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CAPE COD COMMISSION

Technical Bulletin 97-001
Guidelines for DRI Review of Wireless Communication Towers
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I. Background

Throughout the United States, there is a proliferation of new structures on the landscape: communication towers to serve the growing market for mobile telephone and other personal wireless services. Numerous wireless facilities have been constructed on Cape Cod in recent years. Varying in height from less than fifty to over three hundred feet, these towers have a powerful impact on the visual character of the Cape.

Responding to concerns about the visual impacts of wireless facilities, in 1996 the Cape Cod Commission and the Barnstable County Commissioners and Assembly of Delegates adopted a new Development of Regional Impact threshold for these facilities. The Cape Cod Commission's Enabling Regulations specify that construction of any wireless communication tower exceeding thirty-five (35) feet in height is a Development of Regional Impact (DRI). The only personal wireless service facilities that require Commission review are ground-mounted facilities (i.e. wireless communication towers). Wireless facilities mounted on existing structures or buildings are not considered Developments of Regional Impact.

Reconstruction or replacement of an existing wireless communication tower on the same site is not considered a DRI provided that the reconstruction or replacement does not exceed the height of the existing structure by more than twenty (20) feet.

II. Purpose and Intent

The Regional Policy Plan (RPP) sets forth the Minimum Performance Standards for all Developments of Regional Impact, including some specific performance standards and development review policies for wireless communication towers. The purpose of this Technical Bulletin is to provide general guidelines for DRI applicants regarding application requirements and conformance with the Regional Policy Plan. In reviewing proposed wireless communication towers, the Commission may waive application of the RPP's Minimum Performance Standards provided that it finds that such standards are outside the scope of the proposed project.

It is the express purpose of these Guidelines to minimize the visual and environmental impacts of wireless facilities. The Commission will review proposals for wireless facilities in keeping with the Regional Policy Plan and each town's existing bylaws and historic development patterns, including the size and spacing of structures and open spaces.

III. Definitions

A. Abandonment. The intent to abandon or discontinue operations as evidenced by voluntary conduct, whether affirmative or negative, or failure to use a facility for a period of six (6) months or more.

B. Above Ground Level (AGL). A measurement of height from the natural grade of a site to the highest point of a structure.

C. Antenna. The surface from which wireless radio signals are sent and received by a personal wireless service facility.

D. Camouflaged. A personal wireless service facility that is disguised, hidden, part of an existing or proposed structure or placed within an existing or proposed structure is considered "camouflaged."

E. Carrier. A company that provides wireless services.

F. Co-location. The use of a single mount on the ground by more than one carrier (vertical co-location) and/or several mounts on an existing building or structure by more than one carrier.

G. Cross-polarized (or dual-polarized) antenna. A low mount that has three panels flush mounted or attached very close to the shaft.

H. Environmental Assessment (EA). An EA is the document required by the Federal Communications Commission (FCC) and the National Environmental Policy Act (NEPA) when a personal wireless service facility is placed in certain designated areas.

I. Equipment Shelter. An enclosed structure, cabinet, shed or box at the base of the mount within which are housed batteries and electrical equipment.

J. Fall Zone. The area on the ground within a prescribed radius from the base of a personal wireless service facility. The fall zone is the area within which there is a potential hazard from falling debris (such as ice) or collapsing material.

K. Functionally Equivalent Services. Cellular, Personal Communication Services (PCS), Enhanced Specialized Mobile Radio, Specialized Mobile Radio and Paging.

L. Guyed Tower. A monopole or lattice tower that is tied to the ground or other surface by diagonal cables.

M. Lattice Tower. A type of mount that is self-supporting with multiple legs and cross-bracing of structural steel.

N. Monopole. The type of mount that is self-supporting with a single shaft of wood, steel or concrete and a platform (or racks) for panel antennas arrayed at the top.

O. Mount. The structure or surface upon which antennas are mounted, including the following four types of mounts:

1. Roof-mounted. Mounted on the roof of a building.
2. Side-mounted. Mounted on the side of a building.
3. Ground-mounted. Mounted on the ground.
4. Structure-mounted. Mounted on a structure other than a building.

P. Omnidirectional (whip) antenna. A thin rod that beams and receives a signal in all directions.

Q. Panel Antenna. A flat surface antenna usually developed in multiples.

R. Personal Wireless Service Facility. Facility for the provision of personal wireless services, including the mount, antenna(s), equipment shelter(s) and security barrier.

S. Radiofrequency (RF) Engineer. An engineer specializing in electrical or microwave engineering, especially the study of radiofrequencies.

T. Radiofrequency Radiation (RFR). The emissions from personal wireless service facilities.

U. Security Barrier. A locked, impenetrable wall, fence or berm that completely seals an area from unauthorized entry or trespass.

V. Separation. The distance between one carrier's array of antennas and another carrier's array.

W. Wireless Communication Tower. Any guyed, monopole, or self-support (lattice) tower, constructed as a free-standing structure proposed to contain or containing one or more antennas intended for transmitting or receiving television, AM/FM radio, digital, microwave, cellular, telephone or similar forms of electronic communication. This definition does not include amateur radio operator antennas or television antennas which are accessory to a residential use, or communications facilities which are exclusively accessory to a marine use.

IV. Location

Applicants seeking Development of Regional Impact (DRI) approval for personal wireless service facilities should comply with the following:

A. If feasible, personal wireless service facilities should be located on existing structures, including but not limited to buildings, water towers, existing telecommunications facilities, utility poles and towers, and related facilities, provided that such installation preserves the character and integrity of those structures. In particular, applicants are urged to consider use of existing telephone and electric utility structures as sites for one or more personal wireless service facilities. The applicant shall have the burden of proving that there are no feasible existing structures upon which to locate.

B. If the applicant demonstrates that it is not feasible to locate on an existing structure, personal wireless service facilities should be designed so as to be camouflaged to the greatest extent possible, including but not limited to use of compatible building materials and colors, screening, landscaping and placement within trees.

C. The applicant shall submit documentation of the legal right to install and use the proposed facility mount at the time of application for a Development of Regional Impact approval.

V. Dimensional Requirements

Personal wireless service facilities should comply with the following requirements:

A. Height, General. Personal wireless service facilities should be no higher than ten feet above the average height of buildings within 300 feet of the proposed facility. However, the height of a personal wireless service facility should not exceed the height limits of the zoning district in which the facility is proposed to be located, unless the facility is completely camouflaged such as within a flagpole, steeple, chimney, or similar structure.

B. Height, Ground-Mounted Facilities. Ground-mounted personal wireless service facilities (i.e. wireless communication towers) should not project higher than ten feet above the average building height or, if there are no buildings within 300 feet, these facilities should not project higher than ten feet above the average tree canopy height, measured from ground level (AGL). If there are no buildings within 300 feet of the proposed site of the facility, all ground-mounted personal wireless service facilities should be surrounded by dense tree growth to screen views of the facility in all directions. These trees may be existing on the subject property or proposed to be planted as part of the application.

C. Height, Wireless Facility Overlay Districts. If a town has established a wireless facility overlay district (as designated on the town zoning map) where taller facilities are permitted, personal wireless service facilities of up to 150 feet in height may be allowed. Monopoles are the preferred type of mount for such taller structures.

D. Setbacks. All personal wireless service facilities and their equipment shelters should comply with the building setback provisions of the zoning district in which the facility is located. In addition, the following setbacks should be observed:

1. In order to ensure public safety, the minimum distance from the base of any ground-mounted personal wireless service facility to any property line, road, habitable dwelling, business or institutional use, or public recreational area should be the height of the facility/mount, including any antennas or other appurtenances. This setback is considered a "fall zone." The applicant shall provide proof of a legal interest in the fall zone, including but not limited to proof of fee ownership, an easement, or a leasehold sufficient to meet the requirements of this section.

2. In reviewing an application for a personal wireless service facility, the Commission may reduce the required fall zone by as much as 50% of the recommended distance, if it finds that a substantially better design will result from such reduction. In making such a finding, the Commission should consider both the visual and safety impacts of the proposed facility.

VI. Special Regulations. Personal wireless service facilities should comply with the Performance Standards set forth in this section.

A. Design Standards

1. Camouflage. Personal wireless service facilities should be camouflaged or hidden from public view wherever possible by incorporating them into an existing or proposed structure, by using fiberglass to replace building elements, and/or through careful selection of construction materials and/or color.

2. Buffers. If personal wireless service facilities are not camouflaged from public viewing areas by existing buildings or structures, they should be surrounded by buffers of dense tree growth and understory vegetation in all directions to create an effective year-round visual buffer. Ground-mounted personal wireless service facilities should provide a vegetated buffer of sufficient height and depth to effectively screen the facility. Trees and vegetation may be existing on the subject property or installed as part of the proposed facility or a combination of both. The Commission will work with the applicant to determine the types and sizes of trees and plant materials and depth of the needed buffer based on site conditions.

3. Color. To the extent that any personal wireless service facility extends above the height of the vegetation immediately surrounding it, it should be painted in a light grey or light blue hue which blends with sky and clouds.

4. Equipment Shelters. Equipment shelters for personal wireless service facilities should be designed consistent with one of the following design standards:

a. Equipment shelters should be located in underground vaults; or

b. Equipment shelters should be designed consistent with traditional Cape Cod architectural styles and materials, with a roof pitch of at least 10/12 and wood clapboard or shingle siding; or

c. All ground-mounted personal wireless service facilities should be surrounded by a security barrier. Equipment shelters should be camouflaged behind an effective year-round landscape buffer, equal to the height of the proposed building, and/or wooden fence. The Commission, in consultation with local officials will determine the style of fencing and/or landscape buffer that is compatible with the neighborhood.

5. Lighting and Signage

a. Personal wireless service facility mounts should be lighted only if required by the Federal Aviation Administration (FAA). Lighting of equipment shelters and any other facilities on the ground should be designed in accordance with Technical Bulletin #95-001, Development of Regional Impact Guidelines for Exterior Lighting.

b. All signs should comply with the FCC and applicable requirements of the town's sign regulations.

6. Historic Districts Personal wireless service facilities should not be located within an historic district unless they are completely camouflaged.

7. Scenic Landscapes and Vistas

a. Personal wireless service facilities should not be located within open areas that are visible from public roads, recreational areas or residential development. All ground-mounted personal wireless service facilities which are not camouflaged by existing buildings or structures should be surrounded by a buffer of dense tree growth.

b. Any personal wireless service facility that is located within the viewshed of a scenic vista, scenic landscape or scenic road as designated by a town should not exceed the height of vegetation at the proposed location.

B. Noise Standards

Ground-mounted personal wireless service facilities should not generate noise from equipment and/or wind in excess of 50 db at the property line.

C. Radiofrequency Radiation (RFR) Standards

All equipment proposed for a personal wireless service facility should be authorized per the FCC Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation (FCC Guidelines).

D. Hazardous Materials Standards

Under the Regional Policy Plan, a wireless facility in a Wellhead Protection District is limited to household quantities of hazardous materials/waste. The Commission may require provisions for full containment of any hazardous materials used on-site, including an enclosed containment area with a sealed floor, designed to contain 110% of the total volume of all hazardous materials used, handled or stored on the site and a prohibition on floor drains. No hazardous waste should be discharged on the site of any personal wireless service facility.

VII. Co-location

A. Licensed carriers should share personal wireless service facilities and sites where feasible and appropriate, thereby reducing the number of personal wireless service facilities that are stand-alone facilities. All applicants for a personal wireless service facility should demonstrate a good faith effort to co-locate with other carriers. Such good faith effort includes:

1. A survey of all existing structures that may be feasible sites for co-locating personal wireless service facilities;

2. Contact with all the other licensed carriers for commercial mobile radio services operating in the County; and

3. Sharing information necessary to determine if co-location is feasible under the design configuration most accommodating to co-location.

B. In the event that co-location is found to be not feasible, a written statement of the reasons for the infeasibility should be submitted to the Commission. The Commission may retain a technical expert in the field of RF engineering to verify if co-location at the site is not feasible or is feasible given the design configuration most accommodating to co-location. If the Executive Director of the Commission or his/her designee determines it will require the services of an outside consultant / technical expert to assist in the project evaluation, the project Applicant will deposit with the Commission an amount of money estimated to cover 100% of these services. If this initial estimate is insufficient to adequately review the project proposal, the

Applicant will provide the additional funds necessary. Any funds not expended at the conclusion of the review will be returned to the Applicant. The Commission may deny a permit to an applicant that has not demonstrated a good faith effort to provide for co-location.

C. If the applicant does intend to co-locate or to permit co-location, the Commission may request drawings and studies which show the ultimate appearance and operation of the personal wireless service facility at full build-out.

D. If the Commission approves co-location for a personal wireless service facility site, the permit should indicate how many facilities of what type shall be permitted on that site, including the type, size and location of storage cabinets or buildings. Facilities specified in the Development of Regional Impact (DRI) approval should require no further Commission review. Estimates of RFR emissions will be required for all facilities, including proposed and future facilities.

VIII. Modifications

A modification of a Commission-approved personal wireless service facility will require Commission review if the applicant and/or co-applicant wants to alter the terms of the DRI approval by changing the personal wireless service facility in one or more of the following ways:

1. Change in the number of facilities permitted on the site;
2. Increase in the height of the facility greater than twenty feet.

Such changes shall be considered to be major modifications pursuant to the Commission's Administrative Regulations, Section 7 (d) iii.

IX. Monitoring and Maintenance

A. After the personal wireless service facility is operational, the applicant should submit, within 90 days of beginning operations, and at annual intervals from the date of issuance of the DRI Certificate of Compliance, existing measurements of RFR from the personal wireless service facility. Such measurements should be signed and certified by a RF engineer, stating that RFR measurements are accurate and meet FCC Guidelines as specified in the Radiofrequency Standards (sub-section VI C) of these Guidelines.

B. After the personal wireless service facility is operational, the applicant should submit, within 90 days of the issuance of the DRI Certificate of Compliance, and at annual intervals from the date of issuance of the DRI Certificate of Compliance, existing measurements of noise from the personal wireless service facility. Such measurements should be signed by an acoustical engineer, stating that noise measurements are accurate and meet the Noise Standards (sub-section VI.B.) of these Guidelines.

C. The applicant and co-applicant should maintain the personal wireless service facility in good condition. Such maintenance includes, but is not be limited to, painting, structural integrity of the mount and security barrier, and maintenance of the buffer areas and landscaping.

X. Abandonment

A. At such time that the owner plans to abandon a personal wireless service facility, such owner should notify the Commission and the Town by certified U.S. mail of the proposed date of abandonment. Such notice should be given no less than 30 days prior to abandonment. In the event that an owner fails to give such notice, the personal wireless service facility shall be considered abandoned if it is not used for a period of six (6) months.

B. Upon abandonment of the facility, the owner should physically remove the personal wireless service facility within 90 days from the date of abandonment. "Physically remove" includes, but is not limited to:

1. Removal of antennas, mount, equipment shelters and security barriers from the subject property.

2. Proper disposal of the waste materials from the site in accordance with local and state solid waste disposal regulations.

3. Restoring the location of the personal wireless service facility to its natural condition, except that any landscaping and grading should remain after removal of the personal wireless service facility.

C. If a carrier fails to remove a personal wireless service facility in accordance with this section of these Guidelines, the town shall have the authority to enter the subject property and physically remove the facility. The Commission should consider requiring the applicant to post a bond at the time of construction to cover costs for the removal of the personal wireless service facility in the event the town must remove the facility.

XI. General Criteria for Documenting Need for a Proposed Wireless Facility

A. Introduction

The Cape Cod Commission has an established hierarchy of preference with regard to locating personal wireless service facilities. Regional Policy Plan Minimum Performance Standard 4.3.2.1 states that "Whenever feasible, new telecommunications facilities shall be required to co-locate with existing facilities in order to minimize their visual impacts." The Commission's policy thus encourages locating on existing buildings and structures rather than permitting the construction of new towers or monopoles. Commission review is not required for facilities located on existing buildings or structures. In addition, Commission review is not required

for the reinforcement, reconstruction or replacement of an existing wireless communication tower on the same site with an addition of up to 20 feet in height.

The Commission's DRI review for wireless facilities first focuses on alternatives to proposed new towers or monopoles and looks very closely at existing buildings and structures in the vicinity of the proposed tower as possible alternative locations. Applicants are expected to have pursued these locations prior to application to the Commission and the Town, and must adequately document why these sites have proven to be unsatisfactory to the carrier(s). The Commission's engineering consultants will assist in reviewing technical data provided by the primary carrier and all co-locating carriers to assess the feasibility of alternatives.

For new towers or monopoles, the Commission seeks sites with limited impact on significant scenic and historic resources, and seeks proposals with siting and design features which successfully camouflage the facility. The Commission also seeks proposals with at least three committed carriers. Although the Commission has reviewed facilities with fewer co-locators than three, it requires documentation that the proposing carrier has contacted in writing all other carriers licensed for Cape Cod regarding the proposed facility. Co-location for new towers or monopoles is stressed and single-carrier facilities are not encouraged. Single-carrier facilities should incorporate creative solutions which are effectively camouflaged.

B. Application Requirements

The following documentation is required to justify need and must be submitted as part of the DRI application. If the need for a new facility is justified, the applicant must also demonstrate that the proposed location will have the least possible impact on surrounding scenic and historic resources, and that the proposed facility design will have the least possible impact on community character. Other information may be requested during the DRI review process.

1. Demonstration of a coverage and/or capacity problem requiring a solution.

a) Drive test data showing clear failure points in critical locations.

b) Dropped call statistics and/or capacity statistics (if RF coverage appears sufficient)

c) Zoning or assessors or USGS map (11" x 17" or smaller) showing the location of all existing and proposed personal wireless service facilities for that carrier in the town and in adjacent towns, and showing the area of the coverage or capacity problem.

2. Demonstration that all existing structures have been identified and fairly rejected.

a) Provide results from tower databases, town records, Cape Cod Commission maps, and other reasonably available resources to identify potential sites on existing structures.

b) Provide aerial photographs of sufficient resolution and coverage to identify significant features such as utility rights of way, towers, steeples, tanks, and other existing tall structures.
c) For a) and b), consider area greater than the typical "search ring." Extend search for existing structures to the acceptable coverage contours of adjacent sites.
d) Provide propagation plots to demonstrate anticipated coverage from rejected sites or structures.
e) Identify whether a combination of the existing structures considered in a. and b. could address the coverage and/or capacity problem defined in item 1).
f) Provide documentation that demonstrates that sites with potentially good coverage are not available or otherwise unusable.

3. Demonstration that proposed location and height will solve problem

a) Drive test data showing:
   i. Performance of proposed facility
   ii. Composite performance of proposed facility and intersecting facilities
b) Propagation plots in sufficiently enlarged scale to show local terrain effects:
   i. Propagation plot of proposed facility alone
   ii. Propagation of each adjacent facility, separately
   (Identify whether each facility is complete, under construction or proposed)
   iii. Composite propagation plot
   (See Presentation Guidelines below for details)

4. Demonstration that proposed height is minimum necessary to achieve coverage of target area.

a) Provide propagation plots at incrementally lower elevations until reaching an elevation that clearly is not sufficient. Use increments of ten percent of proposed antenna elevation above ground, or ten feet, whichever is greater.
b) Measure and provide data on height of surrounding tree, vegetation, and/or building cover. Supply photographs to corroborate. In complex environments, a plan view is recommended.
c) Provide a propagation plot with top of antenna placed ten feet above average surrounding cover line.

5. Demonstration of visual impact of proposed new structure.

A balloon test or, preferably and where appropriate, a crane at the proposed site is required. The date, time and location of the test must be advertised in a newspaper of general circulation in the town at least 14 days, but not more than 21 days, prior to the test, and the Commission and the town must be notified in writing at least 14 days prior to the test.

a) During crane/balloon test, map locations along local public ways where facility is visible above visual horizon. In addition to mapping local visibility,

anticipate roads where distant views are possible. Use of line-of-sight (also called terrain shadowing) mapping software is encouraged to identify areas to send mapping personnel. However, final map must be the result of personal observation.

b) Map visibility of a lower tower height for comparison. Select height in coordination with Commission staff. Height could be half of the proposed structure's height or 10 feet above the height of local tree, vegetation or building cover. Mark balloon or crane in visible fashion at the alternate height. Visibility of lower elevation can be mapped at the same time by mapping personnel.

c) Field verify actual elevations above ground of test crane or balloon.

d) Provide map that indicates visibility of both elevations from public ways. See Presentation Guidelines below for details.

e) Confer with Commission and town staff to identify points of view of particular interest or concern to be documented at the time of the crane/balloon test.

f) Provide photographs of the proposed site during the crane/balloon test from all representative visibility locations identified in 5.a) and 5.d) and from all points identified in 5.e).

NOTE: If the visibility map and accompanying photographs demonstrate that the height and location of the proposed new structure will have significant visual impacts on surrounding scenic and historic resources, the applicant must provide documentation described in items 3) and 4) for alternative locations outside of such resource areas.

6. Demonstration of Camouflaged Siting and Design Features

a) 1"= 40' vicinity plan to demonstrate how the proposed siting will limit visibility of the personal wireless service facility, showing the following:

i. Property lines for the subject property and adjacent properties within 300 feet of the project property.

ii. Existing tree cover on the subject property and adjacent properties within 300 feet, by dominant species and average height, as measured by or available from a verifiable source.

iii. Outline of all existing buildings, including purpose, on subject property and adjacent properties within 300 feet.

iv. Location of all roads, public and private, on the subject property and adjacent properties within 300 feet including driveways proposed to serve the personal wireless service facility.

v. Proposed location of antenna, mount, equipment shelter(s), and security barrier.

vi. Distances, at grade, from the proposed personal wireless service facility to each building on the vicinity plan.

vii. Contours at each two feet AMSL for the subject property and adjacent properties within 300 feet.

viii. All proposed changes to the existing property, including grading, vegetation removal, parking and temporary or permanent roads and driveways.

b) Cross-sections of the proposed antennas, mounts, equipment shelter(s) and security barrier, showing dimensions of all features, to demonstrate how the design of the facility will be streamlined to limit visibility. The Commission seeks a clean architectural appearance that limits visually cluttered equipment such as mounting hardware, pipes, bolts, and cables.

c) Color and materials of the proposed personal wireless service facility, represented by a color board showing actual colors proposed for antennas, mounts, equipment shelters, cable runs and security barrier, if any.

d) Existing vegetation and proposed landscaping, identified by size and species, shown both in plan and cross- section to demonstrate how vegetation will limit the visibility of the proposed facility.

e) If lighting of the site is proposed, a manufacturer's computer-generated point-to-point printout, indicating the horizontal footcandle levels at grade within the site and 25 feet beyond the property lines. Any FAA lighting requirements and information on the types of luminaires proposed.

7. Demonstration of Co-Location Capability

a) Documentation in writing that the proposing carrier has contacted all other carriers licensed for Cape Cod regarding the proposed facility.

b) Information showing the proposed structure fully populated with wireless facilities, showing all positions and types of facilities which can be accommodated on the proposed facility.

8. Radiofrequency Radiation (RFR) Filing Requirements

The applicant should provide a statement listing the existing and maximum future projected measurements of RFR from the proposed personal wireless service facility, for the following situations:

a) Existing, or ambient: the measurements of existing RFR.

b) Existing plus proposed personal wireless service facilities: maximum estimate of RFR from the proposed personal wireless service facility plus the existing RFR environment.

c) Certification, signed by a RF engineer, stating that RFR measurements are accurate and meet FCC Guidelines as specified in the Radiofrequency Radiation Standards (sub-section VI.C.) of these Guidelines.

9. Hazardous Materials Filing Requirements

The applicant should provide a written description of the type(s) and quantities of any hazardous waste and/or hazardous materials to be used, stored or generated for each wireless carrier proposed to be located on the project site, as well as provide a written description and plans for containment of any hazardous materials/waste.

10. Noise Filing Requirements

The applicant should provide a statement listing the existing and maximum future projected measurements of noise from the proposed personal wireless service facilities, measured in decibels Ldn (logarithmic scale, accounting for greater sensitivity at night), for the following:

a) Existing, or ambient: the measurements of existing noise.
b) Existing plus proposed personal wireless service facilities: maximum estimate of noise from the proposed personal wireless service facility plus the existing noise environment.

Such statement should be certified and signed by an acoustical engineer, stating that noise measurements are accurate and meet the Noise Standards (subsection VI.B.) of these Guidelines.

C. The Commission may waive one or more of the application filing requirements of this section if it finds that such information is not needed for a thorough review of a proposed personal wireless service facility.

D. Presentation Guidelines

1. Propagation plots for each proposed carrier should be:

a) In a scale suitable to view full detail of proposed facility's coverage.
   i. Personal Communication Service (PCS) facilities, for instance, tend to present well in the range of 1:25,000 to 1:50,000.
   ii. Once a scale is selected, create all plots in the same scale. A second scale may be used to show a wider view if necessary. However, a full set of relevant data must be at one scale.
b) Printed in overlay fashion. (Label all overlays clearly)
   i. Print a base map with no propagation data.
   ii. Print a separate overlay for each adjacent facility's coverage.
   iii. Print overlays such that when stacked with their edges aligned, their images are properly positioned.
   iv. Be sure to include registration marking (major roadway would be sufficient) to align each overlay on the map.
c) Printed in a minimum of two colors on each overlay.
   i. Identify all signal levels above your cutoff in one fairly dark color (e.g. >-92dBm = medium blue or green).
   ii. Identify signal levels up to 3dB below your cutoff level in a fairly light color
   (e.g. -92 to -95dBm = orange or yellow)
   iii. Provide justification of selected cut-off level.
d) Presented using a "TILE" display, not radial.
e) Accompanied by specific information detailing the variables selected in the software model; such as morphology, elevation, effective radiated power (ERP), receiver parameters, and propagation model.

f) Composite propagation plots should be presented using the parameters that generated the plots on the overlays, creating a composite map with all relevant plots combined and printed on the map. A “best server” plot format is desirable.

2. **Drive test data**
   a) Shall be presented in the same overlay fashion as the propagation data.
   b) Except, drive test data for adjacent sites may be combined on a single overlay with best signal shown, and data for the proposed site will be on a separate overlay.
   c) Shall be accompanied by a summary of the transmit and receive conditions and any corrections made to "normalize" the data prior to presentation.

3. **Visibility map**
   a) Indicate visibility of structure at proposed height directly on a map
      i. Use light color to highlight locations where structure is visible above visual horizon
      ii. Create an overlay with darker color to indicate visibility of alternate height.
      iii. If there are local visibility conditions and distant visibility conditions, separate visibility maps and overlays may be produced at appropriate scales.

SITE JUSTIFICATION CHECKLIST

Drive test map: Proposed and adjacent sites; include transmit (tx) and receive (rx) parameters.
Propagation data: Overlay set of proposed site at all elevations required.
Overlays of adjacent sites and rejected sites.
Visibility map: Two elevations, lower on overlay; include verification of elevations.
Statistical evidence of call traffic problems (as appropriate)
Aerial photo
Crane or balloon test photos
Vicinity Plan
Design Features and Camouflage Alternatives