BVCNet WiMax Workshop
CUDI April, 2009

Walt Magnussen, Ph.D.

Texas A&M University

22 April, 2009

Agenda

- ITFS/WiMax History
- WiMax Technical discussion
- Potential costs/revenue
- Applications round table
- Next Steps

WiMax History

- Institutional Television Fixed Services (ITFS) first introduced as a line of sight service that made up to 4 microwave channels available to degree granting institutions.

- Late 1980s, FCC allows leasing of spectrum providing 5% of "services" are retained by the license holder.

- 1998 FCC authorizes digital transmission over ITFS channels making two-way data communications possible.

- In 2001 the FCC stated their intention to keep the spectrum in the hands of the educational entities. At the same time Non- Line-of-sight (NLOS) services emerged (i.e. WiMax)

- 2008 – Clearwire and Sprint announce WiMax based metropolitan Wireless Internet Service Provider (WISP) offering
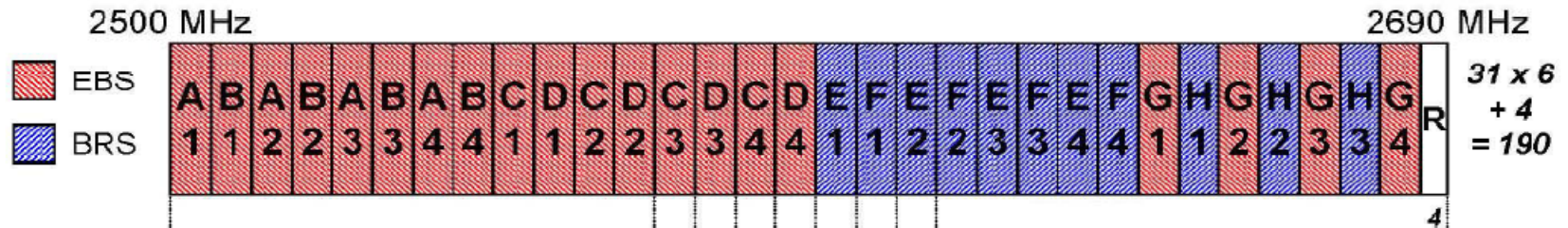
FCC migrates ITFS to EBS

- 2005 FCC begins planning for transition from ITFS to EBS
- April 2006 FCC Docket is released with formal plan (FCC 06-46)
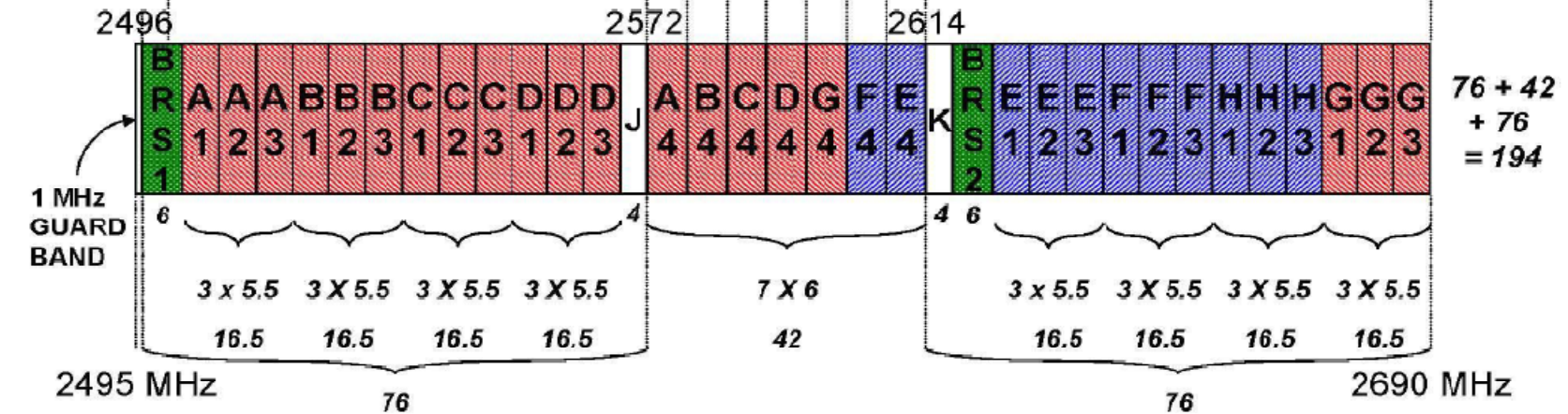- Plan offers transition planning.

Frequency Mapping

BRS-EBS BAND PLANS: PRE-TRANSITION AT 2500–2690 MHz & POST-TRANSITION AT 2495–2690 MHz

BCS channels available

- Bryan ISD – WNC220
  - A1, A2, A3, A4
- College Station ISD
  - B1, B2, B3, B4
- Texas A&M University
  - C1, C2, C3, C4
- Blinn College
  - D1, D2, D3, D4

Spectrum options

- Lease all 4 channels
- Lease 3 channels and build one channel
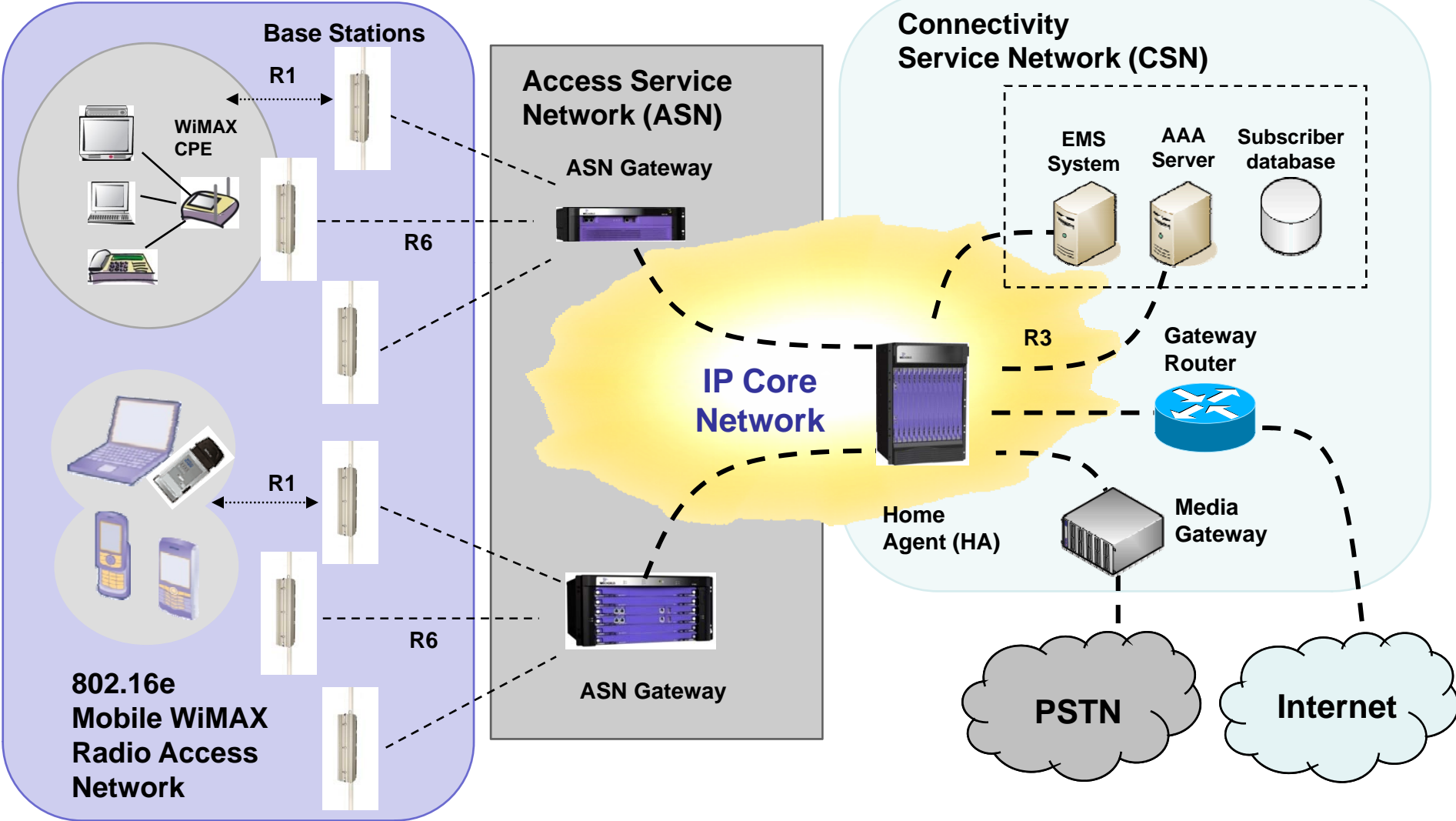- Build all 4 channels
- Do nothing (lose spectrum)

WiMax Tecnology Overview

Based upon information obtained by ADC Corp.

Only other major competitor is Andrews Wireless.

Open Architecture for ADC WiNetworks

ADC FlexWave WiMAX Advantages

- Complete, self enclosed pico, single and 3-sector **802.16e** outdoor base station solutions
  - Pole mountable, no tower or hut needed
  - High power macro outdoor
  - Lower power for pico indoor/outdoor.
  - Fully hardened outdoor solutions
- Backhaul diversity capability BUILT INTO macro base stations
  - Multiple backhaul technologies can be utilized
    - Millimeter Wave, Microwave, Ethernet, Fiber
- Rapid deployment by design
  - Small footprint enclosure, easily mounted anywhere
- Fully integrated and tested EcoSystem with ASN, CSN, CPE, and Backhaul options

FlexWave™ MMX 8000
3 sector BS

FlexWave™ MMX 7000
1 sector BS

FlexWave™ MMX 6000
1 sector Pico BS

WiMAX Base Station Capacity
Maximum Throughput Per Sector (2 x 2 MIMO)

Channel Bandwidth	7MHz	10Mhz
Modulation	Total available bandwidth UL and DL (Mbps)	
64QAM 5\6	29.03	38.81
64QAM 3\4	25.98	37.11
64QAM 2\3	23.07	32.71
QAM 64 1\2	17.39	24.74
16QAM 3\4	17.39	24.74
16QAM 1\2	11.48	16.61
QPSK 3\4	8.66	12.43
QPSK 1\2	5.77	8.28

MMX 5200
Outdoor Unit CPE with Ethernet Interface

- **Mobile-WiMAX-compliant** based on IEEE 802.16e standards
- **Supports worldwide WiMAX deployments** in the 2.5GHz and 3.5GHz bands
- **Excellent performance in NLOS conditions -** overcoming multi-path and deep fading, providing extended range and easy installation
- **Triple-play solution for data, voice and video**
- **High-Gain Integrated Antenna**
- **Automatic Transmit Power Control (ATPC)** allowing for optimal network deployment, tight frequency reuse, and interference avoidance
- **High-data throughput** for high bandwidth utilization
- **Guaranteed voice, video and data services** with a variety of classification/prioritization schemes
- **Sophisticated QoS** allowing differentiated services
- **Support of Ethernet Interface**
- **Up to 26dBm** output power
- **Software selectable** channel bandwidths (beam width of the signal)

MMX 5400
SoHo/SME and Residential Modem – Data Only

- **Mobile-WiMAX-compliant** based on IEEE 802.16e standards
- **Supports worldwide WiMAX deployments** in the 2.5GHz and 3.5GHz bands
- **Excellent performance in NLOS conditions -** overcoming multi-path and deep fading, providing extended range and easy installation
- **Automatic Transmit Power Control (ATPC)** allowing for optimal network deployment, tight frequency reuse, and interference avoidance
- **Self-Install Unit** is easy and convenient to home and office users
- **High-data throughput** for high bandwidth utilization
- **Guaranteed voice, video and data services** with a variety of classification/prioritization schemes
- **Sophisticated QoS** allowing differentiated services
- **Support of Ethernet Interface**
- **Up to 26dBm** output power
- **Two High-Gain Omni Antennas** (7 dBi)
- **Software selectable** channel bandwidths (beam width of the signal)

MMX 5500
SoHo/SME and Residential Data + VOIP

- **Mobile-WiMAX compliant** based on IEEE 802.16e standards
- **Supports worldwide WiMAX deployments** in the 2.5GHz and 3.5GHz bands
- **Excellent performance in NLOS conditions -** overcoming multi-path and deep fading, providing extended range and easy installation
- **Automatic Transmit Power Control (ATPC)** allowing for optimal network deployment, tight frequency reuse, and interference avoidance
- **Self-Install Unit** is easy and convenient to home and office users
- **High-data throughput** for high bandwidth utilization
- **Voice-over-IP -** providing high quality telephony over the Internet
- **Guaranteed voice, video and data services** with a variety of classification/prioritization schemes
- **Sophisticated QoS** allowing differentiated services
- **Up to 26dBm** output power
- **Software selectable** channel bandwidths
- **Two High-Gain Omni Antennas** (7 dBi)
- **Interfaces:** LAN 10/100BaseT: RJ-45   VoIP: RJ-11 Port

MMX 5600
SoHo/SME and Resid'l Gateway+VOIP+WLAN

- **Mobile-WiMAX compliant** based on IEEE 802.16e standards
- **Supports worldwide WiMAX deployments** in the 2.5GHz and 3.5GHz bands
- **Excellent performance in NLOS conditions -** overcoming multi-path and deep fading, providing extended range and easy installation
- **Automatic Transmit Power Control (ATPC)** allowing for optimal network deployment, tight frequency reuse, and interference avoidance
- **Self-Install Unit** is easy and convenient to home and office users
- **High-data throughput** for high bandwidth utilization
- **SoHo/SME and residential service gateway for WiMAX broadband services**
- **VoIP functionalities for phone services over Internet**
- **Supporting 1.X, 2.X, 3.X GHz WiMAX bands**
- **Four** 10/100 ports**, two** independent phone lines (FXS) RJ-11 (P
- **WLAN - 802.11b/g Access-Point**
- Two 2dBi internal Wi-Fi antennas
- **Two High-Gain WiMAX Omni Antennas** (4 dBi)
- **Output Power:** 24dBm +/-2dB maximum

MMX 5700
PCMCIA Card

- **Mobile WiMAX subscriber unit for wireless WiMAX delivery to personal computers**
- **Enables personal broadband connection to any laptop computer**
- **Mobile-WiMAX compliant** based on IEEE 802.16e standard. WiMAX profile Wave2 compliance
- **Support of worldwide WiMAX deployments** in the 2.X and 3.X GHz bands
- **Quadruple play solution** for data, video, voice and mobility to personal computer
- **Plug-and-play** installation and operation
- **Excellent performance in NLOS conditions -** overcoming multi-path and deep fading, providing extended range and easy installation
- **Numerous applications and services -** guaranteed voice, video and data services based on advanced QoS levels and a variety of classification/prioritization schemes
- **Low cost of ownership** through simple installation – Microsoft XP drivers - and demand-based build-out, enabling operators to rapidly penetrate new market segments with minimal CAPEX
- **Supports PCMCIA Type II** Interface
- **OS:** Windows XP SP2 Vista (2008)
- **Output Power:** 20dBm +/-1dB maximum

MMX 5800
USB Dongle

- **Mobile-WiMAX compliant** based on IEEE 802.16e standard. WiMAX profile Wave2 compliance
- **Supports worldwide WiMAX deployments** in the 2.X and 3.X GHz bands
- **Quadruple play solution** for data, video, voice and mobility to personal computer
- **Plug-and-play** installation and operation
- **Full Non-Line of Sight (NLOS) deployment -** overcoming multi-path and deep fading, providing extended range and easy installation
- **Numerous applications and services -** guaranteed voice, video and data services based on advanced QoS levels and a variety of classification/prioritization schemes
- **USB2.0 Interface**
- **MRC (Maximum Ratio Combining)** technology utilizes dual receive antennas to enhance receiving signal quality
- **MIMO (Multiple Input, Multiple Output)** technology improves transmission speed and coverage
- **Output Power @ antenna port** - 23dBm @16QAM

WiChorus SmartCore Platform

Subscribers

SC 1400

SC 600

SC 100

SC 20

| 5,000 Subscribers
1 Gbps | 100,000 Subscribers
5 Gbps | 750,000 Subscribers[1]
25 Gbps | 1,650,000 Subscribers[1]
55 Gbps |

Intelligent ASN Gateway

Intelligent Home Agent

Gbps

1 Redundant Configuration

WiChorus ASN Key Advantages

- **Carrier class, high availability, massively scalable** (5K – 1650K subscribers)
- **Intelligent Real-Time Content Management**
  - Managing Content and Peer-to-Peer Traffic
- **Smooth Migration Path** – from fixed to fully mobile
- **Mobility and Network Optimization**
  - Backhaul and Spectral Optimizations – save CapEx/OpEx
  - Enable fixed, nomadic and full mobility
- **Open Standards-based solutions -** Open R6 interface
  - Enables best-of-breed wireless networks
  - Leverage advances in base station technology (pico/femto, etc.)

CSN Functionality

CSN – a set of network functions that provide IP connectivity services to WiMAX subscribers:

- AAA (authentication, authorization, and accounting)
- DHCP
- Prepaid billing
- Provisioning
- Customer portal
- Policy management
- Captive portal
- Customer care
- Service portal

Features

AAA

DHCP

Customer Interface

Provisioning

Billing

Cost and Deployment Issues for BVCnet

- RFP for spectrum Leasing
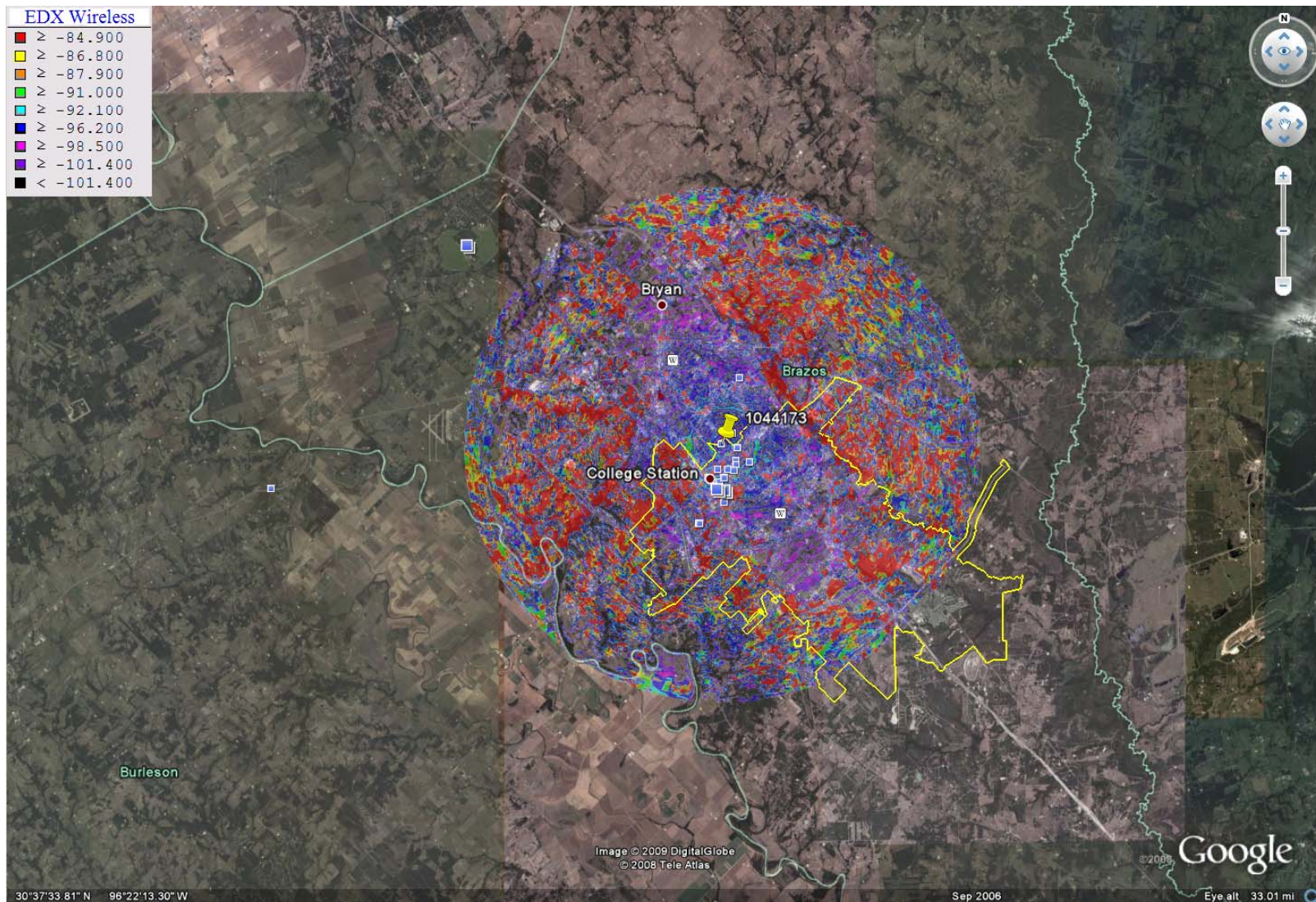- Build our own?
- Management/service issues

RFP

- TAMU to do ILA with BISD, CSISD, Sommerville ISD and Blinn College. Other TAMU Universities to do Telecom Work Orders
- TAMU intends to contract with Todd Gray
- Each entity would sign their own contract and decide upon their own best path.

Tower 1044173 (3 sectors)
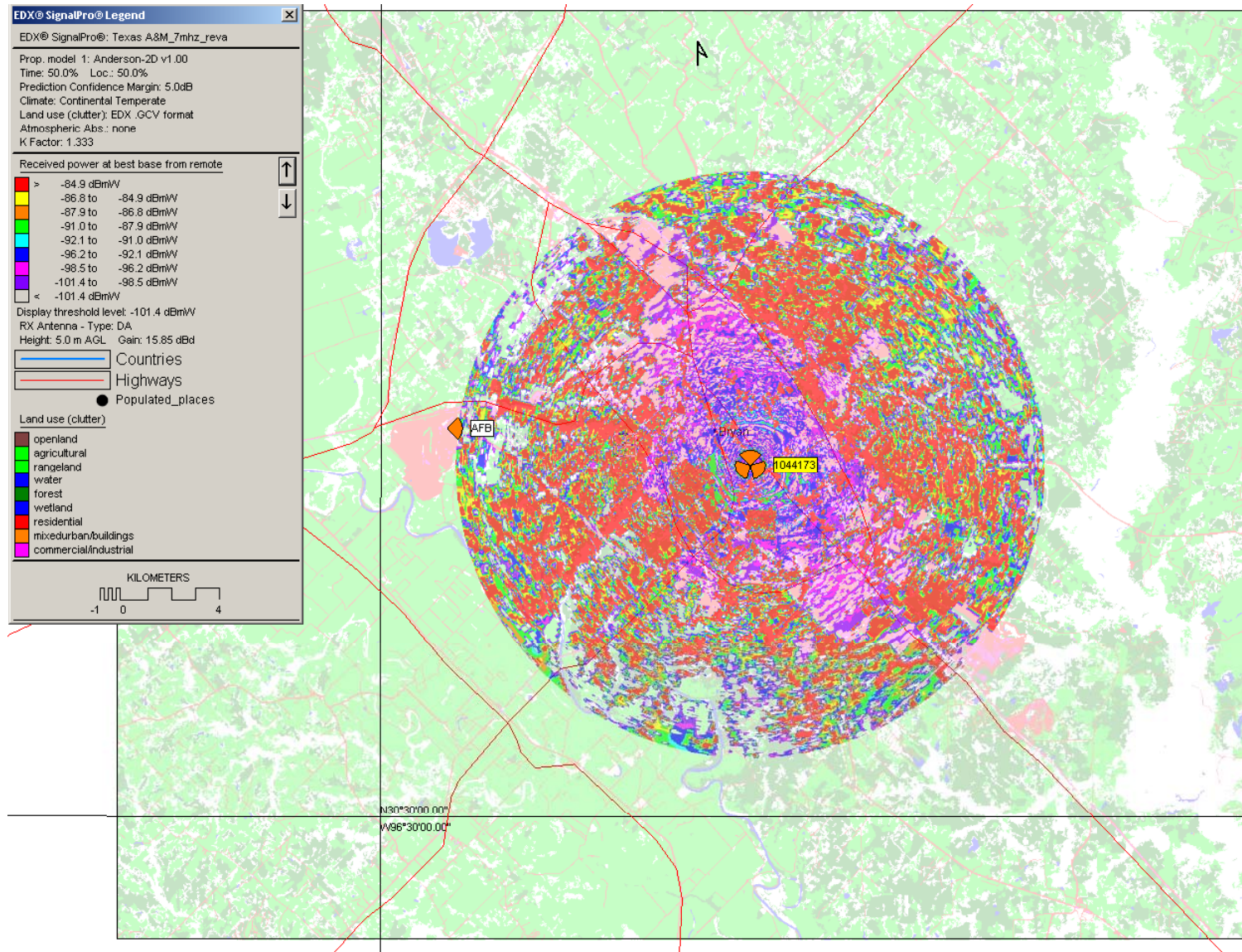
Google Map view

Cost Proposal to Build

Microsoft Excel - Texas A&M WiMax proposal.htm

File Edit View Insert Format Tools Data Window Help Adobe PDF

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Budgetary Quote for Texas A&M Pilot Project

Quan	ADC Catalog #	Description	Sell Price	Extended Price
4	MMX-7125-24 - SYS	Single Sector WiMAX basestation, 2.5GHz, MIMO, 36dBm, GPS, Cables, Mounting kit	$10,900	$43,600
4	MMX-ANT35090	ANT Sector BST 3.3-3.8GHz 17dBi 90° X-Pol	Included	$0
1	MMX-PS3S-ODU	ODU Power System supporting up to 3 Base Stations	$4,900	$4,900
1	MMX-PS1S-ODU	ODU Power System supporting 1 Base station	$2,500	$2,500
25	MMX-5325-2-O/X	Outdoor Subscriber Unit with Ethernet interface to indoor unit, 2.5GHz, MIMO with Indoor combined data and power adapter that interfaces to the outdoor unit, includes one port of 10/100 Base-T, Omni Antenna 7dBi	$450	$11,250
1	MMX-WIC-SC20	WiChorus SC 20 ASN Gateway, supporting 500 users	$31,500	$31,500
1	MMX-WIC-EMS500	WiChorus EMS for 500 Users	$3,750	$3,750
1	MMX-WIC-MGW	WiChorus Mobile Internet Gateway Option for 500 Users	$2,000	$2,000
1	MMX-NMS-04	MMX NMS Basic Package, including license for up to 4 Base Stations (server not included)	$4,875	$4,875
2	MMX-IM-TRAIN	Installation & Maintenance Training Fee for one day (excluding travel and accommodation expenses)	$2,950	$5,900
TOTAL				$110,275

Note: SLA charge of 1.25% of equipment cost for month for Support and software upgrades not included
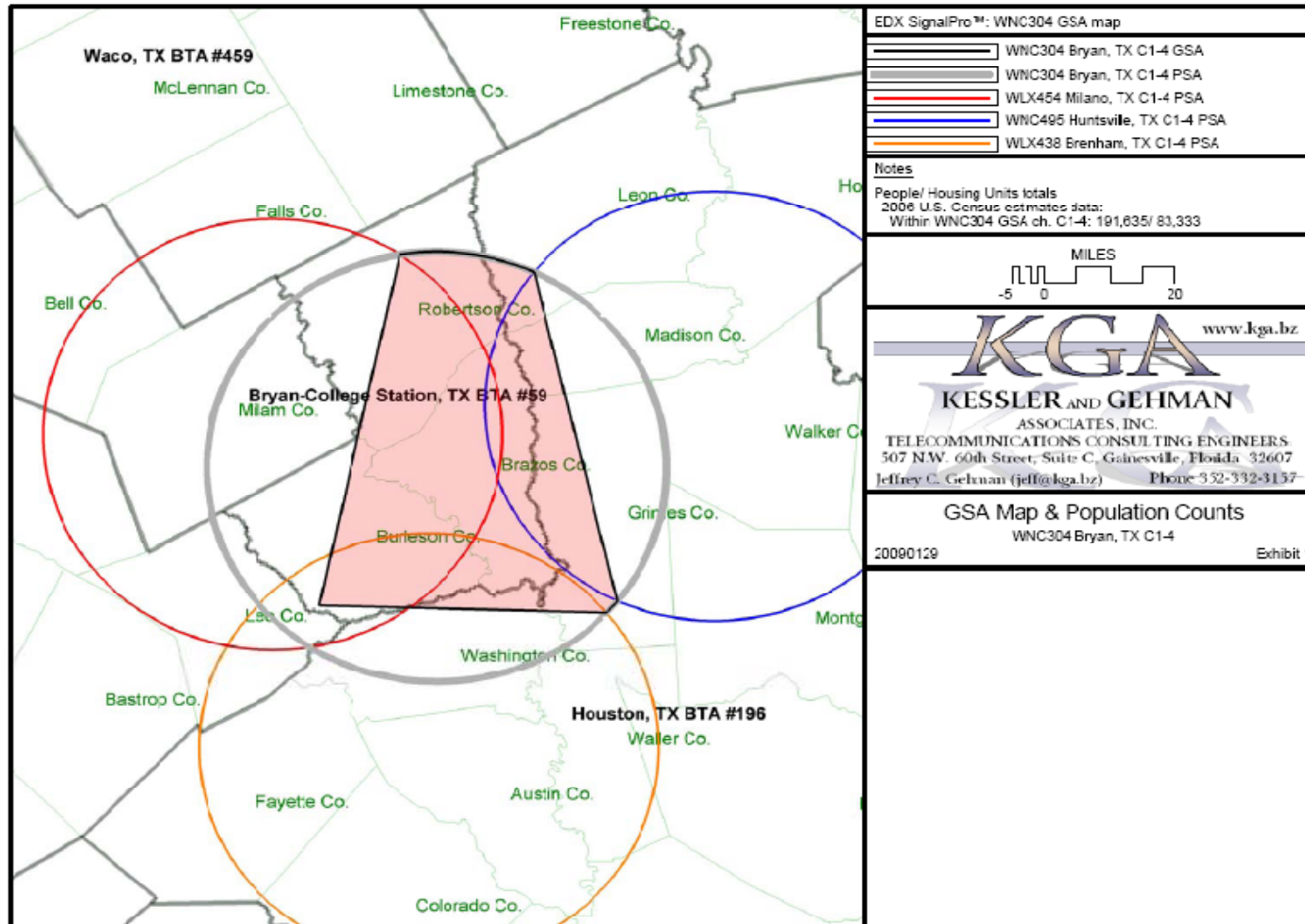
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Ready

Potential Revenue

- Range of revenue for each liscense.
  - Low
    - $75,000 up front
    - $2,250 per month for up to 30 years
  - High
    - 100,000 up front
    - $3,200 per month for up to 30 years

EBS coverage area

Costs

- Atty. fees associated with Lisc. $10,000
- Equipment construction

  $150,000

- Tower Rental (Bryan)

  $12,000/year
- Maint. $18,000/year
- Support $3,000/year

Application Brainstorming

- TAMU
  - Special Events
  - Small off campus sites
  - Faculty with no other Broadband capabilites
  - Fiber backup
  - University Police
  - Bus GPS location

Open Discussion