

**EXHIBIT C**  
**RF STATEMENT**

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## Radio Frequency Engineer Site Analysis



**T-Mobile Project No.:** 9AT1292

**Project Name:** Mountain Park

**Project Description:** construct 108 foot monopine wireless telecommunications facility with an antenna centerline of 100 feet

**Location:** Lake Charles Dr. Roswell, GA 30075

**Operating Frequencies:** PCS Band (1850MHz – 1990MHz)

**Date:** January 26, 2010

### T-Mobile Site Selection Overview

Wireless systems are expanded or introduced in a given area to improve service to customers. There are typically three reasons to add a new facility: extending coverage to new areas, increasing the capacity of the system within the current service area, or improving quality. Some sites do all three.

**Coverage:** Coverage can be defined as having a certain level of signal strength in a particular area. T-Mobile's target is to provide -76dBm of signal strength to our customers in all areas. This level of coverage guarantees reliable signal strength inside buildings to provide excellent voice quality in residential neighborhoods and commercial areas. In today's competitive marketplace, T-Mobile requires adequate coverage to be competitive and to fulfill our responsibilities under our FCC license.

Existing and proposed coverage is demonstrated by use of propagation maps and drive test data. The propagation maps are computer simulations of wireless signal coverage in a given area. One map shows the predicted coverage as it exists without the proposed facility. The other map shows predicted coverage with the proposed facility in place. Propagation maps showing RF coverage in the subject service area with and without the proposed antennas are included in the application documents.

**Capacity:** Capacity is the number of calls that can be handled by a particular antenna site. When we make phone calls, our mobile phones communicate with a nearby antenna site that then connects to land based phone lines. Ongoing phone calls occupy the resources of the serving site, which can handle only a limited number of calls. When a particular antenna site is handling a sufficient number of calls the available radio frequency (RF) channels assigned to that site are used up. When this occurs, the wireless phone user will be unable to place a call from his or her phone. For T-Mobile's specific GSM technology, typical sites with 3 antennas can handle approximately 150 calls at any given time. The maximum capacity of each antenna is equivalent to approximately 50 people calling continuously over an hour. The engineering term for this measurement of capacity is 50 Erlangs. The call traffic of antenna sites is continuously monitored and analyzed so that overloading of sites is prevented. Careful projection allows sufficient lead time to design, permit, and construct the wireless facility prior to exceeding the capacity of surrounding sites. Capacity cell sites are typically required in areas that currently have sufficient coverage. The objective for a capacity site is to handle increased call volume rather than increase the size of a coverage area.



**Interference:** In areas with good coverage, phone calls may still have poor quality that the caller hears as warbled voices or temporary loss of communication. This is often caused by interference. Wireless telephone systems reuse specific radio frequencies at different cell antenna locations. When frequencies are reused at nearby sites, interference may result. Engineers work to achieve the most efficient use of limited frequency resources and reduce interference.



Unfortunately, there are still areas where interference is nearly unavoidable. This typically occurs in areas where one antenna site is having trouble handing off calls to another. On a freeway or busy roadway, for example, the network juggles a call between competing antenna sites seeking to find the best one. When this occurs, the solution is often to locate a new antenna site as close to the location where the bad handoff is occurring. Interference is documented by measuring received call quality (Rx Qual) during a drive test similar to that performed to measure coverage. Rx Qual is a measurement of digital data (voice signal) lost as the result of poor communication between adjacent cell sites. Drive test maps demonstrate the Rx Qual of the area as it exists both with and without the proposed cell site.

#### **Site Selection Process for this Location**

For this project, the objective is to provide in-building coverage in residential areas surrounding Jones Rd, Shallowford Rd and Woodstock Rd in Roswell, GA. It will also minimize dropped calls in the aforementioned area. This determination was made based on the preliminary design analysis/propagation (Coverage Maps), which are included with this letter as a part of the application documents.

Data regarding the terrain within the service area is entered into a computer modeling program along with a series of variables, such as proposed antenna height, available radio frequencies and wireless equipment characteristics. From this information, T-Mobile's RF engineers determined an area for the optimum location and height of the antennas to maximize the coverage objective.

T-Mobile sought potential candidates that would meet **Article 21.2 Standards for Wireless Communications Facilities** and the required wireless coverage objective. Generally the search area includes typical single-family residential lots. T-Mobile attempted to provide the required coverage by proposing a facility at Fire Station #3, located at 740 Jones Road. However, this proposed site was not available once the City of Roswell decided not to enter into a lease with T-Mobile.

The closest non-residential lots are to the east along Woodstock Road, however, these parcels were too far to the east to meet the coverage objectives of T-Mobile. Additionally, this area is too close to an existing T-Mobile facility denoted as 9AT0023B and a site currently under construction at Crabapple Middle School, denoted as 9AT1129, on the attached coverage maps submitted as Exhibit B.

Based on this, other properties that could meet the coverage objective and also the City of Roswell requirements were searched. The subject property met both the needs of T-Mobile's coverage objective and the City of Roswell requirements for wireless facilities.





### **Preferred Locations**

The specific location of the proposed site has been selected to maximize coverage while minimizing the antenna height requirement. The subject site was the best available alternative for building a new wireless facility to meet the coverage objective. The proposed location will allow T-Mobile to provide service to customers who live near the targeted area and travel through it. In all cases, before proposing a new wireless facility, T-Mobile first seeks to meet its objectives by collocating on existing structures. There were no suitable collocation opportunities within the targeted coverage area for this site.

In summary, significant deviation from the proposed location will result in reduced effectiveness, including possible invalidation of the proposed site candidate altogether. The required antenna height is the minimum acceptable to provide the needed coverage with respect to coverage provided by the previously mentioned neighboring cell sites. Lower antenna height will result in reduced effectiveness, again including possible invalidation of the candidate. In some cases, an increased antenna height is possible which can allow some greater flexibility in location placement. However, too much antenna height is unacceptable as it creates interference conditions that degrade performance of one or more other existing cell sites in the T-Mobile network.

When the original RF technical analysis was completed, a search area map and other requirements were provided to T-Mobile's real estate and zoning specialists. A search area is an area in which the tower has to be placed in order to properly meet the needs of the network. With this information in hand, T-Mobile ranked potential sites. Whenever feasible, T-Mobile strives to acquire property that is properly zoned and adjacent to compatible land uses. T-Mobile attempts to select a location that minimizes or limits any negative visual impacts on adjacent or nearby residential areas to the greatest extent possible. Sites adjacent to or on existing tall power line support structures, antenna facilities, water treatment facilities, and on the tops of buildings are selected when they meet the other technical requirements of the system. The existing sites in the study area exemplify the locational hierarchy preferred by the City of Roswell.

To the maximum extent possible, building new freestanding towers are avoided, as are locations adjacent to schools, preschools and view corridors or where demolition is required that would be detrimental to the existing character of the neighborhood. Rooftops, water tanks, and other collocation applications are favored where the design can be screened or incorporated into the existing structure and mechanical equipment can be placed out of view. Sites where zoning ordinances prohibit the location, there is insufficient room for mechanical equipment, required setbacks cannot be achieved or landowners are not interested in leasing property are eliminated from consideration.

### **Predicted Coverage for this Location**

Two coverage plots are attached to this analysis. The first demonstrates the existing level of service. The second plot demonstrates the service that will be provided by the new location at a height of 100 feet (antenna centerline). The colors on the map indicate the different levels of coverage. The legend of the prediction plot shows several different classes of "best servers". The various colors of the plot indicate where a T-Mobile

RF Documentation for 9AT1292 Mountain Park



handset can be reliably used to make and receive telephone calls in the presence of varying receive signals. The terrain, foliage, nearby structures, and facility location are taken into account. The further the distance from the facility, or the more abundant the clutter (trees, buildings, etc.) between the facility and the handset, the weaker the receive signal will be. The following is a short explanation of each server class/ color:

**Green:** In-building coverage represented by receive signals greater than or equal to -76 dBm but less than or equal to -70 dBm. This coverage level will penetrate residential construction.

**Yellow:** In-vehicle coverage represented by receive signals greater than or equal to -84 dBm and less than or equal to -76 dBm. A customer will be able to receive a signal in his or her vehicle.

Other factors, not represented on the plot, include the ability of the site to handle the required call capacity or volume of calls and to provide the extent of data and other services required by T-Mobile customers. This site has been designed to provide coverage consistent with these factors. Finally, T-Mobile RF engineers have determined that this height and location is necessary for the effective functioning of the proposed facility. Any lower tower height would result in some residences not being covered inside their homes, or gaps to the existing network which may result in drops and/or handover failures, and may require another site (possibly another tower) to compensate for the lack of coverage.

#### **Enhanced 911 (E911) Requirements**

In addition to providing improved service to T-Mobile customers, the proposed antenna location is needed to meet Federal Communications Commission (FCC) requirements for Enhanced 911 (E911) service. Provision of E911 service in accordance with FCC requirements is a major component of the demand for additional cell sites.

The proposed facility will provide more precise triangulation for providing E911 service as required by the FCC. This will allow a person who is using E911 because of an emergency to be found more quickly because their location will be more easily determined as this and other antenna sites are added to the wireless network.

#### **Conclusion**

T-Mobile engineers have carefully designed this site to maximize quality of service to our customers, which can best be accomplished at a height of 100 feet (antenna centerline). This location was also selected because of its position relative to existing sites, providing favorable site geometry for federally mandated E911 location accuracy requirements and efficient frequency reuse. Adjustments to the existing network will not help in meeting the coverage objectives, due to the distance from the existing sites to the objective area.

Apart from improving service to T-Mobile's existing customer base, T-Mobile has experienced phenomenal growth in the last few years, with an average national customer growth rate of almost 40% per year. It is not unusual for T-Mobile to add more than a million nationwide customers per fiscal quarter. T-Mobile forecasts this phenomenal growth to continue, and T-Mobile's system design accounts for this predicted growth.

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I hope this information is useful to City of Roswell permitting authorities. If there are any questions regarding the RF data provided in this report, please call. I may be reached via any of the methods listed below.

Sincerely,



Marquise Lewis  
RF Engineer  
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marquise.lewis@t-mobile.com

**Attachments**

Propagation studies showing existing and proposed coverage (one map each).

Tower inventory map showing the location of the proposed facility in comparison to existing facilities within T-Mobile's network (one map).





**MOUNTAIN PARK**

9AT1292D - WITHOUT

2010-01-18 07:03:15

Best Server

- UI
- 76.0 <=x dbm In-Bldg Coverage (Good)
- 84.0 <=x <-76.0 dbm In-Vehicle Coverage
- 94.0 <=x <-84.0 dbm On-Street Coverage
- OL
- 0.0 <=x dbm In-Bldg Coverage (Good)

Primary\_Road

Polygon

Line 1

Line 1

Point

Text

Fill

Secondary\_Road

Polygon

Line 1

Line 1

Point

Text

Fill

Neighborhood\_Road

Polygon

Line 1

Line 1

Point

Text

Fill

'System\GSM\Atlanta\Deployment' filter

Property

Property

Property

Property

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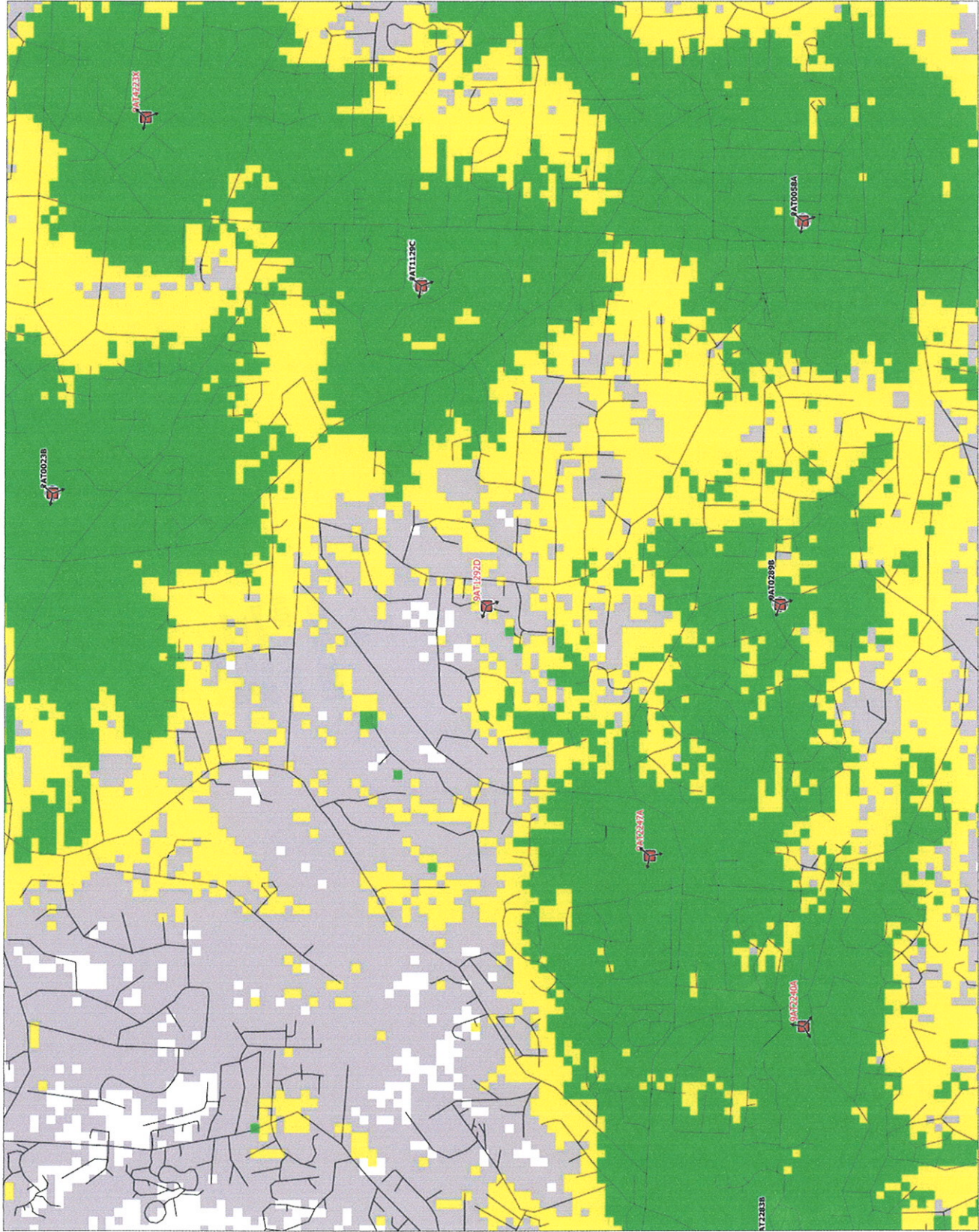
Property

Property

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Top Right: 08°02'N 85°57'W 34°07'13.87N  
Bottom Left: 08°02'N 85°57'W 34°07'13.87N  
Scale Bar: 0 0.25 0.5 0.75 1.00 km



**MOUNTAIN PARK**

9AT1292D - WITH

2010-01-18 06:54:18

Best Server

- UL
- 76.0 <=x dbm In-Bldg Coverage (Good)
  - 84.0 <=x <-76.0 dbm In-Vehicle Coverage
  - 94.0 <=x <-84.0 dbm On-Street Coverage
  - OL
  - 0.0 <=x dbm In-Bldg Coverage (Good)

Primary\_Road

Polygon Line 1

Line Line 1

Point

Text

Fill

Secondary\_Road

Polygon Line 1

Line Line 1

Point

Text

Fill

Neighborhood\_Road

Polygon Line 1

Line Line 1

Point

Text

Fill

'System\GSM\Atlanta\Deployment' filter  
Property

The Right: 88°02'46.57W 34°03'31.86N

Bottom Left: 88°02'46.57W 34°03'31.86N

Scale Bar: 121996

0 0.250 0.500 0.750 1.000 Km

