

REQUEST FOR QUOTATION**Bid No. 3652****Issue Date: 4/18/2012****BIDS TO BE SUBMITTED TO:**

**CITY OF NEW BRITAIN
DEPARTMENT OF PURCHASES
27 WEST MAIN STREET, ROOM 401
NEW BRITAIN, CT 06051**

Sealed bids, subject to the conditions set forth on the second page hereof, will be received by the City Purchasing Agent until the time and date set forth. In compliance with all of the conditions hereof, the Bidder, whose name appears hereon, offers and agrees to furnish and deliver to the destination all of the commodities and/or services against which prices are quoted.

Prices Quoted Must be F.O.B.: 125 Columbus Boulevard, New Britain, CT 06051.

DATE OF BID (RFP) OPENING: 6/1/2012 TIME: 11:00 A.M.

- **DELIVERY REQUIRED: YES**
- **BID BOND REQUIRED: NO**
- **BID BOND AMOUNT: N/A**
- **Performance Surety Bond Required: YES**

Jack Pieper, Purchasing Agent

BID No: 3652

Date of RFP Submittal _____ Time _____

Delivery: _____ days after receipt of order

Bidder Name: _____

Address: _____

City: _____ State: _____ Zip: _____

(Signature and Title)

(Printed Name of Signer)

Bidder's Telephone Number: _____

Bidder's E-mail Address: _____

ITEM NO..	DESCRIPTION OF COMMODITIES AND/OR SERVICES	UNIT PRICE
1	<p>REQUEST FOR PROPOSALS (RFP) FOR A P25 PHASE I and Phase II 800 MHz LINEAR SIMULCAST RADIO SYSTEM WITH RELATED PERIPHERALS AND ACCESSORIES INCLUDING SYSTEM MANAGEMENT SOFTWARE. SERVICES INCLUDE INSTALLATION, CONFIGURATION, AND MAINTENANCE.</p> <p>Duration of the RFP Price (How long will bid price be held for) Number of Days? <u>180 days minimum</u></p> <p>THE FOLLOWING MUST BE EXECUTED/COMPLETED AND RETURNED:</p> <ol style="list-style-type: none">1. Form Pur. 1 (Request for Quotation).2. Notices to Prospective Bidders, Pages 6 and 73. Bid Bond Not Required.4. A complete proposal in the format described in Section 13 of this RFP <p>*PLEASE SUBMIT BIDS IN THE FOLLOWING WAY*</p> <p>ONE (1) ORIGINAL AND FIVE (5) COPIES, ONE (1) CD</p> <p><u>PROPOSALS WILL NOT BE ACCEPTED AFTER THE STATED SUBMITTAL DATE AND TIME.</u></p> <p><u>PLEASE NOTE THAT PROPOSALS SUBMITTED CANNOT BE FAXED OR E-MAILED.</u></p>	

IMPORTANT - READ CAREFULLY BEFORE MAKING BID: CONDITIONS, BID TERMS AND INSTRUCTIONS

CITY OF NEW BRITAIN CONNECTICUT -DEPARTMENT OF PURCHASES

1. All bids must be submitted on and in accordance with this form. If more space is required to furnish a description of the commodities and/or services offered or delivery terms, the Bidder may attach a letter hereto which will be made a part of the bid. All bids must be submitted in duplicate in sealed envelopes clearly identified with the appropriate bid number.

2. Bids and amendments thereto, or withdrawal of bids submitted, if received by the City after the date and time specified for bid opening, will not be considered. If any person contemplating the submission of a bid on this invitation is in doubt as to the true meaning of any part of the specifications, plans or other documents, he should submit a written request for an interpretation thereof to the City Purchasing Agent at least 10 days prior to scheduled bid opening. An interpretation of the bid invitation documents will be made only by addendum duly issued to each person receiving a bid invitation and/or holding plans. The City of New Britain will not be responsible for explanations or interpretations of bid invitation documents except as issued in accordance herewith. Note regarding addenda: Addenda shall be mailed via certified mail to all vendors listed on the City's list of plan holders. Addenda will be made available to those vendors downloading specifications from a website at that same website.

3. Prices should be stated in units of quantity specified, with packing and delivery to destination and all other incidental charges included.

4. The time of proposed delivery must be stated in definite terms. If time of delivery for different commodities varies, the Bidder shall so state.

5. Samples, when requested, must be furnished free of expense to the City, and if not destroyed, will, upon request, be returned at the Bidder's risk and expense.

6. Price Quotations must be stated in units of quantity specified, show unit pricing, include packing and delivery to destination and all other incidental charges included in the grand total price or bid may be rejected. In case of error in the extension of prices, the unit price shall govern.

7. Unless qualified by the provision "NO SUBSTITUTE", the use of the name of a manufacturer, brand, make or catalog designation in specifying an item does not restrict Bidders to the manufacturer, brand, make or catalog designation identification. This is used simply to indicate the character, quality and/or performance equivalence of the commodity desired, but the commodity on which bids are submitted must be of such character, quality and/or performance equivalence that it will serve the purpose for which it is to be used equally as well as that specified. In submitting bids on a commodity other than as specified, Bidder shall furnish complete data and identification with respect to the alternate commodity he proposes to furnish. The City reserves the right to make final determination of equivalency.

Consideration will be given to bids submitted on alternate commodities to the extent that such action is deemed to serve best the interests of the City. If the Bidder does not indicate that the commodity he proposed to furnish is other than specified, it will be construed to mean that the Bidder proposes to furnish the exact commodity described.

8. Bidder declares that the bid is not made in connection with any other Bidder submitting a bid for the same commodity or commodities, and that the bid is bona fide and is in all respects fair and without collusion or fraud. Abstracts of bids received are prepared for distribution by the Department of Purchases.

9. Award will be made to the lowest responsible qualified Bidder, who shall be determined in accordance with and pursuant to Section 2-578, inclusive of the Purchasing Ordinances City of New Britain. The quality of the articles to be supplied, their conformity with the specifications, their suitability to the requirements of the City, and the delivery terms will be taken into consideration in making the award.

10. Section 2-578, item 10, allows up to a ten (10) percent differential in favor of resident Bidders for all purchases and contracts except construction and/or capital improvements. Any city-based bidder, which has submitted a bid, shall be awarded the bid provided that such city-based bidder agrees to accept the award of the bid at the amount of the low bid. In a situation where no city-based bidder submits a bid or where a city-based bidder does not come within the ten (10) percent or chooses not to meet the lowest bid however, there are bids submitted by companies based in Connecticut and other companies based outside Connecticut, in that event the Purchasing Agent shall allow a five (5) per cent differential in favor of the Connecticut based bidder. If more than one Connecticut based bidder submits a bid of not more than five (5) percent higher than the low bid and has agreed to accept the award of the bid at the amount of the low bid, the bidder who has submitted the lower/lowest bid shall be awarded the bid. A "Connecticut based bidder" shall mean a business with a legal principle place of business located within the State of Connecticut. A business shall not be considered a Connecticut based bidder unless evidence satisfactory to the purchasing agent has been submitted with the bid documents has a bona fide principle place of business within the State of Connecticut. For construction projects or capital improvements the lowest bidder shall be determined in the following order unless otherwise prohibited by applicable state and federal legislation. (1) For construction projects or capital improvements involving a total contract price of one million dollars (\$1,000,000.) or less any city-based bidder that submitted a low bid not more than eight (8) percent higher than the lowest bid, provided such city-based bidder agrees to accept the award of the bid at the lowest bid amount. (2) For construction projects and capital improvements of involving a total contract price of more than one million dollars (\$1,000,000.) but less than five million dollars (\$5,000,000.) any city-based bidder that submitted a low bid not more than four (4) percent higher than the lowest bidder, provided such city –based bidder agrees to accept the award of the bid at the lowest bid amount. For construction projects and capital improvements involving a total contract price of over five million dollars (\$5,000,000.) any city-based bidder that submitted a low bid not more than two (2) percent higher than the lowest bid, provided such city-bases bidder agrees to accept the award of the bid at the lowest bid amount.

11. The City reserves the right to award by item, groups of items or total bid; to divide the award; to reject any and all bids, in whole or in part, and to waive any informality or technical defects if, in its judgment, the best interests of the City will be served.

12. Cash discounts may be offered by bidder for prompt payment of bills, but such discount will not be taken into consideration in determining the low Bidder but will be taken into consideration in awarding tie bids. The discount period will be computed from the date delivery is accepted at destination or from date correct invoice is received by the consignee, whichever is the later date.

13. Acceptance of a bid by the City is not an order to ship or a commitment to purchase the goods or services from the bidder.

14. Each bid is received with the understanding that the acceptance in writing by the City of the offer to furnish any or all of the commodities and/or services described therein shall constitute a contract between the Bidder and the City, which shall bind the Bidder on his part to furnish and deliver the articles quoted at the prices stated and in accordance with the conditions of said accepted bid.

15. Any equipment delivered must be standard new equipment, latest model, except as otherwise specifically stated in bid. Where part or nominal appurtenances of equipment are not described, it shall be understood that all the equipment and appurtenances which are usually provided in the manufacturer's stock model shall be furnished.

16. In event of default by the Bidder, the City reserves the right to procure the commodities and/or services from other sources and hold the Bidder liable for any excess cost occasioned thereby. If, however, public necessity requires use of materials or supplies not conforming to the specifications, they may be accepted and payment therefore shall be made at a proper reduction in price.

17. Where a bid bond is required, such bond must accompany the bid; it must be executed by a surety company licensed to do business in the State of Connecticut; or it may be in the form of a cashier's or certified check made out to the "Treasurer, City of New Britain". Said bond or check in the amount of Ten Percent (10%) of the total bid amount shall be given as security that, if the bid is accepted, a contract will be entered into and the performance guarantee properly secured.

18. The bid bond, cashier's or certified check shall be forfeited and the principal amount of said bid bond shall be paid to the City or said check shall be surrendered to the City as the agreed amount of liquidated damages in case of failure of Bidder to enter into contract as above described. The bid bond or check will be released or returned to the Bidder in case his bid is rejected. Bid bonds or checks from the three lowest bidders will be held for a period of 60 days after the bids are opened.

19. All contracts for goods or services where the contract price is more than \$50,000.00 will require a performance bond that must be executed by a surety company licensed to do business in the State of Connecticut in accordance with and pursuant to Section 2-702 inclusive of the Purchasing Ordinances of the City.

20. The Bidder guarantees to save the City, its agents or employees, harmless from liability of any nature or kind, for use of any copyrighted or uncopyrighted compositions, secret process, patented or unpatented invention, articles or appliances furnished or used in the performance of the contract, or which the Bidder is not the patentee, assignee or licensee.

21. The Bidder, where applicable, agrees to pay its labor force Prevailing Wage Rates and to comply to all Laws, Regulations and Ordinances regarding these wage rates and the recording of them set forth by the Connecticut Department of Labor and the City of New Britain Connecticut.

CITY OF NEW BRITAIN

PUBLIC BID NO. 3652

The City of New Britain, through its Purchasing Agent, is seeking competitive proposals for the following commodity and professional services:

REQUEST FOR PROPOSALS (RFP) FOR A P25 PHASE I and Phase II 800 MHz LINEAR SIMULCAST RADIO SYSTEM WITH RELATED PERIPHERALS AND ACCESSORIES INCLUDING SYSTEM MANAGEMENT SOFTWARE. SERVICES INCLUDE INSTALLATION, CONFIGURATION, AND MAINTENANCE.

Specifications for the product and professional services required follow. The Purchasing Agent reserves the right to divide the award and the right to reject any and all bids, in whole or in part, as best serves the interests of the City of New Britain. **SEALED BIDS ARE TO BE SUBMITTED BY THE DATE AND TIME SPECIFIED ON THE COVER SHEET TO: CITY OF NEW BRITAIN PURCHASING DEPT., ROOM 401, 27 WEST MAIN ST., NEW BRITAIN, CT 06051. BID ENVELOPE IS TO BE CLEARLY MARKED ON THE OUTSIDE WITH BID NUMBER AND NAME.**

NOTICE TO BIDDERS:

1. All delivery and any incidental charges must be included in the pricing. Delivery point is: 125 Columbus Boulevard, New Britain, CT. Stated quantities are estimates only; no guarantee is given, express or implied, as to actual quantities to be ordered.
2. The City of New Britain is exempt from the payment of taxes imposed by the federal government and/or the State of Connecticut; such taxes shall not be included in the bid prices.
3. Exceptions to specifications must be clearly stated on a separate piece of paper.
4. Manufacturer must be clearly stated.
5. Questions regarding the Purchasing process may be directed to Jack Pieper, Purchasing Agent, (860) 826-3402. Questions regarding technical specifications may be directed to James P. Donnelly, Director, Public Safety Telecommunications Center, City of New Britain, 860 826-3000.
6. Vendor insurance requirements are as follows:
Vendor shall agree to maintain in force at all times during which services are to be performed the following coverages placed with company(ies) licensed by the State of Connecticut which have at least an "A-" VIII policyholders rating according to Best Publication's latest edition Key Rating Guide.

		(Minimum Limits)
General Liability*	Each Occurrence	\$1,000,000
	General Aggregate	\$2,000,000
	Products/Completed Operations Aggregate	\$2,000,000
Auto Liability*	Combined Single Limit	
	Each Accident	\$1,000,000
Umbrella* (Excess Liability)	Each Occurrence	\$1,000,000
	Aggregate	\$1,000,000
Professional Liability	Each Occurrence	\$1,000,000
	Aggregate	\$ 1,000,000

* "The City of New Britain and Consolidated School District" shall be named as "Additional Insured". Coverage is to be provided on a primary, noncontributory basis.

If any policy is written on a "Claims Made" basis, the policy must be continually renewed for a minimum of two (2) years from the completion date of this contract. If the policy is replaced and/or the retroactive date is changed, then the expiring policy must be endorsed to extend the reporting period for claims for the policy in effect during the contract for two (2) years from the completion date.

Workers' Compensation and WC Statutory Limits

Employers' Liability	EL Each Accident	\$100,000
	EL Disease Each Employee	\$100,000
	EL Disease Policy Limit	\$500,000

Original, completed Certificates of Insurance must be presented to the Acting Purchasing Agent prior to purchase order/contract issuance. Vendor agrees to provide replacement/renewal certificates at least 60 days prior to the expiration of the policy. Should any of the above described policies be cancelled before the expiration date, written notice must be made to the City 30 days prior to cancellation.

Purchaser shall agree to submit proof of the following coverages placed with company(ies) licensed by the State of Connecticut which have at least an "A-" VIII policyholders' rating according to Best Publication's latest edition Key Rating Guide.

7. **HOLD HARMLESS AGREEMENT:** The Contractor, its agents and assigns shall indemnify and hold harmless the City of New Britain, including but not limited to, its elected officials, its officers, and agents, ("the City") from any and all claims made

against the City, including but not limited to, damages, awards, costs and reasonable attorneys fees, to the extent any such claim directly and proximately results from the wrongful willful or negligent performance of services by the Contractor during the Contractor's performance of this Agreement or any other Agreements of the Contractor entered into by reason thereof. The City agrees to give the Consultant prompt notice of any such claim and absent a conflict of interest, an opportunity to control the defense thereof.

Technical Requirements and Additional Specifications are attached and start at page 11 of this bid package. The technical requirements are based on the P25 Statement of Requirements as developed by the national committee for that purpose. These requirements in the form of a list of items, some of which are optional, are amended in a format that would require a vendor to provide the feature as a part of this procurement or as option for this procurement. Moreover, the technical requirements include a summary discussion of the linear simulcast system and the coverage requirement for the system. All of the features of the system as required by the City of New Britain are contained in the specification developed nationally. There are no "one-off" requirements for the City of New Britain and the specification, as written and presented herein, is intentionally open and competitive. While simulcast technology is not natively part of the P25 specification; it is necessary to operate a P25 multi-site system in a public safety environment. The chosen approach is a proven, non-proprietary, technology currently in use in many systems across the United States.

In addition, the City of New Britain is asking all vendors offering proposals to submit an optional proposal for a radio system that meets the general intent of the specifications but may not match all P25 functional requirements. Because the system will be used by public safety officials, the coverage and reliability requirements are not changed. Vendors must continue to meet those requirements without exception. Whether this optional proposal is based on a subset of P25 requirements or commercial requirements is at the discretion of the offerer.

The City of New Britain seeks proposals from highly qualified and experienced radio communications and engineering vendors who have a proven track record of performance and delivery. Vendors are directed to section 10.6 of the RFP for specific qualifying credentials.

CITY OF NEW BRITAIN
PUBLIC BID NO 3652

NOTICE TO PROSPECTIVE BIDDERS
CERTIFICATION REQUIRED

The City of New Britain Code of Ordinances, Sec. 2-575, reads as follows:

Sec. 2-575. Rejection of bid where bidder is in default to city.

The agent shall not accept the bid of a contractor, who is in default on the payment of taxes, licenses or other monies due the city.

The agent shall include in the bid document a form to be executed by a bidder, certifying that said bidder is not in default on the payment of taxes, licenses or other monies due the city.

As used in this section, (1) a “principal” of a contractor shall mean an individual who is a director, an officer, an owner, a limited partner or a general partner; and (2) “default in the payment of taxes” shall mean the failure to pay taxes by the date such taxes are due and payable or the failure to be current with respect to a delinquent taxes payment schedule as set forth in a written agreement with the Tax Collector.

In accordance with this provision, prospective vendors make the following certification:

The principals, as defined above, of the entity submitting responses to Public Bid No. _____ are: (Please type or print clearly and use additional pages if necessary).

1. Name: _____

Local Residence Address (if any): _____

Local Mailing Address (if any): _____

If a principal, as described above, is in any local entity other than the _____ entity submitting a response to this Public Bid No. listed above, state the _____ entity or entity’s names(s) and address(es):

Entity’s Name _____

Local Mailing Address (if any) : _____

2. Name: _____

Local Residence Address (if any): _____

Local Mailing Address (if any): _____

If a principal, as described above, is in any local entity other than the entity submitting a response to this Public Bid No. listed above, state the entity or entity's names(s) and address(es):

Entity's Name _____

Local Mailing Address (if any) : _____

3. Name: _____

Local Residence Address (if any): _____

Local Mailing Address (if any): _____

If a principal, as described above, is in any local entity other than the entity submitting response to this Public Bid No. listed above, state the entity or entity's names(s) and address(es):

Entity's Name _____

Local Mailing Address (if any) : _____

Signature of Principal and their Title of the Entity Submitting this Bid hereby indicates by signing this Notice to Prospective Bidder that the Entity or its Principles as listed herein are not in default on the payment of taxes, licenses, or other monies due to the City of New Britain as of the date of this bid solicitation.

_____ Date: _____

Review by Tax Collector: (To be completed by the City of New Britain's Tax Collector only if the Bidder is awarded the contract as the result of this Public Bid)

By: _____ Date: _____



City of New Britain

New Britain, Connecticut 06051

*"New Britain:
A City for
All People"*

Date: April 18, 2012

Subject: REQUEST FOR PROPOSALS (RFP) FOR A P25 PHASE I & PHASE II 800 MHz LINEAR SIMULCAST RADIO SYSTEM

Public Bid No. 3652

To Whom It May Concern:

Specifications for subject bid solicitation are enclosed for your review and response.

If you do not submit a bid, we request that you complete the bottom portion of this letter and return to the writer's attention. This shall assist the City of New Britain in maintaining accurate bidders' lists.

Your cooperation is greatly appreciated.

Very truly yours,

Jack Pieper

Purchasing Agent

Company Name: _____

Address: _____

We are not responding to subject bid solicitation for the following reason:

- ☐ Our company does not sell the requested product.
- ☐ Our company does not provide the requested service.
- ☐ Our schedule will not allow us to provide the requested service at this time.
- ☐ Other (please explain): _____

City of New Britain

P25 Phase I and Phase II Linear Simulcast 800 MHz Radio System Request for Proposal Requirements



City of New Britain, CT

Index of Contents

Section	Description	Page
1	INTRODUCTION	12
2	OTHER TERMS, CONDITIONS & INSTRUCTIONS	13
3	P25 PHASE 1 DIGITAL LINEAR SIMULCAST TRUNKED RADIO SYSTEM	29
4	SYSTEM PERFORMANCE REQUIREMENTS AND SITE FACILITIES	39
5	RADIO COMMUNICATIONS CONSOLES	50
6	PORTABLE EQUIPMENT	58
7	MOBILE EQUIPMENT	64
8	CONTROL STATION EQUIPMENT AND REMOTE CONTROL EQUIPMENT	70
9	REGULATORY REQUIREMENTS	75
10	OTHER REQUIREMENTS	77
11	RESPONSE SUBMISSION INSTRUCTIONS	88
12	APPENDICES	91

1.0 INTRODUCTION

1.1 GENERAL

The City of New Britain, Connecticut (“the City”) invites prospective and qualified vendors to submit a response to this invitation to engineer, furnish and install an 800 MHz P25 Phase 1 Trunked Simulcast Radio System; and to furnish and install other improvements to existing systems as specified herein. Each bidder is also required to provide an option for upgrading their proposed equipment and software offering to Phase II within the next 12 months. All equipment offered for the public safety departments must be capable of software upgrade to Phase II within the 12 month period. The City, at its option, may elect to proceed with a Phase 2 system immediately or within a later period.

The City seeks a single Vendor (i.e. prime contractor) who can meet or exceed the requirements of this invitation and who can supply the materials and labor on a ‘TURN-KEY’ basis. The City deems all the requirements specified in this document to be part of a single group.

Throughout this invitation, there are instructions for the identification of the manufacturer and the model of the equipment being offered. Vendors are reminded that this information shall be identified in Section 3 of their response.

1.2 PROJECT OVERVIEW

This invitation represents an effort undertaken by the City with the goal of implementing a Citywide 800 MHz P25 Phase 1 trunked simulcast radio system to support its public safety and public service agencies. When completed, the system will provide comprehensive in-building radio coverage to portable units throughout the City.

The City has the necessary funding to implement the project.

1.3 TENTATIVE PROJECT SCHEDULE

Issuance of RFP	April 18, 2012
Submission of Pre-Bid Questions.....	April 23, 2012
Pre-Bid Conference & Site Tour	April 26, 2012
Deadline for Questions	May 1, 2012
Response Due Date	June 1, 2012

1.4 KEY PROJECT CONTACT

The City has designated the following individual as the focal point of contact for **all matters** relating to this solicitation.

Mr. Jack Pieper, Purchasing Agent
City of New Britain
27 West Main Street
New Britain, CT 06051
860-826-3402
jpieper@newbritainct.gov

1.5 CITY'S PROJECT MANAGER

The City has designated the following individual as its Project Manager (TPM) for this project.

Mr. James P. Donnelly
Director, Public Safety Telecommunications
City of New Britain
125 Columbus Boulevard
New Britain, CT 06051
860-826-3087 office
860-229-7528 Facsimile
james.donnelly@newbritainct.gov

2.0 OTHER TERMS, CONDITIONS & INSTRUCTIONS

2.1 DUE TIME & DATE

The Purchasing Agent will accept sealed proposals until **11:00 A.M. on June 1, 2012** at the Finance Department at the City of New Britain, 27 West Main Street, New Britain, CT 06051-2806, where they will be publicly opened. The time/date stamp clock in the Purchasing Department shall be the official time of receipt.

Proposals may be hand-delivered or mailed to the Purchasing Agent at the above address, but must be in a sealed envelope clearly marked "PROPOSAL FOR 800 MHz P25 Phase 1 COMMUNICATIONS SYSTEM." Please submit one (1) original and (5) copies of the proposal along with one (1) CD containing an electronic version.

2.2 RIGHTS OF THE CITY

The City reserves the right to accept or reject any or all responses, in whole or in part, or waive any requirements, if it is deemed to be in the best interest of the City.

Prospective Vendors are alerted to the mandatory requirements of this Request for Proposal (RFP). Any response, which fails to comply with any of these mandatory requirements, will be deemed to be non-responsive and disqualified.

The City reserves the right to accept or reject any or all of the exception(s), clarification(s) and/or substitution(s), in whole or in part, if it is deemed to be in the best interest of the City.

The City reserves the right to require additional information from Vendors and to conduct necessary investigations to determine product reliability, vendor qualifications and performance, and to determine the accuracy of the information in the response.

The City reserves the right to delay any target dates if it is deemed to be in the best interest of the City.

2.3 RFP INFORMATION & WORK CONDITIONS

This RFP establishes the requirements for this Project and it is believed that all information necessary to complete a response is included in this RFP.

All Vendors are expected to carefully examine the RFP documents. Any ambiguities or

inconsistencies should be brought to the attention of the individual(s) identified in the 'INQUIRIES' subsection of this RFP, as appropriate.

It is the responsibility of the Vendor to clarify any information, which is contained in this RFP and not fully understood.

The Vendor, by and through the submission of a response, agrees to be held responsible for: 1) having become familiar with the existing facilities; 2) having become familiar with the existing radio system; 3) having completely understood the nature and scope of the work and; 4) any local conditions that may affect the materials, parts, labor and work to be done.

Nothing in this RFP shall relieve the Vendor from supplying a totally turn-key system package, including, but not limited to all materials, hardware, cabling and labor FOB Destination to be furnished under this contract. The Vendor shall, in all cases, be solely responsible for the delivered system, and for furnishing complete system documentation for each and every part of the furnished system.

2.4 STANDARDS & CODES

In all instances, offered and delivered goods shall be new, unused, in current production and meeting or exceeding all applicable standards and codes of:

- ADA - American with Disabilities Act
- ANSI - American National Standards Institute
- ASME - American Society of Mechanical Engineers
- ASTM - American Society for Testing & Materials
- EIA - Electronic Industry Association
- FCC - Federal Communications Commission
- IEEE - Institute of Electronic and Electrical Engineers
- NEC - National Electric Code
- NEMA - National Electrical Manufacturers Association
- NFPA - National Fire Protection Association
- OSHA - Occupational Safety and Health Administration

All facilities constructions, equipment and cabling installations shall comply with the following applicable codes:

- State Electrical Code
- Local Electrical Codes
- Local Building Codes

2.5 INQUIRIES

Any questions regarding this RFP's content and intention will be fielded and clarifications will be made. No questions or clarifications will be addressed unless received in writing by Jack Pieper,

Purchasing Administrator, no later than **12:00 P.M. on May 1, 2012**. Written requests may be sent by facsimile to his attention at 860-612-4204 or by E-mail to jpieper@newbritainct.gov. Any responses to these questions shall be sent to all potential proposers in writing by facsimile or E-mail, provided potential proposers request said responses.

2.6 PRE-RESPONSE CONFERENCE & SITE TOUR

The Pre-Response Conference will involve the following process:

Step-1: Questions, request for interpretation or clarification, petition for changes, additions or deletions to technical or commercial items in this bid, shall be submitted **in writing** to the Pre-Bid Conference. **Questions are due by end of day April 23, 2012.**

Step-2 All Bidders will convene jointly on the date and time specified to receive answers to the vendor questions submitted in advance, submit additional questions or requests, and to receive any updated information regarding the project.

While additional responses to questions or changes will be given verbally at the Pre-Bid conference, an official, written set of responses and/or clarifications will be provided to all Bidders in the form of an addenda, and will be sent via facsimile or email within 5-business days after the Pre-Bid Conference.

A pre-response conference and site tour will be held for the purpose of clarifying items in this RFP and to provide the opportunity to become acquainted with the existing conditions.

Note that this is the only opportunity prospective Vendors will have to visit and inspect the City's communications facilities. Therefore, attendance is strongly encouraged for prospective Vendors interested in submitting a response. The City will escort Vendors to the sites, participants in the site tour must provide their own transportation.

The City's designated Project Manager (TPM) will chair the conference & site tour.

The conference & site tour has been scheduled as follows:

TIME:	9:00 AM EST
DATE:	April 26, 2012
LOCATION:	City New Britain Police Headquarters 125 Columbus Boulevard New Britain, CT 06051 (For directions, please call 860-826-3000)

The site tour will begin immediately following the pre-bid conference. It is expected that the site tour will take about three hours. Bidders must provide their own transportation.

For planning purposes, it is requested that those Vendors planning to attend notify the Mr. James P. Donnelly, Director, Public Safety Telecommunications, via e-mail at james.donnelly@newbritainct.gov on the number of individuals expected to attend.

Casual attire is suggested for the conference and site tour.

2.7 ADDENDA

Any changes to or extensions of the due date for this RFP will be made by addenda. Addenda will be e-mailed to all vendors. Vendors requiring overnight delivery must provide an account or credit card number. Acknowledgement of receipt of addenda is required to be e-mailed to the Purchasing Agent at jpieper@newbritainct.gov.

Vendors shall be responsible for checking for addenda a minimum of forty-eight hours in advance of the proposal deadline. The City shall not be held responsible for any addenda not received by Vendors.

2.8 SILENCE OF REQUIREMENT

The apparent silence within these requirements as to any detail or to the apparent omission from it of a detailed description concerning any point shall be regarded as meaning that only the best commercial practices are to prevail. All interpretations of these requirements shall be made based on this statement.

2.9 EXCEPTIONS/CLARIFICATIONS/SUBSTITUTIONS

Vendors taking exception to or clarifying the requirements, or offering substitutions, shall state so in their response in accordance with the instructions of the 'RESPONSE SUBMISSION INSTRUCTIONS' section of the RFP.

The City reserves the right to accept any exceptions, clarifications and/or substitutions that are not presented in accordance with the instructions of this RFP.

The absence of exceptions, clarifications and/or substitutions shall indicate that the Vendor has accepted all the requirements of the RFP in the manner described and shall hold the Vendor responsible to perform in strict accordance with the requirements of the RFP. The City reserves the right to accept or reject any or all of the exception(s), clarification(s) and/or substitution(s), in whole or in part, if it is deemed to be in the best interest of the City.

2.10 SUBMISSION OF RESPONSES

Responses are required in paper form with one copy provided electronically via CD.

2.11 LATE RESPONSES

Late responses will not be considered and will not be opened. Responses will not be returned to the vendor.

2.12 RECEIPT OF RESPONSES

Responses will be time stamped upon their arrival at the City of New Britain Finance Department at 27 West Main Street, New Britain, CT 06052.

2.13 PUBLIC DISCLOSURE

All responses received by the City shall be subject to the Connecticut Freedom of Information Act.

2.14 PROPRIETARY INFORMATION

Proprietary information or trade secret information included by the Vendors in their response shall be clearly identified as such in the response.

2.15 RESPONSE DEVELOPMENT COSTS

The City appreciates the time and effort that Vendors expend in preparing responses; however, neither the City nor its representatives shall be liable for any expenses incurred in connection with the preparation of the response to this RFP.

2.16 SUPPLEMENTAL INFORMATION

The City reserves the right to require additional information from vendors and to conduct necessary investigations to determine product reliability, vendor performance and to determine the accuracy of the information in the response.

In addition, the City may wish to make a field trip to visit a Vendor's recent system installations. City personnel will travel at their expense, but may require that the Vendor schedule and arrange the visit with the host user.

2.17 EVALUATION CRITERIA

Responses will be evaluated, at a minimum and not necessarily in this order, in accordance with the following criteria:

- Delivered goods & services on a 'TURN-KEY' basis
- System functionality, expandability, design & features
- State-of-the-art technology as specified in the RFP or better
- Equipment features
- Exceptions, clarifications and/or substitutions to the requirements of the RFP
- Proposed statement of work
- Prospective vendors compliance with the instructions of the RFP
- Detailed itemized equipment list
- System diagrams & drawings
- Radio coverage maps and engineering parameters
- Information of the prime contractor
- Qualifications & experience of the prime contractor
- References of the prime contractor
- Information of the sub-contractor(s)
- Qualifications & experience of the sub-contractor(s)
- References of the sub-contractor(s)
- Past working relationship(s) between prime contractor and sub-contractor(s)
- Qualifications of the Vendor's Project Manager (VPM)
- Estimate of time of VPM on this project
- Project Schedule
- Description of the methodology to implement the offered solutions
- Impact of offered solutions on current operations
- Delivery & storage of equipment

- Equipment grounding and lightning/power surge protection practices
- Training
- Warranty period
- Service response times during warranty period
- Information of the warranty service provider
- Qualifications & experience of the warranty service provider
- References of the warranty service provider
- Information of the preventive maintenance service provider
- Qualifications & experience of the preventive maintenance service provider
- References of the preventive maintenance service provider
- System Documentation
- Overall quality of the response
- Costs

2.18 AWARD OF CONTRACTS

The City will award a contract based on a combination of the lowest dollar cost and most compliant response offered by the most qualified Vendor based upon evaluation criteria used and other considerations deemed appropriate by the City. The City reserves the right, in its discretion to accept the lowest and most compliant response, which may or may not necessarily be the lowest cost response. Moreover, the City as a part of its evaluation may consider the design and quality of offering as key components in its assessment of most compliant response. The right is reserved to reject any or all responses, accept all or any portion of a response, and to waive technical errors, discrepancies or information if, to do so, is deemed to best serve the interest of the City.

NOTE: Any personnel or subcontractors assigned to this project may not be substituted with other personnel or subcontractors unless approved by the City in writing. Any proposal to substitute shall be in writing and include the substitute's qualifications. The City reserves the right to reject any substitute.

2.19 CONTRACT

The contract shall consist of the following:

- General Terms & Conditions
- Actual Contract Document with Exhibits
- Exhibit 1 – Request for Proposal
- Exhibit 2 - Response
- Exhibit 3 – Issued Addenda, Correspondence & Subsequent Project Documentation relating to the Project

2.20 PURCHASE ORDER

Upon the approval of the City, a purchase order(s) will be generated by the City to the successful vendor. The purchase order number must appear on all itemized invoices and packing slips. The City will not be held responsible for any orders placed, delivered, or installed without a valid, current purchase order number.

2.21 CHANGE ORDERS

No oral statement of any person shall modify, otherwise change or affect the terms, conditions or requirements stated in the resulting contract. All changes will be made in writing and incorporated in the contract by amendment executed by the appropriate parties.

2.22 PAYMENT

The sum of 60% of the contract price of the fixed infrastructure equipment will be paid after delivery of the equipment.

The sum of 25% of the contract price for services related to the fixed infrastructure will be paid after the complete installation of all equipment.

The sum of 60% of the contract price of the subscriber equipment will be paid after delivery of the equipment. Subscriber equipment is defined as control stations, mobiles and portable units. Except for subscriber equipment required for the installation, testing and optimization of the system, subscriber equipment shall not be delivered earlier than sixty (60) days prior to the commencement of the Operational System Test described in this document.

The sum of 25% of the contract price for services related to the subscriber equipment will be paid after the complete installation of each subscriber unit.

The balance of the contract will be payable after final system acceptance.

The City is exempt from payment of excise, transportation and sales taxes imposed by the Federal Government and/or the State of Connecticut. Such taxes must not be included in proposal prices. Exemption certificates will be provided upon request.

2.23 CONFLICT OF INTEREST

This RFP in no way precludes, prevents or restricts the vendor from obtaining and working under an additional contractual arrangement(s) with other parties aside from the City, assuming that the contractual work in no way impedes the Vendor's ability to perform the services required under this RFP. The Vendor stipulates that at the time of entering into this RFP it has no interest in nor shall it acquire any interest, direct or indirect, in any agreement that will impede its ability to perform the services required under this RFP. The vendor further agrees that there is no financial interest involved on the part of any City officers or employees of the department involved in the development of the specifications or the award of this RFP.

2.24 ETHICS

The Vendor shall not accept or offer gifts or anything of value nor enter into any business arrangement with any employee, official, or agent of the City.

2.25 DEFECTIVE EQUIPMENT

Materials supplied under this contract shall be subject to the City's approval. Materials found defective or not meeting specifications shall be replaced by the successful Vendor within reasonable time frames after notification and at no expense to the City. All repairs or replacements shall be made with new parts; used parts will not be accepted.

2.26 ASSIGNMENT

The successful Vendor shall not sell, assign, transfer or convey any contract resulting from this RFP, in whole or in part, without the prior, express written consent of the City.

2.27 EQUAL EMPLOYMENT OPPORTUNITY & NON-DISCRIMINATION CLAUSE

The Vendor agrees as follows: The Vendor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Vendor will take affirmative action to ensure that persons of color and women applicants are employed, and that all employees and service beneficiaries are treated, without regard to their race, color, religion, sex, or national origin. Such action shall include, but not be limited to, the following: provision of services, employment, upgrading, demotion or transfer, recruitment or recruitment advertising; layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship.

Vendors shall observe and comply with all federal, state and local laws, ordinances and regulations. Vendors shall indemnify and save harmless the City, all of its officers, agents and servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, or from negligence, whether by vendors, their employees or subcontractors. Concerning matters not covered in these provisions, nothing herein is intended to relieve vendors from compliance with all applicable federal and state legislation or provisions concerning sexual harassment and related subjects.

2.28 INSURANCE

Before commencing work, the successful Vendor shall comply with the following General Conditions and Supplementary Conditions.

2.28.1 GENERAL CONDITIONS

2.28.1.1 Vendor's Insurance Provisions

During the life of the agreement and for such additional time as may be required, the Vendor will provide, pay for, and maintain in full force and effect the insurance outlined here for coverage at not less than the prescribed minimum limits covering the Vendor's activities, those activities of any and all subcontractors or those activities anyone directly or indirectly employed by the Vendor or subcontractor or by anyone for whose acts any of them may be liable.

2.28 CERTIFICATES OF INSURANCE

Before starting work, the Vendor will give the City a certificate of insurance completed by the Vendor's duly authorized insurance representative certifying that at least the minimum coverages required here are in effect; specifying the form that the liability coverages are written on; and, confirming liability coverages will not be cancelled, non renewed, or materially changed by endorsement or through issuance of other policy(s) of issuance without thirty (30) days advance written notice to:

Purchasing Agent
City of New Britain
27 West Main Street
New Britain, CT 06051
City of New Britain Bid Number 3652
Request for Proposals
P25 PHASE I and Phase II 800 MHz RADIO SYSTEM
Page 20

Failure of the City to demand such certificate or other evidence of full compliance with these insurance requirements or failure of the City to identify a deficiency from evidence provided will not be construed as a waiver of the Vendor's obligation to maintain such insurance.

The acceptance of delivery by the City of any certificate of insurance evidencing the required coverages and limits does not constitute approval or agreement by the City that the insurance requirements have been met or that the insurance policies shown in the certificates of insurance are in compliance with the requirements.

The City will have the right, but not the obligation, of prohibiting the Vendor or subcontractor(s) from entering the project site(s) until such certificates or other evidence that insurance has been placed in complete compliance with these requirements is received and approved by the City.

If the Vendor fails to maintain the insurance as set forth here, the City will have the right, but not the obligation, to purchase said insurance at the Vendor's expense. Alternatively, the Vendor's failure to maintain the required insurance may result in termination of this agreement at the City's option.

If any of the coverages are required to remain in force after final payment, an additional certificate evidencing continuation of such coverage will be submitted with the Vendor's final invoice.

All certificates of insurance shall reference the project/contract number for which the insurance is being provided.

2.28.1.2 Insurer Qualifications

All insurance will be provided through companies authorized to do business in the State of Connecticut and minimally have an A.M. Best rating of A:VI. In addition, certified copies of all insurance policies required will be provided to the City within ten (10) days of the City's written request for those copies.

2.28.1.4 Insurance Primary

All coverages required of the Vendor will be primary over any insurance or self insurance program carried by the City.

2.28.1.5 No Reduction or Limit of Obligation

By requiring insurance, the City does not represent that coverage and limits will necessarily be adequate to protect the Vendor. Insurance effected or procured by the Vendor will not reduce or limit the Vendor's contractual obligation to indemnify and defend the City for claims or suits that result from or are connected with the performance of this agreement.

2.28.1.6 Additional Insured

To the extent commercially available at no additional cost, the policy or policies providing insurance as required, with the exception of professional liability (if applicable) and workers' compensation will defend and include the City and its officials, officers, employees, agents, and

volunteers as additional insured's on a primary basis for work performed under or incidental to this agreement. The form of the additional insured endorsement will be the most recent edition of ACCORD form or its equivalent. If the additional insured has other insurance applicable to the loss, it will be on an excess or contingent basis. The amount of Vendor's insurance will not be reduced by the existence of such other insurance.

2.28.1.7 Duration of Coverage

All required coverages will be maintained without interruption during the entire term of this agreement, plus an additional three (3) years for products and completed operations coverage, following final acceptance of the project by the City.

2.28.1.8 Continuous Operation

The Vendor's general liability insurance policy must be endorsed to reflect the fact that the City and any tenants will continue to operate business activities of the Vendor and that no property used in connection with the City and tenants' activities will be considered by the Vendor's insurance company as being in the care, custody, or control of the Vendor.

2.28.1.9 Retroactive Date & Extended Reporting Period

If any insurance required here is to be issued or renewed on a claims-made form as opposed to the occurrence form, the retroactive date for coverage will be no later than the commencement date of the project and will state that in the event of cancellation or nonrenewal, the discovery period for insurance evidencing coverage for each subcontractor.

2.28.1.10 Subcontractor's Insurance

The Vendor will cause each subcontractor employed by the Vendor to purchase and maintain insurance of the types specified below. When requested by the City, the Vendor will furnish copies of certificates of insurance evidencing coverage for each subcontractor.

2.28.1.11 Joint Ventures

If the Vendor is a joint venture involving 2 or more entities, then each independent entity will satisfy the limits and coverages specified here or the joint venture will be named insured under each policy specified.

2.28.1.12 Waiver of Subrogation

The Vendor will require all insurance policies in any way related to the work and secured and maintained by the Vendor to include clauses stating each underwriter will waive all rights of recovery, under subrogation or otherwise, against the City. The Vendor will require of subcontractors, by appropriate written agreements, similar waivers each in favor of all parties enumerated in this section.

2.28.1.13 Cooperation

The Vendor and the City agree to fully cooperate, participate, and comply with all reasonable requirements and recommendations of the insurers and insurance brokers issuing or arranging for issuance of the policies required here, in all areas of safety, insurance program administration, claim reporting and investigating, and audit procedures.

2.28.1.14 Adjustment of Losses

Any loss insured under the policies required here will be adjusted by the Vendor and the City, as their interest may appear, and made payable to the Vendor as trustee for the insureds as their interest may appear, subject to the requirements of any applicable mortgagee clause. The Vendor, as trustee, will have the power to adjust and settle any loss with the insurers unless one of the parties in interest objects in writing within five (5) days after the loss to the Vendor's exercise of this power. If such objection is made, an arbitrator mutually acceptable to the parties in interest and the Vendor will be chosen promptly. The Vendor, as trustee, will in such case make settlement with the insurers in accordance with the directions of such arbitrator. If distribution of the insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

2.28.1.15 Replenishments of Limits

At the Vendor's expense, all limits must be replenished immediately upon the insurer's reductions in limits due to claims on this project or any other project. Failure to do so may result in cancellation of this agreement at the City's sole discretion. If the Vendor fails to renew, replace or replenish the coverages required, the City may do on the Vendor's behalf and deduct the cost from the Vendor's payments.

2.29 INSURANCE AFFIDAVIT

All vendors shall complete this form, which can be found at the end of this section. The completed form shall be included in the response immediately following the cover letter. This form is a mandatory requirement of this RFP. The original signature form shall be included in the original signature copy of the response.

2.30 PERFORMANCE BOND AFFIDAVIT

All vendors shall complete this form, which can be found at the end of this section. The completed form shall be included in the response immediately following the cover letter.

NOTE: This form is a mandatory requirement of this RFP. The original signature form shall be included in the original signature copy of the response.

2.31 AUTHORIZED REPRESENTATIVE AFFIDAVIT

A duly authorized officer or representative of the Vendor, whose signature is binding on the response, shall sign the response.

All vendors shall complete this form, which can be found at the end of this section. The completed form shall be included in the response following the cover letter.

NOTE: This form is a mandatory requirement of this RFP. The original signature form shall be included in the original signature copy of the response.

2.32 NON-COLLUSION AFFIDAVIT

All vendors shall complete this form, which can be found at the end of this section. The completed form shall be included in the response immediately following the cover letter.

NOTE: This form is a mandatory requirement of this RFP. The original signature form shall be included in the original signature copy of the response.

INSURANCE AFFIDAVIT

I, the undersigned agent, certify that the insurance requirements contained in this REQUEST FOR PROPOSAL (RFP) document have been reviewed by me with the below identified Vendor. If the below identified Vendor is awarded this contract by the City of New Britain, CT, I will be able, within ten (10) days after Vendor is notified of such award, to furnish a valid insurance certificate to the City meeting all of the requirements contained in this RFP. (Please type or print clearly)

Agent Signature

Agent Name

Name of Agency

Address

City/State/Zip

Agent Phone Number

Vendor Name

SUBSCRIBED AND SWORN to before me by the above named on the _____ day of

_____, 2012_____.

Notary Public in the for the

State of

PERFORMANCE BOND AFFIDAVIT

I, the undersigned agent, certify that the Performance Bond requirement contained in this REQUEST FOR PROPOSAL (RFP) document has been reviewed by me with the below identified Vendor. If the below identified Vendor is awarded this contract by the City of New Britain, CT, I will be able, within ten (10) days after Vendor is notified of such award, to furnish a valid Performance Bond to the City meeting the requirement contained in this RFP. (Please type or print clearly)

Agent Signature

Agent Name

Name of Agency

Address

City/State/Zip

Agent's Phone Number

Vendor's Name

SUBSCRIBED AND SWORN to before me by the above named on the _____ day of

_____, 2012_____.

Notary Public in the for the

State of

AUTHORIZED REPRESENTATIVE AFFIDAVIT

The undersigned offers and agrees to furnish all of the equipment/services upon which prices are stated in the accompanying response. The undersigned certifies that he/she is a duly authorized officer or representative of the Vendor and is duly authorized to execute the foregoing on behalf of the Vendor. (Please type or print clearly)

Representative Signature

Representative Name

Title

Name of Vendor

Address

City/State/Zip

Phone Number

SUBSCRIBED AND SWORN to before me by the above named on the _____ day of

_____, 2012_____.

Notary Public in the for the

State of

NON-COLLUSION AFFIDAVIT

I hereby certify that the foregoing response has not been prepared in collusion with any other Vendor or other person or persons engaged in the same line of business prior to the official opening of this invitation. Further, I certify that the Vendor is not now, nor has been, for the past six (6) months, directly or indirectly concerned in any pool or agreement or combination, to control the price of services/commodities offered, or to influence any person or persons to offer or not to offer thereon. (Please type or print clearly)

Signature

Name

Title

Name of Vendor

Address

City/State/Zip

Phone Number

SUBSCRIBED AND SWORN to before me by the above named on the _____ day of

_____, 2012 _____.

Notary Public in the for the

State of

3.0 800 MHz P25 PHASE 1 DIGITAL LINEAR SIMULCAST TRUNKED RADIO SYSTEM

3.1 GENERAL SYSTEM OVERVIEW – DESIGN CONCEPT

The City of New Britain seeks to acquire and implement a new 800 MHz P25 Phase 1 digital linear simulcast trunked radio system, hereinafter known as the SYSTEM (upper or lower case) that will replace the existing trunked and conventional systems that are currently being utilized by agencies of the City.

It is expected that this **system** will provide reliable, consistent in-building portable radio coverage throughout the City.

It is the desire of the City to incorporate, at a minimum, into the new 800 MHz radio system all of the functionality of the existing trunked and conventional systems currently in used by the trunked and conventional systems.

It is not the City's intent, by accepting a new technology, to find itself in a position where any functionality is lost. Further, the City does not find it desirable to have to maintain multiple systems and infrastructures. The successful contractor will be expected to provide cost-effective solutions to this problem.

The new system will be installed while the current systems are still in place and operating. There is, however, a sense of urgency to abandon the current 800 MHz trunked system and its subscribers which are well past life expectancy. Vendors are encouraged to developed offerings that will provide for a rapid system installation, even if incomplete, that exceeds the coverage and capability of the existing trunked system. The City would consider pooling radios for police and EMS to facilitate this approach. This approach can also include conventional system approaches as an interim measure. Based on timetable, the existing dispatch center could be run from control stations while maintaining existing console equipment during conversion. It is the intention of the City to install new console and control equipment at its new Public Safety Telecommunications Center currently under construction on Chestnut Street in New Britain. That facility is scheduled for occupancy in late October of 2012.

The system is intended to support the City well into this millennium. System size, capacity, functionality and flexibility must be sufficient to support the City's growth and changing needs, as well as the possibility of other agencies within the City participating in the system. The design approach shall have the flexibility to accommodate additional users, which may enter the system at a later time. In particular, the system offering must be capable of upgrade via software to a Phase II system. The costs for this upgrade must be listed as an option and the vendor must be able to offer this upgrade within 12 months from the date of the proposal. The City, may, at its exclusive option, elect to move to Phase II as a part of the initial implementation.

The City seeks a system design that will:

- use its existing pool of six 800 MHz frequencies
- use proposed and additional radio sites
- use a multimode connectivity backbone with fiber, 11 GHz microwave, 5.8 GHz links, and other broadband links.

- provide Citywide simulcast operation

If other alternatives exist, vendors are encouraged to present them as proposed solutions. Proposals shall include a description of other alternatives proposed.

The 800 MHz trunked radio system architecture shall, at a minimum, be fully compliant with Project 25 Phase One requirements for public safety land mobile radio systems and specifically excludes commercial LTR systems. The equipment must be software upgradeable to P25 Phase 2.

The City's dispatch operations are operated and managed by the New Britain Public Safety Telecommunications Center (PSTC), a separate municipal agency of local government. The City is in the process of constructing a new facility to house both police and emergency communications operations. That facility will host the console hardware, networking, and will provide a control site on an adjacent building. The facility will also be equipped with control stations designed for both operational and EOC use as well as remote control as a back-up to console operations. This approach is detailed further in this RFP. Vendors are cautioned that throughout the implementation of this project, existing operations should not be disrupted. The PSTC must remain operational during the installation.

The City has determined that competition in the procurement of subscriber equipment in the future is of importance to its operations. While the City understands that the base station and interconnecting infrastructure comprising the initial system may contain certain unique and proprietary technologies, the future addition of subscriber units must be open to competition from multiple manufacturers.

Vendors shall name in the proposal other manufacturers who have obtained the necessary technology licenses and who are manufacturing, or have proposed the manufacture of, compatible subscriber equipment. Mobile radios, portable radios, control stations and conventional base stations are of interest to the City.

3.2 800 MHz SIMULCAST OPERATION

The 800 MHz system shall be designed and operated as a multi-site linear simulcast operation with no less than three working sites and one control site as previously described. The design shall employ linear simulcast for all base and repeater operations on 800 MHz. All equipment shall meet or exceed the standards and functionality described in the P25 Phase I specification and as articulated in Appendix A (Statement of Technical Requirements). Trunked repeaters shall be managed by the Master Network Switch and/or Primary Site Trunked Controller that selects the communications channel. The network switch fabric shall be non-blocking and provide real time voice management. When a request for communications from a field unit occurs, the switch system shall acknowledge the request and assign an idle channel for communications. The proper talkgroup also shall be assigned. At any place in this specification where the term controller is used, it shall mean a network switch or core switch capable of voice and data traffic.

Special Note: *The City has an option available to it under the Public Safety Interoperability Communications program sponsored by the former State of Connecticut Department of Emergency Management and Homeland Security to use switch services from the State of Connecticut Department of Public Safety. The Department of Public Safety has installed an*

interoperable switch for its own use and use by municipalities. Each vendor shall examine this opportunity and provide it as an active option to this proposal. Vendors are free to describe savings or added costs and performance consequences of operating the trunked system via this switch rather than a locally resident core.

The system shall allow a transmitting unit access to an available channel and unmute a receiving units speaker with the transmitting units audio, within 500 milliseconds of the transmitting units Push-To-Talk (PTT). Should system traffic be at a level where all channels are busy, the system will automatically give preference to higher priority units attempting access per the P25 requirement. The system shall indicate to the user that channels are busy, that the unit is placed in queue and will be offered a channel in a call back mode. The vendor shall describe in the proposal the extent of priority the system offers.

The mobile and portable units shall be equipped with a dedicated switch or function that allows emergency access. The switch shall be easily accessed, but minimizing the chances for accidental activation. Upon emergency activation, the field unit shall transmit the emergency message on a periodic basis until acknowledged by the console operator (dispatcher).

3.2.1 SYSTEM OPERATING MODES

The trunked radio system shall be capable of operating in the following modes:

3.2.1 Trunked Mode

Day-to-day communications by all users occur using this mode. While in the trunked mode, the system should initially provide for the control of trunked channels at all sites. Expansion capabilities to support additional channels and dispatch consoles that may be required in the future. Vendors shall describe in the proposal expansion capabilities and limitations of the hardware being supplied, detailing maximum number or combinations of simulcast sites, non-simulcast sites/sub-systems, channels, dispatch positions and subscriber units.

3.2.1.1 Talk-around Mode

The mobile, portable and control station radios shall be capable of transmitting and receiving on the repeater's transmit frequencies for localized communications. The talk-around mode, which shall be user selectable shall provide simplex radio channels for direct communications between subscriber units.

3.2.2 Failure Mode

The trunking controller assembly shall employ redundant design to ensure that a single point of failure does not result in any complete system failure. Should the system encounter a controller failure, the system should not lose any system features and shall continue to function in the trunked mode with all features operational. Vendors are required to clearly designate their failure mode as failsafe. Failure mode operation can also occur when the trunked backbone fails. In this mode, the vendor has to describe the means of continuing communications, recovery, and any consequences. For example, in a serious failure and if all base stations are operational, the system might utilize all repeater stations to provide communications. The console dispatch operation might continue to be able to talk (Tx/Rx) into the system during this mode of operation. Dispatching should not be orphaned during any mode of operation. The assignment of repeater stations to other user groups shall be approved by the City during the development of the talkgroup mapping. Each vendor shall describe in detail their level of fault tolerance and the impact of unit failures of critical components.

A Vulnerability Matrix is required from each vendor which lists the potential faults on one axis and the consequences and mitigations on the other.

3.2.2.4 System Programming

Programming of system operational parameters shall be provided by a graphical user interface on P25 network switch computer to be located at the PSTC. The system switch shall be fully redundant and shall have complete fault tolerance to an availability of five 9's (99.999% available). This switch shall be accessible by authorized personal computers and shall provide for "user friendly" operation by trained personnel. Access to system programming functions shall be protected by password security. Hard copy printout of programming functions or data via a networked laser printer is required. Vendors are not required to supply the laser printer.

To facilitate interoperability, system management shall be capable of being partitioned. Manager partitioning shall allow different City Agency managers to control their user database independently of another. The system shall allow the partitioning of subscribers and sub-system infrastructures. Partitioning shall be defined and protected by a user name and a respective password. Partitioning shall allow access to as well as prohibit users from different sub-systems, programming and system management areas, and subscriber ID ranges (talkgroup and individual ID ranges).

3.2.2.6 Minimum Specifications

Power Supply - Primary 120 V.A.C., 60 Hertz. Power supply to be protected by an uninterruptable power supply that will provide filtering of line voltage and will automatically switch to a battery supply/inverter upon failure of commercial power. An external bypass switch to allow maintenance or disablement of the U.P.S. shall be provided.

Environmental - The Master Network and/or Primary Site controller and any auxiliary controllers required at remote base station/receiver sites shall be designed to operate under the following conditions:

- Temperature: -30°C to +60°C
- Humidity: 90% non condensing
- RF Fields: Equipment shall be properly shielded to allow proper operation in equipment rooms or buildings occupied by base station transmitters, with associated strong R.F. fields.

Duty Cycle - Equipment proposed by Vendors shall be rated for continuous duty.

Radio Channel/Site Expansion Capabilities - The Network control function and any auxiliary control functions shall provide for expansion to 20 radio channels of operation at a minimum without major hardware modifications. Modular construction with plug-in circuit cards is required.

IP Interfaces - All necessary interfaces with base repeaters, peripheral computer hardware or the radio interconnect system shall be IP provided by the Successful Contractor. Interfaces shall include cabling, all of which shall be identified by the Vendor's functional diagrams of the system.

Alarms & Diagnostics - The Network controller and its associated subsystems shall provide alarms for key operational parameters, and shall provide for remote inquiry, display, disablement and diagnostic functions via LAN connections and dial-up modem. Alarms shall be displayed at a supervisory position in Dispatch Center, System Manager's office, and in the Radio Equipment room at the PSTC.

3.3 SYSTEM MANAGER/INFORMATION MANAGEMENT SYSTEM

The intent of this section is to describe a fully interactive and complete System Manager/Information Management System and Local Alarm and Control System. Both functionalities will be principal tools to assist the City of New Britain in the provisioning, maintaining the performance, availability, and the integrity of the proposed equipment, including the transmission network, multiplex equipment, power equipment, and various other system components and housekeeping functions.

The radio system is comprised of subsystems, such as 800MHz radio, T1 links, shelters, emergency generators, antenna systems, routers and switches, and towers. Each of these subsystems needs to be remotely monitored, in real-time, and controlled for management and maintenance purposes. The preferred means of network fault notification shall be SNMP over a robust, redundant IP network.

The following sections describe the two elements that comprise the proposed network: [1] 800MHz trunked radio system management, and [2] site monitoring and control requirements.

3.3.1 800 MHz RADIO SYSTEM SM/ISM

The system shall incorporate a graphical user interface (GUI) system manager/information management system to set selected parameters and allow the supervisory personnel to control and analyze system operation. It shall provide to a single terminal, alarm conditions of board level failures of all network elements. Access to the management system shall be controlled through the use of an encrypted password (not displayed on the screen).

The system shall be capable of a remote system manager user terminal without degradation of terminal performance. A remote user device shall be capable of performing /accessing all the same functions/information that a local device can. The speed of the remote device shall be equivalent to that of local devices and the accessing of information shall not be noticeably different in physical appearance or access time. The remote access shall occur over a T1 or greater speed data circuit, or any broadband path including shared broadband. The remote device shall be implemented so that a user cannot determine whether they are using a local or remote terminal.

Vendors are to integrate their proposed radio IP network with a selected segment of the City's public safety network. The principal purpose of this integration is to allow selected users to operate the system from their desktops without requiring specialized devices. Browser based software for user access is the preferred approach. Vendors should describe their approach to system management, user access, and configuration in detail.

The City desires access to the radio system management and diagnostic functions for administrative and maintenance purposes from existing networked workstations through the

existing LAN. Proposals shall describe how the Vendors propose to achieve this requirement and if there are any limitations to the access of these functions.

If the radio console system architecture is networked based between the main console electronics and the operator positions, the Vendors shall not use the existing LAN.

Required system manager capabilities as a minimum must include:

System Configuration - must be able to control all of the programmable features of the radio IP network and the radio infrastructure.

Subscriber Management – must be able to allow an operator to view, set, or modify the talkgroup ID's, and the unique ID permission.

Manager Partitioning - System subscriber management functions shall be capable of user (agency) partitioning. Manager partitioning shall allow a user to view, set or modify subscriber information pertaining to a particular agency while restricting access to other agencies. The highest level manager shall be capable of viewing all subscriber information. Partitioning shall allow access to as well as prohibit users from different sub-systems, programming and system management areas, and subscriber ID ranges (talkgroups and individual ID ranges)

Diagnostic Management - shall allow an operator to view current status and status history of the system. It shall also allow for diagnostics to be performed on network devices (i.e. site controllers, base stations, comparators, etc..)

Dynamic Radio Commands - regrouping of system users, including the ability to predefine, store, and implement regrouping plans as needed. Sending and receiving of status messages to and from subscriber units. Selective radio status information regarding radio's operating status (i.e. on/off, inhibited), last talkgroup affiliation and last site registration.

Selective inhibit/uninhibit of control stations, mobile and handheld radios and trunked repeaters. Field equipment shall be equipped to respond to the system manager commands.

Activity reporting by unit, talkgroup, department (if available), and system wide.

User database maintenance with automatic sharing of data and updates between the console electronics and the trunking system.

Site Activity monitor to display the status and activity of all RF channels of the active sites.

Capability of automatically updating the backup site controller when data base changes are made.

System manager devices are only required if the vendor's software and associated applications require specific host devices. If services are provided via a browser from an aggregated server or cluster of services, then only the server and clustering hardware will be required.

3.3.2 SITE MONITORING AND CONTROL SYSTEM REQUIREMENTS

The system shall provide the capability of automatically monitoring in real-time the status of various infrastructure components. In addition, remote control functions of site elements are also required. The Vendor shall describe in detail how they accomplish this mission and with what equipment. At minimum the following items require monitoring:

Monitoring points:	Communication links [T1s or other broadband] to base station sites, RF transmission line sensors, channel banks, door entry, smoke/fire detection, loss of commercial power, generator on-line, high/low temperature, UPS systems, tower lights tower top amplifier, receiver multicoupler, site frequency standard, and any other mission critical component.
Control Points:	Generator test/run, low fuel, unlock door, high temperature
GPS Clock:	The radio system shall be supplied with a Spectracom GPS clock and time server (Model #9483) or equivalent which meets the requirements of NENA PSAP Master Clock Standard #04-002 and NENA Security Standard #75-001. The system shall provide a minimum of three internet ports. The system shall be rack mountable for an EIA 19" rack.

3.4 800 MHz P25 TRUNKED REPEATERS

3.4.1 ELECTRICAL & MECHANICAL CHARACTERISTICS

The repeater equipment shall be rated for and capable of continuous duty operations.

The physical and electrical architecture of the repeaters shall be such that addition of control circuitry and/or functions at future dates shall not require addition and/or replacement of circuit card shelves and/or chassis assemblies.

To the greatest extent feasible, all equipment assemblies and subassemblies shall be shielded to minimize electromagnetic interference that may be caused to/by electrical equipment co-located and/or adjacent to the repeater.

If microprocessor based equipment is provided, firmware or software used to determine the various functions to be performed shall be field programmable or variable through the use of Electronically Erasable Programmable Read Only Memory (EEPROM) circuits.

It is a critical requirement that power loss or surges shall not alter the repeater software or operating parameters.

3.4.2 POWER SUPPLY

The power supply shall be of completely solid state design and shall operate from nominal 120 VAC at 60 Hz, single phase.

3.4.3 EQUIPMENT HOUSING

Repeaters shall be housed in an EIA standard closed 19" rack cabinet. Station equipment size shall allow for mounting of at least four (4) 100 Watt stations per 72" rack. Each rack shall be equipped with a minimum of two power distribution units with a minimum of six outlets each. These racks shall be equipped with fan cooling units. All racks shall be keyed identically and three keys shall be made available to the City PSTC.

3.4.4 STATION ACCESSORIES

A rack mounted AC power utility strip, with a minimum of four (4) outlets, shall be mounted at the top of each repeater rack.

Each station shall be equipped with the means of determining forward and reflected power of each transmitter.

Central metering, alignment, programming and diagnostic information of all essential circuits shall be provided. This functionality shall be accessible and adjustable electronically by service personnel, via RS-232 serial or IP connection. The connection shall be accessible without the need to remove RF chassis shields or equipment circuit boards. Any external software, hardware and/or cables needed to perform these functions shall be specified and provided on a per site basis (not to include a PC).

For local control operation and for servicing, each base station shall be provided with a monitor speaker. The audio output level shall be rated at no less than ½ watt, and is provided with a volume control. Each base station site shall be provided with three (3) test microphones, any of which can be used to test or service any repeater at the site.

3.5 ANTENNA SYSTEMS

3.5.1 GENERAL

The 800 MHz antenna system design shall be specified by the vendor to provide for balanced 'TALKOUT' & 'TALKBACK' communications only. At the main radio sites, separate antennas shall be used for transmit with combiners and receive with multi-couplers.

The vendors have the option to select any antenna or configuration to reduce the potential for intermodulation or receiver desensitization, and to provide the required coverage within the restraints of the FCC license, if any. Only combiners and multiplexers made by TX/RX Systems or Andrew shall be used. Vendors shall propose models that are equipped for the channels proposed at each site, and are expandable.

The antenna systems shall be provided with any and all necessary lightning and power surge protection devices.

Vendors shall state the manufacturer and model number of the antenna(s) being proposed at each site.

3.5.2 TRANSMISSION LINE & ACCESSORIES

The successful contractor shall supply specify the coaxial antenna transmission lines which shall be furnished and installed by the site developer. Vendors shall state the size and type of transmission line being proposed at each site. RF sensors shall also be provided for each transmission line provided and monitored by the alarm system.

All connectors used shall be type "N", or "BNC", and must be fully compatible with directly associated equipment or jumpers in the system. Connectors must be of non-ferrous construction. No splices or adapters shall be used under any circumstance. However, it is permissible to utilize different connectors on opposite ends of a cable to avoid the use of adapters. When transforming from one diameter cable to another, it is acceptable to use

flange reducers, so long as the cable V.S.W.R. specification is not changed.

Furnishing and installation of combiners, multi-couplers, and pre-amp equipment is the responsibility of the successful contractor and not the site developer.

3.5.3 TRANSMITTER COMBINER

The Vendor shall propose for all radio sites including the control site a transmitter combiner. The combiner shall be manufactured by TX-RX Systems or an approved equal. The Vendor shall state the manufacturer and model number of the transmitter combiner at each site.

3.5.4 RECEIVER MULTICOUPLER

The vendor shall propose for all radio sites including the control site a receiver multicoupler. The multicoupler shall be manufactured by TX-RX Systems or an approved equal. The Vendor shall state the manufacturer and model number of the receiver multicoupler system being proposed at each site.

3.5.5 RECEIVER PRE-AMPLIFIER

The vendor shall propose equipment that utilizes low noise tower top mounted amplifiers, if needed, to provide for a balanced system. Redundant amplifiers and window filters shall be used in the tower mounted assembly. Amplifiers shall be manufactured by TX-RX Systems or an approved equal. The Vendor shall state the manufacturer and model number of the tower top amplifier system being proposed at each site.

Automatic switchover to the standby amplifier shall be provided, and the means to accomplish the switchover shall be described in the proposal. Indication of primary amplifier failure shall be provided via the site alarm system(s). Manual switchover shall also be provided at the control panel, with indication of the amplifier in use.

3.6 EQUIPMENT SITE CONNECTIVITY

The system shall use a combination of connectivity approaches. They include:

1. Fiber from the control site to The Hospital of Central Connecticut. This is fiber that is owned by the City of New Britain. The City has reserved six fibers available for this purpose.
2. Fiber from the control site to the radio control facility within the PSTC inside of the new Police Headquarters. This is fiber that is owned by the City of New Britain. The City has reserved six fibers available for this purpose.
3. There is an 11 GHz Alcatel microwave system (11365.0 GHZ WQKB536) currently in use between the Hospital of Central Connecticut and the current Police Headquarters. This system shall be relocated to the control site and used to connect to the Elam Street facility. The successful vendor shall be responsible for relocating and relicensing this system.
4. There is currently no connectivity in place for the Fire Station #7 site. This is the vendor's responsibility. The vendor may propose a 5.8 GHz system from the Elam Street Water facility OR it may recommend leased T-1 connectivity between the site and the control site OR it may recommend another hop on the microwave system.

The installation and recurring costs charged by the T-1 service provider shall be borne by the City. All city owned fiber is single mode.

4.0 SYSTEM PERFORMANCE REQUIREMENTS AND SITE FACILITIES

4.1 SYSTEM PERFORMANCE REQUIREMENTS AND SITES FACILITIES

It is the intent of the City to acquire and install a 6 channel 800 MHz Linear Simulcast P25 Phase I Trunked Radio System in support of the City's public safety and public service agencies. The system shall guarantee portable in-building radio coverage reliability within the jurisdictional boundaries of the City. The City, at its option, may elect to proceed with a P25 Phase 2 system immediately or within 12 months.

If the system supplied fails to meet the radio coverage reliability specified herein, any and all additions, changes, modifications, improvements, enhancements, etc., to the configuration of the 800 MHz radio infrastructure in order to meet the stated radio coverage requirement, shall be the responsibility of the Contractor at the Contractor's expense.

4.2 RADIO COVERAGE

4.2.1 MINIMUM COVERAGE

Coverage is defined as the minimum usable radio signal required to provide a clear message that is readable and each word is understood in spite of slight background noise. For this project, the quality of messages sought for all communications (mobile and portable) is a digital audio quality of 3.4 or better. The 800 MHz infrastructure shall provide guaranteed 97% area reliability portable in-building radio coverage inside of 16 dB buildings within the jurisdictional boundaries of the City of New Britain. For this project, the jurisdictional boundaries of the City shall be defined as the City limits plus 3 miles. However, the coverage requirements for out of town are limited to on street coverage rather than in-building coverage.

Reliable two-way radio coverage is the foundation of any public safety and local government radio communications system. The purpose of this section in the RFP is to clearly articulate the City's radio coverage requirements for the new system so that proposers can develop their system offerings with a clear understanding of the City's expectations and requirements. The City has already defined the following sites as available and ready for site development:

- The Hospital of Central Connecticut
- Water Tank on Elam Street operated by the New Britain Water Department
- New Tower Proposed adjacent to Fire Station #7 on Stanley Street in New Britain

In addition, a control site is proposed atop the D'Amato Apartments at 40 Chestnut Street, New Britain operated by the New Britain Housing Authority. This site will connect via fiber optic cable to the Public Safety Telecommunications Center on the fourth floor of Police Headquarters. (That facility is currently under construction and scheduled for occupancy in late November of 2012). More details on these sites are provided in later sections.

Coverage Definition

Coverage is defined as the ability to successfully complete inbound (field to dispatch) outbound, (dispatch to field), and radio to radio voice communications in a repeat mode via the system infrastructure throughout the designated areas, standing still, and while in motion, with at least the minimum required level of audio quality (per TIA /TSB-88 or latest approved version DAQ) and with at least the specified level of propagation reliability stated in this Section. This level

of performance is required for analog, digital, and digitally encrypted modes of operation.

Audio Quality

Vendors are will be required to submit with their proposals their recorded samples of analog and digital voice messages for the following DAQ levels:

- DAQ 2.0
- DAQ 3.0
- DAQ 3.4
- DAQ 4.0
- DAQ 5.0

For reference, the DAQ definitions, as defined in Bulletin TSB-88 are listed below:

TSB - 88			
Digital Audio Quality for P25 Digital Radio			
Vocoders			
	Phase 1 C4FM	Phase 2 HDQPSK	Phase 2 HCPM
DAQ 3	2.60%	3.10%	3.30%
DAQ 3.4	2.00%	2.40%	2.60%
DAQ 4	1.00%	1.20%	1.40%

Delivered Audio Quality Subjective Performance Description

DAQ 5.0 Speech easily understood.

DAQ 4.5 Speech easily understood. Infrequent Noise/Distortion.

DAQ 4.0 Speech easily understood. Occasional Noise/Distortion.

DAQ 3.4 Speech understandable with repetition only rarely required. Some Noise/Distortion. Worst Case.

DAQ 3.0 Speech understandable with slight effort. Occasional repetition required due to noise/distortion.

DAQ 2.0 Understandable with considerable effort. Frequent repetition due to Noise/Distortion.

DAQ 1.0 Unusable, speech present but unreadable.

Radio Signal Strength Indication

The radio signal strength required to meet the standard of not less than DAQ 3.4 shall be set at -95 dBm per NFPA specification. This standard shall be met 97% of the time for all tests and no exterior adjacent city block shall fail below this standard and no more than 1% of city blocks shall fall below DAQ 3.0. The contractor will be required to take steps to remediate all coverage issues that result in less than 3.4 DAQ and in excess of -102 dBm. The sole expense for remediation shall rest with the contractor. The City will exempt the following from testing:

- Basements and sub-basements and other subterranean occupancies
- Tunnels and highway underpasses
- Elevators
- Vaults that include lead shielding including those in medical facilities
- Subway structures including the municipal utility system and the utility system at CCSU.

Coverage Reliability

All references to coverage reliability in this document refer to area reliability. For example, the phrase "97% coverage" indicates that 97% of the bounded areas described shall exhibit the specified coverage resulting in a DAQ 3.4 at least 95% of the time. It will not be acceptable to provide a design where two or more adjacent failed grids exist, that is, failed points shall not be unique to any one area, while still meeting the overall coverage reliability goals.

Mobile Radio Coverage

Mobile coverage performance will be expected to exceed and extend beyond the range of portable radios. New Britain public safety units (police, fire, EMS) currently utilize low silhouette "blade type" radio antennas typically mounted on the trunk lid of police vehicles and roof of the cab on fire apparatus and ambulances. The City wishes to continue this practice; therefore the antennas for these units shall be of this type. However, in the event that coverage testing indicates potential performance improvements by conversion to a different antenna the City is open to such proposals.

Portable Radio Coverage On-Street

Portable radio coverage on-street shall be provided with the portable radio and antenna worn on the waist (3' AGL) throughout the City. For day-to-day operation, some user agencies may use speaker/microphones with antennas, however for system design, radio coverage prediction, proposal development and system acceptance testing, speaker/ microphones with antennas on the mic shall not be used. The radio will be positioned at belt level with the antenna. Unusually large portable radio antennas may present operational problems for some user personnel. Proposers must clearly identify the specific antenna proposed for this project and must provide sample radios with the proposed antenna at their oral presentation after submission of a system proposal. Other portable radio antennas that are not proposed shall not be shown at the oral presentations.

Some vendors state that their portable radio carrying devices impact coverage performance. To eliminate ambiguity in this area, the City is requiring that the system design be based on a "belt clip" carrying device. If the carrying devices for your portable radio (leather case with swivel attachment, etc.) have an impact on coverage performance, such impact shall be clearly described in the section of your proposal that includes your proposed coverage maps. It is important that the system design be based on real-world operational characteristics and a "worst case" carrying device which will be defined as the belt clip device.

In-Building Coverage

In-Building Coverage – 10 dB Structures (Typically residential structures)

Coverage is required for portable radios worn on the belt within residential or other structures, defined as buildings with 10 dB or less penetration loss.

In-Building Coverage – 20 dB Structures (Typically medium to heavy structures)

A system infrastructure baseline of 20 dB in-building coverage is required for portable radios worn on the belt while operating within structures having up to 20 dB of penetration loss. A measure of 16 dB structures should be the basis for system design and coverage across the City without secondary propagation methods.

Special Coverage Requirements:

Coverage shall be no less than 97% inside the following buildings:

Common Name	Location
Police Headquarters (new)	121-159 Main Street
City Hall	27 West Main Street
Fire Headquarters	253 Beaver Street
New Britain High School	110 Mill Street
Pulaski Middle School	757 Farmington Av
New Britain Senior Center	55 Pearl Street
Superior Court JD 16	20 Franklin SQ
Fire Station # 2	146 South Main Street
Fire Station # 4	1085 Corbin Av
Fire Station # 5	925 Stanley Street
Fire Station # 7	60 Hartford Road
Fire Station # 8	2155 Corbin Av
Police Athletic League Building	544 Osgood Av
The Hospital of Central Connecticut	100 Grand Street
New Britain Public Library	20 High Street
Szczecny Parking Garage	35 Bank Street
Badalato Parking Garage	35 Washington Street
Blogoslawski Parking Garage	14 Franklin Sq
Public Works Yard Facility	40 Harvard Street
Parks and Recreation Maintenance Yard	Blake Road
New Britain EMS Headquarters	225 Arch street
Central Connecticut State University	1615 Stanley Street
EMS Offsite #1	Jerome Home, 975 Corbin Avenue
EMS Offsite #2	Maintenance Facility, Conoco Dr. (tentative)
Roosevelt Middle School	40 Goodwin Street
Slade Middle School	183 Steele Street
Chamberlain Elementary	120 Newington Av
Diloreto Elementary	732 Slater Rd
Gaffney Elementary	322 Slater Rd
Holmes Elementary	2150 Stanley Street
Jefferson Elementary	140 Horse Plain Rd
Lincoln Elementary	145 Steele Street
Northend Elementary	160 Bassett Street
Smalley Elementary	175 West Street
Smith Elementary	142 Rutherford Street
Vance Elementary	183 Vance Street
EC Goodwin Tech	735 Slater Rd

The listing of buildings is significant. The City prefers that in-building coverage be provided directly by the radio infrastructure. The City also recognizes that even with a baseline system providing 16 dB of in-building coverage, there will still be some buildings within the City that have greater penetration loss. Additional measures may be optionally required to facilitate coverage in these facilities.

To extend coverage beyond the 16 dB level, the City will consider secondary methods of providing heavier coverage within such structures. Such methods which must be presented as additional cost options might include:

- Increasing the baseline coverage of the infrastructure in a particular area of the City to support higher levels of building penetration as required in the immediate downtown area.
- Installation of multi-band channelized bi-directional amplifier systems in selected buildings where building access is permitted. Costs for such solutions shall be provided on a case by case basis so that the City can utilize available funding in a manner that best meets the City's needs.
- Installation of a fiber optic based in-building RF distribution system
- Utilization of vehicular repeater systems or other similar systems to extend tactical on-scene radio coverage into heavy structures Special Note: The City requires a quote on a minimum quantity of eight (8) vehicular repeater systems as a mandatory option.

The City has very few buildings with more than six floors or more than 25,000 square feet on a single floor. Such buildings present significant communication problems for public safety departments when working events inside such facilities, particularly when trying to communicate between the lower floors and upper floors of the facility. It is the intent of the City to resolve such problems to the extent feasible as part of this project. All secondary system approaches will be considered optional.

4.2.2 COVERAGE ACCEPTANCE TESTING

The City will hire a contractor to test every city block at every intersection as well as selected buildings to assure that prior to system acceptance these coverage levels have been completed and certified. The successful vendor is invited to participate in these tests which shall not exceed ten days in duration. Coverage acceptance testing shall be performed during the months of May through August. If the installation schedule does not permit coverage testing to be conducted during these months, then the Contractor is to retest the system during the mentioned months. Total system acceptance will not be granted until the Coverage Acceptance Test Plan has been successfully passed.

Coverage will be tested in two ways:

In-Street Portable and Mobile Coverage

Portable and mobile tests will be performed by traveling over areas throughout the coverage service area. The number of test locations will be based on achieving a high statistical confidence level in the test results. The routes will be run and the test transmissions will be made at random locations without respect to the factors that affect radio propagation loss,

such as natural or man-made obstructions and terrain elevations. Some of these tests will occur within vehicles and others will occur on street. The coverage service area will be divided into city block grids. In order to constitute acceptance, at least 97% of the test locations [grid] must provide an audio quality of DAQ 3.4 or better for voice communications and between -95 dBm and -102 dBm. The portable coverage test shall be considered failed if any two adjacent or contiguous grids, in any horizontal, vertical or diagonal combination, fail to score at least a DAQ 3.4 or better.

Random In-Building Portable Coverage

Random selection of buildings throughout the portable service area will be made. Each building tested must meet 97% reliability overall for the total number of points tested in the building. An equal number of points will be tested on each floor. Elevators and basements are excluded from this test; stairwells are included. Should adequate communications not be achieved (DAQ 3.4) for 97% of test points within a building, then that building shall be identified as a failed test site. In order to constitute acceptance, no more than 5% of buildings tested shall fail.

If the system fails any of the two (2) coverage acceptance test methods described above, then the Contractor shall take corrective action to meet the coverage ATP requirements. This action shall be at no costs to the City, either for corrections or for re-testing of the coverage ATP.

COVERAGE PREDICTIONS

The Vendor's response shall include computer generated radio coverage predictions for each of the 800 MHz radio sites. Predicted coverage contours shall be overlaid on a topographic base map of 1:100,000 scale. For easy visual reference, the outline of the City's boundary shall be clearly highlighted on each map.

Each coverage contour shall be accompanied with its own engineering parameter data sheet. For ease of reference, each map and its corresponding data sheet shall be numbered alike. At a minimum, the sheets shall include the following information:

- site information
- type of coverage (i.e. talkout/talkback)
- propagation model used, calculated radials, terrain database
- reliability/confidence
- antenna mounting heights
- model numbers of antennas, lines, combiner, amplifiers, etc. and associated gains/losses
- system gains, losses & ERP
- identification of the environmental parameters and their associated gains/losses (i.e. foliage, building clutter, etc.)

The following predictions shall be included with the response. For each coverage scenario identified, the worst case of either >TALKOUT= or >TALKBACK= shall be presented. They are:

- portable coverage - in 16 dB buildings
- 97% area reliability
- talkout/talkback to/from antenna at waist level
- individual map per site
- composite for all sites (coverage from each site individually identified)

4.2.3 TESTING ALLOWANCE

The successful bidder is required to provide an allowance of \$25,000 for the City to hire a contractor to assist in the testing of coverage throughout the City. Any balance in this allowance at the end of the project shall be credited to the City. The City shall select and supervise the coverage testing contractor.

4.3 RADIO ANTENNA SITES

Radio antenna sites shall be determined by the vendors but the City has initiated efforts on three sites plus a proposed control site. The following list of sites is offered to prospective vendors for their consideration in the design of the radio system. These candidate sites shall be given primary consideration in the vendor's design.

If some or all of these candidate sites are unsuitable for the vendor's proposed design, prospective vendors are free to propose other radio antenna sites. All other radio antenna sites proposed by the prospective vendors shall be existing and with an antenna support structure. Materials, services and/or site lease costs for these other radio antenna sites shall be included in the cost section of the vendor's response. These costs shall be clearly identified and itemized.

The City is current negotiating the final terms of an agreement with a site developer for four sites in the City. The requirements of the site developer are listed below:

The selected Vendor will be responsible for the installation of all of the vendor supplied Municipal Equipment detailed in this document and any equipment to be removed from the existing facilities on these sites and the current Police Headquarters of the City of New Britain. Power, wiring, and the necessary connections to public utilities are all the responsibility of the successful vendor. The Vendor will supply all of this equipment.

The contractor will coordinate with the City's communications vendor for connection to the City's communications equipment. The towers and masts, equipment shelters and all other associated equipment for the facility will be engineered by the contractor in full cooperation with the City, its Project Manager, and the Project Managers at each of the sites.

EQUIPMENT SHELTER CONTENTS

Each site will be furnished with a complete weatherproof shelter with a interior size of 240 square feet with at least a 84 inch ceiling height. The shelter should be capable of withstanding sustained wind speeds in excess of 100 miles per hour and must be constructed made of materials that can resistant penetration from individual airborne objects as large as baseball. Exterior lights for the facility must be included and must be photosensitive. The doorways to the facility shall be a minimum of 36" wide with a height of 78". Doors shall be fully sealed and airtight. The shelter shall be equipped with a self contained HVAC system with redundant cooling capability. As a failsafe, the shelter shall be equipped with a temperature activated Dayton louver fan with alarm signaling to the City's Public Safety Telecommunications Center. The shelter must be designed to house the following equipment to be provided by the City of New Britain:

- Repeaters (12 in 19" EIA racks)
- System controller
- Routing and switch equipment
- Antenna Combining System
- Receiver Multi-coupler
- HVAC System with redundant cooling
- Alarm Panel
- Internal Grounding System
- Cable Infrastructure
- Space for small desk
- Parts cabinet
- Telephone

The facility shall be provided with a 200 Amp Electrical Service with a minimum of 16 circuit breakers. All power shall be processed through a TVSS (Transient Voltage Surge Suppression) facility to provide for clean power.

The shelter shall be furnished and installed with an ice bridge to the tower or mast to prevent antenna cabling from damage via ice, hail, wind, rain, or debris. The ice bridge shall be designed for the specific purpose intended and shall be made of galvanized or other rust and corrosion free material. All elements of the ice bridge, shelter, generator, and mast must be fully grounded in accordance with the National Electrical Code and ordinances of the City of New Britain. The installation shall meet all National Fire Protection Association rules and regulations for installation of public safety communications facilities.

The successful contractor shall provide for and maintain during the term of agreement an emergency generator capable of operating the entire shelter facility under full power for a period of 120 consecutive hours without interruption. The generator system may be shared among users but priority must be provided to the City's operation. The switch system shall incorporate weekly testing and remote start-up in the event of system failure. The system shall provide contact relays for alerting the City's Public Safety Telecommunications Center of generator testing or power loss. A dual fuel generator is preferred.

At the completion of the development project, all facilities (Towers, Masts, Equipment Shelters, Cabling, site improvements, etc.) will be owned by the City. The City will retain ownership of all

of the equipment it provides. The Vendor will transfer ownership of the antenna, cables and associated system equipment it supplies, including warranties, to the City. The selected contractor will design and construct the towers and masts and associated shelters and site improvements to provide for the City's communications and up to four (4) wireless Service Providers to locate thereon.

The City expects up to four (4) wireless communications Service Providers (carriers) to co-locate on the three of the four new sites. At the completion of the project, the entire facility (towers, equipment shelters and contents, as well as site improvements, etc.) will be owned by the City except as otherwise noted by The Hospital of Central Connecticut on its property. The City will retain ownership of all of the equipment it provides. The Vendor will transfer ownership of the antenna, cables and associated system equipment it supplies, including warranties, as detailed in Exhibit E, to the City. The selected Vendor will design and construct the towers and masts and associated equipment shelters and site improvements to provide for the City's communications and up to four (4) wireless Service Providers to locate thereon.

Final Design - Fully engineered design, certified by a licensed professional engineer, licensed in the State of Connecticut and approved in advance by the City, including but limited to:

- mechanical drawings
- description and assessment of methods of mounting antenna and other associated equipment to the towers and masts, including associated engineering certifications and guarantees to ensure safety and security as well as protection against interruption of the City's public safety communications system.
- structural assessments, including static load and wind-load assessments. utility cable routing
- ground structure detail, including overall site plan and elevation drawings/photographs from enough perspectives to clearly observe all proposed structures, concrete foundation/pad details, etc.

The specific site requirements are as follows:

The Hospital of Central Connecticut

The City plans to continue to use The Hospital of Central Connecticut as its primary site for its 800 MHz P25 Phase 1 Trunked Radio system. That system will include one each transmit and receive 11 foot whip antennas, potentially two 3 foot microwave dishes, two 15 inch microwave dishes, a duplexed 11 foot antenna, and reserved space for public safety LTE in the 700/800 MHz bands as proposed by the Federal Communications Commission and pending in legislation in the Congress of the United States. The City further reserves the right to place one duplex UHF antenna (450 MHz) and one VHF Antenna (168 MHz) at the location at a future date and time. The City prefers the top RAD on the tower for siting its antenna systems. It is the intent of the City to connect from the control site to The Hospital of Central Connecticut via its own fiber optic network. Work is currently underway to accomplish that objective.

Housing Authority of the City of New Britain

The City plans to use the Housing Authority of the City of New Britain at 40 Chestnut Street as a control site for its dispatch and emergency operations centers. As such it will connect those systems via fiber optic cable to the rooftop of the Housing Authority building. The systems to be located there are as follows:

1. 800 MHz control stations for:
 - a. Police patrol
 - b. Police traffic operations
 - c. Police investigations
 - d. EMS
 - e. Fire dispatch
 - f. RAFS West
 - g. ITAC
 - h. ICALL
 - i. EOC 1-7
2. UHF Control Stations
 - a. RAFS West
 - b. MED-9
3. VHF Control Stations
 - a. Inter-City Fire
4. VHF Transmitters
 - a. Region 3 EOC Operations
 - b. Connecticut State Police HotLine
 - c. Hartford County Fire Mutual Aid
5. Microwave
 - a. 11 GHZ transmit and receive (primary control links to the P25 system)
 - b. 4.9 GHZ transmit and receive (backup control links to the P25 system)

It may be possible to combine the 800 MHz control station antennas into an array with an associated multi-coupler. This is a requirement for the P25 radio system. Accordingly, there will be two sets of combined 800 MHz control antennas; one will be directed toward the Hospital of Central Connecticut site while the other will be directed toward the Elam Street Water Tank. The VHF transmitters require individual antennas which will be supplied by the City.

It may be possible to place the microwave antenna dishes on the side and rear façade of the elevator building. The required mast can be placed on the west side of that same structure. The height of the mast is dependent on the likelihood of the combining effort. This question will be answered during the pre-bid meeting.

Roof reinforcement may be necessary depending on engineering review.

Elam Street Water Tank

The Elam Street Water Tank was constructed and has facilities for hosting carrier equipment. It has a steel rail around the entire top of the tank and has cable guides that extend from the interior of the facility to the top of the infrastructure. No drilling is required for cable access. Underground conduit is available for bringing the control lines to the interior of the facility. The equipment shelter must be sited according to the drawing which is available from the Water Department.

The City plans to use the Elam Street Water Tank as a simulcast site for its 800 MHz P25 Phase 1 Trunked Radio system. That system will include one each transmit and receive 11 foot whip

antennas, two 3 foot microwave dishes, two 15 inch microwave dishes, a duplexed 11 foot antenna, and reserved space for public safety LTE in the 700/800 MHz bands as proposed by the Federal Communications Commission and pending in legislation in the Congress of the United States. The City further reserves the right to place one duplex UHF antenna (450 MHz) and one VHF Antenna (168 MHz) at this location at a future date and time.

Fire Station #7 Adjacent Facility

The City plans to use the proposed 120 foot self supporting tower to be constructed adjacent to New Britain Fire Station #7 as a simulcast site for its 800 MHz P25 Phase 1 Trunked Radio system. That system will include one each transmit and receive 11 foot whip antennas, two 3 foot microwave dishes, two 15 inch microwave dishes, a duplexed 11 foot antenna, and reserved space for public safety LTE in the 700/800 MHz bands as proposed by the Federal Communications Commission and pending in legislation in the Congress of the United States. The City further reserves the right to place one duplex UHF antenna (450 MHz) and one VHF Antenna (168 MHz) at this location at a future date and time. The City prefers the top RAD on the tower for siting its antenna systems.

5.0 RADIO COMMUNICATIONS CONSOLES

5.1 GENERAL DESCRIPTION

It is the intent of this section to describe a state-of-the-art IP based radio communications consoles that are user friendly and which will incorporate radio, telephone interface, signaling and other ancillary functions & controls in a manner which will provide simple and efficient operation to the public safety telecommunicators.

The console shall be comprised of control electronics, software, cabling and associated enclosures. Its architecture shall be capable of facilitating future expansion needs in the most efficient and flexible manner; and it shall be in current production and shall be capable of withstanding the environment associated with the delivery of emergency services.

Buttons and LED's consoles are not acceptable and may not be offered.

The console shall be feature & function compatible with the fixed equipment supplied under this contract and with the fixed equipment that is existing.

The City currently operates four (4) primary radio dispatch positions in their Emergency Communications Center (ECC). These positions are supported by a Centracom Series II console as manufactured by Motorola. The City plans for ten (10) positions in the new facility in three different rooms.

Furniture is not required for this equipment. Console furniture will be provided by Eaton (Wright-Line) of Worcester, MA under separate contract. Moreover, the City would prefer to acquire the monitors and personal computers using its own resources. Vendors are required to specify a HP or Dell workstation that will meet or exceed the requirements of the vendor with at least 30% growth.

If other alternatives are feasible, vendors are encouraged to present them as proposed solutions. Proposals shall include a description of other alternatives proposed. Alternatives shall include, at a minimum, the same functionality that currently exists and present pricing options for each of the proposed alternatives.

5.2 DESIRED QUANTITIES

The radio console equipment is as follows:

- A quantity of ten (10) operating positions for the Public Safety Telecommunications Complex in the new facility. (Seven of these require installation in the main dispatch center, one in the PSTC supervisors office, and two in the adjacent Emergency Operations Center. Each console must also be equipped with a corresponding remote control unit connected to a RF control station. The City may elect to reduce this quantity of operating positions for reasons unto itself. The minimum number required by the City for this installation shall be eight (8) operating positions.
- Control equipment must be placed in the designated electronics equipment rooms.
- The City will provide fiber connections to enable connection to any server or control equipment.

5.2.1 SOFT CONSOLES

The City, may at its option, require the provision of a minimum of two “soft” consoles. Such consoles shall operate from laptop computers and shall be capable of controlling a minimum number of channels via a robust IP connection. The typical use of these soft consoles would be in the EOC and in the Police Department’s Mobile Command Post (MCP). The successful vendor shall supply the laptop, software, and any required accessories.

5.3 ELECTRONICS

- 5.3.1 All console electronics shall be IP based state-of-the-art, microprocessor based and use digital audio processing connected to a server or series of servers or equivalent. The City does not seek custom hardware for station electronics. It seeks a personal computer workstation that is capable of multiprocessing, multitasking on a Windows 7 operating system using conventional networking and diagnostic tools. The application running the console activity and the graphical user interface shall employ fault tolerant techniques and shall provide alerts for any pending faults.
- 5.3.2 The main console electronics server shall use a distributed multi-processor architecture and shall employ a physical architecture that consists of electronic assemblies that houses central processing, operator position, radio equipment or auxiliary function interface modules appearing in a graphical form on the display.
- 5.3.3 The physical architecture of the console shall allow for any custom electronics to be placed distantly from the console operator positions.
- 5.3.4 The console central electronics server shall be housed in upright closed equipment cabinets designed for servers in the room reserved within the fourth floor of Police Headquarters for this purpose.
- 5.3.6 All features, functions and operating parameters shall be stored in electrically alterable non-volatile memory technology and shall be field configurable via a GUI user interface.
- 5.3.7 The console shall be equipped with a headset interface that is capable of toggling between telephone audio and radio audio. Two such interfaces shall be supplied for each operating position.

5.4 RELIABILITY & DIAGNOSTICS FEATURES

Due to the critical nature of the communications services provided by the City, a high degree of reliability from the radio console is required. The console, to the greatest extent possible, shall:

- Provide continuous and automatic self testing and diagnosis.
- Provide an alert to all console operators in the event of component or sub-system failure.
- Allow continued operation in the event of failure of a console sub-system, through isolation of the defective sub-system.
- Provide a high degree of modularity to reduce the number of sub-systems

affected by a single component failure.

5.5 MANAGEMENT FEATURES

The console or equivalent system management device shall be equipped to produce usage activity information reports on demand. At a minimum, hourly, daily, weekly and monthly reports shall be possible.

The reports shall include, at a minimum, the following:

- Each event time and date stamped.
- Number of transmissions per position.
- Number of transmissions per channel or talkgroup.
- Total transmission time per position.
- Total transmission time per channel or talkgroup.
- Total receive time per position.
- Total receive time per channel or talkgroup.

Captured activity data shall be able to be reviewed by operator position, channel, time, type of event, etc.

5.6 POWER

- 5.6.1 The equipment shall operate primarily from an external power source supplying a nominal 120 VAC at 60 Hz, single phase.
- 5.6.2 Power losses, restorals, surges, sags and/or brownouts shall not alter the system software and/or operating parameters. Other than total power loss or lethal surges, the console shall remain fully operational while experiencing any of these occurrences within the specifications of its design.
- 5.6.3 The power sub-system of the console electronics shall consist of hot-standby power supplies or hot-parallel power supplies.
- 5.6.4 If hot-standby power supplies are provided, the transition from the primary to the standby power supply shall not cause the consoles to lose and/or reset any of its functional and/or operational capabilities.
- All console operators shall be alerted of the transition to the standby power supply and shall also be alerted of the failure of the hot standby power supply when the primary power supply is in use.
- 5.6.5 If hot-parallel power supplies are provided, failure of one of the supplies shall not cause the consoles to lose and/or reset any of its functional and/or operational capabilities.
- All console operators shall be alerted of the failure of any one of the power supplies.
- 5.6.6 All main console electronics will be connected to the City's UPS system. The system supports 100 kW of power.

5.7 PC MONITORS

- 5.7.1 Each operator position shall be equipped with one 22" LCD flat screen color monitor. The City will supply the make and model number to the successful vendor.

5.8 OPERATING ENVIRONMENT

- 5.8.1 The radio console shall present a Windows graphical user interface environment to the operator. Unix based graphics is not acceptable.
- 5.8.2 Operator positions and the main console electronics shall be networked together using a standard Ethernet LAN.
- 5.8.3 The console's local area network environment shall be Windows 7 or equivalent.
- 5.8.4 In addition to a keyboard, a three button mouse device shall be provided. One button on the mouse shall serve as the equivalent of an instant transmit switch.
- 5.8.5 User screen configurations shall be generally tailorable by the operator.
- 5.8.6 It shall be possible to use a name to identify channels and talkgroups on the screen.
- 5.8.7 The console system shall interface with the State of Connecticut Enhanced 9-1-1 telephone system and its successor Next Generation 9-1-1 system for telephone integration.
- 5.8.9 The Unit ID function shall be equipped with a dynamic alias table that can be updated by a software interface connected to the City's HEARTBEAT computer assisted dispatch system. This dynamic alias function will provide for unit ID's of police officers who are off duty and not assigned to particular police units. However, when the units are assigned, the system will display their assigned unit ID which is different from their radio ID. The preferred system interface shall be XML.

5.9 MASTER FUNCTIONS & CONTROLS

Each operator personal computer IP console position shall be equipped with the following master functions and controls:

- 5.9.1 MASTER TRANSMIT - to transmit manually on all selected channels.
- 5.9.2 MASTER CTCSS MONITOR or DISABLE - to temporarily disable the receiver CTCSS decoder of the selected fixed station(s) for monitoring purposes.
- 5.9.3 SELECT SPEAKER - to monitor selected channels. The speaker shall be driven by a dedicated audio amplifier with operator adjustable volume control.
- 5.9.4 UNSELECT SPEAKER - to monitor unselected channels. The speaker shall be driven by a dedicated audio amplifier with operator adjustable volume control.
- 5.9.5 MONITOR SPEAKER - to monitor specific channels. The speaker shall be driven by a dedicated audio amplifier with operator adjustable volume

- control. Quantity of two (2) for the maintenance and diagnostic position console.
- 5.9.6 CLOCK - shall display time in twenty four hour format and use an LED or LCD display. Clock shall be equipped with an interface to an external master time system.
- 5.9.7 VU DISPLAY - to provide a visual indication of the audio transmit levels.
- 5.9.8 MICROPHONE - a panel mounted gooseneck, cardioid pattern type shall be provided for all dispatcher positions.
- 5.9.9 FOOTSWITCH - dual pedal for transmitting on and disabling the CTCSS decoder of the selected channels. It shall be heavy duty, designed for constant use, and shall be designed so as not to skid on a smooth flooring surface. Required only for the four (7) primary positions.
- 5.9.10 DUAL HEADSET JACKS(s) - to allow use of a switchboard type headset equipped with RJ-327 (two prong) type plug. For training purposes, simultaneous use of both headsets shall be provided. Use of the headset jack shall disable the microphone of the operator position associated with the jack(s). Required for all positions.
- 5.9.11 INTERCOM - to provide communications between operator positions and base stations.
- 5.9.12 SIMULTANEOUS SELECT - to allow the operator to manually select any combination of console controlled channels for simultaneous broadcasts.
- 5.9.13 ALL POINTS BULLETIN - to allow the operator to automatically select any combination of console controlled channels for simultaneous broadcasts. This function shall be field programmable by the dispatcher.
- 5.9.14 ALL RECEIVER MUTE - to mute received audio from all unselected channels. This muting shall illuminate a visual indicator when activated and be canceled manually by the operator or automatically by an operator tailorable timing circuit.
- 5.9.15 ALERT TONES - to provide a 1000 Hz steady tone and a warbling tone for alerting purposes over the air.
- 5.9.16 CROSSPATCH - to provide cross connection of audio between desired channels. Operation of crosspatch shall not inhibit the dispatchers ability to operate on other channels. The controls shall provide a visual indication of crosspatch activity and inactivity. Two (2) separate, distinct and simultaneous crosspatches shall be possible. Each crosspatch shall be able to accommodate any number of desired channels.
- 5.9.17 AUXILIARY SIGNAL INPUT - each operator position shall provide an auxiliary signal input to support external encoders and/or signalling devices.
- 5.9.18 INDEPENDENT AUXILIARY CONTROLS - a total of 8 auxiliary control switches with parallel indicators at each operator position shall be provided. Each

switch shall control a relay that shall be configurable to latching or momentary function. These control relays shall be housed in the proposed radio control room on the 4th floor of the new Police Headquarters and shall be terminated together and identified as such.

- 5.9.19 EXTERNAL INPUT INDICATOR - a total of 16 independent external signal input indicators at each operator position shall be provided. Each indicator shall be configurable for latching or momentary indicate.

5.10 RADIO CHANNEL/TALKGROUP FUNCTIONS & CONTROLS

Each operator position shall be equipped to operate the existing conventional channels as well as the 800 MHz talkgroups. Those include Med-9, RAFS 800, InterCity Fire, CSP HotLine, ITAC, and ICALL.

5.10.1 CONVENTIONAL CHANNELS

- 5.10.1.1 Supply, at a minimum, all existing features, functions, controls and displays.
- 5.10.1.2 In addition to the remote control method required, each channel control card shall operate a relay that activates on each master or instant transmit command.
- 5.10.1.3 The successful contractor shall be responsible for determining the type of control, wireline interfaces, control commands, etc., required to control each conventional channel.

5.10.2 TRUNKED TALKGROUPS

- 5.10.2.1 For each talkgroup, supply, at a minimum, the following features, functions, controls and displays:
 - Individual Volume Control
 - Talkgroup Select
 - Manual Transmit
 - Crosspatch
 - Call Visual Indicator
 - Busy Visual Indicator
 - Channel Crossmute
- 5.10.2.2 In addition to the remote control method required, each talkgroup control card shall operate a relay that activates on each master or instant transmit command.
- 5.10.2.3 Voting receiver displays, if any, shall appear on the LCD screen.

5.13 LOGGING RECORDER INTERFACE

- 5.13.1 The console electronics shall provide a minimum of 48 independent audio outputs suitable for connection to a logging recorder system.

- 5.13.2 The outputs shall supply audio from all the radio channels and talkgroups controlled by the console to the logging recorder. Both transmit and receive audio shall be provided.
- 5.13.3 The outputs shall filter guard and function tones associated with tone remote controlled base stations.
- 5.13.4 System shall include as part of this proposal, the ability to de-trunk audio channels on the logging recorder into talk groups for playback purposes. The vendor shall provide thorough documentation on the system.
- 5.13.5 Each vendor shall provide the name, address, and contact information of two logging recorder suppliers whose equipment has been certified to work with the proposed equipment.

5.14 MINIMUM PERFORMANCE SPECIFICATIONS

In addition to the performance requirements presented in this section, the console electronics to be supplied by the successful contractor shall also meet or exceed the other performance specifications of the existing radio console electronics.

5.15 FIRE ALERTING SYSTEM INTERFACE

The prospective console vendor shall provide support assistance to the City's Fire Station Alerting contractor (Locution Systems, Inc. of Golden, CO). There is no other fire station alerting interface planned at this time.

5.16 TELEVISION/AM FM CROSS MUTE FUNCTION

The console shall provide a muting function for the any AM/FM Radio and Television set located in the communications center when the console transmits button is depressed.

5.17 SPECTRACOM™ CLOCK SYNCHRONIZATION

The successful vendor shall furnish and install the following equipment and software as a part of the radio system. This equipment must not be substituted although it can be acquired from multiple sources. This equipment shall provide the most accurate time available for the system and the associated networks in the building. The system shall be installed in the server room on the fourth floor of the building. It then must be networked to the radio system in the adjacent control room. All other connections to and from the network clock shall be the responsibility of the City.

PSAP Command Center package (compliant to NENA Master Clock specification 04-002):

This package includes:

- NetClock/GPS Time Server/Master Clock Model 9483 with Opt 05 OCXO Oscillator for GPS Back-up
- Opt 16 Card with (3) 10/100/1000Base-T Ethernet NTP Ports
- (1) GPS Outdoor Antenna Model 8225;

- (1) GPS Antenna Surge Protector Model 8226,
- (1) Grounding Kit 8226-0002-0600,
- (1) Outdoor GPS Antenna Cable - 100 ft., CAL7100,
- (4) TimeView® 400 Display Clocks Model TV400W,
- (1) RS-485 Station Cable – 500 ft. CW04100,
- (1) Weather-Proofing Kit, and
- (1) s-ntp-UNL-2LAN PresenTense Package. CD. Licensed to City of New Britain Public Safety Telecommunications Center
- 5 Year warranty on all materials and software from the manufacturer.

6.0 PORTABLE EQUIPMENT

6.1 GENERAL DESCRIPTION

It is the intent of this section to describe state-of-the-art portable radio equipment. The equipment shall be comprised of a handheld transceiver, associated accessories, antenna and user functions and controls.

The units shall be of current production and shall be capable of withstanding the harsh environment associated with use in emergency services personnel.

The units shall be feature & function compatible with the fixed equipment supplied under this contract.

6.2 EQUIPMENT CATEGORIES

The City has defined four categories of equipment. Each category is representative of a suite of functions and features described further in this section, they are:

- Public Safety Standard (These are ruggedized P25 radios for EMS, police, and fire fighters)
- Public Service Supervisors and Managers (These are ruggedized P25 radios for Public Works, Water, Park and Recreation supervisors.)
- Public Service Standard (These are P25 radios for public service employees and volunteers for police and fire efforts.)
- Interoperable Multi-band (These are P25 multi-band radios for the Mayor, Fire Chief, Police OIC, Police Chief, Fire Deputy Chief, Fire Safety and Hazards Lt., and EMS Shift OIC, with one spare held by the PSTC.)

6.3 DESIRED QUANTITIES

The number of units to be supplied is listed on the Bid form entitled Appendix B. The City will acquire no less than 80% of the summary quantities listed on the bid form but it reserves the right to change quantities for reasons unto itself at any time up and until execution of the agreement. In addition, the City requires that the successful bidder provide an allowance of \$10,000 for the procurement of accessories for the system which may arise in the development of the system. In the event the City does not expend any or all of the accessory allowance it shall be credited to the City.

6.4 REGULATORY COMPLIANCE

All portable equipment proposed shall be type accepted under Part 90 of the FCC Rules & Regulations.

6.5 ELECTRICAL & MECHANICAL CHARACTERISTICS

- 6.5.1 The equipment shall be P25 state-of-the-art and microprocessor based.
- 6.5.2 All operating parameters shall be stored in electrically alterable non-volatile memory technology.

- 6.5.3 The unit's operating frequencies, features, functions and other operating parameters shall be field tailorable via PC based programmers.
- 6.5.3.5 The system shall be equipped with an option that provides for Over The Air Reprogramming (OTAR) of frequencies, features, and functions via the trunked radio system channels. This requirement applies to all subscriber units of any kind. This item is an option and may not be acquired at the time of system procurement but could be added at a later date.
- 6.5.4 The physical and electrical architecture of the equipment shall be such that addition of user features and/or functions at future dates shall not require addition and/or replacement of circuit cards within the unit.
- 6.5.5 To the greatest extent possible, all equipment assemblies and sub-assemblies shall be shielded to minimize electromagnetic interference that may be caused to/by electrical equipment co-located and/or adjacent to this equipment.
- 6.5.6 Power loss and/or replacement of the unit's battery shall not alter the operating software and/or parameters.
- 6.5.7 The equipment shall meet or exceed all the requirements of MIL-STD 810C, D and E standards for shock, vibration, salt, fog, dust and rain.
- 6.5.75 All public safety portable radios shall be delivered and rated intrinsically safe based on Factory Mutual standards for class I, II, and III, Division 1, Groups C, D, E, F, and G.
- 6.5.8 The unit shall perform a self diagnostic test each time it is turned on. This test shall be automatic and shall include all radio operating parameters. At the conclusion of a successful test, no operator intervention shall be required. A test that is not successful shall notify the operator.

6.6 POWER SUPPLY & ACCESSORIES

- 6.6.1 The equipment shall operate from a negative ground internal rechargeable battery power source.
- 6.6.2 All power circuits shall provide for reverse polarity protection.
- 6.6.3 Each unit, including the spares, shall be equipped with two high capacity rechargeable batteries.
- 6.6.35 Batteries must be suited for public safety usage, must be intrinsically safe, and may not be nickel cadmium. Vendors shall provide a discussion of options available.
- 6.6.4 Each unit, including spares, shall be equipped with a spare battery.
- 6.6.5 Each unit, including spares, shall be equipped with a single unit rapid type charger.
- 6.6.6 A quantity of 10 multi-unit rapid chargers for shall be supplied.
- 6.6.7 A quantity of 10 CADEX battery exercise/testers for standard units shall be

supplied unless the vendors battery charging system provides equivalent service. Testers shall, at a minimum, perform analysis, conditioning and cycle testing of batteries.

- 6.6.8 Vendors shall indicate the battery options available.

6.7 EQUIPMENT HOUSING

- 6.7.1 The transceiver housing shall house all electronic circuits and/or circuit cards associated with the equipment.
- 6.7.2 The housing shall be constructed of high impact polycarbonate plastic or other suitable high impact material.
- 6.7.3 Removal of the battery from the unit shall not expose its internal circuitry.

6.8 PORTABLE ACCESSORIES

- 6.8.1 Each unit shall be equipped with a remote speaker/microphone with coiled cord.
- 6.8.2 Each unit shall be equipped with a swivel leather carrying case with hold down strap. The leather cases shall have "D" rings on either side to support the attachment of carrying strap. Alternates may be selected at a later date.
- 6.8.3 Each unit shall be equipped with a flexible antenna plus one spare.
- 6.8.4 Each public safety portable radio for police shall be equipped with clear subminiature surveillance earset.
- 6.8.5 Portable radios for public safety, public service supervisors and managers, and all multi-band radios shall include a keypad with DTMF capabilities.
- 6.8.6 Portable radios (60) for police investigators, fire inspectors, police supervisors, and police command personnel shall be furnished with a surveillance kits with hand or lapel miniature microphone, clear earset, and accessory case. Preferably, the vendor may offer this option as an allowance and the user community may procure these devices independent of the contract.
- 6.8.7 Each radio shall be supplied with two batteries and one unit charger. The preferred chargers are smart chargers that support effective battery management. Chargers shall be equipped with an automatic trickle charge after the battery has reached full charge. Batteries shall have diode protection to prevent overcharge.

6.9 PORTABLE FEATURES

- 6.9.1 The unit shall be equipped, at a minimum, with 24 trunked talkgroup capability.
- 6.9.2 The unit shall be equipped, at a minimum, with 10 conventional channel capability.
- 6.9.3 Advanced units shall be equipped with an alpha-numeric character display to

- identify the operating trunked talkgroup or conventional channel.
- 6.9.4 Standard units shall be equipped with an alpha-numeric character display to identify the operating trunked talkgroup or conventional channel.
- 6.9.5 Basic units shall be equipped with a character display to identify the operating trunked talkgroup or conventional channel.
- 6.9.6 The display shall not display less than 6 characters and its brightness shall be user adjustable.
- 6.9.7 The unit shall be equipped with a top mounted rotary volume control switch.
- 6.9.8 The primary trunked talkgroup or conventional channel selector switch shall be top mounted and of the rotary type.
- 6.9.9 The unit shall be equipped with a user operated switch to activate the radio's emergency status notification mode.
- 6.9.10 Each portable radio for public safety users and public service supervisors and managers shall be ruggedized and shall meet immersion standards for not less than 30 minutes per Mil STD 810-F and IP-67.
- 6.9.11 All portable radios for public safety users shall be certified as Intrinsically Safe per Factory Mutual Standards
- 6.9.12 The unit shall be equipped with an external data port. This data port shall allow for connection of test equipment, radio programming devices, etc.
- 6.9.13 The unit shall be equipped with the capability of being selectively enabled or disabled over-the-air.
- 6.9.14 The unit shall be equipped with the capability of having its trunked talkgroup affiliation modified over-the-air.
- 6.9.15 The unit shall be equipped with the capability of placing and receiving telephone interconnect calls. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 6.9.16 Advanced units shall be equipped with a telephone type touch backlit 10 digit keypad for placing manual telephone interconnect calls. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 6.9.17 Standard units shall be equipped with the capability of placing telephone interconnect calls via a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 6.9.18 Basic units shall be equipped with the capability of placing telephone interconnect calls via a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 6.9.19 The unit shall be equipped with the capability of placing and receiving private calls from other users on the radio system. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 6.9.20 Advanced units shall be equipped with the capability of placing multiple

private calls to other users on the radio system via the telephone keypad of from a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.

- 6.9.21 Standard units shall be equipped with the capability of placing multiple private calls to other users on the radio system via a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.

Basic units shall be equipped with the capability of placing multiple private calls to other users on the radio system via a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.

- 6.9.22 All of the above features shall be programmable by the City Of New Britain with software to be supplied with the system by the successful vendor.

6.10 OPERATIONAL CHARACTERISTICS

6.10.1 Operating Bandwidth:

All radios for public safety shall operate on both the 700 and 800 MHz bands (762-870 MHz) including the entire NPSPAC and non-NPSPAC 800 MHz radio channel allocation without degradation, minimum. All radios for Multi-band use shall operate on the 700/800 bands as well as UHF 380-520 MHz or VHF Bands 136-174 MHz.

6.10.2 Modulation Modes:

All of the following: Analog, Digital (P25 Narrow and wide band) Optionally TDMA 2 slot programmable.

6.10.3 Operating Modes:

Trunked and conventional; analog or digital. Half Duplex and Simplex. Conventional operating modes shall be field programmable on a per channel basis.

6.10.4 Communications Modes:

Clear Audio. Options for encrypted digital and/or digital. Options shall include AES or DES encryption priced separately.

6.10.5 Squelch Modes:

The equipment shall support carrier, continuous tone coded or continuous digital coded squelch. Squelch modes shall be field programmable by channel.

6.10.6 GPS Option:

Radios for the police and all public service radios shall be quoted with an option for GPS location transmissions associated with a push to talk, a timed transmission, or a remotely activated function. These GPS transmissions shall be routed to the City's Public Safety network to its Automated Vehicle

Location system operated by the Capitol Region Council of Governments.

6.10.7 Emergency Unit Identification:

Operator activated per P25 requirements

6.10.8 Carrier Control Timer:

A variable timer shall be supplied. Units shall be shipped with a 60 second timeout.

6.10.9 RF Output Power:

No less than three watts per portable radio.

6.10.10 Speaker Audio Output:

.5 watts, minimum.

7.0 MOBILE EQUIPMENT

7.1 GENERAL DESCRIPTION

It is the intent of this section to describe state-of-the-art P25 mobile radio equipment. The equipment shall be comprised of a transceiver, associated accessories, antenna and user functions and controls.

The units shall be of current production and shall be capable of withstanding the harsh environment associated with use in emergency service vehicles.

The units shall be feature & function compatible with the fixed equipment supplied under this contract.

7.2 EQUIPMENT CATEGORIES

The City has defined four categories of equipment. Each category is representative of a suite of functions and features described further in this section, they are:

- Advanced
- Standard
- Advanced EMS Dual Control Head
- Basic

7.3 DESIRED QUANTITIES

The number of units to be supplied is as follows: (See Appendix B)

7.4 REGULATORY COMPLIANCE

All mobile equipment proposed shall be type accepted under Part 90 of the FCC Rules & Regulations.

7.5 ELECTRICAL & MECHANICAL CHARACTERISTICS

- 7.5.1 The equipment shall be state-of-the-art and microprocessor based.
- 7.5.2 All operating parameters shall be stored in electrically alterable non-volatile memory technology.
- 7.5.3 The unit's operating frequencies, features, functions and other operating parameters shall be field tailorable via PC based programmers.
- 7.5.4 The physical and electrical architecture of the equipment shall be such that addition of user features and/or functions at future dates shall not require addition and/or replacement of circuit cards within the unit.
- 7.5.5 To the greatest extent possible, all equipment assemblies and sub-assemblies shall be shielded to minimize electromagnetic interference that may be caused to/by electrical equipment co-located and/or adjacent to this equipment.
- 7.5.6 Power loss shall not alter the operating software and/or parameters.

- 7.5.7 The equipment housings shall be suitable for mounting on vertical or horizontal surfaces.
- 7.5.8 The equipment shall meet or exceed all the requirements of MIL-STD 810F which supercedes MIL-STD C, D and E standards for shock, vibration, salt, fog, dust and rain.
- 7.5.9 Remote mounted transceivers shall be interconnected to their respective control heads through a control cable connectorized at both ends.
- 7.5.10 The unit shall perform a self diagnostic test each time it is turned on. This test shall be automatic and shall include all radio operating parameters. At the conclusion of a successful test, no operator intervention shall be required. A test that is not successful shall notify the operator.

7.6 POWER SUPPLY

- 7.6.1 The equipment shall operate from an external negative ground primary power source supplying a nominal 12 VDC.
- 7.6.2 All power circuits shall provide for reverse polarity protection.

7.7 EQUIPMENT HOUSING

- 7.7.1 The transceiver housing shall house all electronic circuits and/or circuit cards associated with the equipment.
- 7.7.2 Palm microphones, external speaker housings and transceivers housings shall be constructed of high impact polycarbonate plastic or other suitable high impact material.
- 7.7.3 Trunk mounted transceiver housings shall be equipped with a base plate. The base plate shall allow for the removal of the transceiver from its mounted location for replacement or servicing. Removal of the transceiver from the base plate shall not expose its internal circuitry.
- 7.7.4 Advanced and standard units shall be dash mount type with a converter kit to facilitate remote trunk mount or underseat mount.
- 7.7.5 Basic units shall be of the dash mount type.

7.8 MOBILE ACCESSORIES

7.8.1 Microphones

- 7.8.1.1 Each unit, including spares, shall be equipped with a palm type microphone with coiled cord.
- 7.8.1.2 The microphone shall be of the plug-in type.
- 7.8.1.3 Remote units for outside vehicle use shall have, at a minimum, a weatherproof rating.

7.8.2 Speakers

- 7.8.2.1 Each unit, including spares, shall be equipped with a standalone in-vehicle

speaker. Mobiles equipped with dual control heads shall include a speaker and microphone with each control head.

7.8.2.2 The speakers shall be of the plug-in type.

7.8.2.3 Remote units for outside vehicle use shall have, at a minimum, a weatherproof rating.

7.8.3 Antennas

7.8.3.1 Each unit, including spares, shall be equipped with a permanent mount antenna.

7.8.3.2 Each unit, including spares, shall be equipped with a collinear type omnidirectional antenna.

7.8.3.3 Antennas shall be provided with a low loss teflon coated coaxial cable. Length of cable shall be as required.

7.8.3.4 Antennas shall be provided with all their necessary mounting hardware.

7.8.3.5 The antennas shall not degrade the performance of the mobile unit over the operating bandwidth of the system.

7.9 MOBILE FEATURES

7.9.1 The unit shall be equipped, at a minimum, with trunked talkgroup capability of 24.

7.9.2 The unit shall be equipped, at a minimum, with conventional channel capability of 10.

7.9.3 Advanced units shall be equipped with an alpha-numeric character display to identify the operating trunked talkgroup or conventional channel.

7.9.4 Standard units shall be equipped with an alpha-numeric character display to identify the operating trunked talkgroup or conventional channel.

7.9.5 Basic units shall be equipped with a character display to identify the operating trunked talkgroup or conventional channel.

7.9.6 The display shall not display less than 6 characters and its brightness shall be user adjustable.

7.9.7 The unit shall be equipped with a user operated switch to activate the radio's emergency status notification mode.

7.9.8 Advanced units shall be equipped with a user configurable trunked talkgroup/conventional channel scanner. The scanner shall allow the user to selectively add or omit talkgroups or conventional channels from the scanning sequence. A mix of talkgroups and conventional channels shall be allowed in the scanning sequence. User selectable talkgroup/conventional channel priority shall be a feature.

7.9.9 Standard units shall be equipped with a user configurable trunked talkgroup/conventional channel scanner. The scanner shall allow the user to

selectively add or omit talkgroups or conventional channels from the scanning sequence. A mix of talkgroups and conventional channels shall be allowed in the scanning sequence. User selectable talkgroup/conventional channel priority shall be a feature.

- 7.9.10 The unit shall be equipped with a data port. This data port shall allow for connection of test equipment, radio programming devices, etc.
- 7.9.11 The unit shall be equipped with the capability of being selectively enabled or disabled over-the-air.
- 7.9.12 The unit shall be equipped with the capability of having its trunked talkgroup affiliation modified over-the-air.
- 7.9.13 The unit shall be equipped with the capability of placing and receiving telephone interconnect calls. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 7.9.14 Advanced units shall be equipped with a telephone type touch backlit 10 digit keypad for placing manual telephone interconnect calls . Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 7.9.15 Standard units shall be equipped with the capability of placing telephone interconnect calls via a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 7.9.16 Basic units shall be equipped with the capability of placing telephone interconnect calls via a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 7.9.17 The unit shall be equipped with the capability of placing and receiving private calls from other users on the radio system. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 7.9.18 Advanced units shall be equipped with the capability of placing multiple private calls to other users on the radio system via the telephone keypad of from a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 7.9.19 Standard units shall be equipped with the capability of placing multiple private calls to other users on the radio system via a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 7.9.20 Basic units shall be equipped with the capability of placing multiple private calls to other users on the radio system via a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 7.9.21 All of the above features shall be programmable by the City Of New Britain with software to be supplied with the system by the successful vendor.

7.10 OPERATIONAL CHARACTERISTICS

7.10.1 Operating Bandwidth:

All radios for public safety shall operate on both the 700 and 800 MHz bands (762-870 MHz) including the entire NPSPAC and non-NPSPAC 800 MHz radio channel allocation without degradation, minimum. All radios for Multi-band use shall operate on the 700/800 bands as well as UHF 380-520 MHz or VHF Bands 136-174 MHz.

7.10.2 Modulation Modes:

All of the following: analog; digital (P25 Narrow and wide band) Optionally TDMA 2 slot programmable.

7.10.3 Operating Modes:

Trunked and conventional; analog or digital. Half Duplex and Simplex. Conventional operating modes shall be field programmable on a per channel basis.

7.10.4 Communications Modes:

Clear Audio. Options for encrypted and/or digital encryption AES or DES.

7.10.5 Squelch Modes:

The equipment shall support carrier, continuous tone coded or continuous digital coded squelch. Squelch modes shall be field programmable by channel.

7.10.6 Unit Identification:

On every Push-To-Talk.

7.10.7 Emergency Unit Identification:

Operator activated.

7.10.75 GPS Option:

Radios for the police and all public service radios shall be quoted with an option for GPS location transmissions associated with a push to talk, a timed transmission, or a remotely activated function. These GPS transmissions shall be routed to the City's Public Safety network to its Automated Vehicle Location system operated by the Capitol Region Council of Governments.

7.10.8 Carrier Control Timer:

A variable timer shall be supplied.

7.10.9 RF Output Power:

15 Watts, minimum.

7.10.10 Speaker Audio Output:

5 watts, minimum.

7.11 INSTALLATIONS

The contractor is fully responsible for installing the mobile radio units in a 'TURN-KEY' manner, including interfacing to other on-board vehicle systems and subsystems if necessary.

After contract award, the contractor shall develop a mobile installation plan which shall be mutually agreeable with the City.

All rubbish and debris associated with site preparation; unpacking of shipping materials; installation of new equipment; and/or removal of existing equipment related to this project shall be removed from the premises by the contractor. Removal of rubbish and debris shall be performed daily.

The contractor is responsible for providing all materials, cabling/wiring, labor, tools and instrumentation to ensure a complete and successful installation. All tools and instrumentation shall be considered to be normal and customary installation items owned by the contractor.

To the greatest extent possible, all equipment intercabling and/or cable/wiring bundles shall be neatly secured by means of plastic tie wraps, secured by surface mounted clamps and hidden from view. All cables associated with the new installations shall be protected by rubber grommets when routed through vehicle chassis perforations.

Splicing of antenna, power, audio and/or control cables shall be unacceptable.

All mobile unit mounting and antenna locations shall be approved by the City.

New mobile installations shall not interfere with the vehicle's air bag systems.

New mobile installations shall not interfere with the vehicle's instruments or controls.

When applicable, new mobile installations shall require the complete removal of existing units. The contractor shall also note that the new mobile installations may also necessitate temporary removal or relocation of other existing vehicle radios and controls such as electronic sirens, etc.

For purposes of continuity & quality control, to the greatest extent, the contractor shall maintain the same installation crew(s) through completion of all mobile installs.

All mobile radio installations shall be performed on-site at designated City facilities.

8.0 CONTROL STATION EQUIPMENT AND REMOTE CONTROL EQUIPMENT

8.1 GENERAL DESCRIPTION

It is the intent of this section to describe state-of-the-art control station radio equipment. The equipment shall be comprised of a transceiver, associated accessories, antenna system and user functions and controls. The units shall be of current production and shall be feature & function compatible with the fixed equipment supplied under this contract.

8.2 DESIRED QUANTITIES

The number of units to be supplied is listed in Appendix B

8.3 REGULATORY COMPLIANCE

All control station equipment proposed shall be type accepted under Part 90 of the FCC Rules & Regulations.

8.4 ELECTRICAL & MECHANICAL CHARACTERISTICS

- 8.4.1 The equipment shall be state-of-the-art and microprocessor based.
 - 8.4.2 All operating parameters shall be stored in electrically alterable non-volatile memory technology.
 - 8.4.3 The unit's operating frequencies, features, functions and other operating parameters shall be field tailorable via PC based programmers.
 - 8.4.4 The physical and electrical architecture of the equipment shall be such that addition of user features and/or functions at future dates shall not require addition and/or replacement of circuit cards within the unit.
 - 8.4.5 To the greatest extent possible, all equipment assemblies and sub-assemblies shall be shielded to minimize electromagnetic interference that may be caused to/by electrical equipment co-located and/or adjacent to this equipment.
 - 8.4.6 The equipment housings shall be suitable for mounting on desktop surface.
 - 8.4.7 The unit shall perform a self diagnostic test each time it is turned on. This test shall be automatic and shall include all radio operating parameters. At the conclusion of a successful test, no operator intervention shall be required. A test that is not successful shall notify the operator.
-

8.5 POWER SUPPLY

- 8.5.1 The equipment shall operate from an external source supplying a nominal 120 VAC at 60 Hz, single phase power.
- 8.5.2 Power losses, restorals, surges, sags and/or brownouts shall not alter the system software and/or operating parameters. Other than total power loss or lethal surges, the control station shall remain fully operational within the specifications of its design while experiencing any of these occurrences.

8.6 POWER SURGE & LIGHTNING PROTECTION

- 8.6.1 All equipment powered from commercial 120 VAC power shall be equipped with an external surge protector with ground conductor.
- 8.6.2 All antenna feedlines shall be equipped with an external lightning arrestor with ground conductor.

8.7 EQUIPMENT HOUSING

- 8.7.1 The transceiver housing shall house all electronic circuits and/or circuit cards associated with the equipment.
- 8.7.2 Transceiver and accessory housings shall be constructed of high impact polycarbonate plastic or other suitable high impact material.

8.8 STATION ACCESSORIES

8.8.1 Microphones

- 8.8.1.1 All units shall be equipped with a desktop type microphone.
- 8.8.1.2 Three units shall be equipped with a palm type mobile unit microphone with coiled cord.

8.8.2 Speakers

- 8.8.2.1 Each unit shall be equipped with an internal speaker.

8.8.3 Antennas

- 8.8.3.1 Each unit shall be equipped with a heavy duty rated yagi antenna such as the Decibel Products DB-498 or approved equivalent.
- 8.8.3.2 Each unit shall be equipped with all necessary antenna mounting hardware inclusive of brackets, pipes, mounts, etc.
- 8.8.3.3 Each unit shall be shipped with the appropriate length of 1/2" superflex coaxial antenna cable or equivalent with all necessary installation items inclusive of connectors, mounting hardware, hangers, ground straps, wall penetration or feedthru plates, cable boots, etc.
- 8.8.3.4 The antennas shall not degrade the performance of the unit over the operating bandwidth of the system.

8.8.4 Rack Mount - 19" EIA

- 8.8.4.1 A minimum of three of the units shall be equipped with rack panel hardware suitable for mounting in a 19" EIA 53@ space.
- 8.8.4.2 When rack mounted, speaker audio shall be available from the front of the unit.
- 8.8.4.3 If an external audio speaker is used, speaker shall be installed flush with the rack mount panel hardware.

8.9 STATION FEATURES

- 8.9.1 The unit shall be equipped, at a minimum, with trunked talkgroup capability of 10.
- 8.9.2 The unit shall be equipped, at a minimum, with conventional channel capability of 10.
- 8.9.3 The unit shall be equipped with front panel controls for local operation.
- 8.9.4 The unit shall be equipped with a character display to identify the operating trunked talkgroup or conventional channel.
- 8.9.5 The unit shall be equipped with a character display to identify the ID of the field unit calling in.
- 8.9.6 The unit shall be equipped with a character display to identify the emergency ID notification of the field unit calling in.
- 8.9.7 The display shall not display less than 8 characters and its brightness shall be user adjustable.
- 8.9.8 The unit shall be equipped with a user configurable trunked talkgroup/conventional channel scanner. The scanner shall allow the user to selectively add or omit talkgroups or channels from the scanning sequence. A mix of talkgroups and conventional channels shall be allowed in the scanning sequence. User selectable talkgroup/conventional channel priority shall be a feature.
- 8.9.9 The unit shall be equipped with the capability of being selectively enabled or disabled over-the-air.
- 8.9.10 The unit shall be equipped with the capability of having its trunked talkgroup affiliation modified over-the-air.
- 8.9.11 The unit shall be equipped with the capability of placing and receiving private calls from other users on the radio system. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 8.9.12 The unit shall be equipped with the capability of placing multiple private calls to other users on the radio system via a keypad and from a pre-stored list of numbers. Enabling or disabling of this feature shall be a programmable parameter within the unit.
- 8.9.13 The unit shall be equipped with the capability of being operated from a remote control unit.
- 8.9.14 Each unit for the PSTC shall be equipped with a desktop remote control (DRC) unit.
- 8.9.15 Three (3) additional DRC units shall be supplied for the Police Department.
- 8.9.15a Seven (7) additional DRC units shall be supplied for the EOC.
- 8.9.16 One (1) additional DRC unit shall be supplied for each of the six Fire

- Department stations
- 8.9.16a One (1) additional DRC unit and control station shall be supplied for the Emergency Medical Service.
- 8.9.17 Each DRC shall be equipped with a character display to identify the trunked talkgroup or conventional channel in use.
- 8.9.18 Each DRC shall be equipped with a character display to identify the ID of the field unit calling in.
- 8.9.5 Specialized control or base stations:
- The successful vendor shall also furnish and install control stations and transmitters in the control site as follows:
1. RAFS 800 West (control station)
 2. Med-9 (UHF control station)
 3. Intercity Fire (800 MHz control station)
 4. Intercity Fire (VHF control station)
 5. Region 3 Emergency Management (UHF simplex base station)
 6. Connecticut State Police Hot Line (UHF Low band simplex base station)

8.10 OPERATIONAL CHARACTERISTICS

8.10.1 Operating Bandwidth:

All radios for public safety shall operate on both the 700 and 800 MHz bands (762-870 MHz) including the entire NPSPAC and non-NPSPAC 800 MHz radio channel allocation without degradation, minimum.

8.10.2 Modulation Modes:

Analog. Digital P25 Narrow and wide band. Optionally TDMA 2 slot programmable.

8.10.3 Operating Modes:

Trunked and conventional. Half Duplex and Simplex. Conventional operating modes shall be field programmable on a per channel basis.

8.10.4 Communications Modes:

Clear Audio. Options for encrypted digital and/or digital AES or DES

8.10.5 Squelch Modes:

The equipment shall support carrier, continuous tone coded or continuous digital coded squelch. Squelch modes shall be field programmable by channel.

8.10.6 Unit Identification:

On every Push-To-Talk.

8.10.7 Carrier Control Timer:

A variable timer shall be supplied.

8.10.8 RF Output Power:

15 Watts, minimum.

8.10.9 Speaker Audio Output:

5 watts, minimum.

8.11 INSTALLATIONS

The contractor is fully responsible for installing the radio units in a 'TURN-KEY' manner, including furnishing and installing the wireline linking the control stations with the DRC units.

All rubbish and debris associated with site preparation; unpacking of shipping materials; and/or installation of new equipment related to this project shall be removed from the premises by the contractor. Removal of rubbish and debris shall be performed daily.

The contractor is responsible for providing all materials, cabling/wiring, labor, tools and instrumentation to ensure a complete and successful installation. All tools and instrumentation shall be considered to be normal and customary installation items owned by the contractor.

To the greatest extent possible, all equipment intercabling and/or cable/wiring bundles shall be neatly secured by means of plastic tie wraps, secured by surface mounted clamps and hidden from view.

Splicing of antenna, power, audio and/or control cables shall be unacceptable.

All unit placement and antenna mounting locations shall be approved by the City.

All interior and exterior antenna feedline routes at each fixed facility shall be approved by the City.

All exterior antenna feedline connection points shall be sealed with weatherproof tape.

All exterior antenna feedline runs shall not be hanged or supported by nylon or other plastic type cable ties.

All exterior antenna feedline penetrations shall be sealed.

All exterior mounting hardware shall be stainless steel or galvanized.

All items required to provide power to the units shall be supplied, as necessary inclusive of outlets, cabling, fuses, circuit breakers, etc.

For purposes of continuity & quality control, to the greatest extent, the contractor shall maintain the same installation crew(s) through completion of all unit installs.

9.0 REGULATORY REQUIREMENTS

9.1 LAND MOBILE RADIO - EXISTING

The City is currently licensed for six (6) 806 MHz radio channels at the following locations:

SITE NAME	COORDINATES	FREQUENCIES	CALL SIGN
THOCC 50 Grand Street New Britain, CT	41-39-40.4 N 72-47-12.4 W	856.21250 / 811.21250 857.21250 / 812.21250 858.21250 / 813.21250 859.21250 / 814.21250 860.21250 / 815.21250	WNCE562
DiLoreto School 732 Slater Road New Britain, CT	41-41-12.4 N 72-49-28.4 W	855.96250/ 810.96250	WPOZ284

If the successful contractor provides a system design whose parameters differ from those of the existing licenses, the contractor shall, on behalf of the City, compile and prepare all site and RF engineering data; prepare all documents and exhibits; prepare for and conduct all presentations; and attend all meetings as are necessary for the purpose of modifying the existing radio license(s).

Licenses shall also be modified for all NPSPAC channels.

The City will deem this task to be completed when a corrected radio license(s) is granted by the FCC for all the modified radio site locations.

Costs associated with this task shall be separately itemized in the cost section of the vendor's response. Relicensing and coordination costs shall be borne by the successful vendor. The City prefers to obtain a system license rather than a series of individual licenses.

9.2 LAND MOBILE RADIO – NEW

The successful contractor shall assist the City in obtaining a radio license(s) on the existing six (6) 806 MHz radio channels at new radio site locations which are part of the contractors design and which are not included in the previous table. The license application at these new sites shall be in accordance with the extended implementation rules of the FCC.

The contractor shall, on behalf of the City, compile and prepare all site and RF engineering data; prepare all documents and exhibits; prepare for and conduct all presentations; and attend all meetings as are necessary for the purpose of applying for the radio license(s).

The City will deem this task to be completed when a radio license(s) is granted by the FCC for all the new radio site locations.

Costs associated with this task shall be separately itemized in the cost section of the vendor's

response. All coordination and application fees shall be borne by the vendor.

The costs associated with licensing for the Phase II option shall also be included in the cost section of the vendor's response for that item. All coordination and application fees shall be borne by the vendor.

9.3 FEDERAL AVIATION ADMINISTRATION (FAA)

The successful contractor shall be responsible for preparing and filing all necessary FAA documents required in support of the aforementioned tasks.

9.4 ANTENNA STRUCTURE REGISTRATION

The successful contractor shall be responsible for preparing and filing all necessary antenna structure registration documents required in support of the aforementioned tasks.

9.5 STANLEY GOLF COURSE EXCEPTION

The City of New Britain Park and Recreation Department operates Stanley Golf Course in the northwest end of the city. Currently, the Department operates a simplex 450 MHz business frequency for control of its automated Toro™ landscape sprinkler systems. The system is outdated and the hand held radios are in need of replacement. The system currently uses a POCSAG paging format for control of the sprinklers over the 450 MHz business channel. The same system hosts simplex voice communications for golf course workers including the professional golf staff. A total of 14 portable radios are required for this operation. In addition, the golf course uses a fixed control station to communicate across the entire golf course. In order to improve on this approach, the successful vendor should prepare a separate proposal that addresses the following:

1. A means of relicensing the business channel recognizing the need to narrowband the frequency.
2. Alternatives to the Toro™ controls.
3. New subscriber units and control station for the golf course workers.
4. Potential relocation of the control station antenna to the SST adjacent to Fire Station #7.

Vendors should continue to include the portable radios and control stations listed in Appendix B in their proposal because these workers interoperate with other city crews in winter months and have needs to occasionally contact the City's 9-1-1 center for emergency assistance and response coordination.

The separate proposal for this exception may be offered through a dealer but it must be submitted concurrent with the vendor's detailed response to this RFP.

10.0 OTHER REQUIREMENTS

10.1 CITY'S PROJECT MANAGER

The City has designated the following individual as its project manager ("TPM") for this project. After award, this individual will be the focal point of contact for **all matters** between the City and the successful contractor.

Mr. James P. Donnelly
Director, Public Safety Telecommunications Center
City of New Britain
125 Columbus Boulevard
New Britain, CT 06051
860-826-3087

10.2 CONTRACTOR'S PROJECT MANAGER

The proposer shall identify an individual who will serve as the contractor's project manager ("PM") if awarded a contract. This individual shall serve as the single point of contact between the successful contractor and the TPM.

The identified PM shall be an employee of the proposer at the time of the response submission. The PM shall have a proven record of experience in projects of similar scope.

The City reserves the right to accept or reject the identified PM. If, during the term of the contract, it is necessary to replace the PM, the City reserves the right to accept or reject the newly identified PM.

The response shall include the following information on the identified PM:

- Name
- Employment history with proposer
- Home base of operations
- Relevant experience
- Education & training
- List three (3) of the most recent projects of similar scope managed by your identified PM
- Provide a brief description of each listed project & include the major categories of equipment involved inclusive of the manufacturer
- For each listed project, provide approximate start and end dates
- For each listed project, provide name, title and telephone number of a reference contact possessing a technical background

For each of the months identified in the project schedule to be included in the response (see the following section), the proposer shall provide a reasonable estimate of the amount of hours to be spent by the PM on the implementation of this project.

For each one of the months the project hours shall be broken down into "on-site" hours and "off-site" hours, as applicable.

10.3 PROJECT SCHEDULE

The proposer shall provide in their response a "high-level" GANTT chart showing how they plan

to implement the system. This project schedule shall include, at a minimum, the following:

- Contract execution date
- Planned project status meetings
- Major project events & responsibility
- Major & critical project milestones
- Estimated duration of events
- Project closeout date

All project events and/or milestones, which the proposer views as the responsibility of the City, shall be clearly identified in the project chart with a distinctive color.

It is understood that this project schedule shall not be construed to be complete or final. During the period of contract negotiations, the City will allow the successful contractor to submit a detailed schedule for inclusion to the contract.

During the implementation phase of this project, the contractor shall be required to submit updated project schedules on a monthly basis.

10.4 MIGRATION PLAN

Vendors shall develop a migration plan to be included in the response that addresses, at a minimum, the following areas:

- transition of the existing users to the new system: console and subscribers
- relocates the existing 11 GHz microwave and 5.8 GHz systems.
- maintains an interface to the RAFS control station, State Police Hot Line VHF Low band System, Inner City Fire System, and develops an interface to two ITAC channels as well as the Region 3 VHF simplex system, CSPERN and Med-9 control stations.

The plan shall, to the greatest extent, minimize or eliminate disruption to existing operations.

Based on the equipment and/or system solutions offered, responses shall include a description on how each one of the solutions will be implemented and what impact each may have on existing operations. If desired, descriptions can use a bullet item type format to describe the sequence of events.

10.45 LTE MIGRATION

The City of New Britain has a strong interest in the National Broadband Plan as released by the Federal Communications Commission. As such, the notion of the Long Term Evolution (LTE) effort is of significant interest and concern. While the City has no immediate need for services such as those that likely would become available with a wireless broadband system, it does not wish to change technologies in rapid succession for budget reasons. Accordingly, the City is requesting that each offerer provide a road map and a detailed discussion on how they would incorporate their proposed product offering and system design in an eventual LTE or similar 4G broadband product. THIS IS A MANDATORY REQUIREMENT AND AN ELEMENT OF THE PROPOSAL EVALUATION.

10.5 TALKGROUP MAPPING

After contract award, the successful contractor shall be required to develop the talkgroup configuration for the new system. The configurations shall be approved by the City's Project Manager.

10.6 SPECIAL REQUIREMENTS OF BIDDERS

The City of New Britain is a small municipality with limited resources. As such, it must be assured that its radio system provider is of top quality and likely to survive the ever changing climate of communications technology. Accordingly, the City requires bidders to have the all of following qualifications:

1. Over 150 million in revenue attributable to North American public safety radio systems
2. 10 or more North American trunked radio systems with greater than 3 sites
3. 3 or more North American trunked radio systems that use linear simulcast technology
4. 5 or more North American P25 trunked radio systems
5. Switch capable of future LTE implementation
6. Multi-Band Radio for interoperability (VHF or UHF, 700/ 800)
7. All infrastructure and user equipment software upgradeable to P25 Phase 2.
8. All infrastructure shall be engineered and manufactured in North America.

10.7 DELIVERY & STORAGE OF MATERIALS

The contractor shall be responsible for coordinating, unloading, inspecting, accepting and storing all material deliveries. City personnel shall be excluded from performing any of these activities.

All claims necessary as a result of damage or loss during shipment shall be the responsibility of the contractor.

All stored materials shall remain the responsibility of the successful contractor until accepted by the City. The PM or contractor's designate shall be the only individuals authorized to accept materials delivered to the City. The contractor shall present to the TPM a receipt of items being delivered. The TPM's signature on the receipt shall constitute acceptance of the materials.

Proposers shall list in their response the facilities where they plan to deliver the major system items prior to installation.

10.8 INSTALLATION

The contractor is fully responsible for installing their complete system in a 'TURN-KEY' manner, including interfacing to other systems and subsystems.

The contractor is responsible for providing all materials, cabling/wiring, labor, tools and instrumentation to ensure a complete and successful installation. All tools and instrumentation shall be considered to be normal and customary installation items owned by the contractor.

To the greatest extent possible, all equipment intercabling and/or cable/wiring bundles shall be neatly secured by means of plastic tie wraps, secured by surface mounted clamps and hidden from view.

Splicing of antenna, power, audio and/or control cables shall be unacceptable.

All rubbish and debris associated with site preparation; unpacking of shipping materials; and/or the installation of new equipment or systems related to this project shall be removed from the premises by the contractor. Removal of rubbish and debris shall be performed daily.

All facilities, equipment and cabling installations shall comply with the following applicable codes:

- National, State & Local Electrical Codes
- State & Local Building Codes

10.9 GROUNDING & LIGHTNING/POWER SURGE PROTECTION

The contractor shall be responsible for providing all materials and labor for the installation of necessary electrical ground connections and surge protection devices.

The City assumes that the work in this section shall be performed in accordance with certain guidelines and/or standards practiced by the contractor.

Responses shall identify the source or sources of these guidelines and/or standards. If this source is a formal document published by the proposer, one (1) copy shall be included with the response.

10.10 ACCEPTANCE TESTS

10.10.1 GENERAL

The contractor shall develop the plans and conduct the tests defined in this section. Except as specifically stated in this section, the contractor shall provide all items, instrumentation, materials, equipment, vehicles and personnel to conduct the tests.

For each one of the tests and inspections identified in this section, the response shall identify the anticipated responsibilities of the City during such activities.

Costs associated with the tests and inspections defined in this section shall be clearly and individually identified in the pricing section of the response.

10.10.2 INITIAL SYSTEM STAGING & TESTING

Prior to the installation of the fixed infrastructure, the contractor shall stage and test, to the greatest extent, all the equipment and software to be supplied under this contract.

The location of the staging area will be selected at the discretion of the contractor. All costs related to staging and testing will be borne by the contractor.

Sixty (60) days prior to the commencement of this activity, the contractor shall deliver a preliminary test plan to the TPM for review; modification, if necessary; and approval.

At the conclusion of this activity, the contractor shall present to the TPM written certification that the tests performed were in accordance with the approved test plan, and that the results of the test were successful. The TPM's signature on the certification shall constitute acceptance by the City.

The City reserves the right to attend this test. Travel costs for City or designate

personnel attending the test shall not be the responsibility of the contractor.

10.10.3 FIELD TESTS

The City realizes that certain system tests are not possible or practical in a staged environment.

After field installation of the fixed infrastructure, the contractor shall perform those checks and test that were not performed during the initial testing. During this activity, the City also expects that certain critical system parameters and functions, tested during the initial test, will be re-checked and re-tested for verification purposes.

Sixty (60) days prior to the commencement of this activity, the contractor shall deliver a preliminary field test plan to the TPM for review; modification, if necessary; and approval.

At the conclusion of this activity, the contractor shall present to the TPM written certification that the tests performed were in accordance with the approved test plan, and that the results of the test were successful. The TPM's signature on the certification shall constitute acceptance by the City of the field tests.

The City reserves the right to attend these tests.

10.10.4 FIELD INSPECTIONS

After installation of the fixed infrastructure, the contractor shall perform field inspections to verify that equipment installations have been completed in accordance with the City's specifications, the contractor's installation practices and standards; and that workmanship is neat and professional.

Sixty (60) days prior to the commencement of this activity, the contractor shall deliver a preliminary field inspection plan to the TPM for review; modification, if necessary; and approval.

At the conclusion of this activity, the contractor shall present to the TPM written certification that the field inspections performed were in accordance with the approved plan, and that the results of the inspections were satisfactory. The TPM's signature on the certification shall constitute acceptance by the City of the field inspections.

The City reserves the right to attend these inspections.

10.10.5 RADIO COVERAGE VERIFICATION TEST

The contractor shall perform this test in order to validate the 2-way computer generated prediction contours presented in the response.

The contractor shall use the results of this test to amend the contours supplied with the response. Amended contours shall be submitted to the TPM in accordance with the applicable requirements of the system documentation section of this specification.

The test shall be based on a methodology that grids the City's defined service area, and uses audio quality testing to rate the audio quality of the system throughout the service area. Test points within the grids shall be selected at random, evenly distributed and of

sufficient quantity to provide for a high degree of statistical confidence in the results. The quantity and size of grids to be tested shall be approved by the TPM.

For the purposes of this test, proposers shall assume that the City will provide the test vehicles and drivers.

Portable talk-out and talk-back tests only are required.

Sixty (60) days prior to the commencement of this activity, the contractor shall deliver a preliminary radio coverage verification test plan to the TPM for review; modification, if necessary; and approval.

At the conclusion of this activity, the contractor shall present to the TPM written certification that the tests performed were in accordance with the approved plan, and that the results are presented in the amended contours. The TPM's signature on the certification shall constitute acceptance by the City of this test.

The City reserves the right to participate in these tests.

10.10.6 OPERATIONAL SYSTEM TEST

This test shall be performed to demonstrate that the 800 MHz radio system and related sub-systems have been properly configured and optimized; and that they will operate fully and properly without a major system failure. This test shall be performed after all the tests and inspections defined earlier in this section have been accepted, and before system cutover.

During the test, all system features and functions shall be fully operational and accessible to the test users. The City shall approve the selection of test users.

The duration of this test shall not be for less than a continuous thirty (30) calendar day period.

If a major failure occurs within the thirty (30) day period, the continuation or re-start of the test will be at the discretion of the TPM. The City defines major failure as follows:

- any failure which causes full featured or full function trunked operation to be lost on any one radio channel or at any one fixed equipment site

10.10.7 FINAL SYSTEM ACCEPTANCE

System acceptance will be deemed final when the TPM's signature appears on all certifications for the tests and inspections defined in this section.

10.11 TRAINING

The contractor shall provide training for system administrators and users based on classroom style instruction. The proposer shall assume that all training will be conducted in facilities owned or operated by the City or participating agencies.

After contract award, the contractor shall develop a training plan that shall be subject to the City's approval. It is expected that this plan will include, as necessary, session syllabus, classroom materials, audiovisual aids, hands-on fixtures, session schedules, number of sessions, etc.

All training materials produced by the contractor shall become the property of the City.

The City envisions that, at a minimum, training will encompass the following categories. Proposers are asked to offer additional categories than those identified herein if deemed suitable for the systems they are offering.

- Communications Center Administrators & Supervisors - “User” training - system management, alarms, diagnostics & reports (12 people estimated)
- Communications Center Telecommunicators - “User” training - on radio consoles and field equipment (20 people estimated)
- Field Users - “Train-the-Trainer” training – mobiles and portables (25 trainers; 10 per training session; 5 sessions 8A-12P; 2 sessions 1P-5P; 2 sessions 6P-10P; no less than 5 mobiles per session).
- For the purposes of providing hands-on training and to the greatest practical extent, all sessions shall use equipment that is fully system operational.

Furthermore, the contractor shall provide factory training for console, system manager, and trunk system equipment and software for two [2] City personnel. All course material, classes, and travel expenses shall be included in the pricing. Vendors are to provide a list of classes and dates in their proposal, as well as course syllabus.

Costs associated with training shall be clearly and individually identified in the pricing section of the response.

10.12 WARRANTY

The contractor shall provide a one (1) year warranty period from the date of final system acceptance. This warranty shall cover all 800 MHz radio coverage, parts, labor and travel related to all the equipment and software supplied under this contract. Each offering shall provide an extended warranty option for all fixed equipment and software for a period of two (2) additional years.

The City requires the following, not to exceed, response and repair times during this period:

- For all fixed infrastructure equipment
 - ✓ 24-hour x 7-day coverage
 - ✓ 2 hour OSR (on-site response)
 - ✓ 4 hour repair from time of OSR
- For all mobile equipment
 - ✓ 10-hour x 5-day coverage
 - ✓ 2 hour OSR
 - ✓ 4 hour repair or exchange from time of OSR
 - ✓ 3 business days to complete repairs from time of OSR
- For all portable equipment, less accessories
 - ✓ 8-hour x 5-day coverage

- ✓ 8 hour OSR
- ✓ 3 business days to complete repairs from time of OSR

The proposer shall identify in the response the local organization or organizations that will be responsible for warranty during the first year. If more than one (1) organization is offered, a breakout shall be provided which identifies the items that each organization will be responsible for.

The response shall include the following information on the offered warranty organization or organizations:

- Business name, address & telephone
- Number of years in service under this or any other name
- Name of General Manager & of Technical Manager
- Total number of senior technicians (7+ years); technicians (3 to 7 years); & junior technicians (1 to 2 years)
- Number of technicians which primarily perform road service
- Number of technicians which primarily perform bench service
- Describe the approximate size of the area used for bench service & indicate the number of bench repair stations
- Describe the approximate size of the area used for mobile installations & indicate the number of garage stalls
- Brief overview of the relevant experience of the business
- State whether the organization has previously performed work for the City. If so, list the agency or department, contact person name and phone number, the approximate date of the work performed
- State whether the organization has any pending litigation and state whether the organizations has had any litigation in the last 5 years
- List three (3) of the most recent projects of similar scope
- Provide a brief description of each listed project & include the major categories of equipment involved inclusive of the manufacturer
- For each listed project, indicate whether warranty is currently being provided & indicate whether it is through a single or multi year contract
- For each listed project, provide name, title and telephone number of a reference contact possessing a technical background

If the Vendor's warranty and maintenance staff are not the same organization(s) offered to perform the system and equipment installations, the above information shall be stated in the response for the offered installation organization (s). This information shall be included in the response under Section 9 – WARRANTY & MAINTENANCE.

Costs associated with this warranty period shall be clearly and individually identified in the

pricing section of the response.

10.13 PREVENTIVE MAINTENANCE

Preventive maintenance of the system and its components shall be performed during the warranty period. This maintenance shall be limited to the equipment and software supplied under this contract.

The City assumes that this maintenance will be performed at regularly scheduled intervals in accordance with the recommendations of the manufacturer.

The proposer shall identify in the response the local organization or organizations, if different from the warranty section, which will be responsible for preventive maintenance during the first year. If more than one (1) organization is offered, a breakout shall be provided which identifies the items that each organization will be responsible for.

If this organization or organizations are different from those identified in the warranty section, the response shall include the same basic information requested in the warranty section.

Costs associated with this preventive maintenance period shall be clearly and individually identified in the pricing section of the response.

If the Vendor's warranty and maintenance staff are not the same organization(s) offered to perform the system and equipment installations, the above information shall be stated in the response for the offered installation organization (s). This information shall be included in the response under Section 9 – WARRANTY AND MAINTENANCE.

10.14 SYSTEM DOCUMENTATION

10.14.1 GENERAL

After contract award, the contractor shall deliver to the TPM equipment & system manuals as well as system documentation of final field conditions. These manuals shall be provided in both hard copy and CD.

The contents and organization of all field documentation to be submitted by the contractor shall be approved by the TPM.

Costs associated with the documentation required shall be clearly and individually identified in the pricing section of the response.

10.14.2 DOCUMENTATION MEDIA

Equipment & system manuals supplied by manufacturers will be accepted in their standard form.

To the greatest extent, all field documentation shall be prepared in a format suitable for loose leaf storage in 3-ring binders. The contractor shall supply the binders as necessary.

Software and associated documentation shall be supplied to the City on mutually agreed media.

Three (3) complete sets of manuals, CD's, and documents are required to be furnished to the City prior to final acceptance of the system.

10.14.3 INSTALLATION DOCUMENTATION

At a minimum, the following documentation shall be provided:

- 10.14.3.1 Simple single line "as-built" system block diagrams for fixed end equipment installations. Blocks illustrated on these diagrams shall be labeled in such a way as to easily identify the type of equipment represented.
- 10.14.3.2 Simple single line "as-built" diagrams for the antenna systems at each main radio site. Diagrams shall be labeled in such a way as to easily identify the type of item represented including its make and model number. The City envisions that, at a minimum, the following items will be illustrated:
- antennas and associated mounts
 - main transmission line, coaxial jumper cables, and their approximate lengths
 - cable entrance ports, lightning arrestors and ground straps
 - filters, combiners, multicouplers, pre-amps, cross-band couplers, etc.

When delivering these drawings to the TPM, specification or catalog cut sheets for each of the items illustrated shall be included with the submittal.

- 10.14.3.3 For each 800 MHz radio site, "as-built" antenna location plans illustrating the location, azimuth and height above ground level of the 2-way antennas. The location of the antennas shall be shown in top and frontal elevation views. All plans shall be scaled.
- 10.14.3.4 For each 800 MHz radio site requiring a new tower or a new equipment shelter, "as-built" site plans shall be provided. All plans shall be scaled.
- 10.14.3.5 For each main radio site, simple "as-built" floor plans illustrating the location of equipment and/or equipment racks supplied under this contract in relation with other existing site equipment. For ease of reference, rack mounted equipment shall be shown as a frontal elevation view. All plans shall be scaled.
- 10.14.3.6 Computer generated radio propagation coverage maps of the final antenna system configurations at each site. Each map shall clearly contrast the coverage contour with the City's boundaries.

Additionally, each map shall be supported with a detail of the engineering parameters and parameter values used. The City envisions that, at a minimum, the following items will be included on the list:

- site location information
- propagation model

- confidence/reliability
- terrain & antenna heights
- system gains & losses
- environmental losses

10.14.3.7 A detailed inventory of each fixed equipment installed shall be supplied to the City. The inventory shall be prepared in spreadsheet format and shall include, at a minimum, make, model, serial number and location. The inventory shall be submitted in both printed and soft form.

10.14.3.8 A detailed inventory of each mobile and portable equipment shall be supplied to the City. The inventory shall be prepared in spreadsheet format and shall include, at a minimum, make, model and serial number. The inventory shall be submitted in both printed and soft form.

10.14.4 OPERATOR MANUALS or USER GUIDES

An operator manual and/or user guide shall be supplied with each mobile and portable delivered. For mobiles only, an additional quantity representing twenty percent (20%) shall also be supplied. All documents shall also be provide in portable document format (pdf).

A radio console operator manual and/or user guide shall be supplied for each communications center operator. An additional quantity representing fifty percent (50%) shall also be supplied. All documents shall also be provide in portable document format (pdf).

10.14.5 MAINTENANCE & OPERATIONS MANUALS

Maintenance and operations manuals shall be provided to the City for each category of equipment and software supplied under this contract. All documents shall also be provide in portable document format (pdf).

11.0 RESPONSE SUBMISSION INSTRUCTIONS

11.1 OVERVIEW

To facilitate and expedite the evaluation process, all information in the vendor's response should be organized and presented as directed below.

The response may be deemed to be non-responsive and automatically disqualified, at the City's discretion, if the response fails to comply **exactly** with the instructions of this entire section.

11.2 MANNER OF SUBMITTAL

Responses shall comply with the submission requirements of this section and with those contained within the 'GENERAL TERMS & CONDITIONS' Section of this solicitation.

Vendors are reminded that **NO** oral, telegraphic, telephonic or facsimile responses will be considered.

Each copy of the response shall be submitted in a 3-ring binder and all sections shall be divided by the use of numeric index tabs.

11.3 VENDOR RESPONSE ORGANIZATION

Responses shall be organized in the following manner:

COVER LETTER

- Vendor shall submit letter on company letterhead.
- Letter shall be signed by duly authorized representative.
- Include an explicit statement asserting that the vendor will be the prime proposer providing all of the materials and labor required by the specification.
- Immediately following the cover letter include the:
 - Bid Bond
 - Non-Collusion Affidavit
 - Performance Bond Affidavit
 - Insurance Affidavit
 - Authorized Representative Affidavit
- Note that the original signature of the above listed documents is required in the response copy marked as 'ORIGINAL'. Originals only are required.

TABLE OF CONTENTS

SECTION 1 - BRIEF EXECUTIVE OVERVIEW (no more than 4 pages)

- Introduction of the prime contractors company including history, qualifications, experience, main line of business, how business is organized (corporation, partnership, public, private, etc.).
- Introduction of the subcontractor(s) including history, qualifications,

experience, main line of business, how business is organized (corporation, partnership, public, private, etc.).

- Identify all subcontractor(s) by listing name, address, phone and contact person.
- State whether the prime contractor has worked with the subcontractor(s) in the past. If so, provide brief descriptions on: the project(s) (no more than 3); the system elements; the scope of each subcontractor's responsibility; the approximate start date and duration of the project.

SECTION 2 - STATEMENT OF WORK

- Describe the work to be performed by the prime contractor by identifying all major project tasks and milestones.
- Describe the work to be performed by each subcontractor by identifying all major project tasks and milestones. Group all project tasks by their associated subcontractor.
- Identify the anticipated responsibilities of the City.
- Provide a proposed project organizational chart.

SECTION 3 - POINT-BY-POINT RESPONSE

- Unless indicated otherwise a point-by-point response shall be presented in this section.
- Note that some of the specification sections may not need or require a response.
- Any specification section that is not included in this point-by-point response will be deemed to have been accepted and agreed to by the vendor.
- Every point-by-point response shall be identified by its corresponding specification section number. All responses shall follow the same numeric sequence of the specification.
- Reiteration of the specification section text in the point-by-point response is not necessary. However, if it is, for ease of reference, the text of the vendor's response shall have a shaded background or be underlined. Bolding or the use of different fonts is not acceptable.
- If there are any exceptions, clarifications and/or substitutions (E/C/S); identify each item clearly as an exception, clarification or substitution. E/C/S items shall only be presented in this section of the response.
- For clarifications or substitutions, provide an explanation of the difference between what the specification requested and what will be supplied by the vendor. Vendors shall explain why they believe their method of accomplishing the requested functionality will be equal or better.

- For exceptions, provide the reason.

SECTION 4 - TECHNICAL SYSTEM INFORMATION

- Description of the system(s) being offered.
- Include a detailed itemized list and quantities, in matrix form, of all equipment supplied and their intended installed location. Do not include costs. Intended locations shall appear as columns on the matrix.
- Include equipment catalog or specification sheets.
- Include simple block system diagrams illustrating all major system components of each of the systems offered. These diagrams shall be provided on a per site basis.
- Include simple drawings illustrating the frontal elevation and top view of the equipment being offered for all of the 800 MHz radio sites. Frontal elevation views shall depict the offered equipment relative to the racks and/or equipment cabinets being supplied. Approximate dimensions for all equipment racks and cabinets shall be shown on the drawings.
- Include a plan and elevation views of each one of the console configurations offered and identify all dimensions.
- The plan view shall depict the placement of the console furniture relative to the room and shall be drawn to scale.

SECTION 5 - RADIO COVERAGE CONTOURS

SECTION 6 - MIGRATION PLANS

- This section shall contain all the information requested in the 'MIGRATION PLAN' section.

SECTION 7 - PROJECT SCHEDULE

SECTION 8 - CONTRACTOR'S PROJECT MANAGER INFORMATION

- This section shall contain all the information requested in the 'CONTRACTOR'S PROJECT MANAGER' section.

SECTION 9 - WARRANTY & MAINTENANCE

- This section shall contain all the information requested in the 'WARRANTY' & 'PREVENTIVE MAINTENANCE' sections.

SECTION 10 - LIST OF REFERENCES

- Provide a list of five (5) references with radio systems having similar requirements of this solicitation. The systems identified shall have been accepted no less than six (6) months and no greater than two (2) years from the due date of this response. Include a brief description of the system, approximate date of acceptance, contact name and telephone number.
- FOR EACH SUBCONTRACTOR - Provide a list of five (5) references with radio

systems having the similar requirements of this solicitation. The systems identified shall have been accepted no less than six (6) months and no greater than two (2) years from the due date of this response. Include a brief description of the system, approximate date of acceptance, contact name and telephone number.

SECTION 11 - COSTS

- Cost sheets shall be in matrix form to the greatest extent possible. Intended or locations of items shall appear as columns on the matrix.
- The costs shall cover all the items to be supplied by the successful vendor. Costs shall be shown on a per unit and extended basis.
- Identify all cost sheet items, at a minimum, in the following order: item number, model number, descriptor, quantity and intended location, total quantity, unit cost and extended cost.
- Cost for major services such as installation, licensing, systems engineering, program management, coverage testing, training, etc., shall be clearly identified. Costs for these services shall not be lumped.
- List all sub-items associated with each major item.
- Clearly identify each cost sheet with an appropriate header and page number including the costs associated with allowances.
- Any costs for optional items or offerings shall be presented on a separate cost sheet.

12.0 Appendices

Appendix A

Appendix A is the Statement of Requirements for Project 25 systems as developed by the APCO committee, incorporated under TIA Standard 102. The appendix has both Phase 1 and Phase 2 requirements. Some are mandatory requirements, some are standard options, and some are simply options. Two columns have been added to these requirements for the purposes of this procurement. Unless otherwise indicated, the required item matches the P25 requirement statement. Standard options shall be quoted as options unless they are indigenous to the product offering and items that are required options shall be quoted as part of the component price. Each column is specific about the requirement for this proposal as to whether the item is:

- 1.) **(M)** Mandatory and part of the base procurement for the City of New Britain;
- 2.) **(SO)** A standard option that must be quoted as such by the offerer but separately priced for the City of New Britain.

Appendix B

Appendix B is the proposed list of subscriber equipment subject to amendment prior to contract.

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
1.0 Project 25 (P25) Overview	i	i	i	i
1.1 P25 Statement of Requirements (P25 SoR)	i	i	i	i
1.1.1 P25 Statement of Requirement Objectives				
The objectives of this effort to establish a standards profile for the operations and functionality of new digital Public Safety radio systems are as follows:	i	i	i	i
Obtain maximum radio spectrum efficiency.	i	i	i	i
Ensure competition in system life cycle procurements.	i	i	i	i
Allow effective, efficient and reliable intra-agency and inter-agency communications.	i	i	i	i
Provide "user friendly" equipment, "user friendly" being defined as the least amount of mental and physical interaction by the operator.	i	i	i	i
Provide a graceful path from present analog technologies through all phases of Project 25.	i	i	i	i
1.2 Regulatory and Standards Applicability				
1.2.1 Bandwidth Compliance				
1.2.1.1 12.5 and 6.25 kHz Bandwidth	i	i	i	i
Adopt 12.5 kHz bandwidth channels with future migration to 6.25 kHz bandwidth channels as technology allows.	M	M	i	i
1.2.1.2 25 kHz Equivalency Bandwidth	i	i	i	i
Adopt 6.25 kHz bandwidth channels or equivalent.	i	i	M	M
1.3 Other Applicable Standards, Technical Documents, and Requirements				
1.3.1 APCO Project 16	i	i	i	i
1.3.1.1 Project 16 Compatibility	i	i	i	i
The P25 system shall be generally compatible with the requirements specified by Project 16A. In all instances where Project 25 Statement of Requirements conflicts with those of APCO Project 16A, the Project 25 Requirements shall supersede.	i	i	i	i
1.3.2 ANSI/TIA/EIA	i	i	i	i
1.3.2.1 ANSI/TIA/EIA-603 Compliance	i	i	i	i
When operated in the analog mode all radio equipment shall meet the requirements specified in the current edition of TIA/EIA-603 "Land Mobile FM or PM Communications Equipment Measurement and Performance Standards".	M	M	M	M
1.3.3 Subscriber Unit MIL-SPEC Requirements	i	i	i	i
The mobile and portable equipment shall meet the applicable sections of MIL-STD-810E "Environmental Test Methods and Engineering Guidelines" as follows.	i	i	i	i
1.3.3.1 Method 506.3; Rain, Procedure I – Blowing Rain	M	M	M	M
1.3.3.2 Method 509.3; Salt Fog, Procedure I – Aggravated Screening	M	M	M	M
1.3.3.3 Method 510.3; Sand and Dust, Procedure I – Blowing Dust	M	M	M	M
1.3.3.4 Method 514.4; Vibration, Procedure I, Category 10 – Minimum Integrity Test (3 axis)	M	M	M	M
1.3.3.5 Method 516.4; Shock, Procedure I – Functional Shock	M	M	M	M

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
2.0 Detailed Standards Suite Proposed	i	i	i	i
The system will be designed around a suite of operational standards so that field systems manufactured by different vendors can operate together and offer unit-to-unit communications based on predefined activation procedures.	i	i	i	i
P25 Open Interfaces	i	i	i	i
In order to meet the stated objectives and requirements, a comprehensive suite of P25 standards is necessary that defines the P25 interface characteristics and permits the interconnection of all P25 system components. The necessary P25 standards components are as follows.	i	i	i	i
2.1 P25 Common Air Interface (CAI)				
Develop a P25 CAI (U _m Interface) standard.	i	i	i	i
2.1.1 P25 Common Air Interface	i	i	i	i
2.1.1.1 Phase 1 CAI	i	i	i	i
One channel bit-rate, modulation, and link layer shall be utilized for all voice and data capabilities, excepted only for manufacturer-specific subsystems to provide backwards compatibility to existing manufacturer-specific systems.	M	M	i	i
2.1.1.2 Phase 2 CAI	i	i	i	i
For Phase 2, the above paragraph is modified to read: One channel bit-rate, modulation, and link layer shall be utilized for all voice and data capabilities, with backward compatibility as described in Section 5.3.	i	i	M	M
2.1.1.3 Common Channel Operation	i	i	i	i
For common channel operation control, voice, and/or data, features shall be integrated into a single channel.	M	M	M	M
2.1.2 P25 Standard Service Set				
A P25 standard service set for all manufacturers consists of the following requirements.	i	i	i	i
2.1.2.1 Group calls in a Conventional system.	SO	SO	i	i
2.1.2.2 Group calls in a Trunked system.	M	M	M	M
2.1.2.3 Private calls in a Conventional system.	SO	SO	i	i
2.1.2.4 Private calls in a Trunked system.	M	M	M	M
2.1.2.5 PSTN Interconnect calls in a Conventional system.	SO	SO	i	i
2.1.2.6 PSTN Interconnect calls in a Trunked system.	SO	SO	SO	SO
2.1.2.7 The system shall support digital DTMF over dial for PSTN interconnect calls.	M	SO	M	M
2.1.2.8 The system shall provide an SU or console the ability to play tone sequences to another SU.	M	SO	M	M
2.1.2.9 Voice encryption control in a Conventional system.	SO	SO	i	i
2.1.2.10 Voice encryption control in a Trunked system.	SO	SO	SO	SO
2.1.2.11 Preprogrammed (i.e., user definable) Data messages in a Conventional system.	SO	SO	i	i
2.1.2.12 Preprogrammed (i.e., user definable) Data messages in a Trunked system.	SO	SO	SO	SO
2.1.2.13 Tracking of individual and group members in conventional systems as they move, automatically or manually, from channel to channel, site to site, or RFSS to RFSS within and between systems for resource management needed to support voice, data, and OTAR operation.	SO	SO	i	i
2.1.2.14 Tracking of individual and group members in trunked systems as they move from site to site and RFSS to RFSS within and between systems for resource management needed to support voice, data, and OTAR operation.	M	M	M	M
2.1.2.15 Dynamic subscriber unit talk-group regrouping allows merging and un-merging of multiple talk groups in addition to individual radios into a single dynamically defined talk group in a Conventional system.	SO	SO	i	i
2.1.2.16 Dynamic subscriber unit talk-group regrouping allows merging and un-merging of multiple talk groups in addition to individual radios into a single dynamically defined talk group in a Trunked system.	M	M	M	M

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
Requirements 2.1.2.15 and 2.1.2.16 are “dynamic” features used to help dispatchers dealing with unscheduled situations requiring cooperative work of several agencies that normally use distinct talk groups. The regrouping leads to dynamic creation of a “merged” talk group containing all the units previously belonging to the designated talk groups.				
Whenever possible, the operation of the dynamically regrouped units should be encrypted if initial talk groups were operating in encrypted mode. When the Algorithm ID and Key ID information for the merged talk group are required and may be different from those of any of the talk groups that were merged.	i	i	i	i
2.1.2.17 Emergency alarm in a Conventional system.	SO	SO	i	i
2.1.2.18 Emergency alarm in a Trunked system.	SO	M	SO	M
The term “alarm” refers generally to the indication of an occurrence of a system event that may require a response by the system or operator. The term “alert” refers generally to user-oriented signaling (e.g., involving tones).	i	i	i	i
2.1.2.19 Transport of a talker’s ID from the sending equipment to the receiving equipment during voice and data transmissions in a Conventional system.	M	M	i	i
2.1.2.20 Transport of a talker’s ID from the sending equipment to the receiving equipment during voice and data transmissions in a Trunked system.	M	M	M	M
2.1.2.21 Text Messaging – enables text messages to be sent from one unit to another. Text messages may be up to 256 characters in length and may be sent via SU keyboard entry or from a data terminal device connected to a SU, exclusive of overhead.	SO	SO	SO	SO
2.1.2.22 Broadcast Call – a one-way single transmission (i.e., no ‘hang time’) group call.	M	M	M	M
2.1.2.23 Radio Authentication – secure authentication of an SU’s identity.	SO	SO	SO	SO
2.1.2.24 Announcement Group Call – a group call addressed to a group of talk groups (i.e., an ‘announcement group’ that is transmission trunked only).	SO	SO	SO	SO
2.1.2.25 Emergency Call.	i	i	i	i
Emergency group call in a trunked system.	i	i	SO	SO
Emergency group call in a conventional system.	SO	SO	i	i
2.1.2.26 Radio Check – enabling a user to determine if a specific SU is currently available on the system.	SO	SO	SO	SO
2.1.2.27 Unit De-authorization – the system, if authorized, may support the capability to de-authorize a subscriber unit immediately to terminate services to it.	SO	SO	SO	SO
2.1.2.28 Busy Channel Lockout (Conventional Polite Mode).	i	i	i	i
The conventional SU shall be able to operate in a busy channel lockout mode, sensing whether the channel is busy before transmitting.	M	M	i	i
2.1.2.29 Radios operating in the Unaddressed Voice Call mode are configured to not include talk group ID in their decision to unmute for a received call.	M	M	M	M
2.1.2.30 Radios operating in the Digital Carrier Squelch mode are configured to unmute based on receiving carrier, ignoring both the received NAC and the received talk group ID.	M	M	M	M
2.1.2.31 System-wide group call to all SUs in a trunked system.	SO	SO	SO	SO
2.1.2.32 On a conventional system, System Call is a group call to all SUs on one or more channels.	SO	SO	i	i
2.1.2.33 The system shall provide for the restriction of SUs and talk groups to particular sites or RFSSs within the system. Operational considerations may cause this configuration to change over time. This requirement is only applicable to trunked systems (SUs and infrastructure). The system may broadcast information about current operational status and parameters so that subscriber units are able to adjust their operation accordingly.	SO	SO	SO	SO
2.1.2.34 Operational Use of Conventional Talkgroups \$0000 and \$FFFF	i	i	i	i
Subscriber radios shall have a setting for the No Call talk group (\$0000) that inhibits reception of all talk groups except the All Call talk group (\$FFFF).				
2.1.2.35 Surveillance Mode of Operation by P25 Radios	M	M	M	M

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
Users have a need for a mode of operation that can be used during surveillance activities. This mode of operation shall mute all audible indicators, including key beeps and other confirmation and alert tones and disable the internal speaker, and must allow for the use of headsets, or other audio \$FFFF (“Everyone”) Talk Group when in the surveillance mode. The surveillance mode of operation shall be enabled/disabled on a per channel basis. This mode of operation shall not limit or prevent transmit capability.	i	i	i	i
	SO	SO	SO	SO
2.1.2.36 Standards Definition of Priorities for Operational Use Codes	i	i	i	i
When there are perceived or actual conflicting instructions (i.e., codes) in one or more P25 standards the APIC shall identify for the P25 UNS which code takes precedence. (For example, in the case of conventional Talk Groups \$0000 (the No Call Talk Group - hear no one except the All Call Talk Group/speak to no one) and \$FFFF (the All Call Talk Group - hear everyone/speak to everyone), the P25 standards shall define the conditions the codes are used and the priority they are used in operation.)	M	M	M	M
2.1.2.37 Conventional Repeater Hangtime	i	i	i	i
Hangtime is typically sent for several seconds after a conventional repeater has received a transmission from a SU enabling positive feedback to the user that the repeater has been successfully accessed. This data pattern must be standardized to allow for expected operation and interoperability between the repeater and SU equipment.	i	i	i	i
A conventional (non-trunked) repeater shall send during transmitter hangtime a specified data pattern, including specification of the information imbedded in that data pattern.	M	M	i	i
Conventional systems shall provide a signal to SUs that can trigger visual feedback to subscriber unit users indicating that their transmission has reached the repeater station. The visual feedback indication by the SU shall be a settable feature of the SU through programming. The visual feedback indication may be a settable feature of the SU by the user if allowed by the programming.	SO	SO	i	i
Conventional systems shall provide a signal to SUs that can trigger audible feedback to subscriber unit users indicating that their transmission has reached the repeater station. The audible feedback indication by the SU shall be a settable feature of the SU through programming. The audible feedback indication may be a settable feature of the SU by the user if allowed by the programming.	M	M	i	i
2.2 P25 Data Interfaces: Mobile Data Interface (A Interface) and Fixed Host Data Interface (E_d Interface)	i	i	i	i
A Mobile Data Terminal (MDT) should not be interpreted to preclude the radio as an MDT.	i	i	i	i
2.2.1 P25 Mobile Data Interface (A Interface)				
Develop a P25 Mobile Data Interface standard.	i	i	i	i
2.2.1.1 Mobile Data Interface Protocols	i	i	i	i
The A Interface between a SU and one or more MDTs shall be compatible with IP (IPv4 and IPv6) standards.	SO	SO	SO	SO
2.2.1.2 MDT to MDT Communication	i	i	i	i
The P25 system shall provide the ability for any MDT attached to an SU to communicate with any other MDT attached to an SU (direct mode, repeat mode, network mode).	SO	SO	SO	SO
2.2.1.3 MDT to Fixed Host Communication	i	i	i	i
The system shall provide the ability for any MDT attached to an SU to communicate with any fixed host attached to the network.	SO	SO	SO	SO
2.2.1.4 Minimum Data Speed	i	i	i	i
Data transmission shall operate at a speed of at least 9600 bps (including overhead) with minimal error retransmissions.	M	M	M	M
2.2.2 P25 Fixed Host Data Interface (E_d)	i	i	i	i
Develop a P25 Fixed Host Data Interface standard.	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
2.2.2.1 Fixed Host Data Interface Protocols	i	i	i	i
An RF Subsystem (RFSS) shall support a fixed-host data interface based on the Internet protocol suite.	SO	SO	SO	SO
2.2.2.2 Fixed Host to MDT Communication	i	i	i	i
The network shall provide the ability for a fixed host to identify and transparently communicate data with any MDT attached to an SU.	SO	SO	SO	SO
2.2.2.3 Fixed Host to Fixed Host Communication	i	i	i	i
The P25 infrastructure shall provide the ability for a fixed host to communicate with any other fixed host attached to the P25 infrastructure (i.e., the Fixed Hosts may be attached via an E-1 Interface on the same or different RFSSs).	SO	SO	SO	SO
	i	i	i	i
2.3 P25 Telephone Interconnect Interface				
Develop a P25 Telephone Interconnect Interface (E-1 Interface) standard, which provides analog and digital interfaces between the P25 infrastructure (i.e., RFSS) and the Public Switched Telephone Network (PSTN) enabling telephone interconnect of SUs and the PSTN.	i	i	i	i
2.3.1.1 Full Duplex Telephone Interconnect	i	i	i	i
Full duplex telephone interconnect operation may be supported between subscriber equipment and RF Subsystems (RFSSs).	SO	SO	SO	SO
2.3.1.2 System Operator Control of PSTN Access	i	i	i	i
The system operator shall be able to selectively control SU access to/from the PSTN.	SO	SO	SO	SO
2.4 P25 Inter-RF Subsystem Interface (ISSI)	i	i	i	i
Develop a P25-defined ISSI (G Interface) standard enabling connectivity between all P25 RF Subsystems (RFSSs). In the P25 SoR, a P25 RFSS is a collection of infrastructure equipment capable of terminating the P25-defined interfaces as specified in the P25 SoR.	i	i	i	i
The ISSI is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 RFSS equipment and to users of P25 RFSS equipment.	SO	M ¹	SO	M
The ISSI should be considered by user organizations as a planning and operational requirement to achieve interoperability among P25 systems via interconnection of RFSSs from the same or different manufacturers.	i	i	i	i
2.4.1 Multiple P25 RF Subsystem Connectivity				
2.4.1.1 P25 RFSS Connectivity	i	i	i	i
Any P25 RFSS that implements the ISSI shall be able to be connected using the ISSI to any other P25 RFSS that implements the regardless of the types of P25 CAI(s), if any, implemented by those P25 RFSSs. When connecting P25 RFSSs using the ISSI, the interconnected RFSSs may be in the same or different P25 WACNs or P25 Systems. Each P25 RFSS shall be uniquely identifiable.	SO-R	SO-R	SO-R	SO-R
2.4.1.2 P25 RFSS and ISSI Function and Equipment Upgrade Capability	i	i	i	i
Manufacturers of P25 RFSS equipment (hardware and software) that is designed to support the ISSI function are expected to offer P25 RFSS equipment in a manner that will not require major replacement of P25 RFSS equipment to support addition of that manufacturer's ISSI equipment offerings. The ISSI function and equipment should be upgradeable through ISSI software revisions that enable maximum continued use of existing ISSI hardware. Manufacturers of P25 RFSS equipment that is not currently designed to support the ISSI function and equipment are expected to not require major replacement of that manufacturer's legacy P25 RFSS equipment if and when that manufacturer chooses to offer P25 RFSS equipment designed to support the ISSI function and equipment.	i	i	i	i
P25 RFSS equipment from a manufacturer that offers the ISSI shall be upgradeable to provide the ISSI function and to implement the associated ISSI equipment (hardware and software).	SO	SO	SO	SO
ISSI equipment shall be upgradeable via software and hardware revisions.	SO-R	SO-R	SO-R	SO-R
ISSI equipment shall be upgradeable via software-only revisions.	SO	SO	SO	SO
2.4.1.3 P25 RFSS Roaming	i	i	i	i
The ISSI shall support roaming of SUs among P25 RFSSs.	SO-R	SO-R	SO-R	SO-R
2.4.2 Operational Modes	i	i	i	i
2.4.2.1 Trunked:	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
The ISSI shall support two or more RF Subsystems operating in a trunked mode.	SO-R	SO-R	SO-R	SO-R
2.4.2.2 Conventional:	i	i	i	i
The ISSI shall support two or more RF Subsystems operating in conventional (i.e., non-trunked) mode.	SO-R	SO-R	SO-R	SO-R
2.4.2.3 Mixed mode:	i	i	i	i
The ISSI shall support two or more P25 RF Subsystems (RFSSs) where any combination of them is operating elements of the RFSS in trunked mode and any other RFSS is operating elements in conventional mode.	SO-R	SO-R	SO-R	SO-R
2.4.3 Networking Configurations				
2.4.3.1 Support of Operational Modes	i	i	i	i
Networking configurations used to interconnect P25 RFSSs shall support operational modes listed in Section 2.4.2.	SO-R	SO-R	SO-R	SO-R
2.4.3.2 Point to point	i	i	i	i
In its simplest form, the ISSI is used to connect two P25 RFSSs using any of the modes listed in Section 2.4.2.	SO-R	SO-R	SO-R	SO-R
2.4.3.3 Multipoint	i	i	i	i
In a multipoint configuration, the ISSI is used to support two or more P25 RFSSs.	SO-R	SO-R	SO-R	SO-R
2.4.4 Bearer Media for Interconnection	i	i	i	i
Bearer services and/or teleservices provide interconnectivity between P25 RFSSs. The ISSI is to be capable of operation, as required by system performance, over:	i	i	i	i
2.4.4.1 Dedicated links,	SO	SO	SO	SO
2.4.4.2 T1, E1, Fractional T1 and Fractional E1 links and their aggregation into higher bandwidth links (e.g., SONET),	SO-R	SO-R	SO-R	SO-R
2.4.4.3 IP based networks (IPv4 and IPv6).	SO-R	SO-R	SO-R	SO-R
2.4.5 Services to be supported	i	i	i	i
2.4.5.1 Supported Services	i	i	i	i
The ISSI shall support all services specified as Mandatory and Standard Option in the current P25 SoR, the TIA P25 Systems and Standards Definition documents, and their future revisions.	SO-R	SO-R	SO-R	SO-R
2.4.6 Interface Requirements				
2.4.6.1 The ISSI shall consist of a control element and a traffic element.	SO-R	SO-R	SO-R	SO-R
2.4.7 Control Element	i	i	i	i
The Control Element shall convey messages associated with the provision of services, including, but not limited to:	i	i	i	i
2.4.7.1 The management and location tracking of subscribers,	SO-R	SO-R	SO-R	SO-R
2.4.7.2 The authentication of subscribers,	SO-R	SO-R	SO-R	SO-R
2.4.7.3 The management of the setup, maintenance, and tear down of a call, and	SO-R	SO-R	SO-R	SO-R
2.4.7.4 The provision of over the air control and over the air rekeying of subscriber terminals.	SO-R	SO-R	SO-R	SO-R
2.4.8 Traffic Element	i	i	i	i
2.4.8.1 The traffic element shall convey P25 voice and/or data traffic in both encrypted and clear formats between connected P25 RFSSs.	SO-R	SO-R	SO-R	SO-R
2.4.9 Operational Description	i	i	i	i
A prerequisite with ISSI interconnected systems is that operational arrangements must be established between interconnected RFSSs and data elements exchanged must be uniformly interpreted. Such arrangements might include accounting matters (such as system usage, PSTN interconnect usage), talk group correlation, etc.	i	i	i	i
2.4.10 Roaming Subscriber Management				
2.4.10.1 ISSI Roaming Management	i	i	i	i
The ISSI shall support management of subscribers who roam onto ISSI-interconnected RFSSs.	SO-R	SO-R	SO-R	SO-R
2.4.10.2 SU Identification	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
The ISSI shall support home validation of units that roam to a visited RFSS.	SO-R	SO-R	SO-R	SO-R
2.4.10.3 SU Validation	i	i	i	i
The validation of an SU roamer is accomplished via communication from the SU's home RFSS to the visited RFSS.	SO-R	SO-R	SO-R	SO-R
2.4.10.4 Resource Entitlement	i	i	i	i
Resource entitlement for the validated SU roamer is accomplished via communication from the SU's home RFSS to the visited RFSS.	SO-R	SO-R	SO-R	SO-R
(For example, communication of resource entitlement for services and time limits.)				
2.4.10.5 Granting Requested Resources	i	i	i	i
The visited RFSS may then grant the requested resources according to the SU's home resource entitlement, which may further be	SO-R	SO-R	SO-R	SO-R
limited by the visited RFSS (i.e., according to the visited RFSS's resource availability or policy).				
2.4.10.6 Temporary Duplicate "Home Data File"	i	i	i	i
Once a roamer has been validated and its resource entitlement conveyed to the visited RFSS. The visited RFSS shall maintain a	SO-R	SO-R	SO-R	SO-R
temporary duplicate "home data file" in order to provide a faster grade of service. (Temporary refers to how long the data shall be maintained before it must be refreshed/updated, such as hours, days, etc. This directly impacts ISSI data link requirements.)				
2.4.10.7 PSTN Usage	i	i	i	i
The ISSI shall support Project 25-defined telephone interconnect signaling.	SO-R	SO-R	SO-R	SO-R
2.4.10.8 Encryption Key Management	i	i	i	i
The ISSI shall allow transfer of P25-defined key management information across the ISSI.	SO-R	SO-R	SO-R	SO-R
2.4.10.9 Authorized Roamer Access in Emergency Mode	i	i	i	i
An authorized roaming subscriber shall be granted access to the visited RFSS and to the ISSI whenever an emergency button is pressed				
on the SU. All ensuing emergency communications from the subscriber unit shall also be sent to the home RFSS. An authorized roamer's emergency declaration and unit ID shall be recognized by the visited RFSS.	SO-R	SO-R	SO-R	SO-R
2.4.10.10 ISSI Support for Polling of RFSS Capabilities	i	i	i	i
Provide knowledge to a system operator that the communication services for that operator's SUs are functioning properly on another RFSS.	SO	SO	SO	SO
2.5 P25 Network Management Interface (NMI)	i	i	i	i
Develop a P25 NMI (E n Interface) standard.	i	i	i	i
Any manufacturer that builds an RFSS must offer the NMI as a standard option.	SO	SO	SO	SO
2.5.1 Network Management	i	i	i	i
2.5.1.1 Single Management Control.	i	i	i	i
All subsystems and associated subscriber units that compose a P25 system and/or WACN shall be able to operate under the control of a single network management scheme, regardless of manufacturer. The scope of the single network management scheme includes the five basic aspects of network management: Configuration Management, Fault Management, Security Management, Performance Management, and Accounting Management.	SO-R	SO-R	SO-R	SO-R
2.5.1.2 Accounting/System Usage Information	i	i	i	i
An RFSS shall be able to provide accounting/system usage information via the NMI.	SO-R	M	SO-R	M
2.5.2 Element Management	i	i	i	i
Any manufacturer that builds a managed element must offer the corresponding network management capabilities as a standard option,	SO	SO	SO	SO
2.5.2.1 Single Point of Entry	i	i	i	i
Management of P25 system components and software levels shall be able to be performed from a single point. This shall be	SO-R	SO-R	SO-R	SO-R
accomplished in such a manner that an entry change to one database will automatically change all other associated databases without further user action.				
2.5.2.2 Assign Limited Set of Database Fields	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
It shall be possible, as a standard option, for the database administrator to assign a limited set of database fields for update by one or more specified database users.	SO-R	SO-R	SO-R	SO-R
2.5.2.3 Multiple Data Bases	i	i	i	i
As a standard option, to be able to update a limited subset of database fields.	SO-R	SO-R	SO-R	SO-R
2.5.2.4 Vertical Partitioning	i	i	i	i
Overall system management shall be able to delegate vertical partitioning management to the organization responsible for the operation of the partition.	SO-R	SO-R	SO-R	SO-R
2.5.2.5 Roaming Restrictions	i	i	i	i
Roaming restrictions shall be established by the system manager without manual programming of SUs. This requirement is only applicable to trunked systems (SUs and infrastructure).	SO	SO	SO	SO
2.6 P25 Console Subsystem Interface (CSSI)	i	i	i	i
Develop a P25 CSSI (E-Interface) standard. Define requirements for a P25 Console Subsystem Interface and not define requirements for console capabilities.	i	i	i	i
2.6.1 CSSI Applicability				
2.6.1.1 CSSI Applicability to P25 Console Subsystem Manufacturers and to Users	i	i	i	i
The CSSI is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 Console Subsystem equipment and to users of P25 Console Subsystem equipment.	SO	SO	SO	SO
2.6.1.2 CSSI Applicability to P25 RFSS Manufacturers and to Users	i	i	i	i
The CSSI is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 RFSS equipment and to users of P25 RFSS equipment.	SO	SO	SO	SO
2.6.2 General CSSI Requirements	i	i	i	i
2.6.2.1 Packet Data	i	i	i	i
The CSSI shall support the exchange of packet data between a Console and (1) Mobile Data Terminals (MDTs) (including SUs that incorporate MDT functionality), (2) RFSSs (e.g., Fixed Station Hosts), and (3) other Consoles.	SO-R	SO-R	SO-R	SO-R
2.6.2.2 Console Rekeying	i	i	i	i
The CSSI shall support the remote provisioning and management of security keys via a P25 Key Management Facility (KMF).	SO-R	SO-R	SO-R	SO-R
2.6.2.3 Telephone Patching	i	i	i	i
The CSSI shall support telephone patching by the console.	SO-R	SO-R	SO-R	SO-R
2.6.2.4 Conventional/Trunking Patching	i	i	i	i
The CSSI shall support patching between and among conventional and trunking resources. This means the CSSI shall support patching of conventional resources to conventional resources, trunking resources to trunking resources, and conventional resources to trunking resources.	SO-R	SO-R	SO-R	SO-R
2.6.2.5 Time Synchronization	i	i	i	i
The CSSI shall support the exchange of time synchronization data (where the time synchronization error does not exceed five seconds) between consoles, where the consoles may be exchanging information via different RFSSs, different P25 Systems, or different P25 Wide Area Communication Networks (WACNs).	SO-R	M	SO-R	M
2.6.2.6 Supplementary Data Service	i	i	i	i
The CSSI shall support the exchange of messages for supplementary data service between a Console and (1) Subscriber Units, (2) RFSSs, and (3) other Consoles.	SO-R	SO-R	SO-R	SO-R
2.6.3 CSSI Requirements for Conventional Services				
When the CSSI is used to support the exchange of information between a console and a conventional RFSS, the CSSI shall conform to the following requirements.	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
2.6.3.1 Conventional Services	i	i	i	i
The CSSI shall enable console support of all of the services specified in the P25 Standard Services Set (2.1.2) for the conventional mode of operation.	SO-R	SO-R	SO-R	SO-R
2.6.3.2 Voter Control and Status (Conventional)	i	i	i	i
The CSSI shall enable voter control by a console and reporting of voter status to a console for the conventional mode of operation.	SO-R	SO-R	SO-R	SO-R
2.6.3.3 Conventional Channel Status and Control	i	i	i	i
The CSSI shall support the reporting of the status of conventional channels under the control of the console as well as the control of the conventional channel itself.	SO-R	SO-R	SO-R	SO-R
2.6.3.4 Traditional Services (Conventional)	i	i	i	i
The CSSI shall support the exchange of information supporting traditional (i.e., legacy) communications capabilities between consoles and conventional channels.	SO-R	SO-R	SO-R	SO-R
2.6.3.5 Received NAC Code	i	i	i	i
The CSSI shall provide the NAC code associated with a received conventional call.	SO-R	SO-R	SO-R	SO-R
2.6.3.6 Transmit NAC Code	i	i	i	i
The CSSI shall support the console's ability to select the NAC for its voice transmissions.	SO-R	SO-R	SO-R	SO-R
2.6.3.7 Mode of Received Call	i	i	i	i
The CSSI shall provide the RF mode for received calls – digital or analog.	SO-R	SO-R	SO-R	SO-R
2.6.4 CSSI Requirements for Trunked Services				
When the CSSI is used to support the exchange of information between a console and a trunked RFSS, the CSSI shall conform to the following requirements.	i	i	i	i
2.6.4.1 Trunked Services	i	i	i	i
The CSSI shall enable console support of all of the services specified in the P25 Standard Services Set (2.1.2) for the trunked mode of operation.	SO-R	SO-R	SO-R	SO-R
2.6.5 CSSI Requirements for Mixed Mode Services				
When the CSSI is used to support the exchange of information between a console and an RFSS operating in a mixed services mode (i.e., the RFSS supports both trunked and conventional services), the CSSI shall conform to the following requirements.	i	i	i	i
2.6.5.1 Mixed Mode Services	i	i	i	i
In the mixed mode (both conventional and trunked mode of operation), the CSSI shall support services consistent with CSSI support of the trunked mode and conventional mode of operation. The services supported are based on the console's provisioning.	SO-R	SO-R	SO-R	SO-R
2.6.6 CSSI Requirements Applicable to both Trunking and Conventional				
The following requirements apply to both trunking and conventional resources.	i	i	i	i
2.6.6.1 Unit IDs	i	i	i	i
The CSSI shall provide the source unit ID for received digital calls.	SO-R	SO-R	SO-R	SO-R
2.6.6.2 Group Calls	i	i	i	i
The CSSI shall support the console's ability to send and receive group calls.	SO-R	SO-R	SO-R	SO-R
2.6.6.3 Outbound Talk Group Selection	i	i	i	i
The CSSI shall support the console's ability to select the talk group for its voice transmissions.	SO-R	SO-R	SO-R	SO-R
2.6.6.4 Received Talk Group	i	i	i	i
The CSSI shall provide the Talk Group associated with a received call.	SO-R	SO-R	SO-R	SO-R
2.6.6.5 Unit to Unit Calls	i	i	i	i
The CSSI shall support the console's ability to send and receive unit-to-unit calls.	SO-R	SO-R	SO-R	SO-R

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
2.6.6.6 Call Alert	i	i	i	i
The CSSI shall support the Call Alert feature to and from the console subsystem.	SO-R	SO-R	SO-R	SO-R
2.6.6.7 Emergency Alarm	i	i	i	i
The CSSI shall support the transport of Emergency Alarm messages to the console subsystem.	SO-R	SO-R	SO-R	SO-R
2.6.6.8 Emergency Call	i	i	i	i
The CSSI shall support the transport of Emergency Call messages to and from the console subsystem.	SO-R	SO-R	SO-R	SO-R
2.6.6.9 Encryption Mode for Received Calls	i	i	i	i
The CSSI shall provide the encryption mode for received calls – encrypted or clear.	SO-R	SO-R	SO-R	SO-R
2.6.6.10 Arbitration between Multiple Console Transmit Requests	i	i	i	i
The CSSI shall enable the arbitration between simultaneous console transmission requests.	SO-R	SO-R	SO-R	SO-R
2.6.6.11 Parallel Console Audio	i	i	i	i
The CSSI shall enable a console to hear other consoles transmit audio when the other console transmits on a resource the console is also utilizing.	SO-R	SO-R	SO-R	SO-R
2.6.6.12 Encryption	i	i	i	i
The CSSI shall support encrypted calls to and from the console subsystem.	SO-R	SO-R	SO-R	SO-R
2.6.6.13 Vocoding for Patch	i	i	i	i
The CSSI shall support patching of “like-vocoder” resources without needing to revert to base-band before completing the patch.	SO-R	SO-R	SO-R	SO-R
2.6.7 Miscellaneous CSSI Requirements				
2.6.7.1 Detection of Failure Conditions	i	i	i	i
The CSSI shall support the exchange of information supporting detection and reporting of communication failures between a console and a RFSS, including the state of the CSSI to the rest of the system.	SO-R	SO-R	SO-R	SO-R
2.6.7.2 Reporting of System Failure Conditions	i	i	i	i
The CSSI shall support the exchange of information for reporting to the console any system failure that affects normal console operation.	SO-R	SO-R	SO-R	SO-R
2.6.7.3 GPS/AVL	i	i	i	i
The CSSI shall support the transport of GPS/AVL information.	SO-R	SO-R	SO-R	SO-R
2.6.7.4 Location	i	i	i	i
The CSSI shall support the ability of the console to request location information.	SO-R	SO-R	SO-R	SO-R
2.6.7.5 Text Messaging	i	i	i	i
The CSSI shall support the transport of text messaging information to and from the console subsystem.	SO-R	SO-R	SO-R	SO-R
2.6.7.6 Transport Layer	i	i	i	i
The CSSI shall support unicast operation. The CSSI may support multicast operation.	SO-R	SO-R	SO-R	SO-R
2.6.7.7 Digital DTMF	i	i	i	i
The CSSI shall transport digital DTMF messages to and from the console subsystem. Digital DTMF refers to messages which indicate which DTMF digit was received or should be transmitted.	SO-R	SO-R	SO-R	SO-R
2.7 P25 Fixed/Base Station Subsystem Interface (FSSI)				
Develop a P25 Fixed/Base Station (including Repeater) Subsystem Interface (E _r Interface) standard supporting P25 conventional and trunked voice and data services. The FSSI, written “FSI” in abbreviated form, will be defined in terms of specialized FSSI interfaces. The requirements of this or their equivalent. A conventional “digital fixed station” supports the P25 Common Air Interface. The CFSI takes one of two forms – a basic analog interface and an enhanced IP-based digital interface. Definition of the TFSI requires further study.				
The FSSI is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25Fixed/Base Station Subsystem	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
equipment, P25 Console Subsystem equipment, or P25 RFSS equipment and to users of P25Fixed/Base Station Subsystem equipment, P25 Console Subsystem equipment, or P25 RFSS equipment.	SO	SO	SO	SO
2.7.1 Conventional Analog Fixed Station Interface (CAFSI)				
The CAFSI shall provide the following functions:	i	i	i	i
2.7.1.1 Transport of Clear Audio	i	i	i	i
Transport of clear audio between a fixed station and its host, providing capabilities for full-duplex, half-duplex and simplex communications at the discretion of the fixed station.	SO	SO	i	i
2.7.1.2 Transport of E&M Control Signaling	i	i	i	i
Transport of E&M control signaling between a fixed station and its host to provide a simple “Push-to-talk” and “Carrier On Relay” capability. The intent of this requirement is that the FSSI support E & M interfaces used in legacy, pre-P25 analog fixed stations.	SO	SO	i	i
2.7.1.3 Tone Remote Control (TRC) control signaling from a host to a fixed station to provide a variety of control functions. The intent of this requirement is that the CAFSI support TRC interfaces used in legacy, pre-P25 analog fixed stations. The TRC control shall include:	i	i	i	i
a) For airlinks supporting conventional FM operation, transmit channel control, squelch control, monitor control, and analog/digital mode control (if the fixed station also supports P25 digital (CAI) conventional operation).	SO	SO	i	i
b) For airlinks supporting conventional P25 digital (CAI) operation, transmit channel control, squelch control, monitor control, clear/secure controls, and analog/digital mode control (if the fixed station also supports analog conventional operation).				
2.7.1.4 Intercom Capability	i	i	i	i
An intercom capability allowing for the transport of audio between the fixed station and its host without initiating an RF transmission.	SO	SO	i	i
2.7.1.5 Airlinks Supported (FM Operation)	i	i	i	i
Conventional FM operation.	SO	SO	i	i
2.7.1.6 Airlinks Supported (P25 Digital (CAI) Operation)	i	i	i	i
Conventional P25 digital (CAI) operation.	SO	SO	i	i
2.7.2 Conventional Digital Fixed Station Interface (CDFSi)				
The CDFSi shall provide:	i	i	i	i
2.7.2.1 IP-Based Capabilities	i	i	i	i
IP-based capabilities equivalent to those capabilities provided via the CAFSI when the digital fixed station is operating in analog mode.	SO-R	SO-R	i	i
2.7.2.2 Transport of Encrypted Audio	i	i	i	i
Transport of encrypted audio between a digital fixed station and its host.	SO-R	SO-R	i	i
2.7.2.3 Transport of Caller-ID Information	i	i	i	i
Transport of Caller-ID information between a digital fixed station and its host. This includes Unit ID from field units to consoles and from consoles to field units.	SO-R	SO-R	i	i
2.7.2.4 Transport of Talk-group Information	i	i	i	i
Transport of Talk-group information between a digital fixed station and its host.	SO-R	SO-R	i	i
2.7.2.5 Transport of NAC Code Information	i	i	i	i
Reliable transport of NAC code information between a digital fixed station and its host, enabling a host console to select outgoing and display incoming Privacy Codes when the air interface is digital.	SO-R	SO-R	i	i
2.7.2.6 Transport of CTCSS/DCS Information	i	i	i	i
Reliable transport of CTCSS/DCS code information between a fixed station and its host, enabling a host console to select outgoing and display incoming Privacy Codes when the air interface is analog.	SO	SO	i	i
2.7.2.7 Transport of Emergency Alarm	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
Transport of Emergency Alarm and conventional control messages from the digital fixed station to its host.	SO-R	SO-R	i	i
2.7.2.8 Transport of Emergency Indications	i	i	i	i
Transport of Emergency Indications from the digital fixed station to its host.	SO-R	SO-R	i	i
2.7.2.9 Transport of Received Voter Identification	i	i	i	i
Transport of Received Voter Identification from the digital fixed station to its host.	SO	SO	i	i
2.7.2.10 Advanced Control of the Fixed Station – Frequency of Operation	i	i	i	i
The CDFSI shall enable remote control of a conventional Fixed Station’s operation for the frequency of operation.	SO-R	SO-R	i	i
2.7.2.11 Advanced Control of the Fixed Station – Repeating Voice	i	i	i	i
The CDFSI shall enable remote control of a conventional Fixed Station’s operation for repeating or not repeating in-bound voice on the outbound CAI.	SO-R	SO-R	i	i
2.7.2.12 Advanced Control of the Fixed Station – Receiver Squelch	i	i	i	i
The CDFSI shall enable remote control of a conventional Fixed Station’s operation for disabling or re-enabling the receiver squelch.	SO-R	SO-R	i	i
2.7.2.13 Intercom Audio	i	i	i	i
Transport intercom audio to and from the fixed station location.	SO	SO	SO	SO
2.7.2.14 Ethernet 100 Base-T	i	i	i	i
CDFSI equipment shall offer the option of Ethernet 100 Base-T with a RJ-45 connector as the physical and data link layers.	SO	SO	SO	SO
2.7.2.15 Other CDFSI Physical and Data Link Connectivity	i	i	i	i
In addition to Ethernet 100 Base-T, DFSI equipment may offer any industry standard physical and link layer protocols that support the internet protocol.	SO	SO	SO	SO
2.7.3 Trunked FSSI				
Requirements for a Trunked Fixed Station Interface (TFSI) are to be developed.	i	i	i	i
2.8 P25 Wireless/Mobile Console Interface (B Interface)	i	i	i	i
Standardize an open wireless/mobile console interface (the P25 “B” Interface) that provides dispatchers with access to a P25 conventional or trunked system via control stations such as P25 advanced SUs for situations where connectivity via the CSSI or FSSI is not practical (e.g., mobile SU or P25 stand-alone Fixed Station and a P25 Console. A P25 Console is a console with limited functionality for wireless and possibly mobile (including roaming) use by dispatchers. (Note: the P25 CAI may be modified to support additional message types to support the required P25 Console functionality.)	i	i	i	i
2.8.1 B Interface and Wireless/Mobile Console Enhanced P25 CAI Applicability				
2.8.1.1 B Interface Applicability to P25 Console Manufacturers and to Users	i	i	i	i
The P25 Wireless/Mobile Console Interface (B Interface) is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 Console equipment and to users of P25 Console equipment.	SO	SO	SO	SO
2.8.1.2 B Interface Applicability to P25 SU and Stand-Alone Fixed Station Manufacturers and Users	i	i	i	i
The P25 Wireless/Mobile Console Interface (B Interface) is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 SU and stand-alone Fixed Station equipment, and to users of P25 SU and stand-alone Fixed Station equipment.	SO	SO	SO	SO
2.8.1.3 Wireless/Mobile Console Enhanced P25 CAI Applicability to P25 SU and Stand-Alone Fixed Station Manufacturers and to Users	i	i	i	i
The support of wireless/mobile console enhanced P25 CAI messaging required for P25 Console use is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 SU and stand-alone Fixed Station equipment, and to users of P25 SU and stand-alone Fixed Station	SO	SO	SO	SO
2.8.1.4 Wireless/Mobile Console Enhanced P25 CAI Applicability to P25 RFSS Manufacturers and to Users	i	i	i	i
The support of wireless/mobile console enhanced P25 CAI messaging required for P25 Console use is a Standard Option (SO) type of P25 requirement applicable to manufacturers of P25 RFSS equipment, including P25 Console Subsystem and Fixed/base station equipment, and to users of	SO	SO	SO	SO

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
2.8.2 General B Interface Requirements				
The B Interface is defined as open, wireline-based P25 interface between a P25 advanced SU or stand-alone Fixed Station and the P25 Console.	i	i	i	i
2.8.2.1 B Interface Media				
It is desirable that the B Interface be Ethernet, IP-based similar to the Digital FSI, conveying similar information in a similar or the same manner.	SO-R	SO-R	SO-R	SO-R
2.8.3 The B Interface shall support features normally associated with SUs, including the following:				
2.8.3.1 Selecting channels and talk groups;	SO-R	SO-R	SO-R	SO-R
2.8.3.2 Sending and receiving group calls in clear and encrypted modes;	SO-R	SO-R	SO-R	SO-R
2.8.3.3 Sending and receiving individual calls in clear and encrypted modes;	SO-R	SO-R	SO-R	SO-R
2.8.3.4 Conveying PTT IDs and Talk Group IDs;	SO-R	SO-R	SO-R	SO-R
2.8.3.5 Sending Emergency Alert and Status Update messages;	SO-R	SO-R	SO-R	SO-R
2.8.3.6 Responding to Unit Status Request, Radio Check, and Radio Monitor messages;	SO-R	SO-R	SO-R	SO-R
2.8.3.7 Receiving Call Alert and Radio Inhibit/Uninhibit messages;	SO-R	SO-R	SO-R	SO-R
2.8.3.8 Sending and receiving data messages;	SO-R	SO-R	SO-R	SO-R
2.8.3.9 Sending Telephone Dialing.	SO-R	SO-R	SO-R	SO-R
2.8.4 Extended Features Supported by the B Interface				
The B Interface shall also support the following extended dispatch-oriented features in both the conventional and trunking modes:	i	i	i	i
2.8.4.1 Conveying received NAC and Talk Group information and/or the ability for the console to configure on-the-fly the SU's receive and transmit NAC/Talk Group information;	SO-R	SO-R	SO-R	SO-R
2.8.4.2 Receiving Emergency Alert, Emergency Call, Silent Emergency;	SO-R	SO-R	SO-R	SO-R
2.8.4.3 Sending Unit Status Request;	SO-R	SO-R	SO-R	SO-R
2.8.4.4 Sending Call Alert, Radio Inhibit/Uninhibit, Radio Check, and Radio Monitor;	SO-R	SO-R	SO-R	SO-R
2.8.4.5 Initiation of audible signaling (i.e., ability to transmit undistorted (out-of-band) alert tones and priority marker tones);	SO-R	SO-R	SO-R	SO-R
2.8.4.6 Ability to transmit Broadcast and Unaddressed voice calls;	SO-R	SO-R	SO-R	SO-R
2.8.4.7 Discreet Listening;	SO-R	SO-R	SO-R	SO-R
2.8.4.8 SU/Console priority (i.e., higher network access priority than non-console connected SUs);	SO-R	SO-R	SO-R	SO-R
2.8.4.9 Preemptive Call and Dispatcher Interrupt (Call Interrupt);	SO	SO	SO	SO
2.8.4.10 Dynamic Regrouping.	SO	SO	SO	SO
2.8.5 Audio Conveyance				
It is desirable that the audio for the P25 Console be available as digital audio.	i	i	i	i
2.8.5.1 The digital audio stream shall result from use of a P25-specified vocoder for P25 CAI digital radio transmissions to permit tactical patching without transcoding.	SO-R	SO-R	SO-R	SO-R
2.8.5.2 The analog audio stream shall be PCM for FM analog radio transmissions.	SO-R	SO-R	SO-R	SO-R

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
3.0 P25 System Overview	i	i	i	i
3.1 General Project 25 Requirements				
3.1.1 Spectral Efficiency				
3.1.1.1 Improved spectrum efficiency	i	i	i	i
The system shall offer channel utilization that immediately improves spectrum efficiency by at least two (2) times over current analog systems, with a goal of an increase in improvement to at least four (4) times as technology continues to develop.	M	M	i	i
3.1.1.2 Maintained Site Location of Subscriber Units	i	i	i	i
The site (or simulcast RF subsystem) location of all subscriber units, including authorized roamers, will be maintained in a site location registry.	SO	SO	M	M
3.1.1.3 Efficient Use of RF Resources	i	i	i	i
Calls shall not require resources at sites that do not contain addressed subscriber units (except simulcast RF subsystems).	SO	SO	M	M
3.1.1.4 Channel Allocation Based on Unit Site Presence	i	i	i	i
The system shall allocate channels at sites based upon subscriber units present that need to receive a given message.	SO	SO	M	M
3.1.1.5 FCC/NTIA rules for spectral efficiency shall be satisfied.	M	M	M	M
3.1.1.6 Call Prioritization (Priority Call)	i	i	i	i
The system will prioritize call requests.	SO	SO	SO	SO
3.1.2 Channelization				
3.1.2.1 Support existing Channelization plans	i	i	i	i
FCC/NTIA channelization plans shall be supported.	M	M	M	M
3.1.2.2 Co-Existence with P25 Phase 1 and Analog (Phase 0)	i	i	i	i
The P25 system shall be able to co-exist with Phase 1 and with older analog systems, share the same segments of allocated RF spectrum and provide little interference to existing adjacent-channel systems as well as work properly.	M	M	M	M
plan tied to minimum spacing between base stations. In this instance, the improvement in spectrum efficiency with 12.5 kHz digital channels will be				
3.1.2.3 Adaptive to All Public Safety Bands	i	i	i	i
The system shall minimally be equally adaptive to all Public Safety mobile radio frequency bands and blocks of spectrum, without precluding its adapting to other land mobile bands.	M	M	M	M
3.1.2.4 LMRS Frequency Bands	i	i	i	i
Fixed station and subscriber equipment transmitters and receivers shall be capable of being programmed to operate over the entire range of one or more land mobile radio service (LMRS) frequency bands. Operational performance is desired to be without degradation over the band. LMRS Frequency Bands include the following:	M	M	M	M
3.1.2.5 VHF Band	i	i	i	i
138 - 174 MHz	i	i	i	i
3.1.2.6 UHF Band	i	i	i	i
380 - 512 MHz	i	i	i	i
3.1.2.7 700/800 MHz Band	i	i	i	i
764 - 869 MHz	i	i	i	i
3.1.2.8 Co-Channel Operation	i	i	i	i
The system shall be designed to be resistant to interference from co-channel, adjacent-channel, and intermodulation effects, in a manner similar to Continuous Tone-Controlled Squelch System (CTCSS) used in analog systems.	M	M	M	M
3.1.2.9 Out of Channel Emissions	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
The out-of-channel emissions of any future Project 25 standard for 25 kHz channel width or less shall be at least as spectrally pure as the out of channel emissions of the Project 25 Phase 1 FDMA Standard.	i	i	M	M
3.1.2.10 TDMA Operation	i	i	i	i
Fixed station and subscriber equipment shall be capable of operating in a TDMA access method, where the minimum number of communication time slots is either two (2) for a 12.5 kHz bandwidth channel, or four (4) for a 25 kHz bandwidth channel.	i	i	M	M
3.1.2.11 Duplex time Slot Operation	i	i	i	i
Fixed station equipment shall be capable of operating in a duplex time slot mode on a single carrier frequency.	i	i	SO	SO
3.1.2.12 Dynamic Allocation of Channel Bandwidth for Data	i	i	i	i
Transmission of digital data may use dynamic allocation of channel bandwidth, up to the maximum possible for a particular channel width.				
	i	i	i	i
3.1.3 Roaming Functions of SUs and Mobiles within and among P25 Systems				
3.1.3.1 Roaming With Automatic Registration and Authorization (Intra-RFSS)	i	i	i	i
Mobiles and portables (i.e., SUs) will be able to roam over a wide area with automatic connection (i.e., automatic registration and authorization) as the SU roams into a new RF site within the same RFSS.	M	M	M	M
3.1.3.2 Roaming With Manual Registration and Authorization (Inter-RFSS)	i	i	i	i
Mobiles and portables (i.e., SUs) shall be able to roam over a wide area with manual connection (i.e., manual registration and authorization) as the SU roams into a new RF site in a different RFSS.	M	M	M	M
3.1.3.3 Roaming With Automatic Registration and Authorization (Inter-RFSS)	i	i	i	i
Mobiles and portables (i.e., SUs) will be able to roam over a wide area with automatic connection (i.e., automatic registration and authorization) as the SU roams into a new RF site in a different RFSS.	SO	SO	SO	SO
3.1.3.4 Restrictions to Optimize Roaming Decisions	i	i	i	i
SUs shall incorporate unit and talk group restrictions to optimize their roaming decisions. This requirement is only applicable to trunked systems (SUs and infrastructure).	SO	SO	SO	SO
3.1.3.5 Roaming for Interagency Assistance	i	i	i	i
Systems shall support authorized roamers from compatible digital systems for interagency assistance.	i	i	i	i
3.1.3.6 Affiliation	i	i	i	i
Ability for users to affiliate with a talk group.	M	M	M	M
3.1.3.7 De-registration	i	i	i	i
SUs shall be able to disconnect themselves (i.e., “de-register”) from an RFSS.	M	M	M	M
3.2 System Configuration Aspects				
3.2.1 System Architectures				
3.2.1.1 Multiple System Configurations Capability	i	i	i	i
The system or subsystem shall be technically flexible to allow for single and multiple site systems, voting, and simulcast designs.	M	M	M	M
3.2.1.2 Single Station Sites	i	i	i	i
The system shall enable single RF sites to implement single channel trunking.	SO	SO	SO	SO
3.2.1.3 Station Use Efficiency	i	i	i	i
Any individual site need only deploy as many stations as necessary except in RF simulcast subsystems.	i	i	i	i
3.2.1.4 Orderly System Expansion	i	i	i	i
The system shall allow for continued enhancement of standardized functions and features so that the system can grow with user needs.	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
3.2.1.5 Manufacturer-specific Features	i	i	i	i
Further, a standard method shall be specified for segmenting nonstandard (or potentially future-standard), value-added features between manufacturers to safeguard from unintentional interaction between subscriber units of different manufacturer's subsystems. No manufacturer proprietary extensions shall implement features that interfere with the operation of P25-compliant equipment. Manufacturers shall implement P25-compliant features whenever equivalent proprietary features are implemented.	M	M	M	M
3.2.1.6 Full Duplex Operation	i	i	i	i
The system design will accommodate full duplex operation.	i	i	SO	SO
3.2.1.7 Graceful Trunked Operation Degradation	i	i	i	i
The system shall provide graceful degradation that the SU can react appropriately, as infrastructure failures occur.	M	M	M	M
A degradation or fallback mode that requires mitigating behavior by the SU shall be signaled to the SU.	M	M	M	M
The following types of degradation shall be signaled by systems that feature them:				
The degraded modes available on a system depend on that system's design. The following modes are common fallback modes. Where they are offered the standardized method of signaling those fallback modes shall be used.				
System designers may satisfy the requirement for graceful degradation with fallback modes that do not require mitigation by subscriber units and would therefore not require signaling.	i	i	i	i
Single site mode.				
Multi-site systems that offer single site operation as a fallback mode shall signal the SU when they are in this mode.	M	M	M	M
A site signaling this degradation will have lost contact with the rest of the network. Only communication with other SUs served by the same site will be possible. An SU may attempt to gain service from a better connected site.				
Conventional fallback.				
Trunked systems that offer conventional operation as a fallback mode shall signal the SU when they are in this mode.	SO	SO	SO	SO
A system signaling this degradation will be unable to provide trunked voice service but does have available one or more conventional repeaters. Only P25 features that allow control of subscriber unit configuration by elements of the fixed equipment include:				
Dynamic regroup (2.1.2.15 & 2.1.2.16)		SO		SO
Over the Air Programming (3.2.7)		SO		SO
Radio inhibit/uninhibit (3.3.5.10)		SO		SO
Over the Air Re-key (4.1.5.3)		SO		SO
During times of degradation these features shall be handled in a standard, consistent manner that will be documented in the relevant procedures document. All subscriber units affected by a degradation incident shall follow common state changes with respect to these features. For example, if dynamic regroup is active at the time a site goes into a single site mode, it is not acceptable for some units to remain re-grouped while others drop back to their default group. If there is a drop back to default grouping, all regrouped SUs shall drop back at the same time.	i	i	i	i
3.2.2 System Connectivity				
3.2.2.1 System Connectivity	i	i	i	i
Multiple RFSSs shall be combinable into larger wide-area systems using the ISSI described in Section 2.4.	M	M	M	M
3.2.3 ID Structures				
3.2.3.1 RFSSs	i	i	i	i
Up to 64,000 different RFSSs shall be uniquely identifiable.	M	M	M	M
3.2.3.2 Talk Groups/SUs	i	i	i	i
Each RFSS shall provide for at least 2,000 uniquely identifiable functional talk groups or vertical partitions for distinct and separate organizations and at least 48,000 individually identifiable subscriber units (SUs) per RFSS.	M	M	M	M

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
3.2.3.3 Unit Hierarchical Numbering	i	i	i	i
Through hierarchical numbering, individual subscriber units and talk-groups from any radio subsystem are uniquely identifiable in any radio subsystem in concert with their home RFSS identification (similar to hierarchical telephone numbers and area codes).	M	M	M	M
3.2.3.4 Automated Radio Identification (ID) Assignment	i	i	i	i
The system shall have an automated method of assigning radio identification (ID) numbers to consoles, control stations, and mobile and portable subscribers as part of the system management network system database.	SO	SO	SO	SO
3.2.3.5 Phase 1 / Phase 2 ID Structure	i	i	i	i
Where P25 TDMA and FDMA systems are interconnected, it is desirable that all system and subscriber equipment IDs (Talkgroup, Unit, etc) be aligned with the Project 25 ID coding format to facilitate inter-system interoperability.	i	i	i	i
3.2.3.6 Assignment of Unique IDs	i	i	i	i
All manufacturers of Project 25 compliant systems shall use the Project 25 Guidelines to assign Wide Area Communications Network (WACN) and System Identification (IDs) when establishing WACNs and System IDs.	M	M	M	M
3.2.4 Throughput Delay				
Throughput Delay defined as the mouth-to-ear transfer delay of voice information involving a calling SU and a called SU, respectively, shall be as follows:	i	i	i	i
3.2.4.1 Direct mode Throughput Delay	i	i	i	i
Less than 250 msec in direct radio-to-radio communications.	M	M	M	M
3.2.4.2 Conventional Repeater Mode Throughput Delay	i	i	i	i
Less than 350 msec in radio-to-radio communications through a single conventional repeater.	M	M	M	M
3.2.4.3 Single RFSS Throughput Delay	i	i	i	i
Less than 500 msec in radio-to-radio communications involving a single RF subsystem. This requirement does not apply to conventional repeater chains (i.e., when two or more conventional repeaters are serially interconnected within a single RFSS).	M	M	M	M
3.2.4.4 Multiple RFSS Throughput Delay	i	i	i	i
Less than 1000 msec in radio-to-radio communications involving two or more RF subsystems.	M	M	M	M
3.2.5 Direct Modes of Communications				
3.2.5.1 Direct Mode	i	i	i	i
The system shall allow direct mobile-to-mobile communication at any time without degrading normal system performance.	M	M	M	M
3.2.6 Use of Standard Signaling				
3.2.6.1 Call Processing Intelligence	i	i	i	i
RFSSs will contain all the control intelligence to support call processing and track unit location and roamers within the RFSS.	SO	SO	M	M
3.2.6.2 Standard Signaling and Communications Interfaces	i	i	i	i
RFSSs shall support standard signaling and communications interfaces to be flexibly linked into wide-area networks via private or public networks.	M	M	M	M
3.2.6.3 Common Protocols and Coding Formats	i	i	i	i
To facilitate interoperable P25 CAI multi-mode (FDMA/TDMA) system design, it is desirable that all system and subscriber equipment use common (P25 defined) call setup/link protocols and ID coding formats.	i	i	i	i
3.2.6.4 Secure Trunking Control Channel	i	i	i	i
Security for the trunking control channel will be provided. Security services to be provided for the control channel include confidentiality and message replay protection. Encryption shall be the mechanism used when implementing these security services.	SO	SO	SO	SO
3.2.7 Over-The-Air-Programming (OTAP)		SO		So

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
3.2.7.1 Software Changes	i	i	i	i
The system shall have OTAP capabilities to enable making software changes to mobile and portable subscriber units. This feature applies to both trunking and conventional systems.	SO	SO	SO	SO
3.2.7.2 Radio User Interface and Personality Profile	i	i	i	i
OTAP features shall include the radio user interface, scan list, telephone lists, groups, network access codes, wide area communications networks, etc., not to exclude any other parameters.	SO-R	SO-R	SO-R	SO-R
3.2.7.3 Service Programming	i	i	i	i
Capabilities shall include service programming, the operational parameters, including such parameters as power output and frequency, not to exclude other parameters.	SO-R	SO-R	SO-R	SO-R
3.2.7.4 Software Version Upgrade	i	i	i	i
Capabilities shall include upgrading new software versions of the radio operating system, adding new features, fixing bugs, pushing security patches, etc., not to exclude any other parameters.	SO	SO	SO	SO
3.2.7.5 Standardized OTAP Interface	i	i	i	i
OTAP shall be standardized such that a P25 OTAP application can OTAP all authorized P25 radios, regardless of manufacturer, supported on its network.	SO-R	SO-R	SO-R	SO-R
3.2.7.6 Security	i	i	i	i
OTAP messages shall be encrypted with a FIPS-approved encryption algorithm to provide confidentiality for message contents. In addition, the following security services shall be applied to OTAP messages: authentication, integrity, and replay protection.	SO-R	SO-R	SO-R	SO-R
3.2.7.7 Spectrum Utilization Management	i	i	i	i
Spectrum utilization shall be effectively managed, including the capability to limit the airtime traffic to the software or software parameters that are being updated to minimize both latency and use of air time. Other mechanisms, programmable by the system administrator, could include broadcast, scheduled updates (e.g. send downloads during off-peak hours), etc.	SO-R	SO-R	SO-R	SO-R
3.2.7.8 Prioritization and Availability	i	i	i	i
The system administrator shall be provided the capability to prioritize OTAP relative to voice and data communications with the exception of an emergency call, which shall always be given a higher priority. The radio will continue to operate normally during the OTAP process.	SO-R	SO-R	SO-R	SO-R
3.2.7.9 Software Changeover	i	i	i	i
If the switchover process may hinder voice operations, the subscriber units shall switch over to using downloaded software only upon manual acceptance by the user or upon a power reset. If there is no impact to voice operations, the subscriber unit shall switchover to the new software upon manual acceptance, a power reset, or if programmed by the system administrator. The radio shall be able to fallback to the pre-downloaded version if instructed.	SO-R	SO-R	SO-R	SO-R
3.2.7.10 Authentication	i	i	i	i
An authentication mechanism, with replay protection, shall be used to ensure software downloads are from authorized system administrators only.	SO-R	SO-R	SO-R	SO-R
3.2.7.11 No Encryption Impact	i	i	i	i
OTAP shall not change the radio's encryption key.	SO-R	SO-R	SO-R	SO-R
3.2.7.12 Infrastructure Audit Trail	i	i	i	i
The infrastructure shall maintain a log of all changes made, including who made the changes.	SO-R	SO-R	SO-R	SO-R
3.2.7.13 OTAP Acknowledgement	i	i	i	i
A mechanism shall be used to confirm the successful receipt of an OTAP download.	SO-R	SO-R	SO-R	SO-R

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
3.3 Support Audible Signaling				
Support audible signaling to and from subscriber units for functions as described below	i	i	i	i
3.3.1 General				
Because of the inability to faithfully pass audio signaling through some vocoders, radios/systems may use data messages that cause the receiving unit to generate standardized tone signals. These standardized tone signals correspond to a specific signaling command. Audible signals use data messages in the system to initiate audible signals both in the subscriber units and also in the consoles.	i	i	i	i
3.3.1.1 Configuration	i	i	i	i
Users shall be able to select no audible signaling, or any or all of the default types of signaling required in Section 3.3.2.	M	M	M	M
3.3.1.2 Configuration Subject to Personality Programming	i	i	i	i
Users may require alternative signals that are subject to personality programming in the subscriber unit and/or in the console.	SO	SO	SO	SO
3.3.2 Operational or Systemic				
Audible signals may be operational or system in nature.	i	i	i	i
3.3.2.1 Operational Signals (Default)	i	i	i	i
Default audible signaling shall be limited to four standardized signals:	M	M	M	M
3.3.2.2 Emergency	i	i	i	i
Emergency indicates the highest level of a declared emergency.	i	i	i	i
The Emergency audible indication shall consist of a complex signal comprised of sequential pulsed 600 Hz and 1800 Hz sinusoidal tone signals.	M	M	M	M
The signal volume shall ramp from barely audible to maximum set equipment volume over a nominal two-second period.	M	M	M	M
The Emergency alarm shall be initiated by the operation of a momentary switch at the subscriber unit and may also be initiated by a console. It shall terminate after sending for a nominal two seconds regardless of how long the operator holds the switch.	M	M	M	M
Receipt of an Emergency alarm at a console shall cause a latch up output for operation of external alarms. The console operator shall be able to release this latch.	M	M	M	M
A receiving terminal unit shall continue to emit periodic Emergency signals until any digital control on the radio is operated. A receiving console unit shall continue to emit a periodic emergency signal until a series of reset tasks are completed on the console. The emergency audible indication volume on the console shall be turned off or muted by a single button, but the emergency information displayed on the console shall remain until the emergency is reset.	M	M	M	M
The Emergency alert without registration feature enables the FNE to accept an emergency alarm from a user in distress, prior to registration and/or authentication with the target system. The SU then proceeds with the normal registration and/or authentication procedure. The system	M	M	M	M
By depressing a “clear” button on the SU, a user can cancel an emergency. For emergency alert, only the SU that initiated the emergency alert is allowed to cancel the emergency alert. In addition, the SU’s ID must be considered valid by the infrastructure.	M	M	M	M
3.3.2.3 Acknowledge	i	i	i	i
Acknowledge indicates an operator-designated affirmation of a request. This signal allows acknowledgment of a request without speaking.	M	M	M	M
The acknowledge audible indication shall consist of a single, nominal 250 msec pulse of 500 Hz sinusoidal tone signal followed immediately by a single, nominal 250 msec pulse of 1500 Hz sinusoidal tone signal.	M	M	M	M
The acknowledge tone signal level shall be 10dB below the volume control voice level. The total signal duration time shall be nominally 500 ms.	M	M	M	M

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
Acknowledge is initiated by the subscriber unit.	M	M	M	M
3.3.2.4 Message Audible Indication	i	i	i	i
Message Audible Indication indicates that attention is needed to the message that follows.	i	i	i	i
A 1004 Hz sinusoidal tone pulsed on for 250 msec followed by 250 msec of no tone, followed by another pulse of 1004 Hz sinusoidal tone for 250 msec.	M	M	M	M
The console operator shall initiate the Message Audible Indication by initiating a momentary function or switch. The Message Audible Indication tone shall continue in a repeating cycle until the operator releases the momentary function or switch.	M	M	M	M
3.3.2.5 Channel Marker	i	i	i	i
Channel Marker is an indication placed periodically on a talk channel that indicates to new arrivals that the channel is in use. Allows someone coming onto the channel late to know that the channel is in use even when speech is not present. The Channel Marker audible signal shall consist of:	M	M	M	M
An 800 Hz sinusoidal signal pulsed signal held on for 250 msec followed by 10 msec of no signal followed by another pulse of 800 Hz sinusoidal signal for 250 msec.	M	M	M	M
The Channel Marker signal shall continue to be repeated at system-defined intervals until cancelled by the console operator.	M	M	M	M
The console operator shall initiate the Channel Marker.	M	M	M	M
The Channel Marker signal shall be 10 dB below the volume control voice level.	M	M	M	M
In trunked applications, a new arrival on the talkgroup shall be immediately notified of channel priority use by the channel marker function whenever the receiving radio is capable of immediately transmitting on the marked talkgroup.	M	M	M	M
3.3.3 Operational Signals (Personality Programmed)	i	i	i	i
As a standard option, it shall be possible to program the Terminal Device personality to permit selection of the tone signaling patterns and tone frequencies and shall include the choices: "NONE" and "Default".	SO	SO	SO	SO
Personality programmed signals shall be presented in a matrix of audible tone signal functions, tone patterns and tone frequencies which will be presented for selection of the terminal device's internally generated audible signals. A terminal device is any subscriber unit – mobile, portable, or control station and any console.	SO	SO	SO	SO
In the case of Emergency Alert, the choices shall include that the initiating terminal unit will either generate or not generate a local indication of the signal being transmitted.	SO	SO	SO	SO
Subscriber unit (mobile, portable, or control station) personality programming shall provide the ability to permit an appropriately programmed unit to reset an emergency status that has been sent to the system. An option button on the unit's control panel shall be programmed to perform a "CLEAR" function. By activating the emergency status activation switch while holding down the CLEAR button, the system emergency status shall be reset.	SO	SO	SO	SO
3.3.4 Service and Bearer Channel Interface/Service Set				
An RFSS supports standard service signaling and bearer channel interface for interconnection with other RFSSs by a public or private wide-area network. The standard service set between RFSSs is composed of the following requirements.	i	i	i	i
3.3.4.1 Group Calls Setup	M	M	M	M
3.3.4.2 Private Calls Setup	M	M	M	M
3.3.4.3 Voice Encryption Control	M	M	M	M
3.3.4.4 RFSS Registration (roaming)	M	M	M	M
3.3.4.5 Analog Bearer Channel (Note: Support of analog bearer channel is required for backward compatibility for NPSTC mutual aid channels.)	M	M	M	M

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
3.3.4.6 Digital Bearer Channel	M	M	M	M
3.3.4.7 Access Control and Security	M	M	M	M
3.3.4.8 Site Affiliation Control	i	i	i	i
The site affiliation control feature is supplementary to roaming voice and data services and is used to manage traffic loading during periods of high activity. The feature allows a point of attachment to broadcast information announcing its intention to restrict or prohibit users, groups, or traffic that does not meet the requirements of the advertisement. The system operator shall control whether the point of attachment restrict or prohibit emergency services due to traffic loading. This service also provides mechanisms that allow subscribers that cannot otherwise get service (for example, subscribers with no alternate point of attachment) to request exceptions to the advertised rules. The FNE may decide to grant a channel to a lower than advertised class if a channel is available.	M	M	M	M
3.3.4.9 Call Preemption (Preemptive Priority Call)	i	i	i	i
The system will preempt existing calls in order to service new calls and may attempt to ensure that no RF contention issues will occur before allowing preemption.	SO	SO	SO	SO
3.3.5 Other System Functionalities				
3.3.5.1 Dispatcher Interrupt of Calls	i	i	i	i
A dispatcher shall have the ability to interrupt any call enabled by the system that an individual may be engaged in.	M	M	M	M
3.3.5.2 Digital Calls	i	i	i	i
All calls shall be digital except compatible analog voice calls. All digital calls shall use the P25 defined vocoder. Encrypted digital call shall use P25 defined encryption algorithms end to end.	M	M	M	M
3.3.5.3 Operating Environment	i	i	i	i
A manufacturer of a Project 25 software product shall define the extent of the operating environment over which the product is known to work.	M	M	M	M
3.3.5.4 Electronic Serial Number (ESN)	i	i	i	i
The fixed network equipment may support functions of inquire and validation of radio unit ESN.	SO	SO	SO	SO
3.3.5.5 Dispatcher Audio Takeover	i	i	i	i
The dispatcher, while monitoring a call, may interrupt the outbound audio of a transmitting radio and be heard by all units in the call, excluding non-full duplex transmitting radios but including the full duplex transmitting radios.	M	M	M	M
3.3.5.6 Dispatcher Busy Call Takeover (Non-Duplex)	i	i	i	i
When no channel is available (all traffic channels in use) in an emergency situation, the dispatcher may override a channel, exclusive of the formerly transmitting unit. The pre-emption may be ruthless or “top-of-queue” as established by the system management function. Non full-duplex transmitting SU will continue to transmit on the inbound channel.	M	M	M	M
3.3.5.7 Dispatcher Busy Call Takeover (Duplex)	i	i	i	i
When no channel is available (all traffic channels in use) in an emergency situation, the dispatcher may override a channel, inclusive of the formerly transmitting unit. The pre-emption may be ruthless or “top-of-queue” as established by the system management function.	SO	SO	SO	SO
3.3.5.8 Subscriber Unit Audio Preemption	i	i	i	i
This feature enables shutting down a full duplex transmitting SU when it is pre-empted by another user involved in the call. Rules for audio pre-emption may be established by the system operator.	i	i	SO	SO
3.3.5.9 Call Termination by a Dispatcher	i	i	i	i
This feature is supplementary to group and individual calls. It allows a dispatcher to terminate a call in progress. Upon invocation of this feature, the radio system tears down the selected call, freeing up pre-emptable system resources as soon as possible. In some circumstances, such as when	M	M	M	M

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
3.3.5.10 Radio Inhibit	i	i	i	i
The system may enable an SU to be inhibited such that the SU appears to be powered off. When inhibited, the SU does not accept any user input or provide any user output. When the system provides this feature, the system shall also enable an SU to be un-inhibited, thereby returning the SU	SO	SO	SO	SO
3.3.5.11 Discreet Listening	i	i	i	i
The discreet listening feature allows an appropriately authorized system operator to listen to any active SU conversation, regardless of call type (e.g., individual call) and without the SU being aware of this activity. This differs from remote SU monitoring which provides the ability to key up remote SUs for monitoring (i.e., initiate a new call).	SO	SO	SO	SO
3.3.5.12 Radio Unit Monitoring (Remote Unit Monitoring)	i	i	i	i
The system, if authorized, may enable a dispatcher to initiate a call which enables the dispatcher to listen to audio activity at a subscriber radio.	SO	SO	SO	SO
3.3.5.13 Call Alerting	i	i	i	i
The system may enable a user ('originator') to convey the identity of their SU to the SU of another user ('recipient').	SO	SO	SO	SO
3.3.6 Location Services Via GPS				
The Global Positioning System (GPS) or other coordinate location services shall provide all the following mobile radiolocation services under system or operator control for the purpose of:	i	i	i	i
3.3.6.1 Channel selection in conventional systems or talk group selection in trunked systems;	SO	SO	SO	SO
3.3.6.2 Use in existing data bearer services;	SO	SO	SO	SO
3.3.6.3 Emergency location in the event of emergency by activation of an emergency switch;	SO	SO	SO	SO
3.3.6.4 Location coordinates upon PTT that shall include reporting of the following parameters: identity, latitude and longitude, altitude, time of fix;	SO	SO	SO	SO
3.3.6.5 Location coordination for periodic tracking of the unit that shall include reporting of the following parameters: identity, latitude and longitude, altitude, time of fix;	SO	SO	SO	SO
This feature enables the Fixed Network Equipment (FNE) to receive location information from a SU which is equipped with GPS or other location tracking system. The SU periodically transmits a short message containing its location information. The transmit periodicity is a configurable parameter. It is not necessary for the SU to transmit the location information while it is in 'receive mode'.	i	i	i	i
3.3.6.6 Displaying current location coordinates on the subscriber unit.	SO	SO	SO	SO
It shall be possible to send position reports to the following destinations:	i	i	i	i
3.3.6.7 A wired device for receiving location reports;	SO-R	SO-R	SO-R	SO-R
3.3.6.8 A single subscriber unit;	SO	SO	SO	SO
3.3.6.9 The same group of users who would receive a voice transmission from the unit making a position report.	SO	SO	SO	SO
3.3.6.10 Subject to unit configuration it shall be possible to query a subscriber unit for its current location.	SO-R	SO-R	SO-R	SO-R
3.3.6.11 It shall be possible to configure conventional systems to send position reports on either the same channel as the voice or a separate channel.	SO-R	SO-R	SO-R	SO-R

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
4.0 Encryption	i	i	i	i
4.1 Encryption Standard				
4.1.1 Type 3 Encryption Requirements				
References for the following requirements are FIPS PUB 46-3 DES (Data Encryption Standard), FIPS 140-2, NIST Special Publication 800-67, NIST Special Publication 800-20, and FIPS 197.	i	i	i	i
4.1.1.1 AES	i	i	i	i
For interoperability purposes, all Project 25 equipment implementing Type 3 encryption shall utilize the Advanced Encryption Standard (AES) algorithm. Key length for the AES shall be 256 bits.	SO-R	SO-R	SO-R	SO-R
4.1.1.2 DES	i	i	i	i
For backwards interoperability purposes, the Data Encryption Standard (DES) algorithm may be optionally available in Project 25 equipment implementing Type 3 encryption. (NOTE: The DES algorithm has reached the end of its useful cryptographic life. The use of DES in new systems is strongly discouraged.)	SO	SO	SO	SO
4.1.1.3 Algorithms to be Supported	i	i	i	i
Standards for use of the algorithms listed in items 4.1.1.1 and 4.1.1.2 are to be defined for Project 25.	SO	SO	SO	SO
4.1.2 Adopt for Type 1 Encryption:	i	i	i	i
4.1.2.1 Type 1 Standards Definition	i	i	i	i
The Type 1 encryption and key management standards for Phase 1 and II shall be as specified in NSA Specifications ON618551 and ON618536. Qualified users, vendors, and others requiring the cited specifications may contact the National Security Agency, Attn: Secure Wired/Wireless	SO	SO	SO	SO
4.1.2.2 Type 1	i	i	i	i
The Type 1 encryption standard for backward compatibility with existing wideband analog systems shall be as specified in Federal Standard 1023.	SO	SO	SO	SO
	i	i	i	i
4.1.3 Key Fill				
The key fill interface port shall transfer red (unencrypted) and black (encrypted) key variables from the key fill device to the equipment containing the encryption service.	SO	SO	SO	SO
4.1.3.1 Key Fill Interface Port	i	i	i	i
The key fill interface port shall support a standard physical interface.	SO	SO	SO	SO
4.1.3.2 Key Fill Device	i	i	i	i
The key fill device shall be capable of transferring one or more key variables in a single message.	SO	SO	SO	SO
4.1.3.3 Key Fill Device for Transferring Keys	i	i	i	i
The key fill device shall be capable of transferring Traffic Encryption Keys and Key Encryption Keys.	SO	SO	SO	SO
4.1.3.4 Zeroize Operation	i	i	i	i
The key fill device shall be capable of sending a message to zeroize one or more of the key variables used by the encryption service.	SO	SO	SO	SO
4.1.3.5 Key Fill Protocol	i	i	i	i
The key fill interface protocol shall use Key Management Messages (KMMs) similar to the KMMs defined by the OTAR Protocol but with modifications to support key fills.	SO	SO	SO	SO
4.1.4 Four Levels of Encryption	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
4.1.4.1 Allow up to Four Types of Encryption	i	i	i	i
The system shall allow up to four types of encryption with compatible modes of operation and shall provide the same functions associated with clear (unencrypted digital) operation. Subscriber units shall be capable of zero, one or multiple types of encryption, as required. Systems and	M	M	M	M
4.1.4.2 Type 1 Encryption	i	i	i	i
Type 1 encryption is for classified national government communication.	i	i	i	i
4.1.4.3 Type 2 Encryption	i	i	i	i
Type 2 encryption is for unclassified national security-related communications.	i	i	i	i
4.1.4.4 Type 3 Encryption	i	i	i	i
Type 3 encryption is for unclassified sensitive government communications (e.g., Public Safety).	i	i	i	i
4.1.4.5 Type 4 Encryption	i	i	i	i
Type 4 encryption is for other purposes, (e.g., exportable).	i	i	i	i
4.1.4.6 Clear and Encrypted Voice Quality	i	i	i	i
Voice quality for both clear and encrypted communication shall be equal to or superior to current clear voice analog systems and the measure of quality shall include both male and female voices and in defined and measurable quiet, moderate, and loud ambient environments and shall be measured in a defined applicable test based on voice intelligibility designed for public safety radios.	M	M	M	M
4.1.5 Key Management	i	i	i	i
4.1.5.1 Common Key Management System	i	i	i	i
A common key management system will be used to achieve key exchange interoperability between different manufacturer's Key Management Facilities (KMFs) regardless of Air Interface.	SO	SO	SO	SO
4.1.5.2 Key Fill Mechanism	i	i	i	i
The system will provide a key fill device to transfer initial and subsequent keying information into the equipment using encryption.	SO	SO	SO	SO
4.1.5.3 OTAR	i	i	i	i
The system shall have over-the-air re-keying (OTAR) of encryption keys.	SO	SO	SO	SO
4.1.5.4 Radio Inhibit	i	i	i	i
A subscriber unit while inhibited should accept the OTAR commands.	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
5.0 Subscriber Equipment	i	i	i	i
5.1 Mobile/Portable Subscriber Unit Requirements				
5.1.1 General Requirements				
5.1.1.1 Description of Multimode Subscriber Units	i	i	i	i
Subscriber units communicate in either a conventional or trunked environment using clear (unencrypted digital), digitally encrypted voice, or data modes regardless of the manufacturer of the equipment. All systems and subscriber equipment use the P25 defined vocoder. Systems and subscriber equipment that are intended to support the encryption option use P25 defined encryption algorithms. These are required to facilitate mixed mode (FDMA/TDMA) end-to-end delivery of both clear and optionally encrypted voice and data.	i	i	i	i
5.1.1.2 Electronic Serial Number	i	i	i	i
The existence of an ESN (Electronic Serial Number) in a radio (subscriber unit) is to be mandatory. The validation response to an ESN inquiry is to be mandatory.	M	M	M	M
5.1.1.3 Support of Analog Communications	i	i	i	i
Support analog communications within this SU when involved in a call from an analog unit.	M	M	SO	SO
5.1.1.4 Data Port	i	i	i	i
Support a data port to an attached MDT (mobile data terminal), portable computer, or other peripheral device.	SO	SO	SO	SO
The data port will enable text messages to be sent from one unit to another. Text messages may be up to 256 characters in length and may be sent via SU keyboard entry or from a data terminal device connected to a SU, exclusive of overhead.	SO	SO	SO	SO
5.1.1.5 Equivalent Product Size	i	i	i	i
Equipment size shall be comparable to existing analog systems. Portable subscriber units shall be offered for covert and uniformed users (covert portable being smaller) with batteries that shall power these portables for at least 8 hours (5,5,90 duty cycle) with minimal size and weight.	M	M	M	M
5.1.1.6 Subscriber Unit Channel Scan	i	i	i	i
Mobile and portable equipment, both trunking and conventional, shall be able to sequentially scan both conventional channels (at least 8) and a trunked system's control channel in both clear and encrypted mode. While on the trunked system's control channel, the mobile and portable equipment shall be able to sequentially scan trunked talkgroups (at least 8) in both clear and encrypted mode. All scans are to be completed in minimum time. The conventional and/or trunked talkgroups to be scanned shall have selectable priority.				
This feature provides mechanisms by which conventional and trunked subscriber radios are made aware of activity on nearby conventional channels. It is particularly intended to notify a radio user of the presence of activity on mutual aid channels (priority 1), and on his "home" conventional channel or trunked talkgroup (priority 2) when he has selected some other conventional channel or trunked talkgroup for his current operations. Secondly, it provides the ability to monitor lower priority conventional channels and/or trunked talkgroups (priority 3) on an "as-available" basis. Full-duplex subscriber equipment should continue scanning conventional channels and/or trunked talkgroups while transmitting.	SO	M	SO	M
	i	i	i	i
5.1.1.7 Not Home Talk Group Scan	i	i	i	i
This feature is supplementary to group services. It allows the radio users to identify a priority scan group (the "selected" group) and up to 8 non-priority scan groups. When the priority group is not active, the user will be able to monitor audio from non-priority groups on a resource available basis.				
	M	M	M	M
5.1.1.8 Continuity of Scanning while Scanned Talk Groups are Patched	i	i	i	i
Mobile and portable equipment shall be able to continue scanning both conventional channels and trunked talkgroups in both clear and	SO	SO	SO	SO

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
encrypted voice when the channels or talkgroups are patched at the dispatch center or gateway location. The new scanning priority shall be the highest of the members of the patched talkgroups. Subscriber scanning shall return to the original scan talkgroup lists and priorities when the talkgroup patches are disabled at the dispatch center or gateway location.				
5.1.2 Phase 1-Specific Requirements				
5.1.2.1 Support a 12.5 or 25 kHz analog mode	i	i	i	i
Support a 12.5 kHz analog (11K0F3E) mode and a 25 kHz analog (20K03FE/16K0F3E) mode where permitted by FCC/NTIA rules)	M	M	SO	SO
for Phase 1 equipment.				
5.1.2.2 Dual Mode Receive Operation	i	i	i	i
Phase 1 subscriber (mobile and portable) units must have, without user intervention, the ability to receive a properly coded analog (11K0F3E/16K0F3E) or digital signal on the same programmed channel.	SO	SO	i	i
5.1.2.3 Dual Mode Receive Operation	i	i	i	i
The ability to transmit in the mode received (analog or digital), without operator intervention, should be available as a customer specified feature.	SO	SO	i	i
5.1.3 Phase 2-Specific Requirements				
5.1.3.1 Phase 2 Subscriber Analog Modes	i	i	i	i
Support a 12.5kHz Analog (11K0F3E) Mode and a 25kHz Analog (20K0F3E / 16K0F3E Mode	i	i	SO	SO
5.1.3.2 Direct Mode in TDMA Implementations	i	i	i	i
SUs equipment shall be capable of direct mode communication using Phase 1 FDMA.	i	i	M	M
5.1.4 Other General Requirements				
5.1.4.1 Minimum Keypad Configuration	i	i	i	i
To adopt 4 rows by 3 columns matrix as the minimum key pad configuration with the first level and shifted functions to be software programmable and assignable. Label Configuration to conform to the North American telephone keypad standard numerical and symbol layout.	SO	SO	SO	SO
5.1.4.2 Support a multi-point data port to multiple external peripherals.	SO	SO	SO	SO
5.1.4.3 Subscriber Unit Transmitter Inhibit Mode	i	i	i	i
Support a Subscriber Unit Transmitter Inhibit Mode. This is a mode on portable and mobile equipment which when selected by the user would inhibit the transmitter under all conditions until the mode is deselected by the user. While in the transmitter inhibited mode, the receiver would still be capable of receive operation.	SO	SO	SO	SO
5.1.4.4 Support Audible Signaling	i	i	i	i
Support audible signaling to and from subscriber units for functions as defined in 3.3.2.	M	M	M	M
5.1.4.5 Connection of an External Audio and Push-to-Talk System	i	i	i	i
Mobile radio equipment shall include an interface to allow connection of an external audio and push-to-talk system. Audio appearing at this interface will be unencrypted.	SO	SO	SO	SO
5.1.4.6 Capability to Digitally Store Functional Characteristics	i	i	i	i
A Project 25 radio shall have the capability to digitally store functional characteristics, including, but not limited to, channel frequencies, minimum volume settings, and channel scanning patterns. The stored functional characteristics must be issued from an authorized field-programming device.	M	M	M	M
5.1.4.7 Duplex Individual Calls	i	i	i	i
Duplex call is available only to individual calls. This feature enables a properly equipped SU to listen to outbound audio while transmitting inbound audio.	i	i	SO	SO
5.1.4.8 Full Duplex SU Power Control	i	i	i	i

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
The Full Duplex SU Power control feature uses the received power value from the base station to adjust a full duplex equipped subscriber unit's transmit power. This feature is intended to minimize adjacent channel interference for FNE receivers and conserve battery life in portable SUs. The signaling to the SU is done during the SU transmission and therefore requires full duplex radios.	i	i	SO	SO
5.1.4.9 Emergency Alert Without Registration	i	i	i	i
The Emergency alert without registration feature enables the FNE to accept an emergency alarm from a user in distress prior to registration and/or authentication with the target system. The SU then proceeds with the normal registration and/or authentication procedure. The system	M	M	M	M
5.1.4.10 Emergency Alert Clear by SU	i	i	i	i
By depressing a "clear" button on the SU, a user can cancel an emergency. For emergency alert, only the SU that initiated the emergency alert is allowed to cancel the emergency alert. In addition, the SU's ID must be considered valid by the infrastructure.	M	M	M	M
5.1.4.11 DTMF Control Signaling	i	i	i	i
This feature allows DTMF signals to be sent during an individual or group voice call (non-telephone interconnect calls). The DTMF signaling could be sent in "live" or "buffered" mode while SU is idle or in a call. Control codes will be sent for backwards compatibility with legacy vocoder.	SO	SO	SO	SO
5.2 Provide a Vehicular Repeater (VR) Capability	i	i	i	i
Provide a vehicular repeater capability.	i	i	i	i
5.2.1 General VR Capabilities				
5.2.1.1 FDMA or TDMA Implementations	i	i	i	i
Vehicular repeater system requirements shall be met in frequency division (FDMA) or time division (TDMA) channel access methods, according to infrastructure system requirements.	SO	SO	SO	SO
5.2.1.2 Full Duplex Operation	i	i	i	i
The vehicular repeater link channel shall provide two-way, full duplex operation to permit system control and handshake and to permit multiple associated subscriber units to operate on the same single link channel. A FDMA or two-slot TDMA vehicular repeater link will require two frequencies, one for each direction of communication. A four-slot TDMA vehicular repeater link will require a single frequency and employ alternate time slots, one for each direction of communication.	SO	SO	SO	SO
5.2.1.3 Direct Mode Operation	i	i	i	i
Direct mode operation shall support at least the following three modes:	SO	SO	SO	SO
Unit-to-unit direct.	SO	SO	SO	SO
Unit-to-unit repeated.	SO	SO	SO	SO
Unit-to-unit repeated and linked to the infrastructure.	SO	SO	SO	SO
5.2.1.4 In-Band Operation	i	i	i	i
Repeater link channel operation is desired in the same frequency band as the infrastructure channels, so that subscriber units can be used either direct to the infrastructure or through the vehicular repeater. A single antenna and a duplexer that incorporates appropriate filtering is desired for	i	i	i	i
5.2.1.5 Manual or Automatic Channel Selection	i	i	i	i
Where a vehicular repeater system has multiple link channels available, the link channel to be used by a particular repeater may be selected manually or, as a standard option, may be selected automatically. Means shall be provided to "mark" an active repeater link channel as "in-use" on a first come, first served basis, so that other repeater units, within radio signal range, will not select that same channel.				
5.2.1.6 Extended Range	i	i	i	i
The vehicular repeater unit shall provide the ability for a subscriber unit (typically a portable hand held unit) to operate with full feature capability in order to achieve extended signal coverage from/to the infrastructure or from/to other subscriber units. It shall be possible to repeat scanned channels of the system mobile receiver subject to personality programming.	SO	SO	SO	SO

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
5.2.1.7 In-Vehicle or Stand-Alone Implementation	i	i	i	i
The vehicular repeater unit may be a vehicle mounted mobile system or it could be a totally self-contained portable system. As a vehicle mounted mobile system, it is desired that it be an integrated vehicular repeater/mobile radio package.	i	i	i	i
5.2.1.8 Operational Control	i	i	i	i
The vehicular repeater unit shall be controlled by appropriate control words transmitted by the controlling subscriber unit. Such control words may include Network Access Codes, and source and destination IDs. System control functions may be operated manually from within the vehicle.	SO	SO	SO	SO
5.2.1.9 One-To-One Operation	i	i	i	i
A single subscriber unit shall be able to operate exclusively through its companion vehicular repeater unit ("repeat unit") and be able to remotely control the mobile operating channel in a conventional infrastructure, or the mobile system and talk group in a trunking infrastructure. Within the	SO	SO	SO	SO
5.2.1.10 More Than One Operation	i	i	i	i
One or more portable radio units shall be able to operate through a single vehicular repeater unit. Subscriber unit access may be permitted by the use of Network Access Codes, including the receiver NAC \$F7F for multiple subscribers from different groups. Additional subscriber units arriving within range of this single vehicular repeater shall be capable of manually selecting the "in-use" link channel for this repeater ("repeat group").	SO	SO	SO	SO
5.2.1.11 Any Emergency In One-To-One Operation	i	i	i	i
It shall be possible to pair a vehicular repeater unit and its associated subscriber unit so that only control commands and functions from that subscriber unit are recognized by the associated vehicular repeater control system, except that any unit operating through this vehicular repeater in "repeat group" mode may transmit an emergency status. It shall be possible to pair a subscriber unit and a vehicular repeater in the field without special programming equipment. The command set for this option shall include the capability for the controlling subscriber unit to place the vehicular repeater unit into the "repeat unit" or "repeat group" modes.	SO	SO	SO	SO
5.2.1.12 Vehicle Repeater Activation	i	i	i	i
Activation of vehicular repeater mode operation shall be provided by both front panel control and by remote activation (e.g. seat switch, vehicular charger socket insertion switch, etc). Remote activation shall be accomplished by contact closure, voltage sensing or current sensing, and be isolated from vehicle power and ground to permit implementation flexibility.	SO	SO	SO	SO
5.2.1.13 Single Control Capability	i	i	i	i
Vehicle control systems shall use a single control head, loudspeaker and microphone for all functions of the vehicular repeater/mobile radio system when they are an integrated unit.	SO	SO	SO	SO
5.2.1.14 Ease of Operation	i	i	i	i
Control systems of portable and vehicular equipment shall provide simple, easy to understand and operate functions. Legends and status displays shall be easy to view in all lighting conditions likely to be encountered in public safety applications. Displays shall provide operational information (e.g. talk group/channel currently being received or selected for scan priority/transmit). When display of control functions is required, the display shall temporarily display necessary information and then after a programmable time delay revert back to normal operational information.	SO	SO	SO	SO
5.2.1.15 Full Control or Covert Installation	i	i	i	i
A full-function control and display can be offered in a remote speaker/microphone assembly that can be used with mobile units where a concealed installation is required.	SO	SO	SO	SO
5.3 Capability to Operate as Analog				
5.3.1 Phase 1 Subscriber Units				

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
5.3.1.1 Phase 1 Subscriber Equipment	i	i	i	i
Phase 1 equipment 3, irrespective of the manufacturer, must have at least the capability to operate both as analog (11K25F3E and 20K0F3E/16K0F3E where permitted by FCC/NTIA rules) 4, employing standard signaling (TIA-603), and the standardized digital mode defined in the TIA 102 series. For example, trunking and encryption for current systems are not standardized and are not included in this minimum Phase 1 definition. However, manufacturers who presently provide analog or digital equipment with non-standard or proprietary capability must provide Phase 1 equipment that will operate in the analog mode and, as a standard option, in their own proprietary mode on a functional channel basis.	M	M	i	i
5.3.2 Phase 2 Subscriber Units				
5.3.2.1 Phase 2 Subscriber Equipment in a Conventional Phase 1 System	i	i	i	i
Phase 2 equipment intended to replace conventional Phase 1 equipment must have the capability to operate in both conventional Phase 1 and Phase 2 modes on a functional channel basis.	M	M	M	M
5.3.2.2 Phase 2 Subscriber Equipment in a Trunked Phase 1 System	i	i	i	i
Phase 2 equipment intended to replace trunked Phase 1 equipment must have the capability to operate in both trunked Phase 1 and Phase 2 modes on a functional channel basis.	SO	SO	SO	SO
5.3.2.3 Phase 2 Subscriber Equipment in an Analog System	i	i	i	i
Analog capability (e.g., 11K25F3E and 20K0F3E/16K0F3E where permitted by FCC/NTIA rules) 5 and proprietary modes for Phase 2 equipment shall be available.	SO	SO	SO	SO

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
6.0 Interoperability	i	i	i	i
This section defines modes and supported features and services required for interoperability.	i	i	i	i
6.1 Infrastructure				
3 As a Standard Option, a fixed station be capable of dual mode operation (not simultaneously) for analog (Phase 0) and digital (Phase I). This dual mode operation is required (simultaneously) for all subscriber equipment.				
4 16K0F3E is often licensed by the FCC as 20K0F3E.				
5 16K0F3E is often licensed by the FCC as 20K0F3E.				
6.1.1 This section defines modes and supported features and services required for infrastructure interoperability.	i	i	i	i
6.1.1.1 FDMA Phase 1 Interoperability Mode	i	i	i	i
The system shall support an interoperability mode via FDMA Phase 1 conventional operation.	M	M	M	M
6.2 Subscriber Units				
6.2.1 This section defines modes and supported features and services required for subscriber unit interoperability.				
6.2.1.1 Analog Interoperability for TDMA Subscribers	i	i	i	i
For interoperability purposes, TDMA subscriber equipment shall be capable of operating in a conventional 12.5 kHz analog mode as a standard option and in a conventional 25 kHz analog mode where permitted by FCC/NTIA rules as a standard option. This is not intended to restrict any other modes of operation.	i	i	SO	SO
6.2.1.2 Digital Interoperability for TDMA Subscribers	i	i	i	i
For interoperability purposes, TDMA subscriber equipment shall be capable of operating in a conventional digital mode that shall be fully compliant with the Project 25 Phase 1 (12.5kHz FDMA) Common Air Interface. This is not intended to restrict any other modes of operation.	i	i	M	M

City of New Britain Functional and Technical Requirements based on National Standard

Requirement	Phase 1	CoNB	Phase 2	CoNB
7.0 Migration	i	i	i	i
7.1 Migration Aspects (General)				
7.1.1 General Migration Requirements				
7.1.1.1 Console Interface	i	i	i	i
The console interface shall provide for backward compatibility with that manufacturer's existing analog systems.	SO	SO	SO	SO
7.2 P25 Migration Aspects (Phase 0 to Phase 1)				
7.2.1 Phase 0 to Phase 1 Migration Requirements				
7.2.1.1 Phase 0 to Phase 1	i	i	i	i
Each manufacturer's systems (both conventional and trunked) shall provide for backward compatibility with that manufacturer's existing analog systems to facilitate a graceful and gradual migration from analog to digital. As a minimum, this shall include mobile and portable subscriber units. In addition, subscriber units shall include the ability to select and operate on available analog mutual aid channels for communications with the fixed network equipment as well as direct unit-to-unit.	M	M	i	i
7.3 P25 Migration Aspects (Phase 1 to Phase 2)				
7.3.1 Phase 1 Conventional to Phase 2 Migration Requirements				
7.3.1.1 Phase 2 SUs (Conventional Mode)	i	i	i	i
Phase 2 SUs in Phase 2 systems replacing Phase 1 conventional systems shall be capable of operating in Phase 1 conventional mode.	i	i	M	M
7.3.2 Phase 1 Trunked to Phase 2 Migration Requirements				
7.3.2.1 Phase 2 SUs (Trunked Mode)	i	i	i	i
Phase 2 SUs in Phase 2 systems replacing Phase 1 trunked systems shall be capable of operating in Phase 1 trunked mode.	i	i	M	M
7.3.2.2 Phase 2 Infrastructure	i	i	i	i
A Phase 2 system shall support Phase 1 channel modes enabling interoperability of Phase 1 SUs with Phase 2 infrastructures.	i	i	M	M

Tentative Subscriber Quantities

Total Subscribers on Trunked System	718
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