The World of Telecommunications Sites and Site Licensing

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Situation and Meeting Purpose

- Demand growth for wireless services is driving an ever increasing need for new wireless sites
- Opens revenue opportunities
  - A single cell site on a roof top in the Lower Mainland - $20,000 to $30,000 per annum rent
- Opportunity comes with challenges
  - Management of leases
  - Radio Frequency (RF) safety
  - Public fear of radio systems
- Purpose of this session
  - Introduce the telecom revenue opportunity
  - Outline typical installations and associated costs
  - Outline typical License terms
  - Flag key issues
  - Close with a discussion of RF Safety

Telecommunications Industry over Last 30 Years

- Dramatic change
- Continual Transfer of ownership
- Massive market consolidation to a very few key players that now dominate the telephone, television, mobile communication markets – emphasis is on wireless
- Big Wireless players in Vancouver
  - Bell (wireless, telephone, TV distribution, data)
  - Telus (wireless, telephone, data, TV distribution)
  - Rogers (wireless, telephone, data, TV distribution)
  - Shaw (telephone, data, TV distribution)
  - Eastlink (telephone, data, TV distribution)
- New Entrants - wireless entrants
  - Wind (Globalive)
  - DAVE (Mobilicity)

Wireless Carriers – Real Estate Teams

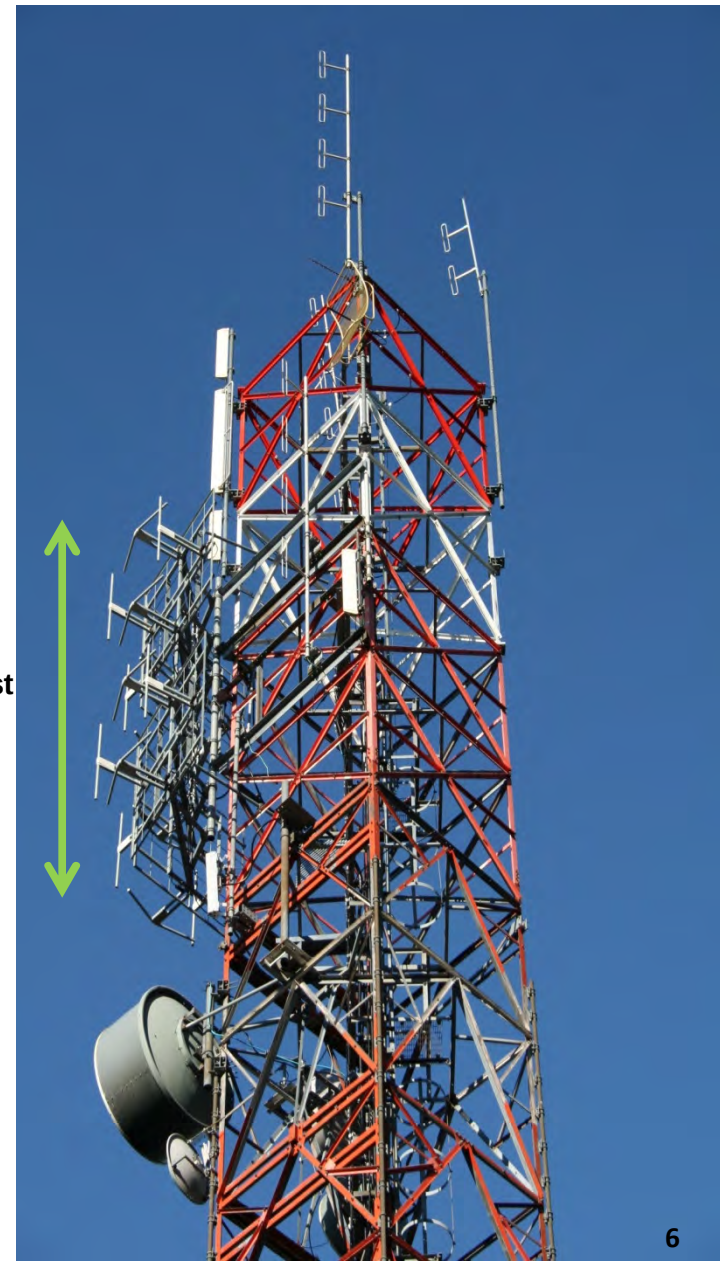
- Represent a significant challenge for Landlords with little or no expertise in negotiating and maintaining rental leases for wireless sites
  - If the Telecom opportunity is pursued, Landlords will need to have trained staff to negotiate and administer wireless agreements
- Wireless Carrier Real Estate Teams
  - Incented to get the best deal for the Carrier
  - Uncanny ability to work landlords and get unprecedented deals such as:
    - Exclusive control of roof tops
    - Leases with no cap to number of antennas
    - No restrictions to sub-tenants
    - 15 year initial terms
  - Set some unrealistic precedents in the Industry which are taking a number of License terms to rectify
    - Most landlords have leases (not licenses)
    - Most landlords are receiving an antenna rental amount much lower than what they should be
    - Most landlords are not able to make the telecom tenants pay for changes to the site and for tenant safety
    - Most landlords have agreements which does not limit the number of antennas on a roof top and now find themselves with far more antennas than they imagined “antenna creep.”
    - Most landlords find themselves with large antenna installations – most of which are not properly permitted

Radio Technologies

- Broadcast
- Paging
- VHF and UHF Mobile Communications
- Cellular: 800MHz (original), 1900PCS, 2100 AWS and coming 700MHz

Broadcast

- "One to many"
- "Point-to-Multi-Point"
- A broadcaster will develop one site to serve Greater Vancouver
- Site must be physically dominant and have power
- Broadcast sites are very high powered
- RF safety procedures must be exercised
- Antennas are massive
- This is a static technology. No new sites are developed. Minimal changes



Mobile Radio

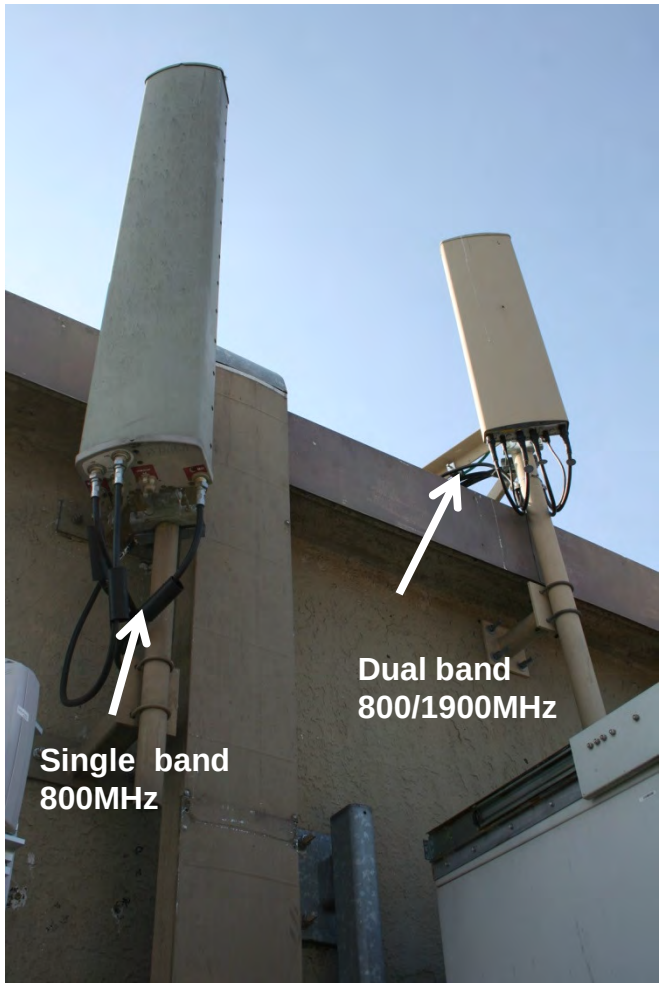
- “Few to many”
- “Point-to-multi-point”
- A mobile radio operator will develop 10-30 sites to serve Greater Vancouver
- Each site must be physically dominant
- Mobile radio sites are very moderately powered
- If mobile radio sites are located on the tops of towers, there is little concern for the RF emission levels at ground levels to be unsafe.
- Antennas are whip, panel or a series of dipoles in a vertical array, typically one meter in length
- Mobile radio operators have to renew their radio systems every 15 years or so and with it comes some design changes to match the technology advances. Semi-static

Microwave

- "One to One"
- "Point-to-Point"
- Used to trunk large volumes of data and bypasses fiber routes and is used as an alternate private technology to leased line connections
- Antennas are parabolic (round)
- Depending on the distance between end points, different sized antennas are deployed ranging from 1ft to 12ft in diameter
- Microwave systems are located in "dominant" sites that have a clear view (line-of-site) to the end point
- Microwave technology within metro areas was all but dead by the early 2000's. The technology has enjoyed a massive resurgence thanks to the demand by cellular operators for inexpensive backhaul solutions from cell sites
  - Cell operators require short distance connections typified by small antennas. 2ft is the most common size deployed
- Microwave systems need to be refreshed every 15 or so years. Also new advances allow greater capacity to the systems which for the operator to take advantage, requires configuration changes. Semi-static

Cellular

- 800MHz – large serving area cells
  - 80 or so to provide service to the Lower Mainland
  - Higher power
- 1900MHz – PCS bands – smaller serving area cells
  - 150 or so sites to provide service
  - Cell radius – 5km
- 2100MHz AWS – smaller serving area cells
  - 250 or so sites to provide coverage
  - Cell radius 2-3km
- All cell sites have sectors
  - One antenna is assigned per sector
  - All antennas are “panel” and typically 1m in length
  - A sector ranges in size from 120 degrees to 15 degrees or smaller
- Cellular equipment has an 8-10 year life before obsolescence



How do Cell Operators address traffic growth?

1. Split sectors
   - Add more antennas to a site
2. Split service areas
   - Add more cell sites by dropping in a new site amongst existing sites and re-configuring the existing sites to accommodate less traffic

Bottom line – Cell sites are always changing. Becomes an issue when managing a license agreement with a cellular operator

Cell Operators are always:

- Adjusting and realigning antennas
- Adding new antennas to sites
- Adding more microwave capability to each site backhaul more traffic

Trends in Antenna Technology for Mobile Carriers

- The market is moving to a “cost per antenna pricing model” for rent
- Towers have limited capacity and methods to reduce numbers of antennas are necessary to ensure structural integrity
- The big carriers are operating service across multiple bands
- Antenna manufacturers are moving to “dual” and “tri” band antennas
  - One antenna can carry multiple frequency assignments
  - Net radiated power significantly increased across the antennas
- Other trends – need for in-building fill

700MHz Cellular

- Subject of coming auction in late 2012
- “Cream” of the mobility spectrum
- Capable of providing coverage to large areas – even larger than 800MHz
- For Landlords with radio infrastructure in place – means more antennas!!

Types of Radio Sites - Towers

- Large capital expenditure
  - A new 45m free-standing will cost between $500K - $600K
  - Includes land surveys, development
  - Foundation design and installation
  - Development of power to site
  - Construction of tower
  - Development of a shelter with back-up power
- Fixed and once built will likely never be removed
  - Towers are EXCEEDINGLY difficult to build in the Lower Mainland due to the public consultation process
  - Once in place, become an integral part of the telecom network and almost impossible to relocate
  - Valuable asset
- 30 year amortization typical
- Tower maintenance includes
  - Regular structural audits / reinforcing as antennas are added to the load
  - Guy anchor points
- Towers do fall. Many examples.

Types of Radio Sites - Free-Standing Towers

- Small "Eiffel" towers, typically less than 50m in height
- Most expensive to build at $10-15K per meter of height
- Requires small plots of land – typically 250 sq meters

Types of Radio Sites – Guyed Towers

- The tower sits on a pivot and is held in place by the guys
- Guyed towers are the tallest towers and can be 100m or more in height
- Guyed towers are less expensive to build than free-standing - $8K-$10K per meter typical
- Requires large tracts of land for the anchor points. The taller the tower, the greater the land required for the anchor points (Acres)

Types of Radio Sites - Monopoles

- Giant lamp standards
- Typically 20-30m in height
- Monopoles are less expensive to build than guyed
- $8K per meter of height typical
- Like free-standing towers, monopoles require small tracts of land – typically 250 sq meters

Types of Radio Sites - Rooftops

- Most prevalent cell site type in Vancouver
- Most prevalent form of new radio site developed each year
- Antennas are mounted to the parapet surrounding the roof top or mounted to the penthouse on the roof top
- RF safety is a ***significant*** issue on roof tops due to the need for workers (HVAC, painters, window washers etc) with no training in the hazards of RF to work on the roof top

Typical Market Principles for Telecommunication Site Licenses

- **The Occupant pays for everything**
  - Proof of structural integrity
  - Permits
  - Power
  - Licensing with Industry Canada
  - Safety Code 6 testing
  - Lock boxes / Access provisions
  - Equipment installation
  - Camouflaging the antennas on rooftops
- **The Occupant must have prior approval before commencing with any new antenna systems**
  - Most landlords ask for an application fee to cover administration costs for first time applicants
  - Most landlords asks for an application fee for each antenna change to address admin costs associated with the changes to the lease
- **The Occupant's monthly license fee includes:**
  - a standard cost ***per*** month per mobility, UHF antenna or GPS antenna
  - a standard cost per month ***per*** microwave antenna proportional to the antenna size
  - a standard cost per square foot ***per*** month for the space occupied for all equipment
- **The Occupant must obey noise and other by-laws**
- **For co-location on towers, Occupant pays for:**
  - Structural tower analysis every time an antenna is added or moved ($3K - $4K)
  - Installation on the tower including special rigging
  - Reinforcement of the tower to support the change in load to match the antenna changes

Permit Conundrum

- Most landlords stipulate that Occupants have all necessary permits
- Telecom operators typically do apply for permits when first developing the site
  - Really just a means for the Operator to get established at the site
- However once the site is developed, telecom operators ***rarely*** apply for City permits for any changes

- **ISSUE** Telecom operators are federally regulated and believe that they do not fall under the jurisdiction of the local Cities.

Aesthetics

- Antennas on the roof raise unnecessary concerns from the tenants. The market is moving to shrouds and screens to hide the presence of antennas

Different views of the camouflage screen.

Top left shows edge of screen. Top right shows mobility panel antennas behind the screen mounted to screen struts. Bottom shows view from the road

Aesthetics Continued

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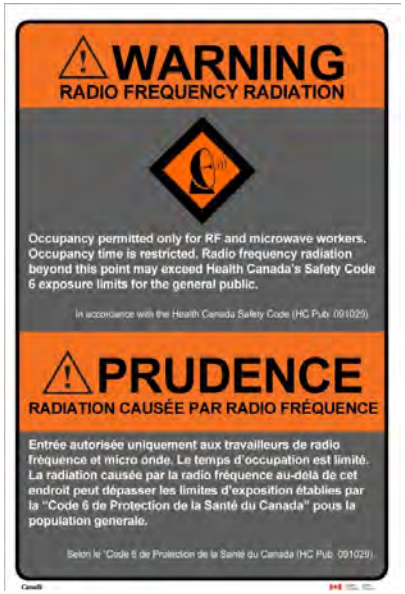
Industry Canada's Roles

- Licenses for frequency assignments
- Resolution of interference issues
- Safety Code 6

What is Safety Code 6?

- Written by Health Canada, the Code stipulates the maximum radiation levels for the general public and for RF workers
- The general public covers everyone that is not trained in the hazards of RF
- RF workers are expected to be trained in the hazards of RF and therefore understand the precautions that need to be undertaken when working near antennas
- Signs and “cordoning off” indicates hazard level. Red signs like the one below indicate exposure levels greater than allowable limits for RF workers. Orange signs like the right indicate exposure levels greater than allowable limits for the general public. Ideally roof tops are designed so that emissions are lower than limits set f0r the general public.



QUESTIONS?