

**Wireless Internet Service Providers  
Business Cases and  
Recommendations for Action**

Redwood Coast Connect  
December 1, 2008

Low residential density of most rural communities, lack of from anchor tenants (or anchor tenants who are already part of a restricted system and so are presently not considered part of the demand market), and a lack of backhaul (middle mile) infrastructure make serving small rural communities across the state very difficult. In the case of the North Coast this is exacerbated by rugged terrain and a tree covered landscape.

It is encouraging to see, even with significant challenges, local wireless internet service providers (WISPs) are stepping to the plate to serve small communities in the regions in which they are located. Many, if not most, of these small entrepreneurial enterprises are not well capitalized and approach expansion in a “pay as you go” mode, meaning each successive expansion must wait until capital is recovered from prior investments. Serving additional communities is a slow, step by step process.

In the north coast region there are two factors which influence expansion into communities by the WISPs—cost and complexity of securing backhaul and the challenge of securing anchor tenants to help offset the cost of supplying residential service.

### **Cost and Complexity of Securing Backhaul**

On the north coast there is only one fiber route coming up from the south along Highway 101 and ending in Eureka, owned by A T& T who leases access to backhaul capacity to other providers the biggest of which is Suddenlink (cable franchise). Charter Internet provides service down from Oregon, but only as far south as Crescent City leaving a fiber gap of approximately 85 miles north-south. There is no access to fiber in Trinity Co. at all.

It has been the goal of efforts to provide broadband access to all North Coast residents to have a fiber backbone from which to build out services. At the same time, WISPs are currently utilizing microwave to provide backhaul alternatives for their expansions. There is concern that once communities are served at any level there will be little pressure to get additional fiber access to the region, however, WISPs voice that the expense of fiber does not justify the investment at current demand levels and waiting until there is fiber backhaul might mean communities wait forever for fiber and never get service. They consider microwave as a “bootstrap” way of getting broadband to unserved and underserved communities with the goal of establishing (and increasing) demand enough to attract additional fiber investment. Our willingness to look at support of microwave as a backhaul alternative for getting communities served with broadband should be evaluated and not dismissed as an inferior alternative.

Backhaul by microwave necessitates a network of “hops” in rugged rural areas from mountain top to mountain top. Many currently have towers, placed during the growth of the cell phone industry. The many various ownerships (private landowners, telecom companies, local, state, and federal government agencies, etc) make getting to each community a patchwork of negotiating access to and prices for tower space rental.

Approximately 65% of the land in the four counties comprising the Redwood Coast Region (Del Norte, Humboldt, Trinity and Mendocino counties) is owned by government. In Trinity County that jumps to approximately 80%. Spanning vast areas of public forest land and be particularly challenging as providing communication services is not part of the mission of either the State parks nor the National forest and park systems. This lack of common commitment to communications infrastructure across multiple government agencies is demonstrated by the current attempts to decommissioning a tower at Shasta-Bolly by the National Park Service. While the tower is not useful to the Forest Service, it does have on it critical microwave equipment, linking a microwave network running east-west through Trinity county to the Interstate 5 fiber line. While decommissioning of the tower might be desirable to the Park Service, the loss of the tower would be a large setback to providing broadband services in Trinity County, and potentially limits a source of redundant broadband capacity to the west coast.

Tower access is also confounded by local land use ordinances and permitting processes, many created to regulate large cell phone service and TV stations before the advent of small scale license free wireless technologies such as wireless network routers and wireless enabled laptops. These wireless regulations, due to the scale of operation for which they were originally created hinder wireless deployment due to the tremendous burden of cost and other factors they impose which make it uneconomical and impractical to comply. For small, unlicensed bandwidth wireless providers, these can be insurmountable obstacles.

Fire towers, located at top of the highest mountains, originally placed and manned to monitor for forest fires on public lands, present possibilities as locations for mounting microwave equipment. There are considerations to this option including the need for engineering to ensure to safety and security of equipment mounted on top, permitting requirements (including CEQA), building of equipment vaults, need for a power source (which could be solar). Without the mission or mandate for public lands to be integrated into solutions for ubiquitous broadband, these issues will be insurmountable in many cases.

Microwave holds promise for serving many, if not all of the unserved and underserved communities at a much lower cost than that of fiber, particularly where there is no existing infrastructure. While fiber infrastructure is provides 10,000 times (or more) the capacity of even the best microwave systems, microwave can play an important role in getting some broadband capacity to communities more cost effectively. Microwave backhaul should be encouraged and barriers to implementing it should be lowered, reduced, or eliminated all together. In addition, in the process of pursuing microwave as part of the solution to serve these communities, bringing all public assets to bear on the process can contribute to the acceleration of the proliferation of broadband by microwave.

## **Competition for Anchor Tenants**

The Redwood Coast Connect report has an extensive discussion about the difficulty in securing anchor tenants in small rural communities. Businesses have a tendency to be small or home based operations, most with broadband demand needs similar to residential uses. Many times the largest employers are government offices, many of which qualify for subsidized rates (E-Rates) and purchase services collectively.

While there are agencies mandated to buy through the state's centralized purchase contract (CALNET), institutions, commissions and agencies that qualify for E-Rates but are not mandated to purchase through CALNET can contract for services from independent providers and still retain their subsidized rates. The provider then captures the subsidy directly from the Universal Services Fund. While providers must meet registration requirements and have a Service Provider ID Number (SPIN), knowing this might help capture additional anchor tenants for broadband service providers in these small communities.

In addition to potential anchor tenants being skimmed off by collective purchasing agreements or networks, WISPs find themselves in competition with municipalities who are finding funding for infrastructure, then looking for ways to put that infrastructure to work reducing costs and increasing revenues. Three examples of this are:

**Trinity County Towers-** Accessed AB140 funds (CPUC program funded to expand telephone services to unserved places.) With those monies, the County is erecting a total of 10 towers (6 currently underway.) While the County will own the towers, their plan is to lease space to private sector service providers to meet both telephone and other service goals for residents.

**Trinity County Public Utilities District-** Frustrated by the lack of broadband service on the horizon, particularly to southern Trinity County, south of Highway 299, the utilities district has been considering taking advantage of their existing pole infrastructure to get much needed broadband to the southern part of the county. However, this could also mean that they will serve their customers throughout the rest of the county creating serious competition to a WISP who has already made significant investments in serving the Weaverville area and is now serving communities moving to the east. A client base in Weaverville, the most populated community in Trinity County with residents is critical to help underwrite the costs of serving other communities to the east through Trinity then eastern Humboldt counties.

**Yurok Tribe-** Similar to Trinity County towers, the Yurok Tribe is erecting a series of towers to serve residents on reservation lands bordering the Klamath River in southern Del Norte County. They are utilizing Rural Utilities Services funding (USDA.) The Tribe formed a tribal utilities district and it is unknown at this time whether they will provide services themselves or look for private sector partners.

**Mendocino County**- Using Homeland Security funding, the County built out a microwave system for public safety, a \$2.5 million investment. The County is now working to use that system to provide services to other departments of the County including libraries (who are E-Rate qualified) further eroding the anchor tenant base for other private sector providers.

These are examples of public infrastructure which could, if coordinated with other efforts, be part of the solution for providing broadband to the hardest to serve communities. There are already complaints of unfair competitive advantage by municipalities who are moving to provide services, frustrating when there are so many people left to serve. Funding and staffing ongoing coordination of all these activities, leveraging these investments with private sector efforts and identifying new opportunities to bring service to additional unserved and underserved communities is a full time occupation and a daunting task for rural regions.

### **Case #1 Serving Mendocino County**

There is one WISP who completed the licensing process with CPUC to become a Competitive Local Exchange Carrier (CLEC). The process was time consuming and expensive and few local wireless providers are likely to pursue this alternative.

Being a CLEC gives access to the copper wire infrastructure owned by Incumbent Local Exchange Carriers (ILEC) who are the large telecom companies. This designation allows the local WISP to provide DSL services through the copper network out to all homes wired for telephone and provides the right to extent service beyond the copper with additional equipment they can add at the end of the line.

This relationship significantly saves costs by piggybacking on both existing infrastructure and connections to consumers. It is reported that uptake rates for CLECs is much higher than that for wireless services.

Access to copper wire loops is not without cost, however, cost differs greatly depending on the telecom tariff zone designations. In 2001 telecoms were allowed to designate zones where the cost for providing services was excessive (remote areas). Zoning designations of 3 and 4 were subsidized by the Universal Services Fund. These designations also increase the cost of access of those lines to CLECs. For example, charges to access copper in the community of Covelo are \$134 per household per month, compared to the community of Willits where the charges are under \$10 per household per month. High charges for remote communities are a barrier to getting broadband services out to those communities.

While under the 1996 federal reform law ILECs are required to give CLECs access to copper loops, they are not required to provide access to fiber. In a recent ruling (California Association of Competitive Telecommunications Companies petition to CPUC) CPUC declined to prevent ILECs from pulling their copper to exchange it for fiber which could leave CLECs without a connection to their end customers should the exchange be made.

Initial switch costs are \$35,000-\$50,000 depending on the size of the community to be served. Other costs include \$15,000-\$20,000 per central office (switching office of the telecom company) to build the serving facility and place the equipment, as well as other costs to bring the service to the central office and connect to the copper network system. There are 20 or so central offices where broadband switch access equipment would need to be placed to provide coverage to all residents currently wired for telephone in Mendocino County. This is a total initial capital outlay of \$1,000,000-\$1,400,000. Additional upfront cost of the provider is approximately \$135 per household connected which includes equipment necessary to have in the home (DSL box). Theoretically speaking this would cover approximately 35,000 homes for an estimated cost of \$175 per home in capital outlay.

There are some communities who will not be able to be served in this way due to a lack of copper wire to the home or the excessive distance of the community from a central office. One option is to continue to serve them with wireless. Another option is to build the telecommunication facilities closer to the end users, which would enable DSL or other high-speed access service.

Actions that could incent this to happen:

- Access to low cost loan funds, and grants, to assist with the upfront capital investment
- Access to ‘any available’ telecommunications resources at ‘any technically feasible location.’ This would include Cal Trans and other state owned telecommunication resources (including fiber)
- Access to put switches in at “regeneration huts” which are signal boosting stations between central offices- to assist in reaching communities who are farthest from central offices.
- A review of telecom tariff zone 3 and zone 4 rates to see if it might be possible to bring them inline with tariff costs charged.

## **Case #2 Serving Trinity County**

Trinity County is presently constructing a series of towers in order to expand telephone coverage to hard to reach areas of Trinity County. While these towers will be municipally owned, space will be leased on these towers to private companies interested in providing a full array of services to residents. Lease costs will be nominal in order to entice services to the county.

Based on access to a series of existing towers at a reasonable lease rate, Trinity County can be covered by an WISP with the expenses being equipment installation on the towers of \$50,000 per tower (10 towers) and approximately \$400-\$500 cost per household (8,500 households), which includes equipment necessary inside the residences. Total estimated upfront cost is \$4,750,000 or \$560 per household. The current residential rate in Weaverville averages \$60.00 per month for broadband.

This plan to cover Trinity County is predicated on the availability of microwave backhaul connecting to the fiber along Highway 5 in Redding. Presently a critical tower used is on U.S. Forest Service land and they are presently working to decommission the tower and take it down. While the Forest Service may not have a present use for the tower it does play a critical infrastructure role in services to Trinity County. Without that tower a replacement location for the existing microwave equipment will be necessary and likely will be in an inferior location.

Actions that could incent this to happen:

- Access to low cost loan funds to assist with the upfront capital investment
- Retaining the tower located on Forest Service land
- Assist Trinity County in negotiating for the balance of the towers to be constructed (6 currently underway).

### **Case #3 Serving the community of Orick**

In 2006 a complete business plan for broadband coverage for the community of Orick was prepared for the County of Humboldt by a consortium of consulting firms. The report is extensive and provides background on the area, a market analysis, financial plan and identified options for getting broadband for the community. The community is a good example of unserved communities in the region, with an estimated 60 users including a few modest businesses in the downtown area. The plan recommends the formation of a community-based ownership structure utilizing the local non-profit economic development corporation. The investment analysis did not indicate a return on investment sufficient to attract private funding. Broadband services were proposed being provided by a private business partner (WISP) utilizing the community owned infrastructure.

The plan recommended that Orick use the 900 MHz band for the point to multi-point access point systems. For backhaul links between sites, the recommended point to point systems are in the 5.8 GHz band. Estimated start-up capital for the recommended structure was just under \$350,000 which included 4 transmission sites necessary to link the valley with backhaul capacity from an IP provider system closer to the urban area of the county, radios for all 60 potential users, technical design and development fees and first year start-up costs. This structure provided the lowest reoccurring cost (\$12,000 compared to \$98,400 in estimated annual reoccurring fees and leases utilizing infrastructure owned by a telecom company.) A revenue analysis revealed with upfront capital costs raised through a combination of E-Rates and grants, the operation of the system could be sustainable on an ongoing basis. This report also contains a fairly extensive list of potential funders for the upfront capital costs. The complete report is available at <http://www.neratech.net/docs/Orick.pdf>.

Interestingly, the Orick area is not presently designated for competition, meaning that other CPUC regulated companies cannot compete with the present designated telecom

provider (Verizon.) The least expensive (and quickest) way to get service to Orick (assuming Verizon is not willing to provide service) is to lift that ban on competition and provide DSL services using a CLEC through the existing copper wire infrastructure. This option is estimated to cost \$120,000 to cover the vast majority of residents.

#### **Case #4 Building for Redundancy**

Multiple microwave routes in and out of the county could provide redundancy for those most in need. Businesses and other tenants for whom redundancy is essential could, with multiple microwave routes, purchase service from multiple providers, switching themselves over should the need arise. Already Humboldt Merchant Services purchases capacity from both a microwave provider and AT&T to ensure they will always be able to service credit card transactions for their national clients.

There was a microwave build-out proposed during the CASF grant process that used a series of towers to create multi-route system centered in Eureka. Routes connected north to Crescent City, linking with Charter, east connecting to the microwave system to Redding developed by Velotech and south connecting with 101 Netlink's system ending in Willits. The routes mapped could cover most, if not all of the unserved communities in Humboldt and southern Del Norte Counties. Total estimated up front capital cost of that system was \$700,000.

#### **Summary:**

The strategies for getting broadband services to rural communities are as unique as the communities themselves. Large telecom providers are well established in the more urbanized communities but have little incentive to invest in serving small outlying areas. While fiber backhaul might be ideal, where fiber is not easily accessible, WISPs are providing alternatives including microwave for a much lower cost.

Due to the capital structure of small local providers, upfront capital costs the barrier to expansion. However, that does not mean that all communities will require grant funding. WISPs use strategies that allow them to recover capital fairly quickly and for the stronger ones access to low cost loans may be sufficient to keep them expanding into unserved communities. The most difficult to serve communities will need grant funding of upfront capital costs but even small communities are able to identify options that create sustainable systems if they are not required to service debt on top of ongoing operating and maintenance costs.

Keys to encouraging expansion of services by WISPs include; minimizing permitting time and cost through uniformity in policy and ordinances at the local and state levels, mobilizing government owned assets to be part of the solution, embracing microwave as an interim solution to a lack of backhaul capacity, and aligning broadband deployment efforts at the state level to work together for maximum efficiency.



There are several actions that have been identified directly by WISPs throughout this paper. Most of those are specific to providers and address issues they are currently facing. The following are more generalized recommendations for action involving WISPs in the effort to provide broadband to all rural communities.

**Recommendations for Action:**

- To the extent possible align interests at the state level in coordinating efforts to get broadband to rural communities. This needs to include a commitment at the permitting agencies as well as across state agencies (e.g. Resources, Transportation, Coastal Commission, EPA).
- Align current broadband linkage efforts at the state level (E-Health, CENIC)
- Develop a low cost loan fund for capital costs. This could be in partnership with a statewide group- SAFE\_BIDCO<sup>1</sup> for example who are already a high risk lender and have program management capacity. This could also serve to leverage CETF and other funding.
- Increase the capacity to mobilize local, state and federal assets for use in getting broadband service to difficult to reach communities (towers, poles, right of way, etc)
- Consider microwave alternatives to fiber backhaul to initiate service to small communities working to increase demand for services over time.
- Develop a small grant program to help communities create plans of action for service; provide incentives for public-private partnerships.
- Create partnerships with other potential funders for these projects (USDA, CDBG, EDA etc) so that programs can leverage each other.

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<sup>1</sup> SAFE-BIDCO- State Assistance Fund for Enterprise- Business and Industrial Development Corporation. A non-deposit lender operating state (CA) and federal loan and guarantee programs that assist all types of business in all stages of development.