



1. Public Safety / Health & Human Services Committee Agenda

Documents: [MAY 13 2014 MEETING AGENDA.PDF](#)

2. Meeting Called To Order And Minutes From April Meeting Reviewed

3. Needle Disposal Update

Documents: [PROGRAM FOR THE DISPOSAL OF SHARPS.PDF](#), [NEEDLE DISPOSAL BROCHURE DRAFT 5.8.2014.PDF](#)

4. Ending Homelessness Task Force Plan Update

Documents: [2014.04 FS MATRIX - PROJECTIONS AND HP DETAILS.PDF](#), [2014.04 OSS MATRIX - PROJECTIONS AND HP DETAILS.PDF](#), [OXFORD STREET SHELTER LONG TERM STAYER INITIATIVE PSHHS COMMITTEE_NARR.PDF](#), [OXFORD STREET SHELTER NEW 2014 BEDNIGHT PROJECTIONS_2.PDF](#), [PSHHS HOUSING PLACEMENT UPDATE.PDF](#)

5. Public Health Division Quarterly Update

Documents: [PSHHS CMTE QUARTERLY UPDATE MAY 14.PDF](#)

6. Substance Abuse Sub-Committee Update

Documents: [SUBSTANCE ABUSE BACK UP MATERIAL_1.PDF](#)

7. Communications System Status Update

Documents: [CITY OF PORTLAND P25 FINAL REPORT_12.05.2013_1.PDF](#)

8. Committee Work Plan Discussion



City of Portland, Maine
Public Safety / Health & Human Services Committee

May 13, 2014
5:30 PM
City Council Chambers

Meeting Agenda

- | | |
|--|-----------------------------------|
| 1. Meeting Called to Order and Minutes from April Meeting Reviewed | Committee Chair |
| 2. Needle Disposal Update
(Public Comment) | S.Hill-Christian,
Dep.City Mgr |
| 3. Ending Homelessness Task Force Plan Update
(No Public Comment) | D. Gardner/HHS |
| 4. Public Health Division Quarterly Update
(No Public Comment) | J. Sullivan/PHD/HHS |
| 5. Substance Abuse Sub-Committee Update
(No Public Comment) | Chief Sauschuck/PPD |
| 6. Communications System Status Update
(No Public Comment) | Chief Sauschuck/PPD |
| 7. Committee Work Plan Discussion
(No Public Comment) | Committee Chair |

May 9, 2014

Councilor Ed Suslovic, Chair
Public, Safety, Health and Human Services Committee

Re: Program for the Disposal of Sharps

Per your request various departments have been meeting to determine the best approach for the creation of a city wide sharps disposal program. Specifically the goal is to provide for the proper disposal of sharps found on private property and publicly owned spaces. In developing the program we considered the following components: 1. Public Information Brochure and One number to call. 2. Distribution of Kits for safe pick up. 3. Neighborhood Cleanup Assistance.

1. Public Information/Brochure - In our research related to the creation of a brochure for distribution to the public, we found that one already exists that has been created by the Maine Department of Environmental Protection. These brochures would be provided to us for free for distribution to the public. We plan to add an insert regarding the Portland Exchange program as well as other Portland specific information. Please see attached.

The brochure will have one number to call when sharps are found. The Department of Environmental Protection (DEP) has indicated they have an 800 number to call in the event a syringe is found and they are available and respond 24/7. We are presently working to confirm this information, and the expected response times. If it is found that this is not a viable solution, we are considering the use of the Department of Public Services dispatch number. We are working to develop consensus regarding a reasonable timeline for DPS response given their other responsibilities. Currently approximately 20 DPS employees have been trained in the proper retrieval and disposal of sharps.

Our goal is to have these issues resolved and the brochures available and ready for distribution by June 1, 2014.

2. Distribution of Kits - Doug Gardner and Portland Exchange Staff, a program of the Health & Human Services Department, researched kits for picking up sharps that could be purchased by the City. They have identified a reasonably priced kit that could be made available to the public. However, our research of other programs across the nation suggests that localities should not encourage citizens to pick up sharps by providing kits.

Instead, it is recommended that localities provide very simple instructions as to the proper method for handling sharps, and the use of everyday household containers for disposal. Therefore, staff is recommending that we not distribute or encourage the use of sharps kits. However, should the committee wish to discuss this option, we will be happy to share photos of kit options and pricing.

3. Neighborhood Clean-up Assistance - Mike Murray will schedule a briefing regarding sharps disposal at his upcoming meeting with the neighborhood associations. Mike will share the brochures, and that he is the contact for scheduling Fire and Portland Exchange staff to assist with neighborhood cleanups. These staff will be available to assist with a brief orientation regarding the proper method for sharps disposal. Fire personnel will also be onsite to assist with sharps collection at neighborhood cleanups.

Although this program is still under development, Fire personnel and staff from the Portland Exchange recently participated in providing sharps education and collection during the Bayside Cleanup. We will continue these efforts throughout the summer.

Please let me know if you have questions or need additional information.

Sincerely yours,
Sheila Hill-Christian

C: Councilor John Coyne
Councilor Cheryl Leeman
Councilor Jill Duson

Attachment

Safe Disposal of Sharps

Why It's Important

Needle stick injuries are a serious public health risk, causing great stress to victims and costing thousands of dollars for medical testing.

Each year thousands of Mainers use millions of needles and lancets or "sharps" as part of their routine for controlling medical conditions such as diabetes, arthritis, severe allergies and migraines. Improper disposal of these sharps into household or workplace trash or by flushing them down the toilet puts you and your family, janitorial and solid waste staff, and the general public at risk for accidental needle sticks. Needle stick injuries are a serious public health risk because of the potential for transmission of blood-borne diseases such as Hepatitis B and HIV/AIDS.

*Simply recapping a syringe is **not** enough to protect against needle sticks.*

"Sharps" Include

- Syringes
- Pen and pump needles
- Lancets
- Infusion sets

This brochure
was brought to you by:



With generous support from
the following partners:



Becton, Dickinson and Company
www.bd.com



With us, it's personal.
www.riteaid.com

Proper Disposal of
Household Sharps
in the State of Maine

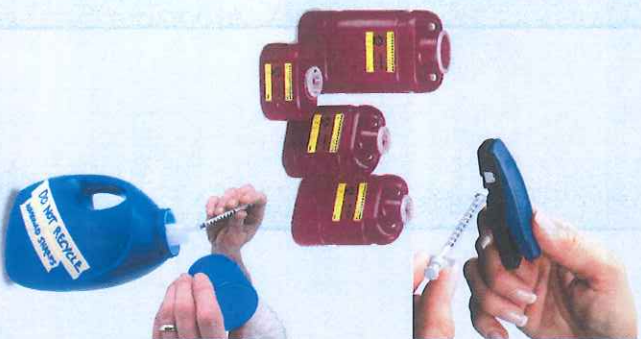


What Should I Do With My Used Sharps?

Proper Containment and Disposal Practices

Handling Sharps at Home

Place used syringes, pen needles, lancets and other sharps in rigid containers resistant to leaks and punctures. **Label filled containers "DO NOT RECYCLE."**



Needle Clipping Devices

Devices that clip the needle off of a syringe allow you to throw the remaining piece in your household trash. Wrap the full device in heavy-duty tape and dispose in your trash.

Commercially Available & Mail-Back Sharps Containers

Filled commercial sharps containers (like the ones seen here) may be placed with household trash. Mail-back containers are designed to be filled and mailed to the manufacturer or manufacturer's disposal partner for proper disposal. While sharps containers may be available for purchase at your local pharmacy, some manufacturers may also provide containers free of charge through patient support programs (registration may be required). Contact the manufacturer for details.

Household Sharps Containers

Make your own sharps container using a heavy plastic bottle with a screw-on cap such as an old liquid laundry soap bottle. Seal with heavy-duty tape **and label** before disposing in your trash.

Getting Rid of the Waste

Local Hospitals

Some hospitals may accept used household sharps and dispose of them as part of their waste stream. Contact the Environmental Services Department at your local hospital for more information.

When You Are Away From Home

All Maine Turnpike Authority rest stops, some Maine airports and some retail stores have sharps disposal boxes for use while you are away from home.

For more information, contact the Maine Department of Environmental Protection Biomedical Waste Program at (207) 287-2651 or visit www.maine.dep/sharps.

Loose syringes, lancets, and other sharps should never be thrown in the trash.

Please Don't...

- Throw loose sharps into the trash or toilet.
- Leave sharps anywhere they could injure someone.
- Store used sharps in glass bottles, soda bottles, milk jugs, aluminum cans, coffee cans, or plastic bags.
- Put containers of used sharps in with recycling.

Proper disposal means:

- ☒ Clipping needles **OR**
- ☒ Placing sharps in proper containers
- ☒ Labeling containers "DO NOT RECYCLE"
- ☒ Using heavy-duty tape to secure container lids

City of Portland



If you find sharps in a
public place:

DO NOT PICK UP

Call the Department of
Environmental Protection
1 (800) 482-0777

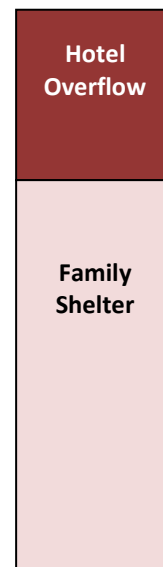
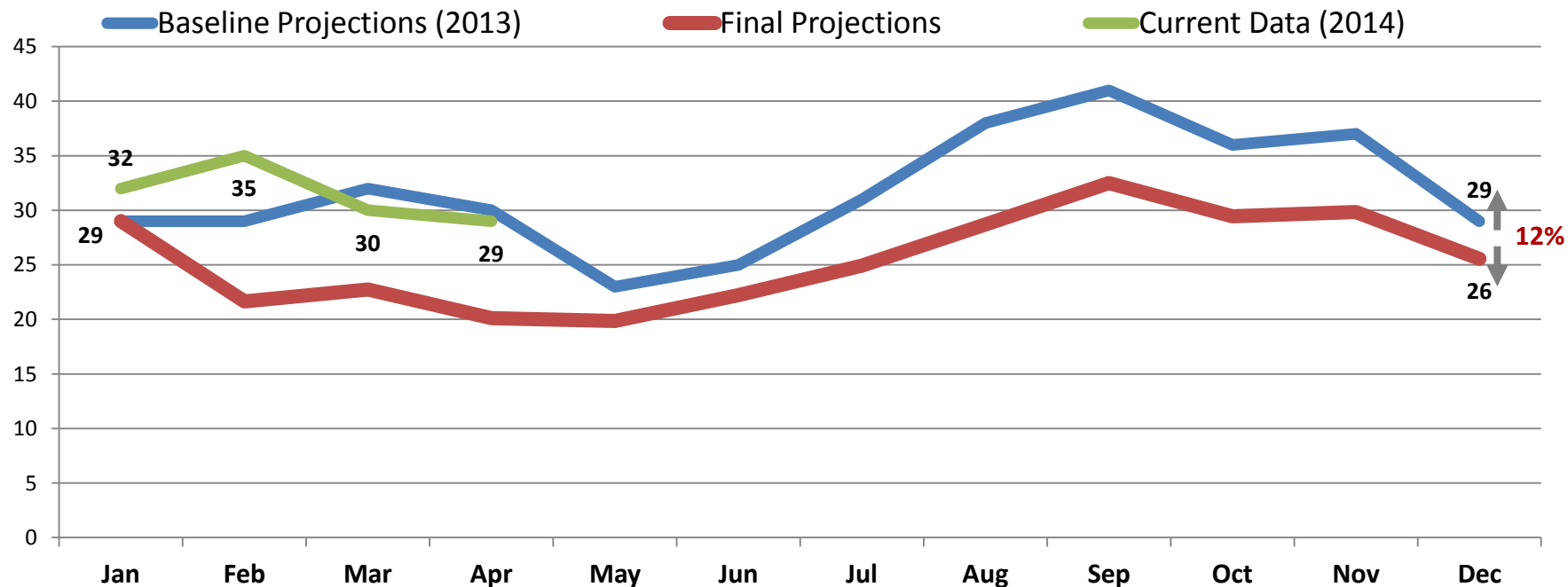
And a trained
specialist will file a report
and clean up the area

For more information on the
Portland Needle Exchange Program:
(207) 756-8024

CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION

FAMILY SHELTER

Average Number of Families Served On Any Given Night – Per Month



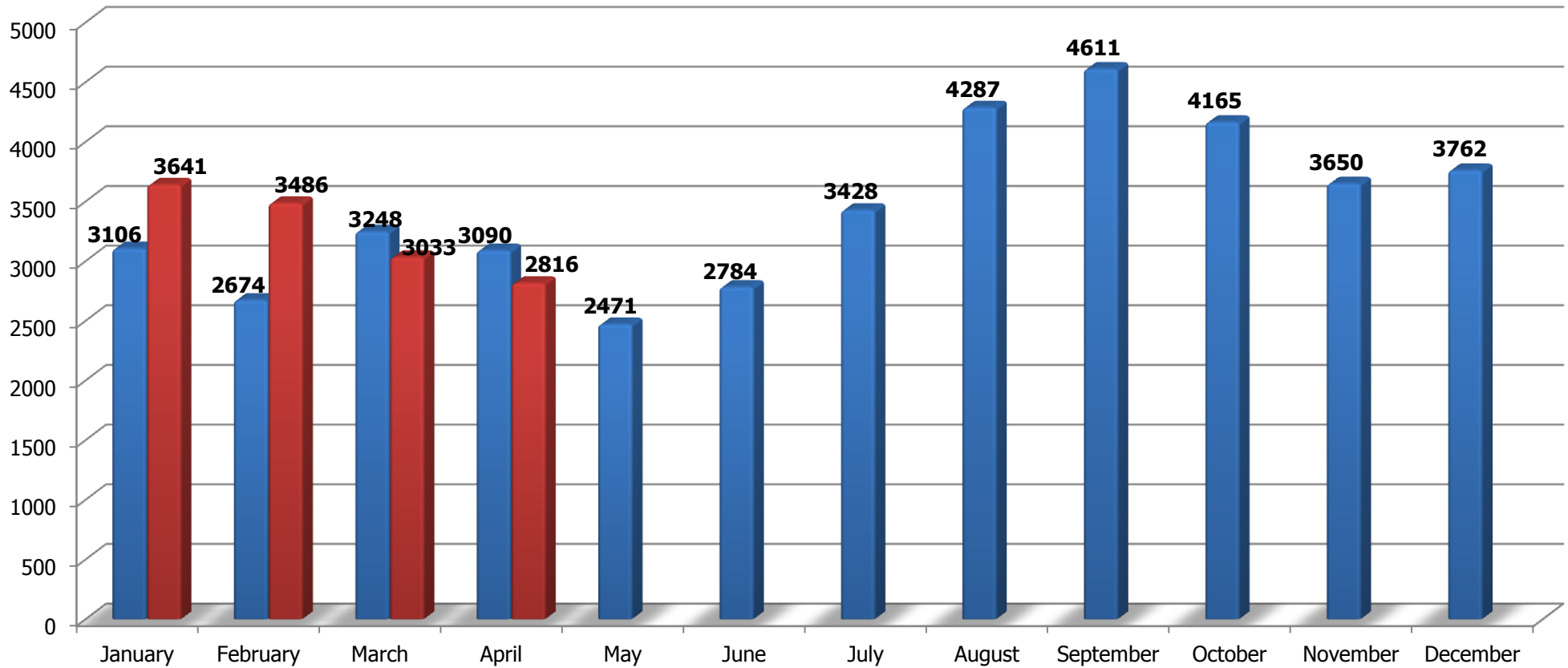
Housing Placement Matrix

Programs/Services	Additional FS Housing Placements (above the Historical Average # of HPs)	Home to Stay Program	Transitional Housing Placements	Total
Estimated Additional Housing Placements through 12/31/2014	24	34	10	58
Actual Additional Housing Placements 01/01/2014 - Present	0	2	1	3

CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION
FAMILY SHELTER

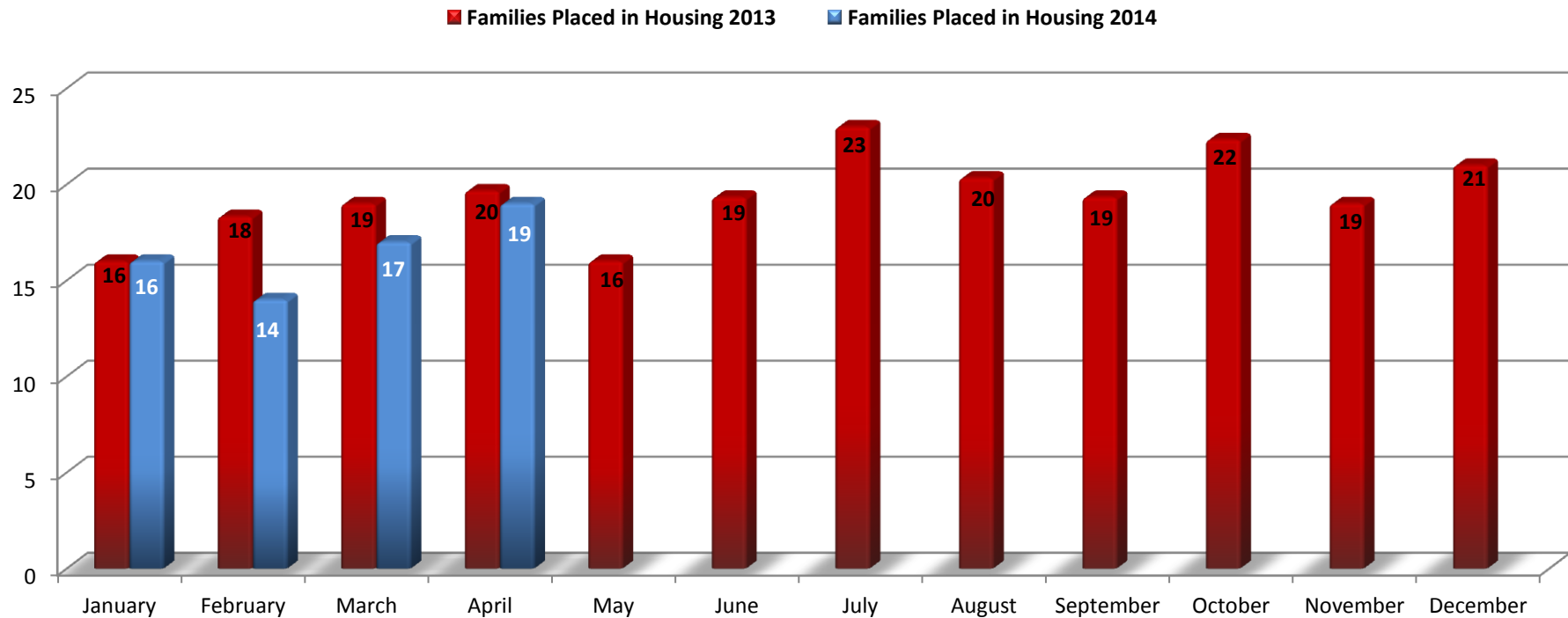
BEDNIGHT USAGE

■ Bednights 2013 ■ Bednights 2014



CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION
FAMILY SHELTER

**PERMANENT AND TRANSITIONAL
HOUSING PLACEMENT DATA**



CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION
FAMILY SHELTER

**PERMANENT AND TRANSITIONAL
HOUSING PLACEMENT DATA**

January 2014		16
Total Housing Placements (families)		
Permanent, No Housing Subsidy		
• Portland	8	50%
• Westbrook	3	20%
• Out of State	1	6%
Permanent, Housing Subsidy		
• CHOM (Portland)	1	6%
Reunification		
• Portland	1	6%
• Lewiston	1	6%
• Scarborough	1	6%

February 2014		14
Total Housing Placements (families)		
Permanent, No Housing Subsidy		
• Portland	7	50%
• Westbrook	1	7%
Permanent, Housing Subsidy		
• BRAP (Portland)	2	14%
• HCV (Standish)	1	7%
• Shelter + Care (Westbrook)	2	14%
Reunification		
• Milo	1	7%

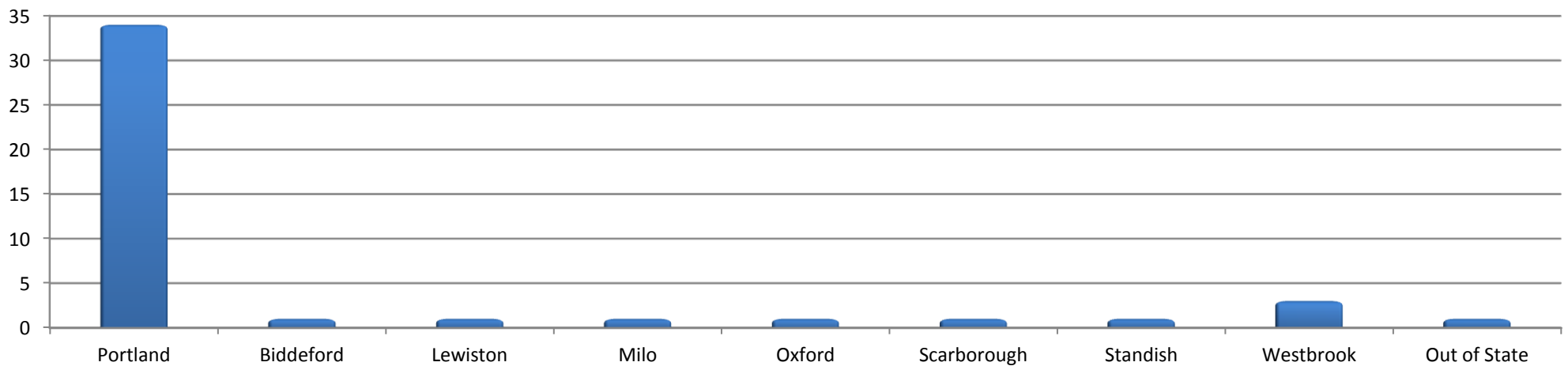
March 2014		17
Total Housing Placements (families)		
Permanent, No Housing Subsidy		
• Portland	13	76%
Permanent, Housing Subsidy		
• Shelter + Care (Portland)	1	6%
Transitional		
• SteppingStones	1	6%
Reunification		
• Portland	1	6%
• Oxford	1	6%

April 2014		19
Total Housing Placements (families)		
Permanent, No Housing Subsidy		
• Portland	11	
• Westbrook	1	
Permanent, Housing Subsidy		
• HCV (Saco)	1	
• Section 8 (Old Orchard Beach)	1	
• Shelter + Care (Portland)	2	
Reunification		
• Biddeford	1	
• Westbrook	1	
• Out of State	1	

CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION
FAMILY SHELTER

**PERMANENT AND TRANSITIONAL
HOUSING PLACEMENT DATA**

■ 2014

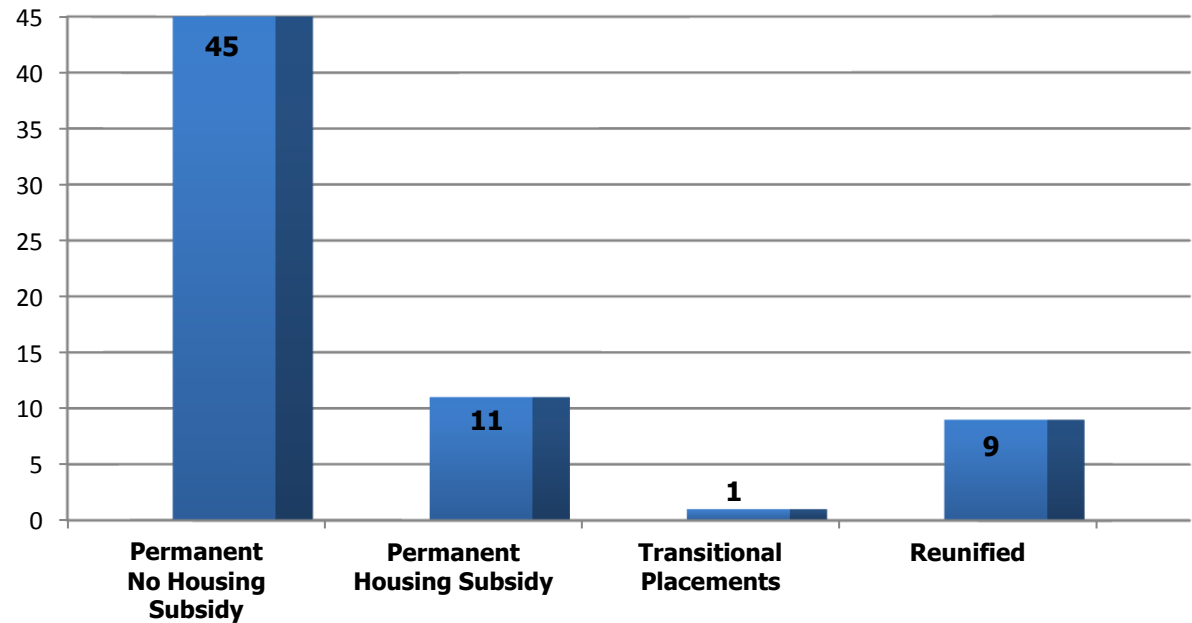


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL	%
TOTAL HOUSING PLACEMENTS	16	14	17	19									66	
Portland	10	9	16	13									48	71%
Biddeford	-	-	-	1									1	2%
Lewiston	1	-	-	-									1	2%
Milo	-	1	-	-									1	2%
Old Orchard Beach	-	-	-	1									1	2%
Oxford	-	-	1	-									1	2%
Saco	-	-	-	1									1	2%
Scarborough	1	-	-	-									1	2%
Standish	-	1	-	-									1	2%
Westbrook	3	3	-	2									8	11%
Out of State	1	-	-	1									1	2%

CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION
FAMILY SHELTER

**PERMANENT AND TRANSITIONAL
HOUSING PLACEMENT DATA**

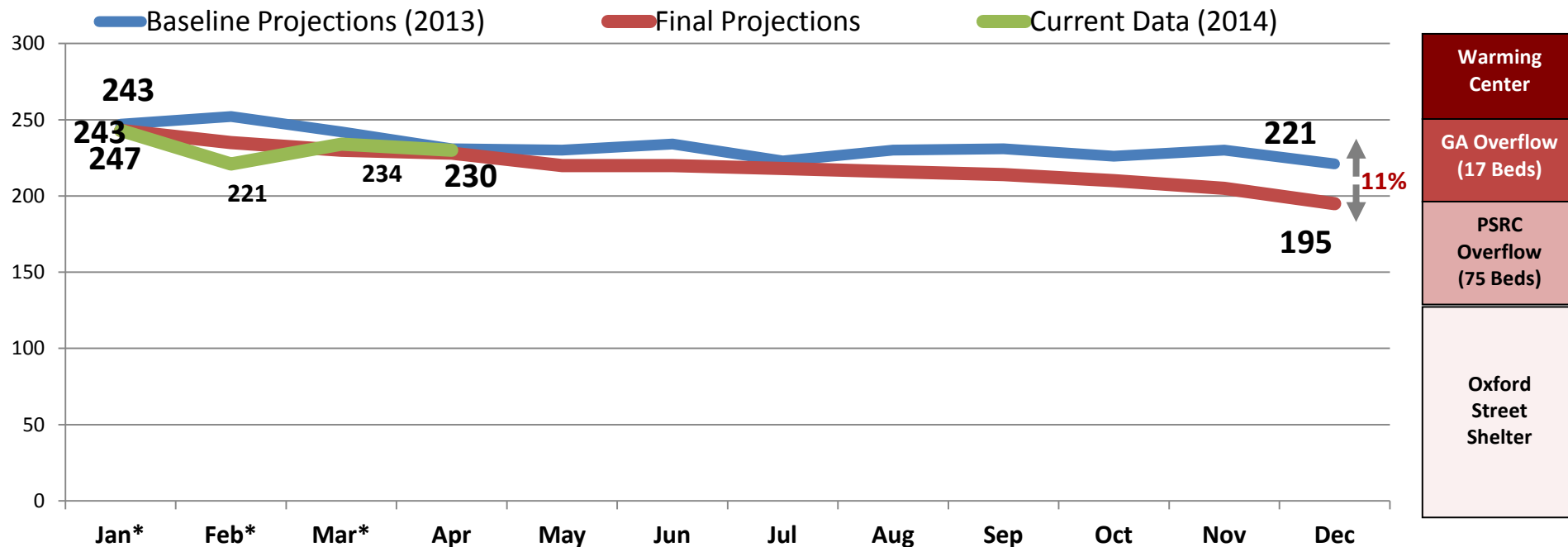
2014					
66					
Permanent, No Housing Subsidy			Permanent, Housing Subsidy		
Portland	39	57%	BRAP	2	4%
Westbrook	5	7%	Shelter Plus Care (S+C)	5	7%
Out of State	1	2%	CHOM	1	2%
			HCV	2	4%
			Section 8	1	2%
			Transitional/Temporary Placements		
			SteppingStones	1	2%
			Reunification		
			Reunification	9	13%



CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION

OXFORD STREET SHELTER & COMMUNITY OVERFLOW

Average Number of Individuals Served On Any Given Night – Per Month

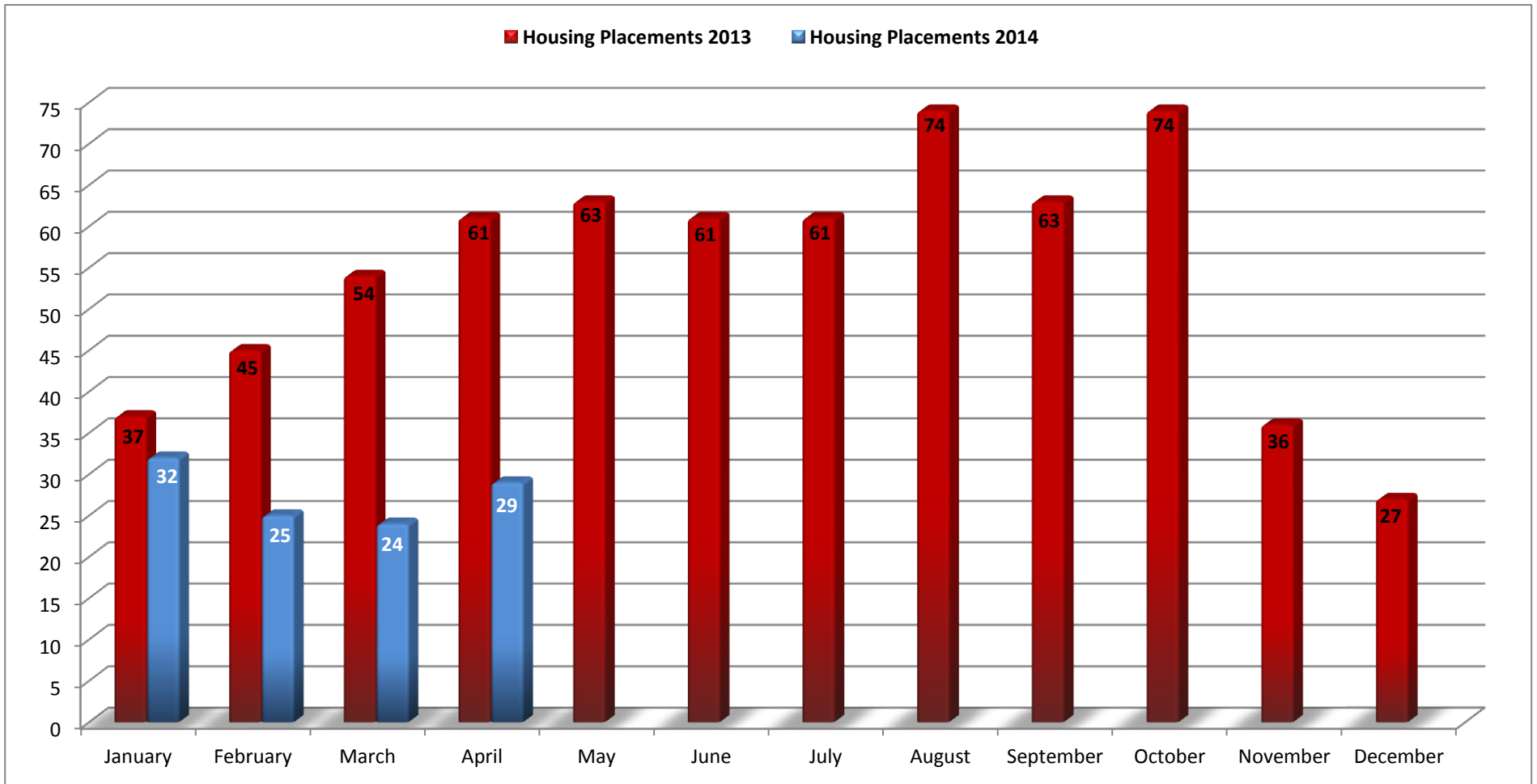


Housing Placement Matrix

New Programs/Services	Additional OSS Housing Placements (above the Historical Average # of HPs)	CLIP PHA Vouchers	York County Shelter Program	Additional Influx of Section 8 Vouchers	Home to Stay Program	Total
Estimated Additional Housing Placements through 12/31/2014	38	26	24	4	36	128
Actual Additional Housing Placements 01/01/2014 – Present	2	0	4	0	12	18

CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION
OXFORD STREET SHELTER & COMMUNITY OVERFLOW

**PERMANENT AND TRANSITIONAL
HOUSING PLACEMENT DATA**



Effective January 2014, Housing Placement focused on Long Term Stayers (LTS), resulting in fewer, but more impactful replacements in terms of bed night reductions and decreased recidivism rates.

CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION
OXFORD STREET SHELTER & COMMUNITY OVERFLOW

**PERMANENT AND TRANSITIONAL
HOUSING PLACEMENT DATA**

January 2014		
Total Housing Placements	32	
Permanent, No Subsidy		
• Portland	6	19%
• Westbrook	1	3%
Permanent, With Subsidy		
• BRAP (Portland)	1	3%
• BRAP (Bangor)	1	3%
• Shelter + Care (Portland)	4	12%
• HCV (Portland)	2	5%
• VHS	1	3%
Temporary/Transitional Housing		
• Home to Stay	4	12%
• York County Shelter (YCS)	1	3%
Reunification		
• Out of state via OSS-pd bus ticket	9	28%
• Out of state- no bus ticket	1	3%
• In-state via OSS-pd bus ticket	1	3%

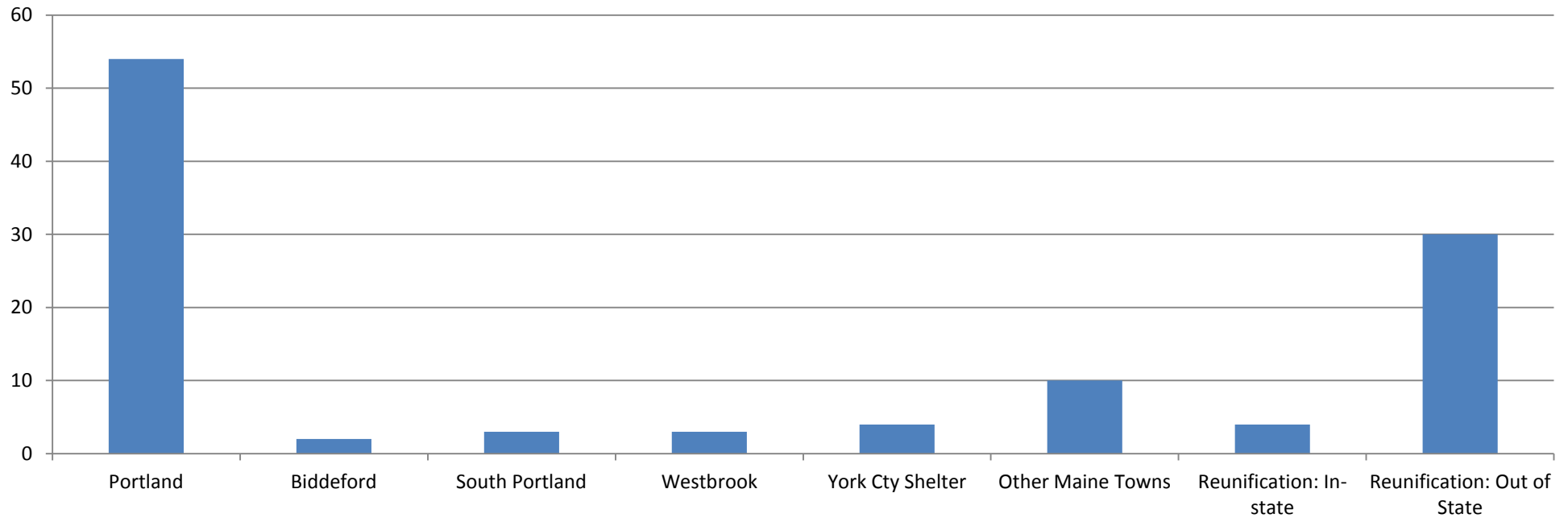
February 2014		
Total Housing Placements	25	
Permanent, No Subsidy		
• Portland	6	24%
Permanent, With Subsidy		
• Avesta (Portland)	2	8%
• BRAP (Portland)	2	8%
• Shelter + Care (Biddeford)	1	4%
• Shelter + Care (Portland)	1	4%
• Shelter + Care (Westbrook)	1	4%
• HCV (Portland)	2	8%
• VASH (Portland)	1	4%
• VHS (Portland)	2	8%
• Project Section 8 (Portland)	2	8%
• Regular Section 8 (Portland)	1	4%
Reunification		
• Out of state via OSS-pd bus ticket	2	8%
• Out of state- no bus ticket	1	4%
• In-state via OSS-pd bus ticket	1	4%

March 2014		
Total Housing Placements	24	
Permanent, No Subsidy		
• Portland	3	13%
Permanent, With Subsidy		
• Shelter + Care (Portland)	1	4%
• Shelter + Care (Westbrook)	1	4%
• HCV (Saco)	2	8%
• HCV (Windham)	1	4%
• STEP (Portland)	1	4%
• VHS (Portland)	1	4%
Temporary/Transitional Housing		
• York County Shelter (YCS)	2	8%
Reunification		
• Out of state via OSS-pd bus ticket	9	39%
• Out of state- no bus ticket	1	4%
• In-state via OSS-pd bus ticket	2	8%

April 2014		
Total Housing Placements	29	
Permanent, No Subsidy		
• Portland	7	25%
• Augusta	1	3%
• Bath	1	3%
• Saco	1	3%
• Searsport	1	3%
• South Portland	2	7%
• Springvale	1	3%
Permanent, With Subsidy		
• BRAP (Portland)	3	12%
• Shelter + Care (Portland)	2	7%
• VHS (Portland)	1	3%
• STEP (Portland)	1	3%
Temporary/Transitional Housing		
• York County Shelter (YCS)	1	3%
Reunification		
• Out of state via OSS-pd bus ticket	7	25%

CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION
OXFORD STREET SHELTER & COMMUNITY OVERFLOW

**PERMANENT AND TRANSITIONAL
HOUSING PLACEMENT DATA**



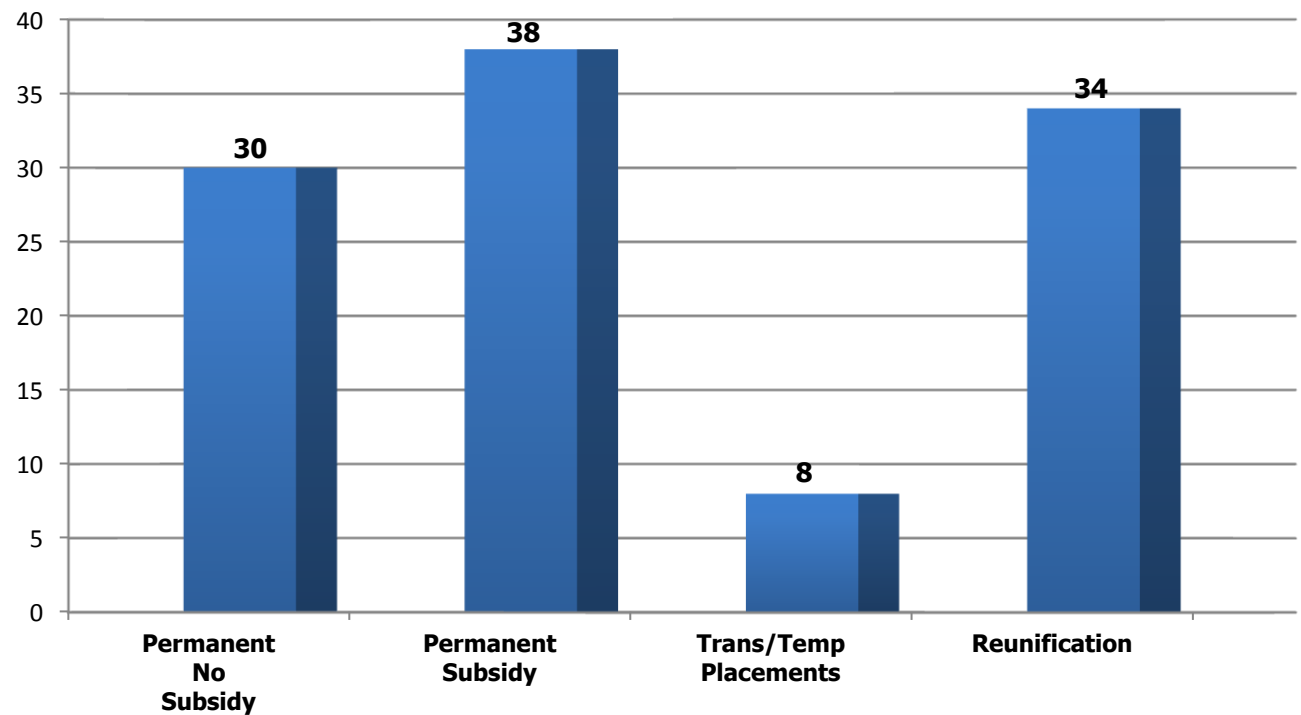
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL	%
TOTAL HOUSING PLACEMENTS	32	25	24	29									110	
Portland	14	19	7	14									54	48%
Biddeford	1	1	-	-									2	2%
South Portland	1	-	-	2									3	3%
Westbrook	1	1	1	-									3	3%
York County Shelter	1	-	2	1									4	4%
Other Maine Towns	3	-	2	5									10	9%
Reunification with friends/family in another Maine town via OSS pd bus ticket	1	1	2	-									4	4%
Reunification with friends/family in another state*	10	3	10	7									30	27%

*Reunifications may be have received assistance with bus tickets

CITY OF PORTLAND
HEALTH & HUMAN SERVICES DEPARTMENT
SOCIAL SERVICES DIVISION
OXFORD STREET SHELTER & COMMUNITY OVERFLOW

**PERMANENT AND TRANSITIONAL
HOUSING PLACEMENT DATA**

2014												
110												
Permanent, No Housing Subsidy				Permanent, Housing Subsidy				Transitional/Temporary Placements				
	Portland	22	20%		Avesta	2	2%		Home to Stay (STEP)	4	4%	
	Augusta	1	1%		BRAP	7	6%		York County Shelter (YCS)	4	4%	
	Bath	1	1%		Project-based Section 8	2	2%		Reunification			
	Saco	1	1%		Regular Section 8	1	1%			Out of state- bus ticket	27	24%
	Searsport	1	1%		Shelter Plus Care (S+C)	12	10%			Out of state- no bus ticket	3	3%
	South Portland	2	2%		Home To Stay (Case Mgmt)	6	5%			In-State	4	4%
	Springvale	1	1%		STEP	2	1%					
	Westbrook	1	1%		VASH	1	1%					
					VHS	5	5%					



Oxford Street Shelter Long Term Stayer Initiative

Effective January of 2014, Oxford Street housing staff have focused resources and efforts to house the most chronic and vulnerable clients residing at the shelter. Clients were selected for targeted services using a two part methodology consisting of our top 30 bed night stayers and also selecting other clients based on vulnerability (mental health, substance abuse, physical issues) and the potential to become a long term stayer.

Housing Progress Report for the original top 30 stayers

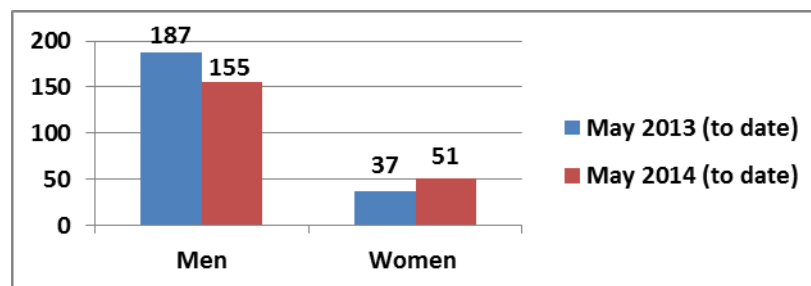
16 Clients have been placed in permanent housing – Only 1 recidivism

14 Clients are actively engaged in services and are working towards housing

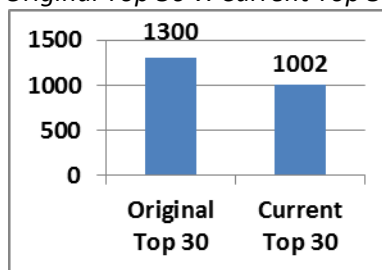
18,376 bed nights have been eliminated as a result of housing placements from this Original Top 30 group. This is the number of bed nights used by the combined total of these 16 clients since their first stay at the shelter.

Top 30: Impact to Date - Original Highest Bed Night Stayers (29 Men, 1 Woman)

Average Clients per Night 2013 vs. 2014



Average Bed Nights Used ***Original Top 30 v. Current Top 30***



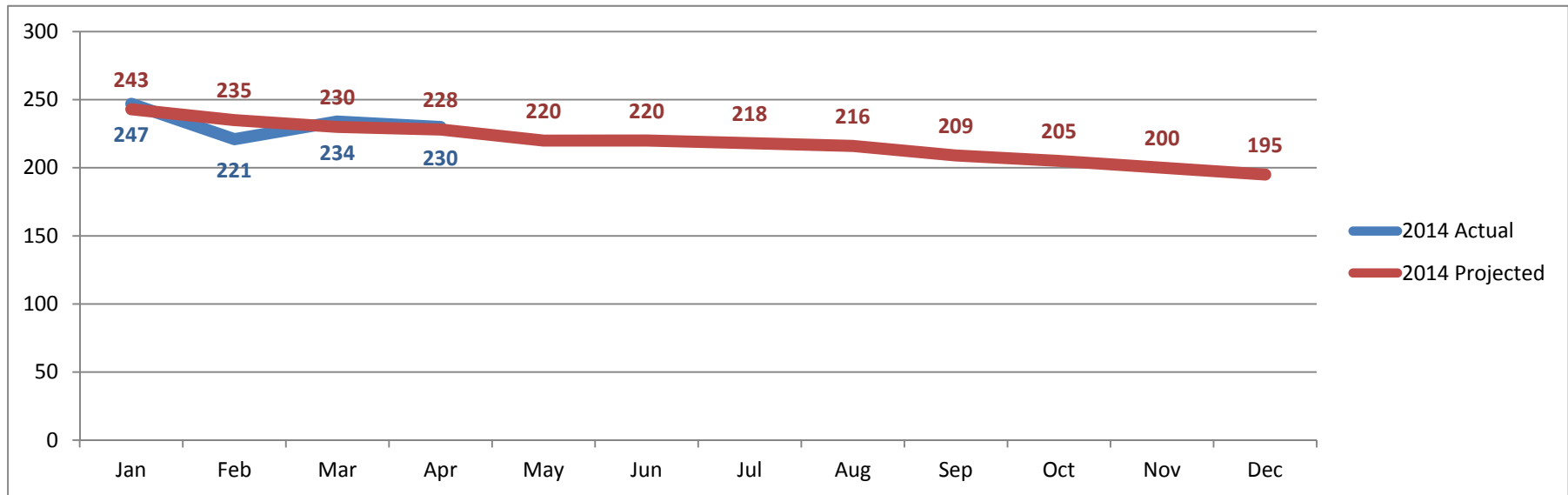
Original Top 30 (2013): The longest term stayer accounted for 3851 bed nights, #30 accounted for 781 bed nights

New Top 30 (2014): The longest term stayer accounted for only 2184 bed nights, #30 accounted for 561 bed nights

Long Term Stayers Goal

Emphasis on women LTS for housing placement due to increase in women bed night usage.

OXFORD STREET SHELTER NEW 2014 BEDNIGHT PROJECTIONS



2014 Resources/Action Plan

NEW Client Support and Services Plan: Requirement effective May 19th. Clients with regular income will be required to use all income sources as potential payment for housing.

TBRA: Tenant Based Rental Assistance Program; HCD/HHS Collaboration

New Resource: Security Deposits & 1st Month Rent

Home to Stay: Full Year of Programming and Resources

- STEP

- HCV

- Case Management

ESG: Rapid Re-Housing Case Management Services.

New LTS Program: Oxford Street Housing Team Change in Focus to Long-Term Stayers and Women's Services (180+ Days in Shelter)/ Chronic and Vulnerable Women.

- 30 Placements/month

- 9,000 Bednights/month

- 108,000 Annual Bednights / 360 Annual Housing Placements

In 2014, the City's partnership with Preble Street will continue to be a key contributor in meeting our goal of getting to 195. The Preble Street VHS (Veteran's Housing Services) partnership has led to a sharp decrease in veteran homelessness, and will continue to lead the charge in that area.

Preble Street's CLIP (Clinical Intervention Team) program has been key in working with chronically homeless individuals through PHA's set aside program through the Community Support Team (CST). 14 vouchers have been used so far, and we hope to use the remaining 26 as soon as they are available.



Douglas S. Gardner
Director, Health & Human Services Department

TO: Chair Suslovic and Members of the Public Safety, Health & Human Services Committee

FROM: Douglas Gardner, Health & Human Services Department Director

CC: Mark Rees, City Manager
Sheila Hill-Christian, Deputy City Manager

DATE: May 12, 2014

RE: Update – Homeless Initiatives

Per your request Chair Suslovic, the following is a brief summary of the City's current initiatives to end and prevent homelessness. As reported to the Public Safety, Health & Human Services committee in February, significant gains have been made to address the complex issues of homelessness since the implementation of the Seven Point Plan (Plan) nearly a year ago. As a reminder, the Plan is comprised of seven areas of focus; 1) Case Management, 2) Rapid Rehousing, 3) Increased Outreach, 4) Zoning Constraints, 5) Special Population Housing, 6) Housing First and 7) Regional Approach. The City, along with its many partners, has made great progress in some areas of the plan, but there remains a great deal to be done.

This update will focus on the progress made in moving individuals and families out of the City's shelters and into permanent housing. During calendar year 2013, the Oxford Street Shelter (OSS) staff assisted over 650 single adults in securing permanent housing. Likewise, the staff at the Family Shelter (FS) secured permanent housing for nearly 200 families in 2013 as well. While the placement data is certainly impressive and the result of the hard work from so many extremely dedicated staff, we did not see a commensurate reduction in the number of folks seeking shelter on a nightly basis. We did face several obstacles which have hindered our progress last year such as Federal Sequestration, delays in program development and limited available housing. In recognition of limited available housing resources, the decision was made to focus on the most chronically homeless, often referred to as long term stayers, at both the FS and the OSS. The Long Term Stayer Initiative is based on the theory that if we are successful in securing housing for folks who stay at the shelter night after night after night, it will create bed capacity and free up resources (e.g. personnel and housing subsidies) that can be made available for others. In addition, as the 100,000 Homes Campaign has taught us, these folks are also the most vulnerable and resource intensive. It is estimated that this group represents approximately 5% of the individuals served at the OSS. There are variations of the Initiative at the Family Shelter and Oxford Street, particularly in defining long term stayers, but the premise remains the same, prioritize resources for those who have been in the shelter the longest. At Oxford Street, the initial top 30 users were identified January and prioritized.

Attached you will find a progress report on the Long Term Stayer Initiative at OSS. As you will see, 16 of the originally identified 30 clients have been placed in permanent housing, eliminating over 18,000 bednights. A new cohort of 30 long term stayers has been identified. The new group will be prioritized for housing resources. As a result of the sharp increase in the number of women seeking shelter, OSS will redouble its efforts to work with women in the long term stayer group as well.

In addition, we will be implementing the next iteration of the Client Support and Services Plan (CSSP) at Oxford Street later this month. The significant increase in the number of housing placements last year can be directly attributed to the original CSSP. The revised CSSP will require all shelter consumers with regular income to use that income to secure permanent housing. The new approach will be based on an individualized assessment and will be tailored to each individual's resources and will contemplate extenuating circumstances such as mental illness and substance abuse.

The City's new Tenant Based Rental Assistance program (TBRA) came online about a month ago. As a new City program, it was delayed for several months while being researched and developed. The TBRA is funded through the City's HOME funds and will provide short term housing subsidies like security deposits and one or two months of rental assistance for eligible adults and families. It is anticipated that one hundred ten (110) households will receive assistance through the program with an average level of assistance of \$1,200 per household. Clients will be encouraged to complete good tenant and good neighbor educational workshops and whenever possible clients will be asked to contribute any financial resources they may have to minimize the amount of financial assistance needed.

Finally, the full City Council will take action on the Housing First Pre-Development RFP in June. The review committee recommended to the Housing and Community Development Committee to fund both proposals received in response to the RFP – one from Avesta Housing and one from Community Housing Options of Maine (CHOM). At its May meeting, the HCDC voted unanimously to recommend to the Council that both proposals receive funding. Each proposal will result in additional housing options for chronically homeless adults.

Please note this is not an exhaustive list of all the activities underway in the city to address homelessness. I have focused on City specific initiatives in this update. There are many other efforts involving homeless and healthcare providers, the business community, housing developers and the City currently underway to meet the unique needs of this extremely vulnerable population. Please let me know if you have any questions or would like any additional information related to these efforts.

ATTACHMENTS: Oxford Street Shelter Long Term Stayer Initiative
 Oxford Street Shelter 2014 Bednight Projections
 Oxford Street Shelter Housing Placement Matrix
 Family Shelter Housing Placement Matrix



Quarterly Update to the Public Safety, Health & Human Services Committee City Council May 13, 2014

As part of the Public Health Division's ongoing efforts to attain public health accreditation, we must demonstrate communication with our governing entity regarding their roles and responsibilities. I am therefore required to affirm these roles and responsibilities as they are stated on the Public Safety, Health and Human Services Committee web page (<http://www.portlandmaine.gov/publicsafecomm.htm>).

"This Committee will develop policy recommendations that will improve and enhance the quality of life, health and safety of all Portland residents and visitors. In that capacity, the committee shall review the operations of the Police and Fire Departments, interact with community-based organizations that provide services and support to various groups in the city to ensure a coordinated effort between the parties, and provide opportunities for neighborhood organizations to express their concerns and issues."

Minority Health Program

- Three staff were invited to speak at the Institute of Medicine Conference in Washington, DC about the CHANNELS project, an interdisciplinary primary care team serving immigrants and refugees with the University of New England.
- Each Community Health Outreach Worker worked with 134 clients between January and March.
- We are partnering with CarePartners, MaineHealth, UNE and Frannie Peabody Center to apply for the Maine CDC's Community Health Worker Pilot Project.

Public Health Systems

- The Accreditation process is moving quickly – we are finalizing our documentation to submit by June 18. Site visit this summer. Accreditation is good for 5 years.

Healthy Portland

- SNAP-Ed staff conducted 107 classes and reached 352 Portland SNAP recipients with direct or indirect nutrition education.
- Staff worked with 20 schools, 39 child care centers, and 19 after-school programs to make at least one evidence-based change in physical activity and nutrition.

Environmental Health

- 92% (450) of food service establishments have been inspected within the last year and 96% (471) within the past two years (a total of 490 permanent establishments); 4% of those not inspected are mobile units not operating during the winter season.

- Investigated 15 complaints since January. None were confirmed; no trends by location or source of food.
- Working through the National Association of City and County Health Officials' Voluntary National Retail Food Regulatory Program Standards mentorship program. Starting a Food Service Advisory Group to help disseminate information and discuss improvements to the program.

Family Health

- The Amanda Rowe School-Based Health Center at Portland High School had its grand opening and will begin offering dental services as well as hygiene. This will be the first time we've been able to offer dentistry.
- 457 students seen at the 4 SBHCs (Casco Bay High School, Deering High School, Portland High School and King Middle School). 1,285 of the 2,681 students (48%) attending these four schools are enrolled in the SBHCs.
- The Maternal & Child Health program providing 204 home visits to 103 families between January 1 and March 31. Lead and hemoglobin screenings were provided to 98 children in Head Start.
- The infant and toddler play groups have served more than 500 parents and children in three months.
- The Children's Oral Health program provided 619 students with cleanings, fluoride, sealants and screenings, and connected 199 kids with active dental disease with a dentist. Thirty children were served in the Bright Smiles volunteer dental clinic.

India Street Clinic

- The Positive Health Care practice was selected to receive the Peter M. Fox Excellence award in recognition that all of the eligible practitioners in the HIV practice are currently credentialed by the American Academy of HIV Medicine. Only 14 practices from around the country were chosen.
- We are seeing a 25% increase in clients and encounters in the Needle Exchange.
- We are now the only STD clinic in the state.

SUBSTANCE ABUSE MEETING

TUESDAY, MAY 6, 2014

ROOM 24 – CITY HALL BASEMENT

12:00 NOON

A G E N D A

- 1) Introductions
- 2) Purpose and Mission of the Committee/Committee Discussion
- 3) Overview of Substance Abuse Issue in Portland/State (City Staff/Co-Chairs)
- 4) Presentation by the Police Department on Substance Abuse and Crime Related Issues (Police Department)
- 5) Review of Legislative Issues and Affordable Health Care Act (Committee Co-Chairs)
- 6) Action Plan/Items for Future Meetings/Membership
- 7) Other
- 8) Date, Time and Place of Next Meeting



CITY OF PORTLAND, MAINE

MAYOR'S HEALTH CARE COMMITTEE

SUBSTANCE ABUSE SUB-COMMITTEE

MISSION STATEMENT

Due to the increased prominence of a number of issues related to substance abuse in our community, this sub-committee of the Mayor's Health Care Committee is established for the following purpose:

- 1) To review, examine and analyze current and emerging issues in the city related to substance abuse including but not limited to alcohol, opiates, marijuana and tobacco.**
- 2) Ensure that a system of care is evident for those persons needing prevention, intervention and treatment services.**
- 3) Review city, state and national policies affecting substance abuse and make recommendations on appropriate policies for the city.**

Substance Abuse Sub-Committee
Invited Community Members

Co-Chairs:

State Representative Richard Farnsworth -	omc@maine.rr.com
David Faulkner – Day One	DavidF@day-one.org

Potential Participants

City of Portland

Mayor Michael F. Brennan	mfpb@portlandmaine.gov
Superintendent Emmanuel Caulk	caulke@portlandschools.org
Councilor John Coyne	jcoyne@portlandmaine.gov
Douglas Gardner - HHS	DSG@portlandmaine.gov
Chief Jerry LaMoria – Fire Dept.	JFL@portlandmaine.gov
Chief Michael Sauschuck – Police Chief	MJS@portlandmaine.gov
Julianne Sullivan – HHS	JAS@portlandmaine.gov
Councilor Edward Suslovic	edsuslovic@portlandmaine.gov
Mark Swann – Preble Street	mswann@preblestreet.org
Joanna Morrissey – 21 Reasons	jmorrissey@mcdph.org
Suzanne McCormick - United Way	smccormick@unitedwaygp.org
Emily Rines – United Way	erines@unitedwaygp.org
Laura Kass – Mercy Hospital	kassl@emhs.org
Michael Baumann – ME Medical Center	macleb@mmc.org
Shannon Trainor – Crossroads	strainor@crossroadsme.org
Carolee Lindsey – Catholic Charities	clindsey@ccmaine.org
Dr. Joseph Py – Discovery House	jpy@discoveryhouse.com
Stephen Cotreau – Ptld Recovery Center	scotreau@masap.org
Andrew Kiezulas – Young People in Recovery	andrew.kiezulas@maine.edu
Tom Natalie – Milestone Foundation	nataliet@milestonefoundation.org
Bob Fowler – Milestone Foundation	bobf@milestonefoundation.org
Joe McNally – Milestone Foundation	joem@milestonefoundation.org
Guy Cousins – Office of Substance Abuse	guy.cousins@maine.gov
Becca Matusovich – Cumberland District PH	Becca.Matusovich@maine.gov
Reverend Kenneth Lewis	revkilewis@aol.com
Christopher Shorr	cshorr@hotmail.com
David Lambert – Muskie School	davidl@usm.maine.edu

Substance Abuse Prevention

- City of Portland, Health and Human Services Dept, Public Health Division has two program areas represented here working on substance abuse prevention:
 - Substance Abuse Prevention program: underage drinking, school policy, Student Intervention and Reintegration Program (SIRP), Rx drug (dangers, safe storage and disposal, Prescription Monitoring Program for Providers), gambling self exclusion, overdose prevention outreach and education
 - India Street Clinical Services: Needle exchange (following slide), HIV and Hep C testing and treatment, outreach and education

Spotlight on a Growing Problem: Heroin

- Use appears to be on the rise. Exact cause is not known. Some potential reasons are:
 - Oxycodone and other opiates have become more expensive
 - Changes to MaineCare
 - Decrease in availability
 - Natural progression to other drugs

City of Portland, ME

December 5, 2013

Public Safety Communications System Migration and Replacement Report

**Assessing Functional Requirements and
Radio System Plan for Project-25 Upgrade**

**Submitted by:
Communications Design Consulting Group LLC
9 Tibbetts Road
Barrington, NH 03825
603/867.9224**

City of Portland, ME

Next Generation Public Safety Communications System

1.0 EXECUTIVE SUMMARY	4
1.1 Mission	4
1.2 Shared Vision	4
1.3 Business Case	4
1.4 Report Objectives.....	5
1.5 Key Findings	6
1.5.1 Radio Coverage Enhancements	6
1.5.2 Subscriber Radio Equipment	6
1.5.3 FCC Frequency Assignments	6
1.5.4 Vehicular Repeater System [VRS]	6
1.5.5 System End of Life.....	7
1.5.6 New System Features	7
1.6 Communications Plan and Recommendations	7
1.7 Proposed Timetable	8
2.0 CURRENT STATE	9
2.1 System Evolution.....	9
2.1.1 Original System – Cutover in 1999.....	9
2.1.2 System Upgrades	9
2.1.3 800 MHz Reconfiguration	10
2.2 Radio System Frequency Licensing Status	10
2.3 Current Radio Configuration	11
2.3.1 System Description	11
2.3.2 Site Connectivity and Backhaul.....	13
2.3.3 Dispatch Centers.....	13
2.3.4 Talk Groups.....	13
2.3.5 Analog-Digital Communications Capabilities	14
2.3.6 Encrypted Communications.....	14
2.3.7 Hardware and Software Configuration	14
2.3.8 Current Portable and Mobile Radio Equipment	14
2.3.9 NPSPAC 800 MHZ Interoperability Channels	15
2.3.10 Vehicular Repeater System [VRS]	15
2.3.11 Life Cycle.....	15
2.3.12 Maintenance	16
3.0 USER ASSESSMENT AND NEEDS	18
3.1 Recommendations and Considerations.....	20
4.0 SIGNAL COVERAGE – Existing and Proposed	21
4.1 Existing Coverage	22

City of Portland, ME

Next Generation Public Safety Communications System

4.2	Coverage Summary Analysis	27
5.0	APCO PROJECT-25 – STANDARD BASED SYSTEM	28
6.0	CONCEPTUAL RADIO NETWORK UPGRADE SCENARIO	30
6.1	Proposed P25 Network Architecture.....	30
6.2	Operating Frequencies	30
6.3	Coverage Enhancement Recommendations	30
6.3.1	Coverage Difference Between Analog and Digital Modulation	32
6.4	System Capacity	32
6.5	Encryption.....	33
6.6	Over the Air Programming [OTAP].....	34
6.7	Communications Consoles and Logging Recorders	34
6.7.1	Console System.....	34
6.7.2	Logging System	34
6.8	System Backhaul	35
6.8.1	Backhaul Alternative – Microwave Radio	35
6.8.2	Unlicensed Microwave	36
6.8.3	Licensed Microwave	36
6.9	System Management and Maintenance	38
6.9.1	System Maintenance	39
6.9.2	Contractor Responsibilities.....	40
6.9.3	Remote Access - Monitoring.....	40
6.9.4	Software Maintenance	40
6.9.5	Service Provider Qualifications.....	41
6.10	System Transition.....	41
6.11	Training.....	42
6.11.1	Recommended Minimum Training Courses	42
6.12	National Public Safety Broadband Network.....	42
6.13	Estimated Budgetary Costs.....	44
6.13.1	Cost Summary	47
7.0	NEXT STEPS	48
7.1.1	Conceptual System Design.....	48
7.1.2	Release Procurement Documents	48
7.1.3	Review Proposals.....	48
7.1.4	Negotiate with Vendors.....	49
7.1.5	Select Vendor.....	49
8.0	APPENDIX-A – Microwave Path Profiles.....	50

City of Portland, ME

Next Generation Public Safety Communications System

1.0 EXECUTIVE SUMMARY

In 1999, the City of Portland began use of its citywide 800 MHz Motorola SmartNet Trunked Simulcast system. The system integrated radio communications for all city departments onto a single technology platform. Since that time some upgrades and modifications to the system have taken place in an effort to meet the communications needs of Portland's First Responders. The City of South Portland is also a system participant using the 800 MHz communications infrastructure for their public safety communications.

The time has now arrived to begin planning for the end-of-life cycle for a number of the system components, software and subscriber units that are no longer supported by the manufacturer.

This report provides information that has been gathered in meetings and interviews. User interviews gathered information from an operational perspective to identify additional system functionality, features, and radio coverage issues, along with other elements desired by the system users while planning for the next generation P-25 system. P-25 is the nationwide standard for Public Safety wireless digital voice communications.

The objective of this document is to provide Portland with a solid foundation of technical knowledge in order for the City to have the necessary information allowing an informed decision in the area of overall radio system replacement by RFP.

Moreover, throughout the document are quantifiable pieces of information that will assist the City in determining its final direction for implementing a P-25 system.

1.1 Mission

Upgrading the existing Public Safety radio network due to lifecycle issues, and making public safety communications more effective, efficient, and cost effective is the overall driving force behind this initiative. Enhancing signal coverage capabilities for all public safety organizations shall receive the highest level of commitment to guarantee a reliable, state-of-the art communication system is in place to ensure the effectiveness of public safety personnel.

1.2 Shared Vision

In the effort to save lives and protect property, Portland and its South Portland public safety partner, share a vision of improving communications to achieve better signal coverage and improved first responder services to the region they serve. Crime, fires, and natural disasters will dictate that public safety agencies cannot effectively protect life and property without effective communications. The shared vision is one wherein no individual in the region shall be at risk due to the lack of an effective public safety communication system.

1.3 Business Case

The proposed next generation P25 system is intended to address user-defined operational requirements collected over the past few months, and to derive the best possible solution from the vendor community. There are few manufacturers capable of providing the Fixed Network Equipment [FNE] necessary for a successful P25 implementation. Each of these vendors uses different types of hardware and software in their design. There are specific interfaces and interoperable functionality defined by the P25 standard; all other internal equipment configurations are proprietary for each supplier.

City of Portland, ME

Next Generation Public Safety Communications System

Due to this environment, there are many areas in which no specific technical definitions may be made without creating sole-source procurement. For example, a given function might be provided by custom equipment in a 19" rack mount from one vendor but another vendor may provide a software solution residing on a server. As a result, no two vendor solutions require the same floor space, electrical loading, HVAC, or any other physical attribute. Therefore, the City's intent to develop performance specifications is endorsed.

Functional and performance requirements have been developed and listed for all aspects of the system. Primary among these in defining a radio system are areas of coverage, operating frequencies, system capacity, and inter-city and inter-agency communications requirements. In plain English, these can be described as answers to these questions:

- | | |
|--------------------------------------|---|
| ▪ Signal Coverage: | Where do users need to talk? |
| ▪ Frequencies: | What channels are available? |
| ▪ Capacity: | How many are talking at once? |
| ▪ Interoperability/Intraoperability: | Who needs to talk to whom? |
| ▪ Reliability: | What is necessary to assure reliable operation? |

Overall radio system design results from combining the answers to these questions into cohesive overall system architecture.

This project is an important undertaking, and the information contained in this report represents a series of steps that will be required to develop and implement communication system improvements capable of meeting the needs of public safety agencies for at least the next ten years and beyond. The material contained in this document is not intended to represent a final system design. The information is presented at a conceptual level, and is intended to be used for planning purposes including discussion and refinement as the project evolves. The final system design will be developed in subsequent project phases in which specifications for systems procurement would be developed.

1.4 Report Objectives

Portland has identified the need to develop a Needs Assessment for its Public Safety Radio System upgrade that will address strategies for implementation of the next generation system, including:

- Identify and understand the use of the Portland's 800 MHz trunked voice communications system
- Radio Coverage Needs
- System Capacity – airtime usage
- Interdepartmental/Interregional Communications
- Redundancy Requirements
- Networking Requirements
- Feature and Functionality Capabilities
- Backup and Recovery Operations
- Technologies required to meet current and long-term needs
- Develop conceptual system designs based upon the Project-25 standard
- System Warranty and Maintenance
- Prepare budgetary cost estimates for equipment/systems

City of Portland, ME

Next Generation Public Safety Communications System

Provide the results of the findings in this report, with a Master Plan that provides a coherent framework within which technical, regulatory, and funding changes can occur without disrupting the overall plan.

1.5 Key Findings

Although the existing land mobile radio systems have continued to evolve over the years and has generally served the City's departments well, CDCG, Portland, and its regional partners have identified areas where public safety communications could be improved and made more capable. The most frequently areas of discussion by the user community are summarized as follows:

1.5.1 Radio Coverage Enhancements

Although the current system provides excellent coverage for in-street hand-held portable radios, radio coverage remains the top concern of most users interviewed. In-building communications is a concern, especially for the fire services. While overall coverage is considered very good, there is a need to enhance in-building communications.

Both PFD and SPFD currently utilize a Vehicular Repeater System [VRS] to enhance in-building communications.

1.5.2 Subscriber Radio Equipment

There are currently 1,303 mobile and portable [both commonly referred to as subscriber units] radios operating on the system. There are a small number of subscriber radios [approximately 10%] that will have to be replaced when migrating to a P25 system. The radios to be replaced total to 237 radios. These include 123 MCS-2000 mobiles and 114 MTS-2000.

However, the remaining 1,166 of existing radios [XTS/XTL] were replaced by the 800 MHz Reconfiguration Project. These units can be re-flashed and reprogrammed for the next generation P25 system. This is also true for the APX radios that South Portland is using.

Motorola XTS/XTL subscriber radios will soon be discontinued as discussed in Section 2.3.8.

1.5.3 FCC Frequency Assignments

The City has sufficient 800 MHz frequencies to meet existing and future capacity demands. The current system is licensed for ten [10] channels of which seven [7] are deployed. Our recommendation is that the next generation system utilizes the ten assigned channels. Per FCC NPSPAC rules, the five national Interop channels are also licensed one [1] call-in channel and four [4] TAC channels.

Moreover, the City is also licensed for ten [10] 800 MHz channels for VRS operations. These are distributed between PFD, PPD, SPFD, and SPPD.

1.5.4 Vehicular Repeater System [VRS]

Both Portland and South Portland Fire Department operate a Vehicular Repeater Sub-System [VRS] for fireground operations to enhance coverage performance inside of buildings. Each fire apparatus has both a VRS unit and a trunked mobile radio installed. The police department also has VRS used under certain conditions.

City of Portland, ME

Next Generation Public Safety Communications System

The VRS communications is critical to Fire Department operations. One purpose of the study is to assess the continued use of the VRS units.

Under current operating conditions, the analog VRS system is limited to the use of one channel per incident. The FD requires multiple concurrent VRS operations.

1.5.5 System End of Life

Similar to computer hardware and software systems, radio systems have planned periods during which radio systems and components will be manufactured, sold, and supported. The result is that, at some future point in time, spare parts for the radio system and its components will no longer be manufactured, and vendors will no longer guarantee that service or components will be available in the event of a system component failure.

The SMARTNET platform is currently beyond the End-of-Life [EOL] cycle for vendor support, as the equipment has been in service since the late 1990's. The 6809 trunked controller has been discontinued for over 10 years.

Independent of the system controller, individual system components are on their own cycles for support and end of life. Radio repeaters, dispatch consoles, and subscriber radios are all on different schedules and some are reaching the end of their planned support lives.

For Portland, system equipment that is no longer being sold by the manufacturer includes the Quantar repeaters, Centracom console, and voting comparators. All of these are currently in the 5 to 7 year component support cycle.

Of the 1,303 subscribers in service, approximately 237 units should be replaced as they are beyond the component repair life cycle. The manufacturer is currently selling and supporting the remaining majority of subscriber units - XTL mobiles and XTS portables; however, discontinuance of manufacturing of these units is approaching [2014 – 2015 timeframe expected].

1.5.6 New System Features

The current City of Portland radio communications system, although nearing the end of its lifecycle, provides the latest in public safety advanced-technology communications system. This includes a set of features [known as APCO Project-16] that defined processor based radio system. In migrating to P25, which is digital voice technology, additional function and features are available. From an infrastructure standpoint, these include geo-redundant master controllers, geo-redundant prime controllers, IP simulcast, and IP connectivity. From an end user feature standpoint, text messaging between subscriber units and GPS location are also available. Note that system users were primarily interested in the infrastructure enhancement and redundancy more than user features.

1.6 Communications Plan and Recommendations

It is recommended that the City of Portland upgrade its public safety communication network to the next generation, Project-25 compliant network, in order to continue to provide superior public safety service to its First Responders and ultimately the public.

The adoption of this plan will require that the City of Portland acquire a new communications infrastructure to replace existing equipment. Existing spectrum and the majority of subscriber radio equipment can be re-

City of Portland, ME

Next Generation Public Safety Communications System

used. The existing radio system will continue to operate during procurement and implementation of the new P25 system and equipment providing an uninterrupted cutover to the new system.

Summarizing:

1. Replace infrastructure components due to lifecycle issues
2. Continue use of VRS units for Fire Department fireground communications
3. Upgrade VRS for multiple concurrent operations
4. Implement geo-redundant master/prime sites: one in Portland and one in South Portland
5. Implement a new 4th transmitter site in the southwest region of the City
6. Install Network Management client terminal at Portland 9-1-1, Portland IT Department, and South Portland

1.7 Proposed Timetable

The schedule below is a high level view of major task and related time frames to complete the project. It is anticipated that once the funding is secured and the initiation of the development of procurement specifications begin, that implementation of the new system will take approximately 8 to 12 months. This timetable is subject to change depending on a number of factors, including the successful vendor's input.

	2013				2014												2015											
	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT		
CIP In Place	CIP In Place																											
Approve Communications Plan	Approve Communications Plan																											
Develop Procurement Specifications												Develop Specs																
Issue RFP												Issues RFP																
Bid Conference & Site Visits												Bid Conference & Site Visits																
Proposals Due													Proposals Due															
Evaluate Proposals & Select Vendor														Evaluate Proposals & Select Vendor														
Detailed Design Review w/ Selected Vendor															Detailed Design Review w/ Selected Vendor													
Contract Negotiations & Execution															Contract Negotiations & Execution													
Manufacture Equipment & Factory Tests																Manufacture Equipment & Factory Tests												
Ship Equipment, Begin Installation																	Ship Equipment, Begin Installation											
Network & Coverage Testing; Training																		Network & Coverage Testing; Training										
Final Acceptance & System Cutover																			Final Acceptance & System Cutover									

City of Portland, ME

Next Generation Public Safety Communications System

2.0 CURRENT STATE

In this section, the original system is outlined along with information on the upgrades that have taken place over the course of the system life. Lifecycle and P-25 issues are also covered at a high level within this section. Further detail on P-25 and lifecycle for the current system is provided in other sections throughout this document.

2.1 System Evolution

The Portland citywide system has evolved over the past 14 years, undergoing system enhancements and improvements.

2.1.1 Original System – Cutover in 1999

The original Motorola SMARTNET simulcast system was installed for the City starting in 1997. The overall architecture consist of a Trunked Radio Simulcast Network utilizing seven [7] 800 MHz channels. The City is licensed for ten [10] 800 MHz channels.

The City's Prime Site is located at the Portland Police Headquarters at 109 Middle Street. The Prime Site is co-located with the redundant Master Controllers.

Initially, citywide coverage was achieved using two [2] RF simulcast remote sites located at the Munjoy Hill Fire Station and the Dorler Tower located at the Riverside Industrial Park.

In order to achieve dispatch capability at 9-1-1 throughout the original system, there is a Central Electronics Banks [CEB] co-located with the Master Controllers at the prime site. The CEB utilizes an audio switch [AEB] that ties in to the controller to de-trunk audio.

The original system architecture is depicted in the high level diagram Figure 2-1 found on page-12.

The following table is a listing of the original equipment that was implemented in the version SMARTNET simulcast system.

Component Description Subsystem

1. Dispatch Console	Centracom II Gold Elite [end of life achieved]
2. Repeaters	Quantar [end of life achieved]
3. Simulcast	5 MHz Rubidium standard
4. Receiver Voting	Digitac
4. Alarm	MOSCAD
5. Network Management	Genesis [replaced under Rebanding]
6. Controller	6809 μ processor [end of life achieved]
7. TDM Multiplexer	Premysis TNSR channel banks

2.1.2 System Upgrades

In an effort to enhance coverage, an upgrade to the system took place after early 2003 where a third simulcast site was implemented at the Maine Medical Center. The intent was to enhance coverage in the downtown peninsula, and to improve coverage at the Portland Jetport and north to the Dorler tower site.

City of Portland, ME

Next Generation Public Safety Communications System

Also, VRS was implemented for the Fire Department in 2002. VRS equipment was purchased to enhance communications inside buildings for fireground operations.

2.1.3 800 MHz Reconfiguration

Most recently, the City's system went through the FCC mandated 800 MHz Reconfiguration, commonly known as Rebanding. This process was in combination with Sprint/Nextel and the FCC in an effort to clear the 800 MHz spectrum for public safety to eliminate radio interference caused by the former Nextel radio system on public safety systems. The cost for Nextel to Reband the City was \$1.2-million. The cost did not include the purchase cost of subscriber units, as this was proprietary information between Motorola and Nextel.

Due to the rebanding process, the system controllers were upgraded to the last software version available for this generation controller [Z-release]. No further upgrades within the framework of the current SMARTNET system is supported by the manufacture of the system.

Furthermore, the majority of subscribers [243 mobiles, 445 portables, 32 control stations] were replaced, as the old radios could not be reprogrammed on the new re-banded frequencies. The replacement radios would have cost the City approximately \$2.1-million in today's [list price] dollars.

The replacement radios were Motorola model XTS2500 portables and XTL2500 mobiles. This replacement places Portland in an envious position as this equipment can be flashed and reprogrammed to operate on a Project-25 system, regardless of manufacturer. This could not be done with the pre-rebanding City subscriber units.

2.2 Radio System Frequency Licensing Status

It is important that the licensing status of the City's public safety systems be kept up to date. CDCG checked the status of Portland's frequency using the Federal Communications Commission (FCC) Universal Licensing System (ULS) and the licenses for these frequencies were found to be current as listed in the table below.

Active City of Portland Call Signs
Federal Registration No: 0003673142

Call Sign	Type	Expires
WQCV566	4.9 MHz	June 6, 2015
WQIG699	4.9 MHz	February 5, 2018
WNRM972	Gen 800	March 21, 2015
WCY9509	Ship	March 26, 2019
WDE9524	Ship	July 13, 2019
WDE9667	Ship	July 25, 2019
WPMW699	Trunked System	February 26, 2014
WPIR701	UHF FXO	October 27, 2015
WPKT807	UHF FXO	July 9, 2022
WNPG314	VHF	May 9, 2014
KCA949	VHF	October 13, 2015
WQKE310	VHF	April 16, 2019
WQX259	VHF	April 16, 2022
WNPE407	VHF	April 24, 2014
KD40707	VHF MO	March 23, 2014
WQIP906	VRS	April 9, 2018
WPVJ264	VRS	July 25, 2022
WPXJ988	VRS	April 21, 2023

City of Portland, ME

Next Generation Public Safety Communications System

The 800 MHz Call sign, WPMW699, is the overall 800 MHz trunked system license. The license authorizes Portland ten [10] 800 MHz channel at three [3] sites. The Portland trunked system is actually configured for seven [7] channels. Regional Planning Committee [RPC-19] and the FCC rules requires that all licensed frequencies be utilized or turned back in for assignment to other Public Safety entities.

Please note that WQCV566 and WQIG699 are general widearea 4.9 GHz bandwidth licenses. Please note that FCC rules require that any point-to-point installation on these frequencies for longer than one year needs to be licensed as point-to-point operations; that is, treated like a traditional microwave system. This would apply to the hop between 109 Middle St. and South Portland Public Safety building.

2.3 Current Radio Configuration

Portland's trunked system architecture provides for a high degree of system reliability. The Master/Prime site, where system processors and control equipment are housed, is located at 109 Middle Street.

2.3.1 System Description

The trunked radio system is comprised of seven [7] RF channels [806/809-851/854 MHz post rebanding frequencies].

The trunked radio system permits users to communicate via virtual talkgroups rather than on specific frequencies. When a user initiates a push-to-talk [PTT], the radio system allocates a specific frequency to carry the radio traffic to all radios that have selected that specific talkgroup.

In trunking systems, one frequency serves as a control channel, coordinating talkgroup assignments between the radio infrastructure and subscriber units. The remaining frequencies are allocated for voice traffic. Since there are several radio sites in the system, all sites have a transmitter simulcast/receiver-voting function so that a large area is covered with reliable signal levels.

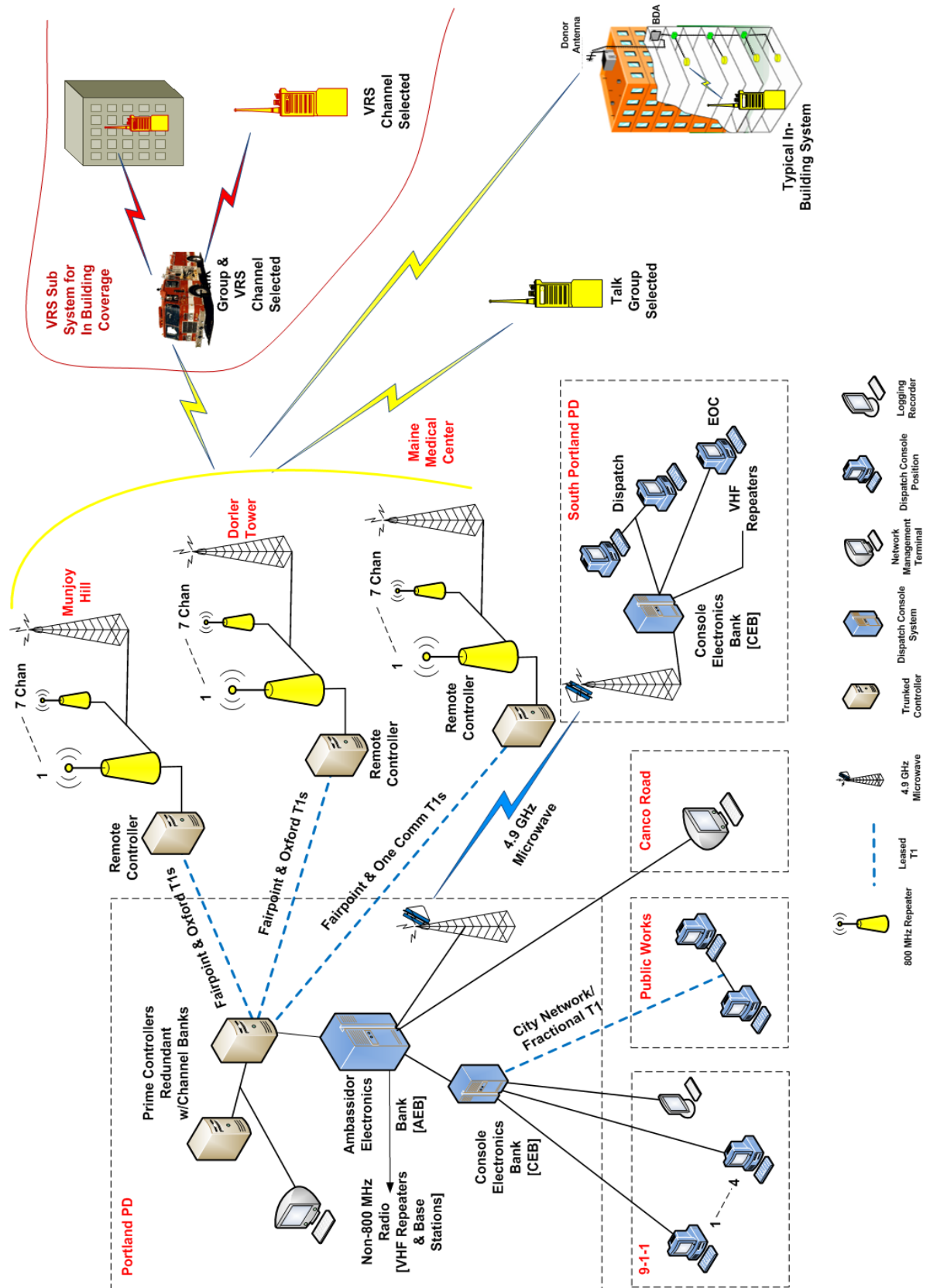
The Prime Site is where all trunked activity is coordinated and the audio is routed to the appropriate remote RF site locations and console positions. Dispatch consoles are linked through the Ambassador Electronics Banks [AEB] networked with the two [Portland & South Portland] Central Electronics Banks [CEB], which make up the dispatch console sub-system. Audio from the system is routed through the AEB/CEB arrangement and distributed to the individual dispatch consoles positions. Audio from the console operator positions follow the reverse path from the dispatcher position to the system controller and out to the base stations located at the remote tower sites, finally arriving at the individual subscriber unit as controlled by the selected talkgroup. The AEB links the two CEB for real time monitoring and control of two separate console systems.

The console sub-system includes Motorola Centracom Gold Elite communications operating positions. There are a total of 9 dispatch positions, including four [4] at PPD; two at DPS; and, three [3] at SPPD.

Connectivity links between the three RF transmitter sites and the communication console locations utilize TDM multiplexors and leased T1 circuits to provide backhaul to the master/prime controller. There is a 4.9 GHz microwave hop interconnecting the South Portland console CEB and operating positions to the Prime Site.

City of Portland, ME Next Generation Public Safety Communications System

Figure-2.1 / City of Portland Existing 800 MHz Trunked Radio Systems Diagram



City of Portland, ME

Next Generation Public Safety Communications System

2.3.2 Site Connectivity and Backhaul

Backhaul refers to communications facilities, such as Microwave Radio, Fiber, and telephone company leased circuits that connect the central system control equipment to remote radio transmitter sites that are located at various locations.

Portland's current backhaul configuration for the trunked network is leased T1 circuits from multiple service providers. These include FairPoint Communications, Oxford Networks, and One Communications. Redundant T1 circuits from two providers are utilized in a diverse routing arrangement to provide high availability. The circuits are as follows:

Munjoy to 109 Middle St:	FairPoint Communications / Oxford Networks
Dorler Site to 109 Middle St:	FairPoint Communications / Oxford Networks
Maine Medical Center to 109 Middle St:	FairPoint Communications / One Communications
South Portland to 109 Middle St:	City-owned 4.9 GHz microwave link
Portland DPS to 109 Middle St:	City fiber routed through City Hall [fractional T1]

2.3.3 Dispatch Centers

The Portland Dispatch Center is located at the PPD at 109 Middle St., and consists of 4 local dispatcher positions. There are also two [2] remote positions located at the DPS on 52 Hanover Street. Radio dispatching is performed for Portland, South Portland, and Cape Elizabeth Public Safety agencies.

South Portland has a backup Dispatch Center that can be immediately activated should the Portland Dispatch Center become unavailable. This includes two full dispatch positions capable of performing 9-1-1 call taking and radio dispatch.

2.3.4 Talk Groups

The City has 90-talkgroups currently provisioned on the system. CDCG extracted and reviewed historical system usage data from the Network Management System [NMS] database and has provided cursory analysis below. In the recent Motorola annual preventive performance checks, it was discovered that historical logging was not turned on the system. Approximately 30-days after activation, CDCG extracted usage data but not of sufficient quantity and quality to be statically within the ballpark to fully understand system capacity, busy, and overall utilization performance.

Our cursory review did show that approximately 15-talkgroups generate most of the system airtime. Of these talkgroups, two [2] talkgroups accounted for approximately 50% of total airtime. This implies many talkgroups with infrequent or no usage. Typically, initial system talkgroup provisioning is generally over designed due to no usage experience when developing talkgroups on a new trunked system. Usually, we find that when upgrading a trunked system low usage or inactive talkgroups are analyzed and assessed for removal. The City should continue to review usage statistics in order to streamline talkgroup usage on the upgraded network.

It is important to note however, that the talkgroups not used in a normal day-to-day operation does not diminish the importance of them. Significant input from field operations went into the creation of the entire talkgroup template, and radio programming. This effort should be fully vetted prior to the implementation of the new system.

City of Portland, ME

Next Generation Public Safety Communications System

2.3.5 Analog-Digital Communications Capabilities

The City's exiting system operates in the analog mode only. All subscribers utilize the analog portion of the system. However, most subscriber radios can be reprogrammed for digital system operation under the P-25 standard.

2.3.6 Encrypted Communications

Portland has limited encryption communication capability having no encrypted talkgroups. Encryption is not utilized on the infrastructure but on radios that communicate in the direct mode.

2.3.7 Hardware and Software Configuration

As mentioned, the City utilizes redundant Motorola M 6800 prime and remote site controllers. Audio processing and distribution sub-systems include DIGITAC voting comparators, universal simulcast communications interface, simulcast distribution amplifiers and Motorola TeNSr channel banks. T-bar switching is utilized transfer from one controller to the alternate controller should there be a failure of the main controller.

The 800 MHz Rebanding project upgraded the system software/firmware version to the Z-release. The Z-release is the last software version of the SMARTNET trunked system lifecycle.

2.3.8 Current Portable and Mobile Radio Equipment

A very important element in the plan of a new City communications system is an understanding of the total number, type, age, and digital migration capabilities of the mobile and portable radios used by agencies in the City.

Initial review of the Portland subscriber inventory shows that there are approximately 9-departments or agencies with approximately 1,303 subscriber units on the system.

The table below shows the exiting subscriber inventory by department for the Portland system.

		PORTLAND								SOUTH PORTLAND	
		Total	FD	PD	DPS	SCHOOLS	TRADES	PARKING	INSPECTION	FD	PD
Control Station	XTL-5000-CS	13	9		1		2	1			
Mobile	MCS-2000	123	73	49		1					
	XTL-1500	47	8		6	33					
	XTL-2500	284	40	10	209		1	6			18
	XTL-5000	8	6	2							
Portable	APX-7000	56									56
	MTS-2000	114	75	39							
	XTS-2500	658	241	214	84	1	29	23	11	49	6
Totals			452	314	300	35	32	30	11	49	80

Radio Totals		City Totals	System Total
Portland	Mobile	444	1303
	Portable	717	
	Control Sta	13	
South Portland	Mobile	18	
	Portable	111	
	Control Sta	0	

Approximately 10% of the Portland subscriber units are nearing the end of their lifecycle. These units continue to provide reliable communications for users but will require replacement in a P-25 system. The

City of Portland, ME

Next Generation Public Safety Communications System

remaining other inventory are Motorola XTL/XTS radios that are in current production. The XTL/XTS units are P-25 capable and can be used on the new system. Motorola has not yet announced end of manufacturing for these units but the “unofficial” dates are at the earliest 2014, which would then enter the five to seven year support cycle taking the City to 2019 - 2021. Motorola announces the discontinuance of a product generally one year ahead of actual discontinuance.

With reliable maintenance the life of the subscribers could possibly be extended another two to four years. The Motorola APX subscriber units will eventually replace the XTS/XTL radios.

2.3.9 NPSPAC 800 MHZ Interoperability Channels

Per FCC and NPSPAC Region-19 regulations, the five [5] NPSPAC National Interop Channels [8CALL plus four 8TACS] are installed at the Dorler and Munjoy Hill sites. The NPSPAC interoperability channels are frequencies assigned nationwide for interoperability calling and tactical purposes. These are conventional channels for outside 800 MHz users/agencies to communicate directly with Portland in a coordinated response. The use of these channels should coincide with the NPSPAC Regio-19 requirements for usage.

2.3.10 Vehicular Repeater System [VRS]

The City of Portland has a Vehicular Repeater System [VRS] integrated with the trunked radio network that is primarily used by the Fire Departments. The VRS system is used for Fireground operations when entering buildings. Special OPS channels for VRS communications are off-network; that is, they operate on a duplex 800 MHz channel that is independent from the City’s 7-channel trunked system.

The VRS system function is multifold; first, when on one of the OPS channels, transmissions from portable radios are re-broadcasted by the VRS unit at higher power level to penetrate inside buildings. Secondly, the VRS unit is interfaced with the 800 trunked mobile radio in the vehicle that has an associated OPS talkgroup selected. This allows simultaneous OPS voice transmissions on both on-network and off-network for communications and voice monitoring at the fire scene.

Lastly, when responding to Mutual Aid incidents, adjacent cities and towns typically utilize the VHF frequency band for communications. The VRS is used to provide interoperability between the two disparate systems, allowing Portland responders to continue communicating among themselves on their 800 MHz radios while the VRS provides the interface to VHF, allowing direct VHF and 800 MHz portable communications.

Under current operating conditions, the analog VRS system is limited to the use of one channel per incident. The FD requires multiple concurrent VRS operations.

2.3.11 Life Cycle

Similar to IT and computer hardware/software systems, radio systems have planned periods during which systems and components are manufactured, sold, supported and finally disposed. This results in the planned discontinuation of manufacture and support for the radio system and its components. At the time of end-of-life manufacture and support, vendors no longer guarantee that service or components will be available in the event that the system or individual components stop working.

The Portland radio system was accepted in 1999 as a Smartnet system using the Motorola 6809 processor [1980s technology]. Given the nature of this integrated system the system controller lifecycle and other individual sub-system components are on their own end-of-life cycles for support as well. RF Repeaters, dispatch consoles, and subscriber radios are all on different schedules with some of these components

City of Portland, ME

Next Generation Public Safety Communications System

currently exceeding their end of life cycles and others approaching. End-of-Life [EOL] equipment includes the Trunked Controllers, Quantar repeaters and Centracom Gold Elite Dispatch Communications Consoles.

The table below presents the life cycle end dates for ordering equipment on the current system as well as showing the end dates for system component support.

TYPICAL MOTOROLA TRUNKED SYSTEM LIFECYCLE						
STATUS OF PORTLAND SYSTEM MAJOR EQUIPMENT SUPPORT						
XTS Portable Radio				System Support Ends	6809 Controller [EOL 2006]	
XTL Mobile Radio					Quantar Repeaters [EOL 2012]	
					Voting Comparitors [EOL 2012]	
					Centracom Console [EOL 2012]	
SYSTEM & TECHNICAL SUPPORT PHASE					COMPONENT SUPPORT PHASE	
New System Deployment	S/W Release (SER); Expand Master Site	Add Voting, Simulcast Channels; Add Remote Sites; Add Console Positions	Add IR Channels	Technical Support & System Support Center; Vendor Support for System Ends	Vendor will Support System based on its "Best Efforts" as Support will Shift from "System" to " System Component" support. Component level [board] repair is based on spare part availability. Motorola has estimated a parts stockpile of 7-Years. Best Effort will be limited by availability of components.	

Note that the expiration of the Technical Support and System Support Center [SSC] marks the official end of Motorola's support of radio system equipment. Once the expiration date is reached, technical support and SSC level support are no longer available. System support beyond EOL will be offered on a "best effort" basis, meaning that the vendor will make its best effort to repair the equipment at the system level. At this point, Motorola shifts its support from system level to individual system component suppliers.

It is possible in the years subsequent to EOL that Portland could experience a decline in the availability of spare parts and the ability of Motorola to restore catastrophic system failures, as individual components reach the end of their respective support periods. Motorola support for the current system cannot be guaranteed after the system and technical support time period as expired.

However, component [board] repair service is defined as the supply of replacement parts to support component level repair. Some of the primary components of the existing system have support periods extending beyond end of life. Component level support is based primarily on the availability of spare parts. Motorola will typically support its product for 5-7-years after the expiration date for manufacturing. Large inventories of spare parts are stored to meet the estimated customer base requirement over the 7-year period. However, support during this timeframe again is "best effort"; with no guarantee that component parts will be available.

2.3.12 Maintenance

The City system is currently maintained using a hybrid approach; that is, contract with Motorola and City personnel. The radio shop supporting Motorola is 2-Way Communications Service located in Newington, NH.

City personnel monitor the overall maintenance of the system along with those subscribers from departments. This maintenance program has successfully kept the Portland system in prime working condition.

City of Portland, ME

Next Generation Public Safety Communications System

DPS has requested that when upgrading to the new P25 system, that consideration be given to obtaining a local service provider for the routine removal and installation of radios. The current service provider is too far from Portland that typically impacts DPS schedules.

3.0 USER ASSESSMENT AND NEEDS

The study team, comprised of CDCG, Portland and South Portland Public Safety personnel, was assembled in order to conduct stakeholder meetings to better understand how they operate, and how a new communications system can be used to support their operations.

Meetings were conducted with:

- Portland Police Department
- Portland Fire Department
- Portland Fire Department Electrical
- Portland IT Department
- Portland Department of Public Services
- South Portland Police Department
- South Portland Fire Department

The Study Team was asked how the existing system met their current needs, and how a new system might more fully meet their future needs. In general, the users primarily stated they are satisfied with the current trunked system operation and reliability.

Discussions were held with the Study Team with regard to all of the existing trunked system function and features used and not used. Moreover, they were offered the chance to include their “wish list” for features and options to be included in a new radio system.

Although most are satisfied with the current signal coverage that the system provides, the top item on the Fire Department list was to improve coverage inside of buildings. This was not unexpected, as firefighters need to communicate in areas of buildings that other public safety department typically do not [electrical, mechanical rooms; basements and sub-basements, etc.].

There were discussions whether to continue the use of the VRS system or to enhance the new system coverage to mitigate in-building communications.

Other topics discussed were:

- System capacity
- Potential of additional transmitter sites to improve system coverage
- Encryption capabilities to allow for the transmission of sensitive information
- Interoperability with surrounding county, state and federal agencies
- Maintain or improve the ability for departments to communicate with each other by radio

The following matrix identifies each of the Study Team response to current problems and/or future needs.

City of Portland, ME

Next Generation Public Safety Communications System

- 1 Don't Care
- 2 No Requirement, Lease Desirable
- 3 Low Requirement
- 4 High Requirement

CURRENT FEATURE/UPGRADE	Current System Capability	P25 Capability	PPD	PFD	PDPS	SPDP	SPFD	Comments
Improved overall coverage	Yes	Yes	3	4	2	2	3	System provides good overall coverage
VRS to improve in-building coverage	Yes	Yes	3	4	1	3	4	Currently utilized for signal penetration into buildings
System capacity/more frequencies	Yes	Yes	3	3	3	3	3	
Secure channels; encryption	Limited	Yes	3	2	1	3	2	Limited encryption requirement
Technology that accommodates growth	No	Yes	3	3	3	3	3	
APCO P25 Standards Based network	No	Yes	4	4	4	4	4	P25 is digital communications only
Replace current equipment	X	Yes	4	4	4	4	4	Existing system components no longer supported
Portable with man-down feature	No	Yes	1	1	1	1	1	
Alpha/numeric paging system	No		1	1	1	1	1	
Data portables	No	Yes	1	1	1	1	1	
V, U, I-TAC interoperability method	Yes	Yes	2	2	2	2	2	Currently utilized for outside agencies responding in Portland
In-building coverage	Yes	Yes	3	4	2	3	4	
Portable in-street coverage	Yes	Yes	4	4	4	4	4	
Microwave site links	Yes	Yes	1	1	1	1	1	Microwave would replace intra-system connectivity
Mixed analog/digital operation	Yes	No	1	1	1	1	1	Operates analog today; migrating to P25 digital infrastructure only
Improve local interoperability	Yes	Yes	3	4	1	3	4	Especially with Mutual Aid partners
GPS Location	No	Yes	3	3	1	3	3	Desireable; contingent on costs
Unit ID	Yes	Yes	4	4	4	4	4	
Broadband/Hi-Speed Data	No	No	3	3	3	3	3	Now using Verizon for broadband; potential Nationwide PS Broadband in the future
Text Messaging	No	Yes	1	1	1	1	1	New feature
Additional System Channels	Yes	Yes	2	2	2	2	2	Current system typical does not have buses
Reliability, Backup & Redundancy	Yes	Yes	4	4	4	4	4	Desire geo-redundant controllers
Emergency Alert	Yes	Yes	4	4	4	4	4	Current system feature
Alarm Reporting	Yes	Yes	4	4	4	4	4	Current system feature
System Usage Statistics	Yes	Yes	3	3	3	3	3	Current system feature; not utilized
Talkgroup Calls	Yes	Yes	4	4	4	4	4	Current system feature
Priority Talk Groupcall	Yes	Yes	4	4	4	4	4	Current system feature
Multiple Priority Levels	Yes	Yes	4	4	4	4	4	Current system feature
Dynamic Regroup/Storm Plan	Yes	Yes	1	1	1	1	1	Not used
Announcement Group Call	Yes	Yes	2	2	2	2	2	Not used
Systemwide Call	Yes	Yes	2	2	2	2	2	Not used
OTAP-over-the-air rekeying [encryption]	No	Yes	2	2	2	2	2	New feature
OTAR-over-the-air programming	No	Yes	3	3	3	3	3	New feature

City of Portland, ME

Next Generation Public Safety Communications System

3.1 Recommendations and Considerations

- Consider geo-redundant Prime and/or Master controllers as the existing system has co-located controllers. Geo-redundant locations would be at Portland Master/Prime site and the South Portland Public safety building. Redundant
- Install Network Management client terminals at Portland 9-1-1, Portland IT Department, and South Portland for system monitoring and provisioning of units. Access to specific modules will be via password used privilege to maintain network security.
- Common system and feature requirements to be included in the system RFP.
- Add fourth site to enhance coverage in weak areas.
- Upgrade VRS system for multiple concurrent operations.

City of Portland, ME

Next Generation Public Safety Communications System

4.0 SIGNAL COVERAGE – Existing and Proposed

Radio coverage is always a major topic in public safety communications planning, as there are several variables that influence the propagation of radio signals. As a result, no radio system can provide 100% coverage; it is impossible to actually obtain 100% area availability just as it is impossible to test every square-foot of the service area to verify coverage.

For the City of Portland's radio system, the coverage service operational area is bounded by Portland, South Portland and the five Islands.

Public Safety coverage standards strive to design systems for at least 95% availability [some chose 97%] and when tested after implementation, typically show 96%-98% availability [difference between design and actual performance, as the design includes additional signal margins to maintain signal levels to the 95%/DAQ-3.4 standard].

Delivered Audio Quality [DAQ] is an industry standard definition of audio quality that has been defined under EIA/TIA-TSB-88. This objective definition set allows scoring of audio quality regardless of the audio source, or whether it is analog or digital.

The DAQ Definitions

EIA/TIA-TSB-88 Delivered Audio Quality [DAQ]	
DAQ	Explanation
5	Speech easily understood
4.5	Speech easily understood; Infrequent noise/distortion
4	Speech easily understood; Occasional noise/distortion
3.4	<i>Speech understandable with repetition only rarely required; some noise/distortion</i>
3	Speech understandable with slight effort. Occasional repetition required due to noise/distortion
2	Understandable with considerable effort. Frequent repetition due to noise/distortion
1	Unusable. Speech present but unreadable.

Public safety systems are typically designed for a given level of coverage reliability over a defined service area, and at a defined DAQ level. The design goal typically called out for public safety operations is DAQ 3.4 over 95% of the service area; this is the recommended design goal for the City of Portland P25 radio system.

To build a system with 100% coverage availability generally means more transmitter sites; picking up the last 3% to 5% reliability means additional cost that most times do not make cost vs. benefits logical, the last 3% is typically unrealistic.

This is to not dismiss coverage as the single most important factor of a reliable communications system – it is! First Responders rely upon radio communications to support their

routine and emergency operations. Municipal public safety agencies in Portland, including law enforcement, fire protection, medical emergency response, detention, transport, natural disaster response, and other public safety provide services to the citizens of Portland. For these departments, immediate access to information is vital to their ability to protect life and property. For the Public Safety practitioner on the street, wireless mobile communications is the primary and many times the only link to information and resources during routine and emergency responses.

Radio communications is literally a lifeline, linking First Responders to back-up, assistance, and other resources that have to be available instantaneously [Mayday condition], even in the harshest of environments.

Mobile radio coverage is the type of coverage provided when using car radios. These radios are more powerful than smaller handheld portable radios. Typically, mobile radios have about 10-times the transmitter power of handheld portable radios. They also have a much better antenna that is typically mounted on the exterior of the vehicle roof

City of Portland, ME

Next Generation Public Safety Communications System

or trunk. Consequently, mobile radios provide substantially better coverage, or greater communications range. There are no mobile coverage issues in Portland.

Due to the reduced range of handheld portable because of lower power levels and an inefficient antenna configuration, portable radio coverage is more difficult to provide. Coverage inside buildings is a lot tougher to provide than on the street because the building structure blocks some of the radio's signal. Heavier buildings exhibit more signal loss than smaller buildings. The amount of loss is measured or quantified using a term called the decibel [dB]. The greater the building loss, the greater that the signal is attenuated. Furthermore, buildings that have numerous windows or extensive glass exteriors allow better in-building penetration, especially in the 800 MHz frequency band.

Portland's radio system infrastructure is extremely reliable [Failsoft mode virtually non-existent], and provides very good in-building communications. For the Fire Department, to achieve greater in-building coverage availability, the use of Vehicular Repeater Sub-System [VRS] is used to increase signal levels inside of buildings, striving for the elusive 100% goal.

4.1 Existing Coverage

Figure-1 below shows computerized modeling of existing coverage for in-street handheld portable communications.

The WHITE colored area of the map represents locations where the predicted coverage meets or exceeds the minimum coverage performance parameters used for public safety, which is 95% reliability with a Delivered Audio Quality [DAQ] of 3.4.

As discussed:

- 95% is a statistical calculation in time and location; simply stated, if the WHITE area is broken into 100 grids, then 95 of the grids will offer successful communications, implying THAT 5% or 5 of the grids fail
- DAQ-3.4 is characterized as "Speech understandable with repetition only rarely required; some noise/distortion"

Propagation loss prediction includes the use of USGS Land Use/Land Cover [LULC] dataset for Maine. There are 21 land cover types [open land, residential, urban, forest land, etc.] assigned to 30-meter square cells.

The GRAY shaded area of the map represents locations where the predicted coverage does not meet the minimum coverage performance parameters. However, it should be noted that GRAY areas do not necessarily mean there is no coverage, but show that coverage is below the design coverage criteria selected [i.e., below 95%].

The YELLOW shaded area of the map represents locations where the predictive coverage operates at threshold levels; that is, DAQ-2.0. This is where the receiver is just about to lose reception because of low signal strength. The map indicates pretty good coverage, as there are very little gray or yellow shades on the map. The City of South Portland does show more problematic areas.

Map-2, Map-3 and Map-4 represents coverage for three in-building scenarios, as follows:

Map-2: The GREEN shaded area of the map represents locations where coverage inside residential buildings is predicted. These include wood-frame homes and 2-story concrete/brick residences.

City of Portland, ME

Next Generation Public Safety Communications System

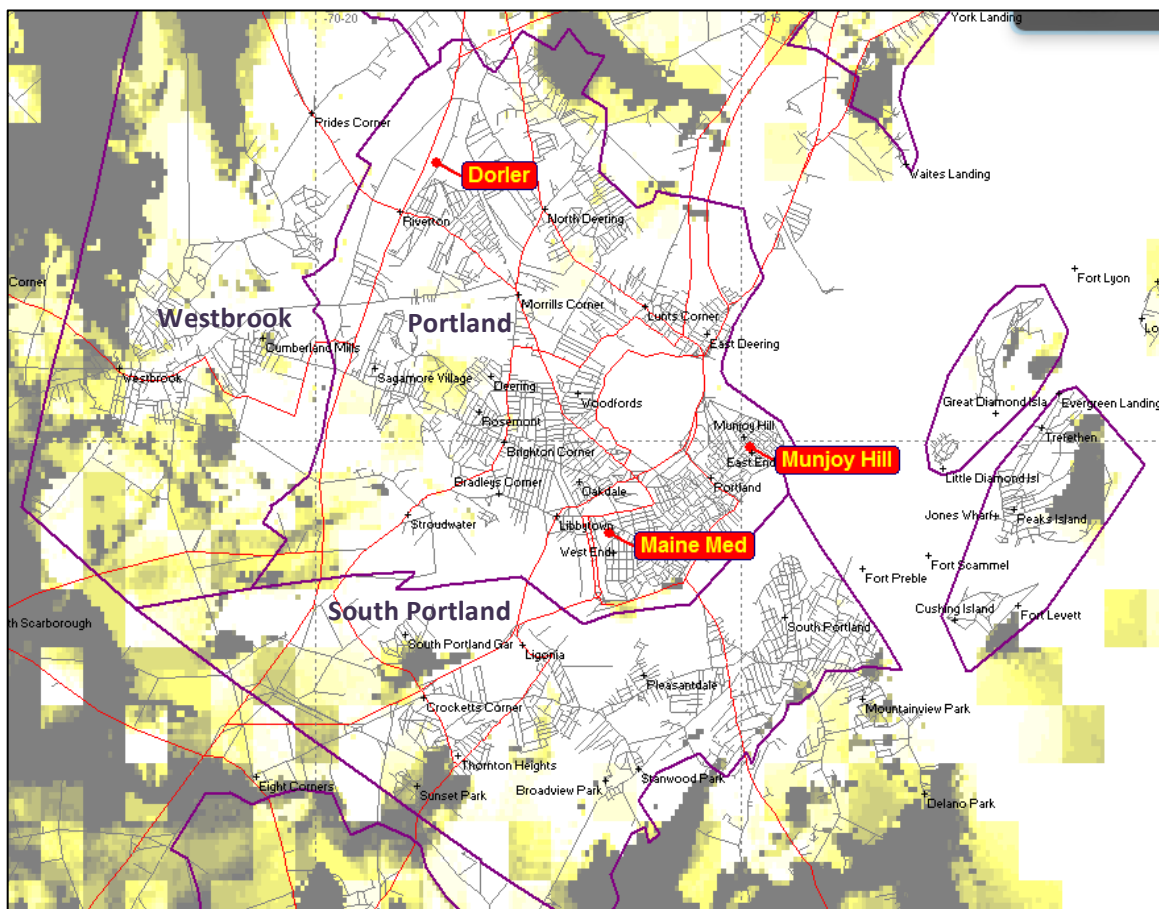
Map-3: The BLUE shaded area of the map represents locations where coverage inside small to medium buildings is predicted. These include schools, midrise office buildings [<75'], small to medium factories, city office buildings, etc.

Map-4: The ORANGE shaded area of the map represents locations where coverage inside large downtown buildings is predicted. These include concrete/steel high-rise buildings; large commercial buildings, large enclosed shopping malls; medium to large hospitals or government buildings.

General notes on building coverage:

- The closer a building is to a transmitter site, the greater the signal strength and the ability to overcome building losses
- For high rise buildings, typically floors 4 – 6 begin to have improved coverage; first and second floors [of course basements] generally have much poorer coverage
- Two identical buildings but one having many more windows will generally have much better in-building coverage as the window aperture allow signals into the building, this is especially true with 800 MHz frequencies.

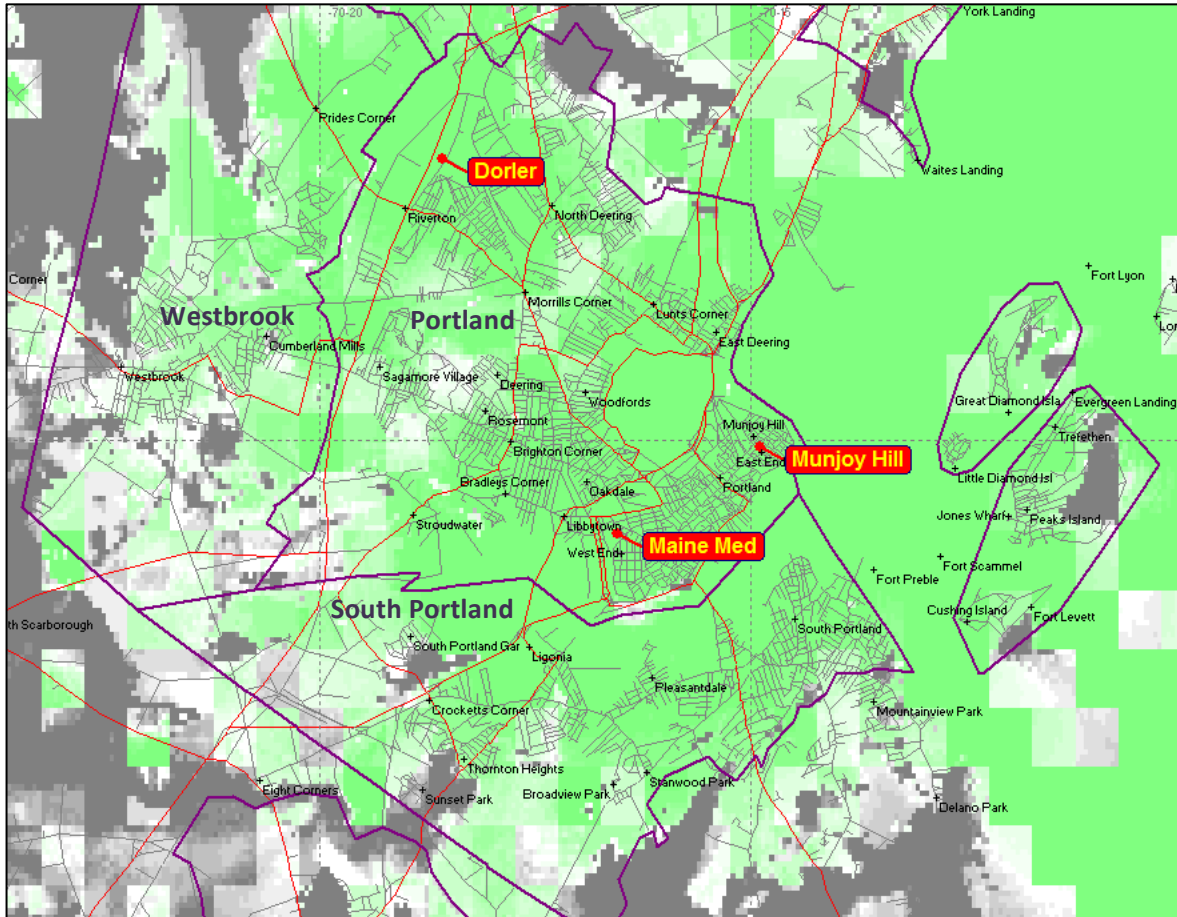
FIGURE-1
Existing In-Street Handheld Portable Communications - PREDICTED



City of Portland, ME

Next Generation Public Safety Communications System

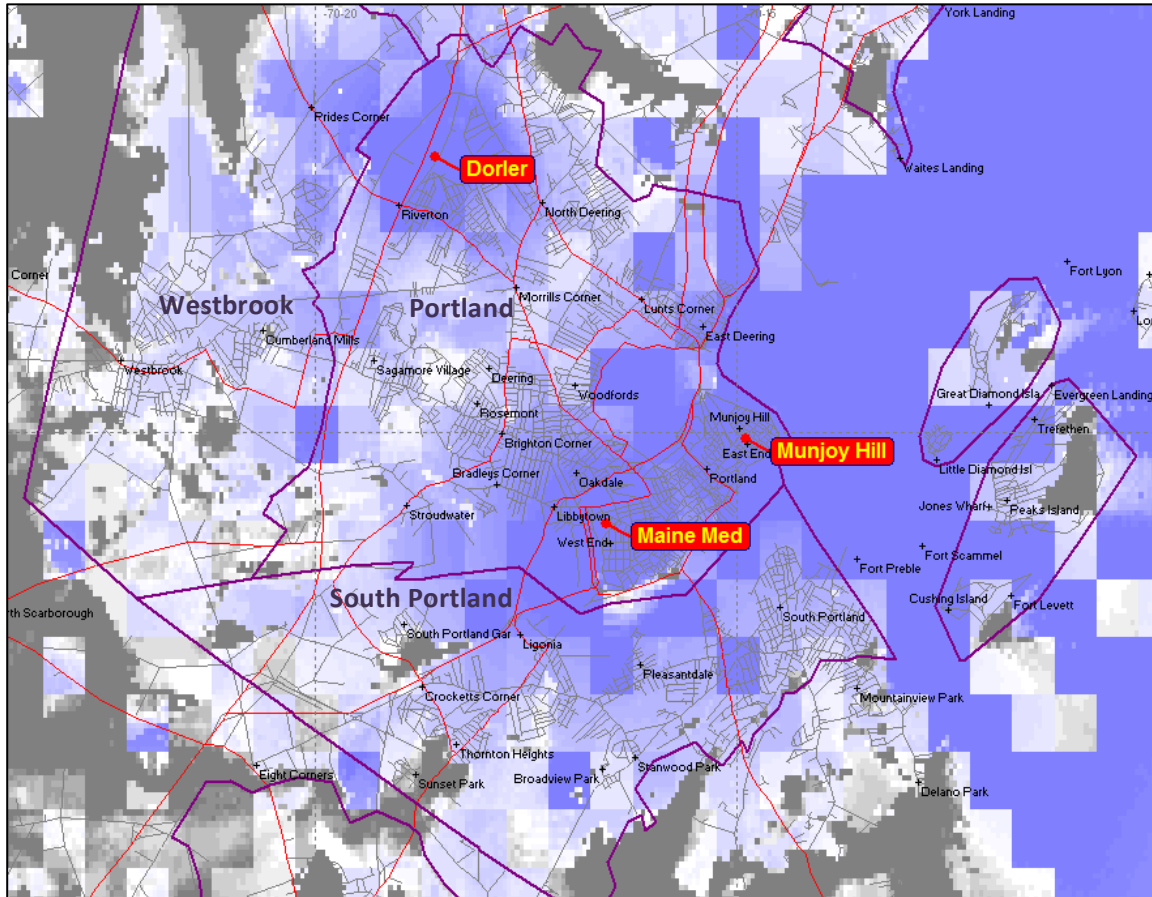
FIGURE-2
Existing Handheld Portable Communications Inside Typical Wood Frame, Concrete/Brick Residential Buildings- PREDICTED



City of Portland, ME

Next Generation Public Safety Communications System

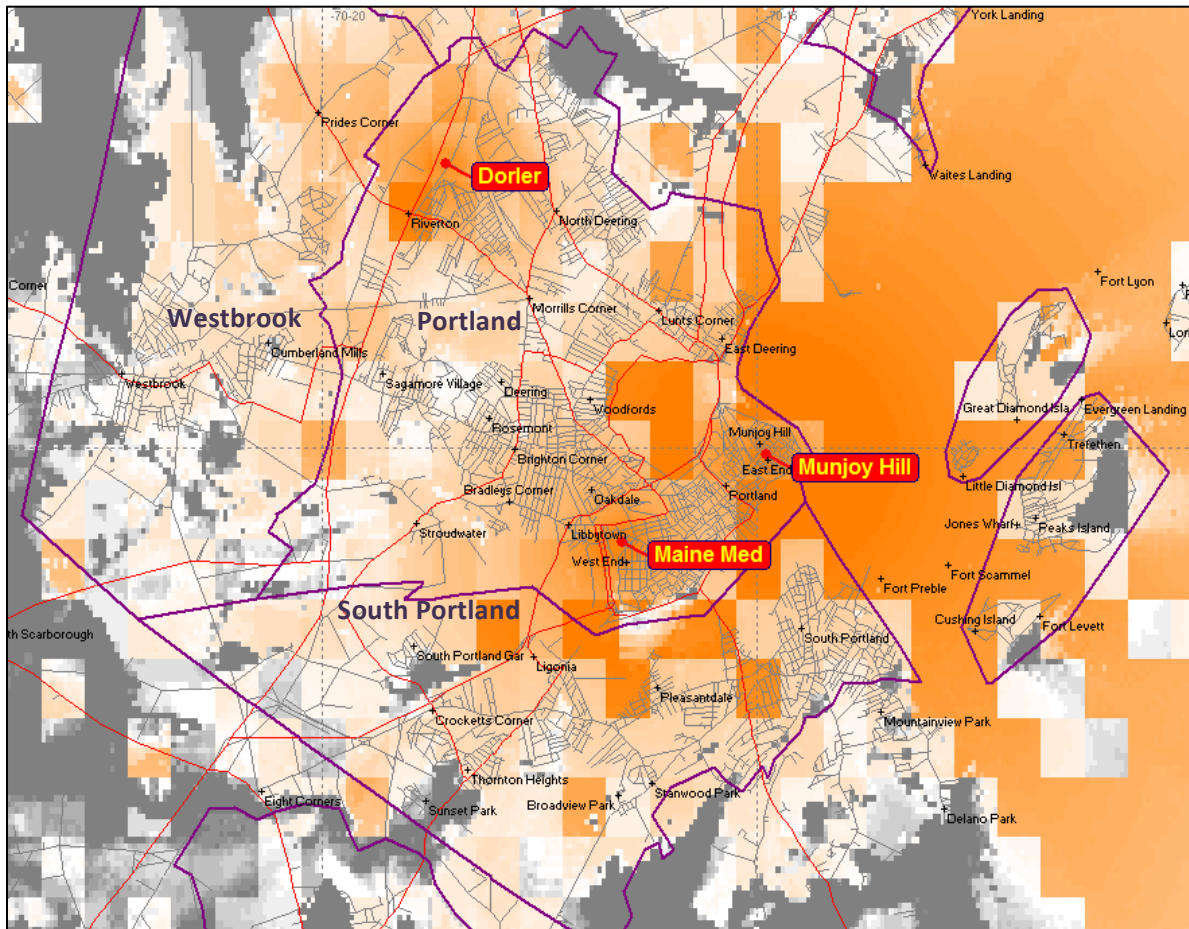
FIGURE-3
Existing Handheld Portable Communications
Inside Small to Medium Midrise Buildings- PREDICTED



City of Portland, ME

Next Generation Public Safety Communications System

FIGURE-4
Existing Handheld Portable Communications
Inside Downtown Concrete/Steel Urban Buildings- PREDICTED



City of Portland, ME

Next Generation Public Safety Communications System

4.2 Coverage Summary Analysis

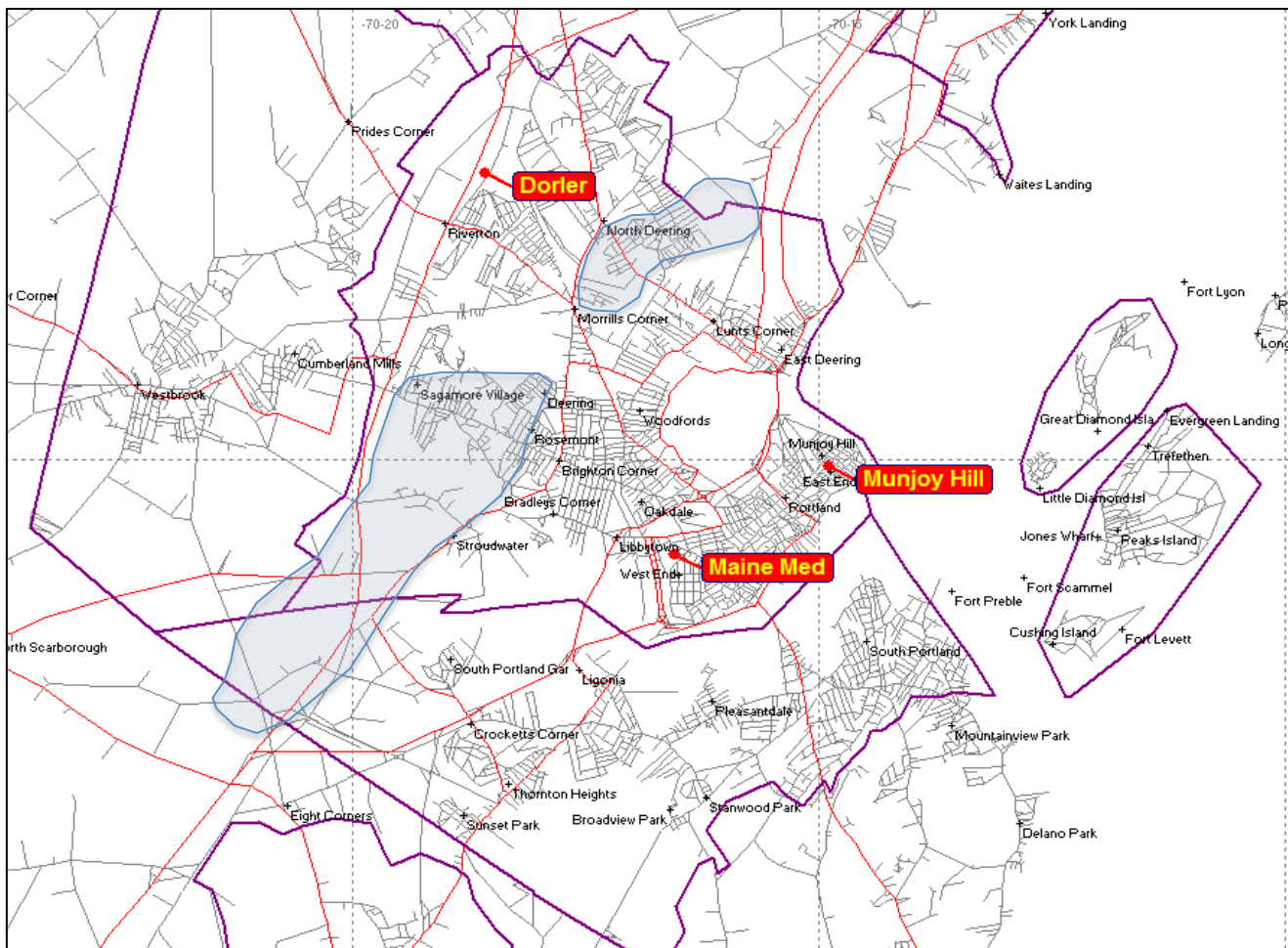
Typical radio system coverage design must consider both location and signal penetration for both outdoor areas and inside buildings. Portland has made the significant investments to assure adequate coverage for most interior locations by using the VRS sub-system.

Coverage map analysis indicate that a primary area exist where signal levels are at borderline conditions. This area begins in the western South Portland area where I95 enters; north through the airport/Maine Mall/Unum areas; north into Portland into the Stroudwater area, and up to Nasons Corners. A potential 4th site could be implemented in this area to enhance coverage.

There is a secondary weak signal area beginning at Nasons Corners, going northeast through Morrills Corner, North Deering/Allens Corner, and on to the Falmouth border.

CDCG has also conducted signal measurement testing in Portland to assist in the assessment of overall coverage both in-street and in-building. The results and analysis are provided in a separate report dedicated to coverage performance issues. The results will be translated into RFP requirements for potential system bidders.

FIGURE-5
Blue Shaded Area Represents Locations Where Weak Signals Occur from Existing System



City of Portland, ME

Next Generation Public Safety Communications System

5.0 APCO PROJECT-25 – STANDARD BASED SYSTEM

Project-25 (P-25) is a partnership between the public-safety communications community (Association of Public-Safety Communications Officials International – APCO) and industry manufacturers whose goal is the publication of a suite of standards that enable the offering, procurement, and operation of digital two-way wireless communications products and systems meeting mission-critical needs of public safety practitioners.

The formal standards development process is conducted by the Mobile and Personal Private Radio Standards Committee (TR-8 Committee) of the Telecommunications Industry Association's [TIA] Standards and Technology Department. TIA is accredited by the American National Standards Institute (ANSI) to develop voluntary industry standards for a wide variety of telecommunications products. P-25 is unique in that it is a user-driven process to develop a family of public-safety communications standards for which the requirements have been defined by state, local and, federal government users.

P-25 has gained acceptance for public-safety, security, public service, and commercial applications. P-25's Common Air Interface (CAI) is the most widely deployed P-25 interface enabling interoperability between P-25 radios and between P-25 radios and P-25 infrastructure regardless of the manufacturer.

Federal agencies, including the Federal Communications Commission and the Department of Homeland Security Office of Emergency Communications, see Project 25 as a standards-based platform that creates a competitive radio system environment. The goal of the standard is to allow system owners to have choices among vendors while maintaining system interoperability within and among systems. Many jurisdictions across the country with system needs comparable to the City of Portland have pursued competitive procurements when upgrading/replacing systems.

Project-25 is an evolving standard divided into two phases. After the release of the Project-25 Phase-1 standard, the TIA standards committee began developing requirements for the next generation of the P-25 under Phase-2.

The major differentiator between Phase-1 and Phase-2 is channel efficiency:

Phase-1 standard is FDMA:	one channel/one conversation per frequency
Phase-2 standard is TDMA	one channel/two simultaneous conversations per frequency. This essentially doubles the system capacity for a certain number of authorized frequencies.

P-25 Phase-1 and Phase-2 Overview		
P-25 Technology or Interface	P-25 Phase-1	P-25 Phase-2
Channel access	FDMA	TDMA
No. of talk paths per frequency	One	Two
Frequency Bands	VHF, UHF, 800	VHF, UHF, 700, 800
Modulation	C4FM	D-QPSK
Data rate	9.6 kbps	12.0 kbps
Vocoder	IMBE	AMBE [1/2 rate]

City of Portland, ME

Next Generation Public Safety Communications System

Backward compatible with	With analog systems	With Phase-1 systems
OTAR	Yes	Yes
Subscriber Peripheral Interface	Yes	
Data Network Interface	Yes	
Network Management System	Yes	
Telephone Interconnect Interface	Yes	
Inter Sub-System Interface [ISSI]	Yes	Yes
Console Sub-System Interface [CSSI]	Yes	Yes

There are multiple vendors that are capable of designing and installing a Project 25 compliant simulcast radio infrastructure, these include Cassidian [formerly EADS-North America], E. F. Johnson, Harris Corporation, Motorola, and Raytheon. There is also ARINC [a system integrator] where in a bid scenario would utilize one of the above vendors. The majority of systems nationwide are either Harris or Motorola.

It is anticipated that Portland will be a P25/Phase-1 system as spectrum resources are not an issue with the City. Portland is licensed for ten 800 MHz channels [one control channel and 9 talk channels]. Ten channels are sufficient for now and the future based on the loading analysis shown elsewhere in this document. If the Portland system was experiencing system busies [indicating that the ten channels are not sufficient to sustain reliable communications], then migrating to Phase-2 might be a better option as the number of talk channels essentially doubles [1 control channel and 18 talk channels for a ten channel system]. Other reasons to migrate to P25/Phase-2 is if the City was changing its operations from the 800 MHz frequency band to 700 MHz, where Phase-2 is essentially required. Moreover, most of Portland's existing subscribers [XTL/XTS] can be converted to P25/Phase-1 operation while the entire fleet would have to be replaced if converting to P25/Phase-2

6.0 CONCEPTUAL RADIO NETWORK UPGRADE SCENARIO

This section discusses the elements of the proposed upgrade to Project-25.

6.1 Proposed P25 Network Architecture

The proposed P25 Next Generation system will provide additional redundancy and reliability that goes beyond the existing 800 MHz trunked network capabilities. Furthermore, unwanted conditions experienced today by the loss of connectivity to the Master Site will no longer be an issue. For example, loss of connectivity to the Master Site forcing Failsoft mode will not occur.

The conceptual network design is comprised of a single simulcast system used to provide the required coverage and capacity. It is recommended that the new system will employ split dual Master Controllers and split dual Prime Controllers, providing a Master/Prime configuration located at two different locations. Remote sites are configured to operate on one of the prime controllers over a fault tolerant IP network that re-routes to the alternate location should the working controller fail. This approach provides redundancy against both controller failure and communications link failure.

It is recommended that the RF network consist of a single simulcast cell configured for ten [10] 800 MHz channels at 3-transmitter sites to provide reliable coverage and system capacity.

However, in order to accommodate the available budget, the primary system will include seven [7] channels at three [3] sites, with an additional three channels and one site to be available as an add-alternate.

Because there are multiple vendors offering systems that comply with the Project 25 standard, and because these standards based systems are designed to provide the levels of voice interoperability required by system users, Portland should be able to pursue a competitive procurement.

6.2 Operating Frequencies

The existing ten 800 MHz channels assigned to Portland 800MHz can be utilized for the new system.

6.3 Coverage Enhancement Recommendations

Based on the coverage analysis discussed in Section-4, our recommendation is to implement a fourth site in the primary deficient area. Preliminary assessment shows that the new tower at the South Portland Fire Sub-Station, located at 43 Crossing Drive, may be utilized. Other locations need to be vetted to assure that the optimum location is selected.

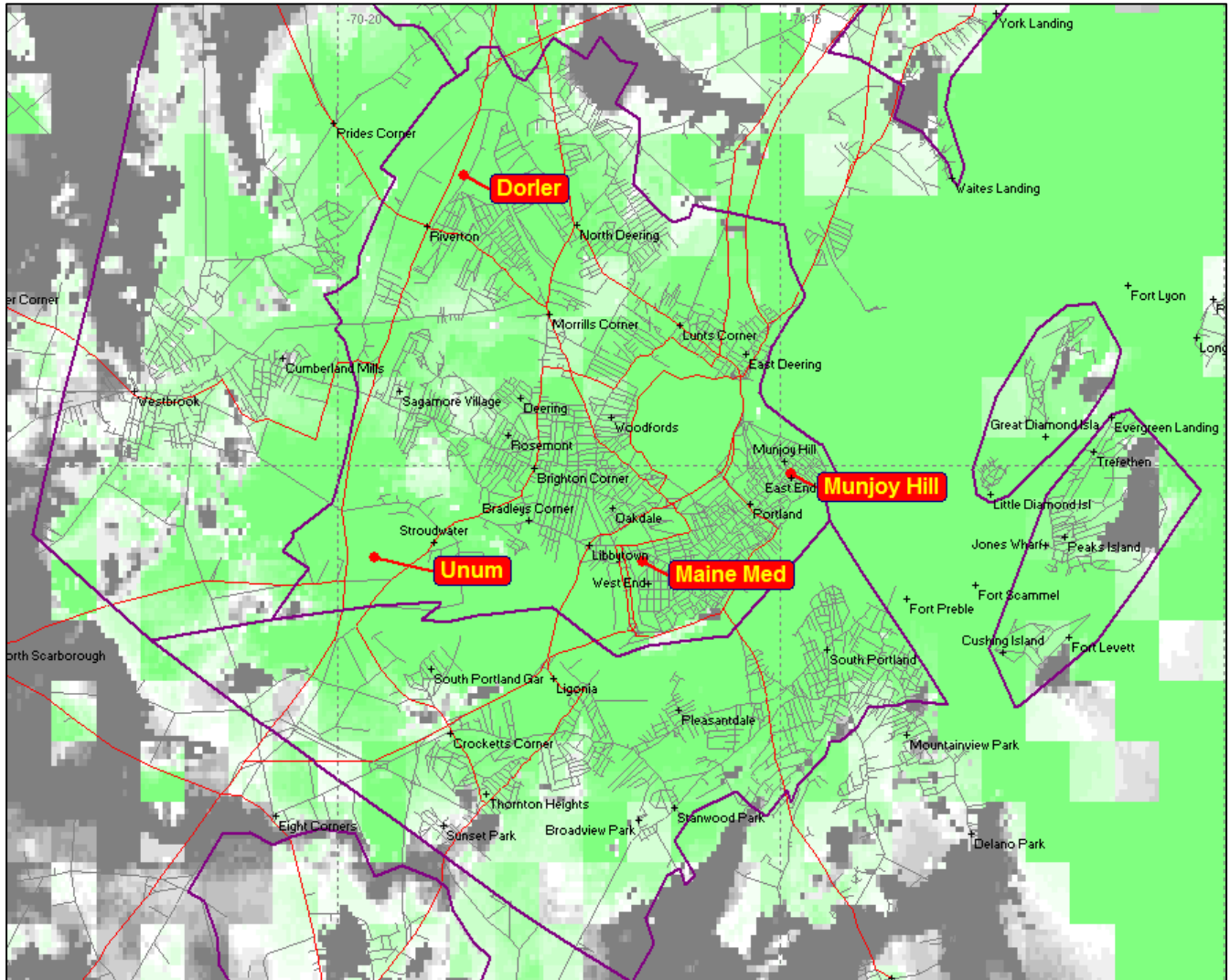
Furthermore, we anticipate the continued use of the VRS system as this sub-system provides the best overall in-building coverage solution. That is, the VRS repeater is located at the fire scene where it provides a high level of signal strength that can penetrate buildings due to the proximity of the VRS unit to the handheld portables.

Note that the final coverage analysis and selection of sites will be the responsibility of the successful vendor, as the City's RFP will be performance based. CDCG is not submitting a system design, but a conceptual framework with guidance to potential vendors to provide enhanced coverage.

City of Portland, ME

Next Generation Public Safety Communications System

FIGURE-6.1
Predicted Handheld Portable Communications Inside Typical Wood Frame, Concrete/Brick Residential Buildings with 4th Site: Unum



City of Portland, ME

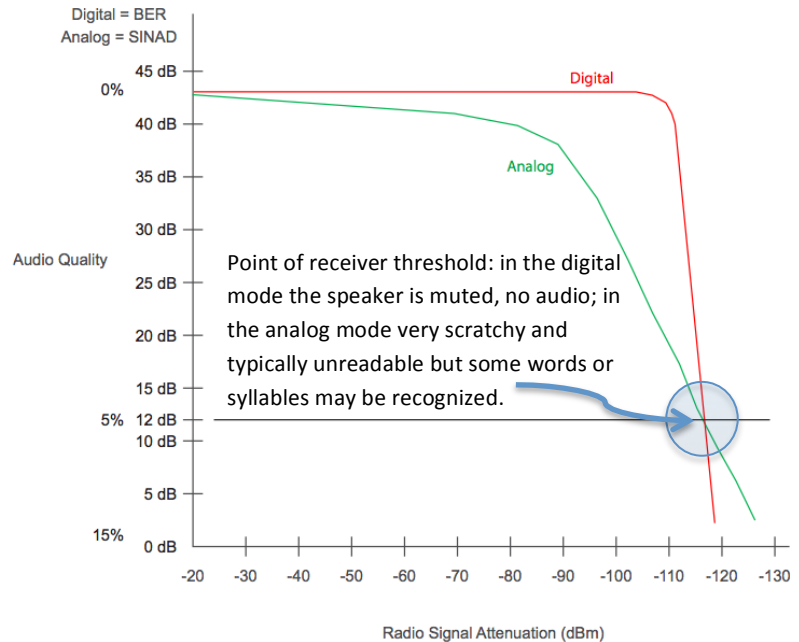
Next Generation Public Safety Communications System

6.3.1 Coverage Difference Between Analog and Digital Modulation

In signal propagation theory, a P-25 digital radio signal will allow for a “slightly” greater coverage performance when compared to its analog radio system counterpart.

With RF power output levels of an FM analog and a P25 digital transmitter being equal, it would be logical to state that digital coverage and analog coverage would be the same. In actuality, even though signal levels may be the same for an analog vs. digital system, the human ear perceives that digital coverage is better.

The signal-to-noise ratio in a subscriber unit in analog systems is heard as “squelch” noise [scratchy] integrated with voice that gets worse as the signal weakens [more noise, more disrupted audio]. In a digital system, this noise is not present since digital signals have built-in error correction, so that in weak signal areas the voice sounds “clear” compared to its analog equivalent. Therefore, in a digital system much more of the covered area sounds better and is perceived to be more usable in a digital signal. The graph above shows this phenomenon.



6.4 System Capacity

System capacity is calculated based on several factors including the number of users, number of push-to-talks [PTT], average call lengths, etc., to determine the number of channels appropriate to a given traffic load in a radio system.

The trunked system Network Management application did not have sufficient historical data to extract meaningful system traffic information. Thus, due to the limited data, CDCG’s analysis is based on empirical data typically experienced in similar trunked systems. Furthermore, the system users did not report any system busies occurring on the system.

A busy occurs when a user depresses the PTT and cannot get a channel request assignment; their radio then beeps to indicate to the user that no channel is available; however, the call is placed in queue. When a channel is free, and the system will beep the user that a channel is available and is assigned that channel to complete their communications.

Portland’s radio inventory is approximately 1,303 radios. Assume that 40% of these are active on the system, results in 521 active units. If we assume that during a normal busy hour, each radio has 1-message per hour; and each message averaging 5 PTT [push-to-talk] per hour, results in 2,605 PTT per hour. Typical average call length per PTT is 1.5 seconds.

City of Portland, ME

Next Generation Public Safety Communications System

Public Safety loading design limits call blocking to 1%. If a call is blocked, it goes into queue where there is a maximum 1-second delay [wait time] before a channel is assigned. With these parameters and using Erlang-C traffic tables, FIGURE 6.4.1 shows the number of trunked channels needed under normal and emergency events.

FIGURE 6.4.1

Table-A
Channel Loading for Worst Case Normal Busy Hour

System Loading Analysis
Worst Case Busy Hour

Calculate the number of channel required to reach desired service level

Yellow Box = User Input	
Blue Box = Output Calculations	
Incoming call rate	2605 # PTT calls per hour
Worst case busy hour	
Average call duration	1.5 seconds
Required service level	99.0% P= 0.01
Probability of system access	
Max delay	1 seconds
Traffic Intensity	1.09 Erlangs
Required Number of Channels:	4 Voice Channels
Probability a call waits	2.68%
Probability call is answered in target time	99.62%

Uses Erlang-C formula; Erlang-C assumes busy call goes in queue

Table-B
Channel Loading for Worst Case Emergency Busy Hour

System Loading Analysis
Worst Case Busy Hour

Calculate the number of channel required to reach desired service level

Yellow Box = User Input	
Blue Box = Output Calculations	
Incoming call rate	5210 # PTT calls per hour
Worst case busy hour	
Average call duration	1.5 seconds
Required service level	99.0% P= 0.01
Probability of system access	
Max delay	1 seconds
Traffic Intensity	2.17 Erlangs
Required Number of Channels:	6 Voice Channels
Probability a call waits	2.59%
Probability call is answered in target time	99.80%

Uses Erlang-C formula; Erlang-C assumes busy call goes in queue

During the normal busy hour Table-A shows that four talk channels are needed for normal day-to-day operations [actually 5-channels since a control channel is required]. Table-B assumes that traffic increases during an incident or an emergency related event. We are assuming that the traffic increases by 200% over the normal day-to-day communications. This scenario requires six talk channels [7-channels to include the control channel] for 99% availability with 1-second wait time when busy.

Since system users stated that they have never encountered system busies, we anticipate that the current 7-channel trunked system can sustain the required communications reliability. However, since the system is licensed for 10-channels, we recommend that Portland increase the new system capacity to this level to ensure reliable communications into the deep future.

6.5 Encryption

Encryption is typically an essential part of Law Enforcement communications. The City currently uses encryption on selected radio units for tactical communications. Communications are in the direct mode – portable to portable. The current infrastructure does not have encryption capabilities, as this was not economically feasible when the system

City of Portland, ME

Next Generation Public Safety Communications System

was purchased. The P25 standard can now easily support encryption on a per talkgroup basis and is no longer cost prohibited. Encryption modes include federal DES/AES encryption [P25 requirement], but some vendors have proprietary encryption protocol available on their system.

Subscribers can be encrypted on the “fly” as P25 requires OTAP [over-the-air-rekeying], where subscribers can be rekeyed by the Key Management Function [KMF] terminal at any time as the new codes are sent out via the trunked radio infrastructure. This eliminates an “encryption” meeting, where personnel meet to have their radio manually rekeyed by inserting the new code into each radio by a special key loader.

6.6 Over the Air Programming [OTAP]

OTAP will enable the City of Portland to remotely program and update subscriber units, without the need to program each subscriber radio by a technician; saving money and time, especially for mobile subscriber units. While there is ongoing work being undertaken in the P25 standards committees, P25 OTAP has not been completely standardized or implemented by the P25 Committee at this date. At this time, any solution Portland procures will be manufacturer proprietary. Also today, OTAP operates only in a manufacturer homogeneous environment.

6.7 Communications Consoles and Logging Recorders

6.7.1 Console System

Communication Consoles will be provided in the same quantity and locations as the present positions. There will be remote console positions at that DPW and South Portland console locations. The design will be an all IP design that will maximize the multiple path diversity of the networks. The consoles will be connected to and automatically switch between primary and secondary controllers and will have redundant and diverse paths to each.

In case of trunking system or link failure, the console positions will have access to backup control stations. The current backup control stations will be upgraded to P25. The existing control stations will continue to be utilized as separate consolettes and maintain independence from the primary radio system for backup capability and interoperability.

The consoles will be tightly integrated with the radio system, allowing system wide programming for alias of unit IDs as well as automatic encryption key updates from the KMF client.

6.7.2 Logging System

The new logging recorders will be provided as a dual redundant system. Each recorder will have redundant features such as hot swappable RAID drives and power supplies.

The new logging system will record all traffic in the new radio system, and will continue to record legacy radio traffic, with the extra capacity to add additional legacy channels that currently aren't separately recorded.

Depending on which vendor is selected, the loggers will also record all current telephone audio and additional lines and telephone sets that the current recorders may not have the capacity for. Note that some manufacturers require two recorders – one for telephone and one for radio.

The logging system will access both the primary and secondary radio controllers, and will directly record from the new radio system in the native IP format that the radio system uses for audio encoding. Recordings will be searchable by both time and multiple tags such as talk group, unit ID, etc.

City of Portland, ME

Next Generation Public Safety Communications System

Three playback stations will be provided, one for the 9-1-1 Communications Center, one at the Supervisor position, and one at the City of South Portland PD.

6.8 System Backhaul

The backhaul communications for the P25 Radio System project requires a fault-tolerant/redundant architecture to ensure high availability. The backhaul network must also provide appropriate Quality of Service [QoS] capabilities to pass critical radio voice communications from remote radio sites to the prime sites.

The City can continue to utilize the existing diverse routed leased T1 circuits or upgrade to Ethernet/IP circuits. The existing connectivity is currently providing the City of Portland reliable performance.

6.8.1 Backhaul Alternative – Microwave Radio

Based on bandwidth requirements to operate the Next Generation system, an alternate to existing leased T1 circuits between the radio sites is the use of microwave radio. Microwave radio is typically the connectivity of choice for many Public Safety networks as it provides sufficient bandwidth and a high degree of availability and reliability.

The conceptual design recommended for the Portland trunked system backhaul is for licensed 11-GHz, 50 – 180 Mbps radio configured in a ring arrangement. No path antenna calculations were performed but the proposed system would employ 2-ft to 3-ft parabolic antennas. Since most of the locations are rooftops, outside units were considered.

The existing hop between 109 Middle Street and South Portland PS Building can still be used in the upgraded system.

The following diagram depicts the proposed microwave route map.



City of Portland, ME

Next Generation Public Safety Communications System

There are two solutions available to the City for microwave connectivity, these are licensed and unlicensed channels.

6.8.2 Unlicensed Microwave

Public Safety has dedicated spectrum in the 4.9 GHz band for unlicensed operation. In recent time, unlicensed frequency band has become popular due to the ease of installations, lower equipment cost, and good performance. Portland currently utilizes this 4.9 GHz solution for microwave connectivity between 109 Middle St and the South Portland Public Safety building.

In 2005, the FCC set aside spectrum in the 4.9 GHz frequency band for Public Safety operations. These frequencies are not protected from interference as they are in the licensed frequency bands [6, 11, 23 GHz].

The following represents the current rules regarding frequency assignment in this band:

1. There are 18-channels available in the 4940 – 4990 MHz frequency band.
2. Multiple channels can be aggregated to increase bandwidth requirements.
3. Any Public Safety eligible can license 4.9 GHz channels online using the FCC ULS database. Applicants typically receive a license grant within a couple of days after submitting the application.
4. The license grant covers all channels within the 4.9 GHz Public Safety band and is valid for 10 years.
5. There is no time limit to place a base and temporary fixed stations authorized under a 4900 MHz band license in operation.
6. A 4.9 GHz Band License gives the licensee authority to operate on any authorized channel in this band within its licensed area of operation.
7. There is no frequency coordination process in this band.
8. There is no channel use exclusivity in this band; frequencies are shared with other licensees.
9. There is no guaranteed interference protection in this band.
10. The NPSPAC Region-19 Regional Planning Committee acts as a clearinghouse for frequencies in this band by maintaining a database of users and assisting in interference resolution.
11. Mobile “mesh” [WAN, PAN, VAN, etc.] is licensed for Primary Operation in this band.
12. Mobile operations can be extended to include temporary fixed point-to-point operations for up to one year.
13. Note that fixed operation will be authorized only on a secondary, non-interference basis to Mobile mesh.
14. After one year, point-to-point operations will require an FCC point-to-point license for each transmitter location, but the authorization is only granted on a secondary, non-interference basis to #9 above.
15. Fixed operations must be placed in operation within 18-months of the grant date.

6.8.3 Licensed Microwave

In the licensed 6, 11, and 23 GHz frequency band licensed microwave networks provide greater flexibility in availability and redundancy. Transport of voice/data over a single transmitter/receiver in a ring configuration provides loop protection; or dual transmitter/receiver in a redundant non-ring configuration for spur hops. The concept is one radio, one antenna at one time. Using space-diversity design, switching for the best signal, can increase transmission reliability.

City of Portland, ME

Next Generation Public Safety Communications System

These concepts work very well with systems employing this technology as multipath transmission are mitigated. Obstacles and reflections cause multipath. The use of adaptive modulation techniques can also be utilized to overcome this phenomenon, and path designs require strict clearances over all obstacles over the path.

Microwave paths are typically designed for transmission availability of 99.999% per year; rain/moisture do not impair transmission quality.

Licensed microwave is generally three or four times greater in cost than unlicensed microwave. Technical difference are summarized as follows:

	Legacy Microwave Public Safety and Commercial	Public Safety Microwave
Regulatory	Licensed	Unlicensed [Licensed required after 1-yr]
Frequency Band	6, 11 & 23 GHz	4.9 GHz
Transmission	Line-of-Sight	Near/Non-Line-of-Sight
Modulation	PCM/QAM	OFDM
Transmission Rates	Up to 400 Mbps	Up to 100 Mbps
Multiplexing	TDM/Ethernet/IP	TDM/Ethernet/IP
Transmission Security	Yes	Yes
Network Management	Yes	Yes
Simulcast Synching Capable	Yes	Limitation
Hot Standby	Yes	No
Ring Configuration	Yes	Limitation
Inside/outside split unit	Yes	Yes
Inside Unit Only	Yes	Yes

CDCG conducted microwave path feasibility studies for the existing sites used to link remote sites to the Master Controller. Data includes site coordinates, ground elevation, tower information, and ground elevation.

Please note the path feasibility study does not represent a final design, since physical path surveys by a microwave transmission surveyor is required for the final design. The physical path survey determines actual on-path obstructions, such as buildings, tree heights, etc., and determines the parameters for final path reliability calculations. Path obstructions, accuracy is typically within 5-ft. Path surveys also verify ground elevation, tower height, and specific installation requirements.

The selected vendor will perform physical path analysis so that engineering calculations will meet specific hardware/software offered by the vendor. For example, antenna type and size.

Computerized path studies were conducted to determine path feasibility and antenna heights based on the path geometry. The antenna centerlines are based on various K-factors [earth curvature based on atmospheric conditions] general expected during a year. Other parameters include the Fresnel Zone clearance factor [F] and a climate factor. An obstruction height of 80-ft was used. The resulting computerized path study propagation clearance criteria used was: 0.3F @ K=2/3 and 0.6F @ K=4/3.

The final path design will be based on a 2-way end-to-end availability objective of 99.999% [a/k/a “five 9s”]. With the paths being short, it may be possible to achieve “six 9 availability” All factors and design criteria data is based on industry accepted best practices models.

City of Portland, ME

Next Generation Public Safety Communications System

Path profiles are found in Appendix-A.

6.9 System Management and Maintenance

Complex technological capital assets, such as integrated mission critical radio communications networks, require considerable ongoing management and maintenance to achieve and maintain a high degree of system availability and reliability. Equipment, antennas and cabling are subject to temperature changes, weather/UV radiation, power surges, and normal wear and tear from daily usage. Many components are continuously powered until they are removed from service, sometimes up to 15 years later.

Portland is planning to give overall responsibility and oversight of the new P25 system to the IT Department.

Radio System Management and Administration is essential for ensuring a Public Safety radio system sufficiently supports the needs of its First Responders, who rely on its operation on a daily basis. In order for Portland to properly manage and administer both the legacy and Next Generation radio system, issues related to resource bandwidth and training must be addressed. To meet this requirement, a phased transition of management and administration is proposed.

As a compliment to the management and administration efforts, radio system maintenance must also be performed. Radio system maintenance includes the periodic repair, as well as the preventative maintenance of fixed infrastructure and user equipment. It also requires performing diagnostics, testing, inspecting, tuning, aligning and repair of installed equipment. Other tasks may include implementing system upgrades, monitoring system operation, and replacement of obsolete equipment, configuration management, and resolving interference problems.

As a result, a strong maintenance infrastructure is needed to support the implementation and the overall long-term maintenance of the proposed technology solution. Portland ownership and management responsibility for maintenance is necessary to provide the high level of service to its end users, including:

- Administrating network standards
- Network prioritization
- Funding
- Monitoring of capital and recurring cost
- Cost allocation for the participating department and agencies
- Administering strong maintenance program

The cornerstone to any maintenance program is the system design. The system design is related to maintenance as it lays out the foundation for system availability and reliability that the maintenance program needs to be tailored to. The design includes underlying planning and equipment that reduces the overall probability of sudden failures; and, certain systems, sub-system, and components used may allow a more efficient maintenance program, minimize future maintenance costs and optimizing reliability.

The primary goal of any strong maintenance and support program is to ensure the availability of reliable communications in extreme environmental, weather or civil disasters, or large-scale event circumstances. The maintenance strategies must be evaluated against specific performance criteria that include the following:

City of Portland, ME

Next Generation Public Safety Communications System

Recurring Costs - Maintenance program should be able to provide a comprehensive and cost effective repair and maintenance services. Maintenance costs should be clearly understood and related to the level of effort required.

Quality of Work - High quality preventative and corrective maintenance reduces the need for follow-up or continuing re-repair of equipment. Effective repair services include logging work performed and updating system documentation to reflect changes to the system configuration.

Time to Repair - Performance metrics of maintenance services typically consider the cycle time [Mean-Time-To-Repair] of the direct maintenance effort. The time to respond to a report of a problem and the travel time required to reach faulty equipment also needs to be considered in reducing overall system down time.

Geographic Coverage - Public safety radio users are spread unevenly throughout the operating region. All of these distributed users and vehicle fleets will require convenient and rapid access to maintenance facilities.

Technical Skills - Current and emerging technologies are complex and require more sophisticated maintenance than ever. Radio systems are not merely RF repeaters/base stations, but integrated computer networks with multiple points of connectivity.

System Management and Administration, as well as the transition to Portland, must be supported by the vendor. Also, system maintenance will need to be performed by a provider that has both the expert technical knowledge to support current technology and the ability to be trained to support emerging technologies in a cost effective manner.

6.9.1 System Maintenance

This report presents an approach to maintenance programs that will address the issue of new system maintenance to meet the City's goal and objectives. The approach will be tailored to meet the needs of Portland and its users, establishing a maintenance framework and program that will migrate to post warranty with strong maintenance support. The framework will include vendor technical support and spare equipment and parts program.

The following discussion provides a framework of post warranty maintenance, it somewhat mirrors what the City is doing today.

Many agencies today are taking a combined approach to maintenance; that is, some basic level of self-provided maintenance with vendors supplementing the work of internal staff.

Self-provided maintenance would utilize a depot style maintenance option, especially for subscribers. In this scenario, Portland communications staff would provide "first look" and periodic maintenance, but equipment would be sent to a vendor maintenance depot when "board level" service or more complicated repair is required. Alternatively, in some cases, the manufacturer or vendor would solely be responsible for maintenance of specific system sub-systems, or equipment.

Regardless of the maintenance approach, there should be a single entity that has general oversight responsibilities for the system. The Maintenance Program should be centered on reliability, recognizing that not all equipment is of equal importance, and that critical equipment and sub-systems need to continue to operate under various extreme operating conditions. Although the system conceptual design begins to

City of Portland, ME

Next Generation Public Safety Communications System

address these issues, the maintenance program needs to address degradation or failures that fit the design so that both personnel and financial resources are optimized for reliability. Long-term maintenance and support of Portland communications systems will require ongoing investments in addition to the initial investment in system infrastructure.

The proposed RFP will require vendors to include turnkey system warranty for one full year after final acceptance. It also requires vendors to provide quotes for annual maintenance costs for each of the first five post-warranty years. Portland will then have adequate information to make determinations as to which maintenance approach will best met its needs. This decision will require consideration of quoted annual costs versus additional staff and equipment needed for self-maintenance. Consideration of quality of service may also be an important factor. Portland can begin this planning effort in approximately the same time frame that the Contractor receives its NTP. It can be assumed that implementation through acceptance will be approximately an 8-month period plus one year of warranty service before maintenance must begin.

6.9.2 Contractor Responsibilities

The chosen Contractor will be required to prepare and submit to the City of Portland's System Manager monthly activity reports on the status of maintenance and repair problems to detect significant patterns and trends.

The Contractor shall also prepare and submit to the City of Portland's System Manager a written summary of all planned preventive maintenance activity to be undertaken each month.

6.9.3 Remote Access - Monitoring

It is recommended that the Contractor have the capability to remotely monitor, diagnose, repair/restore, and otherwise access the proposed Portland P25 system.

6.9.4 Software Maintenance

The Contractor will be responsible for all aspects of system software maintenance and system/database administration during the warranty and purchased maintenance periods within the fixed prices elements of the contract. This work shall include, without limitation, monitoring and tuning of all operating systems, network software, databases, and support of all other Contractor provided system software components. The Contractor shall also be responsible for installation of third party software patches and revisions at no additional charge to the City.

Prior to final acceptance, the Contractor will be required to provide updates to software/firmware; during the warranty period; and, any exercised maintenance period. A software licensing fee will be included to ensure the latest current software is provided. The Contractor shall notify the City when any software updates are released following system acceptance for any licensed software associated with the system. Updates should be one per year with annual software refresh included. Bug fixes cannot count as a software refresh action. The refresh under the contract must be full implementation including installation, engineering, PM and logistics. Software refresh must be a coordinated system-centric event, mitigating the risk of disparate software versions causing problems.

City of Portland, ME

Next Generation Public Safety Communications System

The Contractor shall grant to or obtain in the name of the City of Portland a perpetual, non-revocable, non-transferable, and non-exclusive license to use the Software and documentation related thereto for the City provided.

The Contractor will prepare and submit a comprehensive Maintenance Plan and Procedures Manual for the City's approval. This manual shall include, without limitation, descriptions of the Contractor's Maintenance management system, internal controls, safety practices and detailed procedures for all preventive and corrective work. Estimated task durations shall be included for each maintenance activity contained in the manual. Once approved, the Maintenance Plan and Procedures Manual shall be used by both the City and the Contractor to guide the management of all maintenance work.

6.9.5 Service Provider Qualifications

The Service Provider must be an authorized service shop for the new P25 Next Generation System. The Contractor will be required to maintain one or more properly stocked, equipped, and staffed service facilities to maintain the equipment supplied under this contract. The Contractor will be required to provide experienced personnel to execute the required maintenance tasks during the warranty and any subsequent exercised service period options. All maintenance personnel who perform maintenance on the system shall have completed all required manufacturer-approved training for that equipment and evidence thereof shall be provided to the City of Portland. During the warranty period and any subsequent maintenance options, the maintenance contractor shall have the necessary common and specialized test and repair equipment for the components and all ancillary hardware provided in this contract. The Contractor shall obtain from the manufacturer a warrant that replacement or compatible parts for all system components, not including subscriber equipment, will be available for at least fifteen [15] years after the final acceptance date.

6.10 System Transition

There are alternative routes to the path of transition from the old system to the new system. This transition must be planned and executed with care, and cannot be defined in detail prior to selection of a vendor, since each vendor has different fleet management software that will be applied to this effort.

Various concepts may be outlined at this stage of the conceptual design effort. However, the following overview describes a possible approach.

The transition goal is to have a seamless cutover from the old system to the new system without disrupting service to its users.

Transition deployment of a P25 system (all of these steps are performed after vendor selection and equipment purchase):

- a. Upgrade subscriber fleet as required to ensure P25 operation.
- b. Develop the overall system fleet talkgroup plan for the new system.
- c. Program subscriber fleet for operation on both the new and old system, as required.
- d. Deploy the new portable radios and begin installation of the new mobile radios.
- e. Construct and test the new P25 system on five [5] of the ten [10] 800 MHz channels.
- f. Configure and test interconnection between the old and the new systems.

City of Portland, ME

Next Generation Public Safety Communications System

- g. Begin transitioning DPW operations to the new system.
- h. Coordinate a phased transition of the 800 MHz channels from the old system to the new system to maintain the Quality-of-Service [QOS] on both systems as the users transition.
- i. Verify the new system stability with DPW users on the system.

6.11 Training

Proper training is critical to the efficient and effective operation of a new communications system. Appropriate training for management, maintenance and end users alleviates many problems, both real and perceived. CDCG recommends that upon completion of the work and prior to system acceptance by the City, that factory representatives of the manufacturers shall provide instruction to the operating personnel who have responsibility for all systems. Training shall consist of operational, diagnostics, maintenance and logistics support procedures. The amount of training shall be defined during the project design phase. Where equipment is part of a system, the training sessions shall identify how the equipment interacts with the system as a whole. The fully developed Master Training Program Development and Management Plan shall be submitted to the City for approval at least 30-days before operational implementation of the system and prior to the system's acceptance testing and commissioning.

6.11.1 Recommended Minimum Training Courses

- APCO P25 System Technology Overview
- System Management Training
- Subscriber Equipment Operator Training [Train-the-Trainer]
- Console Equipment Operator & Supervisor Training
- Maintenance Training for Portland Technicians
- KMF Administration/Crypto-Officer Training

6.12 National Public Safety Broadband Network

After several years of advocacy, discussion, and planning by the Public Safety community, a nationwide Public Safety broadband network has become reality.

Congress passed The Middle Class Tax Relief and Job Creation Act of 2012 and created the First Responder Network Authority [FirstNet] as an independent authority within National Telecommunications & Information Administration [NTIA], to provide emergency responders with the first high-speed, nationwide network dedicated to public safety – the National Public Safety Broadband Network [NPSBN].

Congress also provided \$7-billion to implement the system. \$2-billion has been secured and the remaining 5-billion is anticipated to be raised by spectrum auctions. Current cost estimates to build the nationwide network way exceeds what has been allocated. Estimates range from \$12 to \$20-billion.

The NPSBN fulfills a fundamental need of the public safety and recommendations by the 9/11 Report written by the Congressional 9/11 Commission. FirstNet will require an unprecedented level of public-private partnership, collaboration and shared commitment to successfully build this nationwide network.

Using 700 MHz spectrum [a/k/a/ D-Block] re-assigned from commercial auction to public safety by Congress, FirstNet will provide a single platform for daily public safety communications. When natural disasters or other emergencies occur anywhere in the country, FirstNet will allow local, state, regional and national emergency responders to communicate at the direction of the incident commander.

City of Portland, ME

Next Generation Public Safety Communications System

NPSBN Operations will occur on 20 MHz of bandwidth in the lower 700 MHz frequency band. This band lies between the public safety 700/800 MHz narrowband allocations and Verizon. AT&T is in the upper 700 MHz frequency band. This broadband network will be fully interoperable on a nationwide basis to provide public safety with an IP based high capacity data, video, and GPS network, similar to what the public currently experience with commercial 4G networks, smartphones, and a myriad of end user apps.

NPSBN will bring public safety communications into the 21st century. It will be planned and controlled by public safety and not commercial wireless operators. The technology selected is Long Term Evolution [LTE] that both Verizon and AT&T are currently using for their 4G/LTE networks. Although using the same technology and equipment, the NPSBN will be more secure and hardened as compared to their commercial 4G “cousins”.

Note that 1G, 2G, 3G commercial network were designed for voice first with data added, while LTE was designed for broadband data services first; voice, using Voice-over-LTE [VoLTE], will be an add-on in the future that has not yet been defined.

In the long term, a NPSBN LTE system could potentially enable public safety to consolidate networks into a single, integrated wireless network for voice, broadband data, NG9-1-1, etc. allowing end user agencies to purchase smaller, less expensive end user devices.

However LTE, whether private or commercially-owned, does not currently meet requirements for mission-critical voice communications, as defined by the National Public Safety Telecommunications Council [NPSTC], the U.S. Department of Homeland Security Office of Emergency Communications [DHS OEC], and others.

No one knows when it will be available as technical standards and manufacturers have not yet developed end user devices nor have they been evaluated and endorsed by public safety. Public safety must fully vet and examine all aspects of the proposed NPSBN, including technology capability, standardization, degree of coverage and operational capabilities, and tested in the stressed public-safety environment.

Until this occurs, an LTE system will not be a viable replacement for existing public safety Land Mobile Radio [LMR] systems. LMR systems are currently being used by public safety for mission critical voice communications. These systems include conventional and trunked radio system in the VHF, UHF and 700/800 of the FCC Part-90 Rules & Regulations.

For the foreseeable future, the broadband network will offer public safety new tools to help accomplish their mission; and, for many years, will supplement, NOT REPLACE, their public-safety LMR systems.

NPSTC, together with the APCO Broadband Committee, and others, have examined this issue extensively. On April 15, 2013, NPSTC issued a paper titled “Why can’t public safety just use cell phones and smart phones for their mission critical voice communications?” The paper is primarily addressed to public safety officials and concludes: “public safety officials are urged to not abandon or stop funding their public-safety voice LMR systems until such time as it can be demonstrated that broadband can safely and adequately provide public safety with the mission-critical requirements currently provided by LMR.”

There are several key elements of LMR systems that are not currently addressed in LTE standards or networks, they include the following mission critical elements:

Direct or Talk Around: This mode of communications provides public safety with the ability to communicate unit-to-unit when out of range of a wireless network OR when working in a confined area where direct unit- to-unit communications is required.

City of Portland, ME

Next Generation Public Safety Communications System

Push-to-Talk [PTT]: This is the standard form of public safety voice communications today – the speaker pushes a button on the radio and transmits the voice message to other units. When they are done speaking they release the Push-to-Talk switch and return to the listen mode of operation.

Full Duplex Voice Systems: This form of voice communications mimics that in use today on cellular or commercial wireless networks where the networks are interconnected to the Public Switched Telephone Network [PSTN].

Group Call: This method of voice communications provides communications from one-to-many members of a group and is of vital importance to the public safety community.

User Identification: This provides the ability for a user to identify who is speaking at any given time and could be equated to caller ID available on most commercial cellular systems today.

Emergency Alerting: This indicates that a user has encountered a life- threatening condition and requires access to the system immediately and is, therefore, given the highest level or priority.

Audio Quality: This is a vital ingredient for mission critical voice. The listener **MUST** be able to understand without repetition, and can identify the speaker; can detect stress in a speaker's voice; and, be able to hear background sounds as well without interfering with the prime voice communications.

LTE does not currently meet several of these requirements [talk around, push-to-talk, group call, emergency alerting, and audio quality]; there is no timeframe where these function and features will be available.

6.13 Estimated Budgetary Costs

The following estimated budgetary costs are based on a conceptual level. CDCG believes these estimated costs are realistic in 2013 dollars; however, they are subject to change, based on final design criteria selected by the City of Portland.

The projected cost is not based on any specific vendor offering, but on the best industry available average estimates. Actual cost resulting from the final design, the competitive bid process, and vendor discounts may differ.

Cost estimates include engineering, integration, installation project management, and training services.

City of Portland, ME
Next Generation Public Safety Communications System

A - Portland Radio System - Upgrade Costs

		Estimated Expenditures
Item		Estimate
Note:		
REPLACEMENT OF EXISTING SYSTEM ONLY – LIST PRICE		
1	3-site simulcast system; 7-channels	\$2,541,000
2	Communications Console – 9-positions	\$405,000
3	Logging Recorder	\$120,000
4	Installation	\$1,073,100
5	Project Management	\$613,200
6	Engineering	\$306,600
7	Training	\$61,320
8	Factory staging and tests	\$91,980
9	Replacement Mobiles [123 each]	\$442,800
10	Replacement Portables [114 each]	\$638,400
11	Upgrade existing subscribers [1,065 each]	\$426,000
TOTAL CAPITAL COST - LIST PRICE		\$6,719,400

System Costs with Applied Discounts

Typical vendor discounts vary 15% to 20%, depending on equipment bid. Furthermore, vendors offer additional "incentive" discounts should contracts be signed by a vendor specified date.

10%	\$6,047,460.0
20%	\$5,375,520.0
30%	\$4,703,580.0

City of Portland, ME

Next Generation Public Safety Communications System

B - Portland Radio System - Optional Feature Costs

		Estimated Expenditures	
Item		Estimate	
1	Add Dual Master & Prime Site [geo separated]	\$1,198,500	
1a	Installation, PM, Engineering, Staging	\$838,950	\$2,037,450
2	Add GPS Location Server/Client/Software	\$400,000	
2a	Installation, PM, Engineering, Staging	\$280,000	\$680,000
3	Increase from 7 channels to 10 channels	\$229,500	
3a	Installation, PM, Engineering, Staging	\$160,650	\$390,150
4	Add Microwave Radio Connectivity & Multiplex	\$136,500	
4a	Installation, PM, Engineering, Staging	\$58,500	\$195,000
5	Add 4TH site	\$320,000	
5A	Installation, PM, Engineering, Staging	\$224,000	\$544,000
TOTAL CAPITAL COST - LIST PRICE			\$3,846,600

System Costs with Applied Discounts

Typical vendor discounts vary 15% to 20%, depending on equipment bid. Furthermore, vendors offer additional "incentive" discounts should contracts be signed by a vendor specified date.

10%	\$3,461,940.0
20%	\$3,077,280.0
30%	\$2,692,620.0

C - Portland Radio System – Recurring Costs

		Estimated Expenditures
Item		Estimate
1	Leased T1 circuits [assumes \$550/line/month]	\$39,600.00
2	Motorola maintenance contract	
TOTAL RECURRING COST - PER YEAR		\$39,600.00

City of Portland, ME
Next Generation Public Safety Communications System

6.13.1 Cost Summary

TOTAL SYSTEM COST – BASELINE PLUS ALL OPTIONS: \$8,452,800.00
ASSUMES 20% DISCOUNT LEVEL

7.0 NEXT STEPS

This Report helped determine functional and performance requirements to upgrade the legacy trunked radio system to a next generation Project-25 network. The City of Portland Public Safety Radio Planners should discuss and assess the contents of this report, to determine their final requirements and to resolve funding concerns. Once the project has been approved, the City will be prepared to address the next steps in procuring the replacement system.

7.1.1 Conceptual System Design

The next phase is to finalize the system conceptual design step, develop detailed specifications and documentation in coordination with the user agencies to further identify the system requirements. The specifications will be functionality focused, not product focused, and typically will not require the identification of specific hardware or software components, instead requiring that the system's components deliver some well-defined standard of performance. The City will define the system requirements to be used by the bidders to develop the conceptual/functional design of the new system.

These specifications and related documentation will be reviewed with the system stakeholders to ensure that the City's requirements are fully addressed. Once the documents have been approved, they will be released to the vendor community per Portland bid process.

At this time, the City should also designate an Implementation Support Team that will work closely with the selected vendor and the user departments to help ensure that the user requirements are addressed.

7.1.2 Release Procurement Documents

Procurement documents will be finalized and a Request for Proposals [RFP] will be released to the vendor community. Vendors are typically allowed 45 to 60 days to develop and submit a system design that will meet or exceed the requirements identified in the specification documents. These documents will be distributed in hard copy and electronically.

A Pre-Proposal Conference will be held, allowing all vendors the opportunity to visit the City of Portland radio sites in a controlled manner. Vendors typically submit questions, and the answers would be shared with all who have received the proposal documents.

These procedures will be tailored to meet the City's contracting requirements.

7.1.3 Review Proposals

Based on attendance at the Pre-Proposal Conference, the City will be able to judge if the RFP will draw multiple proposals. Vendors will typically be aware that multiple competitors are vying for the same business. We anticipate that this competition will exert downward pressure on vendor pricing. Each vendor will work to develop its proposal and will be required to

City of Portland, ME

Next Generation Public Safety Communications System

submit its proposal in accordance with Portland's bid practices.

Once proposals are submitted, the City's Technical Evaluation Committee, will review the competing proposals and grade them based upon a mutually agreed upon set of criteria.

Depending on the number of proposals received and/or the range of the proposal grades a short list of two [or three] vendors may be selected. These vendors may then be invited to prepare and present a detailed presentation of their offers.

In jurisdictions where radio vendors need to compete for contract award, recent experience has shown that procurement prices may be discounted by as much as 20 percent to 25 percent when compared to a noncompetitive procurement.

7.1.4 Negotiate with Vendors

Once a short list of vendors has been identified, Portland can select one or more companies with which to negotiate. While conducting negotiations with more than one company can be more time consuming, it can also result in the City realizing additional value as the vendors continue to compete through the negotiation process. Once the negotiations are completed, the project moves to the Selection phase.

7.1.5 Select Vendor

Selection does not imply completion, it merely implies that one vendor has risen above the others through the competitive process and that its proposal has been selected. Following selection, the vendor and the City will finalize the contract.

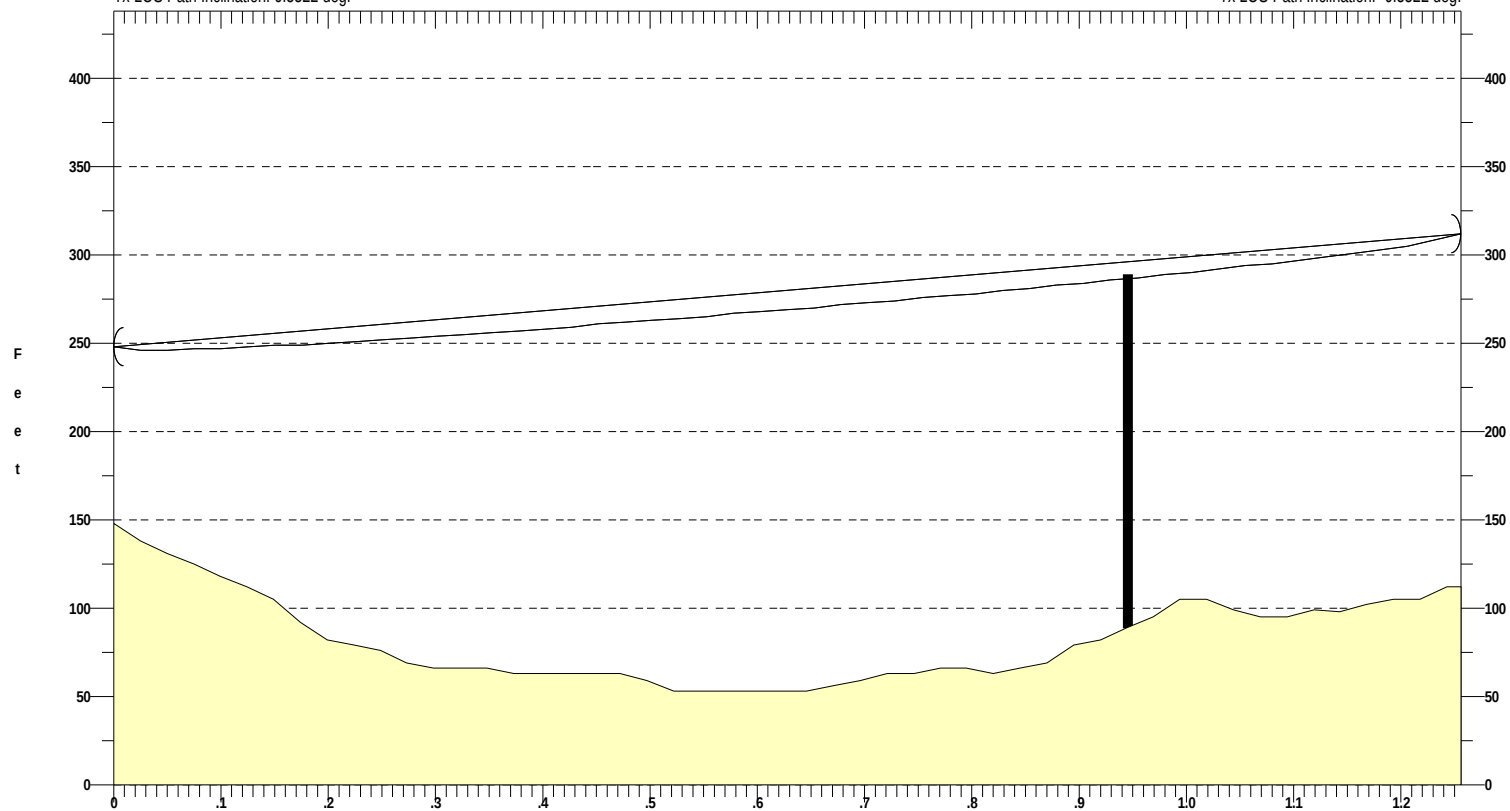
The vendor and the Implementation Support Team will meet to analyze the system design as defined by the contract, and will work through a formal contract design review process which results in a final system design that the vendor is contractually obligated to build.

8.0 APPENDIX-A – Microwave Path Profiles

Path Distance: 1.256 mi.

Tx LOS Path Inclination: 0.5522 deg.

Tx LOS Path Inclination: -0.5522 deg.



Munjoy 43° 39' 56.30" N
070° 14' 53.20" W
Elevation 147.6 ft.
Ant. AGL - Tx/Rx/Div 100.0/100.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 227.791 deg T

Maine Med 43° 39' 12.30" N
070° 16' 00.00" W
Elevation 111.6 ft.
Ant. AGL - Tx/Rx/Div 200.0/200.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 047.778 deg T

KEY:

Profile

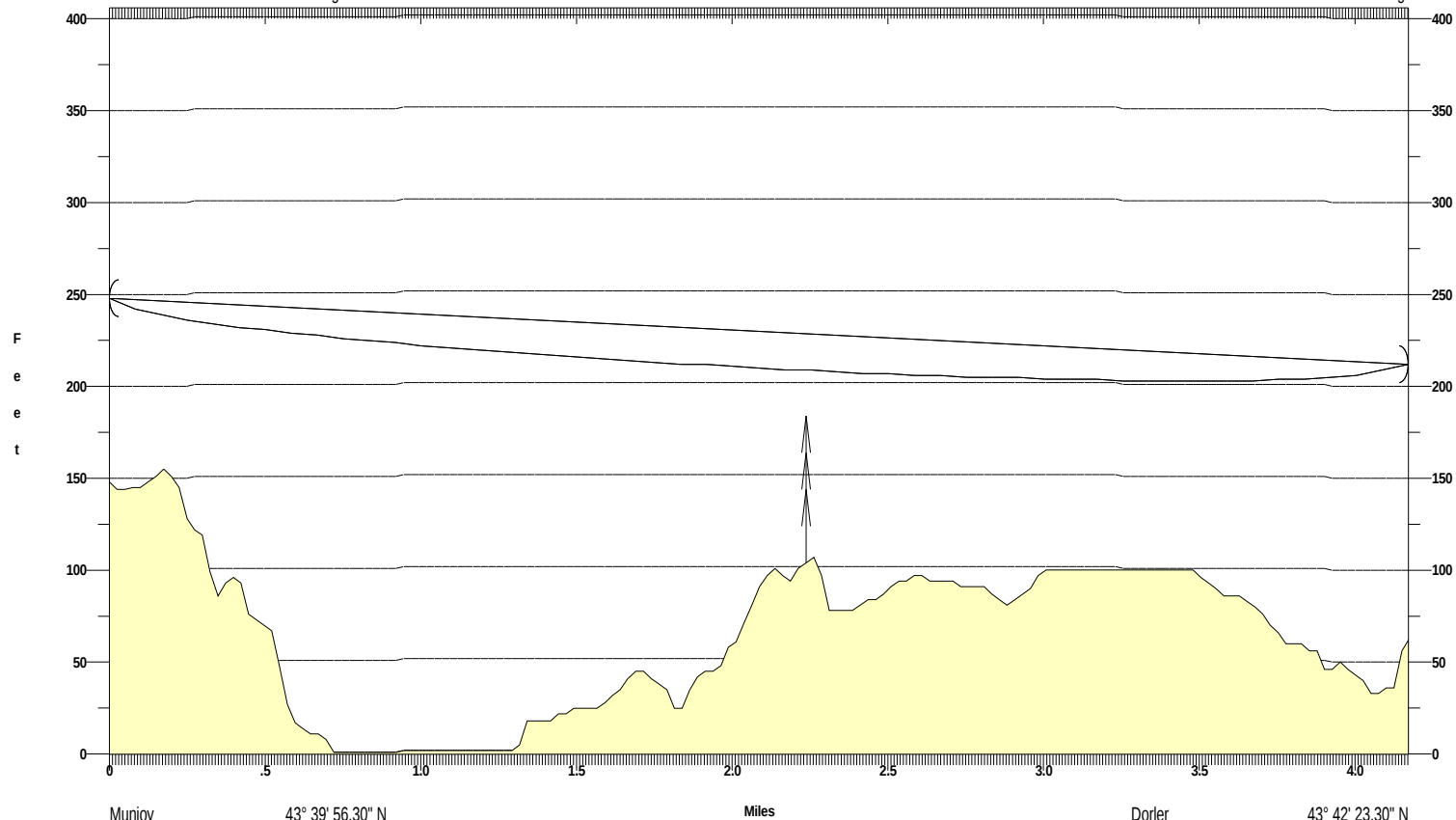
K = 4/3

K = 4/3, F = 0.6°F1

Path Distance: 4.172 mi.

Tx LOS Path Inclination: -0.0918 deg.

Tx LOS Path Inclination: 0.0918 deg.



Munjoy 43° 39' 56.30" N
070° 14' 53.20" W
Elevation 147.6 ft.
Ant. AGL - Tx/Rx/Div 100.0/100.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 312.528 deg T

Dorler 43° 42' 23.30" N
070° 18' 34.20" W
Elevation 62.3 ft.
Ant. AGL - Tx/Rx/Div 150.0/150.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 132.486 deg T

KEY:

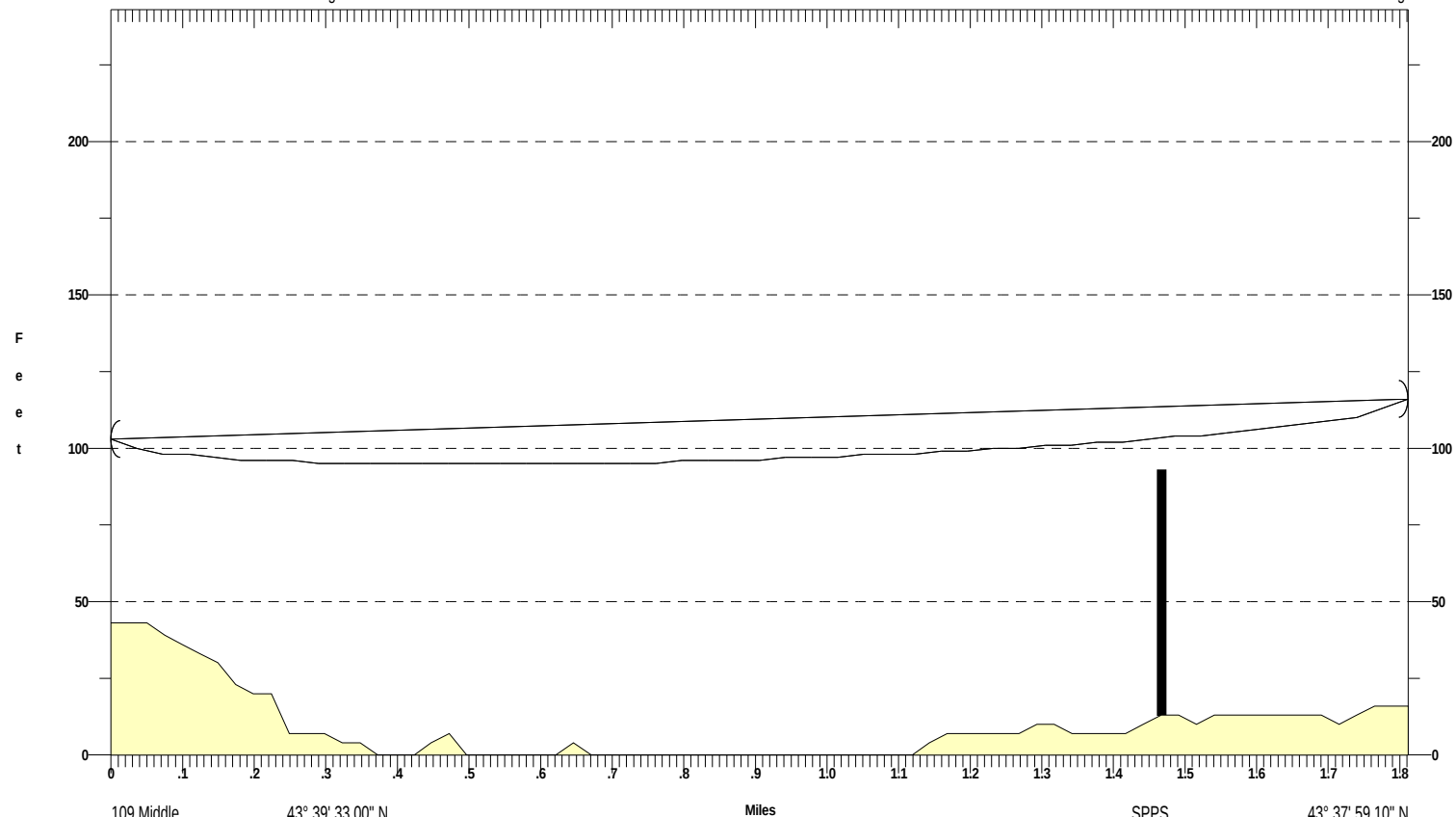
Profile

K = 4/3

K = 4/3, F = 0.6*F1

Path Distance: 1.812 mi.
Tx LOS Path Inclination: 0.0824 deg.

Tx LOS Path Inclination: -0.0824 deg.



109 Middle 43° 39' 33.00" N
 070° 15' 08.90" W
Elevation 42.7 ft.
Ant. AGL - Tx/Rx/Div 60.0/60.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 186.312 deg T

SPPS 43° 37' 59.10" N
 070° 15' 23.20" W
Elevation 16.4 ft.
Ant. AGL - Tx/Rx/Div 100.0/100.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 006.309 deg T

KEY:

Profile

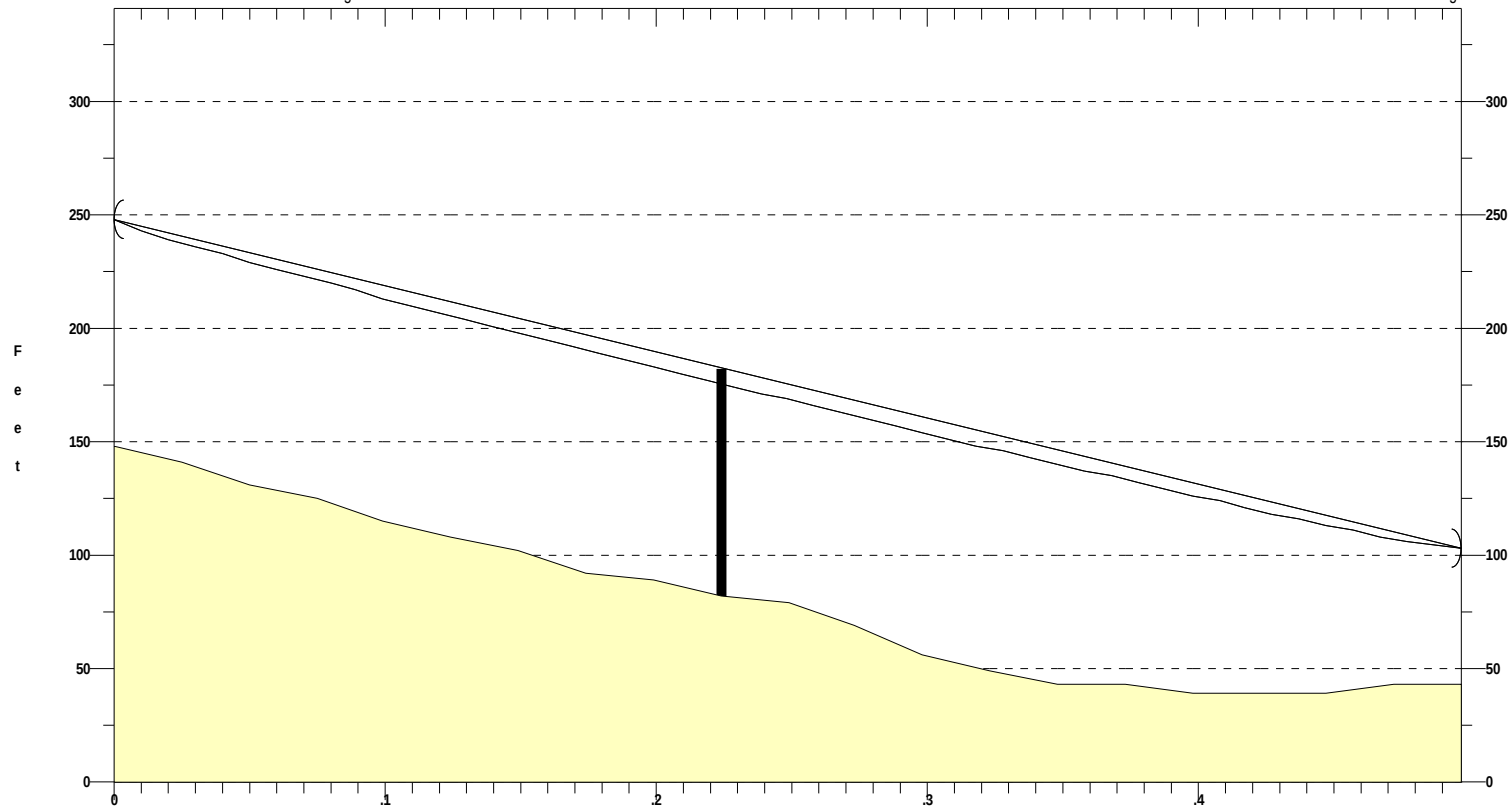
K = 4/3

K = 4/3, F = 0.6°F1

Path Distance: 0.497 mi.

Tx LOS Path Inclination: -3.1598 deg.

Tx LOS Path Inclination: 3.1598 deg.



Munjoy 43° 39' 56.30" N
070° 14' 53.20" W
Elevation 147.6 ft.
Ant. AGL - Tx/Rx/Div 100.0/100.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 206.069 deg T

109 Middle 43° 39' 33.00" N
070° 15' 08.90" W
Elevation 42.7 ft.
Ant. AGL - Tx/Rx/Div 60.0/60.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 026.066 deg T

KEY:

Profile

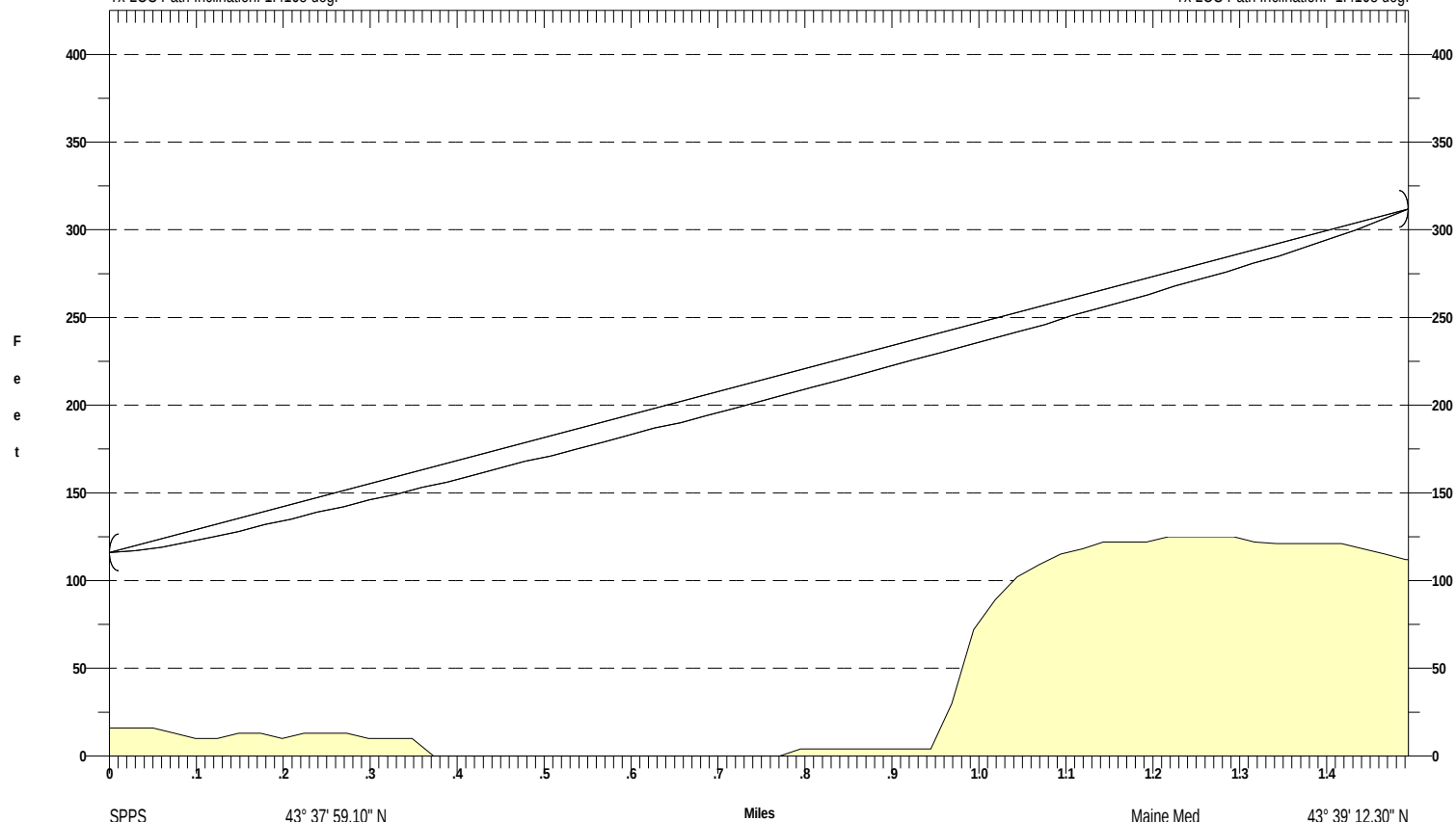
$K = 4/3$

$K = 4/3, F = 0.6 \cdot F1$

Path Distance: 1.494 mi.

Tx LOS Path Inclination: 1.4168 deg.

Tx LOS Path Inclination: -1.4168 deg.



SPPS 43° 37' 59.10" N
070° 15' 23.20" W
Elevation 16.4 ft.
Ant. AGL - Tx/Rx/Div 100.0/100.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 339.946 deg T

Maine Med 43° 39' 12.30" N
070° 16' 00.00" W
Elevation 111.6 ft.
Ant. AGL - Tx/Rx/Div 200.0/200.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 159.939 deg T

KEY:

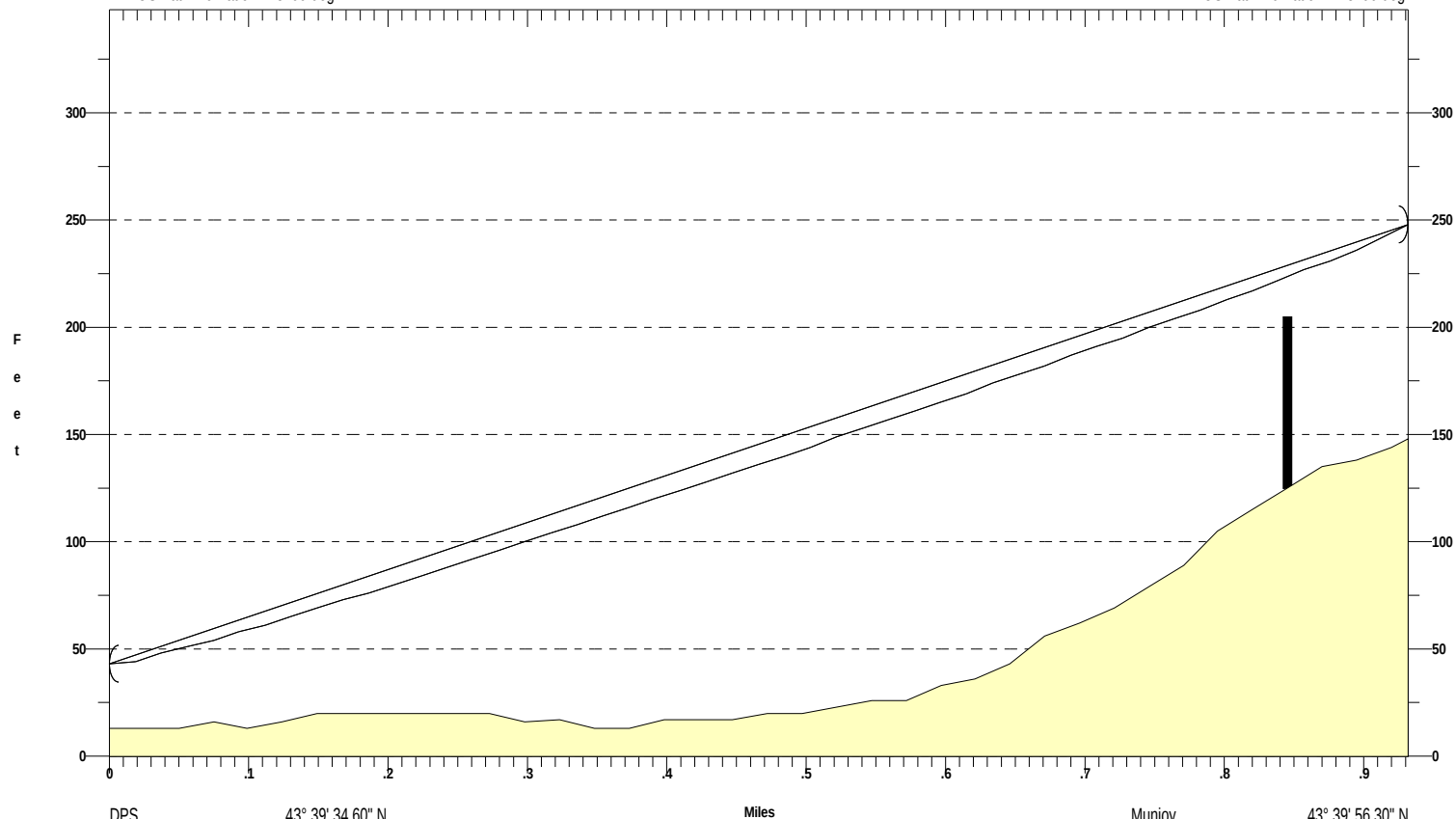
Profile

K = 4/3

K = 4/3, F = 0.6°F1

Path Distance: 0.932 mi.
Tx LOS Path Inclination: 2.3799 deg.

Tx LOS Path Inclination: -2.3799 deg.



DPS 43° 39' 34.60" N
 070° 15' 53.10" W
Elevation 13.1 ft.
Ant. AGL - Tx/Rx/Div 30.0/30.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 063.475 deg T

Munjoy 43° 39' 56.30" N
 070° 14' 53.20" W
Elevation 147.6 ft.
Ant. AGL - Tx/Rx/Div 100.0/100.0/0.0 ft.
Frequency - Tx 4900.00000 MHz
Azimuth 243.487 deg T

KEY:

Profile

K = 4/3

K = 4/3, F = 0.6°F1