



Submitted to
EBRCSA

Submitted by
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June 8, 2012

Final Coverage Acceptance Test for Contra Costa County West Simulcast Cell

June 8, 2012

Mr. William J. McCammon
Executive Director
East Bay Regional Communications System Authority
4985 Broder Boulevard
Dublin, CA 94568

Subject:

Coverage Acceptance Test Report for Contra Costa County West Simulcast Cell

Dear Mr. McCammon:

I have attached the completed Coverage Acceptance Test Report for the Contra Costa County West Simulcast Cell. This deliverable data item completes Task E from Amendment 3 of our contract with the East Bay Regional Communications System Authority.

We have included five executive summaries and two spiral-bound paper copies of the complete report. The complete reports also include a DVD containing:

- The complete report and executive summary in Adobe *.pdf format,
- The results maps in Adobe *.pdf format,
- The complete test results in Microsoft Excel *.xlsx format, and
- All of the test calls and reference audio files in *.wav format.

A copy of everything you have received will be separately shipped to Motorola.

If you have any questions on the report and associated materials, please feel free to contact me.

This report was prepared by:

AECOM



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Enclosures: As noted

cc: Michael J. Logan
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1 Purpose

This Coverage Acceptance Test Report provides the East Bay Regional Communications System Authority (EBRCSA) a detailed report of the radio coverage testing conducted by AECOM in the Contra Costa County West (Contra Costa County West) simulcast cell. This test report describes the coverage testing methods and procedures, provides test documentation and results, the responsibilities AECOM, EBRCSA, and Motorola had during testing, and finally, provides our conclusions and recommendations.

AECOM's Radio Coverage Evaluator (RaCESM)¹ was used to perform the Delivered Audio Quality (DAQ) Portable Outdoor and simulated indoor testing of the service area. DAQ testing collects talk-in and talk-out audio recordings and calculates Delivered Audio Quality (DAQ) values for each recorded test calls. The test evaluated the voice coverage performance under typical operating conditions within the Contra Costa County West service area using a mobile radio to simulate a portable radio operating at hip level. This automated test was conducted concurrently with Received Signal Strength Indication (RSSI) testing conducted by RaCESM. RSSI testing is an additional automated test.

Prior to DAQ testing, Motorola conducted BER testing using their VoyagerSM test equipment. AECOM had planned on collecting BER test data with RaCE, but due to limitations in Motorola's Simulcast equipment, AECOM was unable to conduct BER testing.

Per the specifications developed by AECOM for EBRCSA, a DAQ of 3 is the minimum acceptable level for two-way voice operations in talk-in and talk-out directions. Motorola performed talk-out only a BER based test, with a BER of 2.6% as the maximum acceptable level. All RSSI testing was conducted for informational purposes only.

The following excerpts from the coverage sections of the EBRCSA Radio System Specifications (dated October 21, 2010) are included as an exhibit:

4.7 Coverage Requirements

"The guaranteed performance of this radio system is 95% coverage in both directions (talk-out and talk-in) within the covered area indicated on the propagation maps provided by Motorola.

"When the entire system is completed and all of the standalone sites are fully integrated with the simulcast systems, a minimum level of 95% coverage of the specified type for both talk-out and talk-in directions, in all of the test sectors, shall be achieved in the "covered areas". The reliability shall be calculated as a composite value for the two-county radio system by dividing the total number of passed tiles by the total number of tiles tested. In order to be counted as a "passed tile", both the talk-in and talk-out DAQ values shall be equal or greater than 3.

"4.7.1 Coverage Charts and Analysis

Motorola shall provide coverage charts in the proposal as supporting documentation. The coverage chart will be used as supporting documentation only and shall not be considered a part of confirming or guaranteeing that the system will meet the coverage specifications. Include a detailed description of the propagation models used and the assumptions made in preparation of the coverage charts included in your proposal. Include an analysis of tower-top amplifier (TTA) system performance for those sites where TTA's are included in the design.

"Coverage charts shall be provided for each Coverage Test Sector. The predicted coverage shall be overlaid on a map with the specified Coverage Test Sector clearly defined. The coverage chart shall identify all areas within the Coverage Test Sector that do not meet the specified requirement. Identified coverage deficiency areas in the Coverage Test Sector shall be taken into account when constructing the composite 95% boundary. All areas within the defined Coverage Test Sector shall be considered equal when selecting random coverage test locations.

¹ U.S. Patent # 7,522,978 B2

“4.7.2 Building Loss Factors

All of the Coverage Test Sectors require in-building portable radio coverage. In these Coverage Test Sectors, a Building Loss Factor will be inserted in the test setup to simulate building penetration losses. Building Loss Factors are defined below:

Building Characterization	Building Loss Factor (dB)
Residential	6
Medium Building	15
Heavy Building	20

“4.7.3 Service Area and Coverage Test Sectors

The service area for the EBRCS is defined by the boundaries of Alameda and Contra Costa Counties.

“4.7.3.1 Contra Costa County West Region

The Contra Costa West Region is bounded on the north, west, and south by the county borders. On the east, the line will run south from Crockett (with Crockett inside the test zone), curving east to fully encapsulate Hercules, and then curving back west to run along the western shore of the San Pablo Reservoir, then south to the border with Alameda County. The region contains two test sectors, which completely cover the region.

Test sector 1a: Contra Costa West, Portable on Street (6 dB loss) – includes the entire region described above minus test sector 1b described below.

Test sector 1b: Richmond, Portable in Medium Building (15 dB loss): includes the Cities of Richmond and El Cerrito. This test sector is defined in the Motorola provided shape files named Contra Costa West 7 (The Jail) and Contra Costa West 13.”

2 Definition and Process

2.1 Channel Performance Criterion (CPC)

The channel performance criterion (CPC) is the specified design performance in a faded channel.

2.2 Delivered Audio Quality

Delivered audio quality (DAQ) designations are defined by TIA/EIA TSB-88.1-C and reproduced below in Table 2-1.

Note: DAQ-0 is not defined by TSB-88.1-C: AECOM has added this definition to account for instances where communications failed entirely. For example, a test in which the mobile unit was unable to obtain a channel grant would receive a DAQ score of 0.

Delivered Audio Quality	Performance Definition	Static SINAD equivalent intelligibility
DAQ-0	No speech detected	Not defined within
		TIA TSB-88
DAQ-1	Unusable, speech present but unreadable	< 8 dB
DAQ-2	Understandable with considerable effort frequent repetition due to noise and distortion	12 ± 4 dB
DAQ-3	Speech understandable with slight effort; occasional repetition required due to noise and distortion;	17 ± 5 dB
DAQ-3.4	Speech understandable with repetition only rarely required; some noise and distortion;	20 ± 5 dB
DAQ-4	Speech easily understood; occasional noise and distortion	25 ± 5 dB
DAQ-4.5	Speech easily understood; infrequent noise and distortion	30 ± 5 dB
DAQ-5	Speech easily understood	> 33 dB

Table 2-1 Delivered Audio Quality

2.3 Received Signal Strength Indication

Received signal strength indication (RSSI) is the radio signal strength measured in microvolts (μV) or in decibels in relation to 1 milliwatt at the input to the receiver (dBm). No acceptance criterion for RSSI has been provided for this test.

2.4 Bit Error Rate

Bit Error Rate is the ratio of erroneous bits received to the total number of bits transmitted, usually expressed as a percent.

2.5 Service Area and Conditions

The service area defines or describes the area in which a radio system should provide the desired CPC.

The Contra Costa County West service area is divided into two test sectors: 1a and 1b, shown in Figure 2-1. Test sector 1b is a developed area, and requires portable radio in medium building coverage, defined as 15 dB of additional loss when compared with operating a portable radio on the street. To simulate testing inside medium buildings, testing was conducted using a portable-on-street setup with an added 15 dB loss. Test sector 1a was tested as a portable radio on the street.

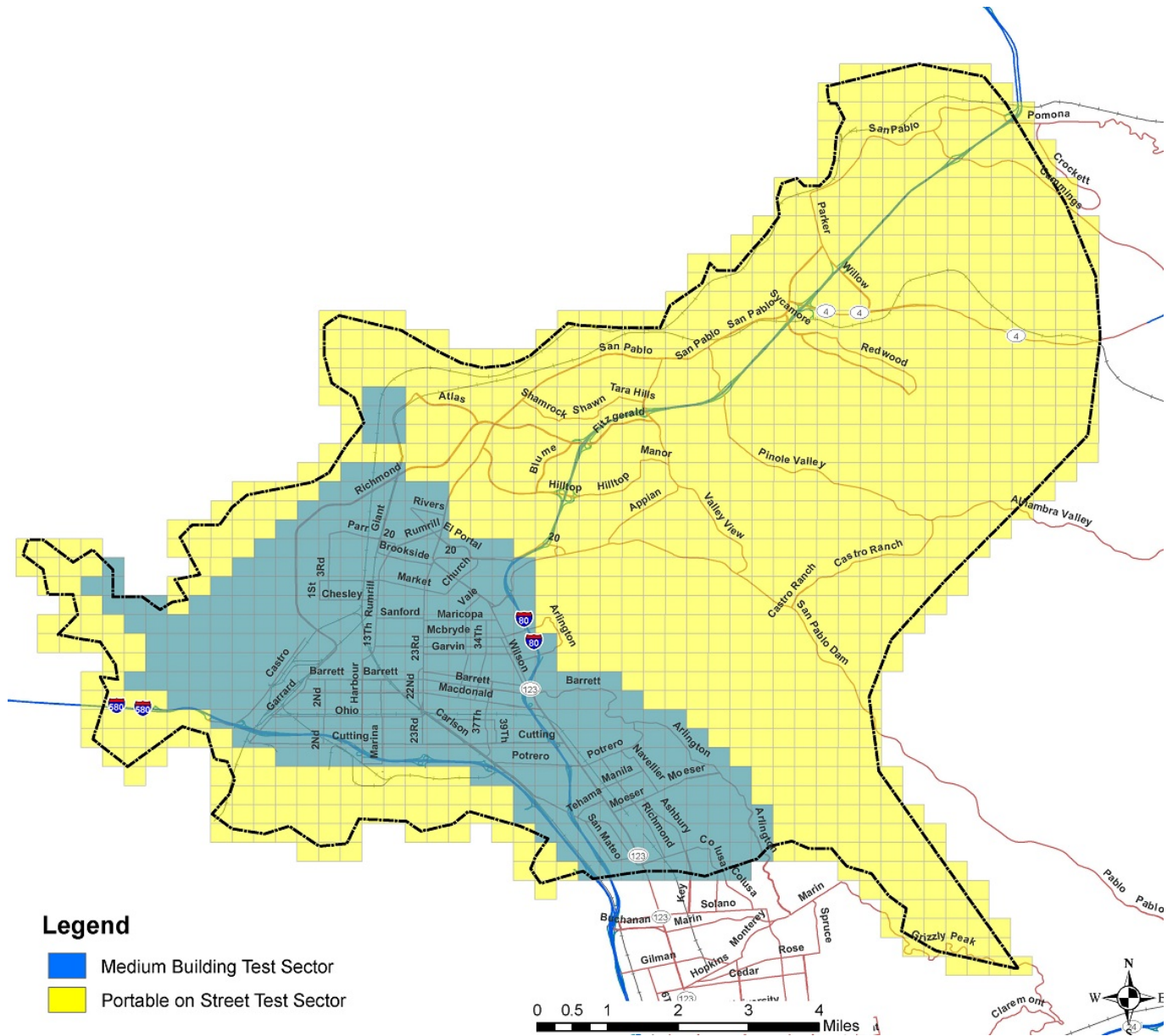


Figure 2-1 Contra Costa County West Service Area

2.6 Motorola Covered Area Reliability

Based on their coverage predictions, Motorola has defined an area within Contra Costa County West over which its radio system is predicted to provide 95% area reliability. This is defined as the Motorola Covered Area, and is what was tested for system acceptance. This area is shown as tiles with a red outline in Figure 2-2 (“Motorola Covered Area”). Not all of these tiles are vehicle accessible. In addition to performing DAQ and RSSI testing in the Motorola Covered Area, AECOM tested all accessible tiles within the jurisdictional area. Tiles that AECOM was able to access and gather test data are shown in Figure 2-2 (“AECOM Tested Tiles”).

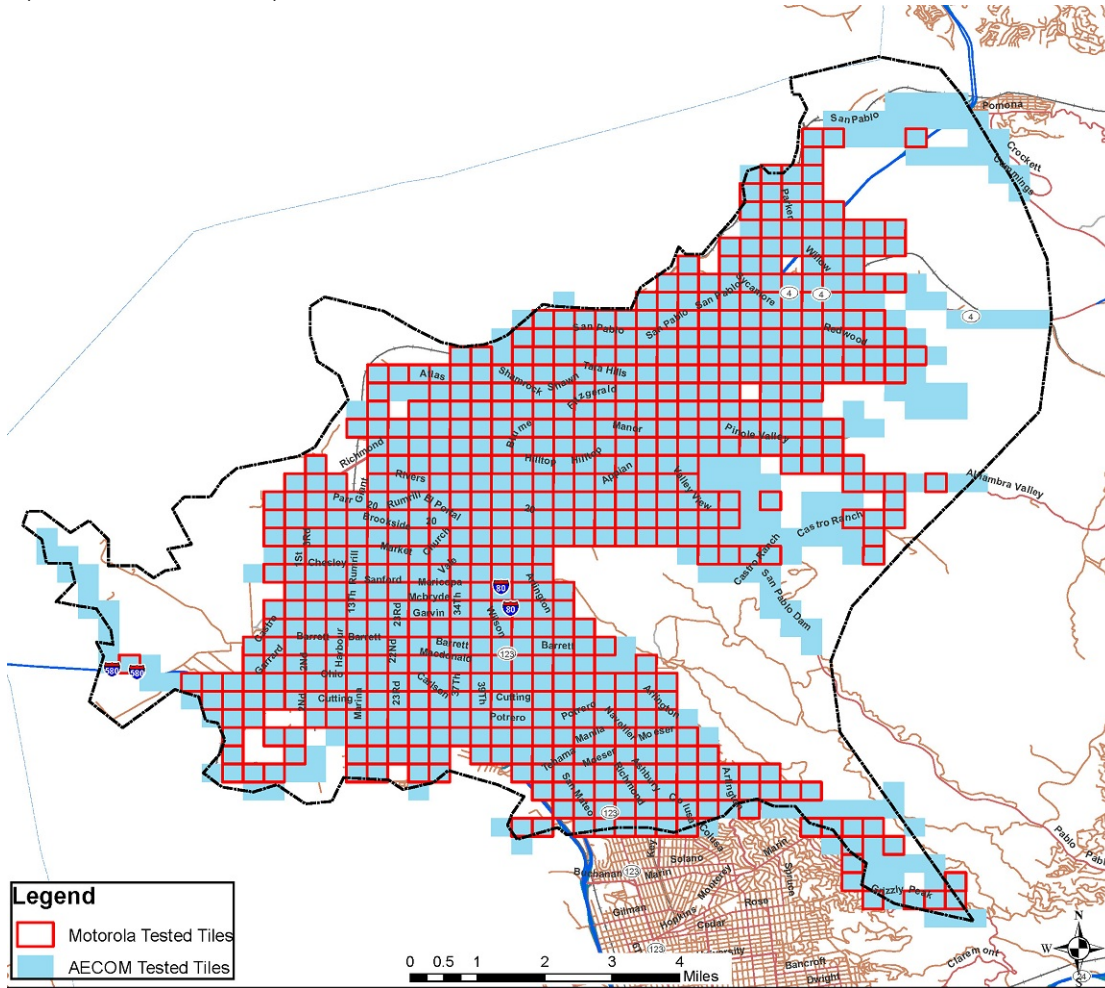


Figure 2-2 Motorola Covered Area and AECOM Tested Tiles

2.7 Validated Service Area Reliability

Coverage testing is a statistical process. Validated service area reliability is determined on the basis of measuring a statistically significant number of random test locations, uniformly distributed throughout the entire service area.

Validated service area reliability is the percentage of locations where talk-in and talk out radio communications meets or exceeds the desired CPC. The validated service area reliability value in percent is calculated by dividing the number of valid test measurements within the defined service area that meet or exceed the required CPC by the total number of valid test measurements.

As the system acceptance is based on the covered area reliability, the validated service area reliability is provided for information only.

3 System Test Equipment

3.1 The Test Set

RaCESM test set consisted of two units: a stationary and a mobile unit. For details on installation, see section 6.

The RaCESM mobile unit (Figure 3-1) consists of the following equipment:

- Mobile radio (700/800MHz APX-7500, supplied by EBRCSA)
- Two RSSI Receivers (ICOM, provided with RaCESM)
- Mobile antenna for each of the above radios (supplied by EBRCSA)
- GPS receiver and antenna for measuring test vehicle location and establishing universal time
- A laptop computer running AECOM's RaCESM software
- Interconnecting hardware and cables
- An attenuation network consisting of a circulator and several attenuators to give the Motorola APX-7500 mobile the simulated characteristics of a portable radio worn on the hip, located either on the street or in medium buildings (depending on the test sector).

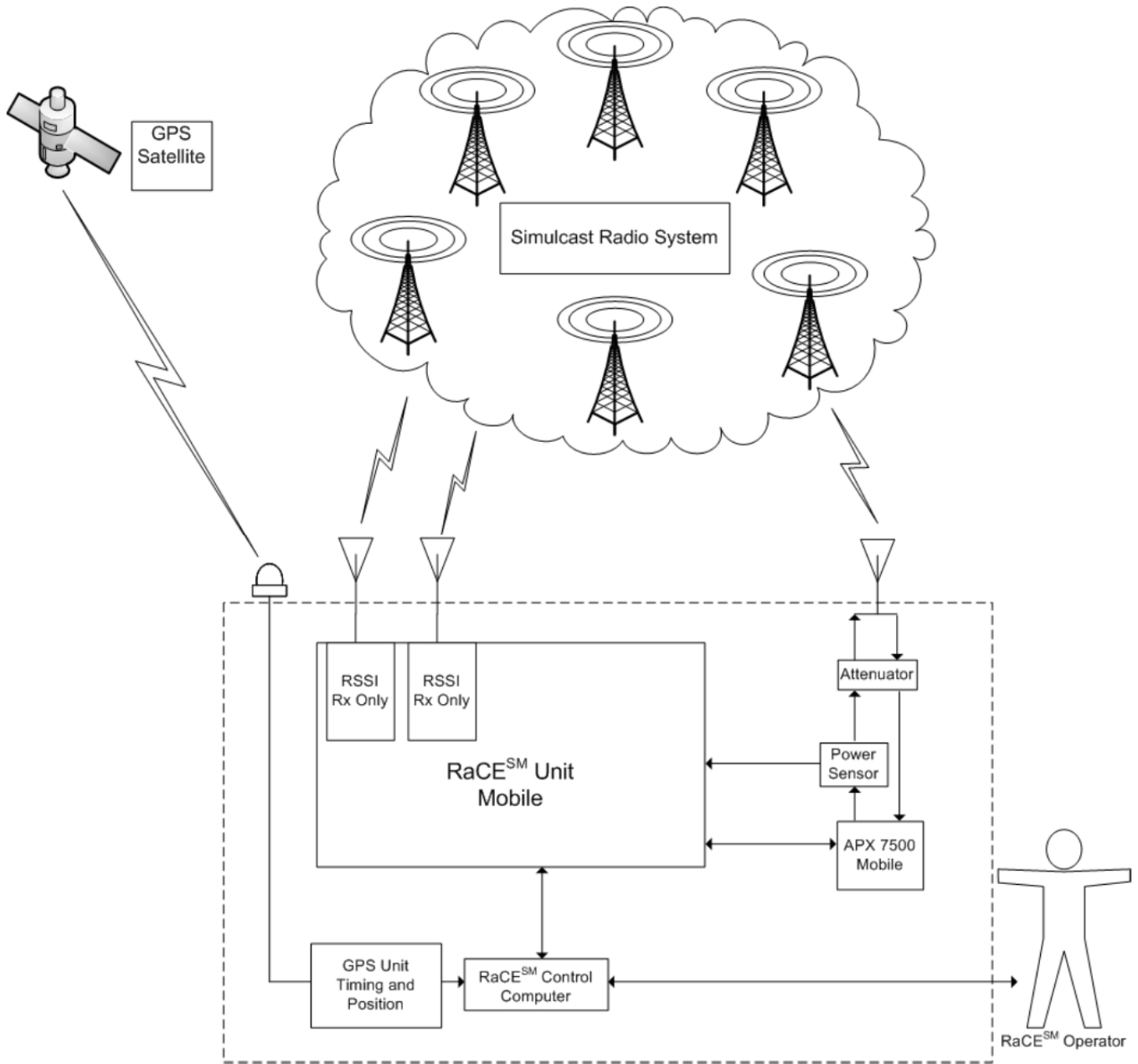


Figure 3-1 Mobile Unit Configuration

The RaCESM stationary unit (Figure 3-2) consists of the following equipment:

- Mobile Radio (700/800MHz APX-7500, supplied by EBRCSA)
- Mobile antenna (supplied by EBRCSA)
- A GPS receiver and antenna for timing correlation
- A laptop computer running AECOM's RaCESM software
- Interconnecting hardware and cables

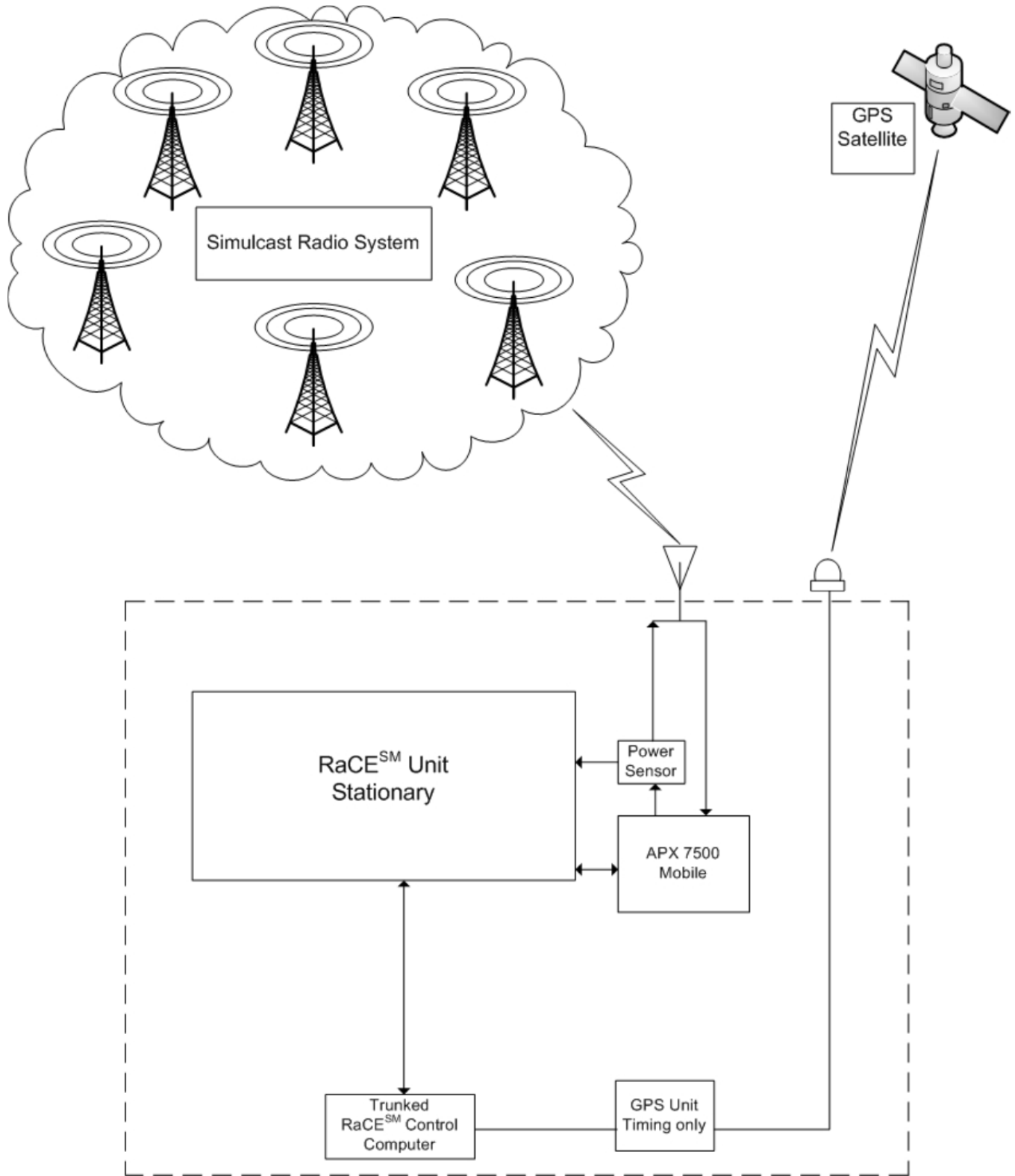


Figure 3-2 Stationary Unit Configuration

3.2 The Test Sequences

The DAQ test sequence was:

- The mobile system keeps track of its location and which tiles have already been tested
- When the mobile test system recognizes that it has entered an untested tile, the mobile test system transmits a recorded message to the stationary test system.
- The stationary system receives the mobile's message and records it.
- After the mobile system finishes transmitting, the stationary system transmits a recorded message to the mobile system.
- The mobile system receives and records the stationary system's test message and RSSI measurements.
- The mobile system marks the tile as having been tested.

3.3 The Test Set Calibration

Motorola was responsible for the programming and calibration of all mobile radios.

RaCESM includes a proprietary algorithm that evaluates DAQ based on added noise or distortion in the received audio of the RaCESM test message. DAQ is not based on signal strength or on bit error rate. Using telecommunication professionals, AECOM has calibrated the effects of noise or distortion on DAQ scores. AECOM then used this input to validate the proprietary algorithm inherent in the RaCESM software.

3.4 RaCESM Equipment Setup

AECOM developed the connector interfaces to the test radios. RaCESM uses the input to the microphone as the point at which to inject the audio signal for the test call. The output to the speakers is the point at which the received audio signal is sent to the RaCESM computer for recording and DAQ scoring. The connector for the test radio contains these points, and served as the interface to the RaCESM mobile and stationary units. We integrated the test radios to the RaCESM equipment in our lab, and adjusted the audio levels for optimum radio performance in a laboratory setting. Standard connectors, supplied with the test radios by BERCSA, enabled us to build the interface cabling between the RaCESM stationary and mobile units and the test radios.

Using the interface cables, we configured the RaCESM mobile unit and the RaCESM stationary unit with an EBRCSA supplied radio. Mobile radios were used for both the RaCESM mobile and stationary units. We then tested each system (mobile + stationary units) for all required test functions on the bench in our lab.

After the bench testing was complete, the RaCESM mobile and stationary systems were shipped to Contra Costa County, where the mobile was installed in the test vehicle, and the stationary installed in the hotel. The RaCESM operator then conducted a road test lasting approximately two hours. All functions to be used in the coverage test were checked during this road test.

To test portable on street coverage with a mobile radio, AECOM installed an attenuator network in the mobile test unit. The attenuator network was designed to simulate portable radio antenna mounted on the hip and, in the medium building coverage zone, in-building conditions. Figure 3-3 is a diagram of the attenuator network used to emulate portable radio receives (Talk-Out) and transmits (Talk-In) under various coverage levels.

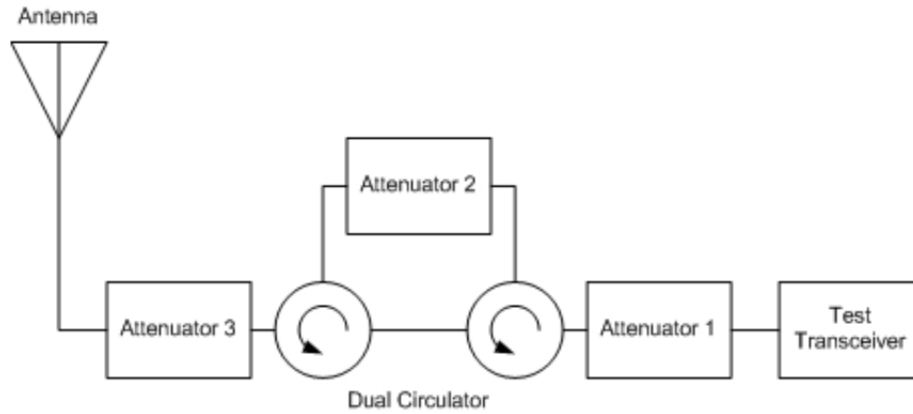


Figure 3-3 Attenuator Network

Table 3-1 provides the calculations for each attenuator for simulating portable-on-street radio performance. It consists of three attenuators. Attenuator 1 is set to compensate for differences in receive system sensitivity of the typical radio being simulated and the test radio. Attenuator 2 is set to compensate for differences in transmit power of the typical radio being simulated and the test radio. Attenuator 3 is set to simulate the level of in-building coverage. When testing Test Sector 1b, which required portable radio in medium building coverage, attenuator 3 was 15 dB, as shown in Table 3-2.

**Table 3-1
Attenuator Calculations**

Attenuation Required to Simulate Portable Radio Receive (Talk-Out)			
Receiver Sensitivity			
Portable Radio Being Simulated (XTS 2500)	0.25 μ V	-119.0 dB	
Test Radio (XTL 2500)	0.25 μ V	-119.0 dB	
Difference			0.0 dB
Antenna System Gain			
Test Set Antenna System			
Mobile Antenna	0.0 dB		
Mobile Coax	-0.8 dB		
Circulator	-0.5 dB		
Total		-1.3 dB	
Portable Radio Antenna System Being Simulated (Hip-Mounted Portable)		-8.5 dB	
Difference			7.2 dB
Attenuator 1			7.2 dB
Building Attenuation Being Simulated (Attenuator 3)			0.0 dB
Total Test Set Receive System Attenuation (Attenuators 1 + 3 + Circulator)			7.7 dB

Attenuation Required to Simulate a Portable Radio Transmit (Talk-In)			
Transmit Power			
Test Radio (XTL 2500)	10.0 W	40.0 dBm	
Portable Radio Being Simulated (XTS 2500)	3.0 W	34.8 dBm	
Difference			5.2 dB
Antenna System Gain			
Test Set Antenna System			
Portable Radio Antenna System Being Simulated (Hip-Mounted Portable)		-1.3 dB	
		-8.5 dB	
Difference			7.2 dB
Attenuator 1 + Attenuator 2			12.4 dB
Attenuator 2			5.2 dB
Total Transmit Attenuation (Attenuators 1 + 2 + 3 + Circulator)			12.9 dB

Actual attenuation used during portable on street testing was measured at 8 dB for the talk-in path, and 14 dB for the talk-out path.

**Table 3-2
Attenuator Calculations**

Attenuation Required to Simulate Portable Radio Receive (Medium Building Talk-Out)		
Receiver Sensitivity		
Portable Radio Being Simulated (XTS 2500)	0.25 μ V	-119.0 dB
Test Radio (XTL 2500)	0.25 μ V	-119.0 dB
Difference		0.0 dB
Antenna System Gain		
Test Set Antenna System		
Mobile Antenna	0.0 dB	
Mobile Coax	-0.8 dB	
Circulator	-0.5 dB	
Total		-1.3 dB
Portable Radio Antenna System Being Simulated (Hip-Mounted Portable)		-8.5 dB
Difference		7.2 dB
Attenuator 1		7.2 dB
Building Attenuation Being Simulated (Attenuator 3)		15.0 dB
Total Test Set Receive System Attenuation (Attenuators 1 + 3 + Circulator)		22.7 dB

Attenuation Required to Simulate a Portable Radio Transmit (Medium Building Talk-In)		
Transmit Power		
Test Radio (XTL 2500)	10.0 W	40.0 dBm
Portable Radio Being Simulated (XTS 2500)	3.0 W	34.8 dBm
Difference		5.2 dB
Antenna System Gain		
Test Set Antenna System		
Portable Radio Antenna System Being Simulated (Hip-Mounted Portable)		-8.5 dB
Difference		7.2 dB
Attenuator 1 + Attenuator 2		12.4 dB
Attenuator 2		5.2 dB
Total Transmit Attenuation (Attenuators 1 + 2 + 3 + Circulator)		27.9 dB

Actual attenuation used during portable in medium building testing was measured at 20 dB for the talk-out path, and 27 dB for the talk-in path.

3.5 EBRCSA Supplied Equipment

See Appendix C for the list of the EBRCSA supplied equipment used in the Contra Costa County West testing.

4 Test Method

4.1 Test Mode

A gridded test determined test points and collect data for coverage acceptance testing.

In the gridded test mode, the area to be tested was divided into equally sized rectangular tiles. Testing large number of tiles is necessary to provide a statistically valid measurement of the overall system performance.

Motorola provided the shape file² for the test tiles. The tile size was approximately 0.25 miles x 0.25 miles, with the total area defined as 50 tiles wide (x-axis) numbered 0 through 50, and 98 tiles high (y-axis) numbered 0 through 97. Tile 0,0 was the south-west corner of the grid. These test tiles were used by AECOM for the DAQ and RSSI testing.

During the test, the mobile unit was driven throughout the service area, in an effort to enter every tile. As the mobile unit entered a tile, the RaCESM software established whether that tile had been tested before, and if not, it activated the test sequence beginning with the talk-in transmission. The stationary unit recorded the talk-in transmission and then initiated the talk-out transmission. The mobile unit recorded the talk-out transmission along with RSSI data during the talk-out transmission and waited until a new, untested tile was entered before automatically beginning a new test.

4.2 Test Samples

A RaCESM DAQ test sample for EBRCSA testing is a paired set of talk-in and talk-out audio recordings.

4.2.1 Test Message

Test messages of five to eight seconds were used for coverage testing. Two hundred messages from lists included in Appendix E were selected for use during test. The selected list numbers are: 2, 4, 7, 8, 9, 10, 13, 16, 18, 19, 24, 28, 34, 38, 39, 46, 47, 50, 53, and 56. The randomly sorted messages were half and half male and female voices.

4.2.2 Valid Test Sample

A valid test sample is one in which all of the following conditions apply:

- RaCESM detected entry into a previously untested tile and initiated the test sequence.
- No RaCESM hardware or software failures occurred during the test sequence.
- No operator errors occurred during the test sequence.
- No busy signal occurred during the test sequence.
- No errant GPS data³ was received and used by RaCESM during the test sequence.

If any of the above conditions were violated, the test sample is invalid and the tile is considered untested.

4.2.3 Inaccessible Tile

For tiles that were accessible but were missed for any reason, AECOM went back and attempted to test the tile.

² A shape file is a popular geospatial vector data format for geographic information systems software. Shape files can be created and read by ESRI (and other) software. Shape files are actually several related files that convey geospatial data.

³ Obviously errant GPS data is a stated position more than 100 meters (~330 feet) from the actual position. This deviation is based on both the accuracy in the civilian GPS course / acquisition (C/A) code and the potential error in the underlying geographical map data in the vehicle.

4.2.4 Tile Retries

Tile retries were performed only where an invalid test sample was collected (see 4.2.2). In these cases, RaCESM operators invalidated the data, and performed a re-test of the tile.

4.2.5 Failed Tile

A failed tile is any tile in which:

- A valid test sample was collected (see 4.2.2), and;
- Either the talk-out or the talk-in DAQ score is less than 3, or does not exist.

4.3 Received Signal Strength Indicator (RSSI) Sample

RSSI data for the control channel was collected on a per tile basis, concurrent with the DAQ talk-out test.

The mobile test unit had two additional auxiliary receivers and antennas to perform RSSI measurements. During the talk-out test transmission, the RSSI receivers collect samples based on the automatic gain control line from the receiver. Multiple samples are collected in each tile, at an average rate of 57 samples per second. The median value of these samples is used, and then the average of the median value from each of the two receivers is presented as the RSSI value for that tile. The dynamic range of the ICOM receiver is -55 dBm to -120 dBm with a 1 dB resolution.

5 System Requirements and Impact

5.1 Testing System Requirements

During RaCESM testing on a trunked system, interruption by other radio users on the same talk-group during RaCESM testing will disrupt the test results. Therefore, we require a dedicated talk group for testing be programmed into the radios and into the system manager. For additional protection, this test talk group can be partitioned to a single, dedicated working channel. This will eliminate outside influences on the test data (e.g., system “busies”). If the RaCESM test is assigned channels randomly (i.e., non-partitioned), the test results may not be as useful due to the different characteristics of the individual transmitters and antennas. Also, RaCESM performs best when only the RaCESM test talk group is using the partitioned channel, as this eliminates potential blocking or queuing by other users.

Under no circumstances can any work be done at any of the transmitter sites concurrent with the testing. If system failures occur, or if maintenance is required at the radio sites, the coverage testing will be stopped. Re-start of the test will then be coordinated with EBRCSA. It may be that some of the earlier test data was corrupted, and that some or all of the previous testing will have to be repeated.

All of these testing requirements were met, and we experienced none of the issues highlighted above. The test talk group was not partitioned to a specific channel because AECOM was the only user on the system during testing.

5.2 Testing an Operational System

When RaCESM is used in a system without a dedicated channel available, the RaCESM units are subject to the same operational limits as any other radios on the system. The effects on testing and operations can be significant. During this coverage acceptance testing, the dedicated talk-group on the trunked P25 system should not be accessible to any user, even for monitoring. Heavy use of the system by other users also poses the potential for queuing, which will corrupt the coverage test data. Under these circumstances, we will stop the test and coordinate the re-start with EBRCSA.

The system was not in operational use at the time of testing, and we experienced no busy signals.

5.3 Radio Requirements

EBRCSA supplied the radios used by RaCESM. See the equipment list for the radios required. Each radio was programmed with talk-groups that were utilized for the testing and a simplex (talk-around) frequency for diagnostics and setup of the test equipment.

6 Test Procedures

6.1 Testing System Requirements

AECOM deployed one (1) drive test team for the testing. The test team consisted of one AECOM employee to operate the RaCESM equipment. EBRCSA provided the driver and the vehicle. Testing was overseen by an AECOM Engineer in Lynchburg, VA.

AECOM tested from 8 am - 5pm Monday through Friday. Progress reports were provided to EBRCSA on the following day.

6.2 Drive Test Areas

The Contra Costa County West Simulcast Cell was divided into two zones, one portable on street, and one medium building. Each was tested at the appropriate attenuation level.

The test team tested every accessible tile.

6.3 DAQ Measurements/Voice Recording

The DAQ measurements were collected using one vehicle with RaCESM set up as discussed in Section 3-1. RaCESM software was configured to provide indications on the computer that both talk-in and talk-out test calls were collected in each tile. Tile samples not meeting this requirement were considered not tested by the software, and were retested as described in section 4.2.5.

The RaCESM operator continually monitored the GPS-indicated position on the laptops and validated this position by having the driver indicate road intersections. If GPS positions were found to be inaccurate, the tester invalidated the test, performed a manual position update, and then retested the grid.

6.4 Frequencies, Talk Groups, and Control Channels

The Control Channel was on 853.7500 MHz for the duration of the testing. AECOM's testing was performed on the "AECOM" talk group. The radios were also programmed with "TAC – AECOM T/A" for simplex operation. The AECOM talk group was not limited to any particular working channels. The following frequencies were utilized by the system during testing:

Channel	Base TX (MHz)	Base RX (MHz)	Function
Contra Costa County West Cell Channel 1	853.7500	808.7500	Control Channel / Voice Channel
Contra Costa County West Cell Channel 2	853.7375	808.7375	Control Channel / Voice Channel
Contra Costa County West Cell Channel 3	853.3000	808.3000	Control Channel / Voice Channel
Contra Costa County West Cell Channel 4	853.2875	808.2875	Control Channel / Voice Channel
Contra Costa County West Cell Channel 5	852.9375	807.9375	Voice Channel
Contra Costa County West Cell Channel 6	852.9250	807.9250	Voice Channel
Contra Costa County West Cell Channel 7	852.6215	807.6215	Voice Channel
Contra Costa County West Cell Channel 8	852.6000	807.6000	Voice Channel
Contra Costa County West Cell Channel 9	851.3625	806.3625	Voice Channel
Contra Costa County West Cell Channel 10	851.3500	806.3500	Voice Channel / Base Station Identifier

Table 6-1 Contra Costa County West Frequencies

6.5 Stationary Unit Locations

The stationary unit was located at the Courtyard Marriott Richmond. This location was selected because of its proximity to the Pearl Ridge Reservoir Site. The RaCE stationary unit was located in room 512, on the fifth floor. During setup, received signal strength of the control channel for the simulcast cell was measured between -56 and -62 dBm, with the received signal from the Pearl Ridge Reservoir site sufficiently stronger than the other sites to provide a capture effect.

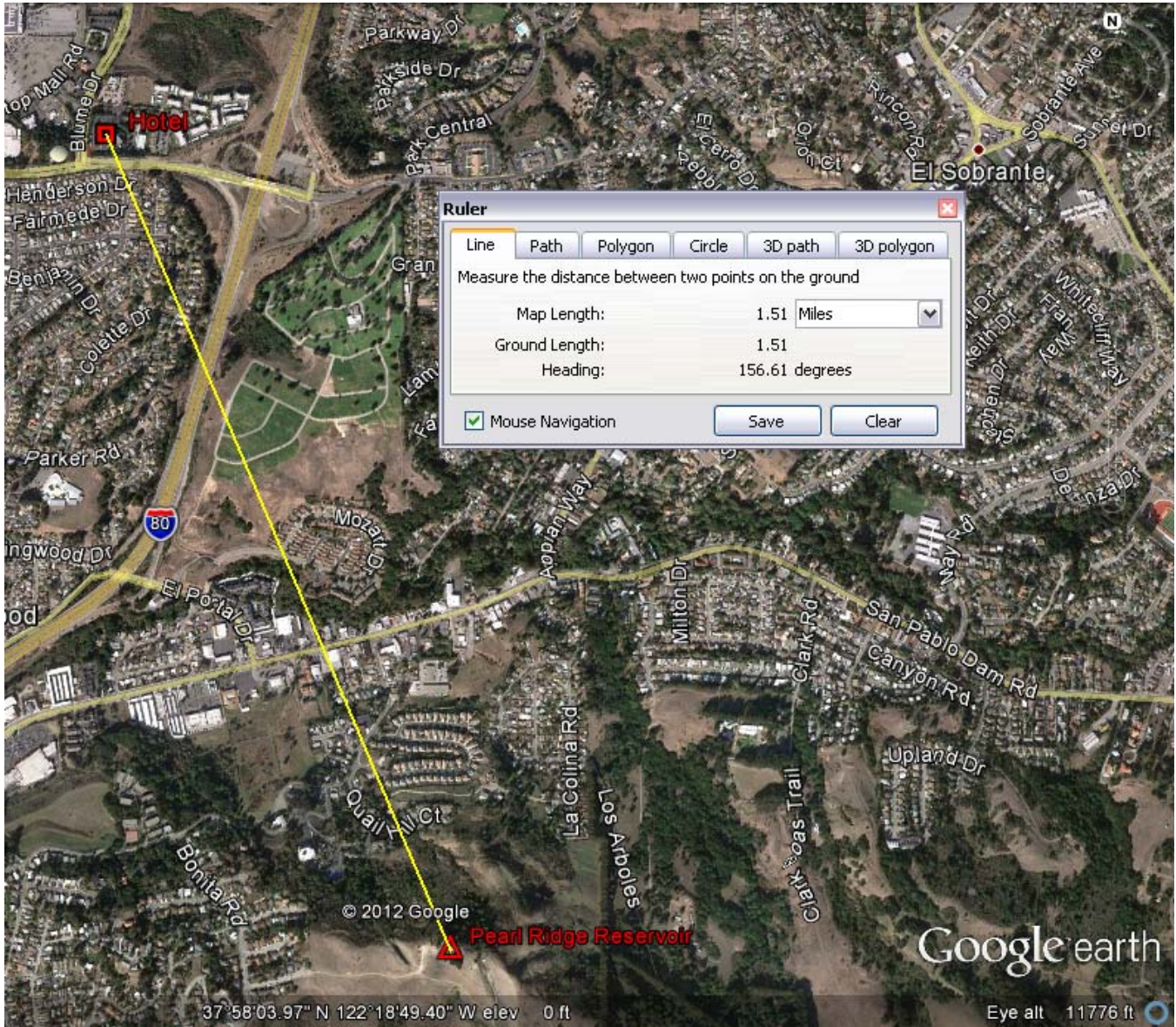


Figure 6-1 Relationship between Hotel and Nearest Site

The hotel is located at 37.978N, 122.323W. The distance between the hotel and the Pearl Ridge Reservoir site is 1.51 miles at a heading of 156.61 degrees. The next closest site is Turquoise, which is 3.15 miles away, at a heading of 69.44 degrees.

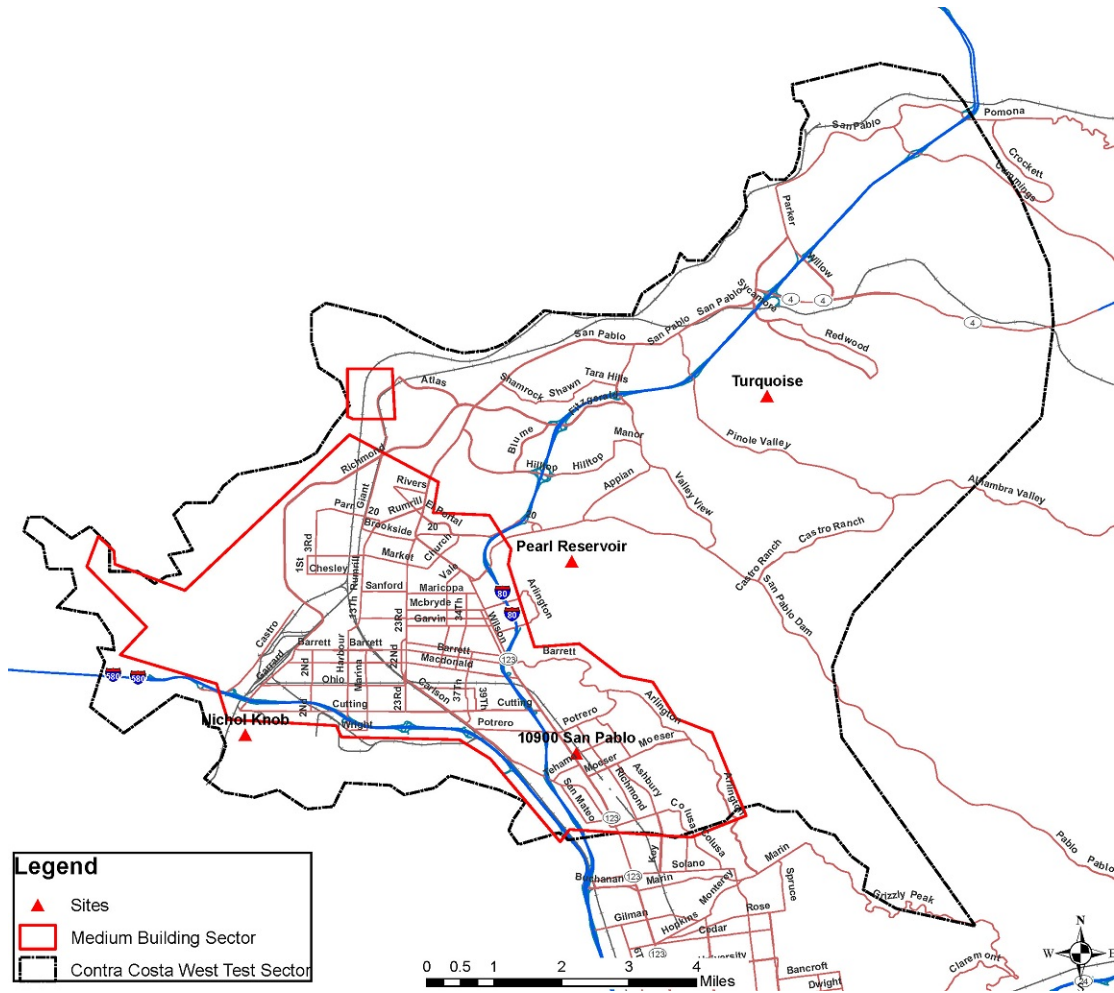


Figure 6-2 Radio Sites in the CCCO West Simulcast Cell

Name	Latitude	Longitude	Elevation AMSL (m)	ERP (W)	TX Ant Azimuth (deg)	TX Ant Model	TX Ant Ht to Tip (m)
Turquoise	37-59-35.8 N	122-16-11.4 W	173.4	182.0	N/A	Antel BCD-80010-3-25	17.2
El Cerrito PD	37-54-58.7 N	122-18-39.9 W	21.0	218.0	350	Antel BCR-80013-25	15.6
Pearl Ridge Reservoir	37-57-27.2 N	122-18-44.7 W	201.0	182.0	N/A	Antel BCD-80010-5-25	21.7
Nickols Knob	37-55-13.0 N	122-22-55.0 W	113.1	75.0	N/A	TX RX 101D-90-06-03N	15.1

Table 6-2 Radio Sites in the Contra Costa County West Simulcast Cell

6.6 Stationary Unit Locations

The test vehicle for the mobile installation was a Ford Crown Victoria, provided by EBRCSA. AECOM installed the mobile equipment on June 17, 2011 and performed a checkout test to ensure proper operation. The equipment remained installed for the duration of the testing.



Figure 6-3 Photograph of Test Vehicle Setup



Photograph showing the roof of the test vehicle with GPS antenna, mobile radio antenna, two RSSI receiver antennas, as well as two permanent antennas not related to RaCESM testing.

Figure 6-4 Photograph of Test Vehicles Antenna Location

6.7 Data Collection, Storage and Post-Processing

At the end of each test day, all RaCESM test data was copied from the mobile and stationary laptops to an external hard drive. Data also remained on the original laptop computer.

6.8 Additional Procedures

See APPENDIX A: RaCESM PROCEDURES for additional test procedures.

6.9 Post Processing

AECOM listened to any test .wav file with a DAQ score of 3 or lower, and a sample of scores above 3. AECOM recommends that EBRCSA listen to any test .wav files that scored below a 3 DAQ. AECOM also recommends that EBRCSA samples 1% of the .wav files with a DAQ above 3.

6.10 Inaccessible Tiles

Certain tiles inside the test sectors 1a and 1b were inaccessible to vehicles, and were therefore not tested. These include some of the coastal areas, the area southwest of the San Pablo Canal, a large portion of the northern part of the test area, the foothills on the eastern end of the test area, and the Wildcat Canyon Regional Park.

7 Results

Conformance testing relies on statistics over a large area, by measuring a statistically significant number of random test locations, uniformly distributed throughout the defined area. Tests are usually conducted throughout either a service area, which is the entire area where the radio system will be used, or a covered area, which is the area that is predicted to have coverage based on the design. For this test, DAQ and BER results pertaining to the covered area reliability are what determine whether the system passes the test. DAQ results pertaining to the service area reliability and RSSI results are provided for information only.

Reliability is defined as the percentage of locations to and from which radio communications meets or exceeds the desired CPC. For the covered area reliability test, the validated covered area reliability value in percent is calculated by dividing the number of valid test measurements within the covered area that that meet or exceed the required CPC by the total number of valid tests within the covered area. The validated service area reliability value in percent is calculated by dividing the number of valid test measurements within the service area that meet or exceed the required CPC by the total number of valid test measurements in the service area.

7.1 Test Results

From the specifications, the coverage guarantee for the system is a covered area reliability of 95% or higher. In order to meet this, 95% of tests must meet or exceed the Channel Performance Criteria (CPC) of DAQ 3 in both talk-in and talk-out directions. The covered area reliability is shown for both medium building attenuation (test sector 1b) and portable on street attenuation (test sector 1a).

Test Sector	Covered Area Reliability: Two-Way DAQ			
	Pass	Fail	Total	%
1a	366	1	367	99.7%
1b	257	0	257	100.0%

Table 7-1 DAQ Test Results – Covered Area Reliability

Table 7-1 shows the results of the covered area reliability DAQ test. Tiles where a test was attempted but could not be completed due to inability to access the system from that location are included as tested tiles with a DAQ score of 0.

From these results, we see that Motorola has exceeded the specified coverage.

Additional test results are provided below for information only.

7.2 Detailed DAQ Test Results

Test Sector	Service Area Reliability: Two-Way DAQ			
	Pass	Fail	Total	%
1a	512	10	522	98.1%
1b	268	0	268	100.0%

Table 7-2 DAQ Test Results – Service Area Reliability

Table 7-2 shows the results of the Service Area Reliability DAQ test. Tiles where the test system was unable to gain system access were counted as failures. Tiles with an incomplete test sequence, as defined in section 4.2, were omitted from these results.

Test Sector	Service Area Reliability: Talk-In DAQ				Service Area Reliability: Talk-out DAQ			
	Pass	Fail	Total	%	Pass	Fail	Total	%
1a	514	8	522	98.5%	516	5	521	99.0%
1b	268	0	268	100.0%	268	0	268	100.0%

Table 7-3 One-Way DAQ Test Results – Service Area

Table 7-3 shows the one-way DAQ test results for both test sectors in the service area.

Test Sector	Covered Area Reliability: Talk-In DAQ				Covered Area Reliability: Talk-Out DAQ			
	Pass	Fail	Total	%	Pass	Fail	Total	%
1a	367	0	367	100.0%	366	1	367	99.7%
1b	257	0	257	100.0%	257	0	257	100.0%

Table 7-4 One-Way DAQ Test Results – Covered Area

Table 7-4 shows the one-way DAQ test results for both test sectors in the covered area only.

Detailed DAQ test results can be found in Appendix F: Composite Results, and are displayed in Figure 7-3 (Medium Building [Sector 1b] Two-way DAQ Test), Figure 7-4 (Portable on Street [Sector 1a] Two-way DAQ Test), Figure 7-5 (RaCE Talk-In Delivered Audio Quality), and Figure 7-6 (RaCE Talk-Out Delivered Audio Quality). Tiles in which DAQ test was attempted but a channel grant could not be obtained are shown in Figure

Figure 7-3 shows only the results from tiles inside the Motorola covered area. The rest of the maps display data from tiles in the service area.

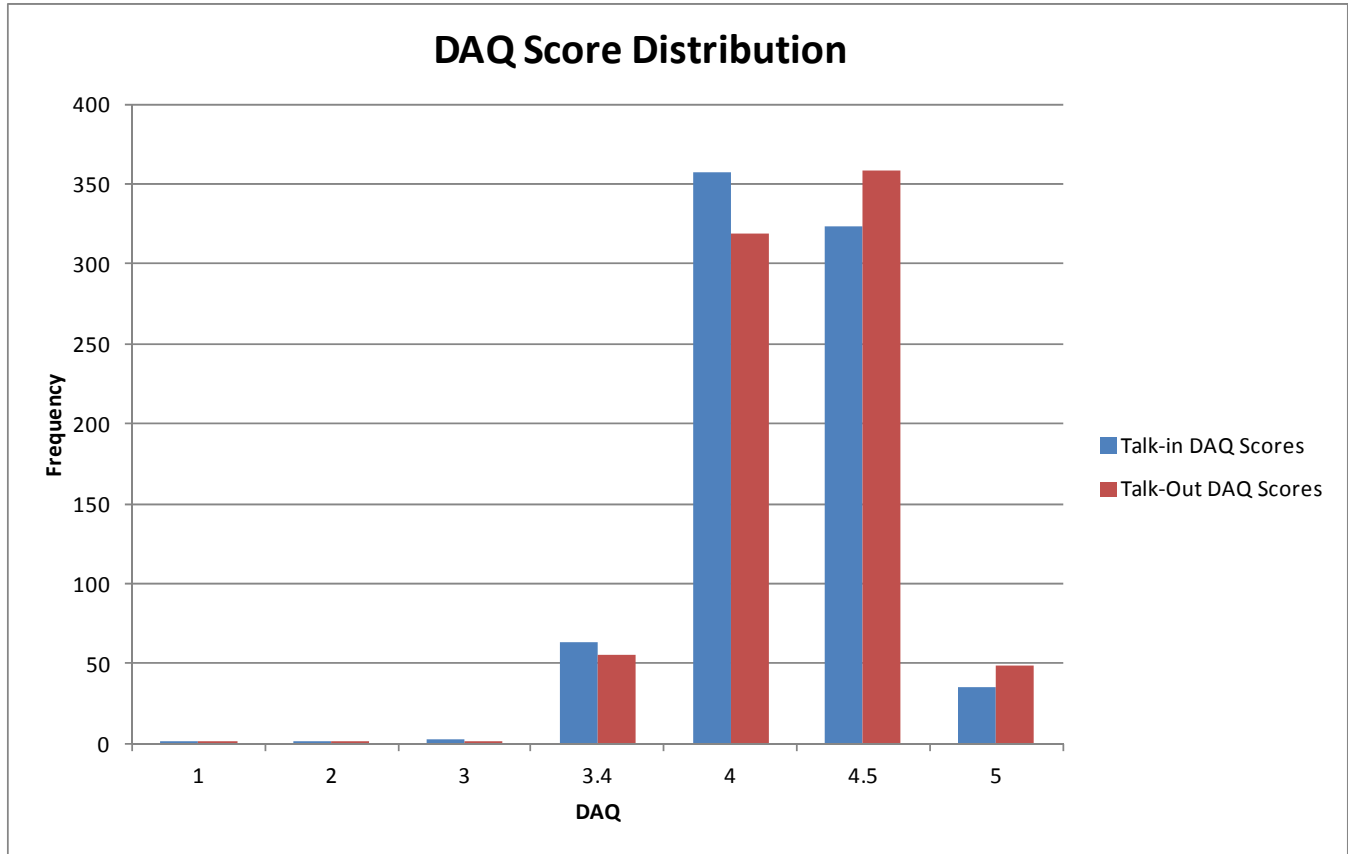


Figure 7-1 DAQ Score Distribution

Figure 7-1 shows the frequency with which each DAQ score was observed over the entire service area. This chart only includes tests where the mobile unit was able to obtain a channel grant. 99.4% of the scores are DAQ 3.4 or above, and 91.9% of the scores are DAQ 4 or above.

7.3 RSSI Test Results

AECOM’s RSSI data was collected without any added attenuation, to provide measurements as close as possible to the ambient signal level present at that location. In analyzing the data, AECOM has used the following cutoffs to organize the RSSI data: successful mobile radio (using a mobile radio with a receive sensitivity of -119 dBm) communications will generally require a RSSI of at least -108.55 dBm, portable on street will generally require a RSSI of at least -99.18 dBm, portable in light building will generally require a RSSI of at least -93.18 dBm, and portable radio in medium building will generally require a RSSI of at least -84.18 dBm. All of these values are RSSI as measured by a mobile radio outdoors.

Test Sector	Received Signal Strength in dBm					Total
	Medium Building	Light Building	Portable on Street	Mobile Only	No Coverage	
	≥ -84.18	≥ -93.18	≥ -99.18	≥ -108.55	< -108.55	
1a	392	76	31	17	3	519
1b	265	3	0	0	0	268

Table 7-5 RSSI Level

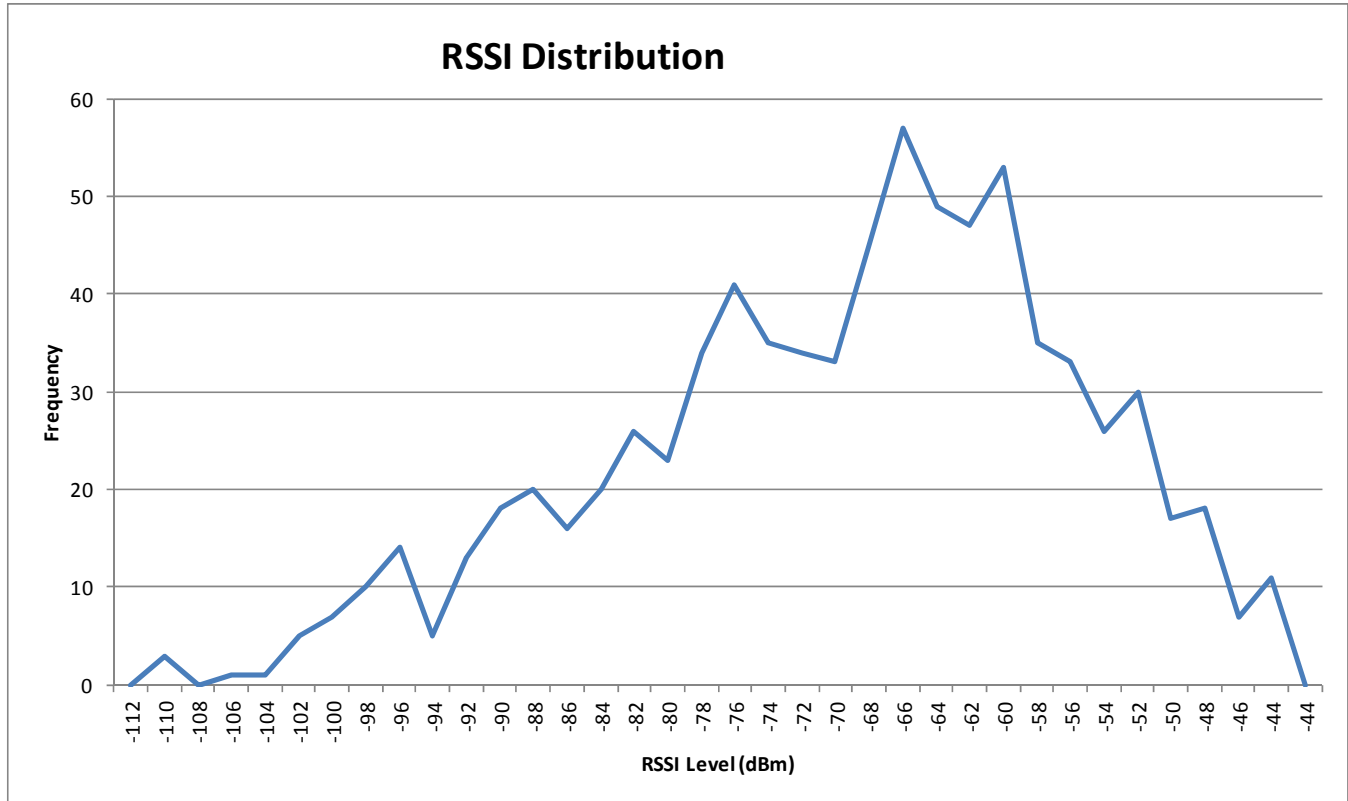


Figure 7-2 RSSI Level Distribution

Figure 7-2 shows the distribution of RSSI scores.

Detailed RSSI test results can be found in Appendix F: Composite Results, and are displayed in Figure 7-7, RaCE Receive Signal Strength Indicator.

7.4 BER Test Results

AECOM did not perform BER testing; however, Motorola’s BER test results are included for ease of reference. The BER CPC is that the BER must be equal to or below 2.6%, and Motorola’s coverage guarantee is that 95% of the tests will meet or exceed the CPC.

Test Sector	Covered Area			
	Pass	Fail	Total	%
1a	365	2	367	99.5%
1b	257	0	257	100.0%

Table 7-6 BER Test Results

Table 7-6 shows the BER test results collected by Motorola. BER testing was only performed in the Motorola Covered Area.

Detailed BER test results can be found in Appendix F: Composite Results, and are displayed in Figure 7-8, Motorola BER.

7.5 DAQ Test Data

RaCESM data includes:

- Mobile unit latitude and longitude
- Talk-In calculated DAQ (from the mobile) – date and time stamped

- Talk-Out calculated DAQ (from the stationary position) – date and time stamped
- Talk-in and Talk-out received audio records (recorded as .wav files)
- Talk-in and Talk-out reference audio records (recorded as .wav files)
- Audio message used for each test direction (talk-in and talk-out)
- Time the audio file was recorded
- RSSI value collected by AECOM
- Grid Reference number for each gridded test tile
- Which test sector the tile was part of
- Whether the tile was in Motorola's covered area, or just the service area

Using the data above, the following information is provided for post processing, as shown in the sample Excel spreadsheet in Table 7-7 below.

Wave File	Direction	Start Time	Latitude	Longitude	Grid_Ref_Str	DAQ_Score
<u>00001.wav</u>	talk-in	2/6/2008 17:24	37.338487	-79.240112	4,4	3.9
<u>00002.wav</u>	talk-out	2/6/2008 17:24	37.338475	-79.240138	5,4	3.5
<u>00003.wav</u>	talk-in	2/6/2008 17:32	37.342162	-79.23593	5,5	3.4
<u>00004.wav</u>	talk-out	2/6/2008 17:32	37.343645	-79.234908	5,6	3.7
<u>00005.wav</u>	talk-in	2/6/2008 17:33	37.339798	-79.226513	4,6	3.5
<u>00006.wav</u>	talk-out	2/6/2008 17:33	37.338575	-79.223762	4,7	3.8
<u>00007.wav</u>	talk-in	2/6/2008 17:33	37.337398	-79.221977	5,7	3.9
<u>00008.wav</u>	talk-out	2/6/2008 17:33	37.335903	-79.21969	6,7	3.4

Table 7-7 Sample Excel Spreadsheet

The data spreadsheet is in Microsoft Excel format. The .wav files contain a link to the collected audio file for that test and will play when selected.

Figure 7-3 Medium Building Two-Way DAQ Test

CLIENT: EBRCSA
PROJECT NO: 60175932

DATA SOURCE AND NOTES:

Shape File data provided from ESRI

Pass: Tiles containing both a talk-in DAQ score ≥ 3 and a talk-out DAQ score ≥ 3 .

Fail: Tiles with a completed test sequence and either talk-in or talk-out DAQ scores < 3 .

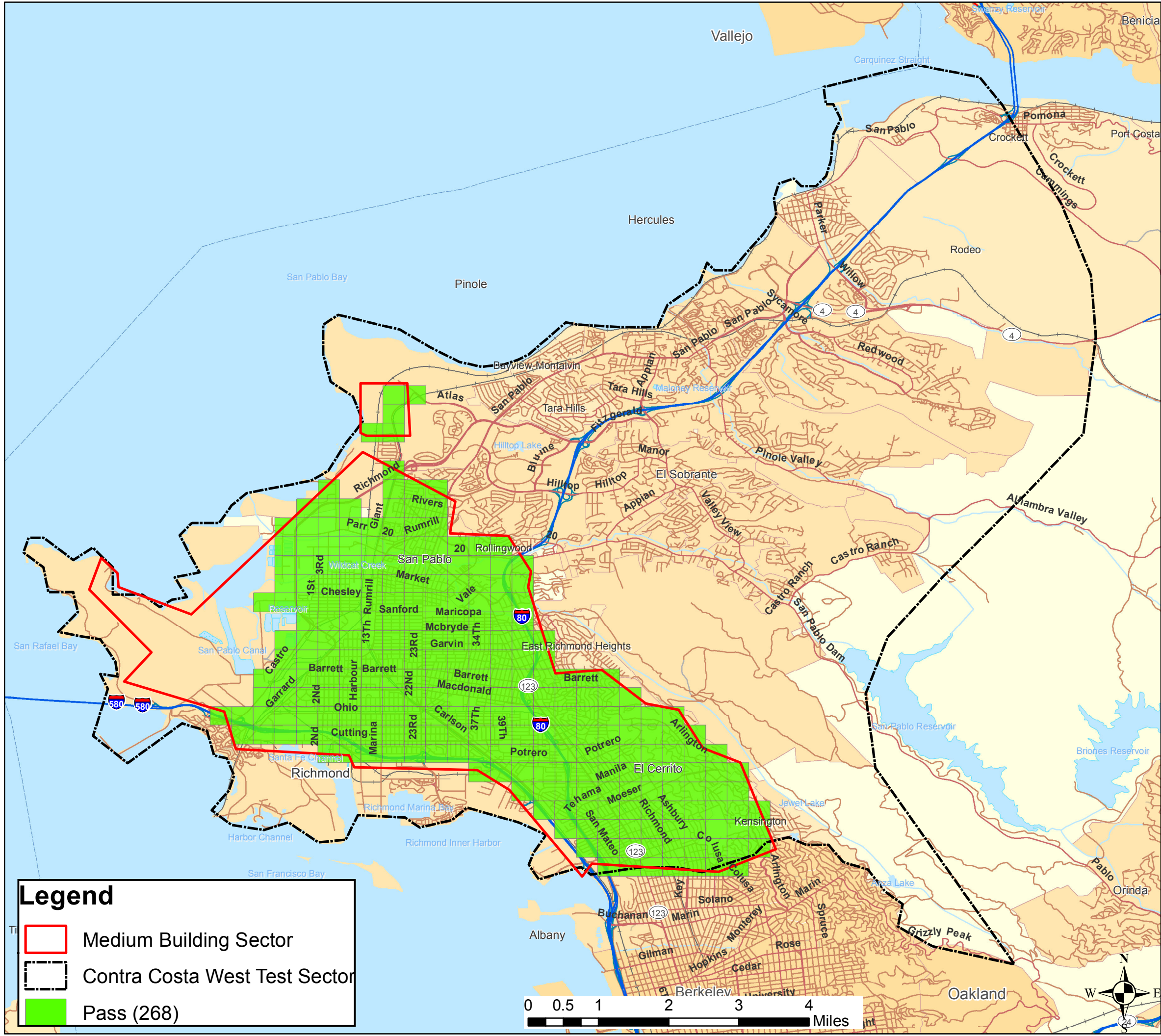
DESIGN: GAD - 07 June 2012
DRAWN: TRM- 08 June 2012
CHECKED: FUU - 8 June 2012
APPROVED: KAB - 8 June 2012

FILE NAME:
M:\Projects\Radio Projects\60091361_20175 EBRCSA\Task E.00 RaCE Testing\CCCO West\Maps\Figure 7-3 Medium Building Two_Way DAQ Test.mxd

REV	DATE	APPROVED BY



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LYNCHBURG, VA 24502
(434) 239-9200 www.aecom.com



Legend

- Medium Building Sector
- Contra Costa West Test Sector
- Pass (268)

Figure 7-4 Portable on Street Two-Way DAQ Test

CLIENT: EBRCSA

PROJECT NO: 60175932

DATA SOURCE AND NOTES:

Shape File data provided from ESRI

Pass: Tiles containing both a talk-in DAQ score ≥ 3 and a talk-out DAQ score ≥ 3 .

Fail: Tiles with a completed test sequence and either talk-in or talk-out DAQ scores < 3 .

DESIGN: GAD - 8 June 2012

DRAWN: TRM - 8 June 2012

CHECKED: FUO - 8 June 2012

APPROVED: KAB - 8 June 2012

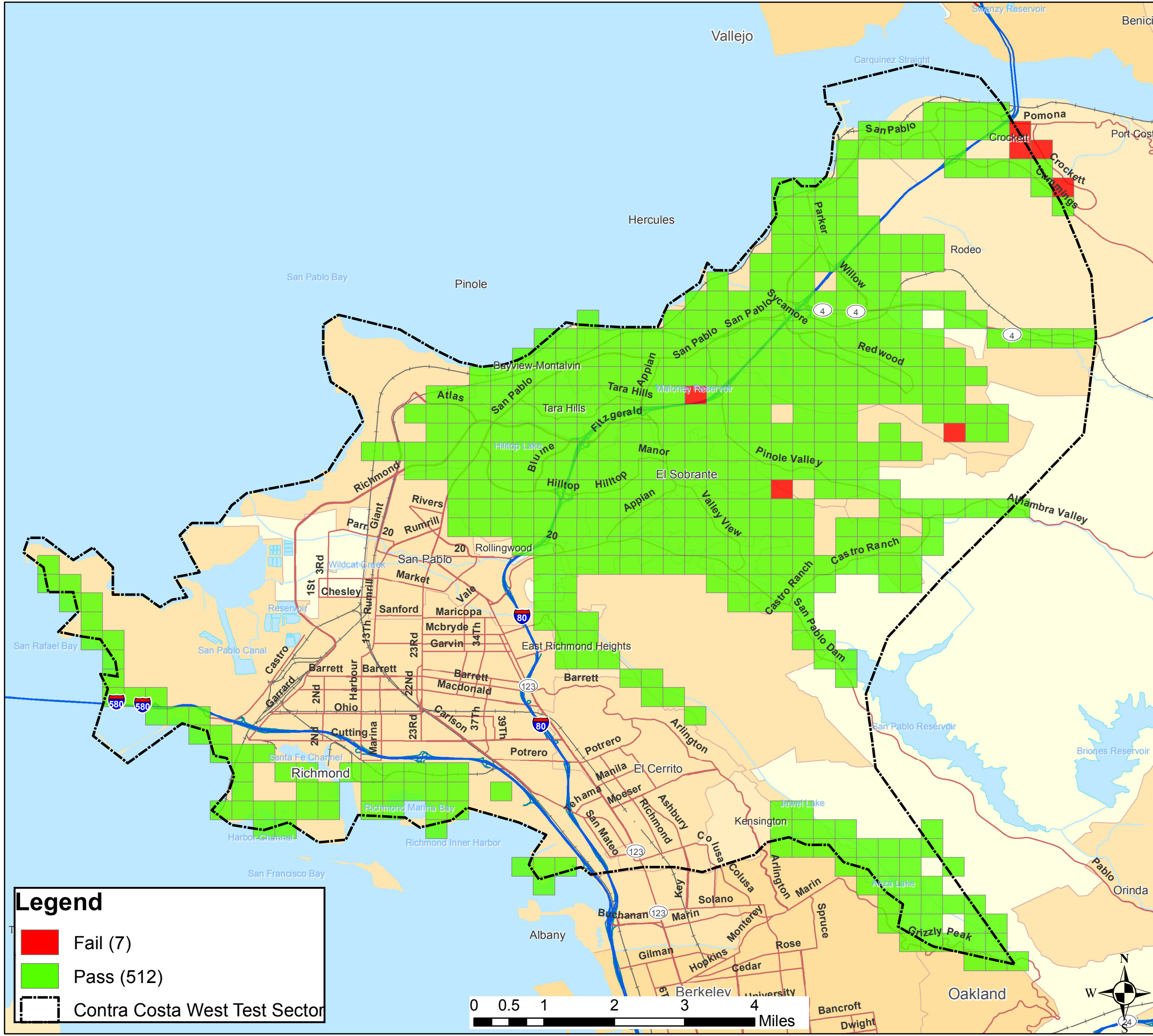
FILE NAME:

M:\Projects\Radio Projects\60091361_20175 EBRCSA\
Task E.00 RaCE Testing\CCCO West\Maps\
Figure 7-4 Portable on Street Two_Way DAQ Test.mxd

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Legend

- Fail (7)
- Pass (512)
- Contra Costa West Test Sector

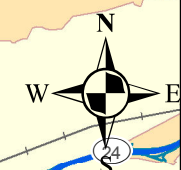


Figure 7-5
RaCE Talk-In
Delivered Audio
Quality (DAQ)

CLIENT: EBRCSA

PROJECT NO: 60175932

DATA SOURCE AND NOTES:

Shape File data provided from ESRI

DESIGN: GDM - 15 July 2011

DRAWN: GDM - 15 July 2011

CHECKED: MJL - 15 July 2011

APPROVED: MJL - 15 July 2011

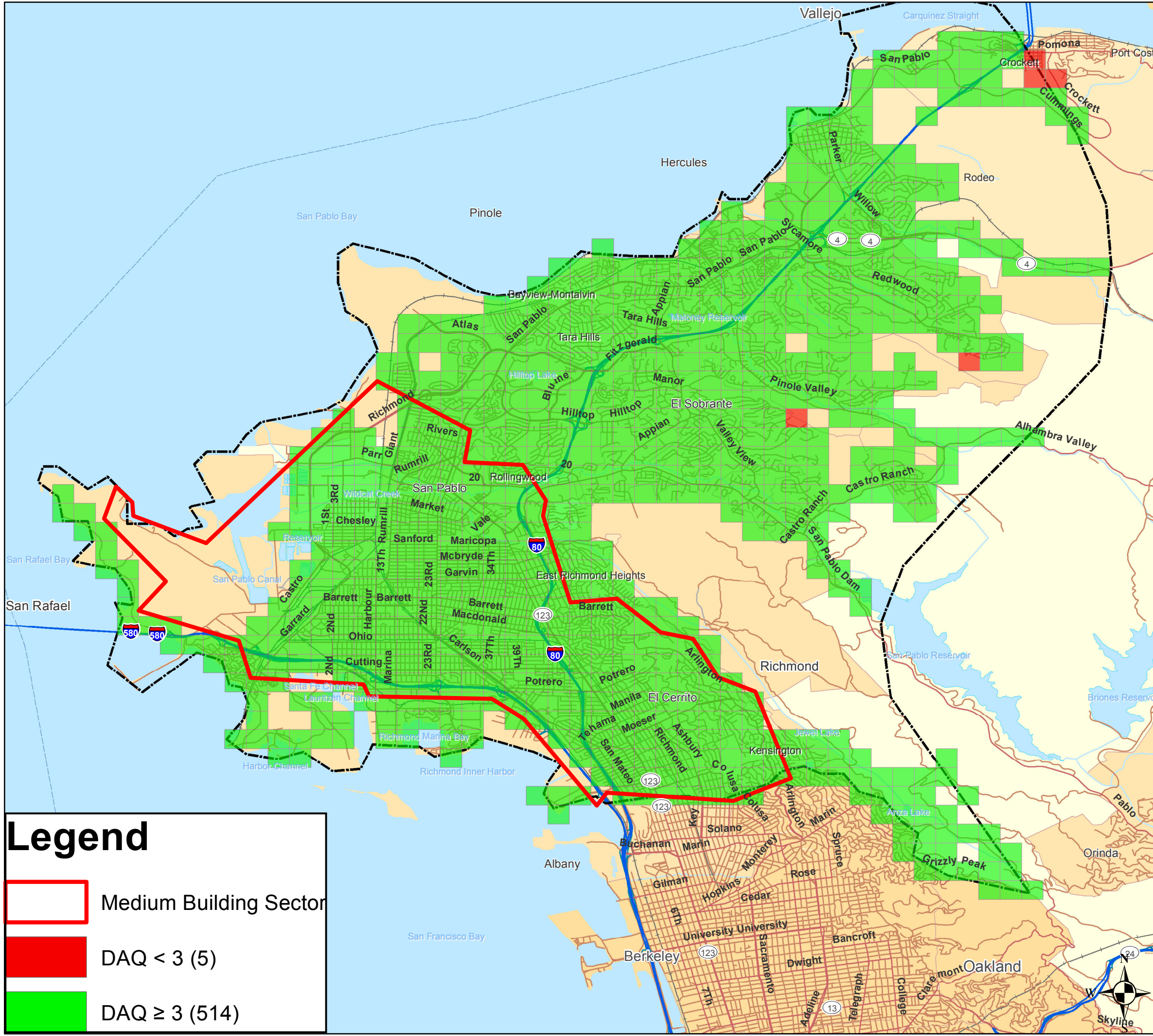
FILE NAME:

M:\Projects\Radio Projects\60091361_20175 EBRCSA\
Task E.00 RaCE Testing\CCCO West\Maps\
Figure 7-5 RaCE_Talk-In DAQ.mxd

REV	DATE	APPROVED BY
1	June 8 2012	KAB - 8 June 2012



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Legend

- Medium Building Sector
- DAQ < 3 (5)
- DAQ ≥ 3 (514)

Figure 7-6
RaCE Talk-Out
Delivered Audio
Quality (DAQ)

CLIENT: EBRCSA

PROJECT NO: 60175932

DATA SOURCE AND NOTES:

Shape File data provided from ESRI

DESIGN: GDM - 15 July 2011

DRAWN: GDM - 15 July 2011

CHECKED: MJL - 15 July 2011

APPROVED: MJL - 15 July 2011

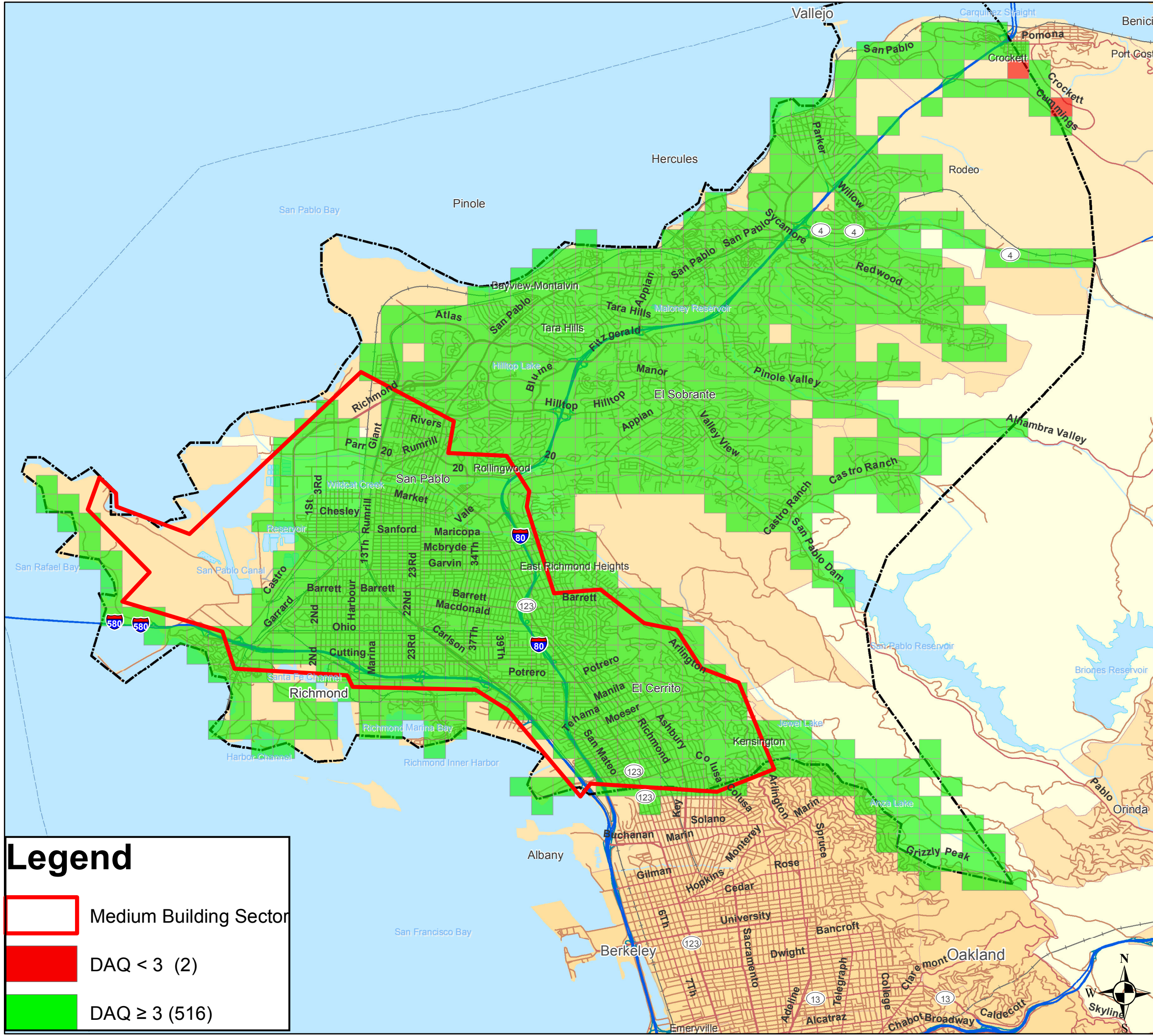
FILE NAME:

M:\Projects\Radio Projects\60091361_20175 EBRCSA\
Task E.00 RaCE Testing\CCCO West\Maps\
Figure 7-6 RaCE_Talk-Out DAQ.mxd

REV	DATE	APPROVED BY
1	June 8 2012	KAB - 8 June 2012



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Legend

- Medium Building Sector
- DAQ < 3 (2)
- DAQ ≥ 3 (516)

Figure 7-7 RaCE Receive Signal Strength Indicator (RSSI)

CLIENT: EBRCSA

PROJECT NO: 60175932

DATA SOURCE AND NOTES:

Shape File data provided from ESRI

RSSI alone does not provide an accurate determination of voice coverage.

Values shown are for Motorola XTS and XTL radios.

DESIGN: GAD - 08 June 2012

DRAWN: TRM - 08 June 2012

CHECKED: FUO - 8 June 2012

APPROVED: KAB - 8 June 2012

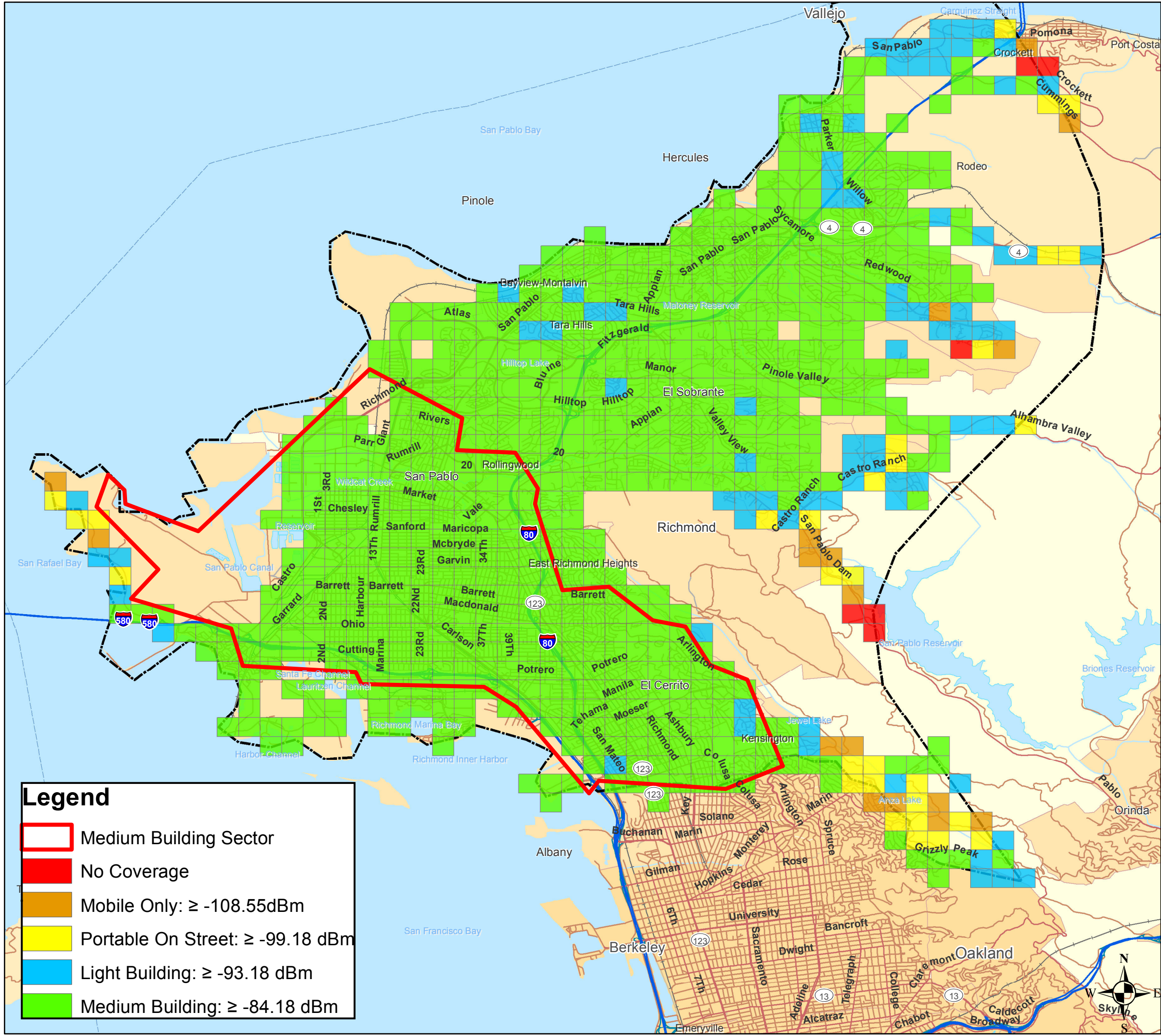
FILE NAME:

M:\Projects\Radio Projects\60091361_20175 EBRCSA\
Task E.00 RaCE Testing\CCCO West\Maps\
Figure 7-7 RaCE_RSSI.mxd

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Legend

- Medium Building Sector
- No Coverage
- Mobile Only: $\geq -108.55\text{dBm}$
- Portable On Street: $\geq -99.18\text{ dBm}$
- Light Building: $\geq -93.18\text{ dBm}$
- Medium Building: $\geq -84.18\text{ dBm}$

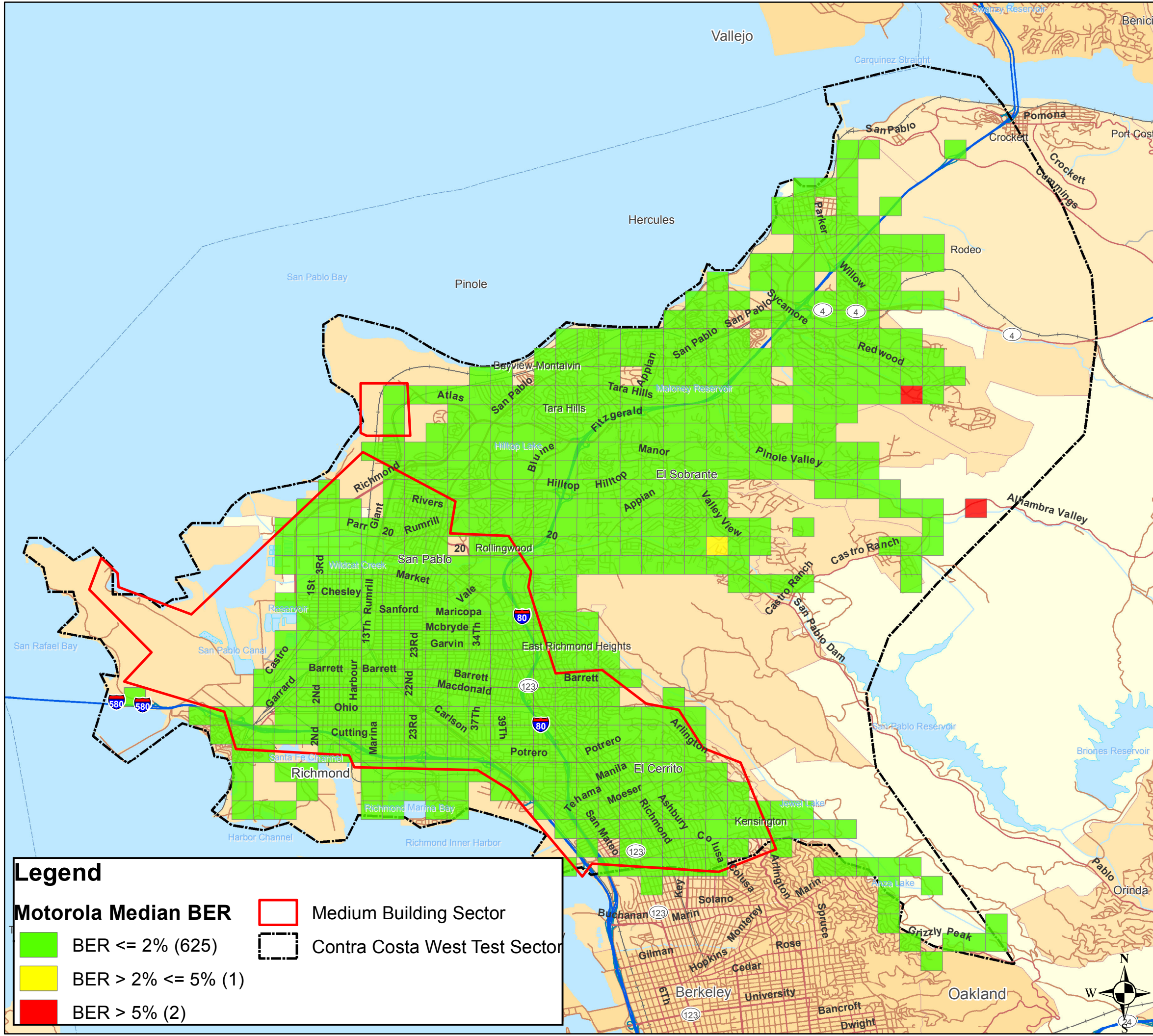
Figure 7-8 Motorola Bit Error Rate (BER) Measurement

CLIENT: EBRCSA

PROJECT NO: 60175932

DATA SOURCE AND NOTES:

Shape File data provided from ESRI



Legend

Motorola Median BER

- BER <= 2% (625)
- BER > 2% <= 5% (1)
- BER > 5% (2)

Medium Building Sector

Contra Costa West Test Sector

DESIGN:	GDM - 15 July 2011
DRAWN:	GDM - 15 July 2011
CHECKED:	MJL - 15 July 2011
APPROVED:	MJL - 15 July 2011
FILE NAME:	M:\Projects\Radio Projects\60091361_20175 EBRCSA\Task E.00 RaCE Testing\CCCO West\Maps\Figure 7-8 Motorola BER.mxd

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Figure 7-9 RaCE Channel Grant Failure

CLIENT: EBRCSA

PROJECT NO: 60175932

DATA SOURCE AND NOTES:

Shape File data provided from ESRI



Legend

- Channel Grant Failure (3)
- Medium Building Sector
- Contra Costa West Test Sector

DESIGN:	GDM - 15 July 2011
DRAWN:	GDM - 15 July 2011
CHECKED:	MJL - 15 July 2011
APPROVED:	MJL - 15 July 2011
FILE NAME:	M:\Projects\Radio Projects\60091361_20175 EBRCSA\Task E.00 RaCE Testing\CCCO West\Maps\Figure 7-9 RaCE_Channel Grant Failure.mxd

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8 Conclusions

AECOM performed two-way DAQ testing in every accessible tile. We listened to all test files with a DAQ score of 3 or lower, and a sampling of the remaining messages. The test results show that the Contra Costa County West simulcast cell meets the coverage requirement of the specifications.

Based on the results AECOM observed, the radio coverage in the Contra Costa County West simulcast cell meets the EBRCSA specifications. Therefore, we recommend that the EBRCS Authority approves the coverage acceptance test of the Contra Costa County West simulcast cell.

Appendix A RaCESM & Test Vehicle Procedures

A.1 Pre-Test Procedures

On arrival at the central testing location, the following procedures will be executed:

- Verify installation of approved version of the RaCESM software on all laptops.
- Set and verify audio levels for each installed radio.
- Mobile Unit – Ensure that the mobile unit remains in the correct configuration as indicated in Figure 3-1.
- Stationary Unit – Reproduce the stationary configuration established above in Figure 3-2.
- Verify the Mobile Unit has the correct Contra Costa County trunked system frequencies input into RaCESM.
- Install mobile RaCESM system into vehicle and verify system operation using the assigned AECOM talk group.
- Extract data from RaCESM mobile and stationary units and verify that the data is acceptable in post processing.
- Send RaCESM test results and project files to AECOM project engineer for validation.

A.2 Daily Test Procedures

Before commencing testing each day, the following procedures will be executed:

- Visually inspect the RaCESM stationary and mobile unit, ensure all cables are properly connected and verify correct attenuation on the mobile circulator network for the area under test.
- Proceed to collect data until each accessible tile has been tested.

A.3 Conclusion of each Day of Testing

At the conclusion of testing each shift, the following procedures will be executed:

- Extract data from the RaCESM mobile and stationary computers and place on the external hard drive.
- Note the days' progress and any other pertinent information necessary and send to AECOM project engineer for review.
- Run the RaCESM post-processing software
- Verify that the extracted RaCESM data is properly correlated and merged. If not, contact the AECOM project engineer for troubleshooting.
- Preserve the extracted RaCESM data on the external storage device.

A.4 Conclusion of Testing

At the conclusion of testing the following procedures will be executed:

- Ensure all test data are extracted and preserved.
- Return all AECOM equipment back to Sacramento.
- Return all Motorola and EBRCSA supplied equipment to its owner in Contra Costa County.

Appendix B EBRCSA Supplied Equipment

The following list contains the EBRCSA supplied equipment necessary for the Contra Costa County West testing.

Equipment	Quantity
<p align="center">Mobile Radio APX-7500 (control heads mounted on the radio)</p>	<p align="center">3</p>
<p align="center">Vehicle install Kit (includes accessory and power cables and mounting trunion)</p>	<p align="center">3</p>
<p align="center">Hand Held Microphone</p>	<p align="center">3</p>
<p align="center">Magnetic Mount Antennas (BNC connectors)</p>	<p align="center">7</p>

Figure B-1 EBRCSA Supplied Equipment and Quality

Appendix C Received Signal Strength Threshold Calculations

The following tables show the calculations used to determine the thresholds for various levels of coverage based on RSSI.

Portable Receiver System				
Portable Antenna		Location		Overall Gain
		Hip		-8.50 dBd
Antenna Radiative Gain (Assumed)		2.15 dBi	0.00 dBd	
Antenna Resistive Loss (Assumed)		-10.65 dBi	-8.50 dBd	
Portable Receiver				
Static Sensitivity (from Manufacturer Specification Sheet)			0.25 µV	-119.03 dBm
Static C/N Ratio (from TSB-88.1-C)				6.50 dB
Noise Floor				-125.53 dBm
Faded C/N Ratio (from TSB-88.1-C)				15.70 dB
Sensitivity				-109.83 dBm
Noise				
Effective Noise Bandwidth (from TSB-88-B)				5.50 kHz
Thermal Noise (kTB)				-136.57 dBm
Environmental Noise (above kTB)			0.00 dB	
Total Noise				-136.57 dBm
Noise Figure				
Receiver Noise Floor				-125.53 dBm
Thermal Noise Floor				-136.57 dBm
Receiver Noise Figure				11.04 dBm
System				
Total Noise Input				-136.57 dBm
		Gain	Noise Figure	
Antenna Resistive Loss		-10.65 dB	10.65 dB	
Receiver		0.00 dB	11.04 dB	
Composite System Gain and Noise Figure		-10.65 dB	21.69 dB	
Noise at Receiver {No = [Ni + (F - 1) * kTB] * g}				-125.53 dBm
Faded C/N Ratio				15.70 dB
Sensitivity at Receiver				-109.83 dBm
Composite System Gains				-10.65 dB
Receiver System Sensitivity (Accounting for Antenna Resistive				-99.18 dBm
Antenna Radiative Gain			0.00 dBd	
System Sensitivity				-99.18 dBm
Receiver System Sensitivity				-99.18 dBm
ArcView Display Parameters				
Portable Location			Attenuation	Signal Strength
Outdoor			0.00 dB	-99.18 dBm
Light Building			6.00 dB	-93.18 dBm
Medium Building			15.00 dB	-84.18 dBm

Table C-1 Portable Radio RSSI Threshold Level Calculations

Mobile Receiver System				
Mobile Antenna	Make & Model			Gain
				-1.00 dBd
Cables	Diameter/Type	Unit Loss	Length	Loss
Coax from Antenna to Receiver	Low-Loss RG-58	8.51 dB/100 ft	15 ft	1.28 dB
Receiver				
Static Sensitivity (from manufacturer specification sheet)			0.25 µV	-119.03 dBm
Static C/N Ratio (from TSB-88.1-C)				6.50 dB
Noise Floor				-125.53 dBm
Faded C/N Ratio (from TSB-88.1-C)				15.70 dB
Sensitivity				-109.83 dBm
Noise				
Effective Noise Bandwidth				5.50 kHz
Thermal Noise (kTB)				-136.57 dBm
Environmental Noise (above kTB)				0.00 dB
Total Noise				-136.57 dBm
Noise Figure				
Receiver Noise Floor				-125.53 dBm
Thermal Noise Floor				-136.57 dBm
Receiver Noise Figure				11.04 dBm
System				
Total Noise Input				-136.57 dBm
		Gain	Noise Figure	
Cable		-1.28 dB	1.28 dB	
Receiver		0.00 dB	11.04 dB	
Composite System Gain and Noise Figure		-1.28 dB	12.32 dB	
Noise at Receiver {No = [Ni + (F - 1) * kTB] * g}				-125.53 dBm
Faded C/N Ratio				15.70 dB
Sensitivity at Receiver				-109.83 dBm
Composite System Gains				-1.28 dB
Receiver System Sensitivity				-108.55 dB
Antenna Gain				-1.00 dBd
System Sensitivity				-107.55 dBm
Location				Signal Strength
Mobile				-108.55 dBm

Table C-2 Mobile Radio RSSI Threshold Level Calculation

Appendix D Checklists

The following Figures are checklists and forms that were used during the Contra Costa County RaCESM Automated Coverage Testing.

Client Name	EBRCSA-Contra Costa West		
Project Number	60091361		
RaCE Stationary Units			
RaCE Unit Serial Numbers	S06		
Computers			
Manufacturer & Model	LENOVO T-61		
Serial Number	L3 C2104		
Radios			
Manufacturer & Model	Motorola APX 7500		
Serial Number	656CLZ6480		
RaCE Mobile Units			
RaCE Unit Serial Numbers	M06		
Computers			
Manufacturer & Model	LENOVO T-61		
Serial Numbers	L3 C2113		
Radios			
Manufacturer & Model	Motorola APX 7500		
Serial Numbers	656CLZ6496		
Date Complete / Initial			
Step 1: Determine Radio/System Requirements			
1.1 Programming of Radios complete	5/13/2011		JMK
1.2 System configuration complete	5/13/2011		JMK
1.3 Hardware requirement complete	5/13/2011		JMK
1.4 Sites/Frequencies complete	5/13/2011		JMK
Step 2: Determine or Develop Radio Interface	5/18/2011		JMK
Step 3: Configure Circulator	5/18/2011		JMK
Step 4: RaCE Software Settings			
4.1 Stationary Project File	6/16/2011		GDM
4.2 Mobile Project File	6/16/2011		GDM
Step 5: Bench Setup / Setting Audio Levels			
5.1 Bench Setup	5/14/2011		JMK
5.2 Set Audio Levels	6/16/2011		GDM
Step 6: Inventory Sheet	6/13/2011		GDM
Step 7: Arrival Setup Checklist	6/16/2011		GDM
Step 8: Daily Checklists	6/17-6/22/2011		GDM
Step 9: Final Report	8/2/2011		GDM
Step 10: Return Customer Equipment	6/24/2011		GDM
Step 11: Restock Equipment, Archive & Clear data from Laptops	6/27/2011		GDM
Name			
Signature	<i>Gary A Mountcastle</i>		Date: 8/2/2011

Figure D-1 Master Checklist

Client Name		EBRCSA-Contra Costa West		
Project Number		60091361		
RaCE Stationary Unit		Primary	Secondary	
	AC Power Cord	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	DC Power Cord	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF Power Sensor Cable (RCA)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Radio Control Interface Cable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	USB Cables for laptop	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Power Cord for Customer Radio	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	DC Power Supply Adapter	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Radio Model XTL5000/Spare	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF Cable from customer radio	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sniffer	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF Attenuator (optional)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Antenna	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Adapters to interconnect above items	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Laptop	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Laptop Power Supply	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	GPS Receiver	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	USB extension cord for GPS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RaCE Mobile Unit		Primary	Secondary	
	Radio Model XTS2500/Spare	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	AC Power Cord	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	DC Power Cord	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF Power Sensor Cable (RCA)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Radio Control Interface Cable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	USB Cables for laptop	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Power Cord for Customer Radio	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	DC Power Supply Adapter	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Networking Cable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF Cable from customer radio	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Sniffer	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Antennas for Radio, RSSI, BER	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Optoelectronics Digital Scout (optional if measuring TX Freq.)		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Scout Data Cable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Scout DC Power Cable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF Sampler	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	RF Cable to Sampler	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Circulator Network (optional)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Adapters to interconnect above items	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Laptop	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Laptop Power Supply (DC Adapter)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	GPS/DR Receiver	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	USB extension cord for GPS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	BER Radio	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure D-2 Inventory Checklist


Client Name		EBRCSA-Contra Costa West
Project Number		60091361
Stationary Unit Setup		
RaCE Unit Serial Number	S06	
Antenna Mounting Location	Window ledge of hotel room.	
Test Set Location		
Name	Courtyard Marriott	
Address	3150 Garrity Way	
City, State	Richmond, CA 94806	
Latitude	37.97752	
Longitude	-122.32323	
Notes: Room 512		
Mobile Unit Setup		
RaCE Unit Serial Number	M06	
Vehicle Year, Make & Model	Ford Crown Vic	
Antenna Mounting on Vehicle	Mobile-Center front of roof,lcom1-Back left of roof,lcom2-Back right of roof.	
Notes:		
Pre-Test Checklist		
1. Initiate the RaCE self-diagnostic tests to insure that the system is operating correctly.	<input checked="" type="checkbox"/>	
2. Confirm the results of the mobile and stationary units in RaCE Explorer. Verify .wav file amplitude and timing is correct.	<input checked="" type="checkbox"/>	
3. Assure secondary Jurisdiction radio that is not part of the test, if present, cannot transmit OR receive	<input checked="" type="checkbox"/>	
4. Establish location and take reference measurement(s) of local Control Channel(s) (-55)-(-60) Measured with Ramsey Comm Analyzer at window.	<input checked="" type="checkbox"/>	
Name: Gary Mountcastle		
Signature		

Figure D-3 Arrival Checklist

Client Name Project Number		EBRCSA-Contra Costa West 60091361	
Date	Forms completed for 6/17/11-6/22/11		
Vehicle Make & Model	Ford Crown Vic		
Vehicle License Plate #			
Test System Operator(s)	Gary Mountcastle		
Driver(s)	Deputy Audrey Catweza		
Manufacturer Representative	NA		
Weather Conditions	All days were sunny and clear. Cool in morning and evening and warmer during the day.		
Daily Pre-Test Checklist			
1	Configure Stationary Systems for daily operation.		<input checked="" type="checkbox"/>
2	Configure Mobile Systems for daily operation.		<input checked="" type="checkbox"/>
3	Verify the attenuation is correctly set.		<input checked="" type="checkbox"/>
4	Assure Jurisdiction radio that is not part of the test, if present, cannot transmit OR receive		<input checked="" type="checkbox"/>
5	Verify Mobile and Stationary Audio levels and timing are correct.		<input checked="" type="checkbox"/>
6	Verify Control Channel(s) are on expected frequency and at the approximate dBm level.		<input checked="" type="checkbox"/>
End of Shift Checklist			
1	Extract data from the mobile and stationary computers and transfer to external hard drive		<input checked="" type="checkbox"/>
2	Process the raw data through RaCE Explorer. Review the test results with an emphasis on checking: 1. Stationary and Mobile correlation. 2. Stationary and Mobile wave form timing and amplitude.		<input checked="" type="checkbox"/>
3	Provide Email to AECOM project engineer indicating number of grids tested, location of testing and any issues encountered.		<input checked="" type="checkbox"/>
Notes:			
Name Gary Mountcastle			
Signature <i>Gary A Mountcastle</i>		Date: 6/17/2011-6/22/2011	

Figure D-4 Daily Checklist

RaCE Release Number		3.05
Client Name		EBCSA-Contra Costa West
Project Number		60091361
	Primary Test Unit	Secondary Test Unit
Test Type	<input type="checkbox"/> Continuous, by Time	<input type="checkbox"/> Continuous, by Time
	<input checked="" type="checkbox"/> Continuous, by Grid	<input type="checkbox"/> Continuous, by Grid
Test Mode	<input checked="" type="checkbox"/> TX + RX	<input type="checkbox"/> TX + RX
	<input type="checkbox"/> RX	<input type="checkbox"/> RX + Access
	<input type="checkbox"/> RX + Access	<input type="checkbox"/> RX + Access
	<input type="checkbox"/> Access	<input type="checkbox"/> Access
	<input type="checkbox"/> RSII	<input type="checkbox"/> RSSI
	<input type="checkbox"/> TX + RX	<input type="checkbox"/> TX
Radio System Type	<input checked="" type="checkbox"/> Trunked	<input type="checkbox"/> Trunked
	<input type="checkbox"/> Conventional	<input type="checkbox"/> Conventional
Radio System Mode	<input type="checkbox"/> Analog	<input type="checkbox"/> Analog
	<input checked="" type="checkbox"/> Digital IMBE	<input type="checkbox"/> Digital IMBE
VOX Activation	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> Yes
	<input type="checkbox"/> No	<input type="checkbox"/> No
Collect pre/post - VOX audio?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> Yes
	<input type="checkbox"/> No	<input type="checkbox"/> No
Minimum Speed to Start Sequence		
System Manufacturer		
Verify IQS to DAQ Conversion Tables	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Verify Primary RSSI Conversion Tables	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Verify Secondary RSSI Conversion Tables	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Maximum Transmit Duty Cycle	%	%
Map File	<input checked="" type="checkbox"/>	<input type="checkbox"/>
TX/Reference Message Files	<input checked="" type="checkbox"/>	<input type="checkbox"/>
RaCE Mobile Project File Name	CCC_West_Mobile_Medium Building.5op CCC_West_Mobile_Portable on Street.5op	

Figure D-5 Mobile Unit Software Settings Checklist

RaCE Release Number		3.05
Client Name		EBRCSA-Contra Costa West
Project Number		60091361
Test Type	<input checked="" type="checkbox"/> Continuous, by Time <input type="checkbox"/> Continuous, by Grid	<input type="checkbox"/> Continuous, by Time <input type="checkbox"/> Continuous, by Grid
Test Mode	<input checked="" type="checkbox"/> TX + RX <input type="checkbox"/> RX <input type="checkbox"/> RX + Access <input type="checkbox"/> Access <input type="checkbox"/> RSII <input type="checkbox"/> TX + RX	<input type="checkbox"/> TX + RX <input type="checkbox"/> RX + Access <input type="checkbox"/> RX + Access <input type="checkbox"/> Access <input type="checkbox"/> RSSI <input type="checkbox"/> TX
Radio System Type	<input checked="" type="checkbox"/> Trunked <input type="checkbox"/> Conventional	<input type="checkbox"/> Trunked <input type="checkbox"/> Conventional
Radio System Mode	<input type="checkbox"/> Analog <input checked="" type="checkbox"/> Digital IMBE	<input type="checkbox"/> Analog <input type="checkbox"/> Digital IMBE
VOX Activation	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Collect pre/post - VOX audio?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
System Manufacturer		
Verify IQS to DAQ Conversion Tables	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Maximum Transmit Duty Cycle	%	%
TX/Reference Message Files	<input checked="" type="checkbox"/>	<input type="checkbox"/>
RaCE Stationary Project File Name	CCC_West_Stationary.5op	

Figure D-6 Software Settings Stationary Checklist

Client Name		EBRCSA-Contra Costa West	
Project Number		60091361	
Stationary Unit			
TX - Audio Setting (Deviation)	NA - Digital Modulation		
RaCE Interface Switch	2	(0-10)	
RaCE Interface Potentiometer	0:00	(Clock Position)	
Computer Volume Lock - Speaker	50	(0-100)	
Computer Volume Lock - Wave	50	(0-100)	
RX - Audio Settings			
Customer Radio Volume Setting	Upper left corner of control head		
RaCE Interface Switch	2	(0-10)	
RaCE Interface Potentiometer	10:00	(Clock Position)	
Computer Volume Lock - Line In	50	(0-100)	
Mobile Unit			
TX - Audio Setting (Deviation)	NA - Digital Modulation		
RaCE Interface Switch	2	(0-10)	
RaCE Interface Potentiometer	14:00	(Clock Position)	
Computer Volume Lock - Speaker	50	(0-100)	
Computer Volume Lock - Wave	50	(0-100)	
RX - Audio Settings			
Customer Radio Volume Setting	Upper left corner of control head		
RaCE Interface Switch	2	(0-10)	
RaCE Interface Potentiometer	1:00	(Clock Position)	
Computer Volume Lock - Line In	50	(0-100)	

Figure D-7 Audio Levels

Client Name		EBRCSA-Contra Costa West		
Project Number		60091361		
Radio Control Pinout				
DB9-Pin			Motorola	
1	TX Audio - Hi	<----->	3	
2	TX Audio - Lo	<----->	4	
3	Gnd	<----->	10	
4	PTT	<----->	8	
5	RX Audio - Hi	<----->	Speaker-Hi	Molex Connector
6	RX Audio - Lo	<----->	Speaker-Lo	

Notes:

Pinout numbers in Motorola connector diagram are for reference only.

Cable connects to control head of Motorola APX 7500

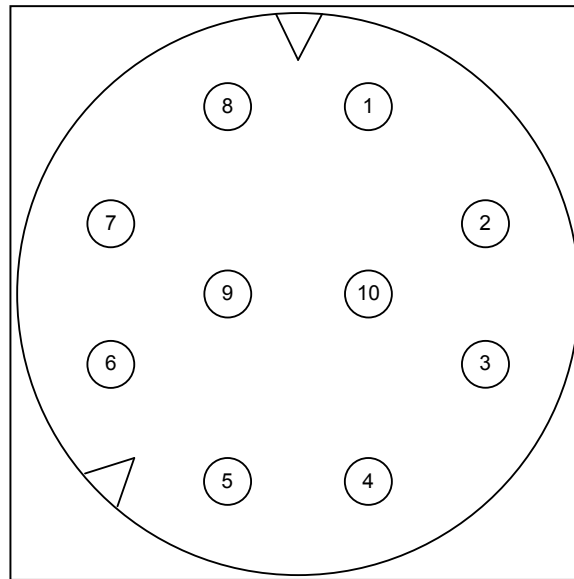


Figure D-8 Radio Interface

Appendix E Standard Harvard Phrases

Harvard Sentences

From the appendix of: IEEE Subcommittee on Subjective Measurements IEEE Recommended Practices for Speech Quality Measurements. *IEEE Transactions on Audio and Electroacoustics*. Vol 17, 227-46, 1969. Also found at [CMU site](#).

Two hundred messages from the Harvard Sentences were used during the coverage testing. The selected phrases used in the messages are shown below. Test messages of five to eight seconds were used for coverage testing, with randomly sorted messages that were half and half male and female voices.

Phrases used for male audio recordings:

List 2

1. The boy was there when the sun rose.
2. A rod is used to catch pink salmon.
3. The source of the huge river is the clear spring.
4. Kick the ball straight and follow through.
5. Help the woman get back to her feet.
6. A pot of tea helps to pass the evening.
7. Smoky fires lack flame and heat.
8. The soft cushion broke the man's fall.
9. The salt breeze came across from the sea.
10. The girl at the booth sold fifty bonds.

List 4

1. Hoist the load to your left shoulder.
2. Take the winding path to reach the lake.
3. Note closely the size of the gas tank.
4. Wipe the grease off his dirty face.
5. Mend the coat before you go out.
6. The wrist was badly strained and hung limp.
7. The stray cat gave birth to kittens.
8. The young girl gave no clear response.
9. The meal was cooked before the bell rang.
10. What joy there is in living.

List 7

1. We talked of the slide show in the circus.
2. Use a pencil to write the first draft.
3. He ran half way to the hardware store.
4. The clock struck to mark the third period.
5. A small creek cut across the field.
6. Cars and busses stalled in snow drifts.
7. The set of china hit, the floor with a crash.
8. This is a grand season for hikes on the road.
9. The dune rose from the edge of the water.
10. Those words were the cue for the actor to leave

List 8

1. A yacht slid around the point into the bay.
2. The two met while playing on the sand.
3. The ink stain dried on the finished page.
4. The walled town was seized without a fight.
5. The lease ran out in sixteen weeks.
6. A tame squirrel makes a nice pet.
7. The horn of the car woke the sleeping cop.
8. The heart beat strongly and with firm strokes.

9. The pearl was worn in a thin silver ring.
10. The fruit peel was cut in thick slices.

List 9

1. The Navy attacked the big task force.
2. See the cat glaring at the scared mouse.
3. There are more than two factors here.
4. The hat brim was wide and too droopy.
5. The lawyer tried to lose his case.
6. The grass curled around the fence post.
7. Cut the pie into large parts.
8. Men strive but seldom get rich.
9. Always close the barn door tight.
10. He lay prone and hardly moved a limb.

List 10

1. The slush lay deep along the street.
2. A wisp of cloud hung in the blue air.
3. A pound of sugar costs more than eggs.
4. The fin was sharp and cut the clear water.
5. The play seems dull and quite stupid.
6. Bail the boat, to stop it from sinking.
7. The term ended in late June that year.
8. A tusk is used to make costly gifts.
9. Ten pins were set in order.
10. The bill was paid every third week.

List 13

1. Type out three lists of orders.
2. The harder he tried the less he got done.
3. The boss ran the show with a watchful eye.
4. The cup cracked and spilled its contents.
5. Paste can cleanse the most dirty brass.
6. The slang word for raw whiskey is booze.
7. It caught its hind paw in a rusty trap.
8. The wharf could be seen at the farther shore.
9. Feel the heat of the weak dying flame.
10. The tiny girl took off her hat.

List 16

1. The empty flask stood on the tin tray.
2. A speedy man can beat this track mark.
3. He broke a new shoelace that day.
4. The coffee stand is too high for the couch.
5. The urge to write short stories is rare.
6. The pencils have all been used.
7. The pirates seized the crew of the lost ship.
8. We tried to replace the coin but failed.
9. She sewed the torn coat quite neatly.
10. The sofa cushion is red and of light weight.

List 18

1. Steam hissed from the broken valve.
2. The child almost hurt the small dog.
3. There was a sound of dry leaves outside.
4. The sky that morning was clear and bright blue.
5. Torn scraps littered the stone floor.
6. Sunday is the best part of the week.
7. The doctor cured him with these pills.
8. The new girl was fired today at noon.
9. They felt gay when the ship arrived in port.
10. Add the store's account to the last cent.

List 19

1. Acid burns holes in wool cloth.
2. Fairy tales should be fun to write.
3. Eight miles of woodland burned to waste.
4. The third act was dull and tired the players.
5. A young child should not suffer fright.
6. Add the column and put the sum here.
7. We admire and love a good cook.
8. There the flood mark is ten inches.
9. He carved a head from the round block of marble.
10. She has a smart way of wearing clothes.

*Phrases used for female audio recordings:***List 24**

1. Try to have the court decide the case.
2. They are pushed back each time they attack.
3. He broke his ties with groups of former friends.
4. They floated on the raft to sun their white backs.
5. The map had an X that meant nothing.
6. Whitings are small fish caught in nets.
7. Some ads serve to cheat buyers.
8. Jerk the rope and the bell rings weakly.
9. A waxed floor makes us lose balance.
10. Madam, this is the best brand of corn.

List 28

1. The horse trotted around the field at a brisk pace.
2. Find the twin who stole the pearl necklace.
3. Cut the cord that binds the box tightly.
4. The red tape bound the smuggled food.
5. Look in the corner to find the tan shirt.
6. The cold drizzle will halt the bond drive.
7. Nine men were hired to dig the ruins.
8. The junk yard had a mouldy smell.
9. The flint sputtered and lit a pine torch.
10. Soak the cloth and drown the sharp odor.

List 34

1. Nine rows of soldiers stood in line.
2. The beach is dry and shallow at low tide.
3. The idea is to sew both edges straight.
4. The kitten chased the dog down the street.
5. Pages bound in cloth make a book.
6. Try to trace the fine lines of the painting.
7. Women form less than half of the group.
8. The zones merge in the central part of town.
9. A gem in the rough needs work to polish.
10. Code is used when secrets are sent.

List 38

1. It takes a lot of help to finish these.
2. Mark the spot with a sign painted red.
3. Take two shares as a fair profit.
4. The fur of cats goes by many names.
5. North winds bring colds and fevers.
6. He asks no person to vouch for him.
7. Go now and come here later.
8. A sash of gold silk will trim her dress.
9. Soap can wash most dirt away.
10. That move means the game is over.

List 39

1. He wrote down a long list of items.
2. A siege will crack the strong defense.
3. Grape juice and water mix well.
4. Roads are paved with sticky tar.
5. Fake & ones shine but cost little.
6. The drip of the rain made a pleasant sound.
7. Smoke poured out of every crack.

8. Serve the hot rum to the tired heroes.
9. Much of the story makes good sense.
10. The sun came up to light the eastern sky.

List 46

1. A clean neck means a neat collar.
2. The couch cover and hall drapes were blue.
3. The stems of the tall glasses cracked and broke.
4. The wall phone rang loud and often.
5. The clothes dried on a thin wooden rack.
6. Turn on the lantern which gives us light.
7. The cleat sank deeply into the soft turf.
8. The bills were mailed promptly on the tenth of the month.
9. To have is better than to wait and hope.
10. The price is fair for a good antique clock.

List 47

1. The music played on while they talked.
2. Dispense with a vest on a day like this.
3. The bunch of grapes was pressed into wine.
4. He sent the figs, but kept the ripe cherries.
5. The hinge on the door creaked with old age.
6. The screen before the fire kept in the sparks.
7. Fly by night and you waste little time.
8. Thick glasses helped him read the print.
9. Birth and death mark the limits of life.
10. The chair looked strong but had no bottom.

List 50

1. A man in a blue sweater sat at the desk.
2. Oats are a food eaten by horse and man.
3. Their eyelids droop for want of sleep.
4. The sip of tea revives his tired friend.
5. There are many ways to do these things.
6. Tuck the sheet under the edge of the mat.
7. A force equal to that would move the earth.
8. We like to see clear weather.
9. The work of the tailor is seen on each side.
10. Take a chance and win a china doll.

List 53

1. Press the pedal with your left foot.
2. Neat plans fail without luck.
3. The black trunk fell from the landing.
4. The bank pressed for payment of the debt.
5. The theft of the pearl pin was kept secret.
6. Shake hands with this friendly child.
7. The vast space stretched into the far distance.
8. A rich farm is rare in this sandy waste.
9. His wide grin earned many friends.
10. Flax makes a fine brand of paper.

List 56

1. The small red neon lamp went out.
2. Clams are small, round, soft, and tasty.
3. The fan whirled its round blades softly.
4. The line where the edges join was clean.
5. Breathe deep and smell the piney air.
6. It matters not if he reads these words or those.
7. A brown leather bag hung from its strap.
8. A toad and a frog are hard to tell apart.
9. A white silk jacket goes with any shoes.
10. A break in the dam almost caused a flood.

Appendix F Detailed Results

The detailed results are presented in table format. The table contains the following columns:

- Grid: a X,Y string describing which tile this row's data is from. See figure F-1 for a map that shows each tile's X,Y string.
- Test Sector: states whether the tile was in test sector 1a or 1b.
- Area: states if the tile was part of Motorola's Covered Area ("Covered Area"). If the tile was not part of it, it's listed as "Service Area."
- Talk-In DAQ: the score of the Talk-In DAQ test.
- Talk-Out DAQ: the score of the Talk-Out DAQ test.
- Median BER (%): the median Bit Error Rate (BER) collected by Motorola in the tile.
- RSSI: The Received Signal Strength Indication (RSSI) in dBm as measured by AECOM in that tile. The RSSI measurements were conducted on the control channel during the talk-out.

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
44,46	1a	Service Area	4.5	4		-87.5
45,46	1a	Service Area	4.5	4		-89
46,46	1a	Service Area	4.5	4.5		-93
41,47	1a	Covered Area	4	4.5	0.2	-77.5
42,47	1a	Service Area	4.5	4.5		-82.5
43,47	1a	Covered Area	4	4.5	0	-83.5
44,47	1a	Covered Area	4	3.4	0	-86.5
45,47	1a	Covered Area	4	3.4	0	-81.5
40,48	1a	Covered Area	4	4	0	-77.5
41,48	1a	Service Area	4.5	4.5		-96.5
42,48	1a	Service Area	4.5	4		-99
44,48	1a	Service Area	4.5	5		-96.5
45,48	1a	Covered Area	4.5	4.5	0	-91
40,49	1a	Covered Area	4	4	0	-96
41,49	1a	Service Area	4.5	4		-97.5
42,49	1a	Service Area	4.5	4		-103
43,49	1a	Service Area	4	4		-96.5
44,49	1a	Service Area	4.5	4.5		-101
24,50	1a	Service Area	4	5		-79
39,50	1a	Service Area	4	4		-101.5
40,50	1a	Covered Area	4.5	4.5	0	-99.5
41,50	1a	Service Area	4	4.5		-93.5
42,50	1a	Covered Area	3	4	0	-102.5
23,51	1a	Service Area	4.5	4.5		-62
24,51	1a	Covered Area	4.5	4.5	0	-60
25,51	1a	Covered Area	4	4.5	0	-69.5
27,51	1b	Covered Area	4.5	4	0	-81.5
28,51	1b	Covered Area	4.5	4.5	0	-78
29,51	1b	Covered Area	4	4	0	-69
30,51	1b	Covered Area	3.4	3.4	0	-77.5
31,51	1b	Covered Area	4	4	0	-77.5
32,51	1b	Covered Area	4.5	4.5	0	-82.5
33,51	1b	Service Area	4	4		-70
38,51	1a	Covered Area	4.5	4.5	0	-97.5
39,51	1a	Covered Area	4.5	4.5	0	-96
40,51	1a	Covered Area	4	4.5	0	-91
41,51	1a	Covered Area	4	5	0	-96
43,51	1a	Service Area	4	4.5		-89.5
26,52	1b	Covered Area	4	4	0.2	-84
27,52	1b	Service Area	4	4		-85.5
28,52	1b	Covered Area	4.5	4.5	0	-73
29,52	1b	Covered Area	4	4	0	-79.5
30,52	1b	Covered Area	4.5	4.5	0	-75
31,52	1b	Covered Area	4	4	0	-72

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
32,52	1b	Covered Area	4.5	4	0	-77
33,52	1b	Covered Area	4	4	0	-71
34,52	1b	Service Area	4	4		-78
35,52	1a	Covered Area	4	3.4	0	-72
36,52	1a	Service Area	4	3.4		-81.5
37,52	1a	Service Area	4.5	4		-73
38,52	1a	Service Area	4.5	4		-93.5
39,52	1a	Service Area	4.5	4.5		-93.5
40,52	1a	Service Area	4	3.4		-84
41,52	1a	Service Area	3.4	3.4		-83
42,52	1a	Service Area	4	5		-82
11,53	1a	Service Area	4.5	4		-78
12,53	1a	Service Area	4.5	4.5		-75
19,53	1a	Service Area	3.4	4		-66
25,53	1b	Covered Area	4	4	0.2	-71
26,53	1b	Covered Area	4	5	0.39	-78
27,53	1b	Covered Area	4	4	0.2	-77
28,53	1b	Covered Area	4.5	4.5	0	-70.5
29,53	1b	Covered Area	3.4	4	0	-82
30,53	1b	Covered Area	4	4	0	-76.5
31,53	1b	Covered Area	4	4	0	-78
32,53	1b	Covered Area	4	4.5	0	-80
33,53	1b	Covered Area	4	3.4	0	-78
34,53	1b	Covered Area	4.5	4.5	0	-77.5
35,53	1a	Covered Area	4	4.5	0	-74.5
36,53	1a	Covered Area	4.5	3.4	0	-87
37,53	1a	Covered Area	4.5	4.5	0	-106
38,53	1a	Covered Area	4	4	0	-102.5
42,53	1a	Service Area	4.5	3.4		-84
9,54	1a	Service Area	4	4.5		-70
10,54	1a	Covered Area	4.5	4	0	-48
11,54	1a	Covered Area	4	4.5	0	-73.5
12,54	1a	Covered Area	4.5	4.5	0.2	-67.5
13,54	1a	Service Area	4.5	4.5		-61.5
14,54	1a	Service Area	4.5	4		-69.5
16,54	1a	Covered Area	4	5	0	-56
17,54	1a	Covered Area	3.4	5	0	-57.5
19,54	1a	Covered Area	4	4	0	-75.5
20,54	1a	Covered Area	4.5	4	0	-69.5
24,54	1b	Covered Area	4	4	0	-75
25,54	1b	Covered Area	4	4	0	-76.5
26,54	1b	Covered Area	3.4	3.4	0	-69.5
27,54	1b	Covered Area	4	4.5	0	-60
28,54	1b	Covered Area	4.5	4.5	0	-72

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
29,54	1b	Covered Area	4.5	4.5	0	-65.5
30,54	1b	Covered Area	3.4	4.5	0.39	-75.5
31,54	1b	Covered Area	4.5	4.5	0	-68.5
32,54	1b	Covered Area	4	4.5	0	-77
33,54	1b	Covered Area	4.5	4.5	0	-85.5
34,54	1b	Covered Area	4	4.5	0	-82
35,54	1a	Covered Area	4.5	4	0	-83
36,54	1a	Covered Area	4	4.5	0	-88
10,55	1a	Covered Area	4	4.5	0	-46
13,55	1a	Covered Area	4.5	3.4	0	-61
14,55	1a	Service Area	4	4.5		-60.5
16,55	1a	Covered Area	3.4	4.5	0	-66
17,55	1a	Covered Area	4.5	4	0	-69
18,55	1a	Covered Area	4.5	4.5	0.2	-70.5
19,55	1a	Covered Area	4	4.5	0	-67
20,55	1a	Covered Area	4	4.5	0.2	-62
22,55	1a	Covered Area	4	4.5	0	-58
23,55	1b	Covered Area	4.5	4.5	0.39	-67
24,55	1b	Covered Area	5	4.5	0	-54.5
25,55	1b	Covered Area	3.4	4	0	-46.5
26,55	1b	Covered Area	4.5	4.5	0	-50.5
27,55	1b	Covered Area	3.4	4	0	-48.5
28,55	1b	Covered Area	4.5	4.5	0	-64
29,55	1b	Covered Area	4.5	4	0	-69
30,55	1b	Covered Area	4.5	4.5	0.2	-69.5
31,55	1b	Covered Area	4.5	4.5	0	-68.5
32,55	1b	Covered Area	4.5	4	0	-82
33,55	1b	Covered Area	4	5	0	-85
10,56	1a	Covered Area	4.5	4	0	-66
12,56	1a	Covered Area	4.5	4.5	0	-52.5
13,56	1a	Covered Area	4	4.5	0	-58
15,56	1a	Service Area	4	4		-60.5
16,56	1a	Covered Area	4.5	4.5	0	-67.5
17,56	1a	Covered Area	4	4	0	-55.5
18,56	1a	Covered Area	4	4	0	-53
19,56	1a	Covered Area	5	4	0	-70.5
20,56	1a	Covered Area	5	4	0	-68
21,56	1b	Covered Area	4.5	4	0	-67
22,56	1b	Covered Area	4.5	4.5	0	-67.5
23,56	1b	Covered Area	4	4	0.39	-57.5
24,56	1b	Covered Area	4.5	4.5	0	-61.5
25,56	1b	Covered Area	4	4.5	0	-51
26,56	1b	Covered Area	4.5	4	0	-55
27,56	1b	Covered Area	4	4	0	-44.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
28,56	1b	Covered Area	4	4	0	-60
29,56	1b	Covered Area	4	4.5	0	-58.5
30,56	1b	Covered Area	4.5	4	0	-81.5
31,56	1b	Covered Area	4.5	4.5	0	-77
32,56	1b	Covered Area	4	4.5	0.2	-72
33,56	1b	Service Area	4	4		-75.5
9,57	1a	Service Area	4	4.5		-68.5
10,57	1a	Covered Area	4	5	0	-48.5
11,57	1a	Covered Area	3.4	4	0	-61.5
14,57	1b	Covered Area	4	4.5	0	-52.5
15,57	1b	Covered Area	4	4.5	0.2	-52
16,57	1b	Covered Area	4.5	5	0	-59.5
17,57	1b	Covered Area	4.5	4.5	0	-49.5
18,57	1b	Covered Area	4	4	0	-59.5
19,57	1b	Covered Area	4.5	4	0	-60
20,57	1b	Covered Area	4	4	0.2	-68
21,57	1b	Covered Area	4.5	4	0	-65.5
22,57	1b	Covered Area	4	4	0	-59.5
23,57	1b	Covered Area	4.5	4.5	0	-64
24,57	1b	Covered Area	4	4.5	0	-59.5
25,57	1b	Covered Area	4.5	4	0	-55.5
26,57	1b	Covered Area	4.5	4	0	-45.5
27,57	1b	Covered Area	4	4.5	0	-53
28,57	1b	Covered Area	4.5	4.5	0	-51
29,57	1b	Covered Area	3.4	4	0	-68
30,57	1b	Covered Area	4.5	4	0	-83
31,57	1b	Covered Area	4	4	0	-80.5
32,57	1b	Service Area	4.5	4.5		-81.5
8,58	1a	Service Area	4	4		-80.5
9,58	1a	Covered Area	4.5	4	0.39	-63.5
10,58	1b	Covered Area	4	4	0	-55
11,58	1b	Covered Area	4.5	4	0	-64
12,58	1b	Covered Area	4	3.4	0	-44.5
13,58	1b	Covered Area	4	4.5	0	-47.5
14,58	1b	Covered Area	4	4.5	0	-49
15,58	1b	Covered Area	4	4	0	-52.5
16,58	1b	Covered Area	5	4.5	0	-54.5
17,58	1b	Covered Area	3.4	3.4	0	-65.5
18,58	1b	Covered Area	5	5	0	-62.5
19,58	1b	Covered Area	4	4	0	-62.5
20,58	1b	Covered Area	4.5	4.5	0	-61
21,58	1b	Covered Area	4	4	0	-62
22,58	1b	Covered Area	4	4	0	-61
23,58	1b	Covered Area	4.5	4.5	0	-60

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
24,58	1b	Covered Area	4	4	0	-48
25,58	1b	Covered Area	4	4	0	-52
26,58	1b	Covered Area	4	3.4	0	-44.5
27,58	1b	Covered Area	4.5	4.5	0	-58
28,58	1b	Covered Area	4	4.5	0	-44.5
29,58	1b	Covered Area	4	4	0	-75.5
30,58	1b	Covered Area	3.4	4	0	-74
31,58	1b	Covered Area	4.5	4	0	-82
6,59	1a	Service Area	4	4		-86.5
7,59	1a	Service Area	4	4		-76
8,59	1a	Covered Area	4.5	4	0.2	-71.5
9,59	1b	Covered Area	3.4	4.5	0	-61.5
10,59	1b	Covered Area	4	4.5	0	-47
11,59	1b	Service Area	5	4		-48.5
12,59	1b	Covered Area	4.5	4	0	-55
13,59	1b	Covered Area	4.5	4.5	0	-49
14,59	1b	Covered Area	4	3.4	0	-53.5
15,59	1b	Covered Area	4.5	4.5	0	-62
16,59	1b	Covered Area	4.5	5	0	-59
17,59	1b	Covered Area	4	4.5	0	-61.5
18,59	1b	Covered Area	4	4.5	0	-54.5
19,59	1b	Covered Area	4	4	0	-65.5
20,59	1b	Covered Area	4	4.5	0	-65.5
21,59	1b	Covered Area	4.5	4.5	0	-66.5
22,59	1b	Covered Area	4.5	4	0	-58.5
23,59	1b	Covered Area	4.5	4.5	0.39	-57
24,59	1b	Covered Area	3.4	3.4	0	-55
25,59	1b	Covered Area	4.5	4.5	0	-61.5
26,59	1b	Covered Area	4	4	0	-49.5
27,59	1b	Covered Area	4	4.5	0.2	-72.5
28,59	1b	Covered Area	4	4	0	-75
29,59	1b	Covered Area	4	4.5	0	-75
30,59	1b	Covered Area	4.5	4.5	0	-76
31,59	1a	Covered Area	4	4.5	0	-88
4,60	1a	Service Area	4	3.4		-83
5,60	1a	Covered Area	4.5	4.5	0	-63
6,60	1a	Service Area	4	4.5		-76
11,60	1b	Covered Area	5	4	0	-45.5
12,60	1b	Covered Area	4.5	5	0	-51.5
13,60	1b	Covered Area	4.5	4.5	0	-60
14,60	1b	Covered Area	4	4	0.2	-66
15,60	1b	Covered Area	4.5	4	0	-64
16,60	1b	Covered Area	4	4.5	0	-65.5
17,60	1b	Covered Area	4	4	0	-69.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
18,60	1b	Covered Area	4.5	4.5	0.2	-65
19,60	1b	Covered Area	4.5	4.5	0	-57.5
20,60	1b	Covered Area	4.5	4.5	0	-62
21,60	1b	Covered Area	4	4	0	-62.5
22,60	1b	Covered Area	4	4	0	-60
23,60	1b	Covered Area	4	4	0	-61
24,60	1b	Covered Area	4.5	4.5	0.2	-68.5
25,60	1b	Covered Area	4.5	4.5	0	-66
26,60	1b	Covered Area	4.5	4	0	-69
27,60	1b	Covered Area	4	4.5	0	-62.5
28,60	1b	Service Area	4.5	4		-57
29,60	1a	Service Area	4.5	4.5		-75.5
30,60	1a	Covered Area	4.5	5	0	-74.5
4,61	1a	Service Area	4.5	3.4		-86
11,61	1b	Covered Area	4.5	4.5	0.39	-53
12,61	1b	Covered Area	3.4	4	0.2	-56
13,61	1b	Covered Area	4.5	4	0	-62.5
14,61	1b	Covered Area	4.5	4	0.2	-64
15,61	1b	Covered Area	4.5	4.5	0.2	-63
16,61	1b	Covered Area	4	4	0	-63.5
17,61	1b	Covered Area	4	4	0	-63.5
18,61	1b	Covered Area	4.5	4	0	-60
19,61	1b	Covered Area	4	4	0	-64.5
20,61	1b	Covered Area	4.5	4	0	-65
21,61	1b	Covered Area	4	4.5	0	-65.5
22,61	1b	Covered Area	3.4	4	0	-58.5
23,61	1b	Covered Area	4.5	4.5	0	-51.5
24,61	1b	Covered Area	4	4	0	-65.5
25,61	1b	Covered Area	4.5	4	0	-65.5
26,61	1b	Covered Area	4	4	0	-68
27,61	1b	Covered Area	4.5	4.5	0.1	-68
28,61	1a	Covered Area	4	4	0	-67.5
29,61	1a	Service Area	4.5	3.4		-73.5
38,61	1a	Service Area	4	4		-100.5
4,62	1a	Service Area	4.5	4		-94
12,62	1b	Covered Area	4.5	4.5	0	-53
13,62	1b	Covered Area	4	4	0	-58
14,62	1b	Covered Area	4.5	4.5	0	-63
15,62	1b	Covered Area	4.5	4.5	0	-67
16,62	1b	Covered Area	4.5	4.5	0	-59
17,62	1b	Covered Area	4.5	4	0	-63
18,62	1b	Covered Area	4	4.5	0	-65.5
19,62	1b	Covered Area	4	4.5	0	-61.5
20,62	1b	Covered Area	4	4.5	0	-63.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
21,62	1b	Covered Area	4	4	0	-56.5
22,62	1b	Covered Area	4.5	4	0	-60
23,62	1b	Covered Area	3.4	4	0	-57
24,62	1b	Covered Area	5	4.5	0	-62
25,62	1a	Covered Area	4	4	0	-51.5
26,62	1a	Covered Area	4.5	4.5	0	-62.5
27,62	1a	Covered Area	3.4	4.5	0	-62.5
37,62	1a	Service Area	3.4	4.5		-97
38,62	1a	Service Area	3.4	4		-99
3,63	1a	Service Area	4.5	4		-84.5
4,63	1a	Service Area	4	4		-89
12,63	1b	Covered Area	4	4	0	-57
13,63	1b	Covered Area	4.5	4.5	0.2	-55.5
14,63	1b	Covered Area	4	4	0.39	-63
15,63	1b	Covered Area	4.5	4.5	0	-58.5
16,63	1b	Covered Area	4.5	5	0	-62
17,63	1b	Covered Area	4	4.5	0	-64.5
18,63	1b	Covered Area	4	3.4	0	-64.5
19,63	1b	Covered Area	4.5	4	0	-61
20,63	1b	Covered Area	5	5	0	-59.5
21,63	1b	Covered Area	4	4	0	-57
22,63	1b	Covered Area	4	4.5	0	-59
23,63	1b	Covered Area	4.5	4	0	-62
24,63	1b	Covered Area	4	4	0	-60
25,63	1a	Covered Area	4	4	0	-67.5
26,63	1a	Covered Area	4	4	0	-56
36,63	1a	Service Area	3	4.5		-101.5
37,63	1a	Service Area	4	4		-102
3,64	1a	Service Area	3.4	3.4		-99.5
13,64	1b	Covered Area	3.4	3.4	0.2	-54.5
14,64	1b	Covered Area	4.5	4.5	0.1	-69.5
15,64	1b	Covered Area	4	4	0	-61.5
16,64	1b	Covered Area	4	4.5	0	-66.5
17,64	1b	Covered Area	4.5	4	0	-59
18,64	1b	Covered Area	4	4	0	-60.5
19,64	1b	Covered Area	4.5	4	0	-59.5
20,64	1b	Covered Area	4	4.5	0	-56
21,64	1b	Covered Area	4.5	5	0	-58.5
22,64	1b	Covered Area	4	4.5	0	-49.5
23,64	1b	Covered Area	4.5	4.5	0	-50.5
24,64	1a	Covered Area	4.5	4.5	0	-66.5
25,64	1a	Covered Area	4.5	4	0	-65
26,64	1a	Covered Area	4.5	5	0	-48
36,64	1a	Service Area	4	4		-101.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
2,65	1a	Service Area	5	3.4		-96.5
3,65	1a	Service Area	4	3.4		-95.5
11,65	1b	Service Area	4	4		-56.5
12,65	1b	Covered Area	4	4	0.39	-66
13,65	1b	Covered Area	4.5	4.5	0	-63.5
14,65	1b	Covered Area	5	5	0	-56
15,65	1b	Covered Area	4	4.5	0	-56.5
16,65	1b	Covered Area	4	4.5	0	-64
17,65	1b	Covered Area	3.4	4	0	-66
18,65	1b	Covered Area	4	4	0.2	-49
19,65	1b	Covered Area	4	4.5	0	-58.5
20,65	1b	Covered Area	3.4	3.4	0	-65.5
21,65	1b	Covered Area	4.5	4.5	0	-60.5
22,65	1b	Covered Area	3.4	4	0	-64
23,65	1b	Covered Area	4.5	5	0	-69.5
24,65	1a	Covered Area	4	4	0	-68.5
25,65	1a	Covered Area	4	4	0	-60
33,65	1a	Service Area	4.5	4		-90.5
34,65	1a	Service Area	3.4	4		-94
35,65	1a	Service Area	4.5	3.4		-92
36,65	1a	Service Area	4.5	4		-97.5
1,66	1a	Service Area	3.4	3		-95.5
2,66	1a	Service Area	3.4	3		-89
12,66	1b	Service Area	4.5	4.5		-66.5
13,66	1b	Covered Area	4.5	5	0	-69
14,66	1b	Covered Area	4.5	4.5	0	-64
15,66	1b	Covered Area	4.5	4.5	0	-66.5
16,66	1b	Covered Area	4	4	0	-57.5
17,66	1b	Covered Area	4	4.5	0	-69
18,66	1b	Covered Area	4	4.5	0	-55
19,66	1b	Covered Area	4	4.5	0	-61
20,66	1b	Covered Area	4	4	0	-67
21,66	1b	Covered Area	4.5	4.5	0	-67.5
22,66	1b	Covered Area	4	4.5	0.2	-65.5
23,66	1b	Covered Area	4.5	4.5	0	-65.5
24,66	1a	Covered Area	3.4	4	0	-61.5
25,66	1a	Covered Area	4.5	5	0	-59.5
32,66	1a	Service Area	4	4		-85
33,66	1a	Covered Area	4	4.5	0.2	-85.5
34,66	1a	Covered Area	4	4.5	0.39	-89
35,66	1a	Covered Area	4	4	0	-82.5
36,66	1a	Covered Area	4.5	4	0	-90.5
37,66	1a	Service Area	4.5	4		-89
40,66	1a	Service Area	4	4.5		-88.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
41,66	1a	Covered Area	4	4	0	-76
1,67	1a	Service Area	3.4	4		-99.5
12,67	1b	Covered Area	4.5	4.5	0	-61.5
13,67	1b	Covered Area	4.5	4.5	0	-66
14,67	1b	Covered Area	4.5	5	0	-69.5
15,67	1b	Covered Area	4	4	0	-68.5
16,67	1b	Covered Area	5	4.5	0	-61
17,67	1b	Covered Area	3.4	4	0	-56
18,67	1b	Covered Area	4.5	4.5	0	-51
19,67	1b	Covered Area	4	4.5	0	-66.5
20,67	1b	Covered Area	4.5	4	0	-53
21,67	1b	Covered Area	4.5	4	0	-66.5
22,67	1b	Covered Area	4	4	0.2	-64.5
23,67	1b	Covered Area	4	4	0	-68.5
24,67	1a	Covered Area	4.5	4	0	-64.5
25,67	1a	Covered Area	3.4	3.4	0	-60
26,67	1a	Covered Area	4	4	0	-67.5
27,67	1a	Covered Area	4.5	4	0	-53
28,67	1a	Covered Area	4.5	5	0	-64.5
29,67	1a	Covered Area	4	4	0	-74.5
30,67	1a	Covered Area	4.5	4	0	-76.5
31,67	1a	Covered Area	4	4	0	-81.5
32,67	1a	Covered Area	4.5	4.5	0.2	-83
33,67	1a	Covered Area	4.5	4.5	0	-78.5
34,67	1a	Service Area	4	4.5		-75.5
35,67	1a	Service Area	4	4.5		-73.5
36,67	1a	Service Area	4	4		-82.5
37,67	1a	Service Area	4.5	4.5		-63
38,67	1a	Service Area	4.5	5		-92.5
39,67	1a	Service Area	4.5	4.5		-94.5
40,67	1a	Service Area	4.5	4.5		-88
41,67	1a	Covered Area	4.5	4.5	0	-85.5
12,68	1b	Covered Area	4	4.5	0.2	-67
13,68	1b	Covered Area	4.5	4.5	0	-62
14,68	1b	Covered Area	3.4	3.4	0	-57
15,68	1b	Covered Area	4.5	4.5	0	-63.5
16,68	1b	Covered Area	4	4	0	-67
17,68	1b	Covered Area	4.5	3.4	0	-67
18,68	1b	Covered Area	4	4	0	-69
19,68	1b	Covered Area	4.5	4.5	0	-67.5
20,68	1b	Service Area	4.5	4		-63
21,68	1b	Covered Area	3.4	3.4	0	-62
22,68	1b	Covered Area	4	4.5	0	-56.5
23,68	1a	Covered Area	4	4	0	-51.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
24,68	1a	Covered Area	4	4.5	0	-54.5
25,68	1a	Covered Area	4.5	4.5	0	-50.5
26,68	1a	Covered Area	4	5	0	-66.5
27,68	1a	Covered Area	4.5	5	0	-55.5
28,68	1a	Covered Area	3.4	4	0	-44.5
29,68	1a	Covered Area	4.5	4.5	0	-57.5
30,68	1a	Covered Area	4.5	4	0	-66
31,68	1a	Covered Area	4	4	0	-67
32,68	1a	Covered Area	4	4.5	2.15	-73.5
33,68	1a	Covered Area	4.5	4.5	0	-85
34,68	1a	Covered Area	4	4.5	0	-67.5
35,68	1a	Service Area	4	4		-65.5
36,68	1a	Service Area	4.5	4.5		-69.5
38,68	1a	Service Area	4.5	4.5		-92
39,68	1a	Service Area	4.5	4.5		-90.5
40,68	1a	Covered Area	4.5	4	0	-93.5
41,68	1a	Covered Area	4.5	4.5	0	-86.5
42,68	1a	Covered Area	4.5	4	0	-70
12,69	1b	Covered Area	3.4	4	0	-58
13,69	1b	Covered Area	5	4.5	0.2	-54.5
14,69	1b	Covered Area	4	4	0	-70.5
15,69	1b	Covered Area	4.5	4.5	0	-57
16,69	1b	Covered Area	4.5	4	0	-60
17,69	1b	Covered Area	4	5	0	-70
18,69	1b	Covered Area	4.5	5	0	-70
19,69	1b	Covered Area	4.5	4.5	0	-64.5
20,69	1a	Covered Area	4.5	4.5	0	-74.5
21,69	1a	Covered Area	4.5	4	0.2	-52
22,69	1a	Covered Area	4	4	0	-51.5
23,69	1a	Covered Area	5	4	0	-64
24,69	1a	Covered Area	4	4	0	-56
25,69	1a	Covered Area	4	4.5	0	-77.5
26,69	1a	Covered Area	4.5	4.5	0	-55.5
27,69	1a	Covered Area	4.5	4.5	0	-53.5
28,69	1a	Covered Area	4.5	4.5	0.2	-64
29,69	1a	Covered Area	4	4	0	-50.5
30,69	1a	Covered Area	4.5	4	0	-67.5
31,69	1a	Covered Area	4	4.5	0	-59
32,69	1a	Covered Area	5	4	0	-68
33,69	1a	Covered Area	4.5	4.5	0.78	-72
34,69	1a	Covered Area	4	4	0.78	-75
35,69	1a	Service Area	4	4.5		-79.5
36,69	1a	Covered Area	4	4	0	-83
38,69	1a	Service Area	4	4.5		-90

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
39,69	1a	Service Area	3.4	4		-89.5
40,69	1a	Service Area	4.5	4		-97
42,69	1a	Covered Area	4.5	4.5	0	-73.5
13,70	1b	Covered Area	4	4.5	0	-56
14,70	1b	Covered Area	5	4.5	0	-59
15,70	1b	Covered Area	4	4	0	-56
17,70	1b	Covered Area	4	4.5	0	-62
18,70	1b	Covered Area	4	4	0	-69.5
19,70	1b	Covered Area	4	4.5	0	-62.5
20,70	1a	Covered Area	4	4.5	0	-66.5
21,70	1a	Covered Area	5	4.5	0	-52
22,70	1a	Covered Area	3.4	4	0	-58.5
23,70	1a	Covered Area	4.5	4	0	-61.5
24,70	1a	Covered Area	4	4.5	0	-69.5
25,70	1a	Covered Area	4	4	0	-57
26,70	1a	Covered Area	4	4	0	-67.5
27,70	1a	Covered Area	4.5	4.5	0	-50
28,70	1a	Covered Area	4.5	4.5	0	-58
29,70	1a	Covered Area	4	4	0	-53
30,70	1a	Covered Area	4.5	4	0	-59.5
31,70	1a	Covered Area	5	4.5	0	-57
32,70	1a	Covered Area	4.5	4.5	0	-78.5
33,70	1a	Service Area	4	4		-81.5
34,70	1a	Service Area	4	5		-72.5
35,70	1a	Service Area	4.5	4.5		-81
36,70	1a	Service Area	4.5	4.5		-53.5
40,70	1a	Covered Area	4.5	4.5	0	-68.5
41,70	1a	Covered Area	4	4	0	-60.5
42,70	1a	Covered Area	4	4.5	0	-78.5
43,70	1a	Service Area	4	3.4		-90.5
44,70	1a	Covered Area	3.4	4	7.44	-91.5
45,70	1a	Service Area	4	4.5		-85.5
46,70	1a	Service Area	4	3.4		-93.5
14,71	1b	Covered Area	4	4.5	0	-55
17,71	1b	Covered Area	4	4.5	0	-66
18,71	1b	Covered Area	4	4	0	-70
19,71	1b	Covered Area	4	4	0	-65.5
20,71	1a	Covered Area	4	4	0	-77.5
21,71	1a	Covered Area	4.5	4.5	0	-71
22,71	1a	Covered Area	4.5	4.5	0	-72.5
23,71	1a	Covered Area	4.5	4.5	0.2	-76
24,71	1a	Covered Area	4	4.5	0.39	-72
25,71	1a	Covered Area	4.5	4.5	0	-62.5
26,71	1a	Covered Area	5	4	0	-67.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
27,71	1a	Covered Area	4	4.5	0	-66.5
28,71	1a	Covered Area	4	4.5	0	-72.5
29,71	1a	Covered Area	4	4.5	0	-55.5
30,71	1a	Covered Area	4	5	0	-72
31,71	1a	Covered Area	4	4.5	0	-66
32,71	1a	Covered Area	4	4.5	0.98	-80
33,71	1a	Service Area	4.5	4		-86.5
34,71	1a	Service Area	4	4		-59
35,71	1a	Service Area	2	4.5		-65.5
37,71	1a	Covered Area	4.5	4	0	-57.5
38,71	1a	Covered Area	4	5	0	-68
39,71	1a	Covered Area	4	4	0	-68.5
40,71	1a	Covered Area	4.5	4.5	0	-78.5
17,72	1b	Covered Area	4	3.4	0.39	-62.5
18,72	1a	Covered Area	4	4	0	-63.5
19,72	1a	Covered Area	4.5	4.5	0.39	-75
20,72	1a	Covered Area	3.4	4	0	-71.5
21,72	1a	Covered Area	5	4.5	0.39	-72.5
22,72	1a	Covered Area	4.5	4.5	0	-70
23,72	1a	Covered Area	4	4.5	0.1	-71.5
24,72	1a	Covered Area	4	5	0.2	-78.5
25,72	1a	Covered Area	4	4.5	0.39	-63.5
26,72	1a	Covered Area	4.5	4	0	-78
27,72	1a	Covered Area	4	4	0	-88.5
28,72	1a	Covered Area	4	4.5	0	-78
29,72	1a	Covered Area	4.5	4.5	0	-79
30,72	1a	Covered Area	4.5	4.5	0.2	-80
31,72	1a	Covered Area	4.5	4.5	0	-67.5
32,72	1a	Covered Area	3.4	4.5	0	-77
33,72	1a	Covered Area	4	3.4	0	-65
34,72	1a	Covered Area	4	4	0	-49.5
35,72	1a	Covered Area	4.5	4.5	0	-49.5
36,72	1a	Covered Area	4	4	0	-66.5
37,72	1a	Covered Area	4	5	0	-75
38,72	1a	Covered Area	5	4.5	0	-75
39,72	1a	Covered Area	4	4.5	0	-71
16,73	1a	Covered Area	4.5	4	0	-75
17,73	1a	Covered Area	4	4	0	-68
18,73	1a	Covered Area	4	4	0	-77
19,73	1a	Covered Area	4.5	4	1.075	-76.5
20,73	1a	Covered Area	4.5	4	0.2	-72
21,73	1a	Covered Area	4.5	4.5	0.2	-71
22,73	1a	Covered Area	4.5	4.5	0	-60.5
23,73	1a	Covered Area	4	4	0	-60.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
24,73	1a	Covered Area	4.5	4.5	0	-67.5
25,73	1a	Covered Area	4.5	4	0.39	-70.5
26,73	1a	Covered Area	4	4.5	0	-68.5
27,73	1a	Covered Area	4.5	5	0	-82
28,73	1a	Covered Area	4.5	4.5	0	-75.5
29,73	1a	Covered Area	4.5	4.5	0	-81.5
30,73	1a	Covered Area	3.4	4	0	-77
31,73	1a	Covered Area	4.5	4	0	-66
32,73	1a	Covered Area	4.5	4	0	-67.5
33,73	1a	Covered Area	4.5	4	0	-48.5
34,73	1a	Covered Area	4.5	4	0	-59
35,73	1a	Covered Area	4	3.4	0	-57
36,73	1a	Covered Area	4	4.5	0	-58.5
37,73	1a	Covered Area	4	4.5	0	-61
38,73	1a	Covered Area	4.5	4.5	0	-73
39,73	1a	Covered Area	4	4.5	0	-74.5
40,73	1a	Service Area	3.4	5		-80.5
41,73	1a	Service Area	3.4	4		-83
16,74	1b	Service Area	4	4		-75
17,74	1b	Covered Area	4	4.5	0	-73.5
19,74	1a	Covered Area	4.5	4.5	0	-78
20,74	1a	Covered Area	4	4.5	0	-76
21,74	1a	Covered Area	4	4	0	-68
22,74	1a	Covered Area	4.5	4	0	-72
23,74	1a	Covered Area	4.5	4.5	0	-72
24,74	1a	Covered Area	4	3.4	0.2	-72.5
25,74	1a	Covered Area	4.5	4.5	0	-72.5
26,74	1a	Covered Area	4	4	0.59	-53
27,74	1a	Covered Area	4	4	0	-66.5
28,74	1a	Covered Area	4	4	0	-80
29,74	1a	Covered Area	4.5	5	0	-67.5
30,74	1a	Covered Area	4	4.5	0	-70
31,74	1a	Covered Area	4.5	4	0	-59
32,74	1a	Covered Area	4.5	4.5	0	-48.5
33,74	1a	Covered Area	4	4	0	-66
34,74	1a	Covered Area	4.5	4.5	0	-65.5
35,74	1a	Covered Area	4	4	0	-65
36,74	1a	Covered Area	4.5	4.5	0	-56.5
37,74	1a	Covered Area	4	4	0	-51.5
38,74	1a	Service Area	4.5	4		-60.5
40,74	1a	Service Area	4.5	4.5		-89
43,74	1a	Service Area	0	4		-110.5
44,74	1a	Service Area	4	4.5		-99
45,74	1a	Service Area	4.5	4.5		-103.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
17,75	1b	Covered Area	4.5	4.5	0.2	-75
18,75	1a	Service Area	4.5	4.5		-68.5
19,75	1a	Service Area	5	4.5		-76
20,75	1a	Covered Area	5	5	0	-67.5
21,75	1a	Covered Area	4	4.5	0	-74.5
22,75	1a	Covered Area	4	4.5	0	-63
23,75	1a	Covered Area	4.5	4	0	-90
24,75	1a	Covered Area	4	4.5	0	-90
25,75	1a	Covered Area	4.5	4.5	0	-79.5
26,75	1a	Covered Area	4.5	4.5	0	-80.5
27,75	1a	Covered Area	4.5	4.5	0	-70.5
28,75	1a	Covered Area	4.5	4	0	-62.5
29,75	1a	Covered Area	3.4	4.5	0	-65.5
30,75	1a	Covered Area	4.5	4	0	-57
31,75	1a	Covered Area	4	4	0	-53.5
32,75	1a	Covered Area	4.5	4	0	-58
33,75	1a	Covered Area	4.5	4.5	0	-60.5
34,75	1a	Covered Area	4.5	4.5	0	-79
36,75	1a	Covered Area	4.5	4	0	-44.5
37,75	1a	Covered Area	4.5	4.5	0	-53.5
38,75	1a	Covered Area	4	4.5	0	-46
42,75	1a	Service Area	4.5	4.5		-90.5
43,75	1a	Service Area	3.4	4		-93
44,75	1a	Service Area	4	4		-91.5
45,75	1a	Service Area	4	4		-86
17,76	1b	Covered Area	4	4.5	0	-78
18,76	1b	Covered Area	4.5	4.5	0.2	-77
19,76	1a	Covered Area	4.5	4.5	0	-74.5
20,76	1a	Covered Area	4.5	4.5	0	-77
21,76	1a	Covered Area	4	3.4	0	-81
22,76	1a	Covered Area	5	3.4	0	-77.5
23,76	1a	Covered Area	4	4.5	0	-66.5
24,76	1a	Covered Area	4.5	4.5	0	-82
25,76	1a	Covered Area	4	4.5	0	-76.5
26,76	1a	Covered Area	4.5	4.5	0	-87.5
27,76	1a	Covered Area	4.5	4	0	-86
28,76	1a	Covered Area	4	4	0	-76.5
29,76	1a	Covered Area	4.5	4.5	0	-62
30,76	1a	Covered Area	3.4	3.4	0	-69.5
31,76	1a	Covered Area	4.5	5	0	-63.5
32,76	1a	Covered Area	4.5	4.5	0	-80
33,76	1a	Covered Area	5	4.5	0	-79
34,76	1a	Covered Area	4.5	4.5	0	-56
35,76	1a	Covered Area	3.4	5	0	-52.5

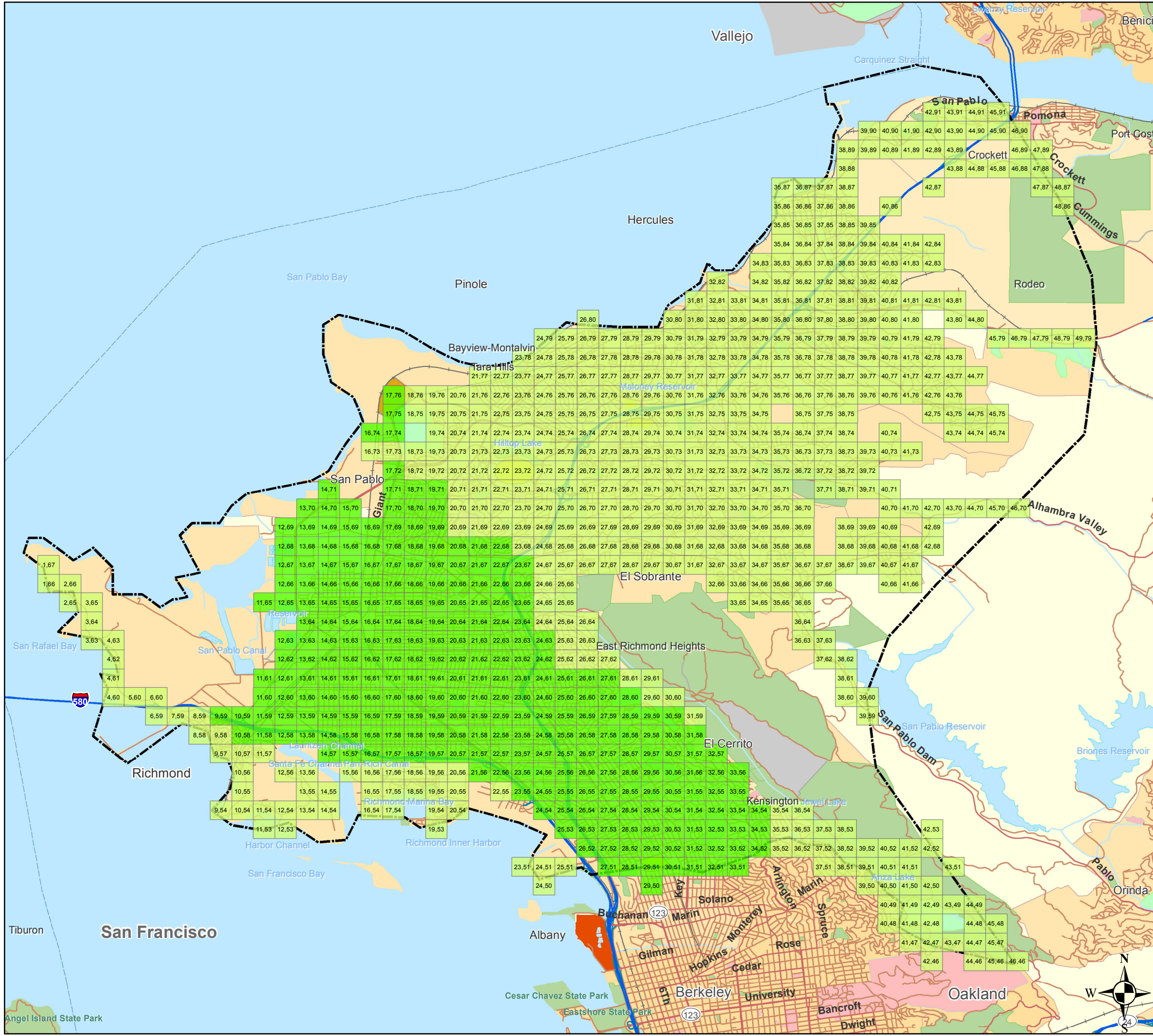
Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
36,76	1a	Covered Area	4	4	0	-44.5
37,76	1a	Covered Area	4.5	4	0	-60.5
38,76	1a	Covered Area	4	4.5	0	-48
39,76	1a	Covered Area	4	4	0	-83.5
40,76	1a	Covered Area	4	4.5	0.59	-85
41,76	1a	Covered Area	4	4	11.055	-90.5
42,76	1a	Covered Area	4	4	0	-100.5
43,76	1a	Service Area	3.4	4		-91.5
21,77	1a	Covered Area	4.5	4.5	0	-79
22,77	1a	Covered Area	5	4.5	0	-90.5
23,77	1a	Service Area	3.4	4		-82
24,77	1a	Covered Area	4	4.5	0.39	-82.5
25,77	1a	Covered Area	4	4	0	-87
26,77	1a	Covered Area	4.5	4.5	0	-65
27,77	1a	Covered Area	4	3.4	0	-78
28,77	1a	Service Area	4	4		-75
29,77	1a	Covered Area	4	4	0	-52
30,77	1a	Covered Area	4	4	0	-64.5
31,77	1a	Covered Area	4	4	0	-61.5
32,77	1a	Covered Area	4	4	0	-61.5
33,77	1a	Covered Area	4.5	5	0	-55.5
34,77	1a	Covered Area	4.5	4	0	-53.5
35,77	1a	Service Area	4	4		-54.5
36,77	1a	Covered Area	4.5	4.5	0	-68
37,77	1a	Covered Area	4.5	4	0	-46
38,77	1a	Covered Area	4	4.5	0	-63
39,77	1a	Covered Area	4.5	4.5	0	-72
40,77	1a	Covered Area	4.5	4	0	-85.5
41,77	1a	Covered Area	4.5	4.5	0	-78
42,77	1a	Covered Area	3.4	4.5	0	-74.5
43,77	1a	Covered Area	4.5	4	0	-71
44,77	1a	Service Area	3.4	4		-60
23,78	1a	Service Area	4.5	4		-78.5
24,78	1a	Covered Area	4	4.5	0	-76
25,78	1a	Covered Area	3.4	3.4	0	-79
26,78	1a	Covered Area	4.5	4	0	-83
27,78	1a	Covered Area	4	4	0	-54.5
28,78	1a	Covered Area	4	4.5	0	-64.5
29,78	1a	Covered Area	4	4	0	-70.5
30,78	1a	Covered Area	4	4	0	-63.5
31,78	1a	Covered Area	4	4.5	0	-63
32,78	1a	Covered Area	4	4	0	-65.5
33,78	1a	Covered Area	4.5	4	0.2	-56.5
34,78	1a	Covered Area	4	4.5	0	-60

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
35,78	1a	Covered Area	4.5	3.4	0	-53.5
36,78	1a	Covered Area	4.5	4.5	0	-52
37,78	1a	Covered Area	5	5	0	-76.5
38,78	1a	Covered Area	4	4.5	0	-75.5
39,78	1a	Covered Area	4	4	0	-72.5
40,78	1a	Covered Area	4	4	0	-77
41,78	1a	Covered Area	4	4.5	0	-71
42,78	1a	Covered Area	4	4.5	0	-51
43,78	1a	Service Area	4	3.4		-73
24,79	1a	Service Area	4	4		-79
25,79	1a	Covered Area	5	4.5	0	-82
26,79	1a	Covered Area	4.5	5	0	-78.5
27,79	1a	Covered Area	3.4	4	0	-74.5
28,79	1a	Covered Area	4	4	0	-82
29,79	1a	Covered Area	4.5	5	0	-72.5
30,79	1a	Covered Area	4.5	4.5	0	-70
31,79	1a	Covered Area	4.5	4	0	-62
32,79	1a	Covered Area	4	4.5	0	-61.5
33,79	1a	Covered Area	4	3.4	0	-66
34,79	1a	Service Area	4	4		-52
35,79	1a	Covered Area	4	4.5	0	-65
36,79	1a	Covered Area	4.5	4.5	0	-54.5
37,79	1a	Covered Area	4.5	4.5	0	-49.5
38,79	1a	Covered Area	4	4.5	0	-67.5
39,79	1a	Covered Area	4.5	4.5	0	-59
40,79	1a	Covered Area	4.5	3.4	0	-45
41,79	1a	Covered Area	5	4.5	0	-75
42,79	1a	Service Area	4	4.5		-73.5
45,79	1a	Service Area	4.5	4		-92.5
46,79	1a	Service Area	4	4		-92
47,79	1a	Service Area	4	4		-98.5
48,79	1a	Service Area	3.4	4		-98.5
49,79	1a	Service Area	4	4.5		-90.5
26,80	1a	Service Area	4.5	4.5		-70.5
30,80	1a	Covered Area	4.5	4.5	0	-60
31,80	1a	Covered Area	4	4	0	-76.5
32,80	1a	Covered Area	5	4.5	0	-66
33,80	1a	Service Area	4.5	4.5		-54
34,80	1a	Covered Area	4	4.5	0	-64
35,80	1a	Covered Area	4.5	4	0	-60
36,80	1a	Covered Area	4	5	0	-51
37,80	1a	Covered Area	4.5	4	0	-70.5
38,80	1a	Covered Area	4.5	4	0	-59
39,80	1a	Covered Area	4.5	4.5	0	-50

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
40,80	1a	Service Area	4.5	4.5		-63
41,80	1a	Service Area	4	4.5		-78
43,80	1a	Service Area	4.5	4.5		-79.5
44,80	1a	Service Area	4	4.5		-88
31,81	1a	Covered Area	3.4	4	0	-54.5
32,81	1a	Covered Area	4	4	0	-72
33,81	1a	Covered Area	5	5	0	-68
34,81	1a	Service Area	4.5	4.5		-52.5
35,81	1a	Covered Area	4	4.5	0	-46
36,81	1a	Covered Area	4	4.5	0	-60.5
37,81	1a	Covered Area	3.4	3.4	0	-70.5
38,81	1a	Covered Area	4	4	0	-75.5
39,81	1a	Covered Area	4.5	4.5	0	-66
40,81	1a	Covered Area	5	4.5	0	-52
41,81	1a	Covered Area	4.5	4.5	0	-80.5
42,81	1a	Covered Area	4	4.5	0.2	-91
43,81	1a	Service Area	4	3.4		-77
32,82	1a	Covered Area	4.5	4.5	0	-81
34,82	1a	Covered Area	4.5	4.5	0	-45
35,82	1a	Covered Area	4	4.5	0	-53.5
36,82	1a	Covered Area	4	4	0.39	-88.5
38,82	1a	Covered Area	4.5	4	0	-87
39,82	1a	Covered Area	4	4.5	0	-63
40,82	1a	Covered Area	4.5	4.5	0	-54.5
34,83	1a	Covered Area	4	4	0	-71.5
35,83	1a	Covered Area	4.5	4.5	0	-64
36,83	1a	Covered Area	4.5	4.5	0	-70
37,83	1a	Covered Area	4.5	4.5	0	-88.5
38,83	1a	Covered Area	3	4.5	0	-81.5
39,83	1a	Covered Area	4	4	0	-72
40,83	1a	Covered Area	4	4.5	0	-65.5
41,83	1a	Covered Area	4	4.5	0	-69.5
42,83	1a	Covered Area	4	4.5	0	-52.5
35,84	1a	Service Area	4	4.5		-77.5
36,84	1a	Covered Area	4.5	4.5	0	-81
37,84	1a	Covered Area	4	4.5	0	-84.5
38,84	1a	Covered Area	4	4.5	0	-60.5
39,84	1a	Covered Area	4.5	3.4	0	-62.5
40,84	1a	Covered Area	4	5	0	-69
41,84	1a	Covered Area	4.5	4.5	0	-54.5
42,84	1a	Covered Area	4.5	4	0	-71.5
35,85	1a	Covered Area	4.5	4.5	0	-59
36,85	1a	Covered Area	5	4.5	0	-73.5
37,85	1a	Covered Area	4	4.5	0	-65.5

Grid	Test Sector	Area	Talk-In DAQ	Talk-Out DAQ	Median BER (%)	RSSI (dBm)
38,85	1a	Covered Area	4	4	0	-77
39,85	1a	Covered Area	4	4.5	0	-69.5
35,86	1a	Covered Area	4	4	0	-67.5
36,86	1a	Covered Area	4	4	0	-86
37,86	1a	Service Area	4	4.5		-77.5
38,86	1a	Covered Area	4	4	0	-86.5
48,86	1a	Service Area	4.5	5		-101.5
35,87	1a	Service Area	4	4		-71
36,87	1a	Covered Area	3.4	3.4	0	-78
37,87	1a	Covered Area	4	4.5	0	-78.5
38,87	1a	Covered Area	4.5	4	0	-75
47,87	1a	Service Area	3.4	3.4		-97.5
48,87	1a	Service Area	4	2		-99
38,88	1a	Covered Area	4	4.5	0	-74.5
43,88	1a	Service Area	4.5	4		-77.5
44,88	1a	Service Area	4.5	5		-77
45,88	1a	Service Area	4	3.4		-89
46,88	1a	Service Area	4	4.5		-79
47,88	1a	Service Area	4.5	4		-85.5
38,89	1a	Covered Area	4.5	4	0	-60.5
39,89	1a	Covered Area	4.5	4	0	-61.5
40,89	1a	Service Area	4	4.5		-96
41,89	1a	Service Area	5	4		-88.5
42,89	1a	Service Area	4	4.5		-87
43,89	1a	Covered Area	4	4.5	0.2	-76
46,89	1a	Service Area	0	1		-110.5
47,89	1a	Service Area	1	3.4		-110.5
39,90	1a	Service Area	4	4		-91
40,90	1a	Service Area	4	5		-89.5
41,90	1a	Service Area	4.5	4		-87
42,90	1a	Service Area	4	4		-85
43,90	1a	Service Area	3.4	4.5		-85.5
44,90	1a	Service Area	4	3.4		-83.5
45,90	1a	Service Area	4	3.4		-85
46,90	1a	Service Area	1	4.5		-104.5
42,91	1a	Service Area	5	4.5		-85
43,91	1a	Service Area	3.4	4.5		-88
44,91	1a	Service Area	4	4		-93
45,91	1a	Service Area	4	4		-99

Figure F-1
Tile Numbers



CLIENT: EBRCSA

PROJECT NO: 60175932

DATA SOURCE AND NOTES:

Shape File data provided from ESRI

- Medium Building
- Portable on the Street

DESIGN: GDM - 15 July 2011

DRAWN: GDM - 15 July 2011

CHECKED: MJL - 15 July 2011

APPROVED: MJL - 15 July 2011

FILE NAME:

M:\Projects\Radio Projects\60091361_20175 EBRCSA\
Task E.00 RaCE Testing\CCCO West\Maps\
Figure F-1 Two_Way DAQ Test with Tile Numbers.mxd

REV	DATE	APPROVED BY



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