	ISDN Digital Subscriber Line	128 Kbps	18,000 feet on 24 gauge wire	Similar to the ISDN BRI service but data only (no voice on the same line)
CDSL	Consumer DSL from Rockwell	1 Mbps downstream; less upstream	18,000 feet on 24 gauge wire	Splitterless home and small business service; similar to DSL Lite
DSL Lite (same as G.Lite)	"Splitterless" DSL without the "truck roll"	From 1.544 Mbps to 6 Mbps downstream, depending on the subscribed service	18,000 feet on 24 gauge wire	The standard ADSL; sacrifices speed for not having to install a splitter at the user's home or business
G.Lite (same as DSL Lite)	"Splitterless" DSL without the "truck roll"	From 1.544 Mbps to 6 Mbps, depending on the subscribed service	18,000 feet on 24 gauge wire	The standard ADSL; sacrifices speed for not having to install a splitter at the user's home or business
HDSL	High bit-rate Digital Subscriber Line	1.544 Mbps duplex on two twisted-pair lines; 2.048 Mbps duplex on three twisted-pair lines	12,000 feet on 24 gauge wire	T1/E1 service between server and phone company or within a company; WAN, LAN, server access
SDSL	Symmetric DSL	1.544 Mbps duplex (U.S. and Canada); 2.048 Mbps (Europe) on a single duplex line downstream and upstream	12,000 feet on 24 gauge wire	Same as for HDSL but requiring only one line of twisted-pair
ADSL	Asymmetric Digital Subscriber Line	1.544 to 6.1 Mbps downstream; 16 to 640 Kbps upstream	1.544 Mbps at 18,000 feet; 2.048 Mbps at 16,000 feet; 6.312 Mpbs at 12,000 feet; 8.448 Mbps at 9,000 feet	Used for Internet and Web access, motion video, video on demand, remote LAN access
RADSL	Rate-Adaptive DSL from Westell	Adapted to the line, 640 Kbps to 2.2 Mbps downstream; 272 Kbps to 1.088 Mbps upstream	Not Provided	Similar to ADSL
UDSL	Unidirectional DSL Proposed by a Company in Europe	Not Known	Not Known	Similar to HDSL
VDSL	Very high Digital Subscriber Line	12.9 to 52.8 Mbps down stream; 1.5 to 2.3 Mbps upstream; 1.6 Mbps to 2.3 Mbps downstream	4,500 feet at 12.96 Mbps; 3,000 feet at 25.82 Mbps; 1,000 feet at 51.84 Mbps	ATM networks; Fiber to the Neighborhood

Source: "DSL Info." Http://www.dsl.com/intro.htlm.

ATTACHMENT B

SURVEY INSTRUMENTS

Iowa Utilities Board Broadband Internet Access Survey for LECs

Iowa Utilities Board Broadband Internet Access Survey for Wireless Providers

Iowa Utilities Board Broadband Internet Access Survey For Cable Providers

IOWA UTILITIES BOARD BROADBAND INTERNET ACCESS SURVEY FOR LECs

1. Please use the worksheet format below to provide the following information for each exchange served: a) exchange name; b) area code (NPA); c) first three digits of the seven digit telephone number (NNX); d) number of access lines (rounded to the closest hundred); e) number of access lines that are currently equipped to provide xDSL services; f) number of access lines that can be readily equipped to provide xDSL services;** g) maximum downstream speeds achievable through available xDSL services (multiple choice); and h) plans to offer xDSL services from the exchange within the next twelve months (yes, no, or not applicable (NA)). Additional sheets are necessary if you serve more than 10 exchanges.

			d) Number of Access Lines* (round to nearest 100)	Number of Access Lines Equipped to Provide xDSL Services (% Option)		g) Maximum Down-Stream Data Speed (Mark Applicable Maximum)			h) Do you plan to offer XDSL services from this exchange within the next 12 months? (Yes, No, NA)
a) Exchange Name	b) NPA	c) NXX		e) Currently Equipped (# or %)	f) Readily Equipped** (# or %)	Over 100 Kbps	Over 200 Kbps	Over 500 Kbps	
0. *Example*	515	255	1000	100	150		X		NA
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									

*If you do not want the number of access lines by exchange released, please mark "confidential" in this cell and provide the percentage of lines currently and readily equipped in the fifth and sixth cells.

**Readily equipped implies the platform capacity available in the exchange wire center.

2. Please assess customer demand for xDSL services (circle one): low (less than 10 inquiries); medium (between 10 and 50 inquiries); or high (over 50 inquiries).
3. Please provide all price schedules related to xDSL services including lease rates for digital modems and other customer premise equipment necessary to access xDSL services.

Contact Person:_____Telephone #:_____E-Mail Address:_____

Address_____Fax #_____

IOWA UTILITIES BOARD BROADBAND INTERNET ACCESS SURVEY FOR WIRELESS PROVIDERS

1. Does your company currently provide high-speed broadband internet access through multichannel multipoint distribution service (MMDS), local multipoint distribution service (LMDS), satellite, or other wireless technology in the state of Iowa. (Mark Applicable Response) _____Yes _____No
2. If yes, please use the worksheet format below to provide information on the communities and locations in Iowa where you provide MMDS, LMDS, satellite, or other wireless technology: a) community name or other location description; b) area code (NPA); c) number of potential customers in the community or location described in "a"; d) number of customers currently capable of receiving broadband internet access using different technologies; and e) maximum downstream data speeds (either in Kbps or Mbps) using the available technology.

a) Community Name or Location Description	b) NPA	c) Number of Potential Customers in the Community or Location Described in "a"	d) Number of Customers Currently Capable of Receiving Broadband Internet Access Using Wireless Technologies				e) Maximum Down-Stream Data Speed (Kbps or Mbps)
			MMDS	LMDS	Satellite	Other	
1.							
2.							
3.							
4.							
5.							
6.							
7.							
8.							
9.							
10.							

Attach additional sheets if the number of locations exceeds 10.

3. Please identify the communities or locations in Iowa in which you plan to provide high speed broadband internet access using wireless technologies within the next 12 months_____
_____
4. Please provide all price schedules related to your wireless broadband internet access services including lease rates for customer premise equipment necessary to access these services.

Contact Person:_____Telephone #:_____E-Mail Address:_____

Address_____Fax #_____

IOWA UTILITIES BOARD BROADBAND INTERNET ACCESS SURVEY FOR CABLE PROVIDERS

1. Does your company currently provide high-speed broadband internet access through cable modems in the state of Iowa? (Mark Applicable Response) _____Yes _____No

2. If yes, please use the worksheet format below to provide information on the communities and locations in Iowa where you provide broadband internet access: a) community name or other location description; b) area code (NPA); c) number of potential customers in the community or location described in "a"; d) number of customers currently capable of receiving broadband internet access through cable modems; and e) maximum downstream data speeds (in Mbps).

a) Community Name or Location Description	b) NPA	c) Number of Potential Customers in the Community or Location Described in "a"	d) Number of Customers Currently Capable of Receiving Broadband Internet Access Using Cable Modems in the Location Described in "a"	e) Maximum Down-Stream Data Speed (Mbps)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Attach additional sheets if the number of locations exceeds 10.

3. Please identify the communities or locations in Iowa in which you plan to provide high speed broadband internet access within the next 12 months_____

5. Please provide all price schedules related to your broadband internet access services including purchase and lease rates for different types of cable modems, cable splitters, and other customer premise equipment necessary to access these services.

Contact Person:_____Telephone #:_____E-Mail Address:_____

Address_____Fax #_____

ATTACHMENT C
Iowa Communities Accessing High-Speed Technology

			xDSL Technology		Cable Modem Technology		Wireless Technology	
County Name	Community Name	Pop. Code	xDSL Technology Is Currently Provided	xDSL Technology Will Be Provided Within 12 Months	Cable Modem Technology Is Currently Provided	Cable Modem Technology Will Be Provided Within 12 Months	Wireless Technology Is Currently Provided	Wireless Technology Will Be Provided Within 12 Months
Adair	Bridgewater	R		X				
Adair	Greenfield	R		X				
Adair	Orient	R		X				
Adams	Brooks	R		X				
Adams	Carbon	R		X				
Adams	Corning	R		X				
Adams	Nevinville	R	X					
Adams	Nodaway	R		X				
Adams	Prescott	R		X				
Allamakee	Harpers Ferry	R		X				
Allamakee	Spring Grove, MN	R		X				
Allamakee	Waterville	R		X				
Appanoose	Brazil	R		X				
Appanoose	Centerville	U		X				X
Appanoose	Cincinnati	R		X				
Appanoose	Exline	R		X				
Appanoose	Iconium	R		X				
Appanoose	Jerome	R		X				
Appanoose	Mystic	R		X				
Appanoose	Numa	U		X				
Appanoose	Plano	R		X				
Appanoose	Rathbun	U		X				
Appanoose	Udell	R		X				
Appanoose	Unionville	R		X				
Audubon	Audubon	R		X				
Audubon	Brayton	R		X				
Audubon	Kimballton	R		X				
Audubon	Ross	R		X				
Benton	Atkins	R		X				

			xDSL Technology		Cable Modem Technology		Wireless Technology	
County Name	Community Name	Pop. Code	xDSL Technology Is Currently Provided	xDSL Technology Will Be Provided Within 12 Months	Cable Modem Technology Is Currently Provided	Cable Modem Technology Will Be Provided Within 12 Months	Wireless Technology Is Currently Provided	Wireless Technology Will Be Provided Within 12 Months
Benton	Belle Plaine	U	X					
Benton	Blairstown	R	X					
Benton	Garrison	R		X				
Benton	Keystone	R		X				
Benton	Luzerne	U	X					
Benton	Newhall	R		X				
Benton	Norway	R		X				
Benton	Shellsburg	R	X			X		
Benton	Urbana	R		X		X		
Benton	Van Horne	R	X					
Benton/Linn	Walford	R		X				
Benton	Watkins	R		X				
Black Hawk	Cedar Falls	U		X	X			
Black Hawk	De War	U		X				
Black Hawk	Elk Run Heights	U		X	X			
Black Hawk	Evansdale	U		X	X			
Black Hawk	Gilbertville	U		X	X			
Black Hawk	La Porte City	R		X				
Black Hawk	Raymond	U		X	X			
Black Hawk	Washburn	U		X				
Black Hawk	Waterloo	U		X	X			
Boone	Beaver	R		X				
Boone	Berkley	R		X				
Boone	Boone	U		X				
Boone	Boxholm	R		X				
Boone	Fraser	R		X				
Boone	Luther	R		X				
Boone	Madrid	U		X			X	
Boone	Napier	U	X					
Boone	Ogden	R		X			X	
Boone	Pilot Mound	R		X				
Bremer	Bremer	U		X				
Bremer	Buck Creek	R	X					

			xDSL Technology		Cable Modem Technology		Wireless Technology	
County Name	Community Name	Pop. Code	xDSL Technology Is Currently Provided	xDSL Technology Will Be Provided Within 12 Months	Cable Modem Technology Is Currently Provided	Cable Modem Technology Will Be Provided Within 12 Months	Wireless Technology Is Currently Provided	Wireless Technology Will Be Provided Within 12 Months
Bremer	Frederika	R	X					
Bremer	Horton	R	X					
Bremer	Plainfield	R	X					
Bremer	Readlyn	R		X		X		
Bremer	Sumner	R		X				
Bremer	Tripoli	R	X					
Bremer	Waverly	U		X				
Buchanan	Aurora	R	X					
Buchanan	Brandon	R		X				
Buchanan	Jesup	R	X					
Buchanan	Littleton	R	X					
Buchanan	Quasqueton	R	X					
Buchanan	Rowley	R		X				
Buchanan	Winthrop	R	X					
Buena Vista	Albert City	R					X	
Buena Vista	Alta	U					X	
Buena Vista	Lakeside	U					X	
Buena Vista	Linn Grove	R		X			X	
Buena Vista	Marathon	R		X			X	
Buena Vista	Newell	R					X	
Buena Vista	Rembrandt	R		X			X	
Buena Vista	Sioux Rapids	R					X	
Buena Vista	Storm Lake	U					X	
Buena Vista	Sulfer Springs	U					X	
Buena Vista	Truesdale	U					X	
Butler	Allison	R	X					
Butler	Aredale	R		X				
Butler	Bristow	R		X				
Butler	Clarksville	R	X					
Butler	Dumont	R	X					
Butler	Shell Rock	R		X				
Calhoun	Farnhamville	R		X				X
Calhoun	Jolley	R						X

			xDSL Technology		Cable Modem Technology		Wireless Technology	
County Name	Community Name	Pop. Code	xDSL Technology Is Currently Provided	xDSL Technology Will Be Provided Within 12 Months	Cable Modem Technology Is Currently Provided	Cable Modem Technology Will Be Provided Within 12 Months	Wireless Technology Is Currently Provided	Wireless Technology Will Be Provided Within 12 Months
Calhoun	Knierim	R		X				X
Calhoun	Knoke	R						X
Calhoun	Lake City	R		X				X
Calhoun	Lohrville	R		X				X
Calhoun	Manson	R						X
Calhoun	Pomeroy	R						X
Calhoun	Richard	R		X				X
Calhoun	Rinard	R		X				X
Calhoun	Rockwell City	R		X				X
Calhoun	Somers	R		X				X
Calhoun	Yetter	R		X				X
Carroll	Breda	R	X					
Carroll	Coon Rapids	R		X				
Carroll	Dedham	R		X				
Carroll	Halbur	R		X				
Carroll	Lanesboro	R		X				
Carroll	Lidderdale	R		X				
Carroll	Manning	R		X				
Carroll	Ralston	R		X				
Carroll	Templeton	R	X					
Cass	Anita	R		X				
Cass	Cumberland	R	X					
Cass	Griswold	R		X				
Cass	Lewis	R		X				
Cass	Marne	R		X				
Cass	Massena	R	X					
Cass	Wiota	R	X					
Cedar	Bennett	R		X				
Cedar	Buchanan	U		X				
Cedar	Cedar Bluff	U		X				
Cedar	Downey	R	X					
Cedar/Muscatine/Scott	Durant	R		X				
Cedar	Lowden	R		X				

			xDSL Technology		Cable Modem Technology		Wireless Technology	
County Name	Community Name	Pop. Code	xDSL Technology Is Currently Provided	xDSL Technology Will Be Provided Within 12 Months	Cable Modem Technology Is Currently Provided	Cable Modem Technology Will Be Provided Within 12 Months	Wireless Technology Is Currently Provided	Wireless Technology Will Be Provided Within 12 Months
Cedar	Massillion	R		X				
Cedar	Rochester	R		X				
Cedar	Springdale	R	X					
Cedar	Stanwood	R		X				
Cedar	Tipton	U		X				
Cedar	West Branch	R	X					
Cerro Gordo	Clear Lake	U	X					
Cerro Gordo	Dougherty	R		X				
Cerro Gordo	Mason City	U		X	X			
Cerro Gordo	Plymouth	R	X					
Cerro Gordo	Rock Falls	R	X					
Cerro Gordo	Rockwell	R		X				
Cerro Gordo	Ventura	R	X					
Cherokee	Aurelia	R		X			X	
Cherokee	Cherokee	U					X	
Cherokee	Cleghorn	R		X			X	
Cherokee	Larrabee	R		X			X	
Cherokee	Marcus	R		X			X	
Cherokee	Meriden	R		X			X	
Cherokee	Quimby	R		X			X	
Cherokee	Washta	R					X	
Chickasaw	Alta Vista	R		X				
Chickasaw	Bassett	U		X				
Chickasaw	Lawler	R		X				
Chickasaw	New Hampton	U		X				
Chickasaw	North Washington	R		X				
Clarke	Murray	R		X				
Clarke	Osceola	U		X				
Clarke	Woodburn	R		X				
Clay	Cornell	R					X	
Clay	Dickens	R		X			X	
Clay	Everly	R					X	
Clay	Fostoria	U		X			X	

			xDSL Technology		Cable Modem Technology		Wireless Technology	
County Name	Community Name	Pop. Code	xDSL Technology Is Currently Provided	xDSL Technology Will Be Provided Within 12 Months	Cable Modem Technology Is Currently Provided	Cable Modem Technology Will Be Provided Within 12 Months	Wireless Technology Is Currently Provided	Wireless Technology Will Be Provided Within 12 Months
Clay	Gillett Grove	R	X				X	
Clay	Greenville	U		X			X	
Clay	Langdon	U		X			X	
Clay	Peterson	R		X			X	
Clay	Rossie	U		X			X	
Clay	Royal	R					X	
Clay	Spencer	U		X	X		X	
Clay	Webb	R		X			X	
Clayton	Clayton	R	X					
Clayton	Elkader	R	X					
Clayton	Farmersburg	R		X				
Clayton	Garber	R		X				
Clayton	Garnavillo	R	X					
Clayton	Guttenberg	R	X					
Clayton	Marquette	R	X					
Clayton	McGregor	R	X					
Clayton	Millville	R	X					
Clayton	Monona	R		X				
Clayton	Osterdock	R	X					
Clayton	St. Olaf	R		X				
Clayton	Volga	R		X				
Clinton	Andover	R		X				
Clinton	Bryant	R		X				
Clinton	Calamus	R		X				
Clinton	Camanche	U		X	X			
Clinton	Charlotte	R		X				
Clinton	Clinton	U		X	X			
Clinton	De Witt	R		X				
Clinton	Delmar	U		X				
Clinton	Elwood	R	X					
Clinton	Goose Lake	R	X					
Clinton	Grand Mound	R		X				
Clinton	Lost Nation	R	X					

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Clinton	Low Moor	R			X			
Clinton	Toronto	R	X					
Clinton	Welton	R		X				
Clinton	Wheatland	R		X				
Crawford	Aspinwall	R		X				
Crawford	Deloit	U	X					
Crawford	Denison	U	X					
Crawford	Manilla	R		X				
Crawford	Ricketts	R		X				
Crawford	Vail	R		X				
Crawford	Westside	R		X				
Dallas	Bouton	R		X				
Dallas	Dallas Center	R					X	
Dallas	Dexter	R		X				
Dallas	Granger	R					X	
Dallas	Linden	R		X			X	
Dallas	Minburn	R		X			X	
Dallas	Redfield	R					X	
Dallas	Waukee	U					X	
Dallas	Woodward	R	X					
Davis	Bloomfield	U		X				
Davis	Drakesville	R		X				
Davis	Floris	R		X				
Davis	Mark	R		X				
Davis	Pulaski	R		X				
Davis	Troy	R		X				
Davis	West Grove	R		X				
Decatur	Davis City	R		X				
Decatur	Decatur City	R	X					
Decatur	Garden Grove	R		X				
Decatur	Grand River	R		X				
Decatur	Lamoni	R	X					
Decatur	Le Roy	R		X				

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Decatur	Leon	R	X					
Decatur	Pleasanton	R		X				
Decatur	Van Wert	R		X				
Decatur	Weldon	R		X				
Decatur	Woodland	R	X					
Delaware	Colesburg	R		X				
Delaware	Greeley	R		X				
Delaware	Manchester	U		X				
Delaware	Petersburg	R		X				
Delaware	Ryan	R		X		X		
Des Moines	Burlington	U		X	X			X
Des Moines	Danville	R		X	X			
Des Moines	Dodgeville	R		X				
Des Moines	Kingston	R		X				
Des Moines	Kossuth	R	X					
Des Moines	Mediapolis	R		X				
Des Moines	Sperry	R	X					
Des Moines	West Burlington	U		X	X			
Dickinson	Terril	R	X					
Dubuque	Asbury	U		X				
Dubuque	Balltown	U		X				
Dubuque	Bernard	R			X			
Dubuque/Jones	Cascade	R	X					
Dubuque	Center Grove	U		X				
Dubuque	Centralia	U		X				
Dubuque	Dubuque	U		X				
Dubuque	Durango	U		X				
Dubuque/Delaware	Dyersville	U		X				
Dubuque	Graf	U		X				
Dubuque	Holy Cross	R		X				
Dubuque	Keywest	U		X				
Dubuque	Luxemburg	R		X				
Dubuque	New Vienna	R		X				

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Dubuque	Peosta	U		X				
Dubuque	Peru	R		X				
Dubuque	Rickardsville	U		X				
Dubuque	Sageville	U		X				
Dubuque	Sherrill	U		X				
Dubuque	Worthington	R		X				
Dubuque/Jackson	Zwingle	U		X				
Emmet	Armstrong	R	X			X		
Emmet	Dolliver	R		X				
Emmet	Estherville	U						X
Emmet	Gruver	U						X
Emmet	Wallingford	R		X				
Fayette	Alpha	R		X				
Fayette	Arlington	R		X				
Fayette	Clermont	R		X				
Fayette	Donnan	R		X				
Fayette	Elgin	R		X				
Fayette	Maynard	R		X				
Fayette	Oran	R	X					
Fayette	Randalia	R		X				
Fayette	St. Lucas	R		X				
Fayette	Wadena	R		X				
Fayette	Waucoma	R		X				
Fayette	Westgate	R		X				
Floyd	Charles City	U		X				
Floyd	Colwell	U		X				
Floyd	Floyd	R	X					
Floyd	Marble Rock	R		X				
Floyd	Nora Springs	R	X					
Floyd	Rockford	R	X					
Floyd	Rudd	R	X					
Franklin	Chapin	R		X				
Franklin	Latimer	R		X				

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Franklin	Sheffield	R		X				
Fremont	Bartlett	R		X				
Fremont	Farragut	R		X				
Fremont	Hamburg	R		X				
Fremont	Percival	R		X				
Fremont	Randolph	R		X				
Fremont	Riverton	R		X				
Fremont	Sidney	R		X				
Fremont	Thurman	R		X				
Greene	Adaza	R		X				
Greene	Churdan	R		X				
Greene	Cooper	U	X					
Greene	Farlin	U	X					
Greene	Jefferson	U	X					
Greene	Paton	R		X				
Greene	Rippey	R		X			X	
Greene	Scranton	R	X					
Grundy	Beaman	R	X					
Grundy	Conrad	R	X					
Grundy	Grundy Center	U		X				
Grundy	Holland	U		X				
Grundy	Morrison	U		X				
Grundy	Reinbeck	R		X				
Guthrie	Bagley	R		X				
Guthrie	Bayard	R		X				
Guthrie	Guthrie Center	R		X				
Guthrie	Herndon	R		X				
Guthrie	Jamaica	R		X				
Guthrie	Menlo	R	X					
Guthrie	Montieth	R	X					
Guthrie	Panora	R	X				X	
Guthrie	Yale	R		X				
Hamilton	Blairsburg	R					X	

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Hamilton	Ellsworth	R		X			X	
Hamilton	Jewell Junction	R					X	
Hamilton	Kamrar	R		X				X
Hamilton	Randall	R		X			X	
Hamilton	Stanhope	R		X				X
Hamilton	Webster City	U					X	
Hamilton	Williams	R					X	
Hancock	Britt	R						X
Hancock	Corwith	R		X		X		
Hancock	Crystal Lake	R	X					
Hancock	Garner	U						X
Hancock	Kanawha	R		X				
Hancock	Klemme	R		X		X		X
Hancock	Miller	R	X					
Hancock	Woden	R	X					
Hardin	Alden	R					X	
Hardin	Buckeye	R		X				
Hardin	Eldora	U	X					
Hardin	Garden City	R		X				
Hardin	Gifford	U	X					
Hardin	Hubbard	R					X	
Hardin	Lawn Hill	R		X				
Hardin	New Providence	R		X				
Hardin	Radcliffe	R		X			X	
Hardin	Steamboat Rock	R	X					
Hardin	Union	R		X				
Hardin	Whitten	R		X				
Harrison	Little Sioux	R		X				
Harrison	Logan	R		X				
Harrison	Magnolia	R		X				
Harrison	Modale	R		X				
Harrison	Mondamin	R		X				
Harrison	Persia	R		X				

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Harrison	Pisgah	R		X				
Harrison	River Sioux	R		X				
Harrison	Woodbine	R		X				
Henry/Washington/Jefferson	Coppock	R		X				
Henry	Hillsboro	R		X				
Henry	Mount Pleasant	U		X				X
Henry	New London	R		X				
Henry	Olds	R		X				
Henry	Salem	R		X				
Henry	Swedesburg	R		X				
Henry	Trenton	R		X				
Henry	Wayland	R		X				
Howard	Cresco	U		X				
Howard	Lime Springs	R		X				
Howard	Protivin	R		X				
Humboldt	Bode	R						X
Humboldt	Bradgate	R						X
Humboldt	Dakota City	U	X					X
Humboldt/Pocahontas	Gilmore City	R					X	
Humboldt	Hardy	R						X
Humboldt	Humboldt	U	X					X
Humboldt	Livermore	R						X
Humboldt	Ottosen	R						X
Humboldt	Pioneer	R						X
Humboldt	Renwick	R						X
Humboldt	Rutland	U	X					X
Humboldt	Thor	R		X				X
Ida	Battle Creek	R					X	
Ida	Galva	R					X	
Ida	Holstein	R		X			X	
Ida	Ida Grove	R		X			X	
Iowa	Conroy	R		X				
Iowa	Koszta	R	X					

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Iowa	Ladora	R		X				
Iowa	Marengo	R	X					
Iowa	Millersburg	R		X				
Iowa/Keokuk	North English	R		X				
Iowa	Parnell	U		X				
Iowa/Poweshiek	Victor	R		X				
Iowa	Williamsburg	U		X				
Jackson	Baldwin	R	X					
Jackson	La Motte	R	X					
Jackson	Miles	R		X				
Jackson	Monmouth	R	X					
Jackson	Nashville	R	X					
Jackson	Preston	R	X					
Jackson	Spragueville	R	X					
Jackson	St. Donatus	U		X				
Jasper	Baxter	R		X				
Jasper	Colfax	R					X	
Jasper	Galesburg	R		X				
Jasper	Ira	R		X				
Jasper	Kellogg	R	X					
Jasper	Lamb's Grove	U		X				
Jasper	Mingo	R		X				
Jasper	Newton	U		X				
Jasper	Oakland Acres	U		X				
Jasper	Prairie City	R					X	
Jasper	Reasnor	R		X				
Jasper	Sully	R	X					
Jefferson	Abingdon	R		X				
Jefferson	Batavia	R						X
Jefferson	Fairfield	U		X			X	
Jefferson	Libertyville	R		X				
Jefferson	Linby	R		X				
Jefferson	Lockridge	R		X				

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Jefferson	Packwood	R		X				
Johnson	Coralville	U	X		X			
Johnson	Hills	R	X					
Johnson	Iowa City	U	X		X			
Johnson	Lone Tree	R		X				
Johnson	North Liberty	U		X				
Johnson	Oasis	R	X					
Johnson	Oxford	R		X				
Johnson	Sharon Center	R	X					
Johnson	Shueyville	R		X				
Johnson	Solon	R		X				
Johnson	Swisher	R	X					
Johnson	Tiffin	R		X				
Johnson	University Heights	U	X		X			
Jones	Hale	R		X				
Jones	Morley	R		X				
Jones	Olin	R		X				
Jones	Oxford Junction	R	X					
Jones	Oxford Mills	R	X					
Jones	Wyoming	R		X				
Keokuk	Delta	R		X				
Keokuk	Harper	R		X				
Keokuk	Keswick	R		X				
Keokuk	Kinross	R		X				
Keokuk	Martinsburg	R		X				
Keokuk	Ollie	R		X				
Keokuk	Pekin	R		X				
Keokuk	Sigourney	R		X				X
Keokuk	South English	R		X				
Keokuk	Webster	R		X				
Kossuth	Algona	U					X	
Kossuth	Bancroft	R						X
Kossuth	Blue Earth, MN	R		X				X

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Kossuth	Burt	R		X				X
Kossuth	Fenton	R						X
Kossuth	Lakota	R						X
Kossuth	Ledyard	R		X				X
Kossuth	Lone Rock	R		X				X
Kossuth	Lotts Creek	R		X				X
Kossuth/Humboldt	Lu Verne	R						X
Kossuth	St. Benedict	R						X
Kossuth	St. Joseph	R						X
Kossuth	Swea City	R						X
Kossuth	Titonka	R	X					X
Kossuth	Wesley	R				X		X
Kossuth	Whittemore	R						X
Lee	Argyle	R		X				
Lee	Fort Madison	U		X				X
Lee	Houghton	R		X				
Lee	Primrose	R		X				
Lee	St. Paul	R		X				
Lee	Wever	U		X				
Linn	Alburnett	R		X		X		
Linn	Cedar Rapids	U	X		X			
Linn	Center Point	R				X		
Linn	Central City	R				X		
Linn	Coggon	R				X		
Linn	Ely	R		X				
Linn	Fairfax	R		X	X			
Linn	Hiawatha	U	X		X			
Linn	La Fayette	R		X				
Linn	Lisbon	R		X				
Linn	Marion	U	X		X			
Linn	Robins	U	X			X		
Linn	Springville	R		X				
Linn	Toddville	U	X					

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Linn	Troy Mills	R		X				
Linn	Viola	R		X				
Linn	Whittier	R		X				
Louisa	Columbus City	R		X				
Louisa	Columbus Junction	R		X				X
Louisa	Cotter	R		X				
Louisa	Fredonia	R		X				
Louisa	Grandview	R		X				
Louisa	Letts	R		X				
Louisa	Morning Sun	R	X					
Louisa	Oakville	R		X				
Louisa	Wapello	R		X				X
Louisa	Wyman	R		X				
Lucas	Chariton	U		X				X
Lucas	Derby	R		X				
Lucas	Lucas	R		X				
Lucas	Oakley	R		X				
Lucas	Russell	R		X				
Lucas	Williamson	R		X				
Lyon	Alvord	R		X				
Lyon	George	R		X				
Lyon	Inwood	R	X					
Lyon	Larchwood	R	X					
Lyon	Lester	R		X				
Lyon	Little Rock	R		X				
Madison	Macksburg	R		X				
Madison	St. Charles	R	X					
Madison	Truro	R	X					
Madison	Winterset	U					X	
Mahaska	Beacon	U						X
Mahaska	Cedar	R						X
Mahaska	Fremont	R						X
Mahaska	Keomah Village	U						X

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Mahaska	Lacey	U						X
Mahaska	Leighton	R		X				X
Mahaska	New Sharon	R						X
Mahaska	Oskaloosa	U						X
Mahaska	Peoria	R		X				X
Mahaska	Rose Hill	R						X
Mahaska	Taintor	R						X
Mahaska	University Park	U						X
Marion	Attica	R		X				
Marion	Bussey	R		X				
Marion	Flagler	U		X				
Marion	Hamilton	R		X				
Marion	Harvey	U		X				
Marion	Knoxville	U		X			X	
Marion	Marysville	R		X				
Marion	Otley	R		X				
Marion	Pella	U		X				X
Marion	Pershing	R		X				
Marion	Tracy	R		X				
Marshall	Albion	R		X				
Marshall	Bangor	R		X				
Marshall	Clemons	R		X				
Marshall	Ferguson	R		X				
Marshall	Gilman	R	X					
Marshall	Green Mountain	R		X				
Marshall	Haverhill	R		X				
Marshall	La Moille	U		X				
Marshall	Laurel	R		X				
Marshall	Liscomb	R		X				
Marshall	Marietta	U		X				
Marshall	Marshalltown	U		X		X		
Marshall	Melbourne	R		X			X	
Marshall	Rhodes	R		X			X	

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Marshall	St. Anthony	R		X				
Marshall	Van Cleve	R		X				
Mills	Emerson	R	X					
Mills	Henderson	R	X					
Mills	Pacific Junction	R		X				
Mitchell	Little Cedar	R	X					
Mitchell	New Haven	R	X					
Mitchell/Howard	Riceville	R	X					
Monona	Blencoe	R		X			X	
Monona	Castana	R					X	
Monona	Mapleton	R					X	
Monona	Moorhead	R		X			X	
Monona	Onawa	U					X	
Monona	Rodney	R					X	
Monona	Soldier	R					X	
Monona	Turin	R					X	
Monona	Ute	R		X			X	
Monona	Whiting	R					X	
Monroe	Albia	U		X				X
Monroe	Avery	U		X				
Monroe	Georgetown	U		X				
Monroe	Lovilia	R		X				
Monroe	Melrose	R		X				
Montgomery	Coburg	U		X				
Montgomery	Elliot	R		X				
Montgomery	Grant	R		X				
Montgomery	Red Oak	U		X				
Montgomery	Stanton	R		X				
Montgomery	Villisca	R		X				
Muscatine	Atalissa	R		X				
Muscatine	Conesville	R		X				
Muscatine	Fruitland	U	X		X			
Muscatine	Montpelier	U	X					

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Muscatine	Moscow	R		X				
Muscatine	Muscatine	U	X		X			
Muscatine	Nichols	R		X				
Muscatine	Stockton	U	X					
Muscatine	West Liberty	U	X					
Muscatine	Wilton	U	X		X			
O'Brien	Archer	R		X			X	
O'Brien	Calumet	R		X			X	
O'Brien	Gaza	R					X	
O'Brien	Germantown	R					X	
O'Brien	Hartley	R					X	
O'Brien	Moneta	R					X	
O'Brien	Paullina	R					X	
O'Brien	Primghar	R					X	
O'Brien	Sanborn	R		X			X	
O'Brien/Sioux	Sheldon	U					X	
O'Brien	Sutherland	R		X			X	
Osceola	Harris	R		X				
Osceola	May City	R		X				
Osceola	Melvin	R		X				
Osceola	Ocheyedan	R		X				
Page	Bethesda	R		X				
Page	Bingham	U		X				
Page	Braddyville	R		X				
Page	Clarinda	U		X				
Page	College Springs	R		X				
Page	Essex	R	X					
Page	Hawleyville	U		X				
Page	Shambaugh	R		X				
Page	Shenandoah	U		X				
Page	Yorktown	U		X				
Palo Alto	Ayrshire	R	X					X
Palo Alto	Curlew	R	X					X

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Palo Alto	Cylinder	R		X				X
Palo Alto	De Pew	R		X				X
Palo Alto	Emmetsburg	U		X			X	
Palo Alto	Graettinger	R	X			X		X
Palo Alto	Mallard	R		X			X	
Palo Alto	Rodman	R	X					X
Palo Alto	Ruthven	R	X					X
Palo Alto	West Bend	R	X				X	
Plymouth	Akron	R					X	
Plymouth	Brunsville	R					X	
Plymouth	Craig	R					X	
Plymouth	Hinton	R		X			X	
Plymouth	James	U		X			X	
Plymouth	Kingsley	R					X	
Plymouth	Le Mars	U	X				X	
Plymouth	Merrill	R					X	
Plymouth	Oyens	U	X				X	
Plymouth	Remsen	R		X			X	
Plymouth	Seney	U	X				X	
Plymouth	Struble	R					X	
Plymouth	Westfield	R					X	
Pocahontas	Fonda	R						X
Pocahontas	Havelock	R	X				X	
Pocahontas	Laurens	R					X	
Pocahontas	Palmer	R		X				X
Pocahontas	Plover	R	X					X
Pocahontas	Pocahontas	R					X	
Pocahontas	Rolfe	R		X			X	
Pocahontas	Varina	R						X
Polk	Alleman	R		X			X	
Polk	Altoona	U		X	X			
Polk	Ankeny	U	X		X		X	
Polk	Bondurant	U		X	X			

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Polk/Dallas	Clive	U	X		X		X	
Polk	Des Moines	U	X		X			
Polk	Elkhart	R		X				
Polk	Enterprise	U	X					
Polk	Farrar	R		X				
Polk	Grimes	U					X	
Polk	Johnston	U	X		X		X	
Polk	Mitchellville	U		X			X	
Polk	Pleasant Hill	U	X		X			
Polk	Polk City	R			X			
Polk	Rising Sun	U	X					
Polk	Runnells	R			X			
Polk	Saylorville	U	X					
Polk/Dallas	Urbandale	U	X		X		X	
Polk/Dallas	West Des Moines	U	X		X		X	
Polk	Windsor Heights	U	X		X			
Pottawattamie	Carter Lake	U	X		X			
Pottawattamie	Council Bluffs	U	X		X			
Pottawattamie	Crescent	R			X			
Pottawattamie	Hancock	R	X					
Pottawattamie	Macedonia	R		X				
Pottawattamie	Minden	R		X				
Pottawattamie	Oakland	R		X				
Poweshiek	Brooklyn	R	X					
Poweshiek	Grinnell	U		X				
Poweshiek	Guernsey	R		X				
Poweshiek	Hartwick	R		X				
Poweshiek	Malcom	R		X				
Ringgold	Beaconsfield	R		X				
Ringgold	Benton	R		X				
Ringgold	Delphos	R		X				
Ringgold	Diagonal	R		X				
Ringgold	Ellston	R		X				

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Ringgold	Kellerton	R		X				
Ringgold	Maloy	R		X				
Ringgold	Mount Ayr	R		X				
Ringgold	Redding	R		X				
Ringgold	Tingley	R		X				
Sac	Auburn	R		X			X	
Sac	Carnarvon	R					X	
Sac	Early	R					X	
Sac	Lake View	R		X			X	
Sac/Calhoun	Lytton	R		X			X	
Sac	Nemaha	R					X	
Sac	Sac City	R		X			X	
Sac	Schaller	R					X	
Sac	Ulmer	R		X			X	
Sac	Wall Lake	R	X				X	
Scott	Bettendorf	U	X		X			
Scott	Blue Grass	U	X					
Scott	Buffalo	U	X					
Scott	Davenport	U	X		X			
Scott	Dixon	R				X		
Scott	Donahue	R	X					
Scott	Eldridge	U	X		X			
Scott	Le Claire	U		X				
Scott	Long Grove	U	X		X			
Scott	Maysville	U	X					
Scott	McCausland	R	X					
Scott	Mt. Joy	U	X		X			
Scott	New Liberty	U	X					
Scott	Panorama Park	U	X		X			
Scott	Princeton	U		X				
Scott	Riverdale	U	X		X			
Shelby	Botna	R		X				
Shelby	Corley	R	X					

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Shelby	Defiance	R		X				
Shelby	Earling	R	X					
Shelby	Elk Horn	R		X				
Shelby	Harlan	R	X					
Shelby	Harlan	U		X				
Shelby	Irwin	R		X				
Shelby	Jacksonville	R		X				
Shelby	Kirkman	R		X				
Shelby	Panama	R		X				
Shelby	Portsmouth	R		X				
Shelby	Westphalia	R		X				
Sioux	Alton	R		X			X	
Sioux	Boyden	R					X	
Sioux	Carmel	U		X			X	
Sioux	Chatsworth	R					X	
Sioux	East Hudson, SD	R		X			X	
Sioux	Granville	R		X			X	
Sioux	Hawarden	R	X		X		X	
Sioux	Hull	R					X	
Sioux	Ireton	R					X	
Sioux	Matlock	R		X			X	
Sioux	Maurice	R		X			X	
Sioux	Orange City	U	X				X	
Sioux	Perkins	R					X	
Sioux	Rock Valley	U					X	
Sioux	Sioux Center	U		X			X	
Story	Ames	U	X			X	X	
Story	Cambridge	R		X			X	
Story	Collins	R		X			X	
Story	Colo	R		X			X	
Story	Fernald	U		X				
Story	Gilbert	U	X				X	
Story	Huxley	R	X					

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Story	Kelley	R	X					
Story	Maxwell	R					X	
Story	McCallsburg	R		X				
Story	Nevada	U		X		X	X	
Story	Roland	R					X	
Story/Polk/Boone	Sheldahl	R		X				
Story	Shipley	U		X				
Story	Slater	R		X			X	
Story	Story City	U		X			X	
Story	Zearing	R		X				
Tama	Chelsea	R		X				
Tama	Dysart	R	X					
Tama	Elberon	R		X				
Tama	Garwin	R		X				
Tama	Haven	R		X				
Tama	Irving	U	X					
Tama	Montour	R		X				
Tama	Tama	U		X				
Tama	Toledo	U		X				
Taylor	Athelstan	R		X				
Taylor	Blockton	R		X				
Taylor/Ringgold	Clearfield	R		X				
Taylor	Conway	R		X				
Taylor	Gravity	R		X				
Taylor	Guss	R		X				
Taylor	New Market	R		X				
Union	Arispe	R		X				
Union	Creston	U		X				
Union	Cromwell	U		X				
Union	Kent	R		X				
Union	Lorimor	R		X				
Union	Shannon City	R		X				
Union	Spaulding	R		X				

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Union	Thayer	R		X				
Van Buren	Birmingham	R		X				
Van Buren	Bonaparte	R		X				
Van Buren	Cantril	R		X				
Van Buren	Douds	R		X				
Van Buren	Keosauqua	R		X				
Van Buren	Leando	R		X				
Van Buren	Milton	R		X				
Van Buren	Mount Sterling	R		X				
Van Buren	Stockport	R		X				
Wapello	Blandensburg	R		X				
Wapello	Chillicothe	R		X				
Wapello/Mahaska/Monroe	Eddyville	R		X				X
Wapello	Farson	R		X				
Wapello	Kirkville	R		X				
Wapello	Ottumwa	U		X				X
Warren	Ackworth	U		X				
Warren/Polk	Carlisle	U				X		
Warren	Indianola	U		X	X		X	
Warren	Lacona	R		X				
Warren	Liberty Center	R		X				
Warren	Martensdale	R		X				
Warren	Norwalk	U				X		
Warren	Sandyville	U		X				
Warren	Spring Hill	U		X				
Warren	St. Marys	R	X					
Washington	Ainsworth	R		X				
Washington	Crawfordsville	R		X				
Washington	Daytonville	R	X					
Washington	Haskins	R		X				
Washington	Kalona	R		X				
Washington	Richmond	R		X				
Washington	Riverside	R		X				

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Washington	Washington	U		X				X
Washington	Wellman	R	X					
Washington	West Chester	R		X				
Wayne	Allerton	R		X				
Wayne	Bethlehem	R		X				
Wayne	Cambria	R		X				
Wayne	Clio	R		X				
Wayne	Confidence	R		X				
Wayne	Corydon	R	X					
Wayne	Humeston	R		X				
Wayne	Lineville	R		X				
Wayne	Millerton	R		X				
Wayne	Promise City	R		X				
Webster	Badger	R		X				X
Webster	Barnum	R		X				X
Webster	Callender	R	X					X
Webster	Clare	R		X				X
Webster	Coalville	R		X				X
Webster	Dayton	R	X					X
Webster	Duncombe	R		X				X
Webster	Fort Dodge	U	X					X
Webster	Gowrie	R		X				X
Webster	Harcourt	R	X					X
Webster	Lanyon	R		X				X
Webster	Lehigh	R	X					X
Webster	Moorland	R		X				X
Webster	Otho	R		X				X
Webster	Vincent	R		X				X
Winnebago	Buffalo Center	R	X					
Winnebago/Hancock	Forest City	U	X					
Winnebago	Lake Mills	R	X					
Winnebago	Leland	R	X					
Winnebago	Rake	R	X					

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Winnebago	Scarville	R	X					
Winnebago	Thompson	R	X					
Winneshiek	Burr Oak	R		X				
Winneshiek	Castalia	R		X				
Winneshiek	Fort Atkinson	R		X				
Winneshiek	Frankville	R		X				
Winneshiek	Harmony, MN	R		X				
Winneshiek	Ossian	R		X				
Winneshiek	Ridgeway	R		X				
Woodbury	Anthon	R					X	
Woodbury	Bronson	R		X			X	
Woodbury	Climbing Hill	R		X			X	
Woodbury	Correctionville	R					X	
Woodbury	Cushing	R					X	
Woodbury	Danbury	R					X	
Woodbury	Holly Springs	R					X	
Woodbury	Hornick	R					X	
Woodbury	Lawton	R	X				X	
Woodbury	Luton	R					X	
Woodbury	Moville	R	X				X	
Woodbury	Oto	R					X	
Woodbury	Pierson	R					X	
Woodbury	Port Neal	R					X	
Woodbury	Salix	R	X				X	
Woodbury	Sergeant Bluff	U	X		X		X	
Woodbury	Sioux City	U	X	X	X		X	
Woodbury	Sloan	R	X				X	
Woodbury	Smithland	R					X	
Worth	Emmons	R	X					
Worth	Fertile	R	X					
Worth	Grafton	R	X					
Worth	Hanlontown	R	X					
Worth	Joice	R	X					

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Worth	Kensett	R	X					
Wright	Belmond	R		X				X
Wright	Clarion	U	X					X
Wright	Cornelia	U	X					X
Wright/Franklin	Dows	R						X
Wright	Eagle Grove	U	X					X
Wright	Galt	U	X					X
Wright	Goldfield	R	X					X
Wright	Holmes	U	X					X
Wright	Rowan	R						X
Wright	Woolstock	R						X