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2013 JUN 21 AM 9:39

CITY OF OAKLAND

AGENDA REPORT

TO: DEANNA J. SANTANA
CITY ADMINISTRATOR

FROM: Ahsan Baig
Acting Director, DIT

SUBJECT: PUBLIC SAFETY TECHNOLOGY NEEDS SUPPLEMENTAL

DATE: June 20, 2013

City Administrator Approval: Deanna Santana Date: 6/21/13

COUNCIL DISTRICT: City-wide

RECOMMENDATION

Staff recommends that the City Council Approve a Resolution Authorizing the City Administrator to Expend ($3,042,000) Three Million Forty Two Thousand Dollars from the FY 2012-13 General Fund Undesignated Fund Balance on Public Safety Infrastructure Upgrades and Immediate Improvement Needs to 911 Dispatch Communications Centers and Delegate Authority to the City Administrator to Award Contracts.

REASON FOR SUPPLEMENTAL REPORT

At the Finance Committee on June 11, 2013, the Committee directed staff to provide a supplemental report providing a side-by-side comparison of the City's system and EBRCSA, including what aspects of this resolution might be covered by adopting the EBRCSA system. Staff recognizes the Committee may be receiving conflicting information from numerous sources related to the necessity of making these investments in light of the ongoing technical analysis of the EBRCSA radio system as an alternative. Staff wishes to express to the Committee that additional details pertaining to the critical and immediate need to make these investments was presented during a recent closed session. The previous Agenda Report and subsequent presentation was attempting to strike a balance of presenting all of the pertinent information related to the immediate need to make these infrastructure investments, while continuing to protect sensitive information related to critical public safety infrastructure. Staff has prepared this supplemental information pertaining to the scope and financial commitment of the proposed investments while the City continues to evaluate the East Bay Regional Communications System Authority (EBRCSA) P-25 radio system as an alternative solution for providing interoperable radio communications to City personnel. This request was made to avoid the potential for unnecessary or potentially duplicative investments in the event the City decides to transition to the EBRCSA radio system at a later date; therefore, absent test data, a side-by-side analysis/comparison cannot be completed until the data are available.

Item: _____
Finance & Management Committee
June 25, 2013

In light of the immediate and extraordinary infrastructure needs which have been identified to Council and which support day-to-day public safety operations, staff believes that these immediate improvements and upgrades are critical to ensuring the City continues to operate a multitude of public safety related systems including the Emergency Outdoor Alerting Siren's and 911 call taking which serve the residents of Oakland and its public safety employees, both of which are unrelated to the future decision related to radio communication providers. Therefore, staff must emphasize that this funding request should not be coupled with the decision making process of the radio communications system.

CITY PUBLIC SAFETY MICROWAVE NETWORK

The City's microwave network which serves as the backbone for public safety related telecommunication services as authorized by the Council in 2010 (*Attachment A*) is reliant on the City facilities identified by this report which require immediate infrastructure improvements and upgrades. The City microwave network provides bandwidth for a multitude of currently utilized applications including public safety related computer aided dispatching, real-time situational awareness systems, VOIP telephone services, and many other day-to-day applications which support our public safety personnel. The network was built with capacity to allow for future support of Next-Gen 911 and other media rich applications such as video and real-time analytics in support of public safety operations. The City's microwave network and its associated bandwidth are not services which would be eliminated by switching radio service providers. It is also important to note, the microwave network currently operated by the Alameda County General Services Agency, and which the EBRCSA radio system is reliant upon, is also collocated within two of the City facilities identified by this report in need of immediate improvements and upgrades and would therefore directly benefit by having these improvements made.

DISPATCH CENTER CONSOLE IMPROVEMENTS

Additionally, these immediate improvements and upgrades will also remediate the infrastructure deficiencies recently discovered within both of the City 911 call taking centers. The previous report detailed this need to include the replacement of consoles, which in turn has caused great confusion in relation to the EBRCSA offer to provide radio console stations if the City utilizes the ERBCSA radio system. These two similar worded phrases are not the same functional parts and these improvements do not seek to make investments in the current radio console stations which are currently integrated with the existing P-25 radio system. The improvements and upgrades which are referenced as "console" refer to the furniture and cabling hardware which serves as the console workstations for our dispatchers. The console workstations currently in operation are past their useful life and are in dire need of replacement. Several console workstations are no longer functional due to safety related issues, wear and tear, or are only used due to equipment failures at other workstations. In addition, these outdated and worn out

workstations also contribute to single channel radio communication failures and an overall decrease in equipment reliability. Most of the current workstations no longer conform to computer workstation safety requirements, and ADA compliance, which may contribute to employee injuries. These workstation hardware and cabling replacements are needed regardless of a change in radio system and will benefit the current P-25 radio system and increase reliability across the multitude of systems which are currently in service at these console workstations. In the event that a policy decision is made, these improvements will further prepare us to transition to EBRCSA by ensuring the console workstations meet the equipment and installation standards for their provided radio console equipment.

DISPATCH CENTER POWER AND SEISMIC IMPROVEMENTS

Further, staff has discovered that our 911 centers do not currently meet the standard grounding and power requirements which are typical of mission critical dispatch centers (known as the R56 standard). As a result, our centers experience a higher than average amount of electrostatic discharge which is resulting in a detrimental and costly damage to all of the technology systems which are currently in operation within these centers. The witnessed effect is an abnormally shorter than average lifespan for electronic devices installed within these centers which resuhs in higher operational costs related to the maintenance and replacement of these devices. This remediation is necessary regardless of the EBRCSA option, and as evidenced by the City of Martinez Staff Report (*Attachment B*) would not be provided by EBRCSA and the financial responsibility to remediate these issues would still fall on the City.

Additional upgrades and improvements to the dispatch workstations include replacement of video display monitors and their associated cabling and switching hardware which are past their useful life and heavily contribuite to the day-to-day computer equipment failures inside our dispatch centers. In conjunction with the replacement of the workstations and video display monitors, the centers will undergo improvements related to correcting missing seismic bracing and cable routing infrastructure to our 911 call taking workstations. Completing this work diuring the time when we await the test data allows for us to shorten the transition time if a decision is made to use EBRCSA. Otherwise, it will be done upon the decision and take about 90 days.

IMMEDIATE UPGRADE AND IMPROVEMENT SCOPE

Below is a chart which details the locations, effected systems, and the proposed improvements and upgrades:

Location	Affected Systems	Improvement Scope
OPD 911 Call Center	City Microwave System 911 Call System IPSS Dispatch System Outdoor Siren System Oakland P25 Radio System Voice Logging Recorder System ShotSpotter	R56 Grounding Remediation Workstation Power Upgrades Workstation Replacements Video Display Replacements ADA Workstation Layout Upgrades Seismic Retrofit – Call Taking Workstations VHF Dispatch Upgrades
OPD 911 Telecom Shelter	City Microwave System Outdoor Siren System Oakland Airport Traffic Management IPSS Dispatch System Alameda County Microwave (EBRCSA P-25) Oakland P25 Radio System	Shelter Replacement Generator Power Reconfiguration Cooling System Replacement Seismic Retrofit – Shelter Foundation Environmental Protection Upgrade
OFD Call Center	City Microwave System 911 Call System IPSS Dispatch System Outdoor Siren System Oakland P25 Radio System Voice Logging Recorder System	R56 Grounding Remediation Workstation Power Upgrades Workstation Replacements Video Display Replacements ADA Workstation Upgrades VHF Dispatch Upgrades
APL Facility	City Microwave Network Outdoor Siren System Public Works Radio System Alameda County Microwave (EBRCSA P-25) Oakland P25 Radio System	Generator Power Reconfiguration UPS Replacement Cooling System Replacement
Seneca Facility	City Microwave Network Outdoor Siren System Public Works Radio System Oakland P25 Radio System	Shelter Replacement Cooling System Replacement Generator Power Reconfiguration
Gwin Facility	City Microwave Network Oakland P25 Radio System Public Works Radio System Outdoor Siren System	Shelter Replacement Generator Power Reconfiguration Cooling System Replacement

ADDITIONAL INFORMATION REQUESTED BY COMMITTEE

The Finance Committee has requested information concerning the analysis currently underway related to utilizing the EBRCSA P-25 radio system as an alternative to Oakland continuing to own and operate its current P-25 System.

Beginning in August 2012, staff has been engaged in fulfilling the request by the City Administrator to fully examine the technical feasibility of transitioning to the EBRCSA P25 radio system, as well as conducting a thorough cost benefit analysis comparing the ongoing operational costs between the two respective systems.

It is important to note that the Oakland P-25 System serves users by way of service contracts outside of the City of Oakland. These users include the following:

- Oakland Housing Authority
- Oakland Unified School District
- Port of Oakland
- City of Piedmont (Police, Fire and Public Works)

These entities have service contracts with the City of Oakland and have not communicated any intention to migrate to another radio system and the City would need to work with them to prepare accordingly their contract needs. However, recent discussions with these external entities have revealed that since the interim mitigations were put in place by the City to stabilize the P25 System, they do not express concern with the current performance of the radios. The examination of transitioning to another system involves additional discussions with these entities to ensure they are technically and financially prepared to find another radio service provider should Oakland transition it's users to the EBRCSA P-25 radio system.

EBRCSA P-25 SYSTEM TESTING

As part of the technical examination effort, staff is conducting the following field and lab based technical tests:

- Performance and Stability Monitoring of EBRCSA (Field Test)
- Cellular Interference Study of EBRCSA Frequency Spectrum (Lab Test)
- Oakland P-25 Radio Hardware Compatibility Testing on EBRCSA(Field Test)
- EBRCSA Coverage Testing (Field Test)

As detailed in the March 29, 2013 Memorandum titled P-25 System Status Report (*Attachment C*) staff has been working to conduct these tests since October of 2012 but due to unfortunate delays caused by both EBRCSA and the City (*Attachment D*), the EBRCSA test radios were not delivered to the City until mid-February. Since that time, staff has been working toward the schedule indicated in the March 29th Memorandum and anticipate meeting the July deadline for completing all of the technical tests.

While the majority of the technical tests are field based, and given the recent findings and subsequent report concerning cellular interference to our existing P-25 radio system (*Attachment E*), staff recently included additional testing of the EBRCSA radio system to include a lab based cellular interference study of the spectrum utilized by the EBRCSA radio system. Staff has indicated that cellular interference causes the greatest number of communication disruptions to our public safety personnel and believes it is extraordinarily important for the City to understand

how the specific issue of cellular interference would evolve if the City were to transition to the EBRCSA frequency spectrum. At the time of this report publication, the official results from this testing have not yet been received by the City.

The technical analysis concerning the ability of our existing vintage radio fleet to seamlessly transition to the EBRCSA radio system is not a simple task given the variety of compatibility issues recently uncovered through interoperability testing of external agency radios. In addition, this analysis is complicated by the fact that no such transition or multi-vendor radio implementation such as this transition to EBRCSA has ever occurred before and there are no real world examples for staff to examine and derive results from. The potential implication here is that in order to transition to EBRCSA, it may require operational changes by our respective radio users to discontinue the utilization of certain non-P25 features, or alternatively replace the existing radio fleet with newer subscriber hardware. The cost magnitude for replacement of the public safety radio fleet is estimated between $15-20 million dollars. This does not include costs documented in letters from EBRCSA.

At the request of the EBRCSA Executive Director, the City, at its own cost, contracted with an independent consulting firm to conduct the respective radio coverage testing (*Attachment F*). This testing provides a technical comparison of the in-building coverage capabilities of both respective radio systems. At the time of this report publication, the official results from this testing have not yet been received by the City.

Finally, the cost benefit analysis of this examination is still underway and its results are heavily dependent on the outcome of the full technical analysis. Staff continues to emphasize that transitioning a vintage radio fleet from one manufacturer to another radio manufacturers system has not yet been attempted elsewhere in the nation and the City has very limited performance data to utilize in this analysis and, therefore, requires staff to perform a detailed examination to understand the full technical, support and subsequent cost implications (near and long term) for the City to transition to EBRCSA before presenting the analysis and making any recommendations.

ADDITIONAL INFORMATION ADVANCED BY THE ADMINISTRATION

While staff is focused on examining the technical compatibility of transitioning Oakland radios to the EBRCSA radio system, staff has highlighted several policy and subsequent cost related areas which should be considered as part of the decision to joining the EBRCSA. As stated, any policy decision prior to receipt of the test data appears premature, but in an effort to illustrate the decision-making factors, the following is provided. Additionally, *Attachment G* provides our preliminary inventory of areas to evaluate upon receipt of test data.

CURRENT EBRCSA GOVERNANCE

The East Bay Regional Communications Authority is a Joint Powers Authority (JPA). The JPA is governed by a Board of Directors which consists of twenty-three (23) members consisting of elected officials, police chiefs, fire chiefs, and city managers. The members are allocated among the various entities as follows:

(3) City Managers Contra Costa County*
(3) City Managers Alameda County*
(3) Elected Officials Contra Costa County**
(3) Elected Officials Alameda County**
(2) One member of each Board of Supervisors
(2) Police Chiefs Association***
(2) County Fire Chiefs Association***
(2) County Sheriffs***
(1) Contra Costa County (CAO)
(1) Alameda County (CAO)
(1) Special District

*selection determined by each County's City Managers Association
**selection to be determined by the Mayor's conference of each County
***one representative from Contra Costa and one from Alameda

POLICY & GOVERNANCE CONCERNS

While there has been some mention of potentially amending the JPA By-Laws to include representation for the City, nothing concrete has resulted from these discussions. In the event that Oakland were to join the EBRCSA and transition its public safety radio fleet of approximately 2000 subscriber radios, it would become one of the largest member users of the EBRCSA; however, it would not be provided with equal representation on the voting body which governs the JPA. In fact, the City of Oakland would not be provided with the ability to voice a single vote on the respective JPA Board, however, it would be responsible for one of the largest ongoing financial obligations based on the per user fee structure.

Staff is aware of similar regional communication system governing board models across California. The typical governance model found within California and across the country bases the structure of votes to be equitably distributed among each of the participating member agencies. One of the most successful and longest standing regional communications system in California is the Sacramento Regional Radio Communications System (SRRCS) operated by the County of Sacramento which also employs this equitable governance model. This is an important factor given the EBRCSA JPA by its own Operating Agreement has granted itself broad powers

which may exceed the operations of a radio system in the future. As an example, the Operating Agreement appears to provide the opportunity for EBRCSA to embark on future projects related to public safety call taking and dispatch operations, as well as future communication projects including broadband data systems. Once again, the City of Oakland would not have a voice in future projects or debt obligations the JPA may undertake; however, the City would become financially responsible to support such efforts regardless of the City's intent to participate in future projects.

In addition to the lack of representation on the EBRCSA board, the City of Oakland should consider the following policy items which are included in the EBRCSA Operafing Agreement:

Section 1.01 – The Authority has the ability to issue Bonds "from time to time."

Section 2.03 – defines that bonds are to be "...issued, sold and delivered... as the authority deems necessary."

Section 2.04 – defines the term of this operating agreement as the data of execution and terminates when "there are no bonds outstanding."

Based on the language in the operating agreement, there is no ceiling or other express limitation on the bond issuance authority of the JPA. There is nothing in the agreement that prevents the JPA from entering into another trust agreement to issue bonds. Further, based on the current governance structure, the City would become obligated to future debt obligations without being able to participate in the governance vote, or be able to withdraw itself from the JPA until all of the current debt obligations are paid in full. The resuh is a perpetual funding obligation for the City and no voice on behalf of the residents which ultimately will bear the responsibility for one of the largest shares of any debt repayment.

Section 4.04 of the Agreement addresses competitive projects. This section may restrict the ability for the City of Oakland to engage in activities diat the Authority would consider being competitive with its own project. This could be interpreted as preventing the City from continuing to own and operate the radio system which serves our non-public safety related users such as public works and the Oakland Unified School District. Further, it may prevent the City from owning and operating any future radio related technologies on the licensed frequency spectrum which Oakland currently utilizes. There are examples of other agencies who participate in the EBRCSA receiving special authorizations to continue operating radio systems which may serve other non-public safety users; however, there appears to be a future obligation for those agencies to transition those users to the EBRCSA once their respective systems reach end of life. Furthermore, the City of Oakland may be deemed to be in direct competition with EBRCSA since our frequency spectrum assets are of a similar technical nature to that used by the EBRCSA radio system. This requires more discussion and research to preserve the interests of the City.

FINANCIAL IMPLICATIONS

While EBRCSA has presented a breakdown of costs to join the JPA, staff needs to confirm that this is a fully accurate description of the costs to join (*Attachment H).* Specifically, the monthly cost per user fee presented by EBRCSA is based on Oakland subscribing either 4000 or 2300 radio users to the EBRCSA system. The City of Oakland operates roughly 2000 radios for its respective public safety agencies, and it is anticipated that by reducing the subscriber count, the cost per user fee would go up in some proportion to how the distribution of their operating costs across each subscriber radio. While these preliminary estimates provide an "order of magnitude" cost, the actual cost can not be determined until the test data is obtained and more complete information is available to negotiate.

In addition to the one-time "buy-in" and monthly costs, staff has identified the following expense areas which would also increase the costs to execute a project to transition to the EBRCSA radio system. Some of the items identified below do not identify costs due to the difficulty in estimating these costs with the limited data and time available to provide this report. It should be noted that some of these cost magnitudes for these items could be in the hundreds of thousands of dollars.

Project Management
Estimate: $180,000

Radio Software Program Development & Radio Reprogramming
Estimate: $200,000

In-Building System Replacement for Eastmont Substation & Police Administration Building
Estimate: $100,000

Voice Recording System Integration
Estimate: $150,000

Vehicle Antenna Hardware
Estimate: $75,000

Dispatcher Training
Estimate: Unknown

Staff Updates to COOP and SOP's
Estimate: Unknown

Preliminary Estimated Total: $705,000 + TBD expenses

Further, in the event the City of Oakland deems it technically necessary to deploy new vendor compatible radios in order to continue operating subscriber radios on the EBRCSA radio system without the loss of functionality currently utilized of the existing P-25 radio system, additional one-time costs related to the equipment purchasing will be necessary. Additional costs related to maintenance technician re-training and operations re-tooling will also be necessary.

Public Safety Mobile Fleet Replacement
Estimate: 650 Units x $5,200 = $3,380,000

Public Safety Mobile Installation Services
Estimate: $357,500

Public Safety Portable Fleet Replacement
Estimate: 1350 Units x $4,100 = $5,535,000
Public Safety Portable Accessories Replacement
Estimate: $159,000

Public Safety Portable Supporting Power Accessories Replacement
Estimate: $100,000

Public Safety Portable Deployment Services
Estimate: $337,500

Specialized Radio Applications Equipment (Desktop Radios/Soft Consoles/Command Vehicles)
Estimate: $950,000

Specialized Radio Applications Services
Estimate: $425,000

Dispatch Console Backup Radio Equipment
Estimate: $180,000

Dispatch Console Backup Radio Installation Services
Estimate: $30,000

Radio Technician Re-Training:
Estimate: $300,000

Radio Operations Re-Tooling:
Estimate: $750,000

Saft Costs Detailed Above: $705,000

Preliminary Estimated Total: $13,209,000 + TBD expenses

The above costs do not reflect non-public safety radio users transitioning to EBRCSA. Should the EBRCSA transition include non-public safety users, additional one-time expenses estimated at $7 million dollars would also be required.

ADDITIONAL FACTORS

In addition to the above costs and factors, staff has expressed the following issues related to what effect abandoning the current P-25 radio system would have from an operations perspective, as well as financial:

- The Oakland P-25 radio system is the only regional system which has interoperability with BART. The City needs to address what happens to the radio gateway (**ISSI**) with BART and how will our existing public safety users communicate in the BART tunnel system?

- The Oakland P-25 radio system was constructed using grant dollars and the City is currently in the performance period of the respective grants. The City needs to address will Oakland be forced to re-pay the grants if it migrates the public safety users off the system?

- What priority level will Oakland public safety users have on the EBRCSA radio system?

- What role would the current City of Oakland workforce which is currently responsible for the operations and maintenance of our existing system have if it transitions to EBRCSA.

PAST CONTRIBUTIONS TO EBRCSA

In closing, since 2007 the City of Oakland has contributed over $10 million dollars to the construction and on-going operations of the EBRCSA system by way of grant allocations and in-kind contributions for use of its radio facilities. Specifically, the City of Oakland purchased and currently holds ownership of the Harris Microwave Network currently operated by Alameda County. This microwave network was funded by the City of Oakland to foster regional communications interoperability between the respective dispatch communication centers across the region. This microwave network is currently utilized by the EBRCSA radio system as the network connection between their radio sites and serving dispatch centers.

Furthermore, the City of Oakland purchased and currently holds ownership for three of the P25 radio sites which are currently operating the EBRCSA radio system. The City of Oakland continues to make these contributions to the region to ensure interoperability between the various police and fire jurisdictions including our own, and to further prove that Oakland was sharing in the respective costs for providing mutual-aid interoperability for first responders. In fact, the EBRCSA radio sites which are operating within the City of Oakland were specifically designed with adequate equipment and spectrum capacity to ensure City personnel would have mutual-aid access to EBRCSA, a functionality which has recently been denied to the City of Oakland by the EBRCSA JPA board, against the advice of its own Executive Director. The City of Oakland should consider these financial contributions to the EBRCSA as investments which should be credited toward any future financial obligations should it decide to join the EBRCSA.

NEXT STEPS

Once staff has completed the technical assessments of the issues that need to be integrated into the analysis and resolved prior to recommending action to the City Council; this is in addition to the receipt of the test data. The various issues are complex, require discussion and determination before such a policy decision is made. The Council should consider three policy options upon receipt of the data respective to the EBRCSA alternative;

Option 1: Join EBRCSA
- (a) All Public Safety Radios (approximately 2000 radios), or
- (b) All City Radios (approximately 4000 radios)

Option 2: Maintain City Systems (P25 & EDACS)
- (a) Public Safety on P-25, and
- (b) Move All City Radios to P-25, or
- (c) Maintain EDACS for "Other" Users

Option 3: Join EBRCSA as Secondary System for Public Safety Radios
- (a) Establish a Smaller EBRCSA Subscriber Number*
  (*City of Hayward EBRCSA model)

Respectfully submitted,

/s/
Ahsan Baig
Acting Director
Department of Information Technology

Prepared by:
David Cruise
IS Supervisor, Wireless Communications
Public Safety Systems Services
Department of Information Technology

Attachments:
(A) City of Oakland Agenda Report re: Contract with Harris Stratex, dated January 26, 2010
(B) City of Martinez Agenda Report re: Authorization of Expenditure Appropriations to Purchase Radio Equipment and Facilitate Infrastructure R56 Grounding Work
(C) City of Oakland Information Memo re: P25 Public Safety Radio System—Status Report, March 29, 2013
(D) Emails from November 2012 re: EBRCSA Testing
(E) Subscriber Radio Performance Measurements Report, dated March 19, 2013
(F) Contract re: Radio Coverage Testing
(G) Draft Evaluation Matrix—Preliminary List of Issues that Need to be Thoroughly Evaluated
(H) Information from EBRCSA

ATTACHMENT A

CITY OF OAKLAND

AGENDA REPORT

To: Office of the City Administrator
Attn: Dan Lindheim
From: Department of Information Technology and Police Department
Date: January 26, 2010

Re: **Report And Resolution Authorizing The City Administrator To: 1) Negotiate And Enter Into A Contract With Harris Stratex, Inc. In An Amount Not-To-Exceed One Million Four Hundred Thousand Dollars ($1,400,000) To Upgrade, Expand, And Integrate The Phase I Of Public Safety Microwave Backbone System, 2) Negotiate And Enter Into A Contract With Harris Stratex, Inc. In An Amount Not-To-Exceed One Hundred Fifty Two Thousand Dollars ($152,000) For Maintenance Over A Two -Year Period; And 3) Waive The City's Advertising, Competitive Bid And Request For Proposal (RFP) Process For Equipment, Products And Professional And Technical Services To Be Purchased From Harris Stratex, Inc., 4) Enter Into Multiple, Additional Competitively Bid Contract(s) To Purchase Networking And Security Equipment For A Total Expenditure Not-To-Exceed One Hundred And Seven Thousand And Eight Hundred And Thirty Seven Dollars ($107,837), For All Such Contracts, Without Return To Council**

SUMMARY

Staff has prepared a report and proposed resolution authorizing the City Administrator to 1) negotiate and enter into a contract with Harris Stratex, Inc. in an amount not to exceed $1.4 million dollars to upgrade, expand and integrate phase I of the Public Safety Microwave Backbone System, 2) negotiate and enter into a contract with Harris Stratex, Inc. in an amount not to exceed $152,000 for maintenance over a two-year period, 3) waive the City's advertising, competitive bid and Request for Proposals (RFP) process for equipment, products and professional and technical services to be purchased from Harris Stratex, Inc., and 4) enter into multiple, additional competitively bid contract(s) to purchase networking and security equipment for a total expenditure not to exceed $107,837, for all such contracts, without return to Council.

The Department of Information Technology (DIT) and Oakland Police Department (OPD) seek to utilize the COPS Interoperability grant funding approved for acceptance by Resolution No. 80894 C.M.S. dated October 16, 2007, to design, install and upgrade the Microwave Backbone for Public Safety infrastructure.

FISCAL IMPACT

Approval of this resolution will authorize the City Administrator to execute a contract in an amount not to exceed $1,400,000.00 between the City of Oakland and Harris Stratex, Inc. to upgrade, expand, and integrate the new Microwave IP Backbone system in Oakland. The work

will include the RF (Radio Frequency) path analysis, assessment of the new City sites, design and modeling of the proposed RF network, installation, integration and testing of the Microwave equipment. The City is required to negotiate and execute separate additional vendor service agreements for additional purchases, installation services, maintenance and support of third party networking and security hardware and software.

The Public Safety Microwave IP Backbone upgrade project will be funded by the U.S. Department of Justice, Office of Community Oriented Policing (COPS) grant funds for the Police Department's FY 2007 Law Enforcement Technology (Interoperable Communications) grant program for the project term of September 1, 2007 through August 31, 2010, in the amount of $988,966. Funding will be appropriated to the Federal Grant Fund (2112); Police Information Technology Division Org. (106410); Agency-Wide Administration Program (PSOl), in a Project Account to be determined. The funding agency requires a (minimum) 25% matching funds component which must be made from local, state, or other non-DOJ/COPS funds. Matching funds in the amount of $332,988 are allocated in the Unclaimed Cash Fund (7440); Property and Evidence Division Org. (102120); Project to be determined; Miscellaneous Contract Services Account (54919), Criminal Investigations Division Program (PS03). The Police Department will account for the expenditure of matching funds in accordance with methods approved by the DOJ/COPS. Additional funds in the amount of $200,000 shall be drawn from JPFA Capital Projects Fund (5200), Communication and information Services Organization (94461), Contract Contingencies Account (54011), Project (P70600), Technology Management Program (IP62), and funds in the amount of $137,883 shall be drawn from U.S. Department of Homeland Security Fund (2123), Emergency Services Program Organization (20711), Computer Equipment Account (57711), Project (G385910), and Program (PS21). The total project cost, inclusive of the matching funds provision, is $1,659,837. The program will be managed by the Department of Information Technology; no immediate need for additional resources is foreseen at this time.

The information listed in the table below shows the sources of funding and the associated totals for the Microwave IP Backbone System project.

Source of Funds	Amount of Funding
DOJ COPS FY'07 Interoperability Grant	$988,966.00
OPD Unclaimed Cash Funds	$332,988.00
PSIC Grant	$137,883.00
JPFA Capital Projects Funds	$200,000.00
TOTAL Source Funding	$1,659,837.00

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January 26, 2010

The following table outlines the use of funds for one time amounts (itemized analysis of costs) associated with installation services, maintenance/support, contingency, and equipment needed to effectively implement, operate and maintain the Microwave IP Backbone System.

Use of Funds	One Time Costs ($)	Item Description
Microwave Equipment and Professional Services for Phase I from Harris Stratex, Inc.	$1,400,000.00	The total contract amount of the Microwave Backbone System from Harris Stratex, Inc. which includes total of 30 hops, radio equipment, redundant radio controllers, engineering design, path analysis, antenna system, structural work, and first year maintenance and support agreement.
Networking and Security Equipment	$107,837.00	The total amount is required to purchase the networking and security gear for connecting the remote sites with annual maintenance and support.
Annual Maintenance Services needed to support the operations	$152,000.00	The total amount is required for annual maintenance and support of the microwave backbone system.
GRAND TOTAL	**$1,659,837.00**	

The annual ongoing cost for microwave maintenance and network support charges ($152,000) shall be paid for from the Radio Maintenance Fund (Fund 4200) as a support system. This increase to the fund will also be reflected in the FY 2011-2013 internal service charge increase to the Police and Fire Departments.

BACKGROUND

The Internet Protocol (IP) has become the global standard networking protocol for interconnecting all types of computer systems and assuring the network interoperability for various platforms. The current public safety backbone system in Oakland relies on 15 year old Analog Microwave Equipment and dedicated leased line circuits with varying speeds from 1Mbps (Million/Mega Bits Per Second) to 45Mbps of speed The next generation of public safety devices require significant amounts of bandwidth and backhaul capacity (up to 100Mbps) to offer the bandwidth needed for business applications such as voice, video, data, images, and mapping, etc.

In recent years, two studies related to the broadband wireless communications needs, solutions and roadmap, have been performed in Oakland:

- Interoperability Study of 08/09 by CTA Communications, and
- Wireless Needs Assessment of 07/09 by Tellus Venture Associates

It is noticeable that both studies highly recommend upgrading the current Analog Microwave Equipment and migration to an Interoperable Microwave IP Backbone infrastructure, owned and maintained by the City, to support the future needs of the Public Safety Voice and Data communications infrastructure. Additionally, this upgrade will yield a significant savings once the new Microwave IP Backbone is operational, in replacing the redundant current leased dedicated circuits, and offer the better regional interoperability with the parmers like East Bay Regional Communication System (EBRCS) and Bay Area Regional Interoperable Communication System (BayRICS).

On October 16, 2007, Council passed Resolution No. 80894, C.M.S., authorizing the Oakland Police Department to receive grant funds totaling up to $988,966 from the Department of Justice Office of Community Oriented Policing Services COPS FY 2007 Law Enforcement Technology Interoperable Communications Grant Program. This allocation of said grant funds is aligned with a collaborative multi-agency, multi-jurisdictional, interoperable communications venture with the City and County of San Francisco, the County of Alameda, and the City of San Jose, and the County of Santa Clara.

KEY ISSUES AND IMPACT

The new Microwave Backbone System is the critical infrastructure required to support the First Responders Project 25 radio system. The Microwave Backbone System will connect all the core infrastructures consisting of P25 Radio Sites, Main Data Center Buildings, and Fire Stations in the City of Oakland. The reference architecture consists of more than 30 links per system layout; however, only core links will be deployed based on the engineering design and study in Phase I. The conceptual system layout assumes the *Line of Sight* for all the links and the final system design will be developed and finalized after a path survey and detailed engineering analysis. A detailed Statement of Work (SOW) will be developed before deployment and implementation of the project to detemiine the appropriate tower stmcture, required stmctural analysis, and site readiness.

Public safety agencies require robust and redundant backhaul communication systems able to survive and perfonn under emergency conditions. The federal government has set aside both valuable spectrum and grant funding for this purpose. Initial reference architecture for a citywide public safety microwave backbone system was developed to meet the operational requirements,

and the financial cost and benefits of each alternative was evaluated. Prime consideration was given to finding immediate offsets of existing costs, such as leased data lines, and the potential for grant funding. Several iterations of this design/financial analysis cycle were performed, resulting in a conceptual system design that meets these operational requirements to the greatest extent possible given the limits of current technology, regulations and funding. Department of Justice (DOJ) Interoperability 2007 grant funding of Community Oriented Policing Servicing (COPS) program, will be used for this public safety application. The reference architecture provides an extensible backbone that minimizes the cost of adding these capabilities, and demonstrates that voice and broadband data technology is deployable and effective.

Sole Source Justification

Due to the extremely tight project schedule (8 months), the magnitude and complexity of the Microwave Backbone Phase I project, and the potential loss of significant grant funding that could occur with delays, it is recommended that Council provides an approval to the City Administrator to proceed with single source procurement of the goods and services as needed to complete this highly valued regional interoperability project. The limited timeline for completion (Aug. 31, 2010, no project extensions allowed), and the procurement of goods and services needed to successfully complete the project and ensure compatibility with existing local and regional microwave and dependant systems makes project completion challenging. The Phase I of the voice and data transport project (which will support the transport needs of the Oakland P25 Communications System) will be built upon the recently completed P25 Radio sites by expanding it to other sites and adding several system enhancements aimed at improving operational efficiencies, system performance, adding system redundant failsafe measures, and extending maintenance and technical support of the system.

City Staff contacted other local public safety organizations that selected Harris Stratex, Inc. through a competitive bidding process, and found the company very reliable, scalable, and cost effective. The reasons listed below provide additional justification:

1. In Oakland, the new digital system will be an upgrade from the current analog microwave communication system originally built by Harris Stratex Inc. Any work, systems enhancements or expansions made by any company other than Harris-Stratex would impact and might void the existing warranties and maintenance agreements leaving County and other network participants at risk. The continued use of standardized equipment in Oakland is critical to maintaining system compatibility and local access to resources in the event of equipment failure. If a jurisdiction experiences a failure, a replacement part can be borrowed from a nearby entity. In addition, local government technical support staffs are trained on the maintenance and repair of this equipment, and have a high level of knowledge and experience regarding equipment functions, reducing maintenance costs and system down-time for repairs.

2. Harris Stratex Inc. Microwave equipment has been the vendor of choice by most local government agencies in the greater Bay Area. Several of these local and regional microwave radio communications network systems are built and maintained by Harris Stratex. The Alameda County and Contra Costa County East Bay Regional Communications System (EBRCS) utilizes the Microwave Backbone solution designed and built Harris Stratex, Inc. Santa Clara County is building the 38 Sites Microwave Backbone Communication System to support the Silicon Valley Regional Communication System (SVRCS) for critical voice and data services. The BayLoop, Microwave Backbone System, interconnecting all the Ten Counties in the Bay Area is being built by Harris Stratex, Inc. Eventually, all these microwave communication systems will be linked together to form a 12 County network for regional support of voice and data interoperability.

3. The project will be completed in 7 to 9 months, fulfilling the grant deadlines. Utilization of Harris Stratex Inc. will allow for a more efficient design and implementation schedule, which will be required to meet the limited time left to complete this complex project.

PROJECT DESCRIPTION

The Analog Microwave Backbone in the City of Oakland, installed and designed by Harris Stratex Inc., is currently used to connect radio sites for redundancy and backup links. Many public safety agencies in the Bay Area, including Alameda County, Contra Costa County, City and County of San Francisco, Santa Clara County, City of San Jose, and the Bay Area Regional Interoperable Communication System (BayRICS) are using the Digital Microwave Backbone solution provided by Harris Stratex, Inc.

The project scope requires the overall network architecture to connect the following main sites:

- Seneca Radio Site
- Gwin Radio Site
- APL Radio Site
- 150 Frank H. Ogawa Plaza
- Emergency Operations Center (EOC)
- Police Administration building (PAB)
- Police Communications Center (911)

In addition, all the fire stations and other critical public safety locations will be comected using the Microwave Backbone technology for high-speed data access to critical information.

SUSTAINABLE OPPORTUNITIES

Economic: Once the new Microwave IP Backbone is operational, the greatest economic savings will be realized, in replacing the redundant current leased dedicated circuits which will provide better regional interoperability with the regional partners.

Environmental: There are no environmental opportunities identified in this report.

Social Equity: Enhancing interoperability promotes public safety by enhancing emergency response time, thereby making communities safer.

DISABILITY AND SENIOR CITIZEN ACCESS

There are no disability or senior citizen access related issues with this report.

RECOMMENDATION

Staff recommends acceptance of this report and approval of the resolution authorizing the City Administrator to 1) negotiate and enter into a contract with Harris Stratex, Inc. in an amount not to exceed $1.4 million dollars to upgrade, expand and integrate phase I of the Public Safety Microwave Backbone System, 2) negotiate and enter into a contract with Harris Stratex, Inc. in an amount not to exceed $152,000 for maintenance over a two-year period, 3) waive the City's advertising, competitive bid and Request for Proposals (RFP) process for equipment, products and professional and technical services to be purchased from Harris Stratex, Inc., and 4) enter into multiple, additional competitively bid contract(s) to purchase networking and security equipment for a total expenditure not to exceed $107,837, for ail such contracts, without return to Council.

Respectfiilly submitted,

Ken Oordon, Acting Director
Department of Information Technology

For Anthony W. Batts
Chief of Police

Prepared by:
Ahsan Baig, IS Manager, Public Safety
Department of Information Technology

Reviewed by:
Captain Eric Breshears,
Acting Deputy Chief, Bureau of Services
Oakland Police Department

Ms. Cynthia Perkins
Legislative Analyst
Oakland Police Department

APPROVED AND FORWARDED TO
THE PUBLIC SAFETY COMMITTEE:

Office of the City Administrator

Item: _____
Public Safety Committee:
January 26, 2010

OAKLAND CITY COUNCIL

Approved as to Form and Legality

City Attorney

RESOLUTION NO._____C.M.S.

RESOLUTION AUTHORIZING THE CITY ADMINISTRATOR TO:

1) NEGOTIATE AND ENTER INTO A CONTRACT WITH HARRIS STRATEX , INC. IN AN AMOUNT NOT-TO-EXCEED ONE MILLION FOUR HUNDRED THOUSAND DOLLARS ($1,400,000) TO UPGRADE, EXPAND, AND INTEGRATE THE PHASE I OF PUBLIC SAFETY MICROWAVE BACKBONE SYSTEM, AND
2) NEGOTIATE AND ENTER INTO A CONTRACT WITH HARRIS STRATEX , INC. IN AN AMOUNT NOT-TO-EXCEED ONE HUNDRED FIFTY TWO THOUSAND DOLLARS ($152,000) FOR MAINTENANCE OVER A TWO -YEAR PERIOD; AND
3) WAIVE THE CITY'S ADVERTISING, COMPETITIVE BID AND REQUEST FOR PROPOSAL (RFP) PROCESS FOR EQUIPMENT, PRODUCTS AND PROFESSIONAL AND TECHNICAL SERVICES TO BE PURCHASED FROM HARRIS STRATEX, INC.; AND
4) ENTER INTO MULTIPLE, ADDITIONAL COMPETITIVELY BID CONTRACT(S) TO PURCHASE NETWORKING AND SECURITY EQUIPMENT FOR A TOTAL EXPENDITURE NOT-TO-EXCEED ONE HUNDRED SEVEN THOUSAND EIGHT HUNDRED THIRTY SEVEN DOLLARS ($107,837), FOR ALL SUCH CONTRACTS, WITHOUT RETURN TO COUNCIL

WHEREAS, on October 16, 2007, the City Council approved Resolution No. 80894 C.M.S., authorizing the acceptance and appropriation of grant funds in the amount of $988,966 from the U.S. Department of Justice, Office of Community Oriented Police Services, FY 2007 Law Enforcement Technology (Interoperable Communications) grant program, to the Oakland Police Department in support of the Interoperability; and

WHEREAS, the Department of information Technology (DIT) and Oakland Police Department (OPD) seek to use the COPS Interoperability Communication grant, to design, install and upgrade the Microwave Backbone for Public Safety infrastructure; and

WHEREAS, the Microwave Backbone project shall assist in deploying the P25 radio upgrade for voice interoperability in the Bay Area region and Broadband Wireless Data for improved response time through more efficient and timely resource allocation, as well as overall public safety management during times of emergency; and

WHEREAS, Oakland Municipal Code Sections 2.04.051 A and 2.04.040.B require advertising and competitive solicitation processes to be determined by the City Administrator for the purchase of professional services; and

requests for proposal/qualification processes upon finding that it is in the best interests of the City to do so; and

WHERERAS, Oakland Municipal Code Section 2.04.050 requires advertising and competitive bids with award to the lowest bidder for the purchase of equipment and products; and

WHEREAS, Oakland Municipal Code Section 2.04.050.1 authorizes the City Council to waive such advertising and bidding requirements upon a finding that it is in the best interests of the City to do so; and

WHEREAS, staff researched and contacted other public safety organizations in the Bay Area that have selected Harris Stratex, Inc. through competitive bidding processes and currently use their Microwave Radio equipment and services; and

WHEREAS, Harris Stratex, Inc. is the only vendor proven to have time tested technology that is compatible with the current Microwave equipment and is the only vendor that can maintain its system; and

WHEREAS, the project includes connecting the critical infrastructure Radio Sites (i.e., Gwin, Seneca, APL, Police Communications Center, Police Admin Building, Police Sub-Station at Eastmont, 150 Frank H. Ogawa Plaza, Emergency Operations Center, and Fire Stations); and

WHEREAS, the Microwave equipment deployment will utilize the existing proven technologies, compatible interfaces and best practices in the current City IT infrastructure to minimize additional integration costs; and

WHEREAS, for the reasons stated above and in the City Administrator's agenda report accompanying this item, the City Administrator recommends that the Council waive advertising, the competitive request for proposal/qualifications process and competitive bidding for the purchase of a Microwave Backbone system; and

WHEREAS, the City Administrator has determined that services provided pursuant to said agreement with Harris Stratex, Inc. are of a professional, scientific, or technical nature and are temporary in nature; and

WHEREAS, the City Administrator has determined that said agreement shall not result in a loss of employment or salary by any person having permanent status in the competitive service; now, therefore, be it

RESOLVED: That pursuant to Oakland Municipal Code sections 2.04.050.1.5 and 2.04.051.B, and based on the reasons set forth in the City Administrator's agenda report accompanying this resolution, the City Council hereby finds and determines that it is in the best interests of the City to waive advertising, competitive bidding and request for proposal/qualifications process for the purchase of professional and technical services for the implementation of a Public Safety Microwave Backbone System and so waives said requirements; and be it

FURTHER RESOLVED: That the City Council authorizes the City Administrator to negotiate

and enter into an agreement with Harris Stratex, Inc. in an amount not to exceed $1,400,000 for the purchase of equipment, products and professional and technical services necessary for the implementation of a Public Safety Microwave Backbone System; and be it

FURTHER RESOLVED: That the City Council authorizes the City Administrator, or his designee, to enter into a maintenance agreement with Harris Stratex, Inc. in an amount not-to-exceed $152,000 for provision of system maintenance over a two-year period to commence at the completion of the warranty period; and be it

FURTHER RESOLVED: That the City Council authorizes the City Administrator, or his designee, to select a vendor or vendors, following a competitive process, and enter into an agreement or agreements with other vendors for a total expenditure not-to-exceed $107,837 for the purchase of network and security equipment; and be it

FURTHER RESOLVED: That grant funds from the U.S. Department of Justice, Office of Community Oriented Policing Services, in the amount of $988,966 shall be drawn from the Federal Grant Fund (2112), Bureau of Services Division Org. (106410), Information Technology Division Program (PS01), in a Project Account to be established; and be it

FURTHER RESOLVED: The funding agency requires a (minimum) twenty-five percent (25%) matching funds component which must be made from local, state, or other non-DOJ/COPS funds, and said funds in the amount of $332,988 shall be drawn from the Unclaimed Cash Fund (7440); Property and Evidence Division Org. (102120); Project to be determined; Miscellaneous Contract Service Account (54919), Criminal Investigations Division Program (PS03); and be it

FURTHER RESOLVED: Additional funds in the amount of $200,000 shall be drawn from JPFA Capital Projects Fund (5200), Communication and information Services Organization (94461), Contract Contingencies Account (54011), Project (P70600), Technology Management Program (IP62), and funds in the amount of $137,883 shall be drawn from U.S. Department of Homeland Security Fund (2123), Emergency Services Program Organization (20711), Computer Equipment Account (57711), Project (G385910), and Program (PS21); and be it

FURTHER RESOLVED: That pursuant to Oakland Municipal Code section 2.04.051.B and based on the reasons set forth in the City Administrator's agenda report accompanying this resolution, the City Council hereby finds and determines that it is in the best interests of the City to waive the competitive request for proposal/qualifications process for the purchase of goods and services from Harris Stratex, Inc. relative to the delivery of services associated with the FY 2007 COPS Interoperability Communications grant program; and be it

FURTHER RESOLVED: That the City Council finds and determines based on the above determinations of the City Administrator, that the goods and services provided pursuant to the agreements authorized hereunder are of a professional, scientific, or technical and temporary nature, and shall not result in a loss of employment or salary by any person having permanent status in the competitive service process; and be it

FURTHER RESOLVED: That the City Administrator or his designee is hereby authorized to

complete all required negotiations, certifications, assurances and documentation required to accept, modify, extend and/or amend the grant awards, and be it

FURTHER RESOLVED: That the City Attorney shall review and approve said agreements as to form and legality and copies of said agreements shall be filed with the Office of the City Clerk.

IN COUNCIL, OAKLAND, CALIFORNIA, _____, 20_____

PASSED BY THE FOLLOWING VOTE:

AYES- BROOKS, DE LA FUENTE, KAPLAN, KERNIGHAN, NADEL, QUAN, REID, and PRESIDENT BRUNNER

NOES-

ABSENT-

ABSTENTION-

ATTEST:_____
LaTonda Simmons
City Clerk and Clerk of the
Council of the City of Oakland, California

ATTACHMENT B

CITY OF MARTINEZ **CITY COUNCIL AGENDA**
March 21, 2012

TO: Mayor and City Council

FROM: Gary D. Peterson, Chief of Police

SUBJECT: Resolution Authorizing Expenditure Appropriations to Purchase Radio Equipment and Facilitate Infrastructure R56 Grounding Work

DATE: March 12, 2012

RECOMMENDATION:

Adopt a resolution authorizing 1) a budget adjustment to the 2011/2012 budget so radio equipment scheduled to be purchased on July 1, 2012, can be purchased prior to March 30th at a discounted price and 2) expend funds for R56 grounding work in the police dispatch center and equipment room.

BACKGROUND:

In the wake of Hurricane Katrina, federal legislation was passed requiring interoperability between public safety agencies, including police and fire agencies. As part of this effort, the FCC mandated local police agencies change the frequency they operate on by January 1, 2013.

The federal government allocated grant funds to replace the radios used in dispatch centers, but the expense for radios used by officers in the field, including vehicle and portable radios, is borne by local jurisdictions. Contra Costa County and Alameda County's FCC compliant system is organized under a joint powers agreement as the East Bay Regional Communications System Authority (EBRCSA). On September 15, 2011, the City Council adopted a Resolution approving an operating agreement with the EBRCSA, which authorized the City's participation in the project.

The City Council also approved the following fiscal impacts:

1. (a) Allocate $128,235 to buyout the debt service resulting from the execution; and, (b) implement the operational agreement. Funding to come from undesignated fund balance of $49,635 and $78,600 from designated emergency capital fund.

2. Authorize the transfer of $450,000 from undesignated fund balance to designated for the purchase of the P25 portable and mobile radios before January 1, 2013.

The expenditure of $128,235 to buyout the debt service resulting from the execution and implementation of the operational agreement was subsequently reduced to $116,200 because additional agencies joined the authority. That expenditure occurred on February 17, 2011.

Currently, the Martinez Police Department maintains eighty-three (83) mobile and portable radios. Department radios are not P25 compliant, and they will not work on the EBRCSA system and do not meet 2013 FCC requirements. In fact, current police radios, purchased more than fifteen years ago, have reached the end of their service life.

Staff reviewed the Office of the Sheriff, Contra Costa County's field study of the different radio manufacturers. The study recommended the Motorola products. Staff field-tested the Motorola APX7500 and APX6000 portables and concurred with the CCCSO's assessment. While all manufacturers provided competitive bids to all impacted law enforcement agencies through the Office of the Sheriff, Contra Costa County. Motorola was selected by our staff on the basis of performance and cost.

The department is in the process of acquiring eighteen Motorola APX7500 Dual Band Interoperable portable radios through another funding stream.

The project requires the purchase of sixty-five (65) additional radios; thirty-three (33) Motorola APX6000 I 700/800 MHz Interoperable single band portable radios; and thirty-one (31) Motorola APX6500 700/800 MHz Interoperable single band mobile (vehicle) radios and associated accessories such as bank chargers, extra batteries and shoulder microphones.

The $450,000 from the undesignated fund balance to be utilized for this project is budgeted in the 2012/2013 budget. Hence, all radios and accessories are scheduled to be purchased on or after July 1, 2012. However, Motorola is providing a promotional and a trade-in incentive that will reduce the amount of funds needed for the purchase of the radios by $44,700.

Table A illustrates the EBRCSA promotion for the APX6000 radio valid through March 30, 2012. Each portable radio is discounted $450. Additionally, a one to one trade-in will provide another $200 discount per unit. Therefore, the purchase of portable units before March 30, 2012, will decrease the cost of the project $21,450.

Table B illustrates the EBRCSA promotion for the APX6500 radio, which is valid through March 30, 2012. Each mobile radio is discounted $550. Additionally, a one to one trade-in will provide another $200 discount per unit. Purchasing mobile units before March 30, 2012, will decrease the cost of the project $23,250.00.

R56 Grounding

Communication network downtime significantly impacts daily operations and much of the potential downtime can be the result of non-compliance to minimum communication site standards. If the communications equipment isn't properly grounded and incorporates surge suppression, it can significantly jeopardize the network, and it also puts those who maintain the site at significant risk. Originally developed by Motorola in 1987 to provide internal guidelines and requirements for the installation of communication equipment, infrastructure and facilities, the "Standards and Guidelines for Communication Sites" (R56) forms the minimum standards required to provide expected system performance, reliability and equipment longevity. The Motorola guidelines have since become the recognized standard in the industry and serve as the most complete and rigorous specification for the protection of communication system equipment installed at public safety and commercial wireless communication sites.

On February 7, 2012, in anticipation of the need to install two (2) EBRCSA project dispatch consoles, representatives from Contra Costa County IT, Motorola and the City of Martinez conducted an R56 grounding study on the City of Martinez dispatch site and equipment/radio/computer room.

On February 28, 2012, we received a written report outlining the work that needed to be completed to meet the R56 standard. See Attachment A.

On March 12, 2012 we received an initial estimate of $11,720.97 from our radio service provider to complete the needed grounding work for the project.

FISCAL IMPACT:

Funding for this project is allocated in the 2012/2013 budget. The total cost to purchase radios without the discounts discussed herein totals $295,417.32. By purchasing radios for this project before March 30, 2012, three months in advance of the next fiscal year, we will expend $250,717.32, which is net savings of $44,700 to the project. Staff is requesting a transfer of $300,000 to ensure that the radios can be purchased at the discounted price and the R56 grounding work can be completed in a timely manner.

ACTION:

Approve resolution authorizing a budget transfer from the already allocated funds from the FY2012/2013 budget in the amount of $300,000 to the FY2011/2012 budget so funds can be expended to advance the EBRCSA project.

Attachments:
Attachment A
Resolution

APPROVED BY: City Manager

Table 1

COST AND EQUIPMENT REQUIREMENTS *P25 Interoperable* Portable - *700/800 MHz*				
QTY		***DESCRIPTION***	***PRICE***	***PRICE***
33		**APX6000 1 700/800 MHz 3 watt P25 Trunked Portable Radio**	**$3,809.00**	**$125,697.00**
33		**Service Advantage - Motorola Depot 4 YR (1YR standard)**	**$162.00**	**$5,346.00**
33		**EBRCSA Promotion APX6500 (Valid through 3/30/12)**	**$(450.00)**	**$(14,850.00)**
33		**Trade-in Incentive (One for one radio, valid through 3/30/12)**	**$(200.00)**	**$(6.600.00)**
33		**Equipment:**	**$3,321.00**	**$109,593.00**
33		**800 MHz programming done by Contra Costa County**	*	*
		Installation		
33		**8.25% Sales Tax:**	**$274.00**	**$9,042.00**
33		**System Total:**	**$3,595.00**	**$118,635.00**

Table 2

COST AND EQUIPMENT REQUIREMENTS *Single Band* P25 *Interoperable Mobile - 700/800 MHz*				
QTY		***DESCRIPTION***	***PRICE***	***PRICE***
31		**APX6500 700/800 MHz 35 watt Mobile P25 Radio**	**$4,440.00**	**$137,640.00**
31		**Service Advantage - Motorola Depot 4 YR (1YR standard)**	**$246.00**	**$7,626.00**
31		**EBRCSA Promotion APX6500 (Valid through 3/30/12)**	**$(550.00)**	**$(17,050.00)**
31		**Trade-in Incentive (One for one radio, valid through 3/30/12)**	**$(200.00)**	**$(6,200.00)**
31		**Equipment:**	**$3,936.00**	**$122,016.00**
		800 MHz programming done by Contra Costa County	*	*
		Installation		
31		**8.25% Sales Tax:**	**$324.72**	**$10,066.32**
31		**System Total:**	**$4,260.72**	**$132,082.32**

RESOLUTION NO. -12

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF MARTINEZ AUTHORIZING AN ADJUSTMENT TO THE 2011/2012 BUDGET BY TRANSFERING $300,000 FROM THE 2012/2013 BUDGET TO THE 2011/2012 BUDGET TO ADVANCE THE EBRCSA PROJECT

WHEREAS, the City Council of the City of Martinez authorized the police department's participation in the East Bay Regional Communications System Authority (EBRCSA); and

WHEREAS, the City can reduce the project costs by $44,700 for portable and mobile radios through vendor discounts; and

WHEREAS, the discount described herein expires on March 30th and the City Council recognizes the need to adjust the budget to purchase the radios and accessories in advance of the original July 1, 2012, purchase date to realize $44,700 savings; and

WHEREAS, the R56 grounding work needs to be completed before project dispatch consoles can be installed.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Martinez hereby authorizes the Finance Manager to adjust the 2011/2012 budget by moving the already allocated $300,000 from the 2012/2013 budget to the 2011/2012 budget for the purpose stated herein.

* * * * * *

I HEREBY CERTIFY that the foregoing is a true and correct copy of a resolution duly adopted by the City Council of the City of Martinez, at a Regular Meeting of said Council held on the 21st day of March, 2012, by the following vote:

AYES:

NOES:

ABSENT:

RICHARD G. HERNANDEZ, CITY CLERK
CITY OF MARTINEZ

ATTACHMENT A

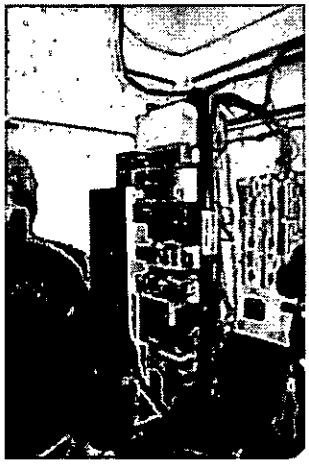
Martinez Dispatch

525 Henrietta St. Martinez, Ca

February 7,2012

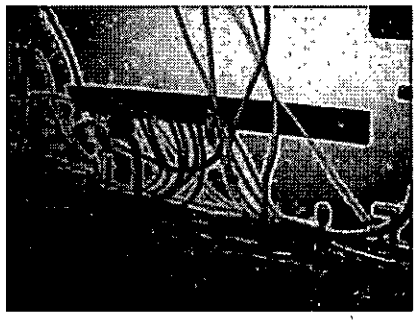
Equipment Room

Equipment room is located on 1st floor, the Dispatch is located on the 2nd floor. Suggest relocation of existing CEB; this would put the soon to be obsolete equipment in a spot for easy removal in the future, and allowing the new long term EBRCSA rack to be placed in a location that will be best served for the next 2-3 decades.



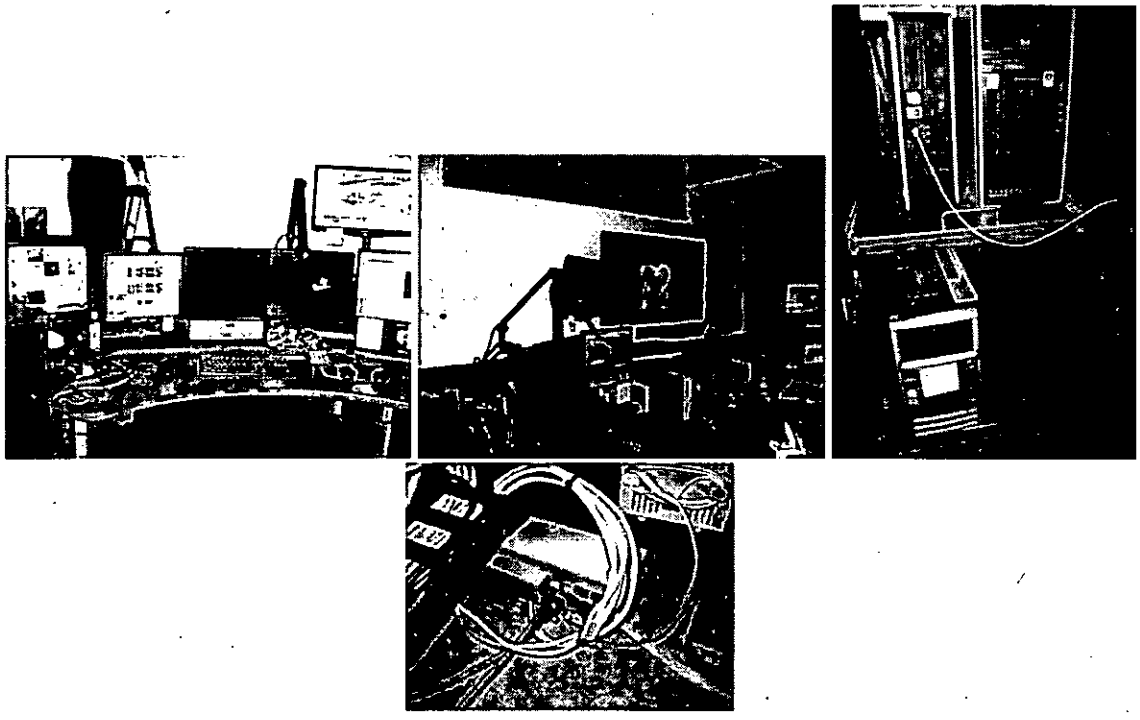
The existing ground system to be upgraded, see Grounding section below for details.

First Aid Kit required



ATTACHMENT A

Console Positions



Upgrade to console grounding. see grounding section below for more details

Two types of fire suppression extinguisher required in Dispatch ABC and BC

Switched powers strips to be replaced with non switched surge protected strips

CIE Grounds to be upgraded to irreversible compression lugs

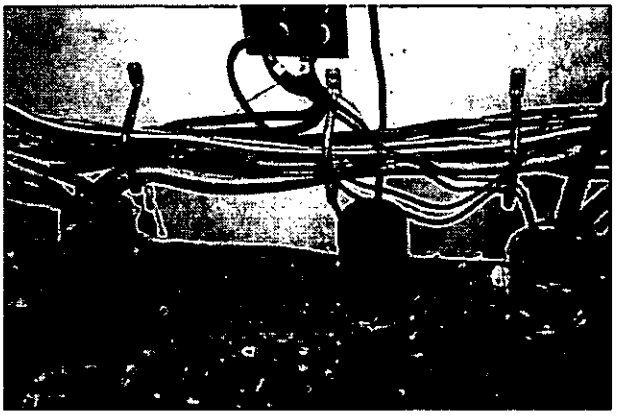
Grounding

An existing ground buss in the equipment room will need to be upgraded to accommodate two hole lugs. Existing ground terminations, and bonds will require upgrade to irreversiblecompression crimp two hole lugs. An unused conduit will be used to run the new #2 Thhn ground into the dispatch area. A new Master ground bar (MGB) will be installed in the equipment room.

From new MGB a single #2. thhn cable run (approx 125') from the equipment room MGB to a new Sub System buss ground (SSGB).to be installed in the dispatch center. This bar should be no smaller that 2" height, with a thickness no less than ¼" and length variable based on quantity of bonded components. From this SSGB a single #2 Thhn will be run to a Ground Buss Bar at each of the 6 console positions. where a SSGB smaller ground buss is installed. From this point #6 thhn conductors will be bonded to all components requiring a bond to ground.

Cable tray grounding will need upgrade to meet compliance. Cable tray requires bond back to MGB. and each section bonded with ground jumpers

Cable Routing



Cables exit equipment room via conduit in the floor. transition into wall vertically to second floor above the false ceiling. The cables drop into existing channels and distribute out to the positions. Interface and ground cables are currently routed in this conduit

Issues

- Future back-up control stations for two main dispatch channels
- Confirm UPS power circuit availability, and termination of power in duplex box at rack location.
- 13 year old generator is not 100% reliable. does not start on occasions.- Not in EBRCSA scope, an issue identified during audit

(

ATTACHMENT C

DISTRIBUTION DATE: 3/29/13

CITY OF OAKLAND

MEMORANDUM

TO: HONORABLE MAYOR & CITY COUNCIL

FROM: Jim Reese

SUBJECT: P25 PUBLIC SAFETY RADIO SYSTEM—STATUS REPORT

DATE: March 29, 2013

City Administrator Approval /s/ Deanna J. Santana

Date 3/29/13

INFORMATION

The purpose of this memorandum is to provide an update about current efforts made to identify and resolve recurring, intermittent issues with the City's P25 radio system. Since our last update, City staff and our vendor partners have continued their efforts to investigate and resolve numerous instances of radio frequency (RF) interference, and other operational issues which affected the performance of our first responder radios. This effort, in conjunction with the ongoing technical review into individual radio trouble reports made by our first responders have led City staff to take immediate corrective actions to resolve and stabilize the P25 radio system.

In addition to these efforts, in August 2012, the City began negotiations with the East Bay Regional Communications Authority (EBRCSA) to fully understand the costs involved to utilize the EBRCSA P25 radio system as an alternative to maintaining and operating the City's P25 radio system. This was one of several alternatives presented by the City's consultant RCC to resolve infrastructure and operational deficiencies found during the course of the consultant's investigation. Staff has been examining the technical feasibility of migrating our public safety communications to the EBRCSA radio system as well as conducting a cost-benefit analysis between both respective options.

Given the City's immediate need to provide reliable radio communications to our first responders, and since the EBRCSA P25 radio system had not yet been fully constructed, and did not provide radio coverage in the Oakland area, City staff began concentrating its efforts and limited resources to improve reliable radio communications to the City's P25 radio system as a short-term solution, while continuing to investigate various long-term solutions, including EBRCSA.

In August 2012, City staff concluded that numerous instances of officers reporting trouble with their radio were correlated to radio frequency (RF) interference occurring near cellular sites in various areas around the City. Immediately following this discovery, the City began to address RF interference testing and mitigation with Pericle Communications. We have engaged in field testing and verification of RF interference sources, filing applicable FCC reports to notify cellular operators to mitigate sites which have verified interference, and conducted technical RF

lab testing of our public safety radio fleet to verify the equipment meets all applicable standards in order to qualify for interference protection under FCC rules. These lab tests and field verification and mitigations are documented in the attached report named, "Subscriber Radio Performance Measurements." The summary of this report is as follows:

- Testing confirms that our P25 radio fleet exceeds all applicable performance standards and is therefore entitled to interference protection under FCC rules
- Field testing has verified that RF interference is caused directly or indirectly by signals coming from wireless transmission sites operated by cellular providers, either individually or in a combination of signals from the cellular carriers.
- FCC rules require wireless operators to mitigate interference upon notification and verification. The Oakland team has been working collaboratively with cellular carriers to mitigate interference on a case-by-case basis.

As of January 21, 2013, 43 wireless sites have been tested with the following results:

- 13 AT&T sites showed no problems
- 5 Nextel sites mitigated by the carrier
- 2 AT&T sites are complicated by another nearby public safety licensee, no resolution
- 1 co-located site was jointly mitigated by AT&T and Sprint-Nextel
- 3 sites are unable to be mitigated due to other signal level issues
- 20 AT&T sites mitigated by the carrier (19 reduced power, 1 beam up-tilt)

The testing report outlines the types of RF interference being experienced by our public safety radios, root causes, and recommended mitigation strategies to the responsible wireless carriers. The issue of cellular RF interference to public safety radios is not a new issue, and Oakland is among many other public safety licensees, both locally and nationwide who experience cellular RF interference. The City team continues to work diligently to locate and resolve cases of RF interference to ensure our first responders' radios perform within public safety standards.

While the issue of RF interference has been certainly a large contributor to the trouble experienced by our first responders, it is not the sole cause. The City discovered deficiencies in relation to the maintenance of our radios which have contributed to radio communication performance issues. City staff has taken numerous steps to address these deficiencies and continues to remedy them on an ongoing basis.

Since the RF interference mitigations began, and in conjunction with improvements to the maintenance of the subscriber unit fleet, and additional operational procedures, overall trouble reports have dropped by well over 85%, and the P25 radio system availability is performing above 99.999% which is well within public safety standards. In addition to the reduction in trouble reports, staff conducted a survey in January 2013 of the Oakland Police Department Communications Center dispatch staff in order to directly measure the perception and subjective opinions of improvements made since August 2012; about 50% of the active dispatch staff responded to the non-scientific survey. The key result of this survey is as follows:

In comparison to August 2012, is the P25 performing better, worse, or about the same?

- Much Better 34.6%
- Somewhat Better 30.8%
- Slightly Better 19.2%
- About the Same 15.4%
- Slightly Worse 0.0%
- Somewhat Worse 0.0%
- Much Worse 0.0%

We continue to direct public safety staff to report any radio problems so that we may continue to remedy these issues. City staff is making ongoing small, targeted improvements to the P25 radio system that produce positive, quantifiable results while continuing to investigate and resolve each and every radio trouble report. Over the next few weeks, staff anticipates completing the last phase in our maintenance plan which is anticipated to produce improvements in overall subscriber radio performance.

The technical review into EBRCSA is ongoing; however, it is important to note that the current phase of this investigation is focused on the ability for the City to migrate its existing radio subscriber fleet onto the EBRCSA P25 system. While much attention has been put on the ability of P25 radios to be "vendor agnostic" to allow interoperability across jurisdictions, regardless of radio manufacturer, the reality is interoperability should not be confused with operability. In fact, in the event Oakland were to migrate the subscriber radios onto EBRCSA as a full-time subscriber, it would be the very first public safety users to attempt to intermix a subscriber unit fleet with a different manufacturer's respective P25 radio system on a full-time basis, which causes the City to review this alternative with great caution. This is certainly not without great technical risk, and Oakland is well served in researching and testing all operational aspects of how our existing subscriber unit fleet is going to operate and react on the EBRCSA P25 system in regular day-to-day use.

To accomplish this testing, once City staff was notified by EBRCSA that it had completed construction of the radio sites covering Oakland, we provided two of our portable subscriber radio units to have them programmed onto the EBRCSA P25 system and allow for testing of both coverage, and subscriber operations. The City then contracted with RCC to complete the in-building coverage portion of the testing and signed an agreement with EBRCSA to allow the testing to commence. EBRCSA provided our programmed subscriber units back to the City in mid-February; since that time we have been working with our consultant to refine the test plan and finalize the automated test collection process. Staff anticipates having RCC begin their portion of the testing in mid-April, with final results on the testing provided to the City in early July.

This testing is the first step toward the City making a decision on how it wishes to proceed. It is important to note that the Oakland P25 radio system is a shared regional communications system, very much the same way EBRCSA serves multiple public entities. In addition to serving the day-to-day communication needs of the Oakland Police and Fire Departments, the Oakland

P25 radio system also serves several external entities, including the City of Piedmont (Police & Fire), Oakland Housing Authority (Police), Oakland Unified School District, Oakland School Police, and the Port of Oakland. Oakland serves these external entities in the form of service contracts and MOU's, and would need to consider and involve these entities in any decision to migrate users to another radio system.

The concept of Oakland operating and maintaining its own P25 radio system goes back to the regional vision for public safety interoperability under the current UASI project called BayRICS, or Bay Area Regional Interoperable Communications Systems. The Oakland P25 system is part of this regional "system of systems" approach for connecting all first responders in the Bay Area, and the Oakland P25 radio system was the first radio system to begin this interconnection to other systems when it demonstrated the first interoperable link to the underground BART P25 radio system in 2012.

Systems like Oakland are meant to be the gateway for smaller entities, like EBRCSA, whose mission is to consolidate many smaller radio systems across counties into a single system and allow their users to connect into the region using larger hub systems, like Oakland. In terms of interoperability from a technical perspective, the Oakland P25 radio system and its users are already fully equipped to communicate with neighboring jurisdictions for purposes of mutual-aid. Oakland has allowed numerous users to communicate on our P25 radio system, including the California Highway Patrol, East Bay Regional Park District, BART, and many other public safety entities.

Over the next month, additional progress will be made in several areas:

- Continue to investigate and mitigate cases of RF interference.
- Complete the maintenance on all Oakland Police portable subscriber units.
- Commence the in-building testing of the EBRCSA P25 radio system.
- Present a detailed plan to fully address the findings and recommendations of the RCC Consultants' independent radio system performance evaluation report.

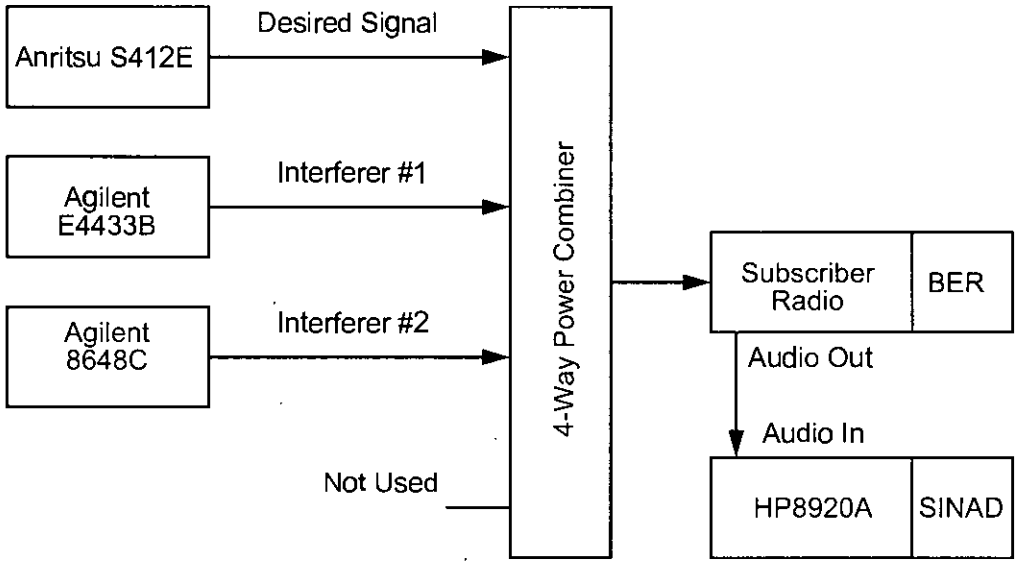
Updates regarding progress made on resolving additional radio system issues will be forthcoming on a regular basis.

Respectfully submitted,

/s/
JIM REESE
Interim Administrative Services Director

Attachment (1)

Subscriber Radio Performance Measurements



March 19, 2013
(Final Report)

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Subscriber Radio Performance Measurements

1.0 Executive Summary

The City of Oakland ("Oakland") operates a 10-channel 800 MHz P25 simulcast trunked radio system in the 851-861/806-816 MHz public safety radio band. This radio system has been rebanded and is operating on its post-rebanded frequencies. Oakland recently experienced degradation of mobile and portable radio performance at numerous locations in the Oakland metropolitan area. Investigation by the City, its vendor Harris Corporation and its consultant Pericle Communications Company shows that the interference is caused directly or indirectly by signals emanating from cell sites operated by AT&T Mobility and Sprint-Nextel. In several cases, a combination of signals from Sprint-Nextel and AT&T Mobility is the culprit. In other cases, just one operator's cell site is required to cause harmful interference.

The nationwide 800 MHz rebanding project, funded by Sprint-Nextel, is designed to significantly reduce the occurrence of interference to public safety radio systems by separating the public safety band from the commercial wireless band. The potential for interference remains after rebanding, but at a much reduced level.

Interference from 800 MHz cell sites generally falls into three categories: transmitter out-of-band emissions (OOBE), receiver intermodulation (IM) and receiver overload. OOBE from AT&T cell sites in Oakland have been measured by the parties and found in virtually all cases to be too weak on the street to cause harmful interference. Receiver IM, on the other hand, is a problem and has been documented at numerous cell sites in Oakland. Receiver overload tends to occur at interfering levels above where receiver IM first appears, but overload can be the dominant problem very close to the cell site when a single carrier is present.

The wireless operators are obligated to mitigate interference under Part 22.970 of the FCC rules, even if the interference is created inside the public safety radio receiver as receiver IM [1]. With the cooperation of AT&T Mobility and Sprint-Nextel, the Oakland team (Oakland, Harris, Pericle) has been mitigating this interference on a case-by-case basis through a variety of means, including reducing transmitter power at the interfering cell sites.

Because receiver IM and overload are the dominant problems in Oakland, it is important to verify that the Oakland subscriber radios are meeting the applicable minimum performance standards, as found in FCC Part 22.970 [1]. Radios that do not meet minimum performance standards are not entitled to full protection under FCC rules. Accordingly, the parties requested that Pericle perform bench tests of the radios for the purpose of verifying that the radios meet minimum performance standards for sensitivity, adjacent channel rejection and receiver intermodulation per Part 22.970.

Oakland public safety users primarily use Harris P7200 portable radios and M7200 mobile radios. P7100 portable radios are also used and one new XG-75 portable radio was measured to compare it to older 7200 and 7100 model radios.

1.1 Compliance with FCC Minimum Performance Standards. Measurements were collected in accordance with TIA-603-D, an industry standard for analog FM radio operation [2]. Although the Oakland radios operate on a P25 digital trunked radio system, Part 22.970 was written with analog radios in mind, so TIA-603-D is the appropriate standard for these tests. Generally, digital receiver interference susceptibility is strongly correlated with analog susceptibility because the interference typically occurs in the receiver front end where hardware is common to both modes. The Part 22.970 receiver minimum standards are shown in Table 1.

Table 1 - Part 22.970 Minimum Performance Standards

Type	12 dB SINAD Sensitivity, dBm	Adj. Channel Rejection, dB	Intermod Rejection, dB
Mobile	-116	75	75
Portable	-116	70	70

Part 22.970 receiver comphance measurements of Oakland radios are shown in Table 2.

Table 2 - Measurement Summary
(Part 22.970 Compliance Per TIA-603-D Test Methods)

Model	S/N	12 SINAD Sensitivity, dBm	Adj. Channel Rejection, dB	Intermod Rejection, dB
P7200	A40041008E0B	-124.2	75.0	78.4
P7200	A4004100CB04	-123.6	75.2	75.7
P7200	A4004100C7A2	-123.8	74.2	74.4
P7200	A4004100CF64	-122.9	74.4	74.7
M7200	A4007400277C	-125.9	75.0	80.1
M7200	A40074002532	-125.9	75.7	81.1
P7100	9153197	-122.0	70.6	77.6
P7100	9153211	-122.4	71.5	78.1
P7100	9152390	-123.0	71.9	77.4
P7100	9153229	-122.4	70.9	77.4
XG-75	A40204000C2D	-123.4	72.2	78.4

Comparing the measurements of Table 2 with the minimum standards of Table 1, we see that all tested radios pass all three minimum standards.[1] Thus, the radios are entitled to protection under Part 22.970 provided the minimum desired signal level at the interference location is above threshold (-104 dBm for mobiles, -101 dBm for portables).

1.2 Background on the Problem in the Field. Given that OOBE are for the most part negligible and the subscriber radios comply with FCC Part 22.970 standards, one might ask why is there still a problem? The answer is that even the best quality commercially available radios have limited ability to tolerate strong interfering signals. Testing in the Oakland metropolitan area supports this conclusion. Consider the following:

- Signals from Sprint-Nextel and AT&T Mobility cell sites, either alone or in combination, are strong enough and occur on the correct frequencies to create harmful receiver intermodulation. These cases are well documented and the information has

[1]The values in Table 2 are the average of 10 values collected over the 10 receive frequencies used in the Oakland system. Both upper and lower adjacent and IM channels were measured and the lowest value of rejection is listed in Table 2. It is important to note that none of the measurements on any frequency fell below the minimum standard, including lower adjacent and upper adjacent channels.

been shared with the parties. Measured levels on the street near cell sites are routinely greater than -20 dBm and are sometimes greater than -10 dBm. Receiver intermodulation interference (3rd order) begins to affect the receiver at roughly -45 dBm.

- Signals from Sprint-Nextel and AT&T Mobility cell sites are in many cases strong enough to cause receiver overload without receiver intermodulation. Overload occurs at roughly -17 dBm of total interfering power. Although stronger signals are required to cause overload than receiver intermodulation, overload is still common because it does not require the precise mathematical relationship inherent to receiver IM. GSM signals in the 869-870 MHz band are especially troublesome because the front-end filter in the Oakland radios does not attenuate signals at these frequencies.

1.3 AT&T vs. Sprint-Nextel. The City of Oakland operates its radio system on frequencies between 851 and 855 MHz. Sprint-Nextel operates its iDEN push-to-talk radio network between 854 and 869 MHz, but following rebanding it will operate exclusively between 862 and 869 MHz. AT&T Mobility operates in two subbands, 869-880 MHz and 890-891.5 MHz. The 800 MHz band plan in Oakland is shown in Figure 1.

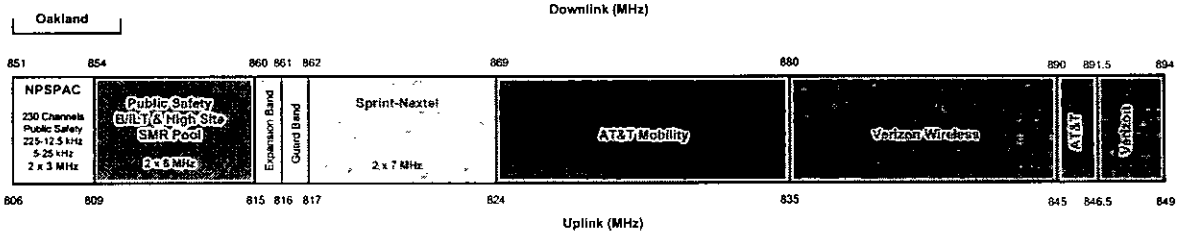


Figure 1 - 800 MHz Band Plan in Oakland, CA

To date, the main source of harmful interference has been AT&T Mobility despite the fact that Sprint-Nextel occupies spectrum adjacent to Oakland. There are several reasons for this disparity. First, Sprint-Nextel operates fewer active cell sites and handles many fewer calls than AT&T. When problems occur in Oakland, Sprint-Nextel usually just turns off the offending signal. The company can afford to do so because it is migrating customers off its iDEN network and will deactivate the network completely by 2017 with some markets terminating soon as June 2013. In its place, Sprint-Nextel will activate new CDMA base stations in the 862-869 MHz band at most of the existing iDEN cell sites. As the CDMA sites are activated, the potential for harmful interference will increase, but the lower power density (Watts/Hz) of CDMA compared to iDEN and somewhat taller sites than AT&T (on average) are mitigating factors.

AT&T, on the other hand, operates a densely populated network that handles a very high call volume each day. Many sites have antennas relatively close to the ground, resulting in strong signals that can cause receiver overload and receiver intermodulation by themselves or receiver intermodulation in combination with Sprint-Nextel signals.

1.4 Recommendations. There is a parallel effort in Oakland to mitigate interference on a site-by-site basis. To date, 47 sites have been investigated and most have been mitigated. See the Appendix to this report for a summary of this effort. Subscriber radio measurements have been used to better understand the interference experienced in the field and to guide mitigation efforts. Because bandpass filters are one of the best mitigation techniques, Pericle has acquired and has been testing 10 external filters with mobile radios. These filters provide over 30 dB rejection at 869 MHz. If bandpass filters prove effective in testing, Oakland should consider installing them in all vehicles with mobile radios.

Unfortunately, there is no practical bandpass filter solution available for the portable radios.

A complete analysis of mitigation methods is beyond the scope of this report, but following are some actions that deserve consideration as part of a larger effort to achieve a long term solution: employ cell site antennas with less null fill, reduce cell site transmitter power (already being done), use bandpass filters for mobiles (testing now), try small bandpass filters molded into the portable antenna (requires hardware development), and replace the P7200 with a newer radio like the XG-75. None of these solutions comes free of charge and some are only partial fixes. Cost-benefit tradeoffs may be necessary to arrive at an optimal solution.

2.0 Test Plan

800 MHz interference generally falls into three categories:

- *Out-of band emissions* (OOBE) which are unlikely from AT&T Mobility due to filtering used at the cell site. One exception is passive intermodulation (PIM) interference in the transmit antenna, but AT&T and Sprint-Nextel test for PIM at site activation and PIM tends to cause interference to the wireless operator's receivers, too. Thus, PIM is likely to be detected through normal cellular network operations.

- *Receiver intermodulation* which is possible, especially 3rd order products that include GSM signals in the 890-891.5 MHz band and 3rd order products that are mixes between AT&T and Sprint-Nextel carriers.

- *Receiver overload* which is caused by strong signals that do not have the mathematical relationship to produce IM products by themselves in the public safety radio receiver, but are strong enough to compress the front-end amplifier and desensitize the receiver. Receiver overload has three types: blocking, local oscillator (LO) mixing and receiver desense. These three types are defined by the Safecom best practices guide [3].

It is important to note that the first type of interference is most easily corrected by filtering at the cell site (unless there is PIM) while the other two types are most easily corrected by filtering at the subscriber radio. A typical public safety radio front-end filter passes 845-875 MHz, but quality is uneven and there is no industry standard for these filters.

Another type of interference that does not fall into any of these three categories is image

frequency interference. This type of interference occurs when a strong signal on the receiver's image frequency gets past the front-end filter and mixes with the LO in the first mixer to fall directly on the intermediate frequency (IF).[2]

All of these types of interference were investigated during this project.

The test plan generally followed the procedures described in TIA-603-D. A block diagram of the test setup for sensitivity, adjacent channel rejection and IM rejection is shown in Figure 2.

It is important to note that many signal generators have phase noise that is too high to measure adjacent channel or IM rejection down to the 70 dB level. Through trial and error, Pericle determined that its Agilent E4433B signal generator had sufficiently low phase noise and for this reason it was used for the adjacent channel interferer and the first IM interferer. Cable and splitter losses were measured with an Agilent E5071B network analyzer and the final calculations for each measurement were adjusted to account for these losses. All test equipment had current calibration at the time of testing. Test equipment used are listed in Table 3.

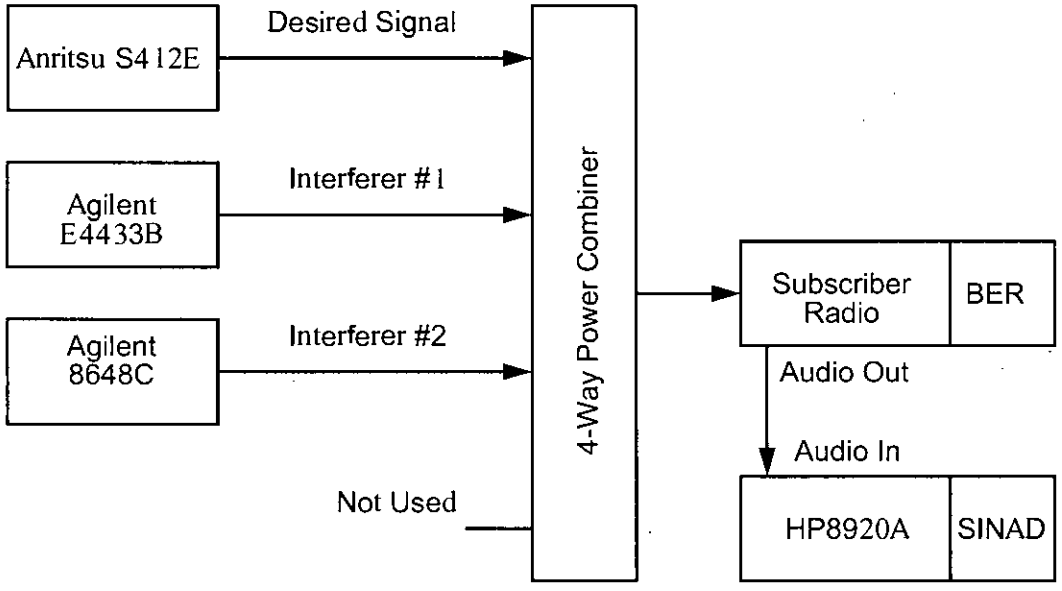


Figure 2 - Test System Block Diagram

The S412E LMR Master was loaned to Pericle by Anritsu. It was used to generate both analog and digital desired signals for the subscriber radio. In the digital case, the S412E was set to generate the standard P25 C4FM test signal which is a continuously repeating sequence of the bits 1011. This signal is similar to, but not identical to the Harris Corporation WCQPSK signal used on its simulcast networks. The S412E is not capable of generating a WCQPSK signal.

[2]The image frequency is twice the IF frequency above or below the RF frequency depending on whether the LO configuration is high side or low side, respectively.

Table 3 - Test Equipment Used				
Mfr.	Model	Type	S/N	Cal Due
Anritsu	S412E	LMR Master	1108054	Current
Agilent	E4433B	Signal Generator	US40051614	Dec 2014
Agilent	8648C	Signal Generator	3426A00754	Dec 2014
Agilent	8920A	Service Monitor	3350A07553	Dec 2014
Agilent	E5071B	RF Network Analyzer	MY42403489	Feb 2013

For receiver sensitivity measurements, both analog and digital, the two interfering signal generators were turned off. For adjacent channel rejection measurements, the 8648C signal generator was turned off

Signal levels for image rejection and receiver overload are necessarily quite high and at these levels, phase noise in the 8648C dominates, even at frequencies above 869 MHz with desired frequencies below 855 MHz. For this reason, a bandpass filter was used with the 8648C for these measurements.

Because the broadband UMTS signals and even the 200 kHz-wide GSM signals used by AT&T Mobility do not resemble the standard interfering signals of TIA-603-D, some spot checks were done with GSM and UMTS interferers using the E4433B. IM measurements using these signals show that the subscriber radios respond to interference power in the receiver IF bandwidth in the same way regardless of the type of interferer. Similarly, for overload measurements, the total power in the RF passband is what matters, regardless of the type of signal.

3.0 Test Results

Part 22.970 measurements of receiver sensitivity, adjacent channel rejection and IM rejection were collected in accordance with TIA-603-D. Note that TIA-603-D requires that the adjacent channel be spaced 25 kHz away and be generated with two audio modulating tones, one at 650 Hz and one at 2200 Hz, each with 2.5 kHz deviation. The interferers for IM rejection are spaced at 50 kHz and 100 kHz from the carrier with the first signal unmodulated and the second modulated with a 400 Hz tone at 3 kHz deviation. Part 22.970 measurements are summarized in Table 4 (also found in Table 2 of the Executive Summary).

Adjacent channel rejection above about 75 dB is most likely limited by phase noise in the signal generator, so actual performance may be better than indicated in Table 4.

Note that all radios exceed the FCC Part 22.970 minimum performance standards listed in Table 1 (see Executive Summary).

Table 4 - Measurement Summary (Part 22.970 Compliance Per TIA-603-D Test Methods)				
Model	S/N	12 SINAD Sensitivity, dBm	Adj. Channel Rejection, dB	Intermod Rejection, dB
P7200	A40041008E0B	-124.2	75.0	78.4
P7200	A4004100CB04	-123.6	75.2	75.7
P7200	A4004100C7A2	-123.8	74.2	74.4
P7200	A4004100CF64	-122.9	74.4	74.7
M7200	A4007400277C	-125.9	75.0	80.1
M7200	A40074002532	-125.9	75.7	81.1
P7100	9153197	-122.0	70.6	77.6
P7100	9153211	-122.4	71.5	78.1
P7100	9152390	-123.0	71.9	77.4
P7100	9153229	-122.4	70.9	77.4
XG-75	A40204000C2D	-123.4	72.2	78.4

4.0 Conclusions

The P7200, M7200, P7100 and XG-75 subscriber radios all pass the minimum performance standards specified in FCC Part 22.970 and therefore qualify for interference protection provided the desired signal exceeds the minimum threshold of -104 dBm for mobiles and -101 dBm for portables [1].

Perhaps the most important defense against cellular 800 MHz interference is a good bandpass filter in the front end of the subscriber receiver. Virtually all contemporary receivers must pass frequencies up to 869 MHz because they must be compatible with pre-rebandcd and post-rebanded systems. Thus, the bandpass filter cannot help with interference from Sprint-Nextel sites which generally operate in the 862-869 MHz band. Filter rejection in the cellular band is possible, but no practical filter is a brick wall and some energy from cellular operator signals will get into the receiver.

Following are some corrective actions that deserve consideration: employ cell site antennas with less null fill, uptilt antennas, reduce cell site transmitter power (already being done), use bandpass filters for mobiles (testing now), try small bandpass filters molded into the portable antenna (requires hardware development), and replace the P7200 with a newer radio like the XG-75.

Bandpass filters for the mobile radios and a replacement portable radio (like the XG-75) are the most straightforward solutions, but like all effective solutions, there is significant cost involved. Long term, manufacturers should install filters in public safety radios that only pass the post-rebanded public safety band (851-861 MHz). Such a filter should attenuate both Sprint-Nextel signals and AT&T signals sufficiently to eliminate the interference problem for all practical purposes.

5.0 References

[1] 47 CFR, Part 22.970, "Unacceptable interference to part 90 non-cellular 800 MHz licensees from part cellular radiotelephone or part 90-800 MHz cellular services, October 1, 2012.

[2] TIA-603-D, "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards," June 24, 2010.

[3] A Best Practices Guide, "Avoiding Interference Between Public Safety Wireless Communications Systems And Commercial Wireless Communications Systems At 800 MHz," December, 2000, www.safecomprogram.gov.

[4] TIA TSB-88.1-C, TSB-88.2-C, TSB-88.3-C, "Wireless Communications Systems Performance in Noise and Interference-Limited Situations, Recommended Methods for Technology-Independent Modeling, Simulation and Verification," February, 2008.

Appendix - AT&T Site Mitigation Summary

As of January 21, 2013, the following summary applies to the Oakland interference mitigation effort:

43 locations visited:

- 13 AT&T sites showed no problem (preemptive visits, no prior complaints)
- 5 sites Nextel mitigated
- 2 sites complicated by public safety site repeater interference, no resolution yet
- 1 site Nextel and AT&T both mitigated (included in 20 AT&T mitigated sites below)
- 3 sites signal too low or excessive multipath (cannot be attributed to cellular operator)
- 20 sites AT&T mitigated (1 beamtilt, 19 reduced power)

See the attached spreadsheet for more information.

	Latitude	Longitude	Address	City	Oakland P25 Signal Level	Bit Error Rate	UMTS Modification	GSM Modification	Test Date and Time	Signals at Site	Zip
1	37.7846333	-122.240916	2011 EAST 12TH STREET	Oakland	-80 dBm	8%	-3 dB Lower	-B dB and 8 deg. Downtilt from 13 deg.	21 Sep 1900	LTE 2 UMTS GSM mid, PCS 1940-55 2 UMTS & GSM and no 1985	94606
2	37.47326	-122.15305	601 5th Ave	Oakland	-77 dBm	12%	Need to involve BART who has not rebanded	Need to involve BART who has not rebanded	1700 26Sep in street and next to building alpha	LTE 2 UMTS GSM mid, PCS 1940-55 2 UMTS & GSM and 1985 VZW	94606
3	37.78725	-122.19476	4300 MACARTHUR BLVD	Oakland	-85	15%	-4 dB both and Beta/Gamma	-10 dB	0907 26Sep Corner of High4and MacArther	LTE 2 UMTS GSM low, PCS 1940-55 2 UMTS & GSM (no 1985)	
4	37.8523333	-122.223666	1307 TUNNEL ROAD	Oakland		0%	None	None	1600 7Oct12	LTE 2 UMTS GSM low, PCS 1940-55 Couldn't get close to site	
5	37.4739	-122.14347	1930 12th Ave	Oakland		0%	None	None	1500 26Sep	ATT and Nextel but high and blocked building roof site	
6	37.7389722	-122.175583	10203 E STREET	Oakland		0%	None	None		ATT Only	
7	37.81204	-122.1987	2810 Mountain Blvd Same as Hwy 13 and Miller	Oakland	-85	14%	-6d8 single upper	None	24-Sep	Adding UMTS carrier	
8			400 Alcatraz Ave	Oakland	-85	1%	none	None	1437 7oct12	2 UMTS GSM low on north, PCS ATT only	
9			1189 53th Ave	Oakland		0%	none	None		Cell Site but Not ATT - found no interference - In industrial complex	
10	37.454	-122.10308	8925 Holly Street	Oakland		0%	none		0800 26Sep	RECHECK	
11	37.77457	-122.23077	3100 East 9th Street	Oakland	-80	>10%	-4 dB	-10 dB	915 25Sep Beta in front of Bank of America BETA	LTE, 850 UMTS X2. GSM low, PCS 1940-55 2 UMTS & GSM (no 19SS)	
12	37.48142	-122.16148	1587 Franklin Street	Oakland		0%	none			Att and Nextel in area	
13	37.48404	-122.15532	2150 Webster Street Site likely on hotel on harrison	Oakland		0%	none		1000 26Sep	High Site, unlikely problem	
14	37.8394722	-122.263416	5427 TELEGRAPH	Oakland	-73	9%			1400 7Oct12	2UMTS LTE GSM high ATT only PCS also	
15	37.7603888	-122.221	4909 TIDEWATER AVE	Oakland	-75	7%	-5 dB both	-10 dB	1015 25Sep Capital Intermodal hard to make happen	LTE 2 UMTS GSM high, PCS 1940-55 2 UMTS & GSM (no 1985)	
16	37.7922222	-122.258527	601 8TH STREET Does Not Exist	Oakland		0%	none	None	1530 26Sep	Most Ukely Nextel	
17	37.7587222	-122.186694	7425 E 14TH STREET	Oakland		0%	none	None	0830 26Sep	RECHECK!	

	Latitude	Longitude	Address	City	Oakland P25 Signal Level	Bit Error Rate	UMTS Modification	GSM Modification	Test Date and Time	Signals at Site	Zip
18	37.8253055	-122.267	3601 TELEGRAPH AVE	Oakland	-75	12%	-4 dB Both	-8 dB	1600 26Sep on 37th at bend gamma	LTE 2 UMTS GSM high, PCS 1940-55 2 UMTS & GSM (no 1985)	94609
19	37.77185	-122.20048	Bancroft Ave @ Fairfax Blvd 5407 Bancroft	Oakland	-84	8%	GSM Mitigated	UMTS Mitigated	1300 8Oct12	ATT Nextel	95601
20	37.73599	-122.16416	International Blvd @ Durant Blvd	Oakland	-79	15%	None (Nextel Interference Problem, Nextel Channel Off)	None (Nextel Interference Problem, Nextel Channel Off)	25-Sep In rear parking lot at base of tower	NEX,ATT and VZW LTE, 850 UMTS X2. GSM exp, PCS 1940-55 2 UMTS & GSM (yes UMTS 1985)	
21	37.73048	-122.21073	Oakland Airport Hangar 3 8711 Earhart Road (ATT Site 8)	Oakland	-73	12%	-5 dB Upper	-10 dB	1045 25Sep intersection Swan and	No LTE 1 UMTS GSM low, PCS 1940-55 2 UMTS & GSM (no 1985)	
22	37.8290277	-122.290861	1552 BEACH STREET	EMERYVILLE	-85	10%	ATT -6 UMTS	-4 GSM	1400 21Sep12	ATT and VZW, LTE UMTS, GSM	94608
23	37.8796388	-122.306916	1255 EASTSHORE HWY	BERKELEY							
24	37.7040555	-122.161055	1465 FACTOR AVE	San Leandro	-90	15%	None Multipath Simulcast Overlap	None Multipath Simulcast Overlap	1502 25Sep by 1401 address Beta	LTE 2 UMTS GSM high, PCS 1940-55 2 UMTS & GSM (no 198	
25	37.6968888	-122.183277	13800 MONARCH BAY DR	San Leandro	-93	11%	4 degree downtilt	4 degree downtilt	1127 25 Sep Fairway and Blue Whale Beta	LTE 2 UMTS GSM high and low and exp, PCS 1940-55 2 UMTS & GSM (no 1985)	
26	37.6886944	-122.13397	50 EAST LEWELLING	San Leandro	-95	12%	None Desired Signal too Low	None Desired Signal too Low	25 September 2012 in parking lot at site Alpha	ATT, Nextel and VZW	
27	37.48339	-122.2272	Naval Air Station	Treasure Island							
28	37.75776	-122.146	3769 Dorisa Ave	Oakland	-85	0%	None	None	8 Oct 12 No interference		
29	37.70581	-122.12979	1459 150th Ave	San Leandro	-93	CC Scan	-4 both UMTS carriers	-10 (GSM Low)	25 Sep 1623 Parking lot HofBrua	ATT and VZW LTE, 850 UMTS X2. GSM low, PCS 1940-55 2 UMTS & GSM (yes UMTS 1985)	
30	ATT		80 Grand Ave	Oakland	-65	0%	None	None	1629 26Sep	LTE 2 UMTS GSM high, PCS 1940-55 2 UMTS & GSM	
31	NEXTEL		4600 Telegraph	Oakland	-20	0%	None	None	1230 7Oct12	Nextel only 868 range	
32	NEXTEL 37.85793	-122.24381	Domingo and Ashbey 11 Domingo Ave.	Oakland	-85	3%	Nextel moved 854 MHz to 863 MHz Channel		1500 7Oct12	Nextel and VZW 854 MHz Active and 861s	

	Latitude	Longitude	Address	City	Oakland P25 Signal Level	Bit Error Rate	UMTS Modification	GSM Modification	Test Date and Time	Signals at Site	Zip
33	Nextel	-122.274	7th St. and Broadway	Oakland	-75	3%	Nextel moved 854 MHz to 863 MHz Channel		1600	Nextel with 354 MHz active	
	37.79975								7-Oct-12		
34	Nextel	-122.22888	30th Ave and 14th St.	Oakland	-80	3%	Nextel moved 854 MHz to 863 MHz Channel		2300	Nextel with 854 MHz active	
	37.77911								11-Oct-12		
35	ATT	-122.25276	Adams and MacArthur	Oakland	-75	18%	ATT Beta UMTS -3 dB	ATT GSM -3 dB Alpha	0900 16Nov12	ATT Only	94611
	37.8162										
36	37.79841	-122.28356	2nd St and Brush	Oakland	-70	8%		Nextel – 3dB 7 carriers	1100 16Nov12	ATT, Nextel, VZW	94607
37	37.799922	-122.270925	9th St and Webster	Oakland	-70	6%	ATT – 2 dB on UMTS		1500 16Nov12	ATT Only	94607
38	37.78449	-122.22219	2112 Fruitvale	Oakland	-90	11%	ATT UMTS – none	GSM -4 dB two sectors	1200 16Jan13	ATT	
										VZW	
										Sprint	
39	37.797	-122.20452	3022 MacArthur	Oakland	-85	12%	ATT UMTS -1 dB both carriers	ATT GSM -10 dB	1300 16Jan13	ATT	
							Nextel -3 dB all carriers			Nextel	
										T-Mobile	
										Sprint	
40	37.78111	-122.17603	Overdale and Seminary Rd	Oakland	-95 and lower	8%	None	None	1400 16Jan13	ATT	
							Desired Signal too Low	Desired Signal too Low		VZW	
										TMobile	
41	37.71693	-122.18268	Redwood and Mountain Blvd	Oakland	-95	10%	None Multipath Suspected	None Multipath Suspected	1500 16Jan13	ATT	
										Sprint	
										TMobile	
42	37.811824	-122.266609	2255 Broadway	Oakland		0%			1200		
									21-Jan-13		
43	37.802886	-122.239256	2825 Park Blvd	Oakland	-75	13%			1300 21Jan13		
44	37.808583	-122.253678	401 Grand Ave	Oakland	-85	20%			1400 21Jan13		
45	37.827106	-122.278826	36th St and San Pablo	Oakland	-35	0%			1500 21Jan13		
					Cc scan rpt						
46	37.831347	-122.245437	5000 Piedmont Ave								
47	37.746929	-122.200894	8000 Coliseum Way								

Cruise, DaVid

From: Cruise, David
Sent: Tuesday, November 20, 2012 6:03 PM
To: 'McCammon, Bill, ACFD'
Subject: RE: EBRCSA Testing

Bill,

Just wanted to give you an update. I have spoken with RCC and am working to have them scheduled to begin the in-building testing in January. As soon as I have definitive dates I wili let you know and schedule a meeting for you to attend. I just want you to be aware that given your position of only providing the radios directly to them, it will delay my work/analysis and report on EBRCSA to the City Administrator.

Best regards,
Dave

From: Cruise, David
Sent: Tuesday, November 06, 2012 6:41 PM
To: 'McCammon, Bill, ACFD'
Subject: RE: EBRCSA Testing

Bill,

Thank you for taking my call today, I am glad we had a chance to talk so I could hear your latest concerns on bow to proceed with the testing of EBRCSA. I am trying my best to accommodate all of your requests (i.e. signing an agreement, hiring an independent consultant) however I was hoping you would understand that our assessment of EBRCSA includes technical factors unrelated to coverage, and does not require the assistance of a consultant. That being said, we did agree to hire RCC to perform in-building coverage testing and will incorporate their findings (after you have had a chance to review) into the final report.

As you know, it has taken several weeks to work out ail of the technical details and coordinate with your vendor to have all of the radios programmed. While I have already had a chance to review most of the engineering documentation you have provided, my next tasks require the use of the portable radios we have worked to have programmed on both respective systems. It was my intention to begin this work now, rather than waiting for RCC to complete the contracted in-building coverage tests which are estimated to take several weeks. I hope you can understand my intentions are to expedite this assessment and the subsequent report to the City Administrator as best possible.

Again, I will pass along all of your concerns, and I will let you know how we intend to move forward. In the event you reconsider your latest requirements and agree to provide me the radios, please let me know and I will arrange to have them picked up.

Regards,
Dave

David Cruise
Public Safety Systems Advisor
Office of the City Administrator
City of Oakland
Mobile: (415) 726-5150

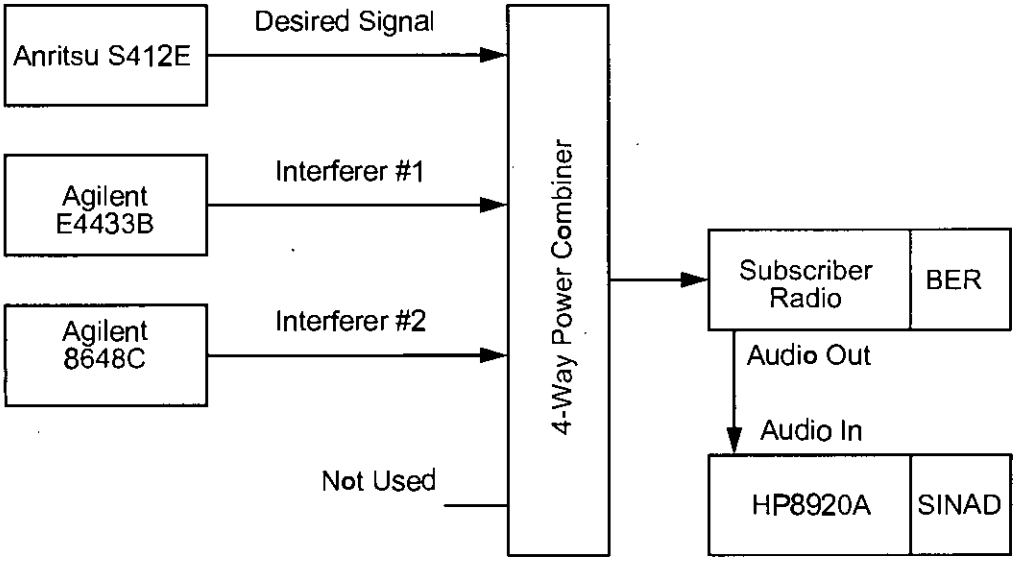
Desk: (510) 238-3917
E-Mail: dcruise@oaklandnet.com

From: McCammon, Bill, ACFD [mailto:Bill.McCammon@acgov.org]
Sent: Tuesday, November 06, 2012 8:30 AM
To: Cruise, David
Cc: DURBIN GARY-C19370
Subject: EBRCSA Testing

Just following up to see if you have a schedule for RCC to do the testing.
Let me know we're ready
Bill

William J. McCammon, Executive Director
East Bay Regional Communications System Authority
4985 Broder Blvd.
Dublin CA. 94568
ebrcsa.org
(925) 803-7802

Subscriber Radio Performance Measurements



March 19, 2013
(Final Report)

Prepared by:

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Subscriber Radio Performance Measurements

1.0 Executive Summary

The City of Oakland ("Oakland") operates a 10-channel 800 MHz P25 simulcast trunked radio system in the 851-861/806-816 MHz public safety radio band. This radio system has been rebanded and is operating on its post-rebanded frequencies. Oakland recently experienced degradation of mobile and portable radio performance at numerous locations in the Oakland metropolitan area. Investigation by the City, its vendor Harris Corporation and its consultant Pericle Communications Company shows that the interference is caused directly or indirectly by signals emanating from cell sites operated by AT&T Mobility and Sprint-Nextel. In several cases, a combination of signals from Sprint-Nextel and AT&T Mobility is the culprit. In other cases, just one operator's cell site is required to cause harmful interference.

The nationwide 800 MHz rebanding project, funded by Sprint-Nextel, is designed to significantly reduce the occurrence of interference to public safety radio systems by separating the public safety band from the commercial wireless band. The potential for interference remains after rebanding, but at a much reduced level.

Interference from 800 MHz cell sites generally falls into three categories: transmitter out-of-band emissions (OOBE), receiver intermodulation (IM) and receiver overload. OOBE from AT&T cell sites in Oakland have been measured by the parties and found in virtually all cases to be too weak on the street to cause harmful interference. Receiver IM, on the other hand, is a problem and has been documented at numerous cell sites in Oakland. Receiver overload tends to occur at interfering levels above where receiver IM first appears, but overload can be the dominant problem very close to the cell site when a single carrier is present.

The wireless operators are obligated to mitigate interference under Part 22.970 of the FCC rules, even if the interference is created inside the public safety radio receiver as receiver IM [1]. With the cooperation of AT&T Mobility and Sprint-Nextel, the Oakland team (Oakland, Harris, Pericle) has been mitigating this interference on a case-by-case basis through a variety of means, including reducing transmitter power at the interfering cell sites.

Because receiver IM and overload are the dominant problems in Oakland, it is important to verify that the Oakland subscriber radios are meeting the applicable minimum performance standards, as found in FCC Part 22.970 [1]. Radios that do not meet minimum performance standards are not entitled to full protecdon under FCC rules. Accordingly, the parties requested that Pericle perform bench tests of the radios for the purpose of verifying that the radios meet minimum performance standards for sensitivity, adjacent channel rejection and receiver intermodulation per Part 22.970.

Oakland public safety users primarily use Harris P7200 portable radios and M7200 mobile radios. P7100 portable radios arc also used and one new XG-75 portable radio was measured to compare it to older 7200 and 7100 model radios.

1.1 Compliance with FCC Minimum Performance Standards. Measurements were collected in accordance with TIA-603-D, an industry standard for analog FM radio operation [2]. Although the Oakland radios operate on a P25 digital trunked radio system, Part 22.970 was written with analog radios in mind, so TIA-603-D is the appropriate standard for these tests. Generally, digital receiver interference susceptibility is strongly correlated with analog susceptibility because the interference typically occurs in the receiver front end where hardware is common to both modes. The Part 22.970 receiver minimum standards are shown in Table 1.

Table 1 - Part 22.970 Minimum Performance Standards

Type	12 dB SINAD Sensitivity, dBm	Adj. Channel Rejection, dB	Intermod Rejection, dB
Mobile	-116	75	75
Portable	-116	70	70

Part 22.970 receiver compliance measurements of Oakland radios are shown in Table 2.

Table 2 - Measurement Summary
(Part 22.970 Compliance Per TIA-603-D Test Methods)

Model	S/N	12 SINAD Sensitivity, dBm	Adj. Channel Rejection, dB	Intermod Rejection, dB
P7200	A40041008E0B	-124.2	75.0	78.4
P7200	A4004100CB04	-123.6	75.2	75.7
P7200	A4004100C7A2	-123.8	74.2	74.4
P7200	A4004100CF64	-122.9	74.4	74.7
M7200	A4007400277C	-125.9	75.0	80.1
M7200	A40074002532	-125.9	75.7	81.1
P7100	9153197	-122.0	70.6	77.6
P7100	9153211	-122.4	71.5	78.1
P7100	9152390	-123.0	71.9	77.4
P7100	9153229	-122.4	70.9	77.4
XG-75	A40204000C2D	-123.4	72.2	78.4

Comparing the measurements of Table 2 with the minimum standards of Table 1, we see that all tested radios pass all three minimum standards.[1] Thus, the radios are entitled to protection under Part 22.970 provided the minimum desired signal level at the interference location is above threshold (-104 dBm for mobiles, -101 dBm for portables).

1.2 Background on the Problem in the Field. Given that OOBE are for the most part negligible and the subscriber radios comply with FCC Part 22.970 standards, one might ask why is there still a problem? The answer is that even the best quality commercially available radios have limited ability to tolerate strong interfering signals. Testing in the Oakland metropolitan area supports this conclusion. Consider the following:

- Signals from Sprint-Nextel and AT&T Mobility cell sites, either alone or in combination, are strong enough and occur on the correct frequencies to create harmful receiver intermodulation. These cases are well documented and the information has

[1]The values in Table 2 are the average of 10 values collected over the 10 receive frequencies used in the Oakland system. Both upper and lower adjacent and IM channels were measured and the lowest value of rejection is listed in Table 2. It is important to note that none of the measurements on any frequency fell below the minimum standard, including lower adjacent and upper adjacent channels.

been shared with the parties. Measured levels on the street near cell sites are routinely greater than -20 dBm and are sometimes greater than -10 dBm. Receiver intermodulation interference (3rd order) begins to affect the receiver at roughly -45 dBm.

- Signals from Sprint-Nextel and AT&T Mobility cell sites are in many cases strong enough to cause receiver overload without receiver intermodulation. Overload occurs at roughly -17 dBm of total interfering power. Although stronger signals are required to cause overload than receiver intermodulation, overload is still common because it does not require the precise mathematical relationship inherent to receiver IM. GSM signals in the 869-870 MHz band are especially troublesome because the front-end filter in the Oakland radios does not attenuate signals at these frequencies.

1.3 AT&T vs. Sprint-Nextel. The City of Oakland operates its radio system on frequencies between 851 and 855 MHz. Sprint-Nextel operates its iDEN push-to-talk radio network between 854 and 869 MHz, but following rebanding it will operate exclusively between 862 and 869 MHz. AT&T Mobility operates in two subbands, 869-880 MHz and 890-891.5 MHz. The 800 MHz band plan in Oakland is shown in Figure 1.

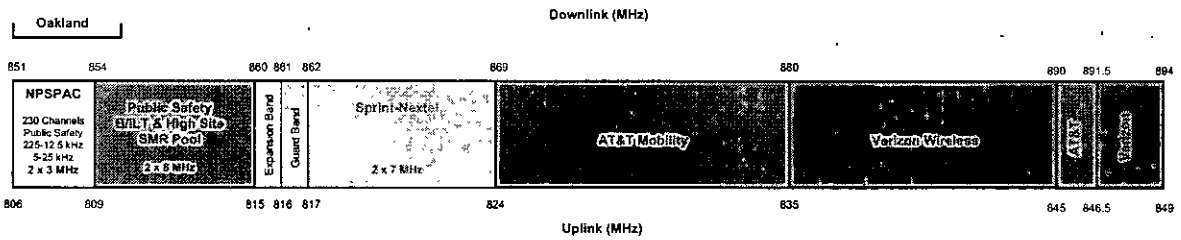


Figure 1 - 800 MHz Band Plan in Oakland, CA

To date, the main source of harmful interference has been AT&T Mobility despite the fact that Sprint-Nextel occupies spectrum adjacent to Oakland. There are several reasons for this disparity. First, Sprint-Nextel operates fewer active cell sites and handles many fewer calls than AT&T. When problems occur in Oakland, Sprint-Nextel usually just turns off the offending signal. The company can afford to do so because it is migrating customers off its iDEN network and will deactivate the network completely by 2017 with some markets terminating soon as June 2013. In its place, Sprint-Nextel will activate new CDMA base stations in the 862-869 MHz band at most of the existing iDEN cell sites. As the CDMA sites are activated, the potential for harmful interference will increase, but the lower power density (Watts/Hz) of CDMA compared to iDEN and somewhat taller sites than AT&T (on average) are mitigating factors.

AT&T, on the other hand, operates a densely populated network that handles a very high call volume each day. Many sites have antennas relatively close to the ground, resuldng in strong signals that can cause receiver overload and receiver intermodulation by themselves or receiver intermodulation in combination with Sprint-Nextel signals.

1.4 Recommendations. There is a parallel effort in Oakland to mitigate interference on a site-by-site basis. To date, 47 sites have been investigated and most have been mitigated. See the Appendix to this report for a summary of this effort. Subscriber radio measurements have been used to better understand the interference experienced in the field and to guide mitigation efforts. Because bandpass filters are one of the best mitigation techniques, Pericle has acquired and has been testing 10 external filters with mobile radios. These filters provide over 30 dB rejection at 869 MHz. If bandpass filters prove effective in testing, Oakland should consider installing them in all vehicles with mobile radios.

Unfortunately, there is no practical bandpass filter solution available for the portable radios.

A complete analysis of mitigation methods is beyond the scope of this report, but following are some actions that deserve consideration as part of a larger effort to achieve a long term solution: employ cell site antennas with less null fill, reduce cell site transmitter power (already being done), use bandpass filters for mobiles (testing now), try small bandpass filters molded into the portable antenna (requires hardware development), and replace the P7200 with a newer radio like the XG-75. None of these solutions comes free of charge and some are only partial fixes. Cost-benefit tradeoffs may be necessary to arrive at an optimal solution.

2.0 Test Plan

800 MHz interference generally falls into three categories:

- *Out-of band emissions* (OOBE) which are unlikely from AT&T Mobihty due to filtering used at the cell site. One exception is passive intermodulation (PIM) interference in the transmit antenna, but AT&T and Sprint-Nextel test for PIM at site activation and PIM tends to cause interference to the wireless operator's receivers, too. Thus, PIM is likely to be detected through normal cellular network operations.

- *Receiver intermodulation* which is possible, especially 3rd order products that include GSM signals in the 890-891.5 MHz band and 3rd order products that are mixes between AT&T and Sprint-Nextel carriers.

- *Receiver overload* which is caused by strong signals that do not have the mathematical relationship to produce IM products by themselves in the public safety radio receiver, but are strong enough to compress the front-end amplifier and desensitize the receiver. Receiver overload has three types: blocking, local oscillator (LO) mixing and receiver desense. These three types are defined by the Safecom best practices guide [3].

It is important to note that the first type of interference is most easily corrected by filtering at the cell site (unless there is PIM) while the other two types are most easily corrected by filtering at the subscriber radio. A typical public safety radio front-end filter passes 845-875 MHz, but quality is uneven and there is no industry standard for these filters.

Another type of interference that does not fall into any of these three categories is image

frequency interference. This type of interference occurs when a strong signal on the receiver's image frequency gets past the front-end filter and mixes with the LO in the first mixer to fall directly on the intermediate frequency (IF).[2]

All of these types of interference were investigated during this project.

The test plan generally followed the procedures described in TIA-603-D. A block diagram of the test setup for sensitivity, adjacent channel rejection and IM rejection is shown in Figure 2.

It is important to note that many signal generators have phase noise that is too high to measure adjacent channel or IM rejection down to the 70 dB level. Through trial and error, Pericle determined that its Agilent E4433B signal generator had sufficiently low phase noise and for this reason it was used for the adjacent channel interferer and the first IM interferer. Cable and sphtter losses were measured with an Agilent E5071B network analyzer and the final calculations for each measurement were adjusted to account for these losses. All test equipment had current calibration at the time of testing. Test equipment used are listed in Table 3.

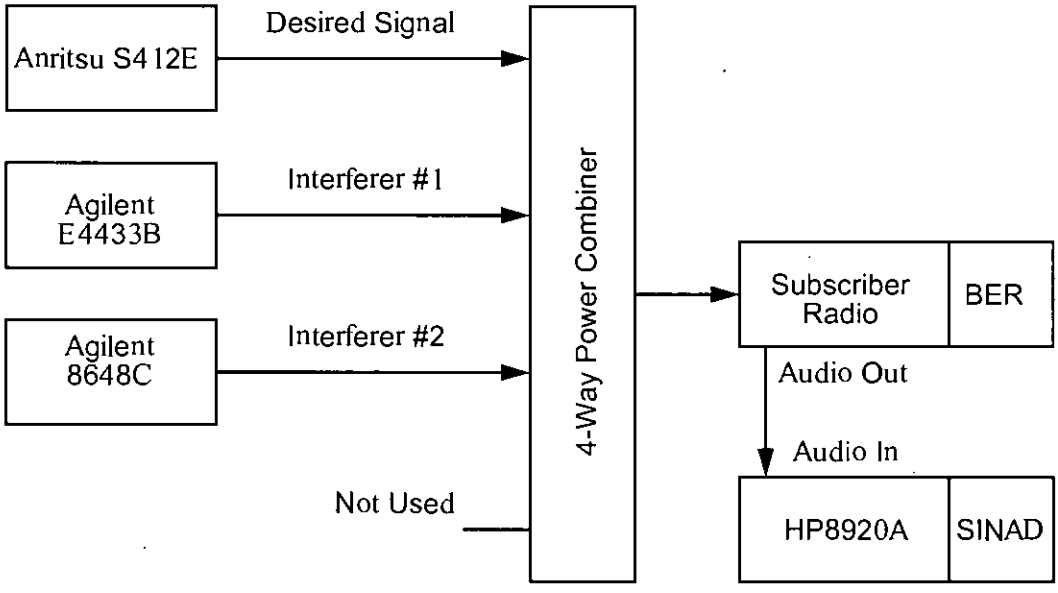


Figure 2 - Test System Block Diagram

The S412E LMR Master was loaned to Pericle by Anritsu. It was used to generate both analog and digital desired signals for the subscriber radio. In the digital case, the S412E was set to generate the standard P25 C4FM test signal which is a continuously repeating sequence of the bits 1011. This signal is similar to, but not identical to the Harris Corporation WCQPSK signal used on its simulcast networks. The S412E is not capable of generating a WCQPSK signal.

[2]The image frequency is twice the IF frequency above or below the RF frequency depending on whether the LO configuration is high side or low side, respectively.

Table 3 - Test Equipment Used				
Mfr.	Model	Type	S/N	Cal Due
Anritsu	S412E	LMR Master	1108054	Current
Agilent	E4433B	Signal Generator	US40051614	Dec 2014
Agilent	8648C	Signal Generator	3426A00754	Dec 2014
Agilent	8920A	Service Monitor	3350A07553	Dec 2014
Agilent	E5071B	RF Network Analyzer	MY42403489	Feb 2013

For receiver sensitivity measurements, both analog and digital, the two interfering signal generators were turned off. For adjacent channel rejection measurements, the 8648C signal generator was turned off.

Signal levels for image rejection and receiver overload are necessarily quite high and at these levels, phase noise in the 8648C dominates, even at frequencies above 869 MHz with desired frequencies below 855 MHz. For this reason, a bandpass filter was used with the 8648C for these measurements.

Because the broadband UMTS signals and even the 200 kHz-wide GSM signals used by AT&T Mobility do not resemble the standard interfering signals of TIA-603-D, some spot checks were done with GSM and UMTS interferers using the E4433B. IM measurements using these signals show that the subscriber radios respond to interference power in the receiver IF bandwidth in the same way regardless of the type of interferer. Similarly, for overload measurements, the total power in the RF passband is what matters, regardless of the type of signal.

3.0 Test Results

Part 22.970 measurements of receiver sensitivity, adjacent channel rejection and IM rejection were collected in accordance with TIA-603-D. Note that TIA-603-D requires that the adjacent channel be spaced 25 kHz away and be generated with two audio modulating tones, one at 650 Hz and one at 2200 Hz, each with 2.5 kHz deviation. The interferers for IM rejection are spaced at 50 kHz and 100 kHz from the carrier with the first signal unmodulated and the second modulated with a 400 Hz tone at 3 kHz deviation. Part 22.970 measurements are summarized in Table 4 (also found in Table 2 of the Executive Summary).

Adjacent channel rejection above about 75 dB is most likely limited by phase noise in the signal generator, so actual performance may be better than indicated in Table 4.

Note that all radios exceed the FCC Part 22.970 minimum performance standards listed in Table 1 (see Executive Summary).

Table 4 - Measurement Summary (Part 22.970 Compliance Per TIA-603-D Test Methods)				
Model	S/N	12 SINAD Sensitivity, dBm	Adj. Channel Rejection, dB	Intermod Rejection, dB
P7200	A40041008E0B	-124.2	75.0	78.4
P7200	A4004100CB04	-123.6	75.2	75.7
P7200	A4004100C7A2	-123.8	74.2	74.4
P7200	A4004100CF64	-122.9	74.4	74.7
M7200	A4007400277C	-125.9	75.0	80.1
M7200	A40074002532	-125.9	75.7	81.1
P7100	9153197	-122.0	70.6	77.6
P7100	9153211	-122.4	71.5	78.1
P7100	9152390	-123.0	71.9	77.4
P7100	9153229	-122.4	70.9	77.4
XG-75	A40204000C2D	-123.4	72.2	78.4

4.0 Conclusions

The P7200, M7200, P7100 and XG-75 subscriber radios all pass the minimum performance standards specified in FCC Part 22.970 and therefore qualify for interference protection provided the desired signal exceeds the minimum threshold of -104 dBm for mobiles and -101 dBm for portables [1].

Perhaps the most important defense against cellular 800 MHz interference is a good bandpass filter in the front end of the subscriber receiver. Virtually all contemporary receivers must pass frequencies up to 869 MHz because they must be compatible with pre-rebanded and post-rebanded systems. Thus, the bandpass filter cannot help with interference from Sprint-Nextel sites which generally operate in the 862-869 MHz band. Filter rejection in the cellular band is possible, but no practical filter is a brick wall and some energy from cellular operator signals will get into the receiver.

Following are some corrective actions that deserve consideration: employ cell site antennas with less null fill, uptilt antennas, reduce cell site transmitter power (already being done), use bandpass filters for mobiles (tesfing now), try small bandpass filters molded into the portable antenna (requires hardware development), and replace the P7200 with a newer radio like the XG-75.

Bandpass filters for the mobile radios and a replacement portable radio (like the XG-75) are the most straightforward solutions, but like ail effective solutions, there is significant cost involved. Long term, manufacturers should install filters in public safety radios that only pass the post-rebanded public safety band (851-861 MHz). Such a filter should attenuate both Sprint-Nextel signals and AT&T signals sufficiently to eliminate the interference problem for all pracfical purposes.

5.0 References

[1] 47 CFR, Part 22.970, "Unacceptable interference to part 90 non-cellular 800 MHz licensees from part cellular radiotelephone or part 90-800 MHz cellular services, October 1, 2012.

[2] TIA-603-D, "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards," June 24, 2010.

[3] A Best Practices Guide, "Avoiding Interference Between Public Safety Wireless Communications Systems And Commercial Wireless Communications Systems At 800 MHz," December, 2000, www.safecomprogram.gov.

[4] TIA TSB-88.1-C, TSB-88.2-C, TSB-88.3-C, "Wireless Communications Systems Performance in Noise and Interference-Limited Situations, Recommended Methods for Technology-Independent Modeling, Simulation and Verification," February, 2008.

Appendix - AT&T Site Mitigation Summary

As of January 21, 2013, the following summary applies to the Oakland interference mitigation effort:

43 locations visited:

- 13 AT&T sites showed no problem (preemptive visits, no prior complaints)
- 5 sites Nextel mitigated
- 2 sites complicated by public safety site repeater interference, no resolution yet
- 1 site Nextel and AT&T both mitigated (included in 20 AT&T mitigated sites below)
- 3 sites signal too low or excessive multipath (cannot be attributed to cellular operator)
- 20 sites AT&T mitigated (1 beamtilt, 19 reduced power)

See the attached spreadsheet for more information.

	Latitude	Longitude	Address	City	Oakland P25 Signal Level	Bit Error Rate	UMTS Modification	GSM Modification	Test Date and Time	Signals at Site	Zip
1	37.7846338	-122.240915	2011 EAST 12TH STREET	Oakland	-80 dBm	8%	-3 dB Lower	-8 dB and 8 deg. Downtilt from 13 deg.	21 Sep 1900	LTE 2 UMTS GSM mid, PCS 1940-55 2 UMTS & GSM and no 1985	94606
2	37.47326	-122.15305	601 5th Ave	Oakland	-77 dBm	12%	Need to involve BART who has not rebanded	Need to involve BART who has not rebanded	1700 26Sep in street and next to building alpha	LTE 2 UMTS GSM mid, PCS 1940-55 2 UMTS & GSM and 1985 VZW	94606
3	37.78725	-122.19476	4300 MACARTHUR BLVD	Oakland	-85	15%	-4 dB both and Beta/Gamma	-10 dB	0907 26Sep Corner of High4and MacArther	LTE 2 UMTS GSM low, PCS 1940-55 2 UMTS & GSM (no 1985)	
4	37.8523333	-122.223666	1307 TUNNEL ROAD	Oakland		0%	None	None	1600 7Oct12	LTE 2 UMTS GSM low, PCS 1940-55 Couldn't get close to site	
5	37.4739	-122.14347	1930 12th Ave	Oakland		0%	None	None	1500 26Seo	ATT and Nextel but high and blocked building roof site	
6	37.7389722	-122.175583	10203 E STREET	Oakland		0%	None	None		ATT Only	
7	37.81204	-122.1987	2810 Mountain Blvd Same as Hwy 13 and Miller	Oakland	-85	14%	-5dB single upper	None	24-Sep	Adding UMTS carrier	
8			400 Alcatraz Ave	Oakland	-85	1%	none	None	1437 7oct12	2 UMTS GSM low on north, PCS ATT only	
9			1189 58th Ave	Oakland		0%	none	None		Cell Site but Not ATT - found no interference - in industrial complex	
10	37.454	-122.10308	8925 Holly Street	Oakland		0%	none		0800 26Sep	RECHECK	
11	37.77457	-122.23077	3100 East 9th Street	Oakland	-80	>10%	-4 dB	-10 dB	915 25Sep Beta in from of Bank of America BETA	LTE, 850 UMTS X2. GSM low, PCS 1940-55 2 UMTS & GSM (no 1985)	
12	37.48142	-122.16148	1587 Franklin Street	Oakland		0%	none			Att and Nextel in area	
13	37.48404	-122.15532	2150 Webster Street Site likely on hotel on harrison	Oakland		0%	none		1000 26Sep	High Site, unlikely problem	
14	37.8394722	-122.263416	5427 TELEGRAPH	Oakland	-73	9%			1400 7Oct12	2UMTS LTE GSM high ATT only PCS also	
15	37.7603888	-122.221	4909 TIDEWATER AVE	Oakland	-75	7%	-5 dB both	-10 dB	1015 25Sep Capital Intermodal hard to make happen	LTE 2 UMTS GSM high, PCS 1940-55 2 UMTS & GSM (no 1985)	
16	37.7922222	-122.258527	601 8TH STREET Does Not Exist	Oakland		0%	none	None	1530 26Sep	Most Likely Nextel	
17	37.7587222	-122.186694	7425 E 14TH STREET	Oakland		0%	none	None	0830 26Sep	RECHECK!	

	Latitude	Longitude	Address	City	Oakland P25 Signal Level	Bit Error Rate	UMTS Modification	GSM Modification	Test Date and Time	Signals at Site	Zip
18	37.8253055	-122.267	3601 TELEGRAPH AVE	Oakland	-75	12%	-4 dB Both	-8 dB	1600 26Sep on 37th at bend gamma	LTE 2 UMTS GSM high, PCS 1940-55 2 UMTS 8 GSM (no 1985)	94609
19	37.77185	-122.20048	Bancroft Ave @ Fairfax Blvd 5407 Bancroft	Oakland	-84	8%	GSM Mitigated	UMTS Mitigated	1300 8Oct12	ATT Nextel	95601
20	37.73599	-122.16416	International Blvd @ Durant Blvd	Oakland	-79	15%	None (Nextel Interference Problem, Nextel Channel Off)	None (Nextel Interference Problem, Nextel Channel Off)	25-Sep In rear parking lot at base of tower	NEX,ATT and VZW LTE, 850 UMTS X2. GSM exp, PCS 1940-55 2 UMTS & GSM (yes UMTS 1985)	
21	37.73048	-122.21073	Oakland Airport Hangar 3 8711 Earhart Road (ATT Site 8)	Oakland	-73	12%	-5 dB Upper	-10 dB	1045 25Sep intersection Swan and	No LTE 1 UMTS GSM low, PCS 1940-55 2 UMTS & GSM (no 1985)	
22	37.8290277	-122.290861	1552 BEACH STREET	EMERYVILLE	-85	10%	ATT -6 UMTS	-4 GSM	1400 21Sep12	ATT and VZW, LTE UMTS, GSM	94608
23	37.8796388	-122.306916	1255 EASTSHORE HWY	BERKELEY							
24	37.7040555	-122.161055	1465 FACTOR AVE	San Leandro	-90	15%	None Multipath Simulcast Overlap	None Multipath Simulcast Overlap	1502 25Sep by 1401 address Beta	LTE 2 UMTS GSM high, PCS 1940-55 2 UMTS & GSM (no 198	
25	37.6968888	-122.183277	13800 MONARCH BAY DR	San Leandro	-93	11%	4 degree downtilt	4 degree downtilt	1127 25 Sep Fairway and Glue Whale Beta	LTE 2 UMTS GSM high and low and exp, PCS 1940-55 2 UMTS & GSM (no 1985)	
26	37.6886944	-122.13397	50 EAST LEWELLING	San Leandro	-95	12%	None Desired Signal too Low	None Desired Signal too Low	25 September 2012 in parking lot at site Alpha	ATT, Nextel and VZW	
27	37.48339	-122.2272	Naval Air Station	Treasure Island							
28	37.75776	-122.146	3769 Dorisa Ave	Oakland	-85	0%	None	None	8 Oct 12 No interference		
29	37.70581	-122.12979	1459 150th Ave	San Leandro	-93	CC Scan	-4 both UMTS carriers	-10 (GSM Low)	25 Sep 1623 Parking lot HotBrua	ATT and VZW LTE, 850 UMTS X2. GSM low, PCS 1940-55 2 UMTS & GSM (yes UMTS 1985)	
30	ATT		80 Grand Ave	Oakland	-65	0%	None	None	1629 26Sep	LTE 2 UMTS GSM high, PCS 1940-55 2 UMTS & GSM	
31	NEXTEL		4600 Telegraph	Oakland	-20	0%	None	None	1230 7Oct12	Nextel only 868 range	
32	NEXTEL 37.85793	-122.24381	Domingo and Ashbey 11 Domingo Ave.	Oakland	-85	3%	Nextel moved 854 MHz to 863 MHz Channel		1500 7Oct12	Nextel and VZW 854 MHz Active and 861s	

	Latitude	Longitude	Address	City	Oakland P25 Signal Level	Bit Error Rate	UMTS Modification	GSM Modification	Test Date and Time	Signals at Site	Zip
33	Nextel	-122.274	7th St. and Broadway	Oakland	-75	3%	Nextel moved 854 MHz to 863 MHz Channel		1600	Nextel with 854 MHz active	
	37.79975								7-Oct-12		
34	Nextel	-122.22888	30th Ave and 14th St.	Oakland	-80	3%	Nextel moved 854 MHz to 863 MHz Channel		2300	Nextel with 854 MHz active	
	37.77911								11-Oct-12		
35	ATT	-122.25276	Adams and MacArthur	Oakland	-75	18%	ATT Beta UMTS -3 dB	ATT GSM -3 dB Alpha	0900 16Nov12	ATT Only	94611
	37.8162										
36	37.79841	-122.28356	2nd St and Brush	Oakland	-70	8%		Nextel – 3dB 7 carriers	1100 16Nov12	ATT, Nextel, VZW	94607
37	37.799922	-122.270925	9th St and Webster	Oakland	-70	6%	ATT – 2 dB on UMTS		1500 16Nov12	ATT Only	94607
38	37.78449	-122.22219	2112 Fruitvale	Oakland	-90	11%	ATT UMTS – none	GSM -4 dB two sectors	1200 16Jan13	ATT	
										VZW	
										Sprint	
39	37.797	-122.20452	3022 MacArthur	Oakland	-85	12%	ATT UMTS -1 dB both carriers	ATT GSM -10 dB	1300 16Jan13	ATT	
							Nextel -3 dB all carriers			Nextel	
										T-Mobile	
										Sprint	
40	37.78111	-122.17603	Overdale and Seminary Rd	Oakland	-95 and lower	8%	None –	None	1400 16Jan13	ATT	
							Desired Signal too Low	Desired Signal too Low		VZW	
										TMobile	
41	37.71693	-122.18268	Redwood and Mountain Blvd	Oakland	-95	10%	None Multipath Suspected	None Multipath Suspected	1500 16Jan13	ATT	
										Sprint	
										TMobile	
42	37.811824	-122.266609	2255 Broadway	Oakland		0%			1200		
									21-Jan-13		
43	37.802886	-122.239256	2825 Park Blvd	Oakland	-75	13%			1300 21Jan13		
44	37.808583	-122.253678	401 Grand Ave	Oakland	-85	20%			1400 21Jan13		
45	37.827106	-122.278826	36th St and San Pablo	Oakland	-85	0%			1500 21Jan13		
					Cc scan rpt						
46	37.831347	-122.245437	5000 Piedmont Ave								
47	37.746929	-122.200894	8000 Coliseum Way								

ATTACHMENT F

David Cruise
Public Safety Systems Advisor
Office of the City Administrator
City of Oakland
150 Frank Ogawa Plaza, 7th Floor
Oaldand, Ca 94612

Dear Mr. Cruise:

This Letter Agreement ("Agreement") will confirm the understanding and commitments of the City of Oakland (the "City") and the East Bay Regional Communications System Authority ("EBRCSA" or the "Authority") regarding coverage testing, by or on behalf of the City, of the Authority's regional interoperable communications system (the "System"). The City and the Authority are collectively referred to herein as the "Parties."

The City and the Authority have agreed to have a third party consultant (the "Consultant"), to be selected, retained and compensated by the City, complete coverage testing of the System within the corporate limits of the City. In an effort to insure that both Parties' interests are considered as this process moves forward, the Parties agree to the following conditions of such testing:

1) Both Parties will be allowed to review the testing methodology and work plan of the Consultant prior to commencement of any testing by the Consultant.
2) The Authority will be provided with a list of all test locations prior to commencement of testing.
3) The Authority will be provided with the preliminary resuhs of the testing.
4) The Authority will have an opportunity to meet with the Consultant to review the results prior to a final report being issued by Consultant or any public release of the results by the City.
5) The City will provide the Authority witb two (2) Harris portable radios to be programmed with talk groups for the Northwest Cell for the testing.
6) The Authority will provide the City with four (4) Motorola Apex portable radios, two (2) of which will be programmed with the System Northwest cell talk groups and two (2) of which will be programmed with talk groups from the City's communications system.
7) The points of contact for the Parties will be David Cruise for the City and William McCammon for the Authority.
8) This Agreement will be interpreted according to the laws of the State of California.

If this correctly states the terms of our understanding please sign one of the two enclosed

copies and return it to the Authority in the envelope provided. You will then receive a fully executed copy of the Agreement.

AGREED:

Dated: 10-16-12

David Cruise, City of Oakland

Dated: 10/17/12

William J. McCammon, EBRCSA

Enclosures: Two copies of Letter Agreement
Return envelope to EBRCSA

1976684.1

Draft Evaluation Matrix—Preliminary List of Issues that Need to be Thoroughly Evaluated

Categories/Items	Oakland P25 System	EBRCSA P25 System	Notes
A. POLICY/GOVERNANCE			
1. Control and Ownership of the Radio System, Sites and Spectrum, etc.	Oakland owns its system, equipment, assets, spectrum, etc		
2. Oakland representation in the EBRCSA Joints Power Authority Board	N/A		
3. Role of Oakland in Decision-making regarding the policies, operational, fiscal and technical issues ,	Oakland makes its own decisions based on the feedback and input of all the stakeholders		
4. Should Oakland choose to join EBRCSA, then choose to withdraw from EBRCSA in the future: a. The City would need to retain ownership of their own licenses b. The City should retain ownership of their radio tower sites and microwave system	Oakland needs to determine the total costs for maintaining the two systems, and for how long		
5. Will Oakland continue to maintain their current system infrastructure equipment? a. As an active backup? b. In a deferred condition that can be reactivated later? c. Or will we trade it in / sell it off?	Oakland needs to determine the total costs for maintaining the two systems, and for how long, if policy decision is made to join EBRCSA		
6. The issue of existing MOU/MOAs related to the current partners and users of the Oakland Radio system			

7. The issue of existing MOU with BART for the underground radio coverage	Oakland needs to consider the possibilities of losing the current capabilities		
8. Will the City have full access to EBRCSA NW System Administrator functions and reports?	N/A		
9. Will there be a limit to the number of talkgroups allocated to Oakland? What is that number, and how is it determined?	Oakland makes its own decisions based on the feedback and input of all the stakeholders		
10. Will there be a limit to the number of individual radio IDs allocated to Oakland? What is that number, and how is it determined?	Oakland makes its own decisions based on the feedback and input of all the stakeholders		
11. Who will determine priority levels of the City's taikgroups?	Oakland makes its own decisions based on the feedback and input of all the stakeholders		
12. Who will determine priority levels of the City's individual radio IDs?	Oakland makes its own decisions based on the feedback and input of all the stakeholders		
13. Will Telephone Interconnect be allowed on the system? If so, how many channels?			
14. Will unit to unit private conversation be allowed on the system?	Oakland makes its own decisions based on the feedback and input of all the stakeholders		
15. Who controls access to other taikgroups?	Oakland makes its own decisions based on the feedback and input of all the stakeholders		

16. Who controls access to Oakland talkgroups?	Oakland makes its own decisions based on the feedback and input of all the stakeholders		
17. Who monitors system usage / abuse?	Oakland DIT staff monitors the system and reports back usage/abuse to OPD and OFD Dispatch Centers		
18. Who is responsible for monitoring and managing the growth of system to prevent busies?	Oakland DIT staff monitors the system and reports back usage/abuse to OPD and OFD Dispatch Centers		
19. What is the target Grade of Service during the peak busy hour? (Is call queuing acceptable during the busiest hour of the week?)			
20. What role would the City Radio Shop play if Oakland joined the EBRCSA system?	Oakland DIT staff is responsible for the maintenance and support of the Oakland Radio system and all subscriber equipment		
B. PROCESS/PERFORMANCE			
1. Training - A comprehensive training plan will be required for the operational and technical staff	N/A		
2. Standard Operating Procedures – All the SOPs will be revised and updated	N/A		
3. Documentation - All the current documentation will be revised and updated to reflect the changes	N/A		
4. We should review system loading	N/A		

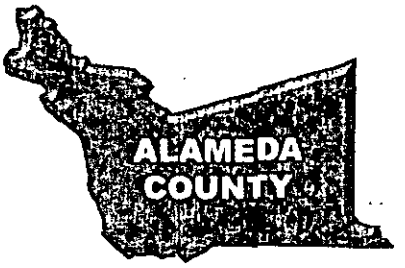
13. Who responsible for monitoring the Mutual Aid taikgroups?	N/A		
14. Who is responsible for assigning an EBRCSA Mutual Aid talkgroup to a specific incident or response?	N/A		
C. TECHNOLOGY			
1. Subscriber Units Compatibility	Oakland owns all Harris subscriber units, mobile and portables		
2. Voice Logging System Compatibility	Oakland owns the hot-standby voice-logging system		
3. Microwave Backbone Compatibility	Oakland owns the fault-tolerant microwave backbone system		
4. Dispatch Consoles Compatibility	Oakland owns all dispatch consoles hardware and software		
5. 911 CAD Compatibility	Oakland owns 911 CAD system and the associated interfaces		
6. NGN 911 Compatibility	Oakland owns NGN 911 Switch and the associated interfaces		
7. What are the operational Fallback Scenarios in the current EBRCSA design?	N/A		
8. System Redundancy and Failover	Oakland owns the fault-tolerant P25 system		
9. Microwave Backbone Capacity	Oakland is at less than 10% of its backbone capacity		
10. Microwave Backbone Redundancy	Oakland owns the fault-tolerant microwave		

	backbone system		
11. Technology Refresh – P25	The P25 system is running on the latest technology platform		
12. Technology Refresh – Microwave	The Microwave backbone system is running on the latest technology platform		
13. Security – Encryption	Oakland Radios are encrypted for special operations		
14. Interoperability	Oakland owns the P25 interoperable system		
D. FISCAL			
1. Debt	Oakland owns all major components of the radio system – P25 Network equipment, Microwave, Voice Logging, Dispatch and Subscriber Radios		
2. One Time Total Cost to join the EBRCSA system, including infrastructure upgrades, dispatch consoles and subscriber devices etc.	N/A		
3. Monthly Cost to join the EBRCSA system	N/A		
4. What are the total costs to Oakland? Recurring and Non-Recurring including outstanding debts	N/A		
5. What are the costs if Oakland simply seeks radio access to the EBRCSA system for interoperability (but keeps its own system for its primary operations)?	N/A		
6. What are the costs if Oakland establishes an ISSI link?	Oakland owns an ISSI solution and ready to be		

	deployed with EBRCSA. The same interface links Oakland with BART.		
7. What are the costs if Oakland joins the system and uses it for backup operations?	N/A		
8. Are there per unit costs?	N/A		
9. Are there obligatory maintenance costs for the system?	N/A		
10. What is the City's share of system utilities, site leases, etc.?	N/A		
11. Will there be per console or per talkgroup costs?	N/A		
12. How will rates be determined going forward?	N/A		
13. Is there an escalation factor?	N/A		
14. Is there an escalation limit?	N/A		
15. What is the on-going maintenance cost of the entire radio network?	N/A		
E. MAINTENANCE			
1. Roles and responsibilities - What role would the City Radio Shop play if Oakland joined the EBRCSA system?	Oakland DIT staff is responsible for the 24x7x365 maintenance and support of the Oakland Radio system and all subscriber equipment		
2. Alarm system – what conditions are monitored and reported?	Oakland DIT staff is responsible for the 24x7x365 maintenance and support of the Oakland Radio system and all subscriber equipment		
3. Where are alarms reported?	Oakland DIT staff is responsible for the		

	24x7x365 maintenance and support of the Oakland Radio system and all subscriber equipment		
4. Who is alerted? What are the call-out / response procedures?	Oakland DIT staff is responsible for the 24x7x365 maintenance and support of the Oakland Radio system and all subscriber equipment		
5. Are there guaranteed response times for various types of outages?	Oakland DIT staff is responsible for the 24x7x365 maintenance and support of the Oakland Radio system and all subscriber equipment		
6. Is there a distinction between Major and Minor outages?	Oakland DIT staff is responsible for the 24x7x365 maintenance and support of the Oakland Radio system and all subscriber equipment		
7. What priority response levels have been established?	Oakland DIT staff is responsible for the 24x7x365 maintenance and support of the Oakland Radio system and all subscriber equipment		
8. Who will maintain City of Oakland user radio equipment? Who will be responsible for the programming?	Oakland DIT staff is responsible for the 24x7x365 maintenance and support of the Oakland Radio system and all subscriber equipment		

9. Who will maintain logging recorder interfaces and recording equipment?	Oakland DIT staff is responsible for the maintenance and support of the Oakland Radio system and all subscriber equipment		
10. Who will maintain Oakland's dispatch consoles?	Oakland DIT staff is responsible for the maintenance and support of the Oakland Radio system and all subscriber equipment		
11. Who will maintain the microwave system and other connectivity?	Oakland DIT staff is responsible for the maintenance and support of the Oakland Radio system and all subscriber equipment		
12. Who will have primary maintenance responsibility for tower sites and other system backbone equipment?	Oakland DIT staff is responsible for the maintenance and support of the Oakland Radio system and all subscriber equipment		
13. What alarms / outages / repairs would be reported to the City of Oakland?	Oakland DIT staff is responsible for the maintenance and support of the Oakland Radio system and all subscriber equipment		



East Bay Regional Communications System Authority

Participating agencies include Alameda and Contra Costa Counties and the following cities and special districts: Alameda, Albany, Antioch, Berkeley, Brentwood, Clayton, Concord, Danville, Dublin, El Cenito, Emeryville, Fremont, Hayward, Hercules, Lafayette, Livermore, Martinez, Moraga, Newark, Oakley, Pinole, Pittsburg, Pleasant Hill, Pleasanton, Richmond, San Leandro, San Pablo, San Ramon, Union City, Walnut Creek, East Bay Regional Park District, Kensington Police Community Services District, Livermore Amador Valley Transit Authority, Moraga-Orinda Fire District, Rodeo-Hercules Fire District, San Ramon Valley Fire District, California Department of Transportation, and University of California, Berkeley

Proposal for the City of Oakland to become part of the EBRCSA

The infrastructure designed by AECOM and purchased from Motorola for the Northwest Cell of Alameda County was based on a system loading model developed by AECOM that includes the City users. The inclusion of the City will not require any additional infrastructure. There are initial startup costs that are required to include the City in the EBRCSA system and they include the cost for dispatch consoles for the Police and Fire Departments, and a onetime payment per subscriber that all member agencies have paid.

There are reoccurring costs to pay for the operations and maintenance of the system as well as debt service costs to retire the debt incurred to complete the infrastructure. The allocation model for the ongoing cost of operations and maintenance, is based on dividing the cost of the operations and maintenance by the number of users, to derive a per subscriber unit cost.

In the case of the debt service, there are two categories of users, those that paid a onetime prepayment per radio to retire their share of the debt and those that participated in the debt financing. Those users that prepaid are only responsible for the ongoing operations and maintenance costs, while those that participated in the debt service will pay a monthly fee to retire their share of the debt, beginning in FY13/14.

The proposal offers two scenarios for the City's participation in the EBRCSA System. The first is inclusion of the Police and Fire Departments in the system while the city continues to operate the current system for non public safety users. This scenario assumes 2300 subscriber units (the count is based on information provided by City staff) moving to the EBRCSA system. The second scenario assumes the transition of all current users of the City system onto the EBRCSA system. This scenario assumes a number of 4,000 subscriber units but needs verification. This is the most cost effective option as the City will not have to maintain the existing system and pay to use the EBRCSA at the same time. It should be noted that all of these numbers are subject to some minor changes based on the user counts.

Onetime Costs:

Dispatch Consoles for the Police and Fire Department: Based on numbers received from the City there are 28 Police and Fire dispatch consoles, the cost for the consoles is $1,540,000. The EBRCSA system funding model includes the cost of consoles for member agencies. The EBRCSA will attempt to obtain additional grant funds and/or assume the cost of the consoles as part of the system financing. It will not be the responsibility of the City to purchase, and\or maintain the consoles.

Subscriber Unit Assessment: The EBRCSA Board of Directors determined that each member agency would be required to pay a onetime assessment of $200 per radio to join the EBRCSA system. This is a cost that would accrue to the City.

Police and Fire Department (2,300 subscriber units)	$460,000
All projected City Users (4,000 subscriber units)	$800,000

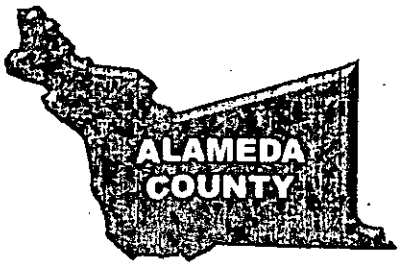
Ongoing Costs:

Operations and Maintenance: The cost to maintain the system is based on cost estimates that include maintenance of the master site, and a software and hardware upgrade contract with Motorola; maintenance of the repeater sites, microwave, and dispatch consoles by local agencies; administration, ufilities and insurance by EBRCSA.

Debt Service: The debt service is determined on a per subscriber unit basis and is a combination of the prepaid subscriber fees and those that participated in the debt financing. It is currently $11 per month for those participating in the debt financing.

Police and Fire Department (2,300 subscriber units)	
Operations and maintenance @$22 per month	S607,200
Debt Service @ $11 per month	$303,600
Total Yearly Cost	$910,800

All projected City Users (4,000 subscriber units)	
Operations and maintenance @$20 per month	$960,000
Debt Service @ $11 per month	$528,000
Total Yearly Cost	$1,488,000



East Bay Regional Communications System Authority

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August 2, 2012

Deanna Santana, City Administrator
City of Oakland
#1 Frank Ogawa Plaza
Oakland CA. 94612

Subject: East Bay Regional Communications System Authority (EBRCSA)

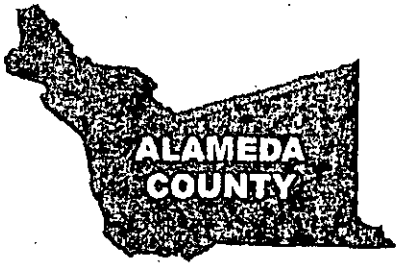
Dear Deanna:

The EBRCSA was formed in 2007 to provide a state of the art public safety communications system for the agencies in Alameda and Contra Costa counties. To date the EBRCSA has 40 member agencies and is in the final stages of the system construction. The EBRCSA system was designed by AECOM, the infrastructure is Motorola IP based ASTRO 25, and the microwave is provided by Aviat Networks. Each repeater site has two hour battery backup, an emergency generator, and all components of the system are monitored on a 24/7 basis insuring uninterrupted system performance.

The Contra Costa West cell is fully operational with over 1,000 users currently on the system, and the Alameda County East and Southwest cells are operational. The Alameda County portion of the system will be completed by mid September with the Contra Costa portion completed by year's end.

It has been a long standing goal of the EBRCSA Board of Directors to have the City of Oakland become a partner and member of the EBRCSA System. The EBRCSA system was designed and built to include the City, inclusion of the City will not require any additional infrastructure.

There are benefits that would accrue to the City by joining the EBRCSA, including the benefit of realizing the highest level of interoperability by participating in a regional "Standards-Based Shared System" as defined by SAFECOM, as well as improved coverage and reduced costs over time through economies of scale. The EBRCSA will replace all of the City's Police and Fire Department dispatch consoles and maintain them as a system cost. The current investment the



East Bay Regional Communications System Authority

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August 16, 2012

Deanna Santana, City Administrator
City of Oakland
#1 Frank Ogawa Plaza
Oakland CA. 94612

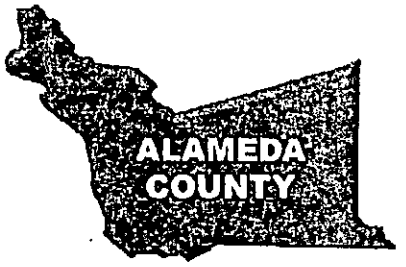
Subject: East Bay Regional Communications System Authority (EBRCSA)

Dear Deanna:

I wanted to get back to you on the meeting that we had with Oakland staff on August 2nd. I thought the meeting was very productive and brought up some good questions as well as a direction that focuses on the development of a full evaluation for the inclusion of the City of Oakland users unto the EBRCSA system.

The costs to EBRCSA and the City as we discussed are based on a number of factors. EBRCSA is prepared to provide the City with hew dispatch consoles for the Police and Fire Departments which will be in the range of $1,500,000. The onetime cost to the City will be the initiation fee of $200 per radio which all other member agencies paid whea they joined. The onetime initiation fee and the ongoing Operations/maintenance, and debt service cost to the City is based on the number of subscriber units the City chooses to bring on the system. Given the ranges of 2,300 public safety users to possibly 4,000 total users the onetime cost ranged from $460,000 to $800,000. The ongoing Operations/maintenance and debt service costs are calculated on a monthly basis with the Operations/maintenance ranging from $20-$22 per month. And the debt service at $11 per month. The total yearly cost ranged from $910,000 to $1,488,000. Once we have the opportunity to refine the user counts we can provide a prepayment option amount for the debt service component we discussed.

Alameda County Office of Homeland Security and Emergency Services
4985 Broder Blvd, Dublin CA 94568 • (925) 803-7802 • www.ebrcsa.org



East Bay Regional Communications System Authority

Participating agencies include Alameda and Contra Costa Counties and the following cities and special districts: Alameda, Albany, Antioch, Berkeley, Brentwood, Clayton, Concord, Danville, Dublin, El Cerrito, Emeryville, Fremont, Hayward, Hercules, Lafayette, Livermore, Martinez, Moraga, Newark, Oakley, Pinole, Pittsburg, Pleasant Hill, Pleasanton, Richmond, San Leandro, San Pablo, San Ramon, Union City, Walnut Creek, East Bay Regional Park District, Kensington Police Community Services District, Livermore Amador Valley Transit Authority, Moraga-Orinda Fire District, Rodeo-Hercules Fire District, San Ramon Valley Fire District, California Department of Transportation, and University of California Berkeley

November 21, 2012

Deanna Santana, City Administrator
City of Oakland
#1 Frank Ogawa Plaza
Oakland CA. 94612

Subject: Third Party Testing of the East Bay Regional Communications System Authority (EBRCSA)

Dear Deanna:

When we met with you and your staff on August 2nd. we discussed several tasks that need to be completed for a complete evaluation of the EBRCSA by David Cruise, and the need to have an independent third party test the capabilities of the EBRCSA system. In my letter to you dated August 16th I included the general areas we discussed at the meeting as listed below:

- Representatives from the City, EBRCSA and Motorola complete a site visit of the Police and Fire Dispatch centers to obtain a better understanding of the dispatch console configuration and peripherals connected to the consoles.
- Meeting with City technical staff, and EBRCSA representatives to overview the EBRCSA system maintenance and operations plan and the specifics of the contract with Motorola for maintenance and software lifecycle replacement
- Submission of more detailed information to the City's staff regarding user counts, and system design parameters.
- Development of a plan to provide coverage testing of the EBRCSA system by RCC
- Develop and evaluate migration and training requirements
- Timeline development of the full proposal

Since the meeting we have worked with David Cruise on the tasks listed above. I met with him and provided detailed system design documents, system operations and maintenance documents, user counts as requested at our meeting, and site visits of the Master Site controller in Dublin and the Seneca site in Oakland. We have not been given an opportunity to visit the dispatch centers to better understand the implications of changing out the dispatch consoles if the City were to decide to move to the EBRCSA system.

I'm concerned that the third party independent testing of the EBRCSA has stalled. I drafted an agreement (see attachment "Letter Agreement" signed October 16th and 17th.) to insure our involvement in the testing process, as well as the ability to view and comment on the test results before they are made public.

There were a few delays in obtaining the appropriate cabling and talk group configurations. The radios were programmed and I notified David on October 30th. that we were ready to provide the consultant with the radios to begin the testing. I was notified by David that there was a "miss understanding" (sic) and that he was going to be doing the initial testing and the consultant testing would take several weeks to complete, once engaged. I informed David that we will only release the radios to an independent third party consulting firm to test the EBRCSA system, and once they have completed their work we are open to further testing by David. This position has been affirmed by the EBRCSA Board of Directors at our most recent Board meeting on November 16th.

I hope you understand the EBRCSA Board is very committed to moving this forward and working with the City, but we are very concerned given the political nature of the situation that we have a qualified independent third party consulting firm complete the testing of the EBRCSA system, as outlined in the agreement.

I am available with representatives from the EBRCSA to work through the testing once you have a consulting firm on board. If you have any questions please feel free to contact me at (925) 803-7802 or by email at bill.mccammon@acgov.org

Sincerely,

William J. McCammon, Executive Director

East Bay Regional Communications System Authority

Cc: EBRCSA Board of Directors