LightUP oakland!

Proposal

Oakland Fiber Optic Infrastructure Pilot Project

Prepared for: Deanna Santana, City Administrator
City of Oakland

Prepared by: LightUP Oakland! Collaborative

June 2013

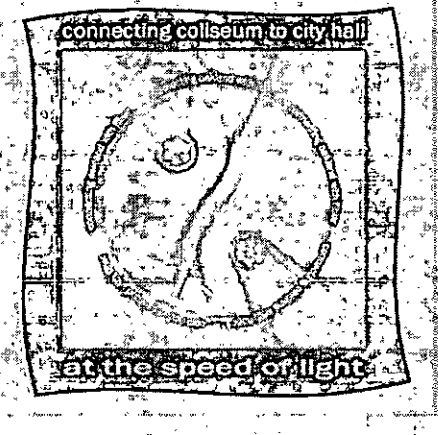


Table of Contents

Introduction

LightUP Oakland! respectfully submits this proposal in consideration of executing the Oakland Fiber Infrastructure Pilot Project in partnership with City of Oakland.

The purpose of this document is to:

- provide a snapshot of LightUP Oaklandl's overall vision
- offer a brief background of fiber optics in Oakland
- define the LightUP Oakland! pilot area
- describe key deliverables
- demonstrate fiber optic need and benefits
- illustrate project alignment with City economic development and public safety objectives
- introduce LightUP Oakland! as a public-private collaborative
- recommend furtherance of the pilot project

LightUP Oakland! seeks to build a defined route of fiber optic cable as the principal component of a pilot project within the underserved Airport-Coliseum district of Oakland, specifically the Oakland Airport Business Park, through a collaborative public-private partnership that includes stakeholder public agencies and a multi-disciplined private sector executive team.

LightUP Oakland! proposes to facilitate technology infrastructure enhancements that serve to feed the pilot area, a key Oakland opportunity business district, with high-speed broadband service in support of fostering its emerging economy, modernizing its industrial and commercial base, attracting and retaining companies that might otherwise go elsewhere, and improving reliability of a critical Oakland emergency response system component.

Access to the speed and capacity only fiber can provide is vital to the continued economic development of the business park. Its proximity to San Leandro's now-operational fiber ring presents a unique opportunity to deploy high speed broadband on a regional basis in keeping with the stated goals of the East Bay Broadband Consortium.

LightUP Oakland!'s intended provision of digital high-speed, fiber-based broadband infrastructure and access supports and furthers City of Oakland strategic goals in the following areas:

- economic development
- public safety and emergency response
- transportation
- healthcare
- education

LightUP Oakland!'s fiber infrastructure pilot is part of a larger vision that better links business, government, and emergency response, both locally and regionally (Figure 1). The envisioned expandable network uses BART as the backbone to ultimately connect "Coliseum to City Hall" – providing fiber access to commercial end users along the way – from the pilot launch point at Oakland Airport Business Park, to downtown. LightUP Oakland! envisions putting in place a robust fiber network that one day serves as the foundation for deploying a citywide Wi-Fi program.

LightUP Oakland! Vision: "Coliseum to City Hall"

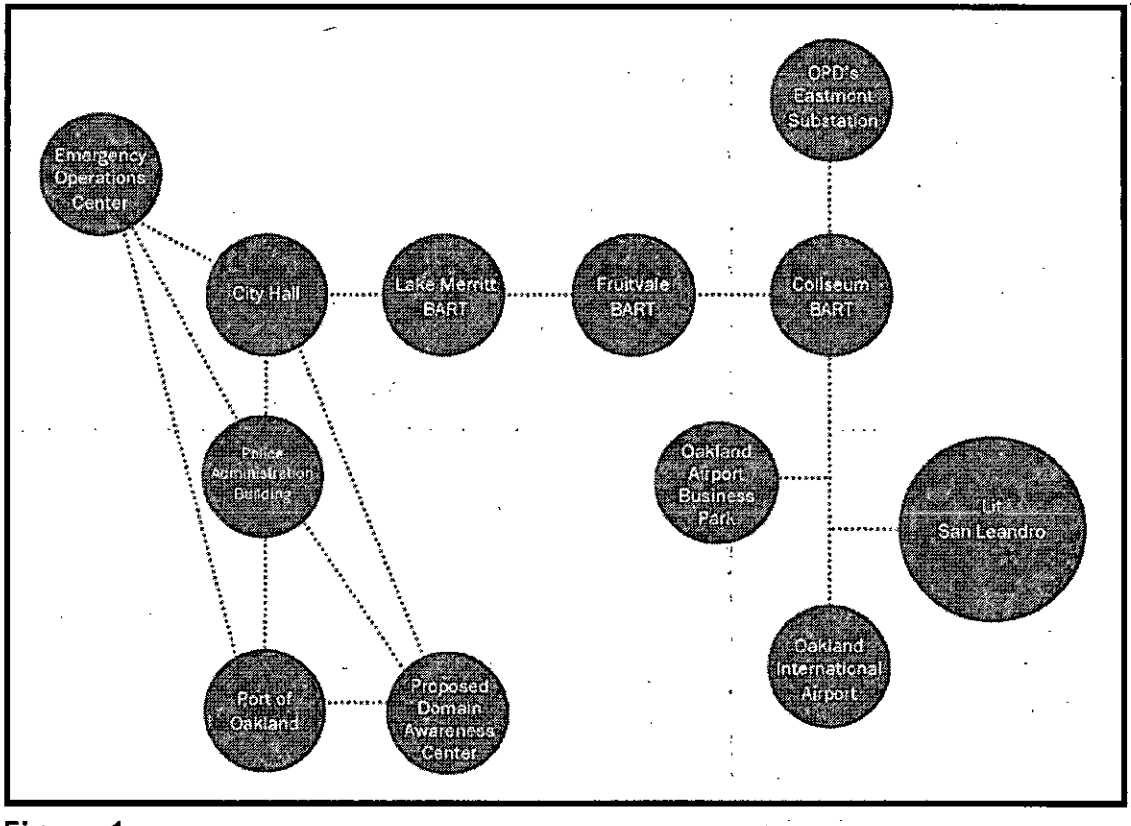


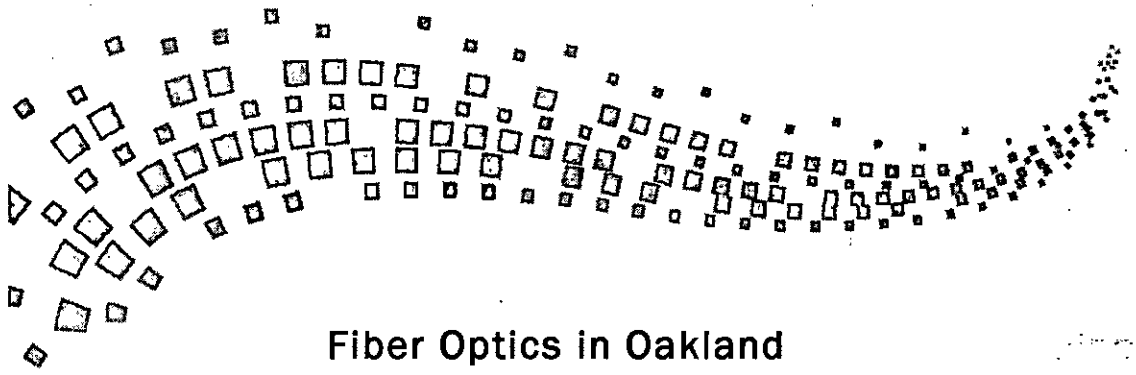
Figure 1

The Lit San Leandro project serves as a major catalyst for LightUP Oakland! In its second year of operation, the fiber ring encircling San Leandro's commercial zone feeds high speed broadband to a commercial and industrial base hungry for access. The project continues to make national headlines as industry in San Leandro begins to show signs of revitalization. Emulation of best practices employed by Lit San Leandro in developing its fiber ring and successful business model will be instrumental in shaping LightUP Oakland!'s plan to bring broadband to Oakland Airport Business Park.

LightUP
oakland!

Mission Statement

To promdte investment, attract and retain
business, improve publlc safety,
and support City df Oakland
strategic economic development objectives
through development of fiber infrastructure that
delivers affordable and reliable
high speed broadband to end users
in Oakland's majdr eommercial corridors,
Coliseum to City Hall



Fiber Optics in Oakland

Oakland's existing fiber assets have been built and expanded upon over the past 40 years as a city government-led and public sector endeavor.

Beginning in the 1970's, the City's Department of Information Technology (DIT) installed the first City-owned fiber lines in downtown, laying the groundwork for Oakland's eventual access to the internet in the 1990's and use of computers as a standard business tool.

BART's incorporation of fiber optic conduit and cable throughout its system since the early 1990's led to a 1998 Executive Decision document being approved by the BART board of directors, authorizing license agreements with various companies for cellular and other telecommunications use of BART right-of-way. While BART's initial purpose for installing fiber within its system was to provide a superior transportation experience for its customers, it has since executed license agreements with ISP's and other organizations to lease access to its fiber optic infrastructure. The execution of these agreements has proven to be a revenue stream that generates upwards of $6 million per year for the agency.

DIT received approval from the City Council in 2006 to execute a comprehensive study that made recommendations for potential implementation of a city-wide Wi-Fi network. The study, released in 2009, revealed that downtown is well-connected to fiber. However, the remainder of Oakland lacks sufficient fiber optic connections to meet the requirements of a comprehensive Wi-Fi network, resulting in a non-cost-effective implementation structure.

DIT assembled a collaborative in 2010 comprised of CEDA, Cisco Systems and IP Networks that made efforts to win a $25 million Broadband Technology Opportunity Program ARRA grant to construct a $35 million Middle Mile Fiber Optic Network that was, for various reasons, not approved.

Recognizing fiber as a viable economic development tool, a January 2012 CEDA staff report indicates the objective to, "Improve telecom infrastructure for info-intensive industries," in

consideration of, "...making underutilized fiber optic facilities available to businesses at a reasonable cost."

Presently, the deployment of fiber optics and high speed broadband complements the City's goal to, "...build the infrastructure to attract larger-scale tech and life science facilities;" that focuses on key industry sectors it wishes to attract, including clean tech, specialty food, international-trade and logistics, and creative arts and media, as highlighted on the City's website.

A 2013 Economic Indicators report, prepared by City of Oakland's Office of Economic and Workforce Development also states an objective of "...focusing its business retention, expansion and attraction efforts on the economic sectors which are most dynamic," including the "Creative Economy" comprised of technology and its ecosystem of software, hardware, social media, communications innovations, technical design and engineering activities, custom, advanced and artisan production and industrial arts, print, film and photography, mechanical design and engineering, and architecture.

Data collected in 2013 by City of Oakland consultant Kimley-Horn and Associates indicates Oakland's existing fiber optic infrastructure is still concentrated, for the most part; downtown (Figure 1). Significant City-owned fiber assets also exist at traffic signals and street lights throughout the city, the locations of which have been mapped; but not aggregated, by DIT.

In its December 2012 Draft Intelligent Strategic Plan (ITS) Update, Kimley-Horn also states, "a top priority of the City is to establish a communication network that extends throughout the city," and continues that, "Proposed projects also emphasize network redundancy by creating communication rings that would provide failover protection due to broken or failed communication links." Kimley-Horn recommends, as two of three potential projects along major Oakland roadways, 1) the installation of new fiber optic corridors, and 2) upgrading existing copper interconnect corridors to fiber.

Even as the City continues expansion of fiber optic connectivity throughout Oakland in keeping with its overall economic development policy and as part of initiatives that purposely include fiber conduit in new telecommunications and public works projects, no overarching and comprehensive government-led strategy appears on the horizon for constructing a dedicated network or networks for the express purpose of attracting investment and providing improved access to the business community.

For decades, City of Oakland and the city's public agencies have recognized the value of installing fiber optic infrastructure as a means of improving the long-term reliability and functionality of key municipal systems. The LightUP Oakland! project builds upon this foresight by expanding the City's existing fiber conduit into a comprehensive network with practical application for every major commercial end user in the Oakland Airport Business Park, and ultimately every business in Oakland that needs access.

Kimley-Horn 2013 Mapping of Existing and Proposed Fiber in Oakland

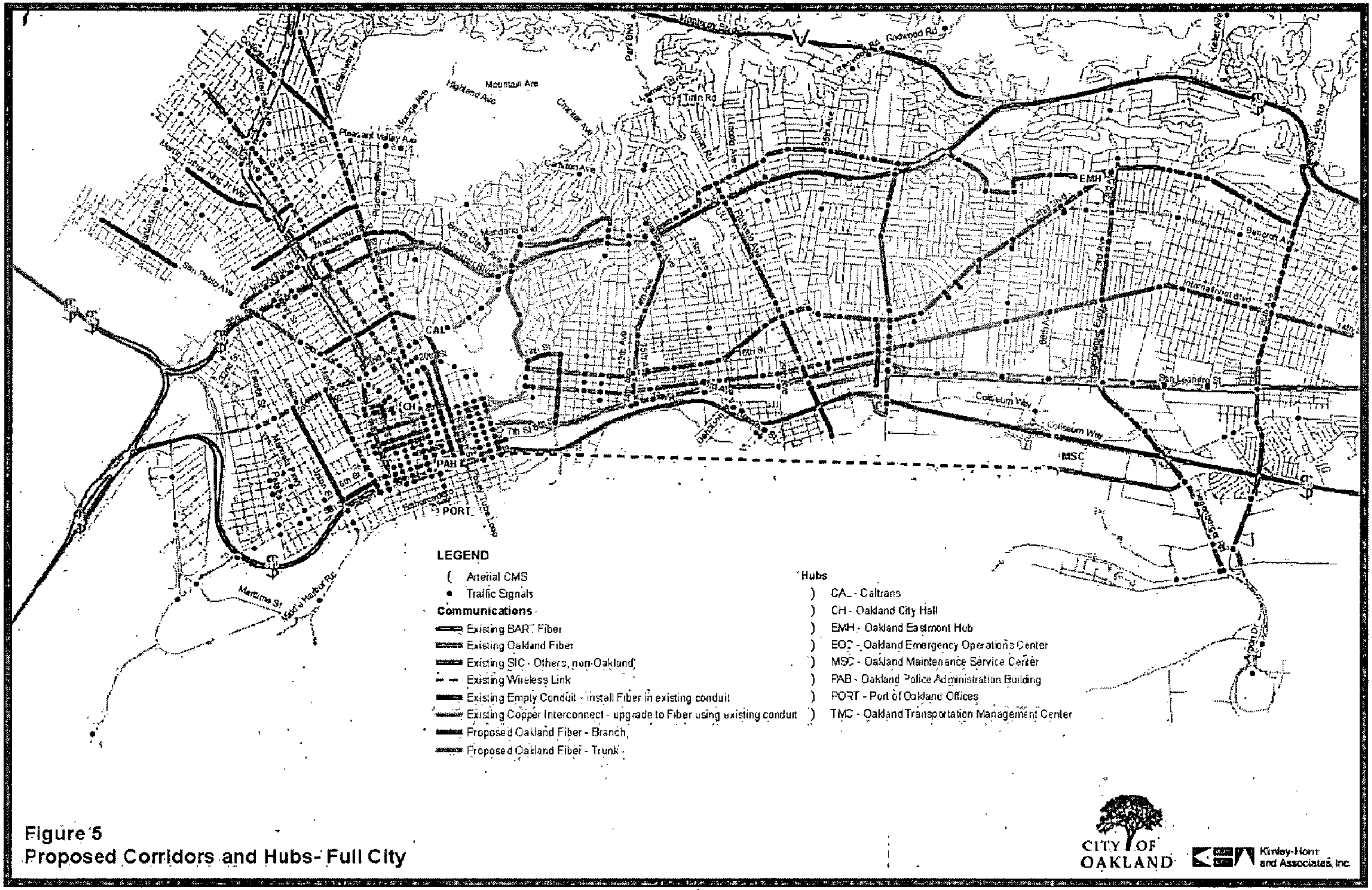


Figure 5
Proposed Corridors and Hubs - Full City

Figure 2

LightUP
oakland!

Pilot Area Profile

Oakland Airport Business Park

- Overview
- Geographic Location
- Lit San Leandro
- Oakland International Airport
- Oakland Airport Connector
- 911 Dispatch Center
- Coliseum City
- Area Master Planning
- Companies and Real Estate

Overview

The LightUP Oakland! pilot area is home to three championship sports teams, world-class entertainment, and a major commercial and industrial employment center. Also the site of two powerful economic engines for the city and region — Oakland Alameda County Coliseum and Oakland International Airport — the last decade has seen significant transformation and improvement to this ever-evolving gateway to Oakland.

A transit hub for the East Bay, the LightUP Oakland! pilot area presents a rare combination of abundant transit options, available land, and centralized Bay Area location. Traversed by more than 16 million vehicles a year, the Airport-Coliseum district has an emerging retail economy, due in part to new auto dealerships and a top-producing Wal-Mart-anchored shopping center. The lifeblood of the LightUP Oakland! pilot area remains its hospitality industry, with an assortment of travel and recreational amenities and over 4,000 quality guestrooms serving visitors from around the globe.

Geographic Location

The pilot area is bounded by Coliseum BART and San Leandro Street to the east, 98th Avenue south, Oakland International Airport to the west, and 66th Avenue north, taking in the entirety of the 400-acre Oakland Airport Business Park, land use of which is regulated by Port of Oakland.

Lit San Leandro

Conceived by Dr. J. Patrick Kennedy (a San Leandro resident and CEO & Founder of OSIsoft, one of the San Leandro's largest employers), Lit San Leandro is a public-private partnership designed to attract new business to San Leandro. The 10-mile digital backbone of fiber optics it created revolutionized the city's telecommunications infrastructure in allowing ISPs to deliver high speed broadband, positioning San Leandro to be a major player in the high-tech and cleamtech economies. Having gained access to the city's available conduit to construct its loop; Lit San Leandro also uses BART's right of way (at the San Leandro BART station) as a vehicle to network the city's commercial districts. The LightUP Oakland! pilot area is uniquely positioned near the terminus of the San Leandro loop that became operational in 2012 and roughly abuts Oakland's border at Doolittle Drive (Figures 2, 3 and 4).

Oakland international Airport

Oakland International Airport enjoys status as California's fourth largest airport, with over 10 million departures and arrivals annually. The airport is in the midst of executing a $200 million Terminal 1 renovation and remodel project, as well as the implementation of a $400+ million, 5-year capital improvement program. Once complete, the Oakland Airport Connector will more conveniently deliver Bay Area passengers to Oakland International Airport terminals.

Oakland Airport Connector

Under construction and expected to be operational mid- to late-2014, BART's Oakland Airport Connector (OAC) will provide a dedicated connection for Bay Area travelers transiting between the BART system and Oakland International Airport. Already a distinctive landmark in the Airport-Coliseum district and a wholly unique feature within the city and region, the OAC stands as a pivotal resource to be exploited in facilitating fiber optics within the pilot area.

911 Dispatch Center

The City of Oakland's 911 call center, managed by the Oakland Police Department's Communications Section, is located on Edgewater Drive in the pilot area, where it dispatches more than 600,000 incoming calls annually. Serving as the critical public safety answering point for the entire city, the 911 call center responds to all emergency calls for police, fire and medical service requests. The Edgewater Drive call center is also the location from which the city's ShotSpotter gunfire detection system and state-of-the-art digital voice recording equipment are monitored.

Coliseum City

Coliseum City is a major pending project within the pilot area, envisioned as a transformative retail and entertainment district development contiguous to new, state-of-the-art stadium facilities for each of Oakland's three teams. Planned as a vibrant regional destination serving local residents and the broader city and regional population, the development of Coliseum City is being directed by City of Oakland's prime consultant, JRDV Urban International, through the awarding of an Exclusive Negotiating Agreement last year.

Area Master Planning

City of Oakland and JRDV Urban International are also In the midst of leading a master planning effort within the LightUP Oakland! pilot area. While improved telecommunications and implementation of fiber infrastructure will certainly be a component of a forthcoming Specific Plan generated by the City's consultant, that envisions development of a new science and technology park, its execution is a 20-year proposition that may or may not occur.

Companies and Real Estate

The pilot area hosts major manufacturing firms, distributors and a variety of service providers, each standing to benefit from ready access to fiber, including, for example:

- Acumen Building Enterprise
- Best Western Inn
- Coliseum Lexus of Oakland
- Comcast
- Comfort Inn
- Courtyard by Marriott
- Days Inn
- Drelsbach Enterprises
- Everett Graphics
- FedEx
- Give Something Back
- Hilton Oakland Airport
- Holiday Inn
- Horizon Beverage
- Lighthouse Community Charter School
- McGuire and Hester
- Oakland-Alameda County Coliseum
- Oakland Harley-Davidson
- One Toyota
- Oracle Arena
- Pet Food Express
- Rainin Instruments
- Red Lion
- Revolution Foods
- UPS
- Wal-Mart
- Webcor
- Zhone Technologies

Five companies in the pilot area appear as Top 25 Sales Tax Producers in a 2013 Economic Indicator report published by City of Oakland.

Also notable is global developer Goodman Birtcher's recent acquisition of a major parcel on Swan Way to build a 375,000 sq. ft. logistics center, now under construction. Arena Center is a newer, but vacant, campus of 150,000 square feet on Oakport Street, one of four Class A buildings in the pilot area that house almost 650,000 square feet of tenant space. Class B, C and flex space account for another 1.4 million square feet of inventory available to potential broadband users within the district. While the pilot area sits within what is arguably the district of most strategic importance to Oakland, attracting investment to this submarket nonetheless remains a challenge due to aging infrastructure and other factors that contribute to a high overall vacancy rate (the highest in the city), less than stellar leasing activity, and lowered real estate values, while its property owners experience an inability to charge rents on par with the rest of the city and region.

Even so, its proximity to an active fiber loop and status as a critical employment centenand regional transportation hub make the Oakland Airport Business Park the logical pilot area and plausible point of origin for potential expansion of a citywide fiber network, Coliseum to City Hall.

LightUP oakland!

Pilot Area within the Airport-Coliseum District and its Proximity to San Leandro Loop

Figure 3

Lit San Leandro's Proximity to the Oakland Border

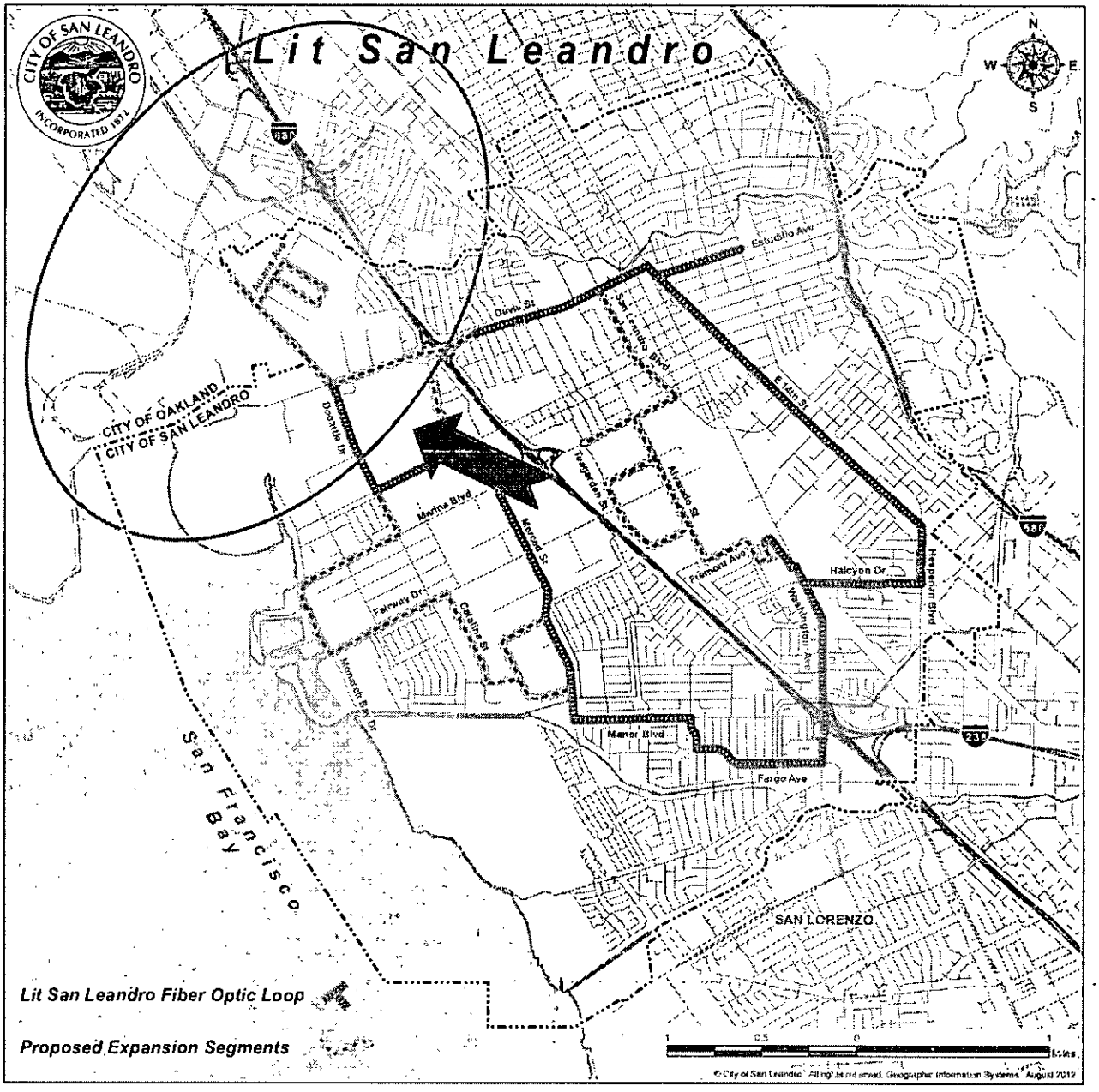


Figure 4

LightUP oakland! Pilot Area - Oakland Airport Business Park

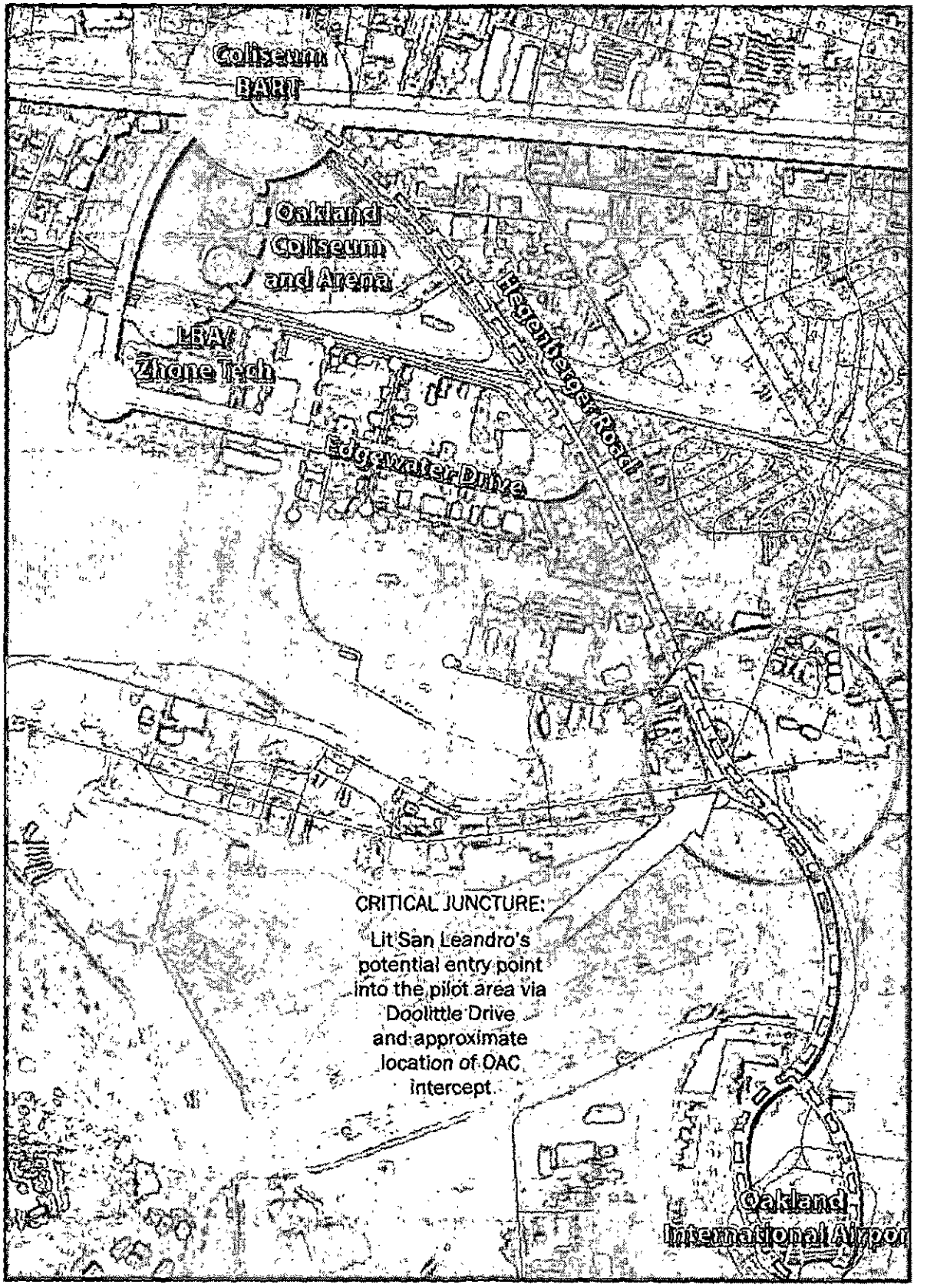


Figure 5

LightUP
oakland!

Key Project Deliverables

Assessment of Existing Resources LightUP Oakland! will access, examine and analyze City of Oakland resources that help facilitate the project, including conduit maps, street light and traffic schematics, and a variety of documents provided by Public Works Agency and other divisions as needed and requested by LightUP Oakland!
Design and Mapping LightUP Oakland!, in cooperation with City of Oakland, Port of Oakland and BART, will map a professional, logical, advisable, responsible and technically-feasible fiber route that maximizes OAC use and draws upon data gleaned from existing City of Oakland resources, the expertise of experienced collaborative members, and best practices utilized as part of similar projects conducted in other cities
Business Plan Creation LightUP Oakland! will provide an overarching and comprehensive project business plan encompassing roles and responsibilities, technical logistics of implementation, financing, capitalization and budgeting, critical path and benchmark mapping, project design, construction specification, and anticipated project marketing
Capitalization LightUP Oakland! will capitalize the project through financing and investment strategies and agreements executed amongst its private sector collaborative members; according to its business plan that includes a comprehensive schedule of costs
Business Plan Execution LightUP Oakland! will execute its business plan that includes, but is not limited to, budgeting, analysis, planning, capitalization, mapping, design, scheduling, logistics, project management, outreach and marketing, and construction. The main deliverable of the business plan – construction – will involve pulling fiber optic cable (up to 288 strands) through existing City of Oakland, Port of Oakland and BART conduit
Fiber Allocation LightUP Oakland! will convey to City of Oakland, Port of Oakland and BART respectively, per negotiated license agreement, ownership and unrestricted exclusive use of 10% of the number of fiber strands installed (cumulatively) or a designated number to each entity

Outreach to Property and Business Owners LightUP Oakland! will conduct outreach to project area property and business owners that involves education of fiber optic benefits, how they impact business retention and attraction, why fiber connectivity should be supported, and the opportunity each will be afforded by having access to the network
Marketing LightUP Oakland! will develop and implement an organized campaign surrounding the project and the business district it serves, including promotion of realized benchmarks, positive region-wide news reports and articles, interviews with stakeholders and business leaders, periodic press conferences and news releases, a public groundbreaking, ribbon cutting, and a variety of public relations events
Stakeholder Collaborative LightUP Oakland! will further cultivate a public-private consortium that includes primary stakeholder public agencies, such as Port of Oakland and BART, along with private sector capital investors and other collaborative members who offer specialized technical expertise for the purpose of executing the LightUP Oakland! business plan.
Business Model LightUP Oakland! will develop a business model that supports monetization of the fiber network and maximizes its potential as a revenue-generating asset, based on successful models employed by other cities

LightUP
oakland!

Project Recommendations

1. LightUP Oakland! respectfully recommends execution of the following agreements in furthering a public-private partnership arrangement between the collaborative and City of Oakland:

   12-Month Non-Exclusive Negotiating Rights Agreement with LightUP Oakland! for development of a comprehensive broadband implementation strategy for the project area

   12-Month Non-Exclusive Negotiating Rights Agreement with LightUP Oakland! for the purpose of negotiating a license agreement to install fiber optic facilities within the City of Oakland's existing conduit in the project area

2. LightUP Oakland! respectfully recommends it work in a cooperative manner with the City Administrator's Office to identify those individuals within City of Oakland who stand as "village experts" in regards to fiber optic technology, whether it be institutional knowledge or current specialized technical expertise. Suggested in the development of a project team are key City staff, selected with the assistance of LightUP Oakland!, from Public Works Agency (and its Traffic Engineering division), Office of Information Technology, and the Office of Economic Development & Workforce Development.

3. LightUP Oakland! recommends the Airport Area Business Association, a 44-year-old organization focused on sustaining commerce in the Oakland Airport Business Park, have a leading role in announcing LightUP Oakland! to the public and be participatory in its marketing management, public relations and business outreach in cooperation with City of Oakland.

LightUP
oakland!

Fiber Optic Needs Assessment

Fiber optics has become widely used in modern telecommunications infrastructure for good reason. Its enormous bandwidth, ability to carry signals over vast distances, and lower installation and maintenance costs are attractive to the health sciences, advanced manufacturing, biotechnology, education, public safety, digital arts, and clean and green sectors that now require high speed and large capacity. If these business types are to be attracted and supported, the need exists for fiber's reliability, durability, higher bandwidth, and ability to handle the push and pull of massive amounts of data and video now required to conduct commerce and communicate effectively in the 21st century. Failure to provide the efficient upload and download of large quantities of data and video to support business operation and expansion will eventually force modern, technology-dependent companies to locate outside of the Oakland Airport Business Park, or outside of Oakland.

The need for high speed broadband in the underserved Oakland Airport Business Park is evident to those major companies conducting business there and to local commercial brokers experiencing difficulties attracting high-tech and other types of business to the district. Built in the 1980's, the business park lacks modern telecommunications infrastructure now enjoyed by similar commercial areas in neighboring cities, leaving local companies at a distinct disadvantage to remain competitive.

The two key telecoms working in Oakland, AT&T and Comcast, provide insufficient service to the business park, or none at all. The local business association reports regular use of cell phones by business park employees as a means of conducting operations; a result of AT&T and other traditional carriers being unable or unwilling to provide basic telecommunications services via copper wire. Comcast reports its inability to service the business park absent a satisfactory cost-to-benefit ratio that justifies installation of equipment to provide business class internet and VOIP. While obtaining even basic DSL service through AT&T proves problematic for business park managers, the company quotes exorbitant fees, in many cases close to $100,000, to provide fiber installation on a piecemeal basis to those companies

able to afford this service and sign multi-year service agreements that put the overall price tag for obtaining true high speed broadband in the hundreds of thousands of dollars.

The need exists for improved connectivity and stability the LightUP Oakland! project will provide to Oakland Police Department's 911 call center located on Edgewater Drive that responds to over 600,000 emergency calls annually, maintains the city's ShotSpotter gunfire detection system, monitors live intelligence feed, and utilizes digital mapping at dispatch consoles, amongst other technology. Fiber infrastructure is needed to ensure the reliability and longevity of Oakland's emergency response system as a whole, a critical component of which resides in the Oakland Airport Business Park.

The need for fiber infrastructure in LightUP Oakland!'s project area to satisfy public safety needs, as well as the requirements of technology-driven companies expecting high speed broadband service as a given when signing a lease, is clear. Deployment of fiber optics in the business park is vital for its continued growth and economic health. Without the unparalleled speed, capacity and reliability provided by fiber, the Oakland Airport Business Park is at risk for being left behind as neighboring commercial zones, one by one, employ broadband strategies that serve to attract 21st century business and investment.

LightUP
oakland!

Extraordinary Opportunity of *Now*

An exciting opportunity exists now to bring fiber optic infrastructure to fruition in the Oakland Airport Business Park:

- A clear and immediate demonstrated need to attract and retain business exists now within
- The Oakland Airport Connector, under construction now, offers a convenient, above-ground network backbone off of which to feed the business park with broadband service
- San Leandro's adjacent fiber loop recently became operational and stands at the ready to offer regional linkage now
- Area master planning occurring now complements the LightUP Oakland! fiber project
- Oakland's emergency response center on Edgewater Drive stands to benefit now from fiber access that improves public safety throughout the city
- Private sector investors who see value in the LightUP Oakland! project are ready to collaborate now with public stakeholder agencies

A fortunate alignment of circumstances causes implementation of LightUP Oakland!'s fiber project to be all at once reasonable, practical, recommended, and urgent. This extraordinary confluence of opportunity meeting need must be harnessed and exploited before it passes.

LightUP
oakland!

Primary Project Benefits

The benefits offered by the LightUP Oakland! project are numerous:

- Fiber infrastructure will serve as a district and citywide asset for decades to come
- Fiber access supports the needs of industry sectors being actively sought by City of Oakland
- Fiber access fulfills a component of area master planning anticipated to incorporate high speed broadband service for a proposed science and technology park
- Fiber access brings heightened visibility to a district needing a cutting edge image to facilitate new business
- Fiber access contributes to property owner, workforce, and City of Oakland prosperity
- Fiber access benefits property owners through increased opportunity to lease up real estate inventory that now stands vacant
- Fiber access resulting in new investment and commercial activity benefits the City of Oakland through increased tax revenue
- Execution of license agreements with ISP's leverages and monetizes the fiber network
- The fiber project maximizes utilization of the OAC as a backbone off which laterals can be run for the deployment of broadband service within the business park
- The citizens of Oakland are beneficiary to a more reliable emergency response system via fiber upgrades to the Edgewater Drive 911 call center that responds to emergency calls, maintains ShotSpotter, monitors live intelligence feed, and utilizes digital mapping at dispatch consoles, amongst other technology
- The project offers system redundancy and greater connectivity to Oakland International Airport
- Expandability of the fiber network lends itself to incorporating Oakland's Police Administration Building, Emergency Operations Center, Eastmont substation, and prpposed Domain Awareness Center, maximizing the opportunity to interconnect the entirety of Oakland's emergency response system and facilitating use of video surveillance; license plate readers; and other innovative crime-fighting technologies that employ rapid, real-time communication amongst law enforcement, public safety agencies, and the community
- A fiber network offers building blocks needed to develop a citywide Wi-Fi program

Municipal and private sector-owned fiber loops are making daily headlines across the nation and around the globe, garnering heightened visibility and positive publicity for the cities in which they reside, including Lit San Leandro that sits next door to the Oakland Airport Business Park:

"Digital West of SLO Helps Businesses Grow with Metro Fiber Project"
The Tribune, June 5, 2013

"Stockholm Fibre Network Adds Billions to Economy"
The Swedish Wire, June 3, 2013

"For Broadband in Northern Illinois, the Future is Now"
Northern Public Radio, June 3, 2013

"Missouri School District Upgrades Fiber Optic Network to 10 Gbps"
The Journal, June 3, 2013

"Local Entrepreneurs Pioneered Broadband and Fiber Optic Networks"
SavannahNow.com, June 1, 2013

"Lafayette: Nation's First City to Provide Gigabit Intranet Service"
Bayou Buzz, May 29, 2013

"New Fiber Optics for Jacksonville Will Add 'Extreme' Speed to Internet"
Florida Times Union, May 28, 2013

"Gov. Patrick Lights First Section of MassBroadband 123"
Providence Business News, April 15, 2013

"San Leandro's Old Chrysler Plant Revved Up for Tech"
San Francisco Business Times, March 8, 2013

FCC Chairman Commends San Leandro for Fiber Network"
Mercury News, February 27, 2013

"In San Leandro, a Drive to Get Wired"
The Wall Street Journal, March 4, 2012

A large marketing and public relations opportunity exists as a benefit of the LightUP Oakland! project, one that highlights the business park, and by extension the city of Oakland, as being:

- locally and regionally connected
- good for business in offering owners and lessees technology enhancements at affordable rates
- poised to meet the demands of 21st century industry via true high speed broadband offerings
- innovative in taking steps to realize maximum and continuing benefit from the OAC
- a conduit for improved public safety throughout the city

The Oakland Airport Business Park and its property owners stand to benefit from an organized marketing and media campaign promoting LightUP Oakland!, the realization of its benchmarks, and the business district it serves. Positive news reports, articles, interviews, press conferences, press releases, a public groundbreaking, and public relations events will garner ongoing publicity long after glass is laid in the ground and broadband service is deployed.. The LightUP Oakland! project presents an exceptional opportunity for the Airport-Coliseum district and the city of Oakland to shine.

The LightUP Oakland! project will benefit the city of Oakland by serving as a potential conduit for regional linkage to the forthcoming joint Port of Oakland/City of Oakland Domain Awareness Center (DAC) that proposes to better network and monitor utility, security and roadway infrastructure. This new emergency operations facility will function as a[illegible] coordination center, responsible for assimilation, analysis and dissemination of security information to maximize domain awareness within Oakland and its region.

The LightUP Oakland! project is one component of a larger, longer-term vision to broaden local and regional connectivity, resulting in a business climate and enhanced public safety that benefits the citizens of Oakland.

LightUP
oakland!

Collaborative Executive and Advisory Team

A Public-Private Partnership

Randall C.M. Whitney, President, Pacific Thomas Capital

Walter Allen, President & CEO, Acumen Building Enterprise

Elbert Chang, PE, TE, Kimley-Horn and Associates

Robert Crawford, CTO, Crawford Telecom

Randy Durrenberger, PE, Kimley-Horn and Associates

Ellen Gao Feng, Sr. Vice President, W.I. Harper

Kevin Grey, Manager Telecommunications Revenue, BART

Stuart Hanson, Vice President, Sabey Data Centers

Debbie Hauser, Principal, BAWP

Dr. Patrick Kennedy, Founder & CEO, OSIsoft, Inc.

Jim Morrison, CEO, Lit San Leandro

Ron Pucclnelli, Chief Technology Officer, Port of Oakland

Chuck Rae, Manager Telecommunications Revenue, BART

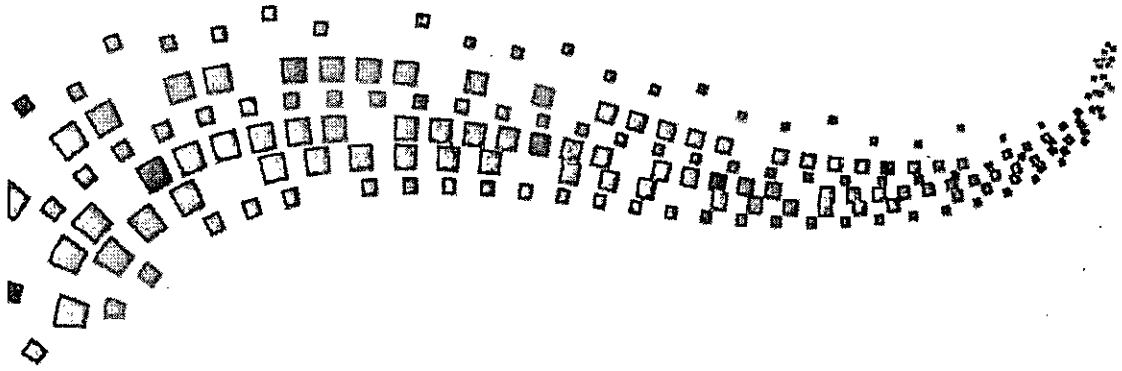
Anita Shue & Eric Dynamic, Principals, UC Telecom

Paul Silliman, 365 Main Data Centers

Clark Smith, CEO, Crosslink Networks Oakland

Chuck Song, Advisor, China Internet Network Information Center

Dr. Baoping Yan, Director General, Computer Network Information Center (China)



Appendices

Exhibit A

CITY OF OAKLAND

CITY HALL • 1 FRANK H. OGAWA PLAZA • OAKLAND, CALIFORNIA 94612

LAURENCE E. REID
Vice Mayor
Councilmember District #7
lreid@oaklandnet.com

(510) 238-7007
FAX: (510) 238-6910
TDD: (510) 839-6451

June 5, 2013

Dear Oakland Business Community Members and Stakeholders:

The deployment of fiber optics in Oakland is critical for the continued growth and economic vitality of our city. Without the unparalleled speed, capacity and reliability provided by fiber, Oakland risks being left behind as neighboring cities, one by one, employ broadband strategies that serve to attract high-tech business.

The demand for more bandwidth and speed in today's digital world is real – advanced manufacturing, the healthcare industry, biotechnology and media services all rely upon the capacity and speed only fiber can provide to streamline operations and remain competitive. Time is money – and could be the difference between choosing Oakland or going elsewhere.

Also used in crime-fighting strategies such as video surveillance with license plate readers and other innovative technologies, high speed broadband can facilitate rapid, real-time communication amongst law enforcement, public safety agencies and the community. Fiber infrastructure will ensure the reliability and longevity of Oakland's emergency response system.

The LightUP Oakland! project is a collaborative, public-private driven effort that includes support from BART and Port of Oakland to bring high speed broadband infrastructure to Oakland. The LightUP Oakland! project presents the opportunity to reposition our major commercial and industrial zones for the 21st century economy, beginning with the strategically important yet underserved Airport-Coliseum area as pilot, using the Oakland Airport Connector as the conduit for feeding the district with broadband service.

The LightUP Oakland! project is in keeping with East Bay Broadband Consortium goals of supporting technology-led development, regional collaboration, and job creation. Broadband infrastructure can provide the foundation upon which the city can further economic development, improve public safety, increase the capacity to attract high-tech business, help to overcome the digital divide, and improve the health of our major commercial corridors. The entire Bay Area will be the ultimate beneficiary of improved infrastructure that begins with the LightUP Oakland! pilot project in East Oakland.

Building fiber infrastructure in Oakland is good for the city and good for the region. LightUP Oakland! has my endorsement to pursue a course of action that brings high-speed broadband infrastructure in Oakland to fruition.

Sincerely,

Larry E. Reid
Vice Mayor
Councilmember, District 7

Exhibit B

The Airport Area Business Association is a regional association of business and industry

Mail:
P.O. Box 14123,
Oakland, CA 94614

Office, by appointment:
333 Hegenberger Road, Suite 328
Oakland, CA 94621

510.545.7773 tel
510.261.4112 fax
debbie@aaba.org

www.aaba.org

http://facebook.com/AABAOAK

June 5, 2013

Ms. Deanna Santana
City Administrator
City of Oakland
1 Frank Ogawa Plaza, 3rd Floor
Oakland, CA 94612

Dear Ms. Santana:

It is my sincere pleasure to submit this letter on behalf of the AABA membership and board of directors in support of LightUP Oaklandl's efforts to implement a fiber pilot in the Hegenberger Corridor.

There is no doubt that the local business community will benefit from having access to affordable high speed broadband, given that telecommunications services are severely lacking and unreliable within the business park – creating a situation that makes it difficult for commercial brokers to attract new companies here. Also, the speed and capacity provided only by fiber is needed if the district is to actively recruit technology-driven companies that already rely on broadband to conduct business.

AABA recognizes the exciting marketing opportunities a fiber pilot presents for the district. Not only will the Airport-Coliseum area be part of a region-wide effort to deploy broadband service, but the district will also serve as the launching point for making fiber available to our major business corridors across the city. The marketing opportunities provided by the fiber pilot will be a shot in the arm for a submarket that is currently impacted by low confidence and high vacancy rates. We look forward to helping LightUP Oakland! promote the corridor as being Oakland's launch point of enhanced technology and innovation.

The core value of the fiber pilot remains, however, the high speed broadband it will offer major end users within the business park, along with increased reliability and system redundancy it can provide to both Oakland International Airport and the 911 call center located on Edgewater Drive in the pilot area.

AABA and the hundreds of businesses we represent wholeheartedly support LightUP Oaklandl's efforts to implement fiber optic infrastructure in the Hegenberger Corridor. We look forward to supporting LightUP Oakland! in whatever way possible to bring the pilot project to fruition.

Best regards,

Debbie Hauser
Executive Director

Exhibit C

ECON DEV POLICY

CITY OF OAKLAND

FILED
OFFICE OF THE CITY CLERK
OAKLAND
2012 JAN 12 AM 8:06

AGENDA REPORT

TO: Office of the City Administrator
ATTN: Deanna J. Santana
FROM: Community and Economic Development Agency
DATE: January 24, 2012

RE: A Follow-up Report and Proposed Action on the Community and Economic Development Director's Economic Development Strategy for the City of Oakland

SUMMARY

On September 27, 2011 the Community & Economic Development (CED) Committee of City Council heard a report by staff on an Economic Development Strategy and directed staff to return with recommendations for the creation of a Strategic Plan. Key areas of interest for the Committee were information on the City's current economic development strategies that are working; workforce and small business development strategies; and strategies to brand and promote the City of Oakland as a choice for businesses and talent. Staff proposes to develop ah updated Economic Development Plan and return to Council by May of 2012, pending identification of resources.

The first phase of the Plan creation will be to confirm Oakland's current status and standing among the existing business community and leadership to define priorities and strategies for going forward, given constraints and need for re-alignment of City resources. The subsequent phase will be to develop the Economic Development Strategic Plan with definable short and long term actions and timelines. This Plan should serve as a coordinating document, relating cross-divisionally as a companion to the adopted General Plan of the City and informing city staff cross-divisionally of the importance of economic development to all divisions of the City.

Staff intends to engage with key partners, such as UC Berkeley, Oakland Chamber of Commerce, Inner City Advisors, the East Bay Economic Development Alliance, and the Oakland Workforce Investment Board as well as others in this process. The creation of a plan will require contracting with an economic development consultant(s) to assist in this effort; in addition to City staff to support this and the ongoing work being done on a day to day basis within Economic Development Division. This level of support is required to ensure that the Plan will be developed by May 2012, given the urgency to respond to the demise of the Oakland Redevelopment Agency and the need for Economic Development staff to continue to serve clients. This report presents staff recommendations regarding the components of the Oakland Economic Development Strategic Plan and requests input and direction of the CED Committee.

FISCAL IMPACT

This is an informational report, thus there is no fiscal impact.

Item: _____
CED Committee
January 24, 2012

- Demographic Characteristics (age, ethnicity, income, educational attainment, housing)
- Market Performance Measures (Retail, Office and Industrial, Hotel, wages, major employers, sectors, real estate)
- Targeted Industry Clusters (venture capital, wages, vendors & suppliers)
- Multiplier effect documentation/ supplier network employment and revenue impact of targeted clusters

Expected Deliverable: Economic Overview/present conditions report

Task 2: Review of existing plans and strategies

- General Plan
- Zoning Updates
- Redevelopment Project Area Plans
- Specific Plans
- Economic Development Plans (Oakland Partnership, WIB Plan, East Bay EDA)
- Industry Cluster Work (private and public)

Expected Deliverable: Cross divisional and cross disciplinary analysis of existing City policies, procedures and plans that support economic development.

Task 3: Key Stakeholder and Market Leader interviews

- CED Committee Planning Session
- Business and Community Leader interviews
- Targeted Cluster focus groups

Expected Deliverable: Publication (web-based) of focus group feedback with update of material previously gained from industry leaders through the Oakland Partnership leadership committees

Task 4: Development of Key Goals for a 21st Century Economic Development Program: Scorecard on Oakland's Performance by:

- Niches of Competence
- Infrastructure for Innovation (Targeted Clusters, Small Businesses)
- Human Capital Assets
- City and Regional Promotion
- Smart and Vibrant Community Places
- City Development and Finance

Expected Deliverable: Trends Analysis report

Task 5: Identification of major areas for strategy development

- Confirmation of major areas for which strategies are required
- Prioritization of key strategy areas

Expected Deliverable: Priority Initiatives and Targeted Industries report

Item: _____
CED Committee
January 24, 2012

Attachment A:

- Complete inventory of youth employment programs and strategically market programs to priority sector businesses
- Close digital divide
  - Continue working with private partners to provide free/low-cost internet access
  - Develop programs and secure funding to increase computer ownership and provide culturally competent computer training to vulnerable communities

Quality of Life and Neighborhood Revitalization

- Upgrade neighborhood commercial areas
  - Expand tourism marketing to include distinctive neighborhood districts
  - Assess the feasibility of creating free shuttles between neighborhoods
  - Expand Neighborhood Marketplace Initiative, which provides grants and other technical support to commercial districts that are not yet CBDs
  - ID permanent funding source for streetscape improvement program, promote façade improvement matching grants to select businesses
- Encourage creativity by continuing to develop City as center for the arts
  - Use land use and financial resources to increase affordable housing and workspaces for artists
  - Award density bonuses for developers who include arts space in their projects
  - Create and support a touring program to raise visibility of SF arts industry
- Recognize and enhance value of parks and open spaces
  - Park and Rec should explore the feasibility of creating and managing Park Improvement Districts
  - Develop ongoing relationships with nonprofits to fund improvements in play structures and other park amenities

Infrastructure

- Provide sufficient real estate for strategic priorities
  - Provide a clear and rational land use entitlement process
- Maximize City's accessibility to local/regional workforce
  - Complete Transbay Transit Center, fund efforts to improve the reliability and efficiency of transit system
  - With MTA, develop bicycle and pedestrian projects of major regional value
- Work to reduce cost of residential and commercial dev.
  - Streamline building and permitting processes
  - Create area plans with program EIRs that reduce need for project-specific EIRs
  - Create incentives for replacing single story retail bldgs. with multi-story mixed-use projects and for additional secondary units
  - Commit to citywide goals for homeownership, which should increase over time

Technology and Innovation

- Support commercialization of research and technology
  - Explore feasibility of creating additional incubator space for early stage biotech companies
  - Explore partnerships with UCSF and other institutions to develop additional research institutes along the ~~likes of QB3~~
- Improve telecom infrastructure for info-intensive industries
  - Consider making underutilized fiber optic facilities available to businesses at a reasonable cost
- Support efforts to create more investment vehicles for startups
- Identify, evaluate and support emerging industries by forming think tank of industry experts on emerging industries

Exhibit D

Kimley-Horn 2013 Mapping of Existing and Proposed Fiber in Oakland

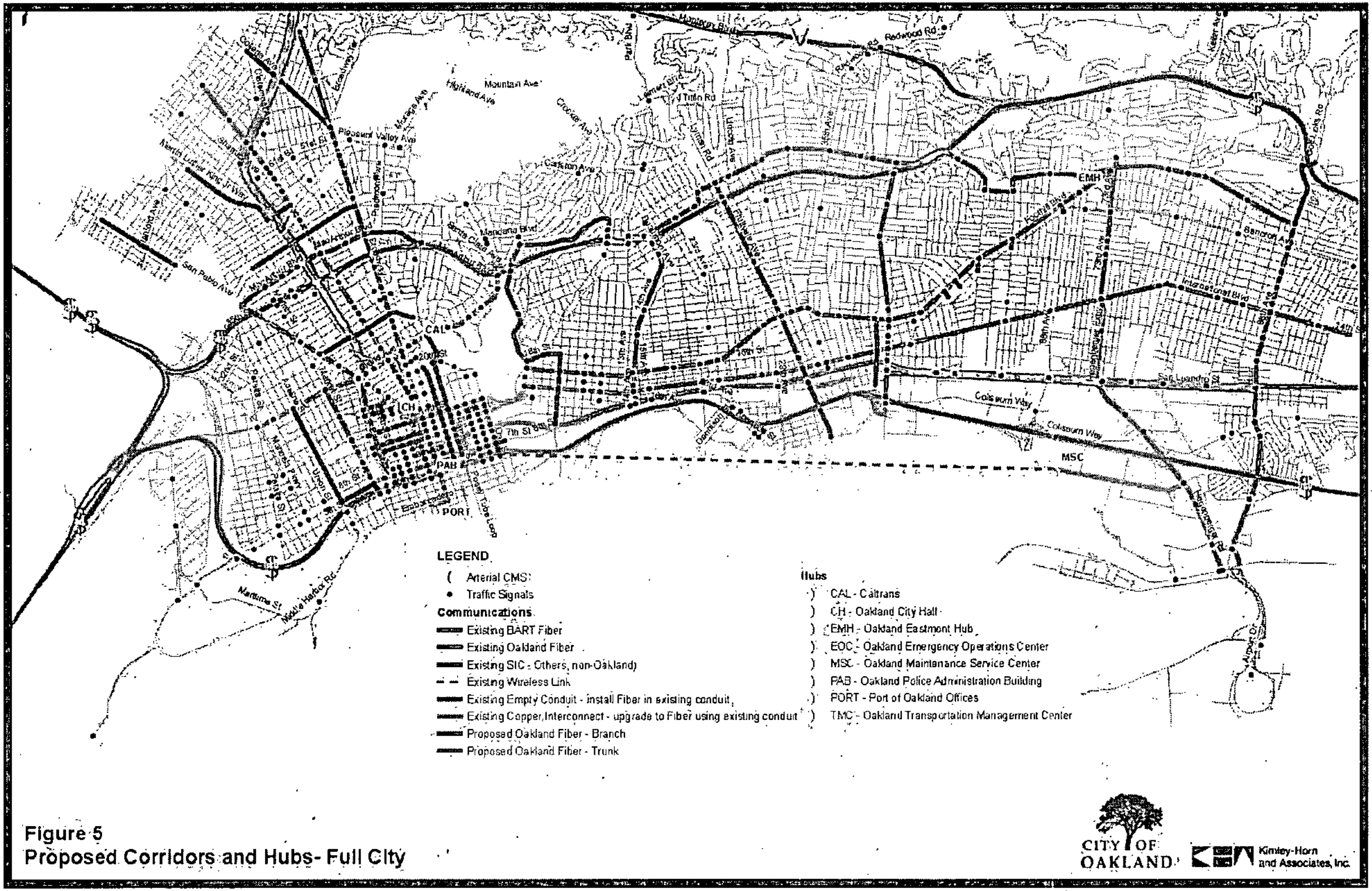
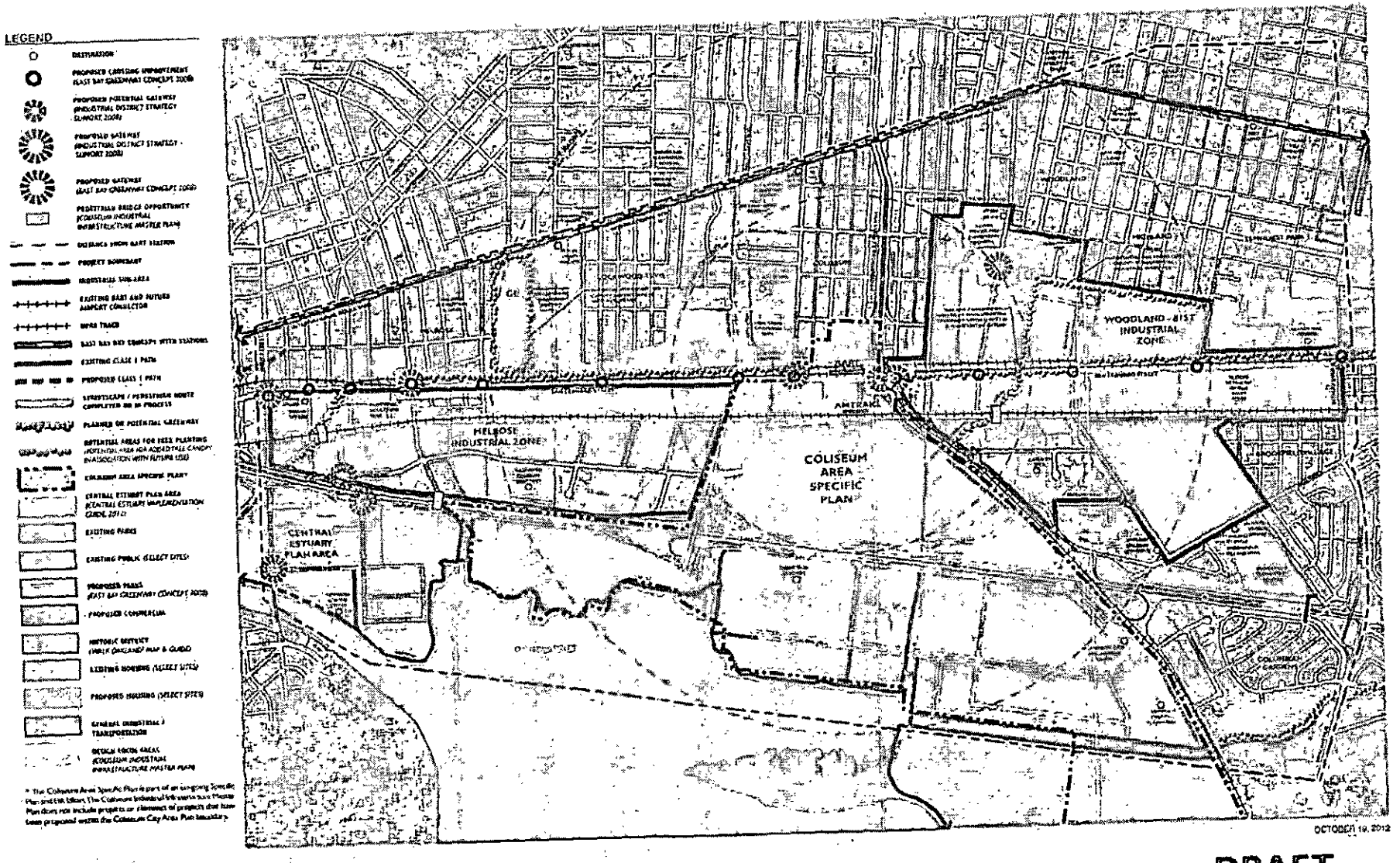


Figure 5
Proposed Corridors and Hubs- Full City

Exhibit E



NOTE: To view all relevant plans and projects, refer also to the Bicycle Connections Plan, the Pedestrian Connections Plan and the Estuarpec Plan.

RELEVANT PLANS & PROJECTS

COLISEUM INDUSTRIAL INFRASTRUCTURE MASTER PLAN

DRAFT

GOLDEN

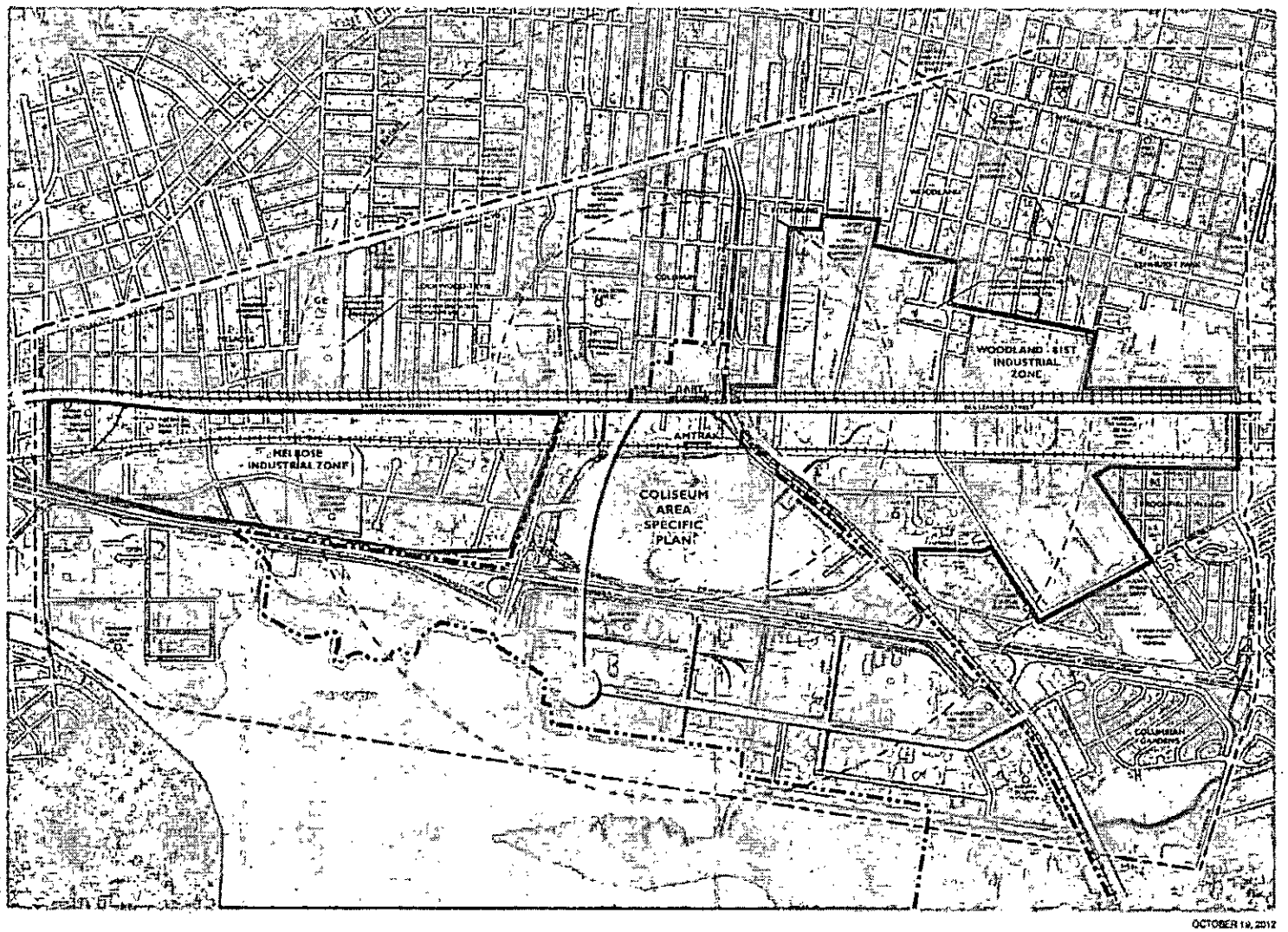
CITY of OAKLAND

Kimley-Horn and Associates, Inc.

LEGEND

- DESTINATION
- DISTANCE FROM BART STATION
- PROJECT BOUNDARY
- INDUSTRIAL ZONE
- EXISTING BART AND FUTURE AIRPORT CONNECTOR
- UPRR TRACK
- COLISEUM CITY BAY A PLAN*
- EXISTING FIBEROPTIC CABLING
- PROPOSED FIBEROPTIC CABLING
- TERMINATION POINT
- EXISTING PARKS
- EXISTING PUBLIC (CLOSED SITES)
- HISTORIC DISTRICT (AREA QUALIFIED MAP & GUIDE)

* The Coliseum Area Specific Plan is part of an ongoing Specific Plan and EIR Effort. The Coliseum Industrial Infrastructure Master Plan does not include projects or elements of projects that have been proposed within the Coliseum City Area Plan boundary.



NOTE: To view all relevant plans and projects, refer also to the Release Plan & Projects Plan, the Bicycle Connections Plan and the Pedestrian Connections Plan

OCTOBER 19, 2012

FIBEROPTIC PLAN

COLISEUM INDUSTRIAL INFRASTRUCTURE MASTER PLAN

DRAFT

GOLDEN GATE CONSULTANTS

CITY of OAKLAND

KHA Kimley-Horn and Associates, Inc.

Exhibit F

Oakland Police Department

Bureau of Services

Communications Section 7101 Edgewater Drive. Building #8

Communications Section

Annual Report 2012

Oakland Police Communications Section 7101 Edgewater Drive Building #8

I. Section Functions / Responsibilities

The Communications Section answers and evaluates various citizen calls for service; dispatches resources or refers calls to the appropriate agency or organizational unit. The Section is the Public Safety Answering Point (PSAP) for the City of Oakland. Communications receives all emergency calls for police, fire, and medical service requests. It dispatches police resources and forwards other emergency calls to the appropriate agency. The Section receives and evaluates all non-emergency calls for police and City services.

Services Provided

- Answers 9-1-1 calls for service and calls on other emergency and non-emergency lines.
- Transfers fire and medical calls to the Fire Services Agency.
- Dispatches police officers, animal control officers, field civilians and on occasion Oakland housing Authority and Oakland Public schools police.
- Refers non-emergency calls to other Oakland Police Department units, when appropriate.
- Responds to requests for audio CD copies of 9-i-1 and other incidents from the court, attorneys, media and other persons.

- Answers the internal Affairs Division "24-Hour" Complaint Hotline after hours documenting misconduct allegations or service complaints, notifying the Watch Commander and dispatching a supervisor if appropriate.

- Maintains and logs all the Use of Force incidents "24-Hour" in the City. Documenting information and forwarding for reporting compliance.

- Monitors the Shot Spotter equipment and creates calls for service and dispatch if appropriate.

- Conducts mandatory basic dispatch training for new hired dispatchers and in-service training for entire staff.

- Supports tactical and other emergency operations via the Tactical Operations Support Team.

- Provides service channel requests for field officers and City personnel when needed. Callbacks, warrants checks and confirmation, Phone notifications and call documentations and follow up services.

- Attends and participates in Community meeting to provide training, awareness and educate the community on the use of 911 services.

II. Staffing

Staffing history: It is critical to the timely delivery of emergency services to maintain Section staffing.

- On 16 Feb 1999, the City Council recognized the importance of maintaining staffing and passed Resolution 74790 C.M.S. The Resolution found that "the 9-1-1 emergency response line is one of the most vital services provided" and that "there is a critical need to begin the testing and hiring without delay". The funding for the hiring was provided through an "increase in General Fund revenues resulting from a utility user's tax settlement". However, in the last six years there have been only three job tests for Dispatchers.

- At the beginning of fiscal year 2003-04, the Communications Section Police Communications Dispatcher (PCD) staffing was reduced from 92 to 73 positions in order to save City funds.

- Starting July 2004, the civilian supervisory (PCS) staffing was reduced from 5 to 4 positions.

- In 2005, one PCD position was cut bringing the Sections authorized full time employee staffing to 72.

- In late 2008 staffing was reduced by two PCD positions from 72 to 70 to save City funds.

Communications Commander Carlos A. Gonzalez

IX. Major Projects for 2013

- Implement the 9-1-1 Wireless Project – In coordination with State Telecommunications, California Highway Patrol, (Golden Gate) AT&T, 9-1-1 and City Information Technology Section begin process to implement the acceptance of wireless (cell phone) calls by the 9-1-1 Center

- Develop and install an internet monitoring system at the Communications Section for live intelligence feed. The installation of three 70" monitors and four 50" monitors to monitor all high risk or tactical operations that require monitoring.

- Establish and maintain a service and maintenance plan for radio consoles and handheld radios. To improve the radio system for daily use for front line officers and public safety personnel.

Carlos A. Gonzalez
Lieutenant of Police
Communications Section

Exhibit G

Bridging the Digital Divide

The EBBC was formed to close the gaps in broadband infrastructure and access and advance the region as a center of innovation for advanced communications technologies.

About the East Bay Broadband Consortium

The East Bay Broadband Consortium (EBBC) is an East Bay regional initiative organized to improve broadband deployment, access, and adoption in Alameda, Contra Costa and Solano counties through a collaborative regional approach.

Broadband – high speed Internet – is a critical 21st century infrastructure that is a key enabling technology for:

- Economic competitiveness
- Public health and safety
- Sustainable Communities
- The Smart Grid
- Access to information and services delivered through broadband applications and technologies

Basic digital literacy skills are virtually essential to every aspect of the 21st century economy. Yet infrastructure and access gaps are present in the East Bay, resulting in a persistent "Digital Divide."

EBBC was formed to close these gaps and advance the region as a center of innovation for advanced communications technologies, leveraging the region's deep knowledge assets. The EBBC Action Plan will identify and leverage opportunities aimed at increasing:

1. The region's broadband infrastructure investments (public and privately financed).
2. Affordable access to broadband technologies.
3. Wide adoption of broadband to acquire the benefits of these technologies.

The EBBC vision is to make the three-county East Bay the nation's leading broadband enabled region in the nation.

The East Bay Broadband Consortium

EBBC was organized by three East Bay economic development organizations – the East Bay Economic Development Alliance (EDA), the Contra Costa Economic Partnership, and the Solano Economic Development Corporation (EDC), in partnership with the California Emerging Technology Fund and support from the East Bay Community Foundation and the Lesher Foundation. In January 2012, EBBC was awarded a three year grant from the California Public Utilities Commission to implement an Action Plan.

The EBBC's three primary roles in achieving the intended goals of the Action Plan are to convene, build consensus and organize the enabling network. The East Bay Community Foundation, East Bay EDA, Contra Costa Economic Partnership, and Solano EDC serve as the Consortium Steering Committee, with the Partnership serving as the fiscal agent. Consortium Members will provide advice and recommendations as well as collaborate in implementing policies and projects. There will be a Technical Advisory Group to provide technical expertise, and additional Work Groups may be formed during the project planning and implementation process.

Exhibit H

LICENSE AGREEMENT

THIS LICENSE AGREEMENT (this "License") is entered into effective as of October 17, 2011 ("Effective Date") by and between the City of San Leandro, a municipal corporation ("City") and San Leandro Dark Fiber, a limited liability company ("SL Dark Fiber"). The City and SL Dark Fiber are sometimes hereinafter referred to individually as "Party" and collectively as the "Parties."

RECITALS

A. The City is the owner of the real property (the "Property") containing City conduit that houses City-owned fiber optic wiring and related facilities, as more particularly described by diagrams and maps in Exhibit A, attached hereto and incorporated herein by reference.

B. The City has the authority to regulate the terms and conditions for the use of the public right-of-way or service easements within the City's jurisdiction.

C. SL Dark Fiber desires to install and operate fiber optic cables and related facilities (the "Project") in the existing conduit or other City infrastructure located on the Property and within the City's right-of-way, that will be used to support the provision of telecommunications services to existing and future customers in the City.

D. On June 6, 2011, the Parties entered into an Exclusive Negotiating Rights Agreement allowing City Staff to pursue negotiations and grant SL Dark Fiber with exclusive negotiating rights regarding SL Dark Fiber's proposed development of the Project.

E. Prior to execution of this License, SL Dark Fiber has demonstrated that it has sufficient financial resources to fund the Project.

F. In order to carry out and complete the Project, SL Dark Fiber must have access to the Property and the public right-of-way in exchange for the grant of dark fiber strands to the City.

G. To this end, the purpose of this License is to grant limited permission to SL Dark Fiber to enter onto and use the Property for the duration of the Project, solely for the purposes of the Project, strictly on the basis stated herein and subject to the terms, conditions and covenants stated herein.

In view of the foregoing recitals and the covenants below, all of which constitute good and valuable consideration, with the intention to be legally bound the Parties agree as follows:

ARTICLE I
DEFINITIONS

1.1. "Abandonment" is defined in Section 2.6(c).

1.2. "Applicable Laws" is defined in Section 5.1.

1.3. "City Property" is defined in Section 3.4.

1.4. "City Strands" is defined in Section 2.4(b).

1.5. "Claims" is defined in Section 10.1.

1.6. "Contractors" is defined in Section 3.5.

1.7. "Construction Permits" is defined in Section 5.2.

1.8. "Effective Date" is defined in the preamble of this Lease.

1.9. Reserved.

1.10. "Hazardous Materials" is defined in Section 11.3(b).

1.11. "Hazardous Materials Claims" is defined in Section 11.1(c).

1.12. "Hazardous Materials Laws" is defined in Section 11.3(c).

1.13. "Indemnitees" is defined in Section 10.1.

1.14. "Initial Term" is defined in Section 2.3.

1.15. "License Fee" is defined in Section 2.2.

1.16. "Permitted Activity" is defined in Section 2.1.

1.17. "Permitted Work" is defined in Section 3.1.

1.18. "Property" is defined in Recital A.

1.19. "Project" is defined in Recital C.

1.20. "Remedial Work" is defined in Section 11.3(a).

1.21. "Required Insurance" is defined in Section 9.1.

1.22. "Scope of Work" is defined in Section 3.1.

1.23. "Reserved.

1.24. "SL Dark Fiber Studies" is defined in Section 2.9.

ARTICLE II
GRANT OF LICENSE; LICENSE FEES; TERM; CONVEYANCE OE FIBER TO CITY; DUE DILIGENCE

2.1. Grant of License; No Leasehold of Property Rights Created. The City hereby grants to SL Dark Fiber a non-exclusive, non-revocable License to enter onto, have access and use the Property, for the sole purpose of installing and operating a fiber optic cable of not more

than a two hundred eighty-eight (288) strand capacity (unless otherwise mutually agreed upon by the Parties in writing) and related facilities in the existing conduit or other City infrastructure located on the Property or within the City's right-of-way in order to support the provision of telecommunications services in the City. This License is not intended to nor shall it be interpreted to create or vest in SL Dark Fiber any leasehold, easement or any other property rights or interests in the Property or any part thereof.

2.2. License Fee. On or before the first day of Years 1 through 10 of the Initial Term of this License, SL Dark Fiber shall pay to the City a fee (the "License Fee") in the amount of one dollar ($1.00) per year for the use of the Property. Such fee is not a revenue sharing arrangement for the telecommunications services to be provided using the Property.

(a) Interest. Any amount due from SL Dark Fiber to the City which is not paid when due shall bear interest at the lesser of ten percent (10%) per annum or the maximum rate which the City is permitted by law to charge, from the date such payment is due until paid, but the payment of such interest shall not excuse or cure any default by SL Dark Fiber under this License.

(b) License Fee Review and Increase. Commencing in Year 11 of this License and for every subsequent year in the Initial Term, SL Dark Fiber shall provide sufficient information to the City to document that SL Dark Fiber's operation of the Project has generated for SL Dark Fiber or any partners, affiliates, subsidiaries, or any majority shareholding entity of SL Dark Fiber no net profit or else SL Dark Fiber shall pay an increased License Fee equal to the market rate for conduit at that time, as defined in Section 2.2(c). This increased License Fee shall then be payable for the remainder of the Initial Term with an annual adjustment for inflation.

(c) Market Rate. Market rate shall be determined by mutual agreement of the Parties based on ten recently negotiated commercial conduit licensing agreements. If the Parties are unable to agree, then they shall submit to formal mediation with a jointly agreed upon mediator. If mediation is unsuccessful, than the parties shall submit to binding arbitration under the rules of the American Arbitration Association and the decision of the arbitrator(s) shall be enforceable in any court having jurisdiction thereof. Arbitration shall occur only in Alameda County, CA. In the event any dispute is arbitrated, the prevailing Party (as determined by the arbitrator(s)) shall be entitled to recover that Party's reasonable attorney's fees incurred (as determined by the arbitrator(s)).

2.3. Initial Term. This License shall commence on the date first signed by the Parties and shall have an Initial Term of twenty (20) years.

(a) Renewal Right; License Fee During Renewal Term. SL Dark Fiber shall have the right to renew the lease for four (4) additional five (5) year terms, immediately following the Initial Term ("Renewal Terms"). The License Fee payable during each of the Renewal Terms shall be the market rate for conduit as determined on the first (1st) year of that

Renewal Term, and shall adjust for inflation each subsequent year of that Renewal Term. All other terms and conditions of this License shall apply during any Renewal Term. In order to exercise the Renewal Right for a Renewal Term, SL Dark Fiber shall send written notification to the City as early as fifteen (15) years prior to the commencement of, and no later than one hundred and eighty (180) calendar days prior to, the expiration of the then-effective term (Initial or Renewal).

2.4. Third Party Access to, and City Ownership of the Fiber Contained in the Project.

(a) The City hereby agrees that SL Dark Fiber may enter into agreements with affiliates or third parties to provide telecommunications services using the portion of the Project SL Dark Fiber owns.

(b) In addition to any fiber optic cable and related facilities provided to the City by SL Dark Fiber under this License and upon Project completion, SL Dark Fiber agrees to convey to the City the ownership and exclusive use of thirty (30) strands of the dark fiber ("City Strands") installed for the Project in any area of conduit where there is sufficient capacity for SL Dark Fiber to install a 288-strand fiber cable. If space constraints limit SL Dark Fiber to install fewer than 288 strands of fiber, then the City shall have ownership and exclusive use of ten (10) percent of the number of fiber strands installed. The Parties agree that there are no restrictions on the City's use of the City Strands.

2.5. City Approval of Sale or Transfer; City Right of First Refusal.

(a) If at any time during the Initial or Renewal Terms of this License, SL Dark Fiber wishes to sell, transfer or otherwise dispose of the Project, or enough of a portion of the Project to result in a change of control, SL Dark Fiber must notify the City. The City shall have the Option and Right of First Refusal for one hundred and eighty (180) days after receipt of such notice within which to elect in writing to purchase such fiber optic cable and/or associated facilities. The addition of investment capital by a third party shall not trigger the City's Option and Right of First Refusal.

(b) If the City elects to exercise its Option and Right of First Refusal to purchase SL Dark Fiber's fiber optic cable and associated facilities; it acknowledges and agrees that it will assume and continue to provide facilities to support any unexpired customer(s) on Project

(c) Agreement(s) for telecommunications services provided on SL Dark Fiber's facilities through any affiliate or agreements with third parties using SL Dark Fiber's facilities to provide telecommunications services using facilities in the Project, provided such agreements satisfy the terms of this License. The City will continue to support the agreements explained in the preceding sentence only for the remaining term of such agreement and any prior exercised contracted extensions and only if such agreement was effective at the time that SL Dark Fiber gave written notice to the City of SL Dark Fiber's intent to sell, lease or otherwise dispose of its portion of the Project.

(d) If the City fails to exercise its Option and Right of First Refusal, then SL Dark Fiber may proceed to sell, assign or otherwise dispose of the Project upon the City's

written consent, which shall not be unreasonably withheld. The City agrees and acknowledges that the purchasing entity shall have the right to use the portions of the Project that the City does not own to continue providing service to support any unexpired customer agreement for telecommunications services provided by SL Dark Fiber or any affiliate or third party with whom SL Dark Fiber has contracted to provide telecommunications services, provided such agreement satisfies the terms of this License and any extensions.

2.6. Termination, Abandonment or Expiration of License or Project.

(a) This License may be terminated at any time by mutual agreement of the Parties.

(b) Either party shall have the right to terminate this License upon the other Party's material breach of this License in which the breaching Party fails to commence a cure of such breach within ten (10) calendar days of written notice of default from the non-breaching party. SL Dark Fiber shall have the right to terminate this License, effective upon ten (10) days written notice to the City, if the results of its investigation into the feasibility of the Project or the Property inspection described in Sections 2.8 and 2.9 below are unsatisfactory or if SL Dark Fiber is unable to obtain other necessary approvals, certifications, rights or interests. Neither Party shall have the right to seek an award of damages as a result of the termination of this License pursuant to this Section 2.6(a). If SL Dark Fiber terminates this License prior to any portion of the Project becoming operational (*i.e.*, the Project is capable of supporting telecommunications services), then ownership of any fiber optic cable or associated facilities already installed will transfer to the City.

(c) After the first five (5) years of the Initial Term, the City shall have the right to terminate this License in the event that SL Dark Fiber abandons the Project for at least one hundred twenty (120) days. For purposes of this Agreement, "abandons" or "abandonment" means the intent to absolutely surrender or relinquish the Project. Periods of disuse due to force majeure events (defined above), or other events causing the Project to be unusable or in disrepair, shall not be interpreted or construed as abandonment. Force majeure is defined as any inability of a Party to perform because it is directly prevented or delayed by reason of strikes, lockouts, labor disputes, supply shortages, utility outages, civil disorders, actions of governmental authorities, actions of civil or military authority, national emergency, insurrection, riots, war, acts of God, fire, floods, epidemics, freight embargoes, power outages or other causes beyond the reasonable control of the party. The City shall attempt to contact SL Dark Fiber at the address contained herein for notices at least once per month during the 120 day period of asserted abandonment to notify SL Dark Fiber that the City believes the Project has been abandoned.

(d) Both Parties acknowledge and agree that if telecommunications services are being provided to customers, any termination of this License (whether by mutual consent or due to breach) that would affect or terminate such telecommunications services is subject to

regulatory requirements and that they will comply with such regulatory requirements. In the event of abandonment, the City will not be bound to any agreements between SL Dark Fiber and and third parties or affiliates.

(e) Ownership of the Project Upon Termination or Abandonment. Upon termination or expiration of this License, or abandonment of the Project ownership of the Project shall automatically transfer to the City.

(f) Effect of Termination on License. Upon termination as provided herein, or upon the expiration of the Initial Term and any extensions thereof, this License shall forthwith be void, and there shall be no further liability or obligation on the part of either of the Parties or their respective officers, employees, agents or other representatives; provided however, that certain provisions of this License shall survive such termination, as specified herein.

(g) Access to Unused Conduit Space. After the first five (5) years of the Initial Term the City may permit others access to unused conduit space and such access will not constitute a reduction in capacity of conduit specified for use by SL Dark Fiber.

2.7. Nonexclusive License. SL Dark Fiber understands that this License does not provide SL Dark Fiber exclusive use of the Property and that the City shall have the right to permit other providers of communications or other entities to install equipment or devices in or on the Property. However, in granting others a similar license for access to and use of the Property, or for the City's own use, the City agrees that it will not make or allow a subsequent change to the Property that materially affects SL Dark Fiber's ability to use the Property for the Project, including reducing the capacity of conduit specified for use by SL Dark Fiber, or that materially interferes with or degrades the services provided by SL Dark Fiber.

2.8. Inspection of Propeny; Right of Entry Agreement. At its sole discretion, SL Dark Fiber must inspect, examine, survey, and prepare any studies, surveys, plans, specifications and reports ("SL Dark Fiber Studies") that SL Dark Fiber deems necessary or desirable to determine the viability of the Project. Such studies may include, without limitation, marketing, feasibility, seismic and environmental studies, financial feasibility analyses and design studies. SL Dark Fiber's inspection, examination, survey and SL Dark Fiber Studies shall be at SL Dark Fiber's sole expense. SL Dark Fiber shall be responsible for obtaining the City's advance written permission for access to the Property as may be necessary to prepare the SL Dark Fiber Studies. SL Dark Fiber shall provide the City with a summary of the results of SL Dark Fiber Studies for the limited purpose of notifying the City that SL Dark Fiber has determined that the Property is suitable for the Project. After any necessary inspection, examination, survey or review SL Dark Fiber shall repair, restore and return the Property to its condition immediately preceding SL Dark Fiber's entry therein at SL Dark Fiber's sole expense, unless otherwise directed by the City. The provisions of this Section 2.8 shall survive the expiration or earlier termination of this License.

2.9. AS-IS Conveyance. The City hereby grants this License to SL Dark Fiber for the Property in its "as-is" condition existing on the Effective Date, and SL Dark Fiber acknowledges that, except as otherwise expressly set forth in this License, the City makes no representations or warranties to SL Dark Fiber with regard to the condition of the Property or the fitness or

suitability thereof for SL Dark Fiber's purposes, including but not limited to, matters pertaining to topography, utilities, soil, subsoil, presence or absence of fill, presence or absence of Hazardous Materials (as defined in Section 11.3(b)), drainage, flood zone designation, environmental laws, rules, or regulations. The City shall allow SL Dark Fiber to have access to the Property at no charge for inspection and verification of the suitability of the Property for the Project. SL Dark Fiber shall rely solely on its own independent investigation and judgment as to all matters relating to the Property and the suitability of the Property for SL Dark Fiber's use. SL Dark Fiber represents that it has, prior to the execution of this License, made investigations of the Property, including without limitation such inquiries of governmental agencies, soils testing, tests and inspections as SL Dark Fiber has deemed necessary to determine the condition of the Property and that SL Dark Fiber, by execution hereof, accepts the Property in its current "as-is" condition and state. Notwithstanding this provision, the City agrees that it will negotiate with SL Dark Fiber in good faith to accommodate SL Dark Fiber's capacity needs, including replacing, relocating or sharing existing City fiber optic cable or related facilities with SL Dark Fiber. Any costs arising from such accommodation shall be mutually agreed to in writing by the City and SL Dark Fiber.

2.10. Financial Feasibility. Prior to the execution of this License, SL Dark Fiber must provide the City with confirmation that it has sufficient financial resources and commits to fund the Project.

2.11. Annual Reporting. Together with any applicable License Fee, SL Dark Fiber shall send to the City a confidential written annual report detailing information regarding the number of subscribers, capacity used, capacity available, and revenue received from the Project. Such report is designated a SL Dark Fiber trade secret exempt from disclosure under the California Public Records Act.

ARTICLE III
SCOPE OF WORK; PERFORMANCE OF WORK; DEVELOPMENT SCHEDULE

3.1. Scope of Work. Pursuant to this License, the City authorizes SL Dark Fiber to install the Project in the existing conduit of the Property (hereinafter "Permitted Work") as described in the "Scope of Work," attached as Exhibit B and incorporated herein by this reference. The performance of the Scope of Work shall be at SL Dark Fiber's own risk, subject to inspection with or without notice at any and all times by the City, final approval by the City and subject to the City's review of SL Dark Fiber's final plans for the Project. Any improvements made to the Property as a result of the Scope of Work shall be for the benefit of the City, and all costs shall be home by SL Dark Fiber.

3.2. Development Schedule. SL Dark Fiber shall make all effons to comply with the Development Schedule, attached as Exhibit C and incorporated herein by this reference, which includes a schedule describing the anticipated dates by which SL Dark Fiber shall obtain entitlements, commence construction, and complete the Project. The City shall assist SL Dark Fiber in obtaining any necessary permits or entitlements from the City (including but not limited to encroachment permits and environmental review). The City acknowledges and agrees that the schedule set forth in Exhibit C is a best estimate by SL Dark Fiber and that any failure or inability to meet the deadlines set forth in Exhibit C shall not constitute a material breach or

grounds for termination of this License, unless SL Dark Fiber abandons the Project for one hundred twenty (120) days.

3.3. Workmanlike Standard. The Permitted Work shall be performed in a good and workmanlike manner consistent with the standard of care and level of skill presently maintained by the practice of professionals in this locale; in compliance with all federal, state and local laws, ordinances, rules and regulations, in a manner so as not to disturb the occupancy, business or quiet enjoyment of any other tenants or licensees of the Property; and in a manner so as to avoid harm to person(s) or the Property.

3.4. Damage to City Property During Construction and Installation of the Project. Precautions must be taken by SL Dark Fiber to avoid interference with or damage to the City's real and personal property. SL Dark Fiber's equipment must not damage wire lines at, over or near the Property, as well as any other utilities or structures located thereon. SL Dark Fiber shall be liable for any damage to the Property, or any other property of the City or the City right-of-way (all of the foregoing, collectively, "City Property") that occurs as a result of this License and the use of the Property, unless caused by the gross negligence or willful misconduct of the City or its employees, agents or contractors. Any waste generated in the process of completing the Permitted Work will be the responsibility of SL Dark Fiber, at SL Dark Fiber's sole cost and expense.

3.5. Subcontractors. SL Dark Fiber shall be responsible for all Contractors and all subcontractors engaged to complete the Permitted Work ("Contractors"), including, without limitation, responsibility for the payment of any compensation or other amounts payable to Contractors, and shall be responsible for their conduct and the conduct of their employees, agents and volunteers. SL Dark Fiber shall direct the Permitted Work rendered or performed by Contractors using SL Dark Fiber's skill and attention, shall require discipline and good order among its employees and subcontractors, and shall not knowingly employ or engage, on the job, any person unfit or unskilled for the task assigned to him or her. All Contractors and subcontractors shall be properly licensed and insured to complete work within the public right-of-way.

3.6. Materials and Supplies. SL Dark Fiber shall, at SL Dark Fiber's own cost and expense, furnish (unless herein otherwise specifically provided) all superintendence, labor, tools, equipment, materials, and supplies and all other things requisite and necessary to perform the Permitted Work under this License.

3.7. Supervision by SL Dark Fiber. SL Dark Fiber shall be responsible for the direction of the Permined Work, be responsible for all methods, sequences and procedures used in connection with the Permitted Work, and be responsible for coordinating all portions of the Permitted Work. All persons entering the work zone pursuant to this License shall wear safety glasses with side shields, hard hats and steel-toed safety shoes, and shall abide by CAL-OSHA rules and regulations.

3.8. Independent Contractor. SL Dark Fiber and the agents and employees of SL Dark Fiber are not employees of the City. SL Dark Fiber is acting as an independent contractor and nothing herein contained shall be construed inconsistent with that status.

ARTICLE IV
ECONOMIC BENEFITS; CONFORMANCE WITH GENERAL PLAN

4.1. Economic Benefits of Project. Exhibit D, attached hereto and incorporated herein by reference, confirms that the Project is consistent with the City's Economic Development Plan and General Plan.

4.2. Addition of Other Businesses to Project. Exhibit E of this License identifies third parties that SL Dark Fiber may contract with to provide telecommunications services using facilities that are included in the Project, and describes how SL Dark Fiber proposes to allow businesses or other entities access to the Project. Such list shall be updated from time to time upon the City's request. The disclosure of such affiliates or third parties is provided as a courtesy only, and shall not be construed as a request for approval from the City.

ARTICLE V
COMPLIANCE WITH LAW; PERMITS AND APPROVALS; LIENS AND ENCUMBRANCES

5.1. Compliance With Law. In completing the Permitted Work, SL Dark Fiber shall comply, and shall require Contractors to comply with all applicable federal, state and local laws, statutes, ordinances, codes, rules, regulations, orders, judgments and decrees (collectively, "Applicable Laws").

5.2. Permits. SL Dark Fiber shall obtain all necessary permits and authorizations required by Applicable Laws. Prior to commencing the Permitted Work, SL Dark Fiber shall apply for and obtain, or cause to be applied for and obtained, from the City all necessary separate authorizations by the City, apart from this License, required by the City's Municipal Code and any other City rules and regulations, including encroachment permits, building permits and any other City permits (collectively "Construction Permits") from the City. The City shall assist SL Dark Fiber in obtaining all such permits. SL Dark Fiber shall comply with all generally applicable City requirements for the issuance of Construction Permits, such as the payment of standard fees, the submission of plans, installation plans, and traffic control plans. If SL Dark Fiber commences the Permitted Work without meeting such requirements, the City shall notify SL Dark Fiber of such deficiency and give SL Dark Fiber a reasonable period to cure such deficiency. If SL Dark Fiber does not cure such deficiency within sixty (60) days, then the City may, at its option, immediately remove any or all non-conforming equipment. Any removals of such equipment pursuant to this Section shall be at the risk of SL Dark Fiber and any such removed equipment shall be stored only for sixty (60) days by the City and disposed of thereafter in a manner to be determined solely by the City. SL Dark Fiber shall reimburse the City for all costs of removal and storage incurred, within thirty (30) days of receipt of an invoice detailing the same.

5.3. Liens and Encumbrances. SL Dark Fiber shall at all times keep the Property free and clear of all liens and encumbrances (including mechanic's liens) affecting title to the Property or arising from any act or omission of SL Dark Fiber or those claiming under SL Dark Fiber. The provisions of this Section 5.3 shall survive the expiration or earlier termination of this License. SL Dark Fiber shall pay as due all undisputed claims for work done, and for services

rendered or material furnished to the City Facilities as part of the Project, at the City's request. If SL Dark Fiber fails to pay any undisputed claims or to discharge any undisputed liens, the City may do so and collect all costs of discharge, including its reasonable attorneys' fees. Payment or discharge by the City shall not constitute a waiver of any right or remedy the City may have on account of SL Dark Fiber's default. SL Dark Fiber may withhold payment of any claim in connection with a good faith dispute over the obligation to pay, so long as the City's property interests are not jeopardized. If a lien is filed as a result of nonpayment, SL Dark Fiber shall within ten (10) business days after knowledge of filing of the lien, provide the City with an executed copy of a discharge of the lien, or deposit with the City cash or a sufficient corporate surety bond or other security satisfactory to the City in an amount sufficient to discharge the lien plus any costs, attorney fees or other charges that could accrue as a result of any foreclosure sale or sale under the lien. This License shall be subject and subordinate to any liens and encumbrances as are now on or as the City may hereafter impose on City Property, and SL Dark Fiber shall upon request of the City, execute and deliver agreements of subordination consistent with this Section.

ARTICLE VI
REPRESENTATIONS

SL Dark Fiber represents and warrants to the City as follows:

6.1. Facilities and Experience. SL Dark Fiber is able to cause the performance of the Permitted Work and has the knowledge, experience and competence to do so.

6.2. Solvent. SL Dark Fiber is financially solvent, able to pay its debts as they mature and is possessed of sufficient working capital to cause the performance of the Scope of Work and meet their obligations under this License.

6.3. Authority. SL Dark Fiber is authorized to do business in California; the County of Alameda and the City, and is properly qualified, certified and licensed to cause the performance of the Permitted Work by all necessary governmental and quasi-governmental authorities having jurisdiction over SL Dark Fiber.

6.4. Execution. SL Dark Fiber's execution of this License and performance of it is within its duly authorized powers, and neither SL Dark Fiber, nor its respective employees, agents or subcontractors are subject to any restrictive obligations imposed by any third party which would impair SL Dark Fiber's ability to cause the performance of the Permitted Work, or which would prevent SL Dark Fiber from complying fully with the requirements of this License.

ARTICLE VII
COSTS

7.1. Project Costs. SL Dark Fiber has the sole responsibility for all Project costs, including without limitation all design, development, and construction costs and the cost of all improvements, if any. SL Dark Fiber shall submit design and construction drawings and plans in conformance with the Development Schedule attached as Exhibit C. Except as otherwise expressly provided herein, SL Dark Fiber shall pay all of its own costs and expenses incurred in connection with this License and the activities contemplated hereby. SL Dark Fiber shall be

responsible for any environmental studies required by the California Environmental Quality Act ("CEQA"), including an Environmental Impact Report should one become necessary, that is required for the approval of this License or other agreements pertaining to the Project.

7.2. City Responsible for its Own Expenses. The City will be responsible for its costs (including staff, attorney and consultant time) and expenses to permit SL Dark Fiber to access the Property and to conduct any studies including without limitation any environmental, marketing, financial feasibility, and design studies it deems necessary to assist it with the analysis of the Project.

ARTICLE VIII
MAINTENANCE; REPAIRS

8.1 Obligation to Repair, Maintain and Secure the Project. SL Dark Fiber shall have sole responsibility for the installation, operation, maintenance, security, replacement and repair of the Project and, the City shall have sole responsibility for the routine inspection, maintenance, repair, and security of the Property, including all conduit, vaults and other City infrastructure. Repair obligations in the event of damage caused by a third party is set forth in section 8.7 below. In the event of damage to City Property, including but not limited to City conduit, caused by SL Dark Fiber or its Contractor related to SL Dark Fiber's work to install or to repair the Project, including but not limited to theft or damage to City Infrastructure, SL Dark Fiber shall be responsible for repair and restoration of the City's Property and conduit. Both Parties agree and acknowledge that time is of the essence for repair of the Property used for the Project that is in use to provide telecommunications services. SL Dark Fiber shall be responsible for replacement or repair of its fiber optic cable and related facilities. 8.2 Secure and Safe Condition and Good Repair. SL Dark Fiber shall keep the Project and the City Property free of debris and anything of a dangerous, noxious or offensive nature or which would create a hazard or undue vibration, heat, noise or interference. SL Dark Fiber shall, at its own expense, maintain the Project in (i) a safe condition, in good repair; (ii) in a manner reasonably satisfactory to the City so as not to conflict with the use of or other leasing of the Property by the City; and (iii) in conformity with such requirements and specifications as the City may require at the time of installation and thereafter in compliance with all federal and state applicable laws and regulations of general applicability, including but not limited to the National Electrical Safety Code. SL Dark Fiber shall not interfere with the City or other tenant's use of the City Property, related facilities or other equipment on the City Property. SL Dark Fiber shall secure the Project at all times to prevent access and theft of the Project. The City shall secure the Property, including any City infrastructure or conduit, to prevent access, damage or theft of the Project and SL Dark Fiber shall cooperate with such efforts.

8.3 City's Rights with Regard to Maintenance. SL Dark Fiber recognizes the City must have the right to take any reasonable action that it deems necessary, in its sole discretion, to repair, maintain, alter, or improve the Property and provision of electrical power thereon to protect the public health and safety of its citizens, including users of the Property. The City acknowledges and agrees that, to the extent feasible, any such action shall not damage, interfere with or degrade the telecommunications services or facilities provided by SL Dark Fiber, its affiliates or designated third parties. Other than emergency repairs, the City shall have no duty to make repairs to the Property used by the Project until SL Dark Fiber has given written notice

to the City of the repairs to be made or the condition to be corrected. The City shall have no liability for failure to make any repair required of it if the repair is completed within a reasonable time following the notice from SL Dark Fiber. The City agrees that it will take all reasonable steps to prevent damage such as cable cuts to the Project by ensuring that all such property is marked or otherwise identified in City records to prevent accidental damage, by requiring any entity (including City personnel or contractors) to consult such markings or records prior to undertaking any ground disturbing activities, and by including a condition on all excavation permits that requires the applicant to pay for any damage to the City's Property and all SL Dark Fiber property located thereon. The City agrees to seek reimbursement for such repair and restoration from the entity that caused the damage, but that such repair and restoration shall not be delayed pending such reimbursement.

8.4 Mutual Cooperation. The City agrees to cooperate with SL Dark Fiber, in a reasonable and non-discriminatory manner, in obtaining, at SL Dark Fiber's expense (including reimbursement of the City's reasonable attorney and administrative fees), any City or federal licenses and permits required for or substantially required by SL Dark Fiber's use of the City Property. SL Dark Fiber shall use reasonable care during the installation of its fiber cable, and after installation shall test to verify that SL Dark Fiber's fiber optic facilities do not cause interference or loss of signal of any City owned or operated communications services.

8.5 Relocation at City's Request. SL Dark Fiber understands and acknowledges that the City may occasionally require SL Dark Fiber to relocate or remove the Project, at SL Dark Fiber's sole cost and expense, whenever the City reasonably determines that the relocation or removal is needed to address an emergency situation that puts at risk the public health or welfare. If the City desires for SL Dark Fiber to relocate facilities for any of the following non-emergency purposes: (a) to facilitate the construction, completion, repair, relocation, or maintenance of a City facility or project; (b) to prevent interference with the proper operation of City-owned light poles, traffic signal poles, or other City facilities or services, the City shall give SL Dark Fiber thirty (30) days notice and shall afford SL Dark Fiber a reasonably equivalent alternate location for the same License Fee. The City and SL Dark Fiber shall mutually agree in writing who shall bear the costs for such non-emergency moves. If, after agreement on payment of costs is reached, SL Dark Fiber fails to relocate or remove any of its facilities as requested by the City within a reasonable period that enables SL Dark Fiber to avoid disruption of service to its customers, the City shall be entitled to relocate or remove the same at the sole cost and expense of SL Dark Fiber, with notice to SL Dark Fiber. In such event the City shall not be responsible for damage, but shall use reasonable care to preserve such removed equipment or facility until retrieved by SL Dark Fiber.

8.6 Alterations; Improvements. SL Dark Fiber shall not make or allow to be made any alterations, additions or improvements to any of the Property or any part thereof without first obtaining the written consent of the City. If the City provides such consent, all alterations, additions or improvements shall be made at the sole expense of SL Dark Fiber. SL Dark Fiber may update or replace the Project from time to time with prior written notice to the City; provided that (i) the replacement has been previously approved in writing by the City in this License or otherwise; (ii) the replacement is no heavier or larger and uses no more electrical power, or creates no greater health, safety, or visual impact than the model it is replacing; (iii) the electrical power consumption, size and weight of the updated equipment does not, in the

reasonable judgment of the City, place an undue burden on or risk of damage or injury to the Property, the City facilities thereon, or persons working on or affected by the City facilities; and (iv) any change in their location on the Property is approved in writing. SL Dark Fiber shall submit to the City a detailed proposal for any replacement to its equipment ih the Property and any supplemental materials, as may be requested. No equipment upgrade or replacement within the Property may be undertaken without written approval of the City, prior to the installation.

8.7 Repairs, Damages and Notification. Any damage done to Property by SL Dark Fiber, its agents or contractors, during construction, installation, repairs, maintenance, replacement, relocation and/or during operations shall be repaired or replaced immediately at SL Dark Fiber's sole cost and expense and to the City's sole satisfaction. Except in case of emergency, SL Dark Fiber shall notify the City in advance in writing and obtain approval of SL Dark Fiber's proposed construction, maintenance or repair activities to be performed on the Property in order to coordinate those activities with the City's operations. The City's approval of any construction, maintenance, and repair activities under this subparagraph shall not be unreasonably withheld. In cases of emergency, any construction, maintenance, and repair work performed without written notification to the City shall be limited to the work necessary to eliminate the emergency or otherwise protect the public health and safety, and SL Dark Fiber shall notify the City as soon as possible of the emergency and any work performed to eliminate it or protect the public health and safety. Any damage to the Property, including conduit or other City infrastructure by third parties unaffiliated with either Party shall be promptly repaired by City. Both Parties agree and acknowledge that time is of the essence for repair of the Property used for the Project that is in use to provide telecommunications services. If the Project is damaged, SL Dark Fiber will make all necessary repairs. The City shall take all reasonable and necessary actions to recover the damages caused by the third party to the Property or the Project, including but not limited to any legal action. If both the Property and the Project are damaged, SL Dark Fiber and City agree to split the costs incurred by City to recover all damages from the responsible third party in proportion to the cost of damage. For example, if the cost to repair the Property is three times the cost to repair the Project, then the City shall pay for three quarters of the total cost and SL Dark Fiber shall pay for one quarter. SL Dark Fiber shall have the right at its own expense to have counsel participate in any such legal action.

ARTICLE IX
INSURANCE

9.1. Types of Insurance Required. Prior to commencing any activities under the Scope of Work, SL Dark Fiber shall procure, or cause to be procured, and keep in full force and effect during the life of this License, at SL Dark Fiber's sole cost and expense, all of the following types of insurance:

Type of Insurance Policy	Limits
Commercial general liability policy, combined single limit	$2,000,000
Contractual liability coverage	
Comprehensive automobile liability coverage	$2,000,000
Worker's compensation	Statutory

For purposes of this License, the foregoing insurance shall be referred to herein as "Required Insurance."

9.2. Qualifications of Insurers and Deductibles. All of the Required Insurance shall be issued by an admitted insurer or insurers as defined by the California Insurance Code with a Bests' rating of no less than A:VII. The deductibles under each of the policies issued for the Required Insurance shall be reasonable in amount and in no event shall exceed the sum of Ten Thousand Dollars ($10,000.00) under each such policy.

9.3. Additional Insured; Form of Endorsement. All policies for Required Insurance will be required to name the City and its respective directors, officers, employees, agents and representatives as additional insureds by way of an endorsement. Prior to the Effective Date, SL Dark Fiber shall furnish the City with certificates of insurance in a form acceptable to the City evidencing the Required Insurance coverage and duly executed endorsements evidencing such additional insured status.

9.4. Cancellation Provisions. All of the Required Insurance shall provide (by way of endorsement or otherwise) that no cancellation, expiration, reduction or modification in such Required Insurance can occur or be implemented without first notifying the City with at least thirty (30) days prior written notice.

9.5. Primary insurance Endorsement. All Required Insurance shall contain an endorsement providing that such insurance is primary and that any insurance maintained by the City is noncontributory with the Required Insurance. All Required Insurance shall also contain language to the effect that any loss shall be payable notwithstanding or negligence of the City that might otherwise result in the forfeiture of the Required Insurance. Waiver of Subrogation. All Required Insurance shall also contain an endorsement providing for a waiver of subrogation against the City by SL Dark Fiber.

9.6. Worker's Compensation. This policy or policies shall cover the entire liability of Contractor to employees as determined by California law. The policy shall contain a waiver of subrogation against the City.

9.7. Comprehensive General Liability. General Liability Insurance must be Two Million Dollars ($2,000,000.00) combined single limit per event and annual aggregate for bodily injury and property damage liability arising out of the Permitted Work to be performed under this License.

9.8. Certificates of Insurance. Prior to the commencement of the Services, SL Dark Fiber shall provide to the City certificates of insurance evidencing the obtaining of the Required Insurance as provided in this Article.

ARTICLE X
INDEMNITY

10.1. Indemnity. To the fullest extend allowed by law, SL Dark Fiber shall defend, with counsel reasonably acceptable to the City, indemnify and hold harmless the City, its agents, officers and employees (the "Indemnitees") from and against any and all present and future

liabilities, losses, damages, fines, deficiencies, penalties, claims, demands, suits, actions, causes of action, legal or administrative proceedings, judgments, costs and expenses (including without limitation reasonable attorneys' fees and court costs) (all of the foregoing, collectively "Claims") which directly or indirecdy, in whole or in part, are caused by; arise in connection with, result from, or are alleged to be caused by this License or SL Dark Fiber's (or its agents, employees, consultants, contractors or subcontractors) failure to comply with all applicable state and federal laws and regulations relating to the construction of the Project, including without limitation, all applicable federal and state labor laws and standards, or in any other manner arising from or relating to the design, development, construction, or the operation or maintenance of the Project, whether such Claim shall be discovered before or after termination of this License. SL Dark Fiber shall not be required to indemnify the City for any Claim caused in whole or in part by the gross negligence or willful misconduct of the City (including its employees, agents and consultants). At its sole discretion, SL Dark Fiber may participate at its own expense in the defense of any claim, action or proceeding, but such participation shall not relieve SL Dark Fiber of any obligation imposed by this License. SL Dark Fiber shall notify the City promptly of any Claims and cooperate fully in its defense. It is further agreed that the City does not and shall not waive any rights against SL Dark Fiber which it may have by reason of this Section because of the acceptance by the City of SL Dark Fiber's deposit with City of any of the insurance policies described in this License. The provisions of this Section 10.1 shall survive the expiration or earlier termination of this License.

10.2. Release of Claims. SL Dark Fiber hereby waives, releases, and discharges forever the Indemnitees from all present and future Claims arising out of or in any way connected with entry upon or use of City Property by Licensee or Licensee's agents, employees, contractors or subcontractors, including without limitation all Claims arising in connection with any injury to persons or damage to or theft of vehicles, equipment, materials, or any other personal property, except and to the extent caused solely by the gross negligence or willful misconduct of any of the Indemnitees. The provisions of this Section shall survive the expiration or earlier termination of this License.

ARTICLE XI
ENVIRONMENTAL MATTERS

11.1. The City covenants that to the best of its knowledge, there are no Hazardous Materials present in, on or under the Property. Based on this covenant, SL Dark Fiber hereby covenants and agrees that throughout the Initial Term:

(a) The Project, and the use and operation thereof, shall be in compliance with all Hazardous Materials Laws, and SL Dark Fiber shall not cause or permit the Property or any portion thereof to be in violation of any Hazardous Materials Laws, as defined below;

(b) SL Dark Fiber shall not permit the Property or any portion thereof to be a site for the use, generation, treatment, manufacture, storage, disposal or transportation of Hazardous Materials, as defined below, nor shall SL Dark Fiber permit the presence or release of Hazardous Materials in, on, under, about or from the Property with the exception of materials customarily used in construction, operation, use or maintenance of facilities, provided such materials are used, stored and disposed of in compliance with Hazardous Materials Laws.

(c) Upon receiving knowledge of the same, SL Dark Fiber shall immediately advise the City in writing of (i) any and all enforcement, clean-up, removal or other governmental or regulatory actions instituted, completed or threatened against SL Dark Fiber or the Property pursuant to any applicable Hazardous Materials Laws; (ii) any and all complaints, claims, citations, demands, inquiries, reports, or notices made or threatened by any third party against SL Dark Fiber relating to damage, contribution, cost recovery, compensation, loss or injury resulting from any Hazardous Materials; (iii) the presence or release of any Hazardous Materials in, on, under, about or from the Property; or (iv) SL Dark Fiber's discovery of any occurrence or condition on any real property adjoining or in the vicinity of the Property classified as "Border Zone Property" under the provisions of California Health and Safety Code, Sections 25220 et *seq.*, or any regulation adopted in connection therewith, that may in any way affect the Property pursuant to any Hazardous Materials Laws or cause it or any part thereof to be designated as Border Zone Property. The matters set forth in the foregoing clauses (i) through (iv) are hereinafter referred to as "Hazardous Materials Claims." The City shall have the right at its own expense to join and participate in, as a party if it so elects, any legal proceedings or actions initiated in connection with any Hazardous Materials Claim.

(d) If the presence of any Hazardous Material on the Property results in any contamination of the Property in violation of Hazardous Materials Laws, except to the extent such contamination is caused by the City, its employees, agents or contractors, SL Dark Fiber shall promptly take all actions at its sole expense as are necessary to remediate the Property as required by law; provided that the City's approval of such actions shall first be obtained, which approval may be withheld in the City's reasonable discretion. All costs and expenses of any Remedial Work shall be paid by SL Dark Fiber, it being understood that the City shall incur no cost, expense or liability in connection with any Remedial Work. The City shall have the right, but no obligation, to join and participate in, as a party if it so elects at the City's cost, any legal proceedings or actions initiated in connection with any Hazardous Material Claims.

11.2. Release of Claims. SL Dark Fiber hereby waives, releases and discharges forever Indemnitees from all present and future Claims SL Dark Fiber may have arising directly or indirectly from the presence or alleged presence of Hazardous Materials on, under, in or about the Property; provided however, this release excludes and shall not apply to (i) any Hazardous Material that originates from any City-owned property other than the Property and which migrates onto the Property after the Effective Date, or (ii) any Hazardous Materials that are generated or caused by the Indemnitees' acts or omissions after the Effective Date.

SL Dark Fiber is aware of and familiar with the provisions of Section 1542 of the California Civil Code which provides:

> A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS FAVOR AT THE TIME OF EXECUTING THE RELEASE, WHICH IF KNOWN BY HIM MUST HAVE MATERIALLY AFFECTED HIS SETTLEMENT WITH THE DEBTOR.

As such relates to this Section 11.2, SL Dark Fiber hereby waives and relinquishes all rights and benefits which it may have under Section 1542 of the California Civil Code.

SL Dark Fiber Initials

11.3. Environmental Indemnity. Subject to Sections 11.1 and 11.2 above, SL Dark Fiber shall indemnify, defend (with counsel reasonably acceptable to the City) and hold Indemnitees harmless from and against all Claims arising during the Term of this License and resulting, arising, or based directly or indirectly in whole or in part, upon (i) the presence, release, use, generation, discharge, transport, storage or disposal of any Hazardous Materials on, under, in or about, or the transportation of any such Hazardous Materials to or from, the Property during the Term of this License, (ii) the failure of SL Dark Fiber, SL Dark Fiber's employees, agents, contractors, subcontractors, licensees, permittees, or any person acting on behalf of any of the foregoing to comply with Hazardous Materials Laws, or (iii) the breach by SL Dark Fiber of any of its covenants contained in this Article 11. The foregoing indemnity shall further apply to any residual contamination in, on, under or about the Property or affecting any natural resources, and to any contamination of any property or natural resources arising in connection with the generation, use, handling, treatment, storage, transport or disposal of any such Hazardous Materials, and irrespective of whether any of such activities were or will be undertaken in accordance with Hazardous Materials Laws and shall include, without limitation, Claims arising in connection with any investigation of site conditions or any clean-up, remedial, removal or restoration work ordered by a court or required by any federal, state, or local governmental city or political subdivision. It is further agreed that the City does not and shall not waive any rights against SL Dark Fiber which it may have by reason of this Section because of the acceptance by the City, of SL Dark Fiber's deposit with the City of any of the insurance policies described in this License. This Section 11.3 shall survive the expiration or earlier termination of this License.

(a) Remedial Work. For purposes of this License, "Remedial Work" means all investigation, testing, analysis, monitoring, restoration, abatement, detoxification, containment, handling, treatment, removal, storage, decontamination, clean-up, transport, disposal or other ameliorative work or response action required by (i) any Hazardous Materials Laws, (ii) any order or request of any federal, state or local governmental city, or (iii) any judgment, consent decree, settlement or compromise with respect to any and all enforcement, clean-up, removal, remedial or other governmental or regulatory actions or agreements or orders threatened, instituted, or completed pursuant to any Hazardous Materials Laws or any actions, proceedings or claims by such entities or third parties relating to or arising out of the breach of any Hazardous Materials Laws or the presence or release of any Hazardous Material in, on, under or from the Property.

(b) Hazardous Materials. As used herein, "Hazardous Materials" means any substance, material, or waste which is or becomes regulated by any local, state or federal authority, city or governmental body, including any material or substance which is: (i) defined as a "hazardous waste," "extremely hazardous waste," or "restricted hazardous waste" under Sections 25115, 25117 or 25122.7, or listed pursuant to Section 25140 of the California Health and Safety Code, Division 20, Chapter 6.5 (Hazardous Waste Control Law); (ii) defined as a "hazardous substance" under Section 25316 of the California Health and Safety Code, Division 20, Chapter 6.8 (Carpenter-Presley-Tanner Hazardous Substance Account Act); (iii) defined as a "hazardous material," "hazardous substance," or "hazardous waste" under Section 25501 of the

California Health and Safety Code, Division 20, Chapter 6.95 (Hazardous Materials Release Response Plans and Inventory); (iv) defined as a "hazardous substance" under Section 25281 of the California Health and Safety Code, Division 20, Chapter 6.7 (Underground Storage of Hazardous Substances); (v) petroleum; (vi) friable asbestos; (vii) polychlorinated biphenyls; (viii) listed under Article 9 or defined as "hazardous" or "extremely hazardous" pursuant to Article 11 of Title 22 of the California Administrative Code, Division 4, Chapter 20; (ix) designated as "hazardous substances" pursuant to Section 311 of the Clean Water Act (33 U.S.C. §1317); (x) defined as a "hazardous waste" pursuant to Section 1004 of the Resource Conservation and Recovery Act, 42 U.S.C. §6901, *et seq.* (42 U.S.C. §6903); or (xi) defined as "hazardous substances" pursuant to Section 101 of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §9601, *et seq.*, as the foregoing statutes and regulations now exist or may hereafter be amended.

(c) Hazardous Materials Laws. As used herein "Hazardous Materials Laws" means all federal, state and local laws, ordinances, regulations, orders and directives pertaining to Hazardous Materials, including without limitation, the laws, statutes and regulations cited in the preceding Section 11.3(b), as any of the foregoing may be amended from time to time.

ARTICLE XII
MISCELLANEOUS

12.1. Notices. Except as otherwise specified in this License, all notices to be sent pursuant to this License shall be made in writing, and sent to the Parties at their respective addresses specified below or to such other address as a Party may designate by written notice delivered to the other parties in accordance with this Section. All such notices shall be sent by:

(i) personal delivery, in which case notice is effective upon delivery;

(ii) certified or registered mail, return receipt requested, in which case notice shall be deemed delivered on receipt if delivery is confirmed by a return receipt;

(iii) nationally recognized overnight courier, with charges prepaid or charged to the sender's account, in which case notice is effective on delivery if delivery is confirmed by the delivery service; or

(iv) facsimile transmission, in which case notice shall be deemed delivered upon transmittal, provided that (a) a duplicate copy of the notice is promptly delivered by first-class or certified mail or by overnight delivery, or (b) a transmission report is generated reflecting the accurate transmission thereof. Any notice given by facsimile shall be considered to have been received on the next business day if it is received after 5:00 p.m. recipient's time or on a non-business day.

City: City of San Leandro
City Hall
835 E. 14th Street
San Leandro, CA 94577
Telephone: 510.577.3354

Facsimile: 510.577.3340
Attn: City Manager

SL Dark Fiber: SL Dark Fiber
303 W. Joaquin STE 100
San Leandro, CA 94577
Telephone: (510) 877-4383
Facsimile: (510) 405-2001
Attn: Crystal Calvan

12.2. Modification. No waiver, modification or amendment of this License shall be effective or enforceable unless made in writing, signed by SL Dark Fiber and the City and specifying with particularity the nature and extent of such waiver, modification or amendment. Any waiver by the City or SL Dark Fiber shall not affect or impair any right arising from any subsequent default.

12.3. Dispute Resolution Procedure. The City and SL Dark Fiber shall endeavor to resolve all disputes through business-like negotiations, without resort to litigation. Accordingly, if a dispute arises, the Parties shall meet and engage in reasonable good faith negotiations to resolve the matter. If the Parties are unable to negotiate a mutually acceptable resolution within ten (10) calendar days they shall be free to pursue any legal remedies which may be available. Except as to those matters that the Parties mutually agree to be resolved by such alternate dispute resolution mechanisms as the Parties may deem appropriate, all claims, disputes and other matters in question which arise out of or relate to this License shall be decided by a court of competent jurisdiction.

12.4. Governing Law and Forum. This License shall be governed by the laws of the State of California, and any action to enforce or interpret its provisions must be brought in courts with jurisdiction in Alameda County, California.

12.5. Relationship of Parties. The Parties agree that nothing in this License shall be deemed or interpreted to create between them the relationship of lessor and lessee, of buyer and seller, or of partners or joint venturers.

12.6. Attorneys' Fees. In the event any suit, action or proceeding arising from or based upon this License, the Permitted Work or the Scope of Work shall be instituted by SL Dark Fiber or the City, the prevailing party in any such action, suit or proceeding shall be entitled to recover its reasonable attorneys' fees, costs and disbursements, including the cost of reasonable investigation, preparation and professional or expert consultation incurred by reason of such suit, action or proceedings. This attorney fee provision shall not apply to any suit, action or proceeding brought by a third party.

12.7. Severability. If any term or provision of this License or the application thereof shall, to any extent, be held to be invalid or unenforceable, such term or provision shall be ineffective to the extent of such invalidity or unenforceability without invalidating or rendering unenforceable the remaining terms and provisions of this License or the application of such terms and provisions to circumstances other than those as to which it is held invalid or

unenforceable unless an essential purpose of this License would be defeated by loss of the invalid or unenforceable provision.

12.8. Entire License; Amendments In Writing; Counterparts. This License contains the entire understanding of the Parties with respect to the subject matter hereof and supersedes all prior and contemporaneous licenses and understandings, oral and wrinen, between the Panics with respect to such subject matter. This License may be amended only by a written instrument executed by the Parties or their successors in interest. This License may be executed in multiple counterparts, each of which shall be an original and all of which together shall constitute one License.

12.9. Successors and Assigns; No Third-Party Beneficiaries. This License shall be binding upon and inure to the benefit of the Parties and their respective successors and assigns; provided however, that neither Party shall transfer or assign (either directly or indirectly; voluntarily or involuntarily, by operation of law or otherwise) any of such Party's rights hereunder by operation of law or otherwise without the prior written consent of the other Party, and any such transfer or assignment without such prior written consent shall be void. Subject to the immediately preceding sentence, this License is not intended to benefit, and shall not run to the benefit of or be enforceable by, any other person or entity other than the Parties and their permitted successors and assigns. This provision shall not preclude SL Dark Fiber from contracting with affiliates or third parties to provide telecommunications services using SL Dark Fiber's property in the Project.

12.10. Captions. The captions of the sections and articles of this License are for convenience only and are not intended to affect the interpretation or construction of the provisions hereof

SIGNATURES ON FOLLOWING PAGE.

IN WITNESS WHEREOF, the Parties have executed this License as of the date first written above.

City of San Leandro

By: Lianne Marshall

Name: Lianne Marshall
Interim City Manager

APPROVED AS TO FORM:

By: _____
City Attorney

ATTEST:

By: Marian Handa
City Clerk

SL Dark Fiber
a limited liability company
By: J. Patrick Kennedy

Name: J. Patrick Kennedy

Its: [Managing Member]

EXHIBIT A
PROPERTY

CITY OF SAN LEANDRO

City Fiber Network

0 0.25 0.5 1 Miles

EXHIBIT B
SCOPE OF WORK

Scope of Work. Pursuant to this License, the City authorizes SL Dark Fiber to install the Project in the existing conduit of the Property (hereinafter "Permitted Work") as described in the "Scope of Work," attached as Exhibit C and incorporated herein by this reference. The performance of the Scope of Work shall be at SL Dark Fiber's own cost and risk, subject to final approval by the City and subject to the City's review of SL Dark Fiber's final plans for the Project. Any improvements made to the Property as a result of the Scope of Work shall be for the benefit of the City, and all costs shall be borne by SL Dark Fiber.

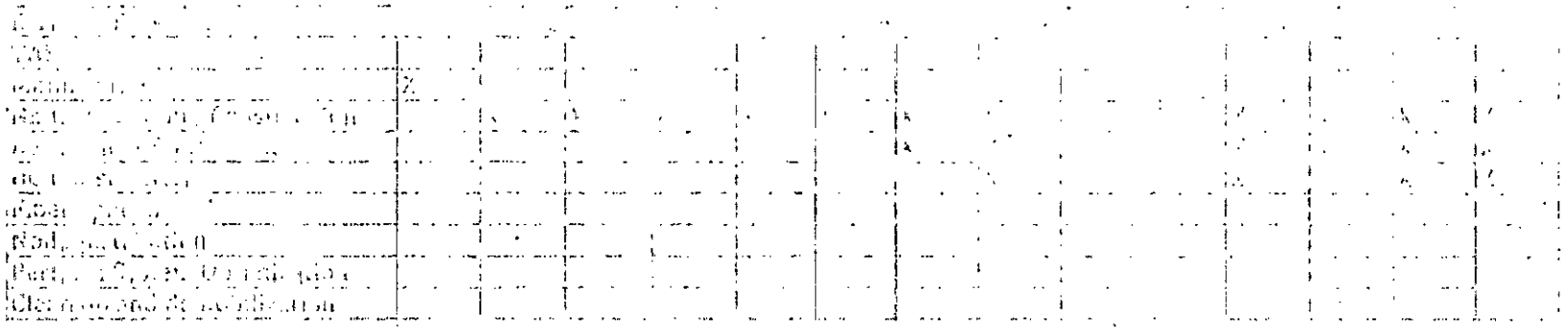
Traffic Studies, Permits, Fees
Route Verification adding Mule Tape and Trace Cable
Installation of 288 Strand Fiber Optic Cable
- Main Cable throughout loop – Approx 60,000 ft including Splices
- Splice Loops added to appropriate vaults
- Connection to the BART Telecom Vault
- Testing throughout
- Temporary use of 777 Davis as NOC for testing

Installation of Laterals from time to time to connect customers to the Project (all costs to be borne by San Leandro Dark Fiber)

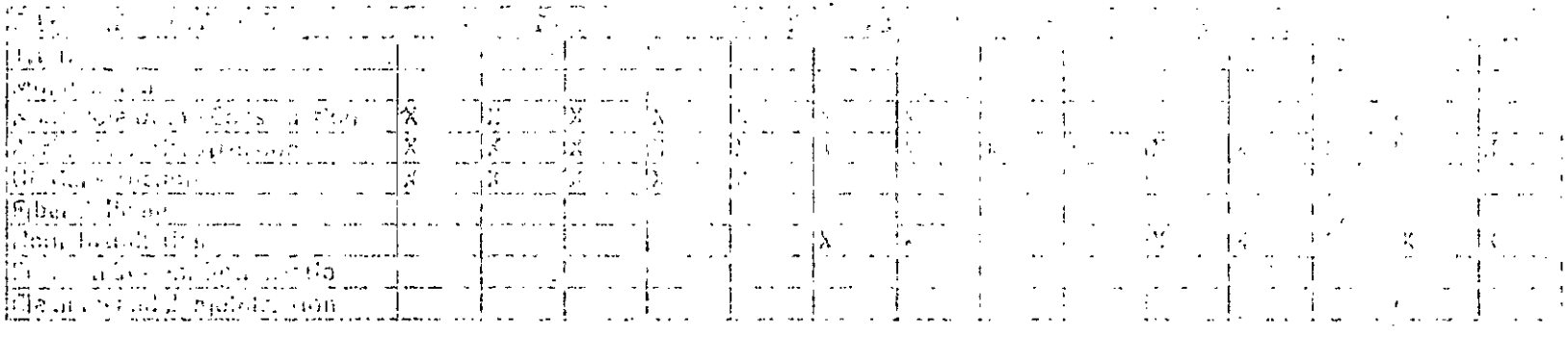
EXHIBIT C

DEVELOPMENT SCHEDULE

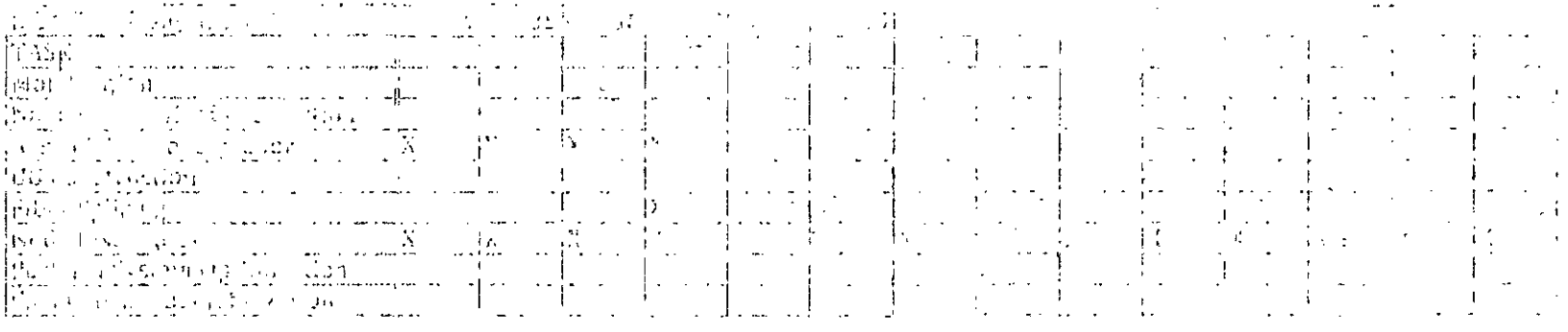
DAY START AFTER NTR	1	2	3	4	5	6	7	8	9	10	12	13	14	1S	16	17
TASK																
Mobilization	X															
Node Pole Utility Construction		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Aerial Fiber Construction							X	X	X	X	X	X	X	X	X	X
UG Construction								X	X	X	X	X	X	X	X	X
Fiber Splicing																
Node Installation																
Perform System Optimization																
Clean up and demobilization																



DAY START AFTER NTP	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
TASK																
Mobilization																
Node Pole Utility Construction	X	X	X	X	X	X	X									
Aerial Fiber Construction	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
UC Construction	X	X	X	X	X											
Fiber Splicing																
Node Installation						X	X	X	X	X	X	X	X	X	X	X
Perform System Optimization																
Clean up and demobilization																



DAY START AFTER NTP	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
TASK																
Mobilization																
Node Pole Utility Consiruciion																
Aerial Fiber Construction	X	X	X	X												
UC Construction																
Fiber Splicing				X	X	X										
Node Installation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Perform System Optimization																
Clean up and demobilization																



DAY START AFTER NTP	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
TASK																
Mobilization																
Node Pole Utility Construction																
Aerial Fiber Construction																
UG Construction																
Fiber Splicing																
Node Installation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Perform System Optimization																
Clean up and demobilization																

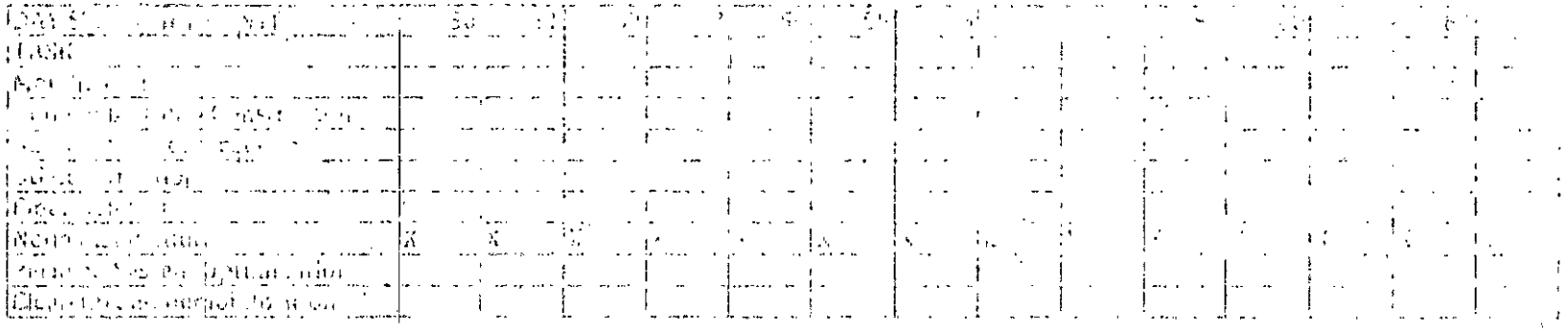


EXHIBIT D
ECONOMIC BENEFITS OF PROJECT
Confirm Project is Consistent with Economic Development Plan and General Plan

The first sentence in the San Leandro General Plan is "San Leandro enters the new millennium with a deep appreciation of its past, a clear understanding of its present, and this shared vision of its future."
The General Plan further points out that:

Almost a third of the City's land is used for industrial and commercial purposes, including about 1,800 acres of industrial land and 900 acres of commercial land. Industry and commerce provide thousands of jobs, millions of dollars in annual sales and property tax revenues, and many critical services to San Leandro residents. The City is committed to keeping its economy healthy, maintaining a competitive edge within the region, and staying attractive to established and emerging businesses.

This project recognizes that San Leandro has historically been a City that has supported, via infrastructure such as power, water, rail, highways and sewer, the industrial market. To compete, grow and attract this next generation of business, San Leandro must again act as it did when it built its own, modern sewer facilities. The modern equivalent is a fiber optic Information Highway. Such infrastructure is not only consistent with the General Plan; it is the extension of long standing traditions of attracting jobs to the area and goal of SB 375. In the last few decades, the character of the industries that live in the SF Bay Area has changed from the traditional manufacturing facilities to, as Alvin Tofler called it, the Information Age. It is the access, at sufficient speed, to telecommunications, data centers, and other information enabling technologies. It is the support of the new manufacturing world by considering programs like the Department of Commerce Foreign Trade Zones and the recognition of the world wide nature of investment through tools from the INS like the EB-5/Regional Center visa for jobs program, and state programs like the Enterprise Zone.

The next generation manufacturing will undergo rapid change as new technologies are evolved like the 3D Printing that allows the manufacture of physical items directly from the computer drawings so that an appliance manufacture no long has to inventory all the formed and machined parts that comprise the appliance. Other manufactures will make high tech devices or software – a strength of the US. These new companies and startups are essential to our economy because we will never recapture plants that are dependent upon low cost labor or natural resources that do not include the price of the environmental damage.

Economic Development efforts in San Leandro are guided by an Economic Development Strategy and Work Program; a document first adopted by the City Council in 1997, and designed to create a positive environment for investment in the local economy. In that document it was noted that the challenge was to attract the investment needed to recycle existing commercial and industrial properties that are no longer functional. It was recognized that it would be important to establish a process for the continual upgrade of the area so that the City does not stagnate; these

correspond to the EDAC vision elements of A Sustainable Community and A Diversified Economy.

The "Lit San Leandro" project is a game changer. It is truly an infrastructure project – it is not being put in for a particular job or upgrade, it is being installed for the use of next generation manufacturers and commercial (e.g. hospitals) operations. Fibers carry extremely large amounts of information very rapidly – it is hard to imagine but in a recent experiment referenced below, the Karlsure institute in Germany managed to send 26 terabits per second.

http://www.gizmodo.com.au/2011/05/record-breaking-laser-beam-transfers-26-terabits-per-second/

This is hard to quantify but this data transfer speed would transfer the entire Library of Congress across the fiber in 10 seconds. In the case of Internet usage, good Internet today is 1 Mbit and the T-1 – the staple of the telecom industry – is 1.4 Mbit. A typical building for both telecom and Internet usage might have a single T-1 or if really data intensive with 100's of workers it might use a T-3 (essentially 3 T-1 lines). At the speeds above, a single fiber the diameter of a human could accommodate nearly 2,000,000 T-1 lines. In the fiber industry you need a fiber to send and one to receive and generally you have two pair of fibers that are sent different routes so to "light" a complex it takes 4 fibers. The speed is then a function of the electronic/laser interface at the building and fast equipment today supports 120 channels of 100 GB communication.

Although many might say that this is more than the world will need, it is instructive to look at the telecommunications needs over the last decade. In my company we have grown from a single T-1 to more than the equivalent of 32 T-1 lines and we project orders of magnitude increase in the requirements to accommodate "The Cloud." in the US many areas are out or close to out of bandwidth because we underestimated or did not envision companies like Netflix, HTTP (the Web), YouTube or Bit Torrent whose users consume over 50% of the download bandwidth of the Internet. We must expect nothing except explosive growth of these kinds of companies with "The Cloud" and we can already see that critical service (e.g. Hospitals, Military) are demanding dedicated networks.

The bottom line is that to create a business that depends upon fiber optic requires:

1. A Loop Structure (for redundancy)
2. Dark Fiber (Dedicated) for High Security Communication
3. Availability
4. Fiber (commonly called "All Glass") connection to data centers, services providers, and other facilities for distributed companie
5. All of these (1-4) at a reasonable cost.

The Lit San Leandro Project has all of this. It completes an 11 mile loop around San Leandro and connects into the Route Diverse gateway to the rest of the world via BART Telecommunications.

The Economic Benefit to San Leandro would be via property taxes and, if applicable, sales taxes for the manufacturing jobs and supporting commercial operations to support the new employees.

Lease rates today in San Leandro are as low as S0.40/sq ft/month (Reynolds and Brown) whereas a lit Class A office building would lease for about S3.00/sq ft/month (David Irmer). This would have the effect of creating a like increase in value of structures and it would help achieve a higher % leased. The most important feature is that it creates a unique feature for next gen manufacturers that cannot be matched in other Bay Area Cities. The closest is Santa Clara (which has itsr own fiber loop) but because of the proximity to land and workers, is not very competitive with San Leandro. This uniqueness also provides the incentive for building owners and developers to remove the older generation of manufacturer and build high tech buildings and plants. This is critical because most of the existing structures are not suitable for the high tech industry and until the potential upside is large enough, investors cannot justify this curtail step. A description of the Lit San Leandro project is available by email at pat@osisoft.com.

EXHIBIT E
POTENTIAL THIRD PARTIES CONTRACTS

Exhibit F of this License identifies third parties that SL Dark Fiber may contract with to provide telecommunications services using facilities that are included in the Project. Such list shall be updated from time to time upon the City's request. The disclosure of such affiliates or third parties is provided as a courtesy only, and shall not be construed as a request for approval from the City.

Phase 3 Communications

Lit San Leandro

Exhibit I

City of Oakland
Wireless Broadband Feasibility Study

7 August 2009

CITY OF OAKLAND

Tellus Venture Associates

Stephen A. Blum
Stuart P. Browne
Philip Lucachick
Julia O'Daly

Tellus Venture Associates
www.tellusventure.com

Table of Contents

1. Executive Summary

1.1. Findings

The Oakland Wireless Broadband Feasibility Study finds:

- A point-to-point wireless broadband system serving specific community and institutional needs is financially and technically sustainable for the City of Oakland.
- The cost of building and operating such a system can be met through identifiable cost savings, efficiency gains and budgetary choices based on the economic value of benefits.
- Public Internet access by way of community anchor institutions is financially and technically feasible, and universally supported by a diverse range of Oakland residents, organizations, agencies and businesses if it is implemented in a fiscally sound manner.
- Enabling entrepreneurial opportunities for local businesses on a pay-as-you-go, public-private partnership basis is likewise backed by Oakland stakeholders and supported by the financial and technical analysis conducted for this study.
- Providing wireless Internet service to residences or individual consumers is not financially sustainable or technically feasible for the City of Oakland, and is opposed by nearly all stakeholders, who cite the widespread technical and financial failure of such systems in other cities.

1.2. Community Priorities

A comprehensive stakeholder assessment process gathered extensive comment from members of the public, local businesses and non-profits, City staff and other government agencies. This research included district-based focus groups, a town hall meeting, workshops, meetings, written staff surveys, and inbound and outbound telephone and email contact.

The top strategic goals identified by Oakland residents and other stakeholders are:

Stakeholder Assessment Strategic Goals	
Priority	Strategic Goal
1	Sound financial planning
2	Free school access
3	Free public access at libraries, community centers, parks, etc.
4	Affordable access for the public
5	System facilitates improved productivity
6	Public project awareness

Oakland residents, City staff and representatives from local businesses, non-profits, government agencies believe that a wireless broadband system must, to the extent financially and technically possible, meet five design criteria:

Stakeholder Assessment Design Criteria	
Priority	Strategic Goal
1	Flexible and interoperable
2	Reliable network
3	High level of security
4	Full city coverage
5	Mobile and real time data access

In the context of the stakeholder discussions, "full city coverage" means that any proposed wireless service or facility should be available equally and evenly throughout Oakland, within the limits of technology and finances. For example, if wireless broadband service is provided to City libraries, it should be provided to all libraries to the extent practical.

On the other hand, stakeholders strongly believed the City should not spend money on blanket wireless coverage based on inappropriate technology or unsustainable economics. Failed municipal wireless networks in other cities were frequently and emphatically offered as examples of what the City of Oakland should not do.

1.3. Current Opportunity

The American Recovery and Investment Act of 2009 (ARRA) includes $7.2 billion in funding for broadband development. The bulk of that funding will come through Broadband Technology Opportunities Program (BTOP) grants administered by the National Telecommunications and Information Administration (NTIA).

Consistent with the BTOP grant criteria released by NTIA on 1 July 2009, this feasibility study presents a conceptual point-to-point system that will:

- Provide broadband access to community anchor institutions such as schools, libraries and organizations and agencies serving vulnerable populations, as well as job-creating strategic facilities in Oakland.
- Provide improved access to broadband service to consumers living in underserved areas of Oakland through community anchor institutions and proven middle-mile solutions.
- Improve access to, and use of, broadband service by public safety agencies that serve Oakland.
- Stimulate the demand for broadband, economic growth and job creation for all members of the Oakland community.

The reference architecture developed during this study is not intended as a final design, however it is a financial and technical proof-of-concept that will support a BTOP grant application by the City, and provide an objective basis for the system and performance requirements in subsequent requests for proposals (RFP).

1.4. System Design

This study uses a modular implementation approach, and develops a reference architecture that employs a variety of spectrum, technology and applications to meet the diversity of stakeholder needs in the City of Oakland:

Reference Architecture	
Segment	Primary Users
Backbone	Central infrastructure for all users
Public Safety	Police, fire, health, public works
Government	All City departments, City staff in field
BayRICS	Police and fire
Public	Community anchor institutions
Business	Underserved commercial properties

In this conceptual design, the backbone segment provides the underlying broadband infrastructure necessary for supporting all users of the system. Once it is built, the system can be extended to serve any or all user groups, depending on policy priorities and funding availability.

For analytical purposes, the reference architecture is based on specific technologies, because concrete examples are necessary to developing benchmark specifications and costs. However, prospective vendors will not be asked to build the reference design or use any specific technologies. They will be free to propose any solution that meets the financial and technical requirements contained in the RFP.

The prospective budget for the system includes equipment costs for connecting to community anchor institutions and other public facilities. Funds for more than 600 such connections are included in the budget and are supported by the financial analysis.

1.5. Financial Analysis

Funding for construction and operation of the core system will come from five primary sources:

- Offsetting current expenditures by replacing some existing leased lines with faster and more survivable wireless links.
- Broadband Technology Opportunity Program grants.
- Federal and state public safety grants.
- Use of existing City facilities such as towers and telecommunications sites.
- Providing service to underserved commercial properties for a fee on a public-private partnership basis.

The system has the potential for reducing City expenditures, enhancing revenues and improving public services through increased efficiency. This productivity gain primarily comes from allowing staff to work from the field without having to return to their offices to access information technology resources.

The business case analysis also shows that the market value of the new services provided is greater than the cost of building and operating the system, even when discounted rates are available to government and nonprofit organizations. The cost offsets and other value created by the system pay its full costs over time, including capital financing costs.

1.6. Next Steps

To meet BTOP grant application requirements and deadlines, five steps should be taken in the next four weeks:

- Develop an implementation plan that meets BTOP schedule requirements and ARRA criteria for "shovel-ready" projects.
- Identify complementary ARRA-funded projects and potential partners, per BTOP guidelines.
- Determine the source for the 20% matching funds required by BTOP, including making any necessary applications to State agencies.
- Prepare and submit grant applications covering as those BTOP categories for which the City of Oakland qualifies.
- Release an RFP to support the BTOP grant application as soon as possible.

The NTIA schedule and qualification criteria will be difficult to meet. However, because of it, the ideal time to move forward with a wireless broadband system in the City of Oakland is now.

2. Findings and Recommendations

2.1. Introduction

The goal of the Wireless Broadband Feasibility Study is to determine if a wireless broadband system can be deployed, either comprehensively or modularly, in the City of Oakland to achieve key objectives:

- Enhance economic development.
- Improve public safety.
- Increase the effectiveness of public, private, and nonprofit organizations through improved access to state of the art broadband wireless technology.
- Help overcome the digital divide.
- Improve quality of life for all Oaklanders.

Tellus Venture Associates was engaged in September 2007 to conduct a thorough evaluation of this question through a process that included staff and community participation, and technical and financial analysis.

2.2. Needs and Requirements

The study began with an extensive assessment, consultation and research effort that included goal setting and technical meetings, and an assessment process with Department of Information Technology (DIT) staff. Workshops for staff from all City departments, and for representatives from local non-profits, businesses and other government agencies followed. Finally, a town hall meeting and a series of citywide, council district-based focus groups were held to gather comments from as broad a cross section of the public as possible.

The information collected was analyzed, and priorities, needs and design criteria were developed. The top strategic goals identified during the research were:

1. Sound financial planning.
2. Free school access.
3. Free public access at libraries, community centers, parks, etc.
4. Affordable access for the public.
5. System facilitates improved productivity.
6. Public project awareness.

From these strategic goals and after deeper discussions on heeded capabilities, a set of top level system design requirements were established. According to the research, any wireless

broadband system deployed for the City of Oakland should, to the extent financially possible, meet five criteria:

1. Flexible & interoperable.
2. Reliable network.
3. High level of security.
4. Full city coverage.
5. Mobile & real time data access.

Operational requirements identified by all potential users and beneficiaries of the system were then evaluated against these design criteria and against the available technological options. Finally, seven prioritized operational requirements were established:

1. Extensible network backbone
2. Point to point networking
3. Citywide data access
4. Video: incidents and events
5. Video: surveillance and monitoring
6. Video: routine operations
7. Mobile communications

To ensure that any system deployed can address these requirements and priorities within tight budget constraints, a modular approach was used, so individual segments could be deployed separately, in any order, over a flexible time frame.

2.3. Reference Architecture

An initial reference architecture for a citywide wireless broadband system was developed to meet these operational requirements, and the financial cost and benefits of each alternative were evaluated. Prime consideration was given to finding immediate offsets of existing costs, such as leased data lines, and the potential for grant funding.

Several iterations of this design/financial analysis cycle were performed, resulting in a conceptual system design that meets these operational requirements to the greatest extent possible given the limits of current technology, regulations, and funding.

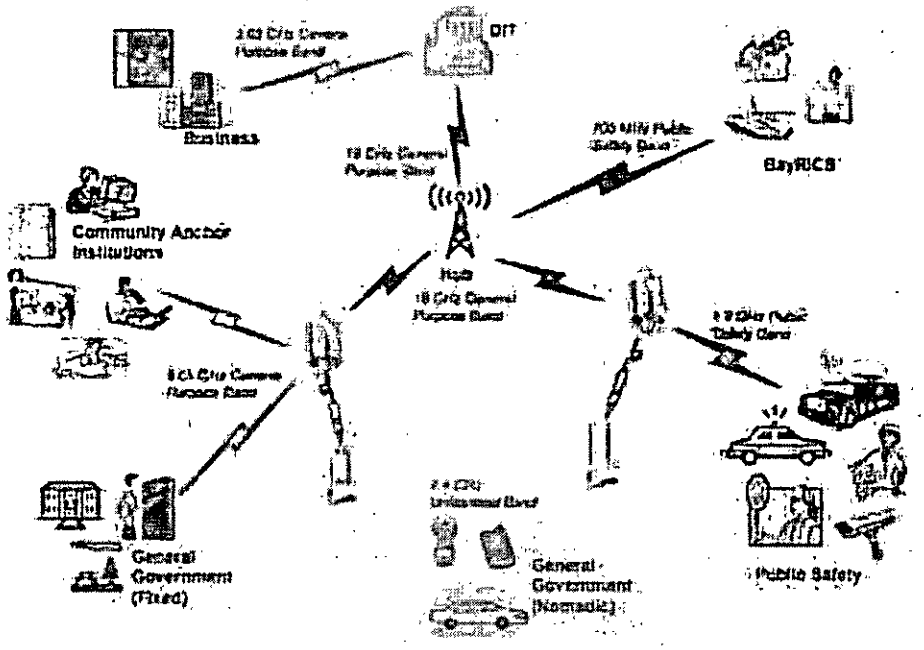
Public safety agencies require robust and redundant systems able to survive and perform under emergency conditions, and the federal government has set aside both valuable spectrum and grant funding for this purpose. General purpose grant funding, such as the American Recovery and Reinvestment Act of 2009 (ARRA) program, may also be used for public safety applications. This variety of possible sources greatly increases the chances of

successfully funding the project. Consequently, the reference architecture focuses on maximizing these resources.

Scenarios and altematives for extending broadband capabilities to other City departments build on this core system. Other point-to-point links would serve other government agencies, businesses and the general public through community anchor institutions. As noted above, there is virtually no public support or financial case or technologically viable method for providing a ubiquitous citywide "cloud" of Internet access coverage by the City of Oakland.

The reference architecture provides an extensible backbone that minimizes the cost of adding these capabilities, and demonstrates that wireless broadband technology is deployable and effective in the City of Oakland.

Figure 2.1 – Oakland Wireless Broadband System Conceptual View



The backbone of the system is a wireless broadband system operating on licensed frequencies in the 18 GHz band. The backbone is buih around six hubs; centerihg on the DIT facility at Frank Ogawa Plaza, and then extending first to fire stations and police department facilities, and then potentially to other city-owned locations. These links will operate at speeds up to 600 Mbps. There are no regulatory restrictions on the type of applications or users that may be supported.

Two types of connectivity are provided at each backbone location, or "node". First, high speed city network access is provided directly to the location itself. Second, wireless access points operating on the unlicensed 2.4 GHz band are installed at each node, providing convenient information technology network access at or near the backbone location for city employees, and potentially offering fixed IT network connectivity to nearby City facilities.

The second half of the core system described by the reference architecture is a public safety wireless broadband segment that radiates out from each of these backbone nodes. This segment takes advantage of the 4.9 GHz band that the federal government has set aside exclusively for public safety purposes. This segment will support fixed uses, such as surveillance cameras, and what are referred to as "nomadic" applications.

Figure 2.2 – Core System

Nomadic applications are midway between fixed uses, such as permanent cameras or links between buildings, and truly mobile applications such as video from moving vehicles or handheld devices that people use while walking around. Examples of nomadic applications include using a laptop computer in a parked car, or streaming video from the scene of a fire.

2.4. Alternatives and Scenarios

Beyond the reference architecture, and building upon it, additional system segments provide some level of wireless broadband service to every corner of the community. These segments include:

- Fixed links for general government purposes on the 3.65 GHz semi-licensed band.
- 802.11 standard hotspots on the unlicensed 2.4 GHz band for general government nomadic purposes.
- A 700 MHz system for mobile public safety applications that is being developed separately by a coalition of Bay Area cities, initiated by Oakland Mayor Ron Dellums.
- Public Internet access offered at community anchor institutions such as community centers, non profit organizations and public housing.
- Business grade Internet service to unserved and underserved commercial buildings.

Each of these alternatives and scenarios can be implemented independently. In some cases costs are offset by replacing existing leased lines or by improvements in efficiency and productivity. In other cases, costs are offset by users or through programs such as the ARRA package.

2.5. Business Case Evaluation

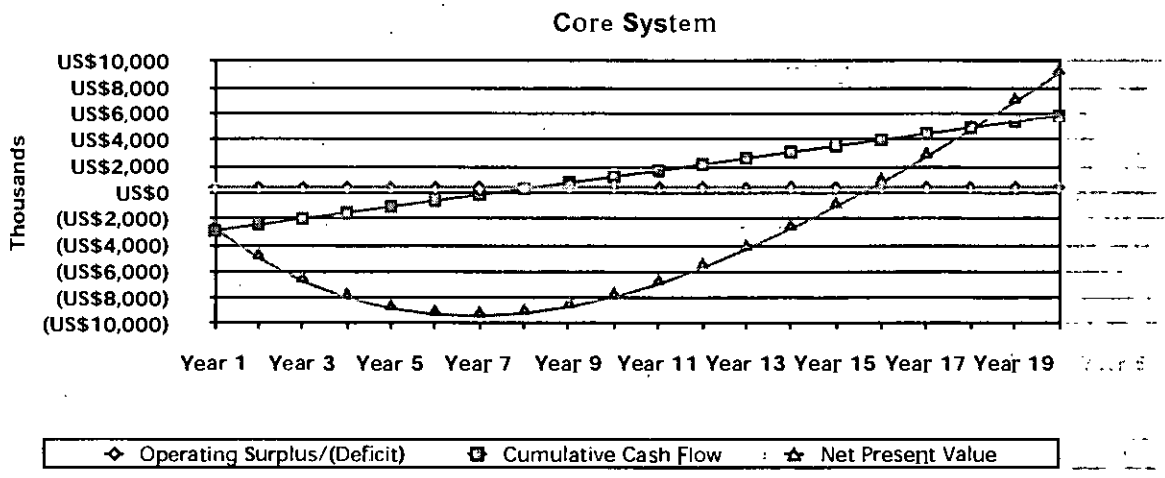
Financial analysis of the reference architecture's core system and the alternatives and scenarios is based on:

- The annual out of pocket cost of operations versus cost offsets and other funding
- The ability of the system to repay construction costs over time
- The long term capital value of the system

The core system pays for itself on an operating basis, based on the hard cost savings provided by replacing a few, redundant leased circuits. The system also pays for its full cost over time, even if no public safety grant funding is available. Enough cost savings are generated to support the ongoing operations of the 700 MHz public safety mobile system as well.

Various cost savings and efficiency gains, potentially including improved tax revenue collection, provide both an operating cost and long term capital cost justification for extending City network access to all employees and departments. Business-oriented services are designed to be self-supporting, and to provide an opportunity for local entrepreneurs to be part of an innovative public-private partnership with the City.

Figure 2.3 – Oakland Wireless Broadband Core System Financial Analysis



There is no immediate funding source for public Internet access via community anchor institutions, however the financial analysis clearly shows that the value of these services more than outweighs the cost of building and operating the necessary facilities. These facilities will provide essential digital inclusion services to unserved and underserved segments of the community, and are intended to meet the ARRA grant funding criteria.

2.6. Conclusion

This study demonstrates that a citywide broadband system based on wireless technology is both technically and financially feasible. This system can extend and enhance cohnecdvity to the City's existing information technology network, providing tiew capabilities and enhanced efficiencies to City departments and employees. It can alsb provide sustainable Internet access to unserved and underserved communities in Oakland.

The ARRA program offers a unique window of opportunity to fund and operate this system, and significantly enhance the quality of life and public services ayailable to Oakland residents. This study offers a solid basis for policy makers to evaluate the alternatives and decide how to move forward. Once those decisions are made, this study provides the tools needed to implement those decisions and support the quest for grant funding, including a shovel-ready request for proposal document.

3. Needs Assessment

3.1. Overview

Extensive primary research was conducted to facilitate the establishment of a sound vision for the deployment (or not) of an achievable and sustainable wireless broadband network in the City of Oakland. Under the direction of the City of Oakland's Department of Information Technology, several specific objectives were to be evaluated:

- Enhance economic development.
- Improve public safety.
- Increase the effectiveness of public, private, and nonprofit organizations through improved access to state of the art wireless broadband technology.
- Help overcome the digital divide.
- Improve the quality of life for all Oaklanders.

A total of 15 assessment sessions were conducted to obtain comments from and ascertain the needs and priorities of

- Members of the public
- City of Oakland staff
- Businesses
- Nonprofit organization
- Educational institutions
- Other govemment agencies

In December 2007, a meeting was held with communications and information technology personnel from key City departments. Then, in July 2008, a series of workshops were conducted, three for city staff, and one each for the business community, nonprofit organizations, and educational institutions and other local govemment agencies.

Seven public focus groups were held in September 2008, one in each council district, along with a citywide town hall meeting at Oakland City Hall. Throughout this process, additional public comment was gathered in person and by phone and email.

Many concerns, issues and ideas were put forth during the course of this research. However this study is limited to the assessment of how the City of Oakland's needs might be met by wireless broadband technology, and a comprehensive examination of all related concerns is outside its scope. Key concerns that are noted and treated as potential limiting factors for a wireless broadband deployment include:

1. Web-based communications and service delivery by government agencies.
2. Interoperability between City departments, and with outside agencies.
3. General information technology and telecommunications infrastructure and policy.
4. Provision of computer hardware, software, training and technical support to under-served communities and individuals.

A summary of scope, methodology and findings is in Appendix A below, and complete minutes and research documents from all events are contained in Volume 2 of this study.

3.2. Analytical Framework

The results of this research are broken down into two categories: strategic goals and design criteria. Strategic goals encompass top level concerns voiced by study participants, and are broad concepts that might be applied to any major project. These goals can help guide policy makers and managers as implementation progresses, and inform the recommendations made by this study.

Design criteria, on the other hand, are specific attributes that study participants believe a wireless broadband system should meet. Any wireless broadband system that might result from this study should meet these criteria to the greatest extent possible.

3.3. Strategic Goals

Although each public session and community workshop was made up of different participants drawn from broad cross sections of Oakland's very diverse community, the groups were remarkably consistent in identifying and prioritizing strategic goals. Figure 3.1 provides a breakdown of these goals.

The top three goals identified during the focus groups, town hall meeting, and workshops for nonprofit organizations and local government agencies were free school access, free public access at community anchor institutions, and affordable access for the public.

The endorsement of these goals, however, was not unconditional. Nearly all the participants assessed these goals within the context of what were perceived to be greater needs of the Oakland community and with an explicit awareness of the fiscal constraints facing the City. Participants made a distinction between "free" and "affordable" service, and overwhelmingly chose not to endorse the provision of free Internet access to businesses and residences. Providing public access, free or otherwise, at public facilities, such as libraries and community centers, or high traffic areas, such as bus shelters, the convention center or the downtown area, was generally seen as a much higher priority than providing residential Internet service of any kind.

The city staff and business community workshops were similarly consistent, although the focus was on different goals and priorities. The top concerns were insuring that any system facilitates improved productivity and the public is aware and in support of any wireless broadband project. Both these goals received further endorsement from various public, nonprofit and local agency groups.

Figure 3.1 – Strategic Goals

	Free school access	Free access at public facilities	Affordable access	System facilitates improved productivity	Public project awareness	Employs local vendors	Facilitates community outreach
City Workshops							
Police, Fire, Admin				X	X		
Pub Wks, CEDA, Finance				X	X		
Library, Museum, Parks				X	X		X
Community Workshops							
Businesses				X		X	
Non-profits	X	X	X		X		X
Agencies & Education	X	X	X				
Focus Groups							
Focus group 1	X		X		X		
Focus group 2	X	X	X		X	X	
Focus group 3	X	X	X	X			
Focus group 4	X	X					
Focus group 5	X	X	X	X	X		
Focus group 6	X	X				X	
Focus group 7	X	X	X				
Town Hall Meeting	X	X	X	X		X	

Two other goals – using local vendors to build and operate a system and facilitating community outreach – were mentioned in a handful of groups, but overall received significantly lower support.

Although the groups did not specifically identify financial goals, such as lowering City operating costs or meeting specific budget requirements, a consistently high level of concern was expressed for the financial and managerial aspects of any broadband initiative. All of the various goals were explicitly discussed within this context. For this reason, an additional goal of sound financial planning and fiscal responsibility is included as a top priority.

Consequently, the six strategic goals identified by this research for a wireless broadband initiative by the City of Oakland are:

1. Sound financial planning.
2. Free school access.
3. Free public access at libraries, community centers, parks, etc.
4. Affordable access for the public.
5. System facilitates improved productivity.
6. Public project awareness.

These goals are further addressed in the final study recommendations.

3.4. Design Criteria

The fourteen groups discussed six design criteria that were seen as relevant to any wireless broadband network that the City might procure.

Figure 3.2 – Design Criteria

	Flexible & inter-operable	Reliable network	High level of security	Full City coverage	Mobile & real time data access	Revenue stream for City
City Workshops						
Police, Fire, Admin	X	X	X	X	X	
Pub Wks, CEDA, Finance	X	X	X	X	X	
Library, Museum, Parks			X		X	X
Community Workshops						
Businesses	X					X
Non-profits						
Agencies & Education	X		X	X		
Focus Groups						
Focus group 1	X					
Focus group 2	X					
Focus group 3	X	X				
Focus group 4		X		X		
Focus group 5	X					
Focus group 6	X	X	X			
Focus group 7	X					X
Town Hall Meeting		X	X			

The top concern, identified by city staff, businesses, local agencies and six out of seven focus groups, was that any system be flexible and interoperable. In other words, that it can be used by all city departments (although every department wouldn't necessarily need access to all the features and capabilities), that it serve as a means of communications with other public agencies, and that the public can use and benefit directly from it, as appropriate. System reliability (including disaster survivability for emergency systems) and security were also perceived as being necessary by most participants.

Complete coverage of the City and mobile access to real-time data was not seen as a necessary technical requirement by most groups, however both were particular priorities of City staff Both requirements will have to be met if City of Oakland departments are assumed to be regular users of any citywide wireless broadband system. Additionally, there was a general concern expressed during most focus groups, the town hall meeting and some workshops that all areas of the City be served equally, if not fully.

There was some discussion of whether a wireless broadband system should be a source of revenue for the City, however only three groups identified it as a requirement. Instead, as noted above, when the focus of discussion turned to financial and managerial issues, the emphasis was on cost savings and greater efficiency rather than revenue generation.

Consequently, the research identified five attributes which can be described as necessary for a citywide wireless broadband system:

1. Flexible & interoperable.
2. Reliable network.
3. High level of security.
4. Full city coverage.
5. Mobile & real time data access.

It should be noted that "full city coverage" refers to providing a given service or facility equally and evenly throughout Oakland, within the limits of technology and finances. For example, if wireless broadband service is provided to City libraries, it should be provided to all libraries to the extent practical. It does not mean blanketing the City with wireless Internet access, in fact that approach was generally opposed by nearly all stakeholders.

These design criteria are taken into account in the assessment of functional system requirements and the design of the reference architecture below. In addition, the business case analysis looks at the costs involved in meeting these criteria to the fullest extent practical.

4. Operational Requirements

Strategic priorities and operational needs must drive the overall design, deployment and management of any citywide wireless broadband system in the City of Oakland; but ultimately prospective users of the system will individually decide whether the system meets their particular needs and whether or not they want to pay for it. Those needs are defined by the applications and information they use, and by the circumstances in which they use it. If a network does not meet the requirements imposed by these operational considerations on a given user, then that user will not be served by it.

Figure 4.1 – Operational Requirements by User Group

Operational Requirement	Public Safety	Emergency Services	Public Works	Finance & Admin	CEDA	Human Services	Parks & Recreation	Other Agencies	Business	Non-Profits	Public
Citywide data access	X	X	X	X		X	X	X			
Mobile communication	X	X	X								
Video: routine operations	X	X	X	X							
Video: incidents & events	X	X	X				X	X			
Video: surveillance & monitoring	X		X				X		X		
Point to point networking					X		X	X	X	X	
Extensible network backbone					X		X	X	X	X	X

Seven operational requirements were identified. The applications that drove these requirements are described below, followed by a technical summary. At a top level, though, no single type of user needs a network that meets all of these criteria. There is overlap between these requirements. Meeting one, for example providing citywide data access, might support another, such as transmitting live video from emergencies or planned events.

Three of these requirements concern video transmission. Video was singled out because it is the most bandwidth intensive application currently in common use. A network that supports the sustained, high bandwidth requirements of video transmission today, should support other types of applications well into the future. The three different video modes are:

- Planned transmissions to support routine operations at specific locations.
- Unplanned transmissions from as wide a range of City locations as possible.
- Surveillance and monitoring.

Other operational requirements are the ability to access data throughout the City, either through the City's IT infrastructure or the Internet, mobile communications, point to point networking and an extensible network backbone.

4.1. Citywide Data Access

Provided that any system deployed meets the basic security and other design criteria of the various City departments, there was a nearly universal belief expressed throughout the research process that citywide data access would boost the efficiency, productivity and public accessibility of City operations and services. In particular, representatives from the police, fire, public works and emergency services departments indicated that wireless technology in the field would allow them to better communicate and access vital information where they need it most.

On a general basis, two-way data communication from the field can provide City departments with increased awareness of ongoing incidents and improve communications between and amongst supervisors and field personnel, as well as the emergency operations center. A citywide network could also enhance survivability of the City's communications system during a disaster by providing a redundant pathway. Another potential benefit is the ability to communicate with other government agencies, on a routine basis as well as in emergencies.

Emergency and routine communications priorities for the police department include high data rates, scalability, reliability and no dead spots. In addition, the fire department needs access above and below ground, for example in basements and tunnels.

Another potential application for citywide data access is improving communication to and from neighborhood service coordinators, and citizens groups such as neighborhood watch or CORE (Citizens of Oakland Respond to Emergencies).

City departments have a variety of needs. For example, simply having a nearby hotspot available would allow a human services caseworker to access current client information before making a site visit. Building inspectors stated that they spent considerable time in the field checking building sites and performing code compliance inspections, but then had to return to an office to complete their reports. Access to plans and documents for real time submission, approval and confirmation was identified as a potential benefit by both City staff and representatives from the business community.

Having remote access to information could allow the finance department to increase tax revenue by conducting more, and more thorough, field audits. Police officers would like better access to resources such as Department of Justice databases.

The City's human services department has a multipurpose senior services program (MSSP). Having access to a citywide wireless network could be helpful to the registered nurses (RNs) who go into the field to check on clients. Currently, they are using commercial wireless service to access the Internet, but not City IT resources. Such a network could also be used for remote health monitoring, and to deliver other services to the elderly, on a routine basis and in emergencies.

Another possible use of a citywide data network is to create the Internet equivalent of a tradhional bookmobile. Computers and supporting technology can be brought directly into neighborhoods on a periodic basis (along with the necessary training and technical support) and connected to the Internet from wherever is most advantageous. Similarly mobile facilities could be used to deliver health care to under served communities, either at central locations or in homes.

The Oakland Unified School District and the Port of Oakland are two government agencies that could be primary users of the system. The jurisdictions of both agencies are essentially within the city limits, and therefor might be well served by a citywide network. Both agencies also have their own wireless broadband programs, and could be good partners in any City project. Other government agencies that have a presence in Oakland could also make use of a citywide network, but this use would be supplemental to whatever network strategy they may adopt to cover their entire jurisdictions.

4.2. Mobile Communication

Mobile communication is a specific kind of citywide data access need that is necessarily met wirelessly. Mobile users need to be able to communicate to and from moving vehicles, including boats and aircraft. In addition to adequate radio frequency signal strength, maintaining this sort of connectivity for data networking requires the use of appropriate protocols, modulation techniques and other network design elements.

The City of Oakland already has an extensive radio communications system designed to support public safety, public works and other City departments, particularly for voice communications. In other cases, City workers use commercially available facilities, for example data service provided by cellular telephone carriers.

Location-based services for vehicles and other assets is one mobile data application that was discussed by workshop participants which the City does not currently have. It was also identified as a need by business representatives.

Other mobile services might be, in effect, extensions of existing networks. For example, real-time information about transit bus locations and status could be gathered wirelessly, and delivered to members of the public through their mobile phones.

Achieving truly mobile communications is not an easy, or inexpensive, challenge. Options for creating a mobile data infrastructure, and the associated costs, are explored below.

4.3. Video Transmission

Three types of video transmission needs were identified:

1. *Live, high quality video from incident sites and organized events.* Live video from the scene, for example, of a major fire would allow field personnel who were staging or were not yet involved to gain situational awareness and to better prepare before deploying. Fire department representatives, in particular, identified visual information as being particularly valuable for deployment to and management of incidents, as well as for coordination with police and public works personnel. Command staff and communication center personnel would also gain increased awareness and be better equipped to make decisions, manage assets and communicate with field personnel. A technically similar application would be to transmit live coverage of a soccer match from a park via the City's KTOP cable access station.

2. *Video to support routine operations.* Video could be used to reduce the time and expense associated with transporting personnel to handle course-of-business operations at varying locations. Examples would be the use of video lineups at the Eastmont police substation or performing sewer inspections. Another would be to offer video-based training, either live from a central location to remote sites, such as fire stations, or on an on-demand basis. In the long run, wired connections are faster, more reliable and cheaper for fixed, point to point communications than wireless. However, wireless facilities could be used to test applications, rapidly deploy or extend connectivity to new or seldom used locations, and support operations until an economic case exists to install hardwired connections.

3. *Surveillance and monitoring.* The same economic and technical tradeoffs apply to these sorts of applications. Where a need is more or less permanent, such as watching high-traffic areas or a frequently flooded underpass, fixed wireline facilities would generally be preferred. However, those facilities are not available or

economically feasible at every location, or might be too expensive to acquire if the need had not yet been proven. Wireless technology can be used to reach problematic locations, test the effectiveness of video monitoring in a specitic location, and quickly adjust coverage as needs change or as private sector participants join the system. For ad hoc surveillance, for example from an area experiencing a sudden increase in crime or of traffic congestion caused by a freeway closure, wireless technology would almost always be the means of choice.

4.4. Point to Point Networking

Wireless technology is well suited to providing quick connectivity to, say, a someone who is using a laptop computer on a city street to connect to an access point. However, depending on location and the availability of wired connections, wireless technology could also connect a fixed location to the City's IT infrastructure or the Internet. In this sort of application, both ends of the connection would be wired (for example, a desktop computer connecting to a central server) but part of the intermediate transmission chain would be wireless.

City workers at some locations, such as park offices, lack wired connectivity to the City's information technology infrastructure. A wireless system could be used to quickly extend network access to such locations, or to test the effectiveness of a particular application at a particular location. The economic and technical case for extending hard wired facilities can then be properly evaluated.

In many respects, the requirement for point to point networking is the same as the requirement for video support of ongoing operations. The major difference is in the capacity and quality of service requirements involved. Live video requires continuous access to a large amount of bandwidth, with little tolerance for network congestion or capacity sharing, and little ability to make momentary use of empty bandwidth. Standard data networking, on the other hand, is more amenable to sharing facilities, can make good use of bandwidth that varies in capacity, and usually requires less capacity.

Point to point capability could also be used to extend Internet service to community groups and public facilities, where it can be made available to anyone at little or ho cost. This approach has advantages over attempting to deliver wireless Internet service directly into homes.

First, the laws of physics make it very difficult, and very expensive; to achieve reliable two-way wireless data transmission from inside a building to an outside access point using consumer grade equipment or untrained personnel. Mobile phone compahies have spent years and billions of dollars trying to solve this problem and have yet to deploy sufficient

assets to comprehensively do so. Municipalities that have attempted it have either failed or, at best, have achieved partial success at significant cost.

Second, raw bandwidth can be combined with properly configured and maintained equipment, neighborhood-specific training and ongoing technical support. Where cities have been able to provide some level of residential wireless Internet service to communities in need, usage of this service has been lower than anticipated. In some cases, usage has been unacceptably low because people lack the basic technological prerequisites to make use of it.

Point to point networking can also be used to enhance other programs, for example health care and education, that can make onsite use of Internet resources. These programs (or the facilities themselves) might be operated by non-profits or other government agencies who in turn might be able to help offset costs.

4.5. Extensible Network Backbone

Wireless network services, such as citywide data access, mobile communication, video transmission and point to point networking, would be supported by a shared network backbone that would connect these facilities back to the City's IT infrastructure and, possibly, the Internet. This backbone would likely include both wireless and wired facilities.

This backbone can be designed so that it can be expanded and extended to support additional services as desired. For example, the City could sell access to its network backbone to building owners that needed to upgrade Internet connectivity, or to groups – public and private sector alike – that wanted to install public wireless hotspots.

A few research participants thought that it would be a good idea for the City to provide utility-like Internet service to the general public, either on a subsidized basis to targeted communities, or on a general market basis. Most participants did not support the idea, and in many cases expressed emphatic opposition. For technical and economic reasons, the municipal wireless Internet utility model has generally failed. As also noted below, there are a handful of chies where this model is still being pursuing, usually with significant public subsidies, but these exceptions have little in common with Oakland.

For these reasons, this study will not recommend the adoption of the municipal wireless Internet utility model by the City of Oakland. Nevertheless, an extensible network backbone would support such an endeavor, should circumstances change.

Other government agencies that have a significant presence in Oakland, such as BART or the County of Alameda, but that have operations that extend well beyond Oakland's borders, could use this backbone to supplement and extend their existing network architecture where they have a specific need. Likewise, the City of Oakland may be able to share wireless or other broadband facilities owned by other agencies. For example, BART has a broadband system with wireless capabilhies throughout its right of way, and offers some level of access to City departments.

5. Network Design Priorities

5.1. Methodology

The network design attributes needed to support these operational requirements are assessed according to five criteria that measure resource intensity – bandwidth, quality of service (QoS), ubiquity, simultaneous users of a given network segment, and mobility – and are rated as low, medium and high. At this stage in the analysis, resource intensity also provides a rough proxy for cost: higher resource intensity generally equates to higher cost.

Figure 5.1 – Ratings Scale for Operational Requirements

	Low	Medium	High
Bandwidth	2 Mbps or less per session	2 to 20 Mbps	More than 20 Mbps
Quality of Service	Variable & bursty (web browsing, database queries)	Fault tolerant (file transfer)	Uninterrupted streaming
Ubiquity	Specific points	Designated areas	Citywide
Simultaneous Users	One	Few	Many
Mobility	Fixed	Portable	Mobile

When resource intensity is plotted against the relative number of user groups identified as likely beneficiaries of a given operational requirement, a rough picture emerges that helps to clarify design priorities. In this analysis, the simultaneous users criterion is given double weight because being able to support many users at once, across a wide range of applications and departments, is a critical requirement for a cost-effective network.

Figure 5.2 – Prioritization of Categories

Category	Priority
High demand, low cost	High
Low demand, low cost	Medium
High demand, high cost	Medium
Low demand, high cost	Low

Using these categories, operational requirements can then be assigned a rough, provisional priority. This prioritization has a very limited purpose. It is used to guide the initial development of the reference architecture and business model, and provide a starting point for further analysis of the technical feasibility and constraints of, and the economic case for deploying a network that can support these operational requirements. This prioritization is

also relative: it compares the demand for and the cost of any given requirement against the other requirements. It is an intermediate step used in determining the total cost and the ability or willingness of potential users to defray those costs, which is the central focus of the business case analysis below.

Operational requirements that have a high demand and low cost relative to other requirements are assigned a high priority. The applications supported by these requirements should provide the biggest bang for the buck. Requirements that have costs commensurate with demand – low demand/low cost, high demand/high cost – are assigned a medium priority. Lowest priority are requirements that have a relatively low demand and high cost.

5.2. Prioritization

This provisional analysis first assesses the resource intensity of the seven operational requirements identified by the research conducted in the City of Oakland.

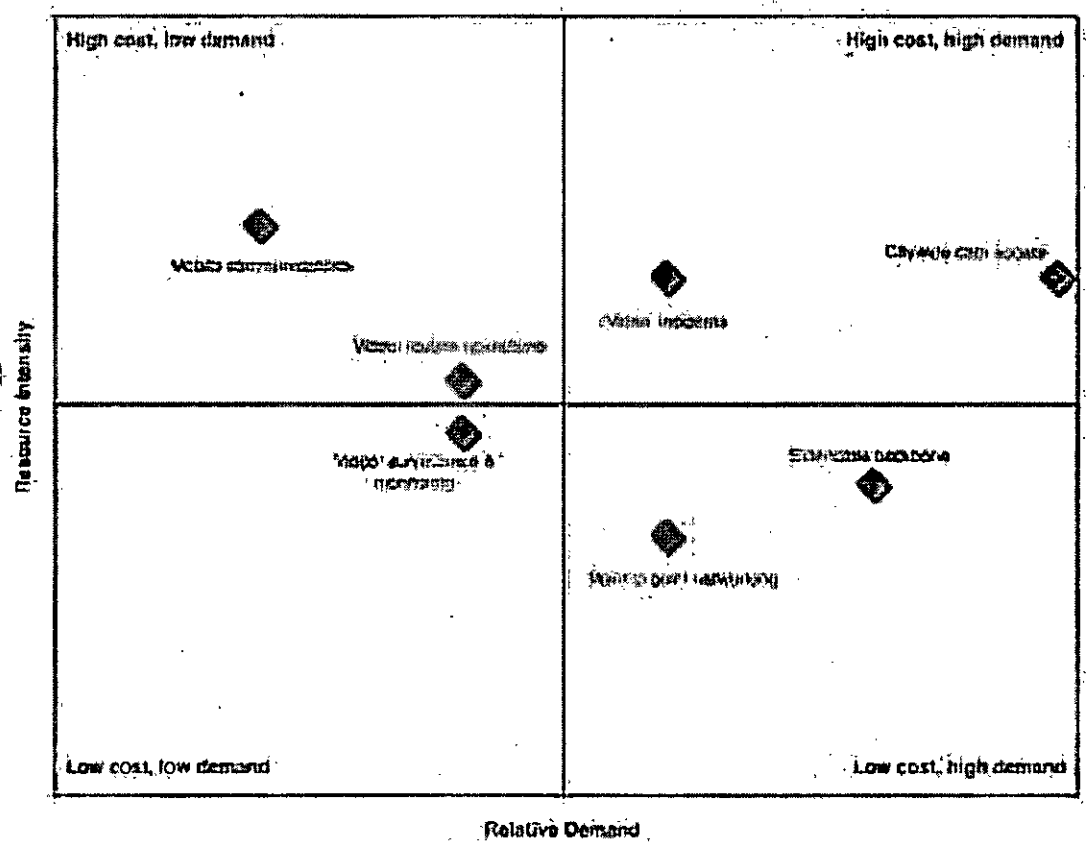
Figure 5.3 – Operational Requirements by Resource Intensity

	Bandwidth	QoS	Ubiquity	Simultaneous users	Mobility
Citywide data access	Low	Low	High	High	Medium
Mobile communication	Low	Low	High	High	High
Video: routine operations	Medium	High	Low	Medium	Low
Video: incidents & events	High	High	High	Low	Medium
Video: surveillance & monitoring	Medium	Medium	Low	Medium	Low
Point to point networking	Medium	Medium	Low	Low	Low
Extensible network backbone	Medium	Medium	Medium	Low	Low

Figure 5.4 then shows how these operational requirements sort into the four prioritization categories described above.

By this analysis, an extensible network backbone and point to point networking are the operational requirements with the highest priority, in that order. Although an extensible backbone is somewhat more costly than point to point networking, the potential demand is significantly greater. Citywide data access has the third highest priority, despite its relatively higher cost, because of its potential to serve a greater number of users than any other requirement.

Figure 5.4 – Relative Demand versus Resource Intensity of Operational Requirements



Video from incidents and events is fourth on the list, showing a cost generally in line with demand.

Figure 5.5 – Provisional Operational Requirement Priority

Priority	Operational Requirement
1	Extensible network backbone
2	Point to point networking
3	Citywide data access
4	Video: incidents & events
5	Video: surveillance & monitoring
6	Video: routine operations
7	Mobile communication

Next, in order of priority, are video for surveillance and monitoring, and video to support routine operations. Both have midlevel demand and cost, with surveillance and monitoring showing a marginally better balance between the two factors. Last priority is mobile communications, which has the lowest relative demand and highest relative resource intensity of the seven operational requirements.

It is important to note that all of these operational requirements were identified as being both desirable and beneficial by the research process. The fact that one requirement is low on the list does not necessarily mean that it shouldn't be supported by the reference architecture, or by any eventual network that the City deploys. Conversely, a high provisional priority does not guarantee implementation.

Nor are these seven requirements mutually exclusive. Implementing one can create basic infrastructure that lowers the cost of another, or can attract additional users, which in turn could raise demand. One example given above is video to support routine operations, which might be added to a point to point network facility for a low marginal cost. Another example is mobile communications, which might be supported by a citywide data access network to a degree that is sufficient for certain applications. Finally, creating a wireless broadband network with an extensible network backbone will ensure that operational requirements that are not supported in an initial deployment can be accommodated in later phases.

The next step in the process is to create a reference architecture and a business model that support these operational requirements, while meeting the strategic goals and design criteria identified by this study.

6. Reference Architecture

6.1. System Overview

Public safety and other departments in the City of Oakland have requirements for fixed and nomadic broadband communications that can be met by a wireless Ethernet system.

This system can also serve other government agencies, private businesses, community based organizations and non-profits, and the community at large.

Figure 6.1 – Operational Requirement Matrix

Priority	Operational Requirement	Comment
1	Extensible network backbone	Phase one design can be expanded for additional bandwidth, and infrastructure can support phase 2 scenario for citywide Internet access.
2	Point to point networking	Design supports bidirectional point to point links up to 15 Mbps, throughout the city.
3	Citywide data access	Basic design covers entire city limits, and budget allows for supplementation in difficult areas. User terminal options range from USB-enabled data modems to vehicle or building-mounted subscriber units)
4	Video: incidents & events	Ad hoc, high bandwidth coverage (up to 15 Mbps) is available throughout the city. Field units are available to support needs.
5	Video: surveillance & monitoring	Scalable bandwidth (up to 15 Mbps in theory) is available throughout the city.
6	Video: routine operations	Point to point bandwidth (up to 15 Mbps) is available throughout the city.
7	Mobile communications	Network not optimized for mobile use, but can support up to a point. Network is designed to be upgradable when mobile protocols are finalized.

A reference system plan using a hub/spoke/cloud architecture has been designed using:

- Antenna towers, space and power at existing public safety radio repeater sites which are owned and operated by the City of Oakland and provide city wide coverage at radio frequencies.
- Point-to-point (PTP) FCC licensed 18 GHz radio links from these exisfing repeater sites.
- Point to muhipoint (PMP) FCC licensed 4.9 GHz radios installed at city fire department stations and police department sub stations to support fixed and transportable broadband Ethernet links from city agencies.
- Point-to-point (PTP) 4.9 GHz subscriber units (SU) that can be fixed or nomadic to support video camera links, voice over Internet protocol (VoIP) links and high speed internet data.

- A second phase scenario which allows the system to be expanded to include provision of Internet service to the community, either directly or indirectly via City facilities such as community centers.

This design provides wireless Ethernet connectivity throughout the city limits of Oakland. The traffic generated, from units in the field and from police or fire stations, is aggregated into five major hubs, located at existing City of Oakland communication facilities, and from there to a sixth hub at the Oakland City Hall complex. There are three options for connecting these hubs into the City of Oakland's existing information technology network:

- Use existing data links, either upgraded for the purpose or used as is.
- Install high capacity wireless PTP links.
- Multi-Point Label Switching (MPLS) IP Virtual Private Network (VPN) links from the five hub sites to a central location.

For the purposes of this study we have used the second option, the high capacity wireless PTP links, to connect five hubs into the central aggregation point (and sixth hub) at the City Hall complex. This option is the middle-case altemadve, providing cost-effective connectivity with minimal impact on the City's existing IT infrastructure.

In some of the scenarios, some or all of the hubs are connected to the public Internet by DS3 grade (45 Mbps) MPLS lines. These lines can be used to route traffic directly onto the public Internet and to connect the hubs to the City Hall complex.

6.2. System Plan Description

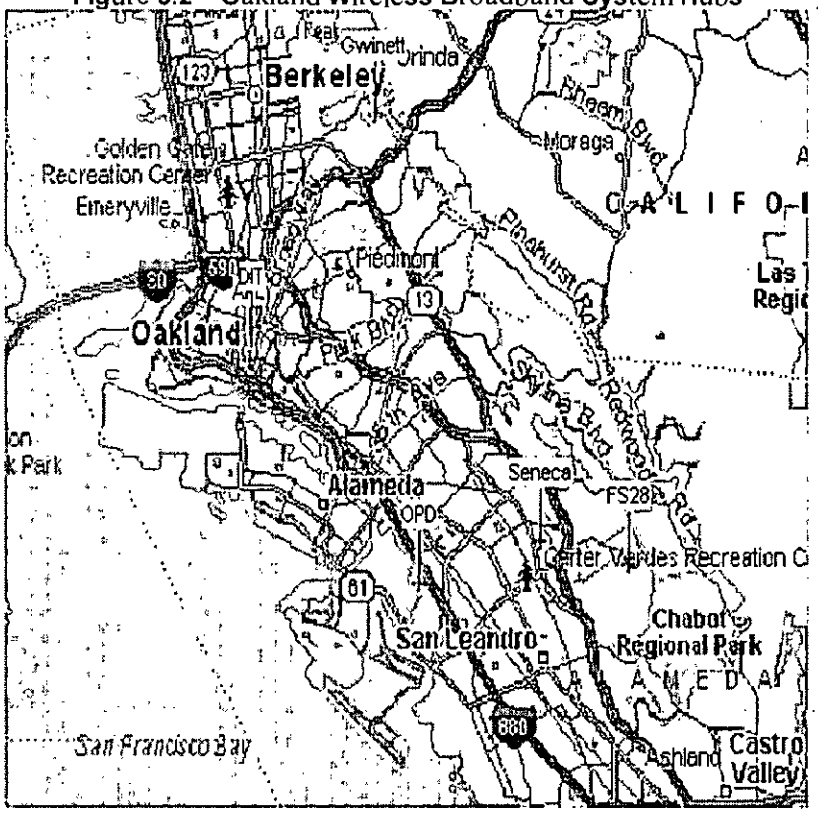
This reference architecture for a citywide wireless broadband system has been designed to take advantage of existing City of Oakland facilities. The system relies on a star network architecture consisting of the six hub sites, twenty-six spokes and thirty-two wireless local area network (WLAN) clouds to service subscriber radios in the field, and provide the means to establish fixed links as needed, either permanently or temporarily.

In the some scenarios, additional "spoke" links are added to the hub sites. These additional spokes could terminate, for example, at community centers, schools, businesses or nonprofit organizafions. From these sites; Internet access could be further extended into the community. At the hubs, these spokes would connect directly to the public Internet and could be physically separate from the City's IT infrastructure, sharing only logistical facilities such as towers and power supplies, and management and maintenance resources. Altematively, this added capacity could be fully integrated into the initial system, with public traffic securely and logically separated from City traffic.

6.3. System Hubs

Four existing radio repeater sites (which include a fire station) that currently support 800 MHz public safety radio services to the City's police and fire departments, a police department site at 7101 Edgewater Drive, and the Department of Information Technology in City Hall were selected to be hub sites for the wireless system. Each of the hubs would be equipped with PTP 18 GHz radios installed on repeater site towers linking to a corresponding 18 GHz radio installed at twenty-five fire stations (the City's twenty-sixth fire station is a hub location) and one police substation. Each of the hub sites would then be connected back to the central aggregation point at the City Hall complex via additional 18 GHz PTP radio links.

Figure 6.2 – Oakland Wireless Broadband System Hubs



For some scenarios, radios used for public Internet access (or the entire system, if desirable) would be interfaced to DS3 leased lines provided by a local telecommunication carrier. These lines would utilize Mulfi-Point Label Switching (MPLS) technology to provide public Internet access and to create an Internet Protocol (IP) Virtual Private Network (VPN), exclusively for City use if desired

Figure 6.3 – System Plan

Site Base Statio	Address Oakland, California	Latitude	Longitude	AMSL Feet	Tower Height (ft)	Hub Location	RF Path Length	Ch. BW
Station 1	1605 Martin Luther Way	37°48'27.55"N	122°16'30.30"W	28	TBD	APL	0.45	15
Station 2	100 Jack London Squa	37°47'41.79"N	122°16'31.86"W	12	TBD	APL	0.49	15
Station 3	1445 14th Street	37°48'39.91"N	122°17'34.29"W	14	TBD	APL	1.27	15
Station 4	1235 E. 14th Street	37°47'24.60"N	122°14'51.25"W	32	TBD	APL	1.57	15
Station 5	934 34th Street	37°49'17.44"N	122°16'35.40"W	33	TBD	APL	1.29	15
Station 6	6080 Colton Blvd.	37°49'56.97"N	122°12'28.35'W	918	TBD	Gwinett	2.30	15
Station 7	1006 Amito Dr.	37°51'37.38"N	122°14'3.41'W	912	TBD	Gwinett	0.62	15
Station 8	463 %1st Street	37°50'13.32"N	122°15'41.21"W	119	TBD	Gwinett	2.76	15
Station 10	172 Santa Clara Ave.	37°49 7.37"N	122°15'8.52'W	115	TBD	Gwinett	3.49	15
Station 12	822 Alice Street	37°47'55.28"N	122°16 7.62"W	23	TBD	APL	0.27	15
Station 13	1225 Derby Ave.	37°46'38.86"N	122°13'40.63'W	45	TBD	Seneca	4.12	15
Station 15	455 27th St	37°48'57.26"N	122°15'59.43"W	38	TBD	APL	1.00	15
Station 16	3600 13th Ave.	37°48'10.36"N	122°13'49.29"W	197	TBD	APL	2.26	15
Station 17	3344 High Street	37°47'9.60"N	122°11'50.37'W	185	TBD	Seneca	2.97	15
Station 18	1700 50th Ave.	37°46'19.30"N	122°12'23.53"W	50	TBD	Seneca	2.82	15
Station 19	5766 Miles Ave.	37°50'44.47"N	122°15'0.19"W	236	TBD	Gwinett	1.89	15
Station 20	1401 98th Ave.	37°44'39.88"N	122°10'13.56"W	34	TBD	Seneca	1.04	15
Station 21	13150 Skyline Blvd.	37°47'21.28"N	122° 8'59.07'W	1140	TBD	FS-28	3.00	15
Station 22	751 Air Cargo Way	37°43'13.50"N	122°13'12.11'W	5	TBD	Seneca	4.18	15
Station 23	7100 Foothill Blvd.	37°46'10.18"N	122°10'24.01"W	104	TBD	Seneca	1.20	15
Station 24	5900 Shepard Canyon	37°49'31.66"N	122°11'57.71'W	781	TBD	Gwinett	2.89	15
Station 25	2795 Buters Drive	37°48'33.36"N	122°11'27.25'W	836	TBD	Gwinett	4.07	15
Station 26	2611 98th Ave.	37°45'4.54"N	122° 9'20.66"W	185	TBD	FS-28	1.76	15
Station 27	8501 Pardee Drive	37°43'49.53"N	122°12'6.97"W	9	TBD	FS-28	4.51	15
Station 28	4615 Grass Valley	37°45'3.52"N	122° 7'22.86'W	485	TBD	Hub	0	15
Station 29	1061 66th Ave.	37°45'33.21"N	122°11'51.91"W	245	TBD	FS-28	4.06	15
Eastmont PD	2651 73rd Ave.	37°46'4.33"N	122°10'27.41'W	94	TBD	OPD	2.33	15
APL	1100 Broadway	37°48'8.09"N	122°16'20.63"W	13	450	Hub	0	15
Gwinett	7185 Marlborough Terra	37°51'50.09"N	122°13'22.94"W	637	45	Hub	0	15
Seneca	9000 Seneca	37°45'25.36"N	122° 9'27.88"W	220	60	Hub	0	15
OPD	7101 Edgewater Dr.	37°44'49.23"N	122°12'18.91"W	7	250	Hub	0	15
DIT	150 Frank Ogawa Plaza	37°48'18.19"N	122°16'16.07"W	39	TBD	Hub	0	15
RF Hub	**Address**	**Latitude**	**Longitude**	**AMSL**	**Tower Hgt**	**FCC ULS**	**# Radios**	**BW**
APL	1100 Broadway	37°48'8.09"N	122°16'20.63"W	13	450	yes	8	113
Gwinett	7185 Marlborough Terra	37°51'50.09"N	122°13'22.94"W	637	45	yes	7	105
Seneca	9000 Seneca	37°45'25.36"N	122° 9'27.88"W	220	60	yes	6	90
FS-28	4615 Grass Valley	37°45'3.52"N	122° 7'22.86'W	468	12	yes	4	60
OPD	7101 Edgewater Dr.	37°44'49.23"N	122°12'18.91"W	7	250	yes	1	15
DIT	150 Frank Ogawa Plaza	37°48'18.19"N	122°16'16.07"W	39	TBD	yes	5	75
Notes:	1. Tower height in feet. Fire station towers average 50' to 75' -TBD							
	2. RF Path lengths In miles.							
	3. Channel bandwidth in Mbps.							
	4. PTP Backhaul channel frequency at 18.0 GHz (licensed). Bandwidth per link is 15 GHz.							
	5. PMP WiMAX radio frequency at 4.9 GHz.(licensed).							
	6. WiMAX radio can be sectored for 360 degree coverage in six sectors (6 radios).							
	7. All Radios have SMNP and vendor supplied M&C for network management.							
	8. Network Operations Center located at DIT.							

If implemented, the wireline Layer 3 MPLS VPN (L3VPN) facility in some scenarios provides enhanced border gateway protocol (BGP) signaling, MPLS traffic isolation and router support for VRF's (virtual routing/forwarding) to create an IP based VPN. A Layer 3 MPLS VPN also provides Quality of Service (QoS) facilities which rely on resource reservation control mechanisms rather than achieved service quality methods.

Quality of service is the ability to provide different priority to different applications, users, or data flows, or to guarantee a certain level of performance to a data flow. For example, a required bit rate, delay, jitter, packet dropping probability and/or bit error rate may be guaranteed. Quality of service guarantees are important if the system capacity is insufficient, especially for real-time streaming multimedia applications such as VoIP and video (since these often require fixed bit rates and are delay sensitive) and in networks where the capacity is a limited resource. In the absence of network congestion, QoS mechanisms are not required.

6.4. System Spokes

Each of the PTP radio hops supports data channels up to 108 Mbps in bandwidth operating in the 18 GHz radio frequency band and would require FCC licensing. The radio path lengths are all less than 5 miles line of sight (LOS). The financial analysis below evaluates 15 Mbps and 108 Mbps alternatives, and even higher speeds are possible through software upgrades.

WLAN Base Stations

The hubs, fire stations and the police substation would be equipped with 50 to 75 foot towers to support the PTP radio and the PMP radios that create the Internet "clouds" around each of those sites. Each of the six hub sites will also be equipped with 4.9 GHz radios and function as base stations as well as hubs.

These locations will function as a WLAN base station. Each antenna tower will be equipped with three (3) PMP radios using 802.16 (WiMAX) standards that operate in the 4.9 GHz band and require FCC licensing.

Additionally, 802.11 standard outdoor access points operating in the unlicensed 2.4 GHz band would be installed at each spoke and hub location, to provide additional connectivity to City workers wishing to access the City's information technology network. In some cases, these access points could also be used to provide fixed links to nearby City facilities. There are no significant regulatory restrictions on the type of traffic or applications that can be used on these access points.

However, the available frequencies in the 4.9 GHz band are designated for public safety use, which "must be related to the protection of life, health or property." This definition is fairly broad, and does not necessarily limit usage to police, fire and emergency services agencies. It would include, for example, supporting most public works field operations, or enhancing security at City facilities, through such things as surveillance equipment or through increased onsite availability of trained personnel. It would not include supplying public Internet access or providing television coverage of sporting events.

On the other hand, there is no significant usage restriction on the 18 GHz spoke links, or on the 3.65 GHz cloud radios designated for the second phase scenario. This reference architecture provides sufficient flexibility to deploy additional 18 GHz spokes (or remote units for applications such as public video coverage) or 3.65 GHz point-to-point links on an as-needed basis in the event a specific City application is deemed unacceptable for use at 4.9 GHz.

Each of the radios will be tower mounted and interfaced to 120° sector antennas to create 360° radio coverage of the local area. Coverage at 4.9 GHz is in the 3 to 5 mile range. Overlapping "clouds" in some parts of the city center will create very intense coverage and could support mobile interconnection from subscriber units as 802.16 technology is improved. All the radios used in the system are software upgradable and care must be taken to ensure forward compatibility with upcoming mobile 802.16 standards to the greatest extent possible.

There are several options for connecting City users or equipment to the cloud, including:

- Fixed 802.16 protocol user terminals, such as might be connected to a surveillance camera or installed in a park office to provide LAN facilities.
- Portable 802.16 protocol user terminals that could be installed, for example, on a truck used for remote video production.
- Hybrid 802.16/802.11 terminals that could be installed on a vehicle, such as a fire engine, or at an office or worksite.
- USB-compatible 802.16 modems which could be connected directly to laptop computers.

This public safety cloud coverage would be available outdoors. Not every type of public safety user terminal will be able to directly access the cloud from every point in the City, so consideration will have to be given to matching terminals to user needs in order to provide the appropriate range of coverage.

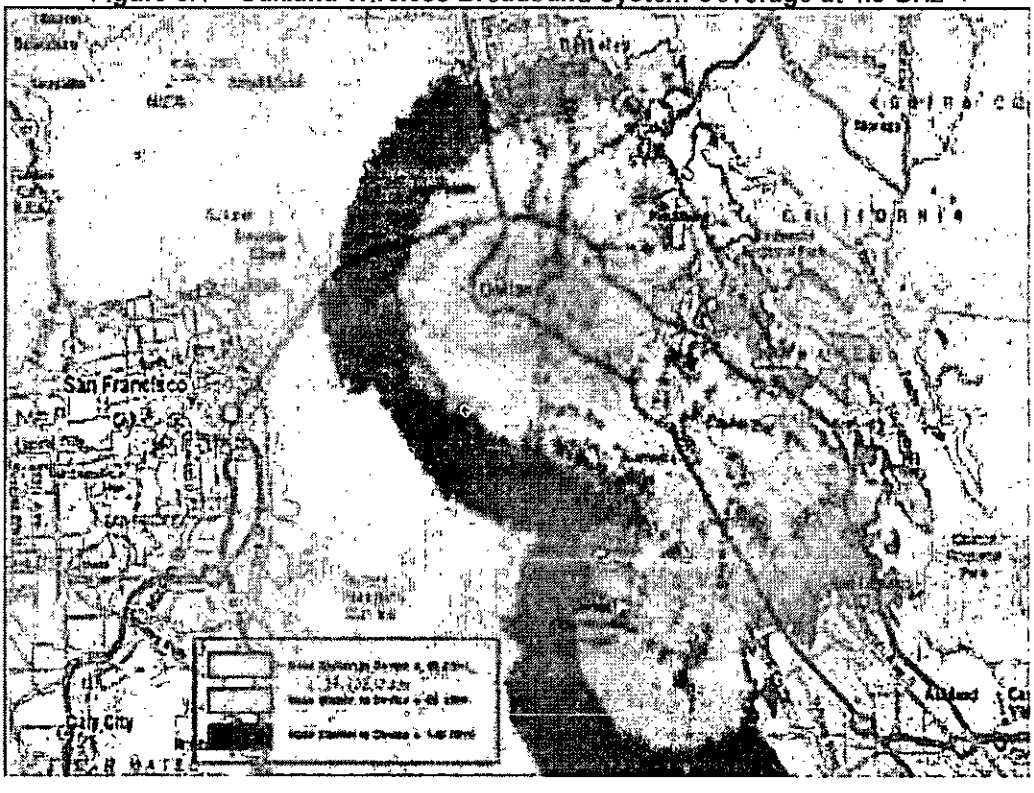
Indoor coverage will depend on building location, type, size and construction. Cost effective solutions are available for extending fixed access from the cloud to the interior of structures, however the use of portable equipment, such as USB modems, will be restricted.

For the second phase scenario, similar radios operating preferably in the 3.65 GHz band (assuming successful frequency coordination with existing users) or at altemative frequencies could be used to extend Internet access to community anchor institutions.

6.5. System Coverage

The geographic coverage of the 4.9 GHz reference architecture was modeled by RCC Consultants, Inc. using their proprietary Comsite tool. A complete set of maps can be found in Appendix B.

Figure 6.4 – Oakland Wireless Broadband System Coverage at 4.9 GHz

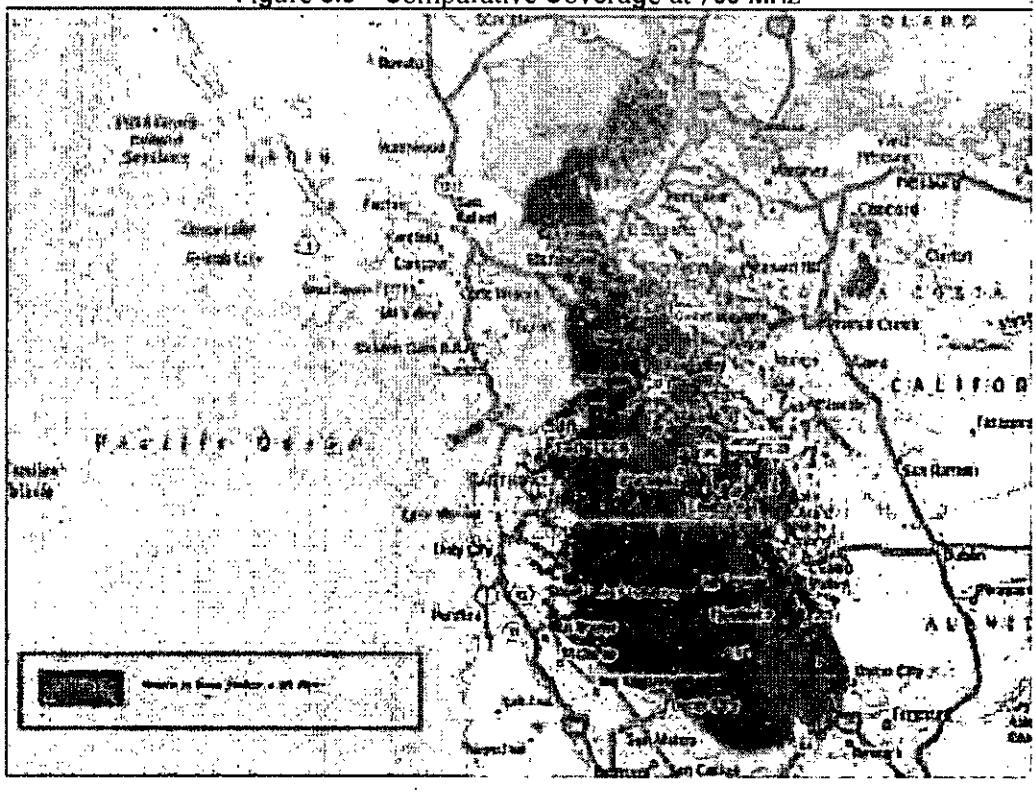


These maps show the expected reach of the 4.9 GHz base stations to users in the field. The parameters used assume maximum allowable effective radiated power, tower height of 75 feet (except for three hubs which were modeled using 25 foot towers) and QAM modulation. General assumptions were made for all locations. No effort was made to shape or optimize coverage for specific sites.

Three different contours were mapped: -85 dBm, -95 dBm and -100 dBm, which roughly correspond to connection speeds of 24 Mbps, 6 Mbps and 1 Mbps respectively. Nearly all of Oakland west of the SR13/I-580 line is covered by the 6 Mbps contour, and the 1 Mbps contour covers most of what remains in that area. Site-specific engineering can mitigate the small white areas and further extend the 6 Mbps contour. Given the generalized parameters of the reference architecture, the modeling shows that full coverage is feasible at 4.9 GHz west of the SR13/I-580 line.

Coverage east of the SR13/I-580 line, in the Oakland hills area, is more problematic. It is difficult to fully cover that sort of terrain and vegetation using the 4.9 GHz band. There are two options: build an extensive 4.9 GHz repeater network or look at other frequencies. As more fully described below, the City of Oakland is part of an effort to create a Bay Area-wide 700 MHz public safety network.

Figure 6.5 – Comparative Coverage at 700 MHz



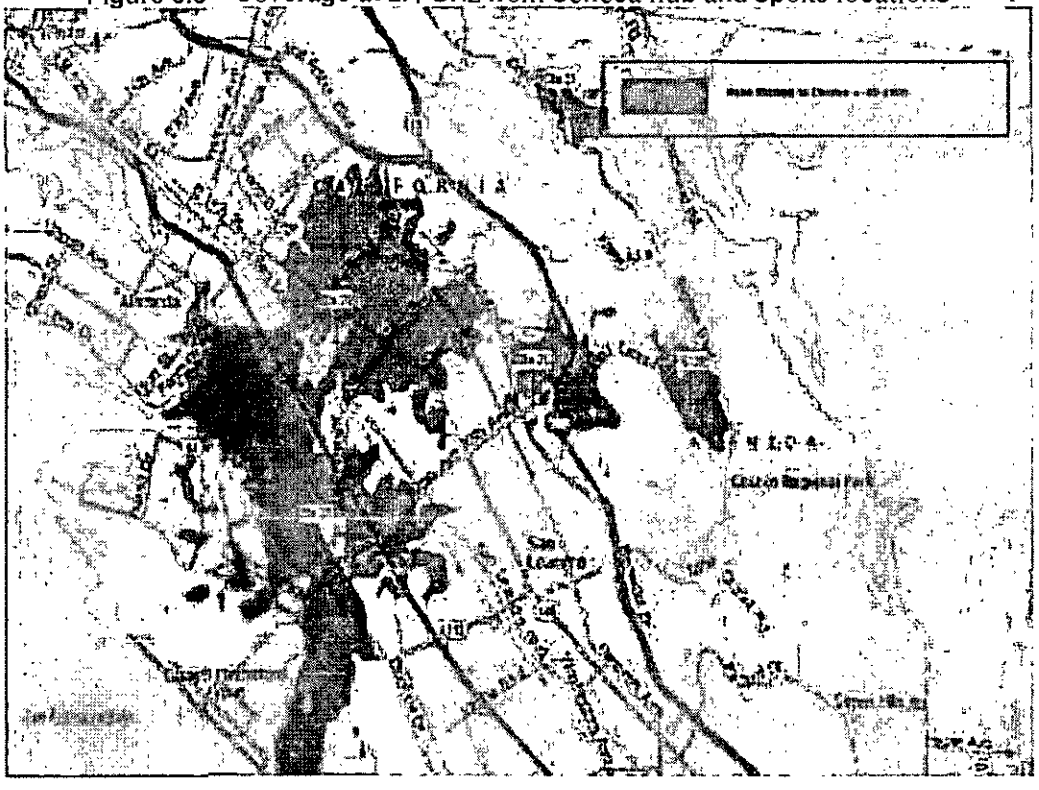
For comparison purposes, coverage of a mobile network operating at 700 MHz was modeled. No effort was made to optimize coverage or transmitter sites. The six hub locations used for the reference architecture were also used for the 700 MHz sites. With only these six locations, a 700 MHz system covers nearly the entire Oakland hills area. A

frequency-specific network design and use of advantageous locations in neighboring jurisdictions should provide as close to 100% coverage as is physically possible.

Although the 4.9 GHz reference architecture can provide very useful service in the Oakland hills, further optimizing coverage there will quickly reach the point of diminishing returns. This system will provide excellent service throughout the balance of the City, and because licensing requirements are well established and equipment is widely available, it can truly be regarded as "shovel-ready." Once the core system is constructed and actual coverage is evaluated, a decision can be made whether to attempt to enhance 4.9 GHz coverage in the hills, or to rely on a 700 MHz solution.

Finally, the coverage of 802.11-standard access points at 2.4 GHz was mapped. The result shows that placing access points at hub and spoke locations will provide ample laptop-grade connectivity for City workers who drive to those locations.

Figure 6.6 – Coverage at 2.4 GHz from Seneca hub and spoke locations



The maps show the -85 dBm contour line, which is the practical limit for reliable fixed connecdvity using specialized, higher powered bridges (which cost about $200). City facilities which lie within that limit have an excellent chance of establishing a 1 Mbps or better connection to the system. It should be noted, however, that the 2.4 GHz spectrum is

unlicensed and subject to interference and competidon from other users. These maps should be used as guides for field tesdng fixed 2.4 GHz links, rather than as firm predictions of results.

6.6. System Flexibility, Interoperability and Security

A system which supports Ethernet traffic throughout is more fiexible, interoperable and secure than one which relies on Intemet protocol alone. Extending Ethernet connecdvity all the way to the end points of the system allows data to be transmitted seamlessly between this wireless broadband system and the City of Oakland's existing information technology network, in the process extending existing network protocols and security measures.

Broadband networks are commonly described in terms of "layers". Layer 1 is the physical equipment used to construct the network. In a wireline network, this layer might consist of fiber optic cables or copper wire, along with the other devices, such as routers and switches, which connect and manage the traffic. In a wireless network, radio waves or, sometimes, beams of light replace copper and fiber optic connections.

Layer 2 is called the data link layer. This layer is where the "ones and zeros" of digital communication are formed and transmitted. Ethernet, which is specified in the reference architecture, is a robust and commonly used Layer 2 protocol.

The next step up is the network layer, or Layer 3, which chops up the stream of ones and zeros into manageable packets and routes those packets from the beginning, through what might be a maze of connections, to the final destination. Intemet protocol (IP) is the most familiar Layer 3 standard.

In effect Layer 3 rides on top of Layer 2, and Layer 2 rides on top of Layer 1. There are several more layers to consider when designing a complete system which might include computers, applications and data structures. But the first three layers are collectively referred to as the media layers and form the fundamental structure of a broadband network.

Each layer has its own security considerations and methodology. At Layer 1, security is a physical issue. For an outdoor wireline network, Layer 1 security is provided by locking up equipment and either burying a line or stringing it high and out of reach. Because lines can cross great distances, Layer 1 security is problematic. For a wireless network, the problems are multiplied because radio transmissions can be intercepted. The radios can be physically locked up, but the actual transmissions are easily accessible to anyone.

The soludon, for wireline and wireless networks alike, is to build encryption and other security technology into Layers 2 and 3. All traffic going through the radios specified in the

reference architecture can be encrypted using 256-bit Advanced Encryption Standard (AES) security, which meets the latest Federal Information Processing Standard 197 for data security.

However, because the reference architecture allows for a seamless extension of the City's existing IT network, additional security levels and methods can be used as needed. For example, a secure "tunnel" – a virtual private network – can be formed inside the encrypted data stream going from a police car to a relay point on a fire station and then on to a central hub. The data flowing through that tunnel can be further encrypted, providing several layers of security that will continue uninterrupted as the information from the wireless system to the City's existing IT network and finally to a secure database at Police Department headquarters.

Likewise, outside agencies or public users can access the system using common Layer 2 and 3 protocols that are already implemented on their own networks or individual equipment. At its basic level, this reference architecture is interoperable with the standard data transmission protocols used for nearly every purpose. Any given department, agency or other authorized user can access the system and run their existing data communications through it.

Interoperability between different users would be determined by those users on a case by case basis. There are factors which limit interoperability between different users and data networks, however this network design should not provide additional obstacles or limits. In that sense, it is neutral ground.

Another interoperability consideration is forward compatibility with other potential wireless broadband systems. One such system is the region-wide proposal to establish a 700 MHz wireless broadband system for public safety purposes. This network would be more specialized than the system defined in this reference architecture and would encompass a 10-county region. Although the proposed 700 MHz system could not be accessed by the equipment described in this report, using a common, widely used Layer 2 protocol such as Ethernet should make it easier to integrate data traffic if desired. Layer 1 forward compatibility issues to be considered include selecting equipment that is not likely to cause radio frequency interference and making sure that physical assets, such as tower sites, can support the larger antennas and/or power requirements that a 700 MHz system might require.

This architecture allows public Internet traffic to be transported on the same system as public safety or other sensitive and confidential data, and for one agency's data to be completely separate from another's. Although wired networks provide an extra measure of security over wireless systems, both are vulnerable to tapping. True and effective protection

comes from thorough, end to end network design and rigorous application of security principles. The reference architecture adopted by this study allows each City department, outside agency or other user to adopt and implement the most appropriate data networking and security methods for its individual needs.

6.7. Expandability, Mobile Access and Citywide Coverage

"Citywide" coverage, in the context of this report, does not mean ubiquitous, cloud-type availability for all users, at all times, within the boundaries of the City of Oakland. Even the 4.9 GHz "cloud" intended for public safety users will have spotty coverage in parts of the Oakland hills. The anticipated 700 MHz BayRICS system will have effectively ubiquitous coverage, and within the limits of its capacity can fill those gaps for public safety users.

Other segments of the reference architecture are intended either as limited reach hotspots, for example for City employees working in the field, or as point to point links serving specific locadons such as a community center or library. For a number of reasons, including a near total lack of public support, expense and technical issues, the reference architecture does not attempt to provide ubiquitous public Internet access.

However, to insure that these point to point links are available throughout the City, this reference architecture can be expanded to include additional fixed lines of communication, for example by placing additional PTP "spoke" radios at locations which require high bandwidth connecdvity such as a computer educadon lab at a community center.

Each hub location can support up to 10 spoke sites, and if necessary addidonal back haul capacity out of each hub can be acquired. To carry this example to the extreme limit, more hub radios could be installed at each hub location, and additional hub locations could be established, without having to do a fundamental redesign of the network or replacing any significant components.

It is likewise possible to increase the number of public safety "cloud" radios, and to extend the system into moving vehicles and hard to reach canyons. If additional spoke locations, such as libraries, are added to the system, those sites could also be used to add more capacity to the cloud. This reference architecture is designed to be scalable. Hub locations will be able to support additional spokes, which could be either integrated into the existing system or kept physically separate, depending on security considerations and other operational needs. Backhaul capacity from the hubs to City Hall could be increased by adding addidonal wireless links, or even by installing land lines if the demand for capacity grows sufficiently.

Although it is possible for users to connect to the system while moving, it would not always be with the highest degree of reliability. In particular, as a user moved from the area covered by one cloud radio to another, there is a chance the connection would be dropped, and there would be a momentary interruption in connectivity while the link was being reestablished. More robust mobile protocols are being developed for this technology and this reference architecture is designed to support it when it becomes available, largely through software upgrades.

6.8. Reliability

All equipment and other system infrastructure and design features selected for this reference architecture meet 99.99% availability standards. All hub and initial phase spoke locations are already hardened to public safety standards. Overlapping coverage of hub, spoke and cloud radios provides redundancy if there is a failure, and the modular design of the system allows for rapid replacement of faulty or damaged equipment.

In addition, in the event of an emergency, equipment intended for routine portable applications, such as event video transmission, could be repurposed to fill in sudden gaps. Subscriber terminals mounted on public safety apparatus could also be used for emergency coverage.

6.9. Case Studies

The technology presented in this reference architecture has been deployed by cides and other public agencies, and its effectiveness has been field proven. The Federal Communications Commission set aside the 4.9 GHz band specifically for public safety purposes, and local agencies have made extensive use of it for many years. Examples include:

Galveston County, Texas is using 4.9 GHz point to point links, deployed using a hub and spoke topology very similar to the reference architecture developed for this report. The system links the county's central 911 dispatch center with seven locafs emergency communicadons facilities. If has already fulfilled its role as back up capacity to the primary landline network, supporting all operadons for a week in 2008 when the wired network went down completely.

The U.S. Coast Guard is using a point to point 4.9 GHz broadband network as the primary path for its coastal surveillance system based at the Port of Miami. This particular network is optimized for high reliability over long distances (up to 13 miles), but still supports a minimum throughput rate of 10 Mbps and meets all military security standards.

The Phoenix police department deployed a 4.9 GHz network in 2006, primarily for surveillance purposes. The objective, which they met, was to create a system that allowed cameras to be installed and moved quickly, to respond to day to day changes in crime pattems and investigatiye needs. The video is monitored by officers in a central location, and relayed wirelessly to police cars as needed.

The Cities of Lewiston and Auburn, and the Auburn schools in Maine are using 4.9 GHz point to point links over distances as far as 10 miles to serve an extensive network of surveillance cameras, and to provide connectivity to govemment IT networks. The network has been operating since 2006. Some links are primary connections, others are used to provide redundancy to critical locations.

In 2005, Beaverton, Oregon installed a hybrid 4.9 GHz WiMAX and WiFi network very similar to this reference architecture. The usage case is very similar as well. Police cars have been fitted with nomadic radios, and officers access the public safety network from the field. In addition, the system supports point to point links for surveillance purposes.

The general govemment altemative described above relies on the semi-licensed 3.65 GHz band, rather than the 4.9 GHz public safety spectrum. The same kind of equipment used for 4.9 GHz public safety networks is available for the 3.65 GHz band; as well as unlicensed frequencies in the 5 GHz range.

System roll outs are just beginning in the 3.65 GHz band, but early adopters, such as business Internet service providers Rapid Link and VoiceNetworks, have successfully built commercial operations using that spectrum in Southem California and other large urban markets. Intemationally, the 2.5 and 3.5 GHz bands are used extensively for Internet service, and enterprise and government data networks. Taiwan has been using WiMAX-based 2.5 GHz technology for networking since 2005. 3.5 GHz networks are common in Asia and Europe.

In the U.S., Clearwire is providing Intemet service by way of 2.5 GHz facilities in Baltimore and Portland, Oregon, and plans a nationwide roll out. In California, the City of Santa Barbara uses unlicensed 5 GHz spectrum for public safety communications.

Likewise, WiFi (802.11) based networks and hotspots are very common, and are used for both public Intemet access and secure municipal networking. The City of Milpitas was one of the first cides to adopt WiFi for city networking purposes in 2004. Tucson, Arizona uses WiFi to transmit video from ambulances to hospital emergency rooms.

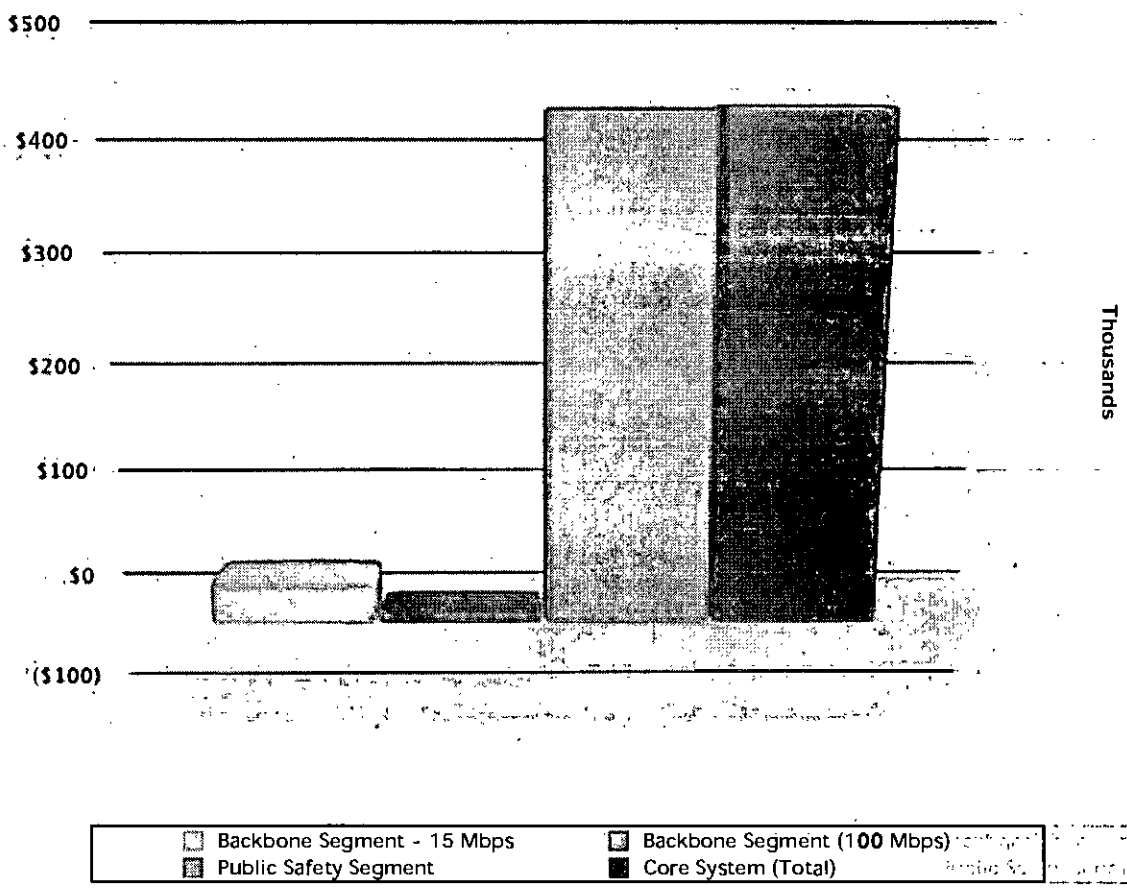
One of the most dramatic examples of WiFi suitability for public safety applications occurred in 2007, when emergency responders used a partially completed municipal WiFi network to support rescue operations following a bridge collapse in Minneapolis. Cellular phone and data facilities near the incident were overwhelmed by the public, but responders were able to use standard, consumer-grade WiFi equipment to securely carry emergency communications.

The 18 GHz system used for backbone connectivity in the reference architecture is an engineered, point to point wireless network. Rather than rely on wide area coverage to reach nomadic or randomly located fixed locations, this system would be designed location by location and link by link. These sorts of engineered wireless networks have been in operation for decades by many organizations, including the City of Oakland.

7. Business Case and Financial Analysis

7.1. Modeling Framework

Figure 7.1 – Core System Operating Surplus/Deficit)



The business model analysis is broken into five segments:

- Core system, which includes:
  a. Common backbone infrastructure with a minimum link bandwidth of 15 Mbps,
  b. Expanded common backbone, with a minimum link bandwidth of 100 Mbps,

    c. Public safety facilities
- General City of Oakland IT support alternatives, which include:
    a. Fixed wireless broadband links
    b. City IT network access by field workers (also referred to as nomadic or portable applications).
- Mobile video scenario
- Business and entrepreneurship opportunities scenario
- "Drinking fountain" model public access scenario

The core system is described by the reference architecture and evaluated by the primary business model. In addition, alternatives and scenarios have been developed and analyzed. Taken together, these segments support the requirements identified in Chapter 4 above. To evaluate these system elements...

- Specific cost offsets, value propositions, revenue enhancements and operating efficiencies have been identified as sources of and justification for funding each segment of the project.
- Cost estimates have been developed for construction and operation.
- Each segment is evaluated on the basis of surplus/deficit, cumulative cost and net present value calculations.

Figure 7.2 – Business Model Assumptions

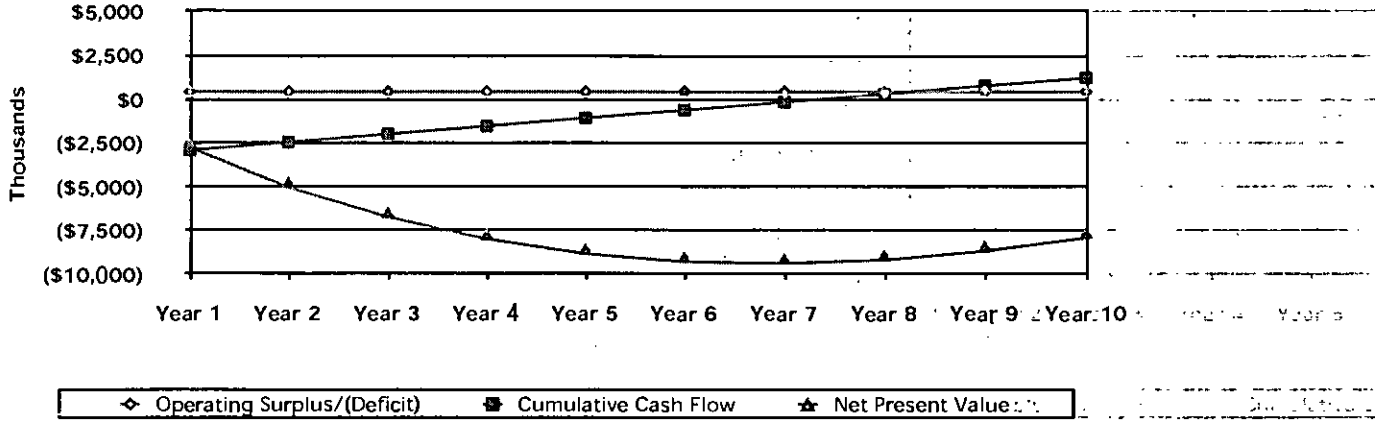
Expenses	
	Site installation costs are averaged, with an expectation that some existing facilities will be available
	Cost estimates do not include additional IT infrastructure beyond boundaries of wireless broadband facilities
	Project management, design, furnishing & commissioning is estimated at 25% of total base capital expenditure
	DOIT wireless network security cost is estimated at 10% of total base capital expenditure
	DOIT acceptance, testing & documentation cost is estimated at 12.5% of hardware related capital expenditure
	Cost of capital is benchmarked at 5%
	Base operating costs are annual rates per node and per site
	DOIT overhead is estimated at 15% of base operating cost
	Annual software upgrades and licensing are estimated at 20% of software capex
	Annual hardware replacement is estimated at 5% of hardware capex
	Internet bandwidth costs are included only in public service provisioning scenarios
	Public service provisioning scenarios include a 5% franchise & facilities fee payable to the City
Funding	
	Commercial carrier cost offsets & new facility market values are based on actual City landline circuit costs
	Efficiency gains are based on PTE costs and performance measures in the 2007-2009 City budget
	Tax revenue gains are based on efficiency gains and City Auditor revenue/cost ratio
Modeling	
	All cost and revenue figures are expressed in constant 2009 dollars
	No intra-system charge backs are included

A number of assumptions have been made in creating this business model. These assumptions are based on nominal City of Oakland cost estimates and management

accounting practices where applicable, on research conducted specifically for this study and on standard industry experience and practice.

The public safety segment is assumed to be the base case deployment option and as such provides the capital cost justification for the overall backbone infrastructure. The backbone segment is self-supporting on an operating basis, but does not pay off its full capital cost without factoring in the additional public safety benefits.

Figure 7.3 - Core System



This backbone infrastructure will also support all other segments and sub-segments. The general government IT alternative is broken into two sub-segments: fixed and nomadic (also referred to as portable).

A mobile video solution for public safety applications is presented as an alternative scenario, using a 700 MHz broadband system proposal (BayRICS) developed by a Bay Area-wide public safety consortium, of which the City of Oakland is a member.

Two other potential options for high speed mobile video are the prospective deployments of a 2.5 GHz mobile WiMAX service by Clearwire and various LTE systems by incumbent mobile telecom carriers. Any RFP requirements developed as a part of the Oakland Wireless Initiative will, to the extent possible, allow commercial carriers to respond as they deem appropriate.

Business and entrepreneurship opportunities and drinking fountain model public access are also presented as alternative scenarios within the business model. The core backbone of the system, developed to support governmental uses, is integral to these two segments. The

business model will also outline the cost of additional equipment and operating costs to support these two segments.

7.2. Methodology

The complete business model, including detailed breakouts and alternate scenarios, can be found in Appendix C. The information in this chapter is summary only, and most figures have been rounded for the purpose of clarity.

All cost and funding figures are expressed in constant dollars. In other words, inflation is not figured into the model. A piece of equipment or a service that sells for a dollar today is assumed to sell for a dollar ten years from now. The constant dollar method is a clearer and simpler analytical method for comparing cost and funding projections over time.

For example, a quick glance at a graph of constant dollar surplus/deficit projections over ten years tells whether the trend is up, down or flat. If an inflation adjustment was included in the model, then the slope of such a graph would have to be calculated and the inflation adjustment backed out before meaningful year to year comparisons could be made.

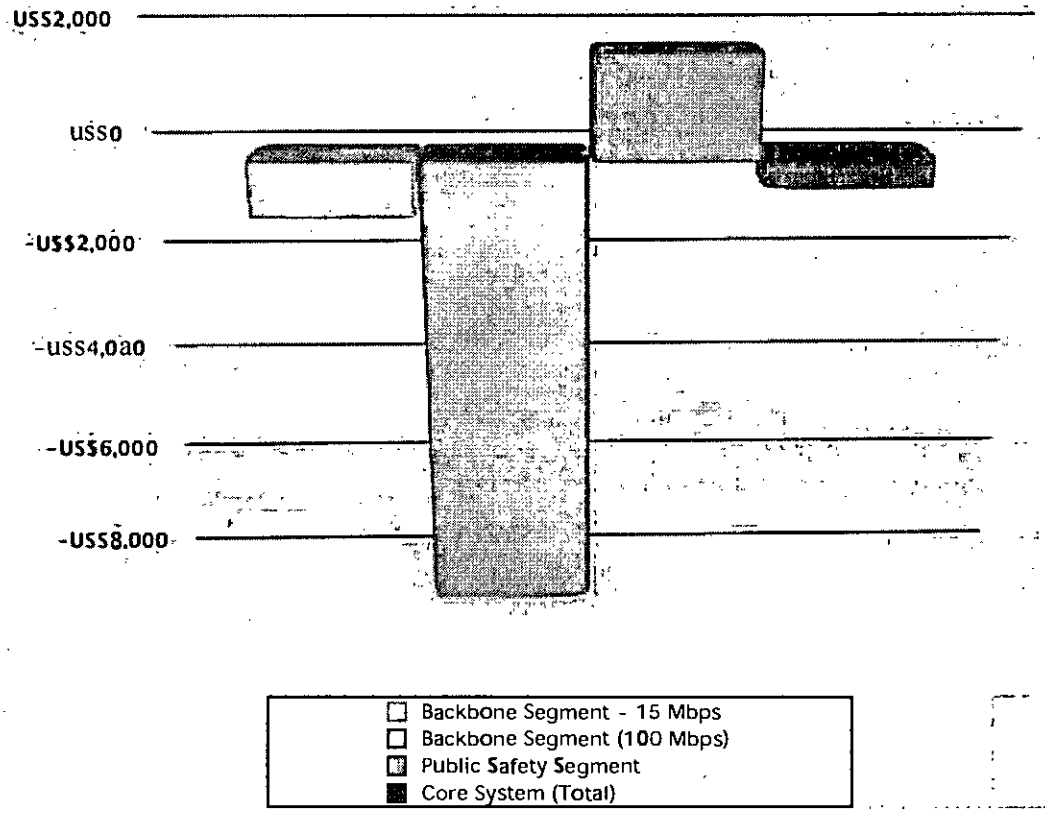
Although inflation adjustments are useful for budgeting purposes, adding a constant inflation figure unnecessarily complicates trend analysis and other long term comparisons. The constant dollar method allows for rapid and meaningful analysis of the value of the project over time, including the cost of funding.

A three step process is used for bottom line analysis of any given segment or scenario:

1. Annual operating surplus or deficit. Without considering the construction cost, which is treated as a capital expense, the annual cost to operate a given segment is subtracted from the associated funding source. This step shows whether funding is sufficient to support ongoing operations from year to year.
2. Cumulative cash flow. The capital costs incurred in each year are subtracted from the operating results, and then carried forward to show whether operating deficits and capital expenditures are eventually covered by the funding sources.
3. Net present value. Finally, the net present value technique is used to factor in the time value of money. A dollar received today is worth more than a dollar promised today and received in ten years, because the dollar received today could be earning interest during that time. By assuming that the City would have to pay interest on any money it borrows (5% is used for the purposes of calculation) and calculating the net present value on that basis, a clearer picture emerges of the long term financial cost of the project.

These three metrics show to what extent the cost of building and operating the system is offset by the cost savings, new value creation, efficiencies and increased revenue it generates.

Figure 7.4 – Core Network Year 10 Net Present Value (000)



This information can be applied in two different ways. First, it can be looked at as a pro forma business plan for construction and operation of the system by the City itself. Second, it can be used to evaluate the feasibility and market value of a public/private partnership, such as a build/lease arrangement, or a simple purchase of services from a telecommunications vendor.

7.3. Cost Estimates

Capital Expense

Construction cost estimates are based on suggested retail prices from a variety of digital radio, tower and network equipment manufacturers. Installation and licensing estimates are based on standard costs. Furnishing and commissioning is estimated at five percent of hardware cost, engineering and design is estimated at 10% of hardware cost, and project management is estimated at ten percent of hardware and installation cost.

Figure 7.5 – Capital Expense

Core Segments	Nodes	Licensing	Towers	Network	Installation	Total
Backbone (15 Mbps Base)	US$613,267	US$74,400	US$77,438	US$208,713	US$35,700	US$1,198,697
Backbone (100 Mbps Increment)	US$367,685	US$0	US$0	US$90,713	US$24,600	US$482,998
4.9 GHz Public Safety Segment	US$1,175,988	US$235,200	US$0	US$0	US$0	US$1,693,428
Sub Total	US$2,156,940	US$309,600	US$77,438	US$299,426	US$60,300	US$3,375,123
Scenarios & Alternatives						
General Government Fixed	US$682,294	US$190,800	US$245,588	US$245,588	US$66,600	US$1,966,369
General Government Nomadic	US$627,273	US$0	US$0	US$0	US$0	US$751,113
BayRICS 700 MHz Scenario	US$885,000	US$14,400	US$0	US$13,275	US$3,600	US$934,275
Business and Entrepreneurship	US$83,084	US$0	US$0	US$0	US$0	US$129,164
Drinking Fountain Model	US$927,130	US$0	US$44,250	US$44,250	US$12,000	US$1,977,310
Sub Total	US$3,204,781	US$205,200	US$289,838	US$303,113	US$82,200	US$5,758,231
Total	US$5,361,721	US$514,800	US$367,276	US$602,539	US$142,500	US$9,133,354

Department of Information Technology expenses are estimated at 10% of base capital expenditure for network security and 12.5% for testing, acceptance and documentation. Costs do not include information technology or network facilities beyond the boundaries of the reference wireless broadband system architecture.

The capital cost of each segment is calculated individually and in isolation, for the purpose of analyfical clarity. Adding in a charge back for the cost of constructing the backbone segment, for example, would result in money being shifted back and forth through the model. The bottom line result would remain the same, but the model would be more complicated and harder to understand. However, as with inflation adjustments, such charge backs would be appropriate in a budgetary document.

Operating Expense

In the model, most annual operating costs vary according to the number of nodes and sites. A node is a radio, which is the essential active data transmission hardware. Switches, routers and network interfaces associated with a given radio are considered to be integral to the node. A site is a physical location which contains one or more nodes.

As an example, take the backbone infrastructure proposed for a typical fire station. A single tower would be installed, which would support one 18 GHz radio link back to a central hub and a WiFi radio for local network access. The station would count as a single site with two nodes. Adding the proposed public safety capability would involve installing three 4.9 GHz radios at the fire station. In that case, there would be a total of five nodes at the location, but it would still count as a single site.

Figure 7.6 – Operating Expense	
Core Segments	**Annual**
Backbone (15 Mbps Base)	US$85,145
Backbone (100 Mbps Increment)	US$29,175
4.9 GHz Public Safety Segment	US$178,065
Sub Total	US$292,385
Scenarios & Alternatives	
General Government Fixed	US$222,967
General Government Nomadic	US$84,529
BayRICS 700 MHz Scenario	US$55,032
Business and Entrepreneurship	US$94,209
Drinking Fountain Model	US$788,059
Sub Total	US$1,244,796
Total	US$1,537,181

Ongoing equipment replacement and software upgrades and licensing are calculated as a percentage of original purchase price, 5% and 20% respectively.

For services provided to the private sector, including non-profits, a 5% franchise and facilities fee is included to account for the value of City resources such as antennal mounting locations, rack space and indirect IT support.

Finally, a 15% overhead charge is applied to all operating costs (except the franchise and facilities fee, which is in effect an overhead cost itself) to account for the value of administrative and support services provided by the City. As with capital costs, each segment is treated separately, without considering charge backs or cross-subsidies.

Except for this general overhead charge, only direct system expenses are included in the model. For example, where providing Internet access is integral to a segment, such as the Business and Entrepreneurship Opportunities scenario, the cost of outside bandwidth is included. But when a segment is primarily intended for internal City IT network use, the potential cost of incidental Internet usage is not considered.

7.4. Grant Funding Considerations

The American Recovery and Reinvestment Act of 2009 (ARRA), commonly referred to as the stimulus package, has a total of $4.7 billion allocated for the Broadband Technologies Opportunities Program (BTOP) administered by the National Telecommunications and Information Administration (NTIA).

Figure 7.7 – National Telecommunications and Information Administration Broadband Technologies Opportunity Program (millions)	
Broadband deployment	US$3,900
Expand public computer center capacity	US$200
Innovative programs to encourage sustainable adoption of broadband service	US$250
State-level broadband mapping	US$350
Total	US$4,700

NTIA has released specific grant request specifications, and evaluation and scoring methods. Goals and specifications include:

- Provide access to broadband service to consumers living in unserved areas.
- Provide improved access to broadband service to consumers residing in underserved areas, which can include urban neighborhoods.
- Provide broadband education, awareness, training, access, equipment and support to community anchor institutions, which include:
    a. Schools, libraries, medical and healthcare providers, community colleges and other organizations that facilitate greater broadband use by these organizations.
    b. Organizations that provide outreach, access, equipment and support services to facilitate greater use of broadband service by low-income, unemployed, ages and otherwise vulnerable populations.
- Job-producing strategic facilities located within state-designated economic zones.
- Improve access to, and use of, broadband service by public safety agencies.
- Stimulate the demand for broadband, economic growth and new jobs.
- No less than one grant in each state.
- Increase the affordability and take up of service, and the greatest broadband speed possible to the greatest population of users in the area.
- Enhance service for health care delivery, education or children to the greatest population of users in the area.

A similar program administered by the U.S. Department of Agriculture allocates $2.5 billion for broadband development in rural areas, however Oakland is not eligible for that funding.

In general terms, NTIA funding is available for cities such as Oakland. However, to qualify for grants to build infrastructure, cities have to meet stringent qualification criteria. At this time, Oakland does not appear to qualify for first round infrastructure funding, but criteria might change in later rounds.

There is a requirement for matching funds, usually 20%, from a non-federal source. The requirements follow typical Federal telecommunications grant guidelines, which can allow in-kind services to be counted towards matching funds. This business model identifies and puts a value on potential in-kind services which could fill the gap.

Another potential source of grant funding is the U.S. Department of Homeland Security (DHS). Most DHS grants focus on public safety and security needs. Consequently, the business model divides the proposed system into public safety and non-public safety segments to facilitate DHS grant applications.

Although the business model is intended to support grant funding efforts, it does not include any grant funds in the analysis. Each segment is evaluated on the basis of its direct benefits to the City of Oakland. Insofar as grant funding is available to offset capital and operating costs, the financial case for building the system is only improved.

7.5. Core System Analysis

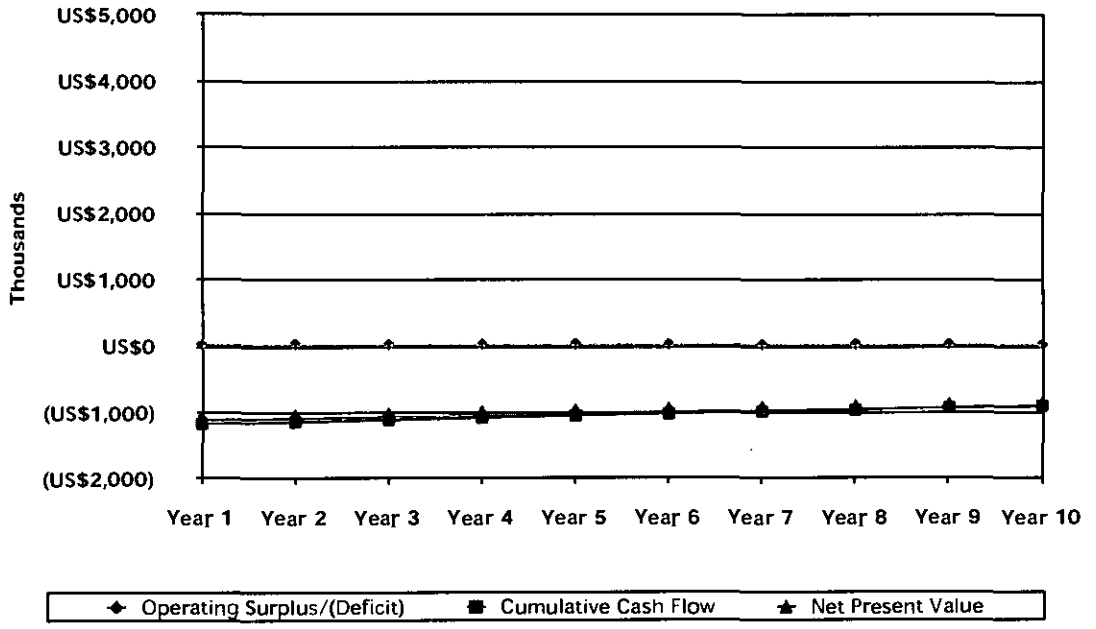
Backbone Segment

The backbone segment is analyzed in two steps: first, a base facility with a minimum link bandwidth of 15 Mbps is evaluated. Then, the cost of an incremental upgrade to 100 Mbps is considered. The working assumption is that the higher bandwidth option is preferred, however a two-part analysis provides flexibility for future budgetary evaluations.

One-time construction costs for the 15 Mbps base total $1.2 million, which includes the cost of radios, towers, licenses, network connectivity equipment, installation, design and project management. Segment facilities include:

- High speed (100 Mbps) links between the Department of Information Technology (DIT) and all five hub locations (Edgewater 911 center, Fire Station 28, and the APL, Gwinett and Seneca sites), plus Fire Station 1/EOC and the Eastmont police substation.
- Multiple T1 grade (15 Mbps) links between DIT and the remaining fire stations.
- Secure network access via WiFi (802.11n at 2.4 GHz) at the above locations.
- Network Operations Center (NOC), including test equipment, at DIT.

Figure 7.8 - Backbone - 15 Mbps Base

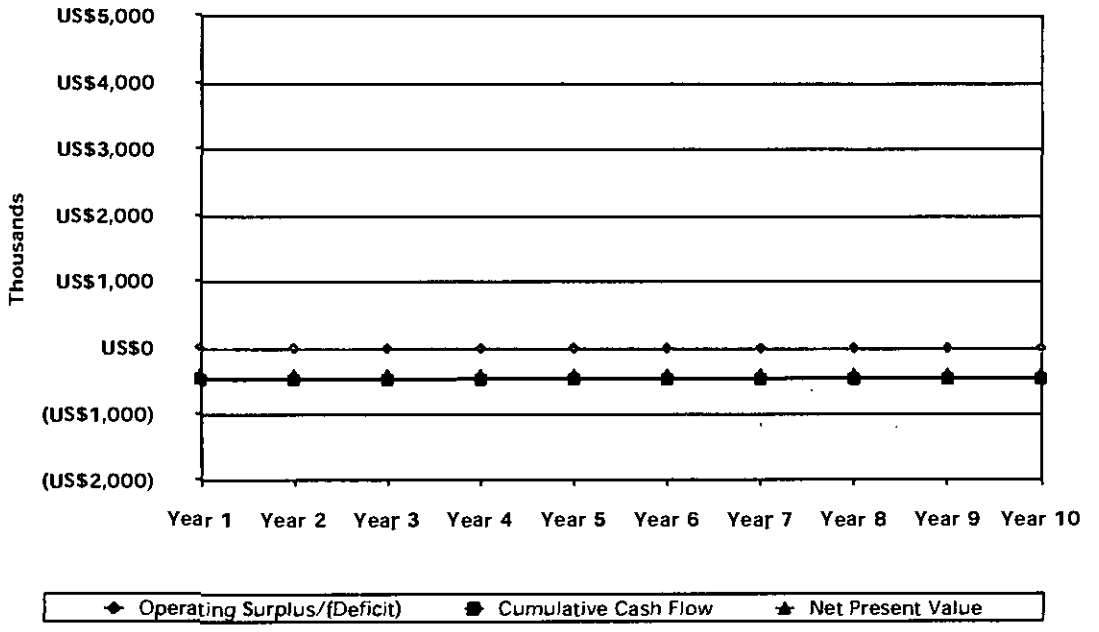


Annual operating expense for the base 15 Mbps segment is estimated to be $85,000 per year, with maintenance, replacements and upgrades accounting for $50,000 of that cost.

Upgrading the backbone to a minimum link bandwidth of 100 Mbps adds $483,000 to the capital cost for a total of $1.7 million. Annual operating cost increases by $29,000. Additional facilities include:

- 108 Mbps bi-directional, upgradable radios used for all 18 GHz nodes.
- All links between hubs and DIT are upgraded to 622 Mbps bi-directional via software upgrades and additional radios.
- The links to Fire Station 1/EOC and the Eastmont police substation are upgraded to 311 Mbps bi-directional via software upgrades.

Figure 7.9 Backbone - 100 Mbps Upgrade



Several high speed data links used by public safety agencies have been identified as replaceable by this segment. Annual out of pocket costs for these links are approximately $116,000.

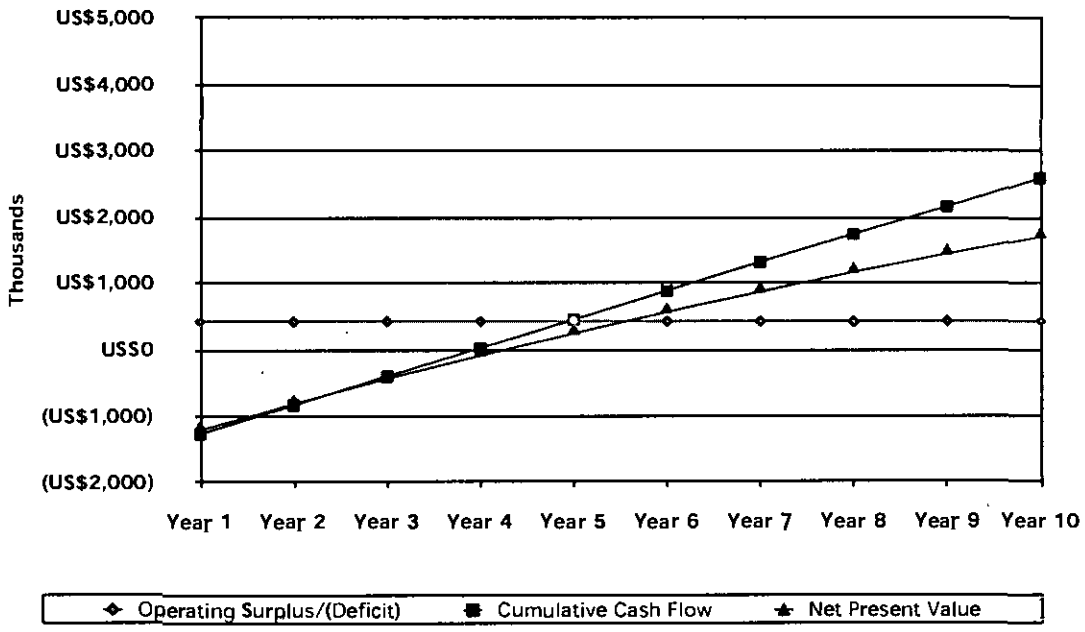
The backbone segment would provide better than T-1 grade circuits to all fire stations, replace two T-1 circuits serving the Police Department, and replace three DS-3 circuits serving the EOC, the Eastmont substation and the Edgewater 911 center. These three circuits represent a fraction of the total landline bandwidth leased by the City to serve these locations, and would enhance overall survivability and reliability by providing independent alternate pathways.

Public Safety Segment (Fixed and Nomadic)

The public safety segment of the reference architecture provides high speed broadband connectivity, sufficient for video applications, to fixed locations and vehicles. However, the technology is not designed to work while vehicles are moving. In other words, it is intended for fixed and nomadic (or portable) applications, and not for mobile use.

The capital cost to build this segment is estimated at approximately $1.7 million. Operating costs are pegged at $178,000 annually, with maintenance and equipment replacement accounting for about half of that figure.

Figure 7.10 - Public Safety Segment



The bandwidth provided by this segment can be used by public safety personnel to access either the City's IT infrastructure or the Internet from the field. Some manufacturers claim to offer USB-enabled devices that can be plugged into personal computers and used in the same way as a cellular data card. However, these devices have not been field proven at this time, and should be assumed to have a limited range and/or high power consumption requirements.

An alternative is to mount more robust devices into vehicles. For the purposes of evaluation, the business model assumes 100 of these vehicle mounted devices would be bought, however the infrastructure and the operating cost offsets can support many times that figure, if non-reimbursable funding sources can be found for additional vehicle mounted units. These units can be used to provide connectivity to laptops and handheld devices through WiFi or other technology.

Cost offsets for the public safety segment include the cost of providing commercial cellular data service to laptop and handheld computers that have been acquired or are already in the purchasing pipeline. The Police Department has identified 842 such nomadic devices, the Fire Department 50 and the Public Works Agency 120. The estimated annual cost for providing commercial data service to these units is $607,000.

A comprehensive, integrated wireless broadband infrastructure will provide Oakland's public safety agencies with more options and greater capabilities than simple Internet

access through commercial carriers. However, the Police and Fire Departments have already committed to widespread deployment of laptop and handheld computers and, to some extent, commercial data services. Both agencies already make use of extensive fixed data lines from commercial carriers as well. Additionally, quantifying the efficiency and performance measures used by these two agencies is difficult to do in ways that are directly relevant to their true mission. Taking all these factors together, it would be speculative to try to value the gains in efficiency and performance measures that the Police and Fire Departments could realize through a wireless broadband system.

Similar considerations apply to the Public Works Agency, particularly where public safety issues are concerned. However, routine operations are more quantifiable and more easily enhanced by information technology. The public works agency has purchased an advanced management information system for that purpose, and it is reasonable to assume that integration of that system into the City's IT infrastructure and extending it to workers in the field will result in efficiency gains. Consequently, efficiency and performance measure gains for public works activities are included with other departments under the general government nomadic segment below.

General Government Alternatives: Fixed and Nomadic Segments

Deploying fixed wireless broadband capacity that can be used for non-public safety purposes will allow replacement of landline circuits that are currently costing the City $89,000 per year. As with the public safety segment, this figure only includes a fraction of the circuits being leased by the City.

More than sixty locations operated by the Parks and Recreation and Human Services Departments do not currently have this sort of high speed service, and the market value of extending the City's information technology infrastructure to these locations is estimated to be $87,000 annually. Because there is no regulatory restriction on the use of these segments, these new wireless links can also support public Internet access and other programs at recreation centers, swimming pools, rental facilities, Head Start/Early Head Start locations, shelters and senior centers.

Community gardens and open spaces have not been included in this calculation. To the extent such locations are included in this segment, the business case for deployment will be improved.

The Public Works Agency manages more than 300 separate locations for the City. This study identifies approximately half of these locations as being suitable for high speed wireless data links. The other half could also benefit from wireless connectivity. We have based the value of connecting these locations on the cost of providing a minimal data link

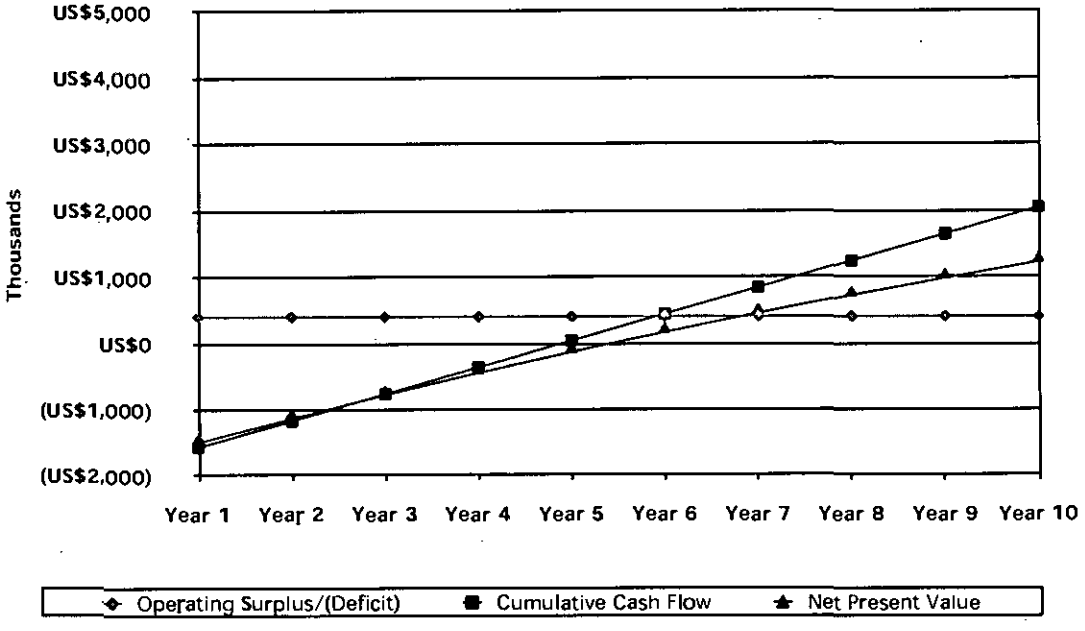
for security purposes. To the extent these facilities could make use of greater bandwidth, the business case for the system is only enhanced. The estimated market value of these security links is $143,000 per year.

Adding remote monitoring capability should result in fewer routine trips and improved emergency response to these 157 sites. We estimate the value of the annual efficiency gain at $84,000, which is approximately equal to the average cost of one full time equivalent (FTE) for the Public Works Agency's facilities and management program.

Allowing non-public safety workers to access the system from the field is also an identified need with quantifiable benefits to virtually every department. Besides the Public Works Agency, major beneficiaries include the Finance and Management Agency, the Human Services Department and the Community and Economic Development Agency (CEDA). Parking enforcement personnel, tax auditors, tax officers, case workers and field inspectors can all make use of the system on a daily basis. The market value of providing remote data access to these workers is estimated to be $53,000 annually.

Allowing these workers to access their departments' IT resources and file reports from the field will result in greater operating efficiencies, estimated to be an average of one hour saved per day by eliminating repetitive trips and speeding up access to information.

Figure 7.11 - General Government Fixed Alternative



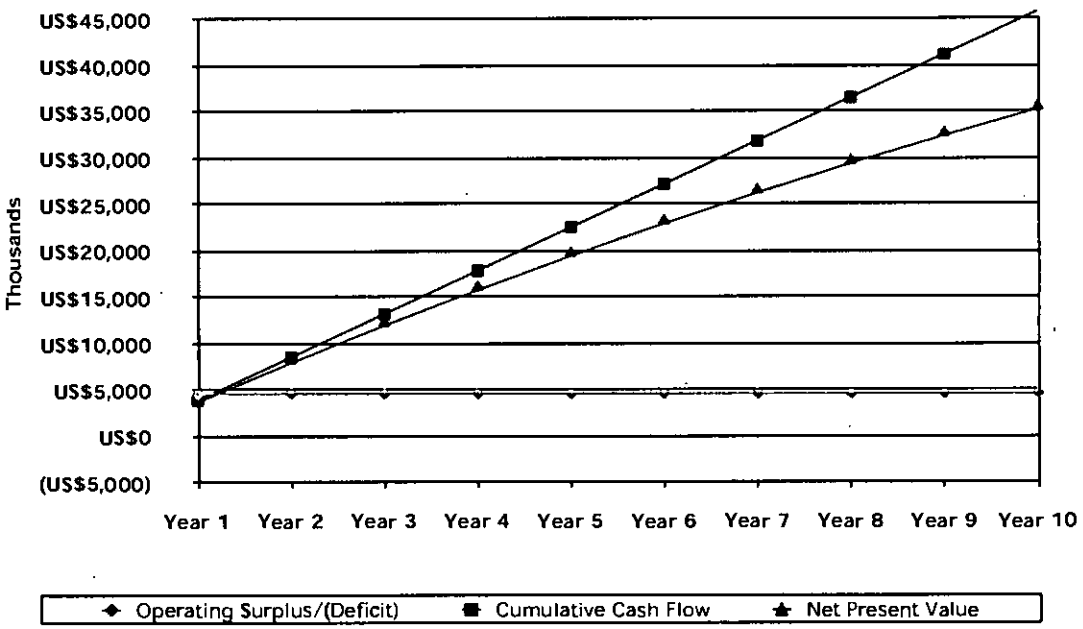
Performance improvement measures adopted by the Finance and Management Agency directly relate to enhanced tax revenue flowing to the City. Using the City Auditor's performance standard of a 4 to 1 dollar return on direct, specific auditing activities (as opposed to overall agency activities), the resulting annual revenue enhancement is estimated to be $2.5 million.

For Public Works, CEDA and Human Services field workers, the estimated yearly gain in FTE value is $2.2 million annually. Likewise, extending fixed wireless link capability to non-public safety locations will improve operating efficiencies. For example, supervisors will be able to securely access and report personnel data from their primary work locations. The value of these gains in efficiency and performance measures is estimated to be $221,000 annually.

In total, $624,000 in recurring funding offsets have been identified for fixed general government applications, such as providing broadband access to recreation centers, and $4.7 million for nomadic applications.

To support the fixed applications, an additional 18 GHz link has been budgeted to serve the main library, 33 additional access points would be installed at existing backbone sites, and 120 non-public safety locations would receive lower cost subscriber devices. The construction cost for this segment is estimated at $2 million.

Figure 7.12 - General Government Nomadic Alternative



To support nomadic user by providing widespread access by way of common WiFi devices, 86 WiFi access points would be added to the 32 budgeted for the backbone segment. Together, these 118 access points would not provide ubiquitous coverage, but would ensure that city employees are never very far – walking distance or a short drive at most – from access to the City's IT infrastructure or the Internet. The capital cost of extending this kind of nomadic connectivity is $751,000.

Annual operating cost is $223,000 for the fixed general government segment and $85,000 for the nomadic segment.

7.6. Additional Scenarios

BayRICS 700 MHz Mobile Segment

One option for providing mobile, or near-mobile, broadband coverage throughout the City – of the sort contemplated for public safety video applications – is to blanket the city limits with outdoor WiFi coverage. This level of coverage would not be sufficient to provide Internet connectivity to homes or businesses, but it would effectively cover streets and open spaces.

The construction cost would be approximately $10 million, with an annual operating expense of nearly $1 million. The surplus generated by the public safety segment above does not come close to covering this additional expense.

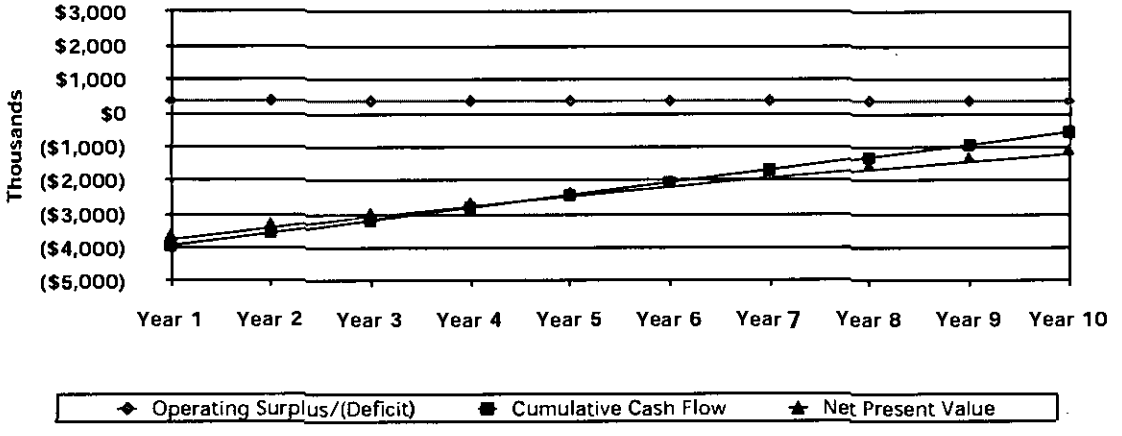
Although it is likely that such a system would support most mobile video applications, it is not at all certain. The technology employed is not specifically designed to support mobile applications, and the spectrum used can be problematic. The high cost and unknown reliability of a WiFi-based mobile video system eliminate this option from further consideration. Its only advantage is that it could be deployed immediately.

A cheaper and more reliable option is the 700 MHz BayRICS (Bay Area Region-wide Voice and Data Interoperable Communications System) system proposed by Oakland Mayor Ron Dellums, San Francisco Mayor Gavin Newsom and San Jose Mayor Chuck Reed on 11 September 2007. City of Oakland staff have been participating in the consortium, and have ensured that it will take into account the unique characteristics and needs of Oakland.

No additional funding sources have been identified to support this segment, however in the core business model, the core system shows a significant operating surplus and pays back the entire capital cost within eight years.

At this point, the details of the BayRICS system have not been fully defined. For comparison purposes, we assumed that six BayRICS sites would be built in Oakland and used the cost estimates generated by the Major Cities Chiefs' Workshop. The operating surplus is more than sufficient to meet the added operating expense of this conceptual segment, and the additional capital expense delays full positive cash flow by only four years. This analysis assume a worst case funding situation: no grant money would be available and the entire cost would have to be self-funded by the City of Oakland.

Figure 7.13 – BayRICS 700 MHz Scenario

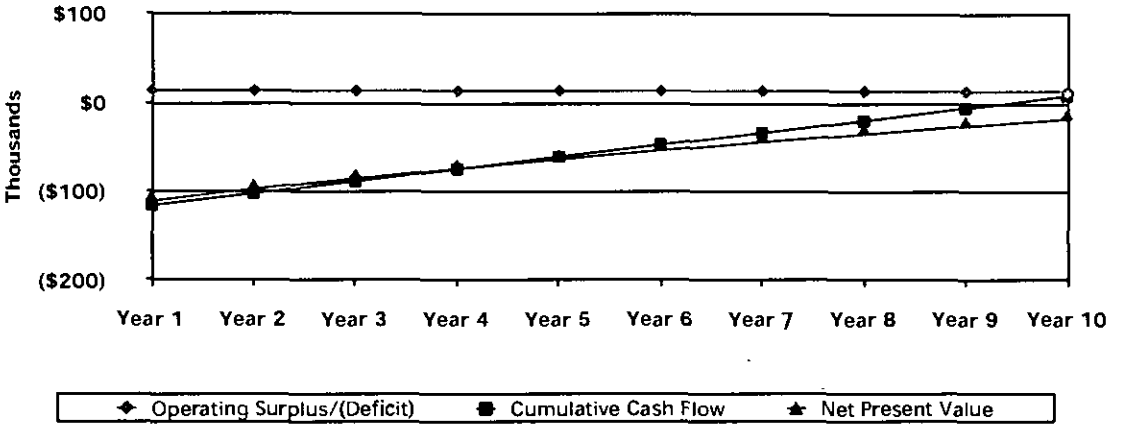


Business and Entrepreneurship Opportunities

Some commercial properties in Oakland are unable to obtain affordable high-speed broadband service from existing carriers. This lack restricts business and employment growth in Oakland, particularly in areas where it is needed most. The reference architecture developed for this study, in particular the core system, can be used to enable delivery of T-1 grade or better service to problematic locations.

It might not be appropriate for the City to directly compete with incumbent telecoms carriers. However, it is appropriate for the City to enable opportunities for new and/or small businesses, particularly in areas or locations where services are lacking. The City can help the business community overcome challenges by making facilities and technical resources available on a wholesale basis to qualified small businesses and business groups.

Figure 7.14 - Business & Entrepreneurship Opportunities Scenario



This scenario assumes that independent, commercial DS-3 grade Internet bandwidth, selected portions of the backbone system and standardized customer premise equipment (CPE) will be combined to create a facility that can support multiple T-1 grade circuits and lower bandwidth hotspots. Building this infrastructure would require a capital investment of $129,000, with annual operating expenses of $94,000.

Revenue would be derived from selling this capacity to local resellers or associations at the monthly wholesale rate of $300 per T-1 equivalent and $200 per hotspot. Providing standardized CPE and core maintenance service would generate additional revenue.

A pro forma estimate puts annual wholesale revenue to the City at $108,000, allowing for pay-as-you-go funding of the program.

Drinking Fountain Model Public Access

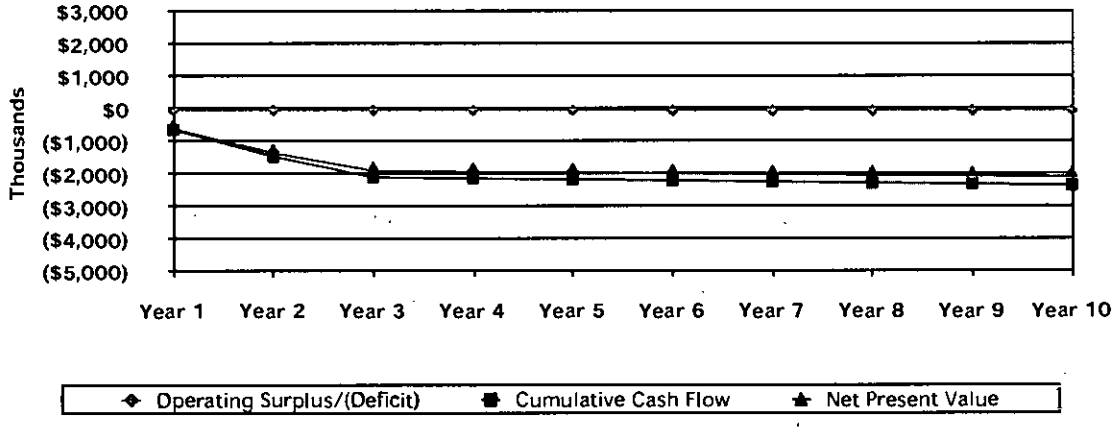
The backbone infrastructure and technical resources created through the Oakland Wireless Initiative can also be used to extend Internet access into the community, providing free or low cost access at community anchor institutions. This access also provides an enabling element for educational, economic development, employment, social, health and other programs. This increased service to the community would be in addition to any Internet access or related programs provided at city-owned community anchor institutions such as recreational centers, senior centers, libraries and the Oakland Museum.

One of the top priorities identified by Oakland residents during the stakeholder analysis process was ensuring that schools had sufficient Internet access. During the workshop process, it was determined that the Oakland Unified School District and other educational institutions already have access to adequate bandwidth through existing programs.

However, those programs place restrictions on the usage of that bandwidth. Offering alternative Internet resources to these institutions could expand their policy and programmatic options.

Community organizations and neighborhood institutions also support programs that could be enhanced by access to high speed Internet bandwidth. For example, the Oakland Housing Authority operates 267 sites where common area Internet access might be offered to residents. In total, the business model assumes that 627 such sites could be supported, including providing each site the necessary equipment to connect to the system.

Figure 7.15 - Drinking Fountain Model Public Access Scenario



Assuming a discounted T-1 equivalent rate of $100 per month, the yearly value of providing high speed bandwidth to these community anchor institutions is estimated to be $752,000, against a capital cost of $2 million and an annual operating budget of $788,000. Although the value proposition justifies the operating expense, accounting for the capital cost is more problematic.

No specific funding source has been identified for this program. However it would be a viable candidate for ARRA funding as well as other broadband funding initiatives currently in the pipeline. The job creation, digital inclusion, educational and public safety benefits are significant, and are directly in line with the BTOP goals and priorities set by Congress.

It is also possible to find funding sources on a case-by-case basis for individual sites. Because this program relies on unrestricted segments of the overall system, it can be built out as needs are prioritized and funds become available.

8. Appendix A: Summary of Research

8.1. Scope

While the scope of this feasibility study is restricted to the assessment of wireless broadband technology, applications and economics, and the needs that might be served directly by such technology, the scope of the assessment sessions was necessarily much broader.

Participants were not expected to immediately make distinctions between needs that might be met by the deployment of wireless broadband facilities, and needs that were either general in nature or for which wireless technology is not an appropriate solution. Conversations with and among participants were far ranging, and covered a wide variety of topics, concerns and needs. Volume 2 of this report contains detailed minutes of these sessions, along with other public comments, and could be very useful for a number of purposes unrelated to this study.

Topics discussed that are either outside the scope of this study or are too general to be comprehensively addressed by it include:

1. *Web-based communications and service delivery by government agencies, including the City of Oakland, to the public.* From an information technology perspective, general purpose content and applications are a key service government agencies provide to the public, a fact which was emphasized throughout the research process. Examples included the City of Oakland web site, an online permit process and a number of educational opportunities and applications. Although increased demand for online resources would tend to support a case for wireless broadband deployment, the same could be said of wired access. It is important to ensure that any public wireless Internet access deployed is able to support online services, but this study does not encompass determining the type, extent and need for such services.

2. *Interoperability between City departments, and between City departments and outside agencies.* As detailed below, to the greatest extent possible, any wireless broadband system deployed by the City of Oakland should be usable by all appropriate parties, and should facilitate rather than hinder cooperation. However, full interoperability is also a function of policy, management and other factors, which extend into areas that this study is not intended to address. Interoperability also depends on existing technology, which this study assesses in the specific context of wireless broadband feasibility, rather than in terms of general interoperability.

3. *General information technology and telecommunications infrastructure and policy.* Any wireless broadband system that might be deployed is necessarily an extension of the City's existing information technology network, and must support and adapt to the policies, standards and network architecture already in place. Where appropriate, this report will make recommendations concerning changes in this infrastructure insofar as it concerns integrating wireless resources, but it does not address general information technology strategy or implementation.

4. *Provision of computer hardware, software, training and technical support to under served communities and individuals.* As noted below, in order for under served communities and individuals to make use of broadband access of any sort, they must also have access to computer resources, including training. This consideration is a limiting factor for some aspects of a wireless broadband system, and must be assessed during any implementation process. Wireless technology, and the policy adopted to deploy it, can also create opportunities to increase the availability of these resources. However, a full assessment of this need and the means to fill it are outside the scope of this study.

8.2. Methodology

Examples of the agenda, discussion guides and other material used in this research can be found in Volume 2 of this study. The primary research program consisted of a series of targeted workshops and public focus groups, as well as a town hall meeting.

The six workshops were structured as semiformal meetings in a business setting. Three workshops were for city personnel, with participants invited from all city departments. One workshop was held for the local business community, one for local non-profits, and one for educational organizations and other government agencies. Department of information technology personnel were present at all workshops, and contributed information and observations as appropriate. However, since DIT is the department that is responsible for this study, they were not primary participants.

The workshops opened with introductions, and then moved to a presentation of background information about the study and on wireless broadband initiatives elsewhere. Participants then discussed their particular needs and concerns. This information was gathered on flip charts, which were then used to facilitate a brainstorming session. The workshops closed with participants prioritizing needs and solutions.

One focus group was held in each of the seven Oakland City Council districts, and participants were recruited from people who live and work in the respective district. An effort was made to recruit people from all demographic categories in each district, and although every focus group did not include participants from all possible demographic

categories, taken as a whole the groups did encompass nearly every segment of the greater Oakland community. Focus group participants were assured of anonymity.

Each group was led through the same discussion guide, with the goal of sparking a wide ranging discussion of needs that could then be channeled into topics specific to wireless broadband. To set the stage, participants introduced themselves and were given a brief presentation of various examples of municipal broadband deployments. They were then asked open ended questions about their perceptions of needs and existing City services, which led to interactive discussion of relevant topics. Each session closed with a summary of the points raised in the discussion and a brief prioritization exercise.

The town hall meeting was designed as an open and unstructured public discussion, with no screening or targeted recruitment of participants. It began with a presentation about various municipal wireless broadband projects and an overview of the study process. Members of the audience then asked questions and presented their own views about what they thought were the important needs and service priorities for the City of Oakland, and their opinions and suggestions concerning wireless broadband specifically. All public comment was taken as presented, with no effort made to channel the discussion or produce a group consensus or identify common conclusions.

8.3. Technical Kickoff Meeting

On 7 December 2007, City of Oakland personnel responsible for networking and telecommunicafions met with prime study contractor Stephen Blum and technical lead Stuart Browne to discuss information needs, and to be briefed on the planned course of the study. Blum and Browne presented background information on the technology and economics of municipal wireless broadband and discussed technical information needs.

All participants agreed to help collect the technical data and later did so, using a guide and questionnaire prepared by Browne.

8.4. Workshops

Workshop 1: Police and Fire Departments, Mayor's Office, Administrator's Office, KTOP

This workshop focused on public safety and emergency services. Participants brainstormed and discussed potential applications that could increase response time, improve service efficiency and increase interoperability between agencies in times of emergency. A representative from the Human Services Department attended, and provided ideas on how wireless technology could be used to serve the elderly.

Police department representatives discussed a current effort to provide all police officers with laptop computers, and the need to provide those computers with data access in the field. Fire department representatives stated that they are not currently accessing data from the field and that personnel, for example fire inspectors, are recording information on paper in the field and returning to their offices to manually enter it into computers.

Police and fire representatives believed that better visual information from the scene of incidents would lead to improved coordination between their departments, and would enhance their ability to respond to those incidents.

Network independence and cost savings were two key potential benefits identified. Using commercial networks for public safety can be problematic, primarily due to security concerns. There was a belief that costs could possibly be reduced if a Citywide network was in place. Increases in efficiency and productivity also could be possible. Participants identified an opportunity to make field workers more efficient by providing remote access to records, and to file reports and record other information without having to return to the station. The result could be better service and faster response, as well as an increase in the amount of time field workers could spend in the field.

Security and privacy were key concerns. Participants agreed that, in general, any wireless technology used must be secure and able to support Federal standards, including encryption and segmentation for law enforcement communications. Privacy standards, for medical records for example, must also be met.

Coverage must be adequate to support intended users and should represent an upgrade in capability, according to participants. They observed that police and fire personnel already have to contend with radio dead spots because of hilly terrain, and ideally any wireless network deployed would help alleviate that problem. Another challenge is the need to communicate with aircraft and boats.

Another concern of participants was system survivability during a disaster, such as an earthquake, and ensuring that the system is adaptable to meet the rapidly shifting needs and circumstances that major emergencies present. Participants believed that any system must have a high degree of reliability, with adequate emergency power, backup equipment and spare capacity to function at all times, during emergencies as well as routine operations.

Workshop 2: Public Works, Facilities Management, Risk Management, Human Services, Community Economic Development Agency (CEDA)

In this workshop, the focus was cost savings, productivity, and driving new revenue opportunities for the City. Some of the same issues mentioned in Workshop 1, such as gaining efficiency in work management systems, were also raised. Location-based tracking was identified as a way to manage City assets. Ideas for emergency and disaster management applications were also offered.

Participants discussed ways wireless technology might improve efficiency and productivity, echoing comments in the earlier workshop about the benefits of being able to access information and file reports from the field. Potential cost savings were identified as well. For example, the public works department is acquiring 150 new laptop computers. Purchasing commercial wireless data service would cost approximately $50 per month for each computer, for a total budget of $90,000. An independent City wireless network might be able to provide comparable service for less money.

Specific applications that could enhance productivity were discussed, such as remote reporting and two-way access to the City's geographical information system (CIS). City tree crews would like to be able to access right of way and property line information while in the field. The traffic division is currently looking at wireless technology as a way of managing radar feedback signs. Currently, they are transferring data by swapping out physical media on individual units. Managing and monitoring traffic signals was also mentioned as a potential application.

Other uses for wireless technology mentioned included filling in dead spots in current City radio and commercial carrier data network coverage, providing remote access to desktop computers and enabling telecommuting. One observation made about telecommuting was that in addition to being a potential productivity enhancer, it is also useful in preparing for emergencies. According to one of the participants, the federal department of homeland security requires some employees to work from home one day per week, to ensure they can do their jobs if they are unable to report to their primary offices during an emergency.

Wireless technology was also mentioned as a potential economic development tool, which could boost the value of some properties by enabling state-of-art broadband facilities. In other cases, it could provide a back-up service for businesses that rely on wired connections or as an extension of wired networks for businesses with significant numbers of field workers within the city limits. Another potential economic development opportunity identified by participants was providing wireless public Internet access in high traffic areas, which could be of particular benefit to mobile workers and the travel industry.

Participants also thought that wireless technology could aid in increasing the trust of the general public and promoting transparency. The rationale was that when field workers were interacting with the public, for example during an inspection, wireless data access would allow them to show processes and results in real time, rather than having to wait days, or longer, to provide feedback. Another need identified was the lack of affordable Internet access in some neighborhoods, and wireless technology was discussed as one element of a potential solution.

Workshop 3: Finance Department, Office of Emergency Services, Oakland Museum, Parks and Recreation Department

The discussion in this workshop centered on ways that wireless technology could plug holes in current networking capabilities, extend information technology resources into the field and enhance existing City services.

Participants came from a diverse group of departments, with a variety of institutional needs. Both the finance and parks and recreation department representatives saw value in being able to access their existing information technology assets directly from the field. For example, being able to access information remotely would allow the finance department to conduct more and better field audits, potentially leading to increased tax revenue flowing to the City.

Adding geographic information to existing databases, and accessing that information automatically through location-based services, was seen as a way to enhance tax code compliance, as well as compliance with other City requirements. Location-based services were identified as a way of improving City operations and services, such as emergency response management.

Some parks and recreation offices do not yet have wired access to the City's information technology infrastructure, and wireless technology was mentioned as a potential means of providing connectivity. Currently, supervisors have to go to a central office to file routine reports, such as personnel-related records. This situation was seen by the group as being inefficient and a specific application where wireless technology could improve productivity. As with previous groups, participants believed that being able to access and file information from the field would increase productivity by reducing the need to travel back and forth to an office.

Security was a central concern. Participants noted that the two examples above involve confidential information that has to be carefully controlled, both while it is being transmitted and on any devices that are used in the field. The City's current IT infrastructure

already has extensive safeguards, such as virtual private networks (VPNs) built into it. Any wireless extensions to the existing network would have to support those safeguards.

The representative from the office of emergency services echoed comments made by police and fire department personnel during the first workshop. Wireless facilities could improve communication with emergency responders on a routine basis as well as during major incidents, and provide a back-up to existing systems.

Finally, improving communications with and service delivery to the public was seen as a significant potential benefit of wireless technology. For example, it could enhance interactive tours of the Oakland museum, provide better public access to the museum's collection, and aid in volunteer recruitment and management.

Workshop 4: Oakland Businesses

Participants discussed gaps in services and facilities, both public and private, and ways wireless technology might plug those gaps. Much of the discussion focused on the economic case for extending networking resources and capabilities, including ways that the City might pay for the facilities needed, and on opportunities for private businesses and individuals to participate in such a project.

Business representatives generally believed that adding wireless connectivity to the City's IT facilities could increase the productivity of field workers, potentially reduce crime by improving surveillance, and improve service delivery to business, such as expediting building inspections permit processes.

A couple of specific business opportunities were idenfified and discussed. First, downtown Oakland has a number of "Class B" buildings that lack commercial-grade Internet access. A wireless network could be a way to bring connectivity to those buildings, and the use of wireless technology internally could be a way of quickly distributing access throughout a property. Second, adding wireless hotspots in key locations, such as bus shelters, the downtown area and Jack London Square, could help increase tourism and convention business.

Several suggestions for financing wireless facilities were offered. One idea was to allow business owners to buy in to a video surveillance network, making it possible for them to add supplemental coverage of their own locations, and to assist with monitoring and reporting. Another was to maximize advertising and sponsorship opportunities.

One suggestion made was to integrate public transit information and dial-a-ride service with mobile phone networks, offering both a way to deliver information to the public and a

means of billing. Transportafion-related applications were seen as potentially fundable through grants.

Participants generally believed that any wireless system deployed should be financially sustainable, and the costs of the system should fall primarily on those who benefit from it. They also emphasized that the value of any system should be determined before decisions are made, and that costs be in line with the value added.

A City wireless system could also encourage other wireless-related businesses to develop, according to participants. For example, access to wireless facilities might make it possible to offer new voice communication or Internet access services, or extend the reach of current, commercially available services to new places and new customers. Businesses might also be able to use a citywide system to track employees and assets.

Workshop 5: Oakland Non-profits

Participants were concemed about providing access to Internet resources and services to those who don't yet have it, particularly youth and the economically disadvantaged. They generally believed these individuals would be left behind, academically and technologically, if efforts were not made to educate them with the basics of technology. The discussion focused on the benefits of Internet access, regardless of whether it was provided wirelessly or otherwise.

One of the key points of the discussion was that the inability to access Intemet resources and services is due to several factors, including access to the necessary hardware and software, basic technology skills, computer-specific skills and professional technical support, as well as an inability to obtain Internet access service, either because it is not available or it is not affordable.

Two ways of overcoming Intemet access issues were discussed. One was to deliver alternate Intemet service into homes for free or at a reduced rate. Another was to provide it to community groups and at public facilities, making it easier to combine it with hardware, software, training, technical support and other necessary resources, and to create programs that serve the specific needs of different parts of the community. A variation on this idea, which favors the use of wireless technology, is to create mobile centers, similar to bookmobiles, that take these programs directly into neighborhoods.

One of the participants was from Kaiser Foundation Health Plan, Inc. He described a mobile medical clinic that Kaiser is currently testing in Hawaii. Its immediate purpose is to provide health care to under served communities, but ultimately it could be a platform for providing care directly to people in their homes. Other Oakland area hospitals are also

expanding online services, and City infrastructure, wireless or otherwise, could help link these efforts.

Internet access, wireless or otherwise, was seen as a means to help achieve goals, rather than as a goal itself Those goals included improving educational levels, teaching skills, encouraging the pursuit of higher education, improving delivery of health care, increasing access to social services, and community building. Participants generally had a sense of urgency about reaching these goals, and saw needs as being immediate and pressing.

Workshop participants generally favored business models, network architectures and technology that was non-exclusive and available to all. Creating competition for incumbent Internet service providers was seen a beneficial. Job training opportunities were also identified, for example training local residents to become network technicians.

Workshop 6: Education and other Government Agencies

Participants in this workshop were primarily management level information technology and telecommunications staff from local government agencies. As a result, the discussion focused on common technical challenges, and interagency cooperation and the means to foster it. There was considerable willingness amongst all participants to discuss sharing resources and cooperating where possible.

Several of these agencies, for example the Oakland Unified School District (OUSD), BART, the Metropolitan Transportation Commission and the Port of Oakland, have existing broadband networks within the Oakland city limits, including wireless facilities. In addition, BART is extending public wireless access, through mobile phone carriers and other means, throughout its system. OUSD and the Port operate more or less completely within the city limits, and face some of the same networking challenges as the City. In some cases, participants said, the City could share existing facilities. In other cases, agency representatives said they would be interested in making use of City resources.

One example of project congruency is the Port's current program to install public wireless Internet access in high traffic areas that it controls, such as the airport and Jack London Square. Another example is OUSD's program to create a wireless overlay of its existing information technology network within all its buildings. This network is not intended to provide public Internet access, however one suggestion made was for the City and OUSD to cooperate in providing public access in common areas, such as auditoriums, after school hours, if legal and security concerns could be addressed.

OUSD and Peralta Community College District representatives expressed other security concerns. Rogue wireless access points – personal wireless routers that are attached to a secure network – are an issue, and in some instances have shut down networks.

Emergency planning is another area of potential interagency cooperation. For example, some OUSD schools are designated as emergency evacuation shelters. If activated, those sites would have communication needs that are radically different from normal day to day operations, and could benefit from wireless broadband facilities that could be quickly adapted to satisfy those needs.

Ongoing technical coordination, from the planning process on through to deployment and operations, was seen by participants as essential to any partnership. Security was one area of particular concern. Individually, agencies have to meet security requirements that are unique to their jurisdiction. Consequently, any common broadband facilities have to be able to meet all the security requirements of all the partners.

One suggestion that was generally endorsed by all participants was that interagency planning and coordination should extend beyond the workshop, as a group or one-on-one as appropriate. One existing group that was mentioned as an example, and potentially as a forum, is the recently formed Bay Area transportation CIO roundtable.

Participants also believed that policy-level coordination is an important element in creating any ongoing cooperative effort. The governing authorities of each agency have concerns and priorities that might or might not be consistent with City policies and, according to participants, advance coordination would be necessary to ensure a smooth process.

8.5. Focus Groups

Focus Group 1 - District 6

The majority of the participants either lived or worked in East Oakland. This focus group had the highest youth participation of all the focus groups, with young people comprising more than half of the participants. Council member Desley Brooks, who represents this district, made opening remarks to the participants.

Top priorities

- Overcome economic and educational hurdles to hardware and access, ensuring that everyone who wanted access could afford it, and who needed hardware could get it.
- Equip all schools.
- Secure post-disaster resources.

(Prioritization of topics was done by participants themselves as part of the concluding process of each focus group.)

Focus Group 2 - District 5

This focus group was the smallest. The participants either live or work in this predominantly Latino area of Oakland. Perhaps because of its smaller size, this group engaged in a very lively discussion. Participants ranged in age from high school students to senior citizens.

Top priorities

- Access for all, "not just free access, but having the tools – the hardware and the software – to even endeavor taking advantage of the access".
- Service providers ought to be a part of Oakland.
- Make sure any public services are multilingual.

Focus Group 3 - District 4

This session was very interactive. The focus group took place in the Dimond library, one of the few libraries that offer free wireless access to the Internet. While the focus group was taking place, members of the public parked outside the closed library, just to make use of this access. This group seemed well versed on innovative technologies. Council member Jean Quan and members of her staff participated in this focus group.

Top priorities

- Easy and inexpensive access for all, the more people on the network, the more valuable it becomes.
- Bandwidth and strong infrastructure to support use
- Public access should start in public areas.

Focus Group 4 - District 1

Senior citizens were well represented at this focus group and it was held at a senior center. The group seemed very engaged with the city, in terms of volunteerism and other roles, and very educated about the status of Oakland politics. Overall this group focused more on city issues than on issues relating to their personal needs.

Top priorities

- Better real time communication in emergencies.
- Public safety and emergency response.
- Education.
- Technology and software.
- Accessibility across Oakland.

Focus Group 5 - District 2

This focus group had the most culturally diverse group of participants, who spoke a remarkable variety of languages. Language issues might have led some to engage in discussion less than others, but even so a broad range of issues, some unique to the district, were put forth.

Top priorities

- Leadership necessary to effectively implement.
- "Public face" on this initiative.
- Public utility-type service.
- Training.
- Access.

Focus Group 6 - District 3

This focus group was one of the most balanced in terms of male/female ratio and above/ below 40 age range. The majority of participants in this focus group lived or worked in West Oakland.

Top priorities

- Infrastructure.
- Public access.
- Content, in terms of what is accessible over the system.

Focus Group 7 - District 7

The participants of this focus group lived or worked in East Oakland. Just under half of the participants were young people. Perhaps as a result, the discussion was free flowing and covered topics and ideas that had not yet been considered.

Top priorities

- More WiFi at community centers, schools, libraries, etc.
- If the city wants to create more revenue, focus on WiFi on buses so people will use them more.
- Have WiFi available as a public service.

8.6. Town Hall Meeting

The Town Hall meeting was well attended. Participants focused on the City's plans and what should be considered during the assessment process. A good portion were technology-oriented and seemed to have a good understanding of what would be involved in designing and deploying wireless broadband solutions for the City of Oakland.

Top priorities

- Access for unserved areas is important, but needs to be combined with other necessary resources such as equipment, training and support.
- Some solutions are easier to implement than other, and can be deployed quickly, such as offering free WiFi access at all City libraries.
- Costs have to carefully considered.
- Wireless broadband facilities created for City staff should address genuine needs.
- Wireless technology can help provide public as well as infrastructure support in emergencies.

8.7. Samples of Public Comment

As noted above, detail notes and other documentation from all the sessions, as well as other public comment received during the study, is contained in Volume 2 of this study. Typical comments include

"The Diamond Library has WiFi, but the Eastmont Branch doesn't. All the libraries need it."

"Residents could use Internet to report incidents to the City, or the police department. With wireless reporting police could see whether there are clusters of incidents happening repeatedly in an area, and send a cruiser to that area."

"Need to know what benefits the taxpayers are getting from the wireless service as well as what benefits the vendor is getting."

"Will development of this infrastructure produce the kinds of jobs we need in Oakland?"

"Security is important for privacy."

"Let's not spend all this money to hire brand new people to recreate stuff that already exists. See what already exists... and leverage existing resources."

Train teenagers to be technicians to support access and hardware. " The point is to train people in the community, not bringing folks from outside."

"Wireless access is only good if you have the equipment. Consider lending programs such as Berkeley's tools program for home improvements, for video cameras, digital cameras, computer equipment."

"Provide WiFi access in bus shelters as well as on buses. "[While riding the bus] people spend a lot of time sitting around doing nothing; it would be much more enjoyable and productive for people with WiFi access. In Japan they provide all the messaging in different languages."

"It's fairly common throughout the country that most libraries have WiFi, so we are a little bit behind the times now. The main library does not have it. We get asked for it easily five times per week. In terms of the digital divide, patrons who come in to use equipment at the library don't have computers or printers at home, so providing WiFi in some neighborhoods might not actually provide access."

"I have a concern that commercial implementation of WiMAX or a 4G system by a major corporation could easily render something that we put up ourselves obsolete."

"Must be careful not to underestimate the cost associated with broad-scale wireless access. This makes me think pragmatically about the drinking fountain model, where you focus first on services that can piggyback on existing wired connections at schools, recreation centers, and public buildings as a nexus for people to come together that might otherwise have difficulty accessing the Internet."

"I love technology – wireless everywhere would be wonderful. However, given other cities' problems with wireless, Oakland's current resource problems, and frankly track record – please don't do it."

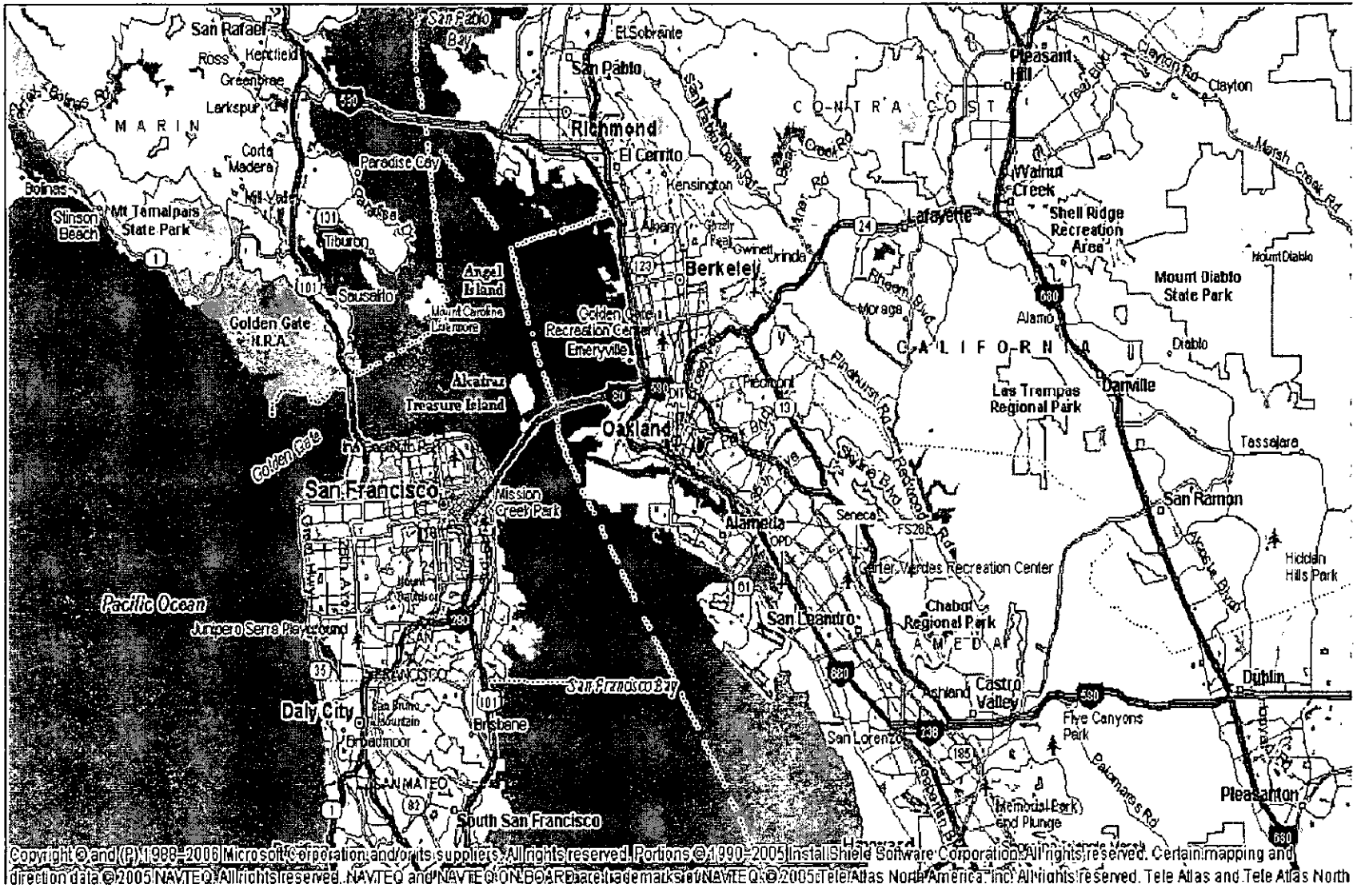
9. Appendix B: Frequency Mapping

Oakland Reference Architecture

Coverage Maps

4.9 GHz
2.4 GHz
700 MHz

RF Hub Locations



Oakland Reference Architecture

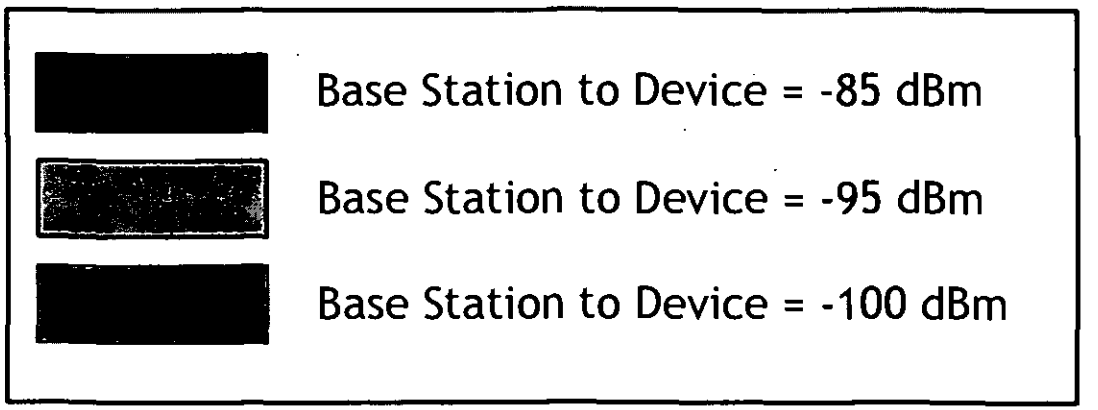
Coverage Maps

4.9 GHz
2.4 GHz

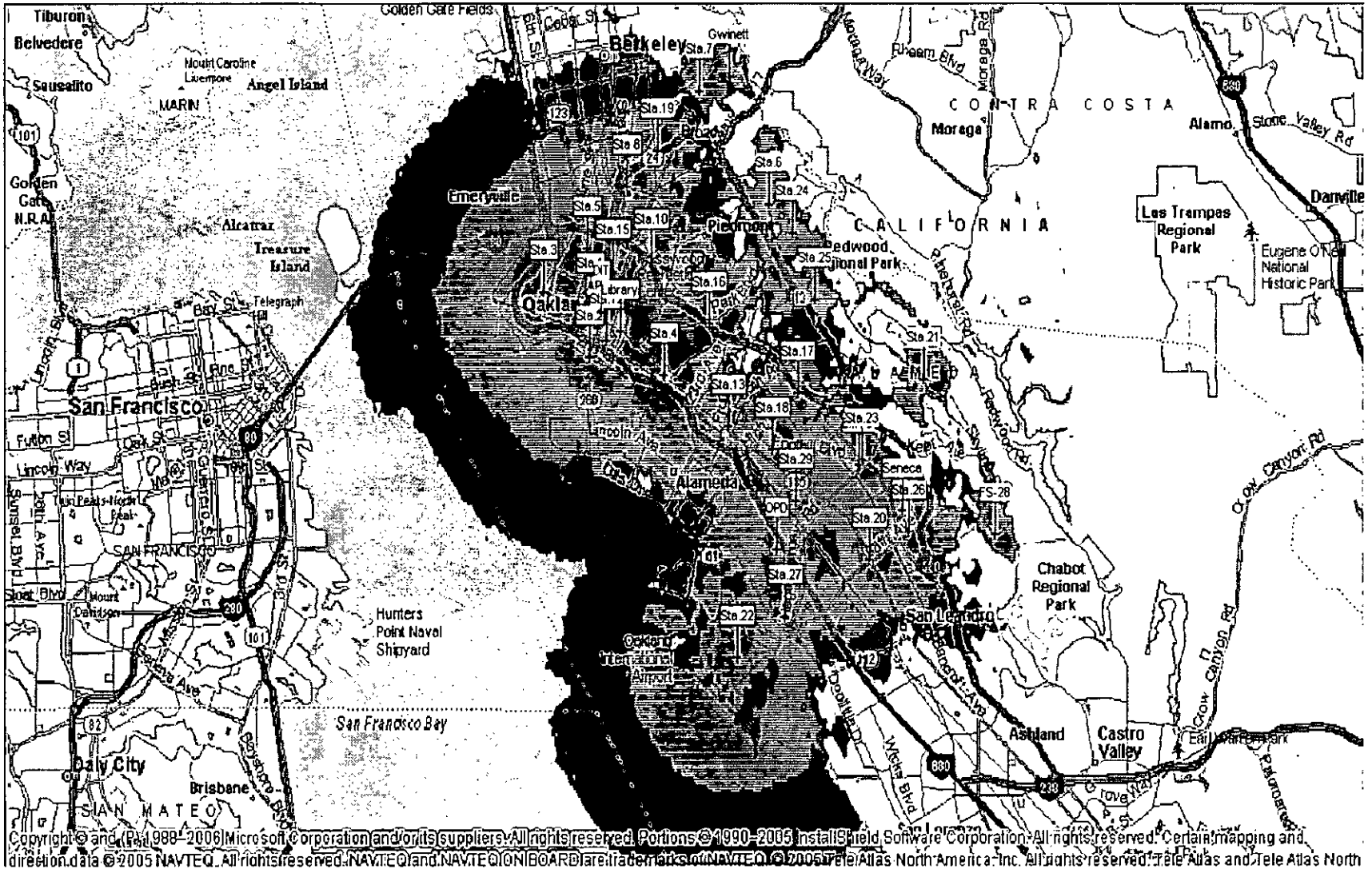
4.9 GHz and 2.4 GHz Assumptions

- Maps are for informational purposes only.
- Do not assume a particular system design, other than frequency band.
- Maps do not account for subscriber density or multi channel access points.
- Maps are based on Talk Out- Base Station to Subscriber
- All maps are based upon a reliability of approximately 95% Area Reliability.
- 2.4 GHz Maps are based on an ERP of 36 dBm - Maximum allowable per FCC.
- 4.9 GHz Maps are based on an ERP of 29 dBm - Maximum allowable per FCC.
- Gwinnett, Seneca, and FS 28 location on tower adjusted to 25 ft.

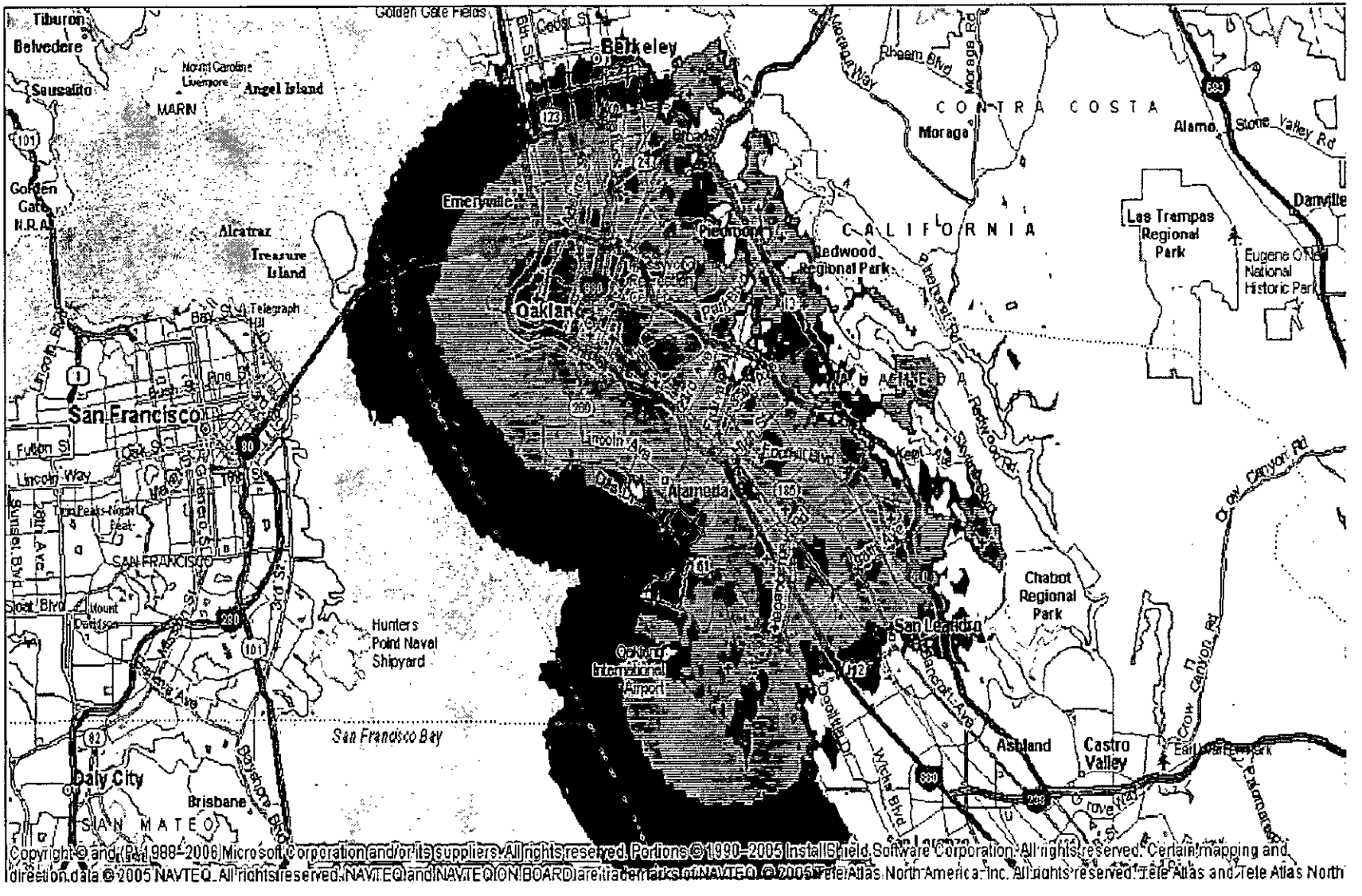
Map Legend - 4.9 GHz and 2.4 GHz



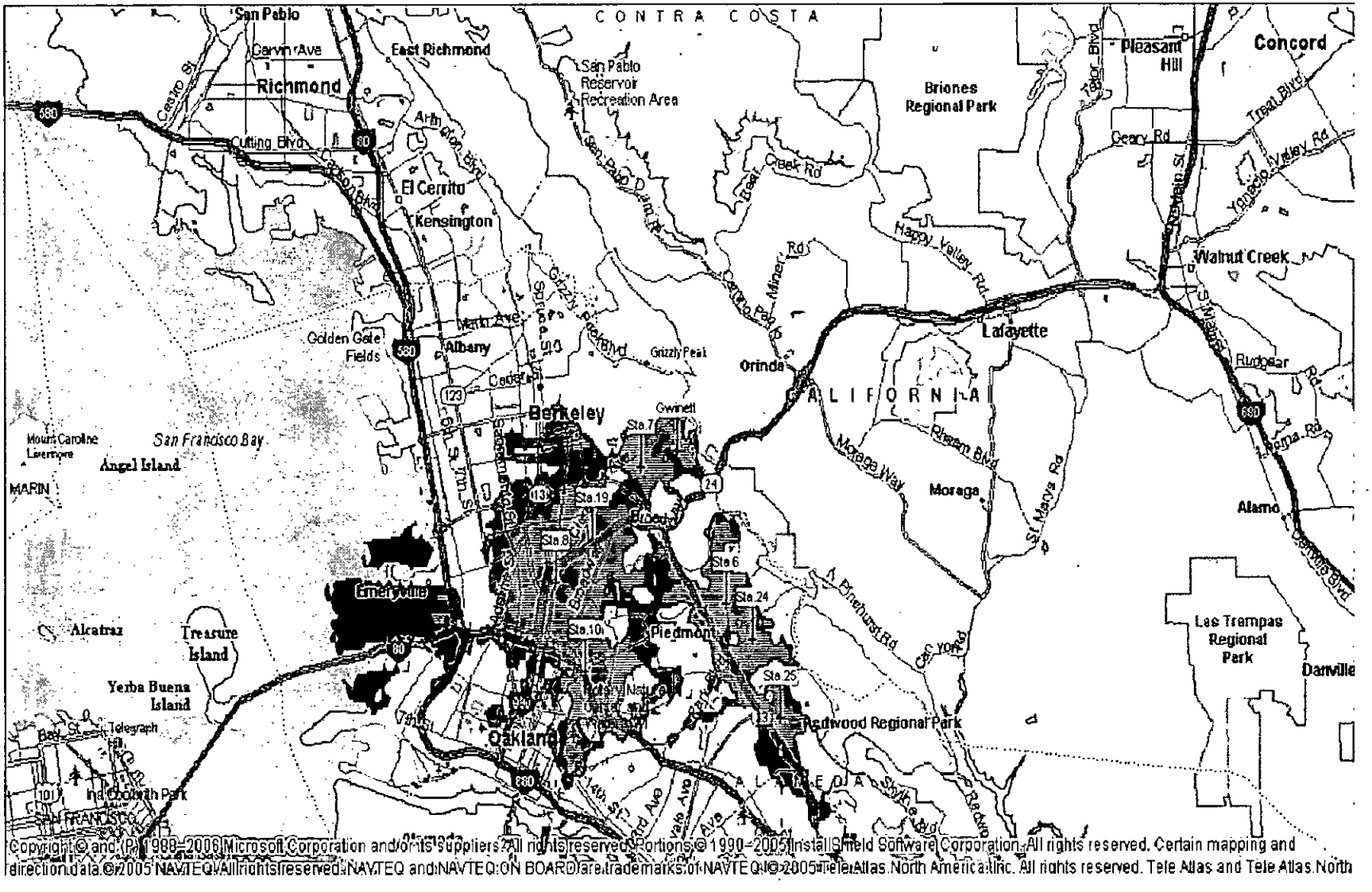
Composite - 4.9 GHz



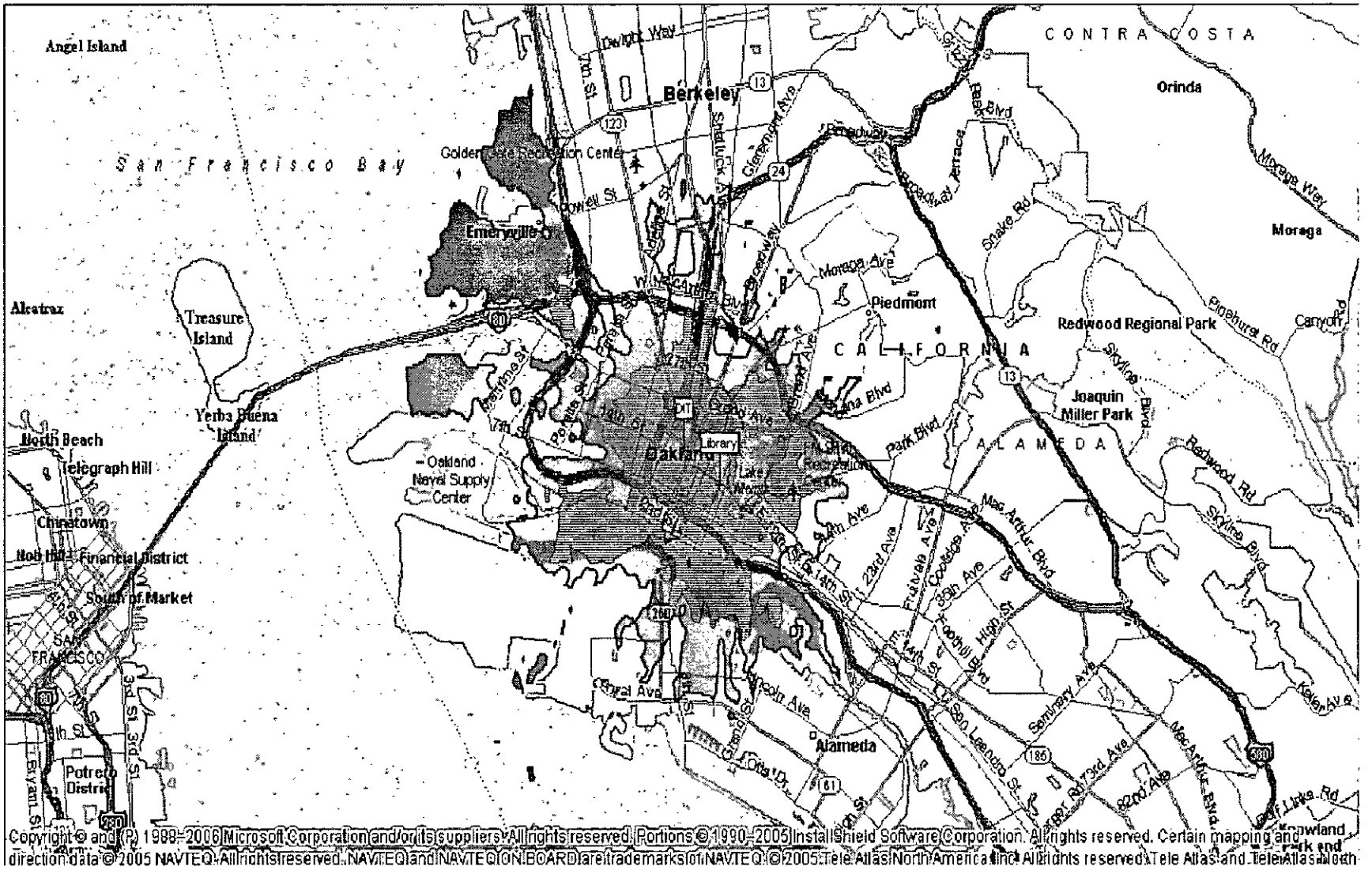
Composite - 4.9 GHz



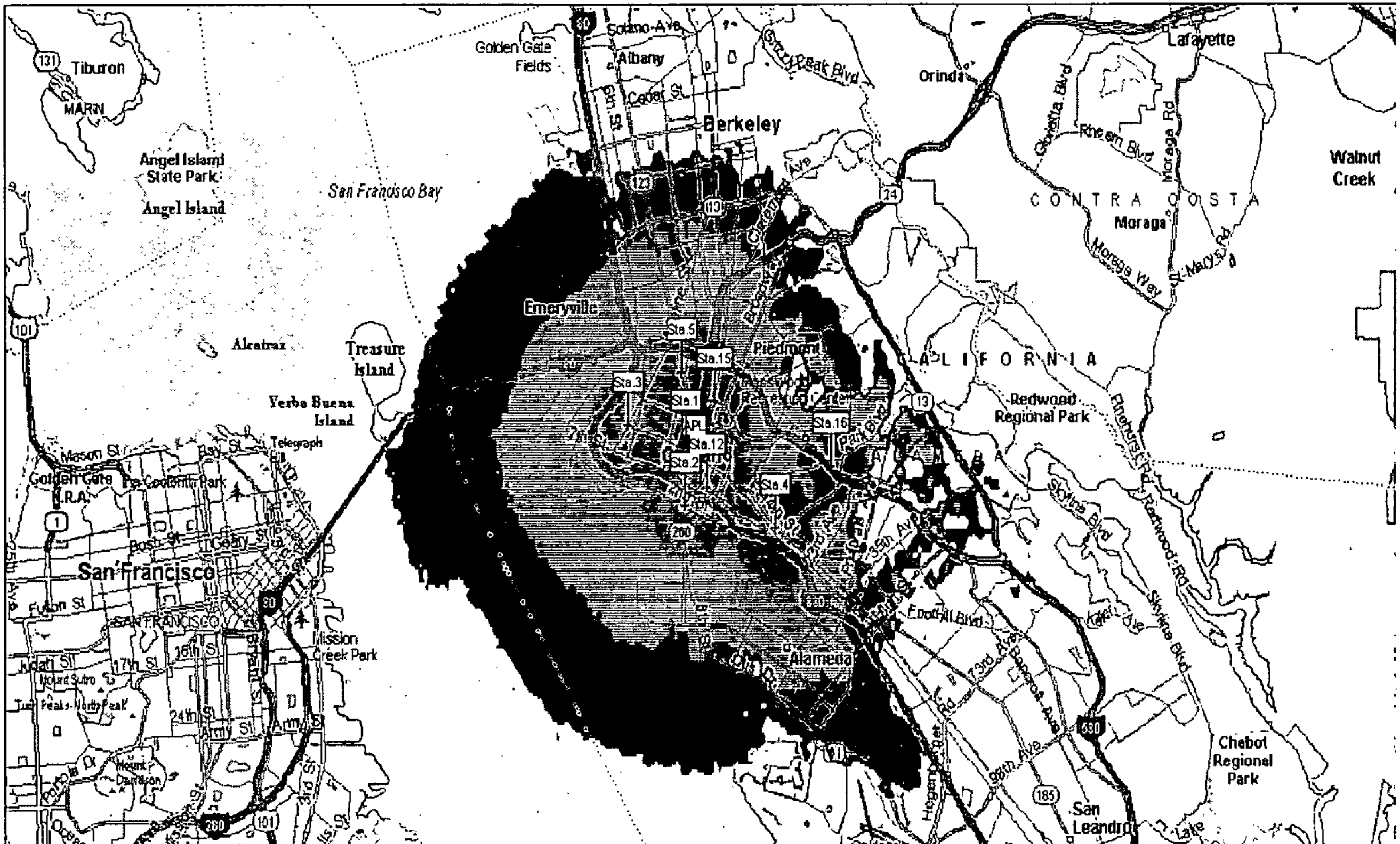
Gwinnett - 4.9 GHz



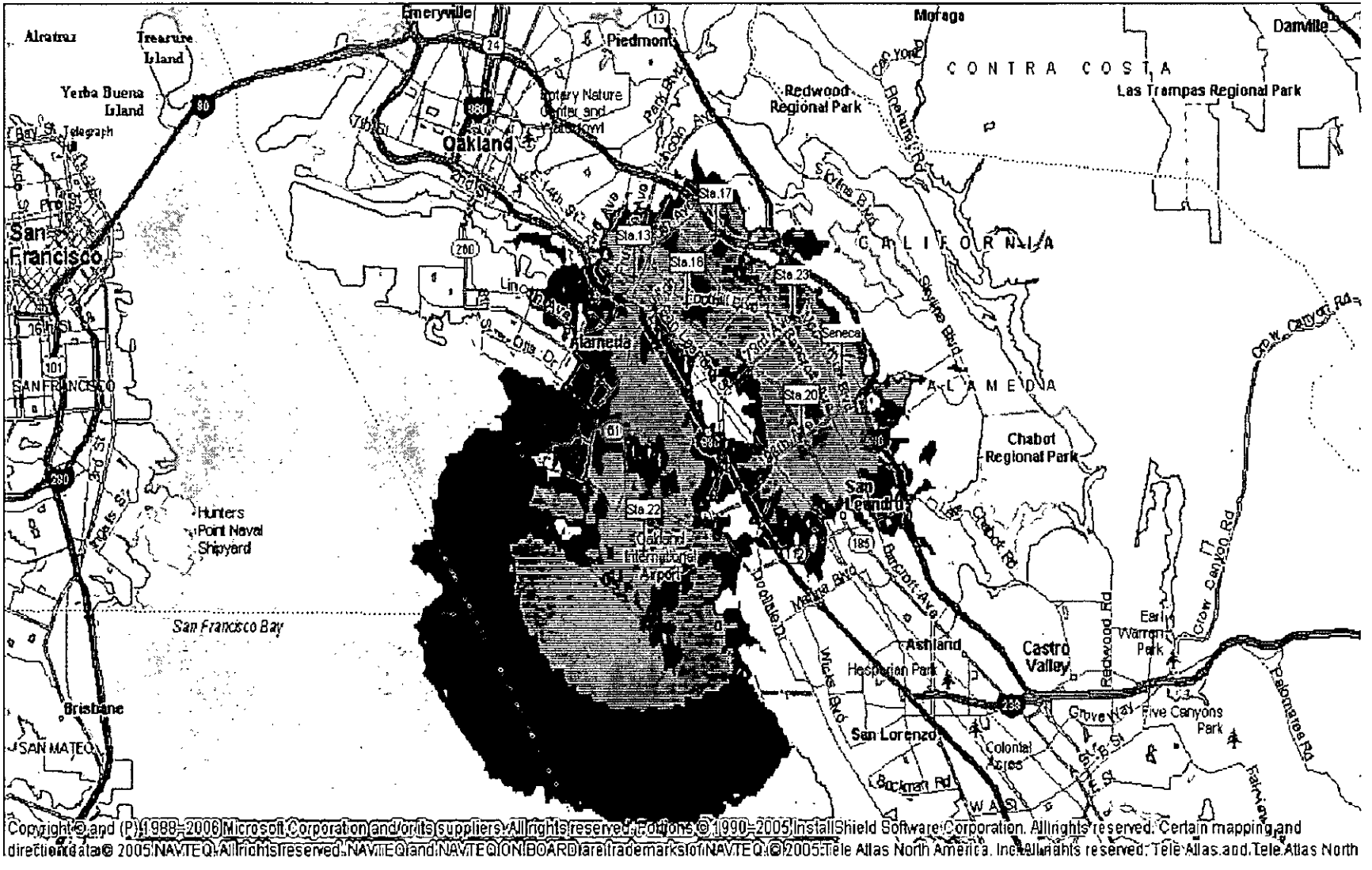
DIT- 4.9 GHz



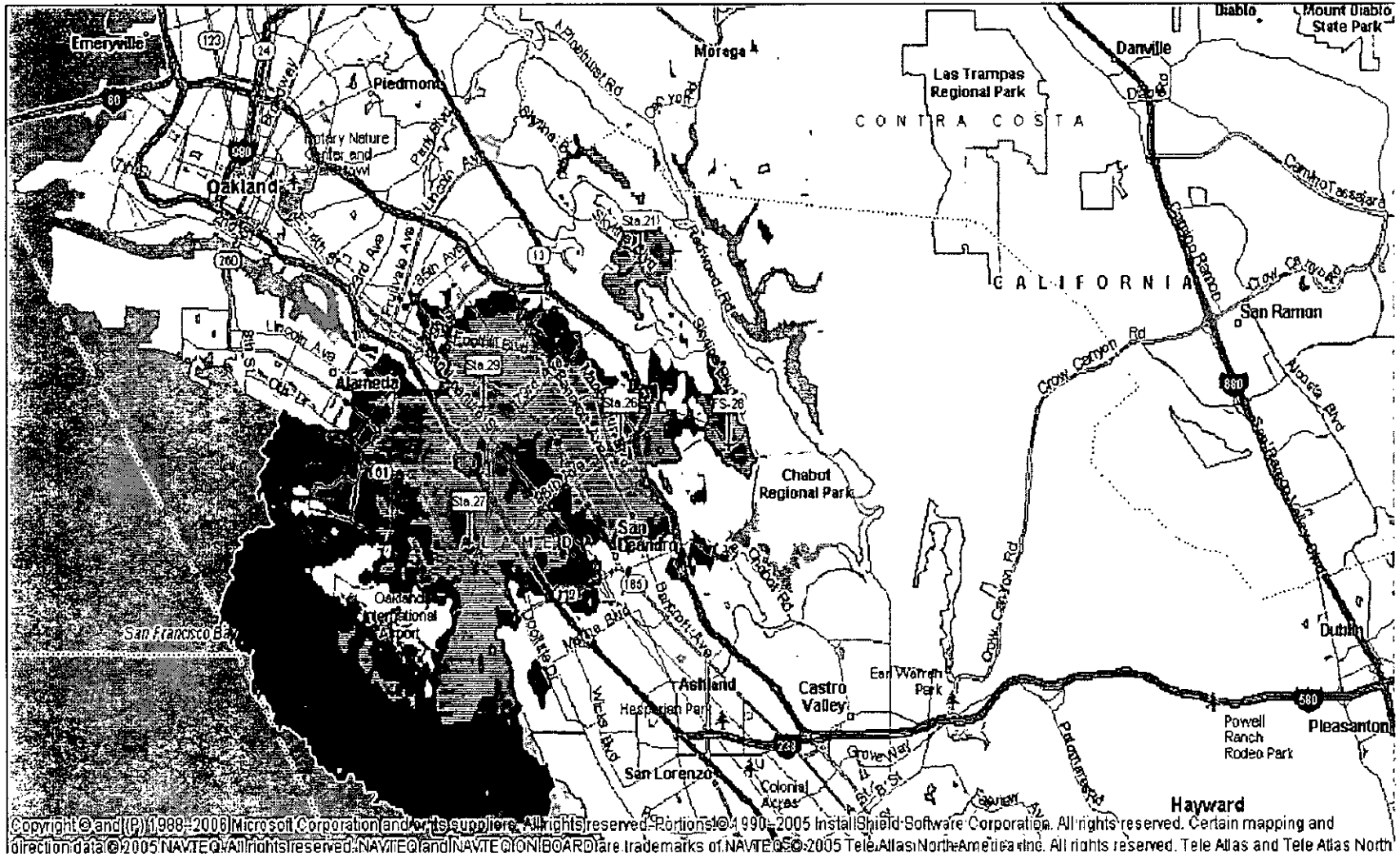
APL - 4.9 GHz



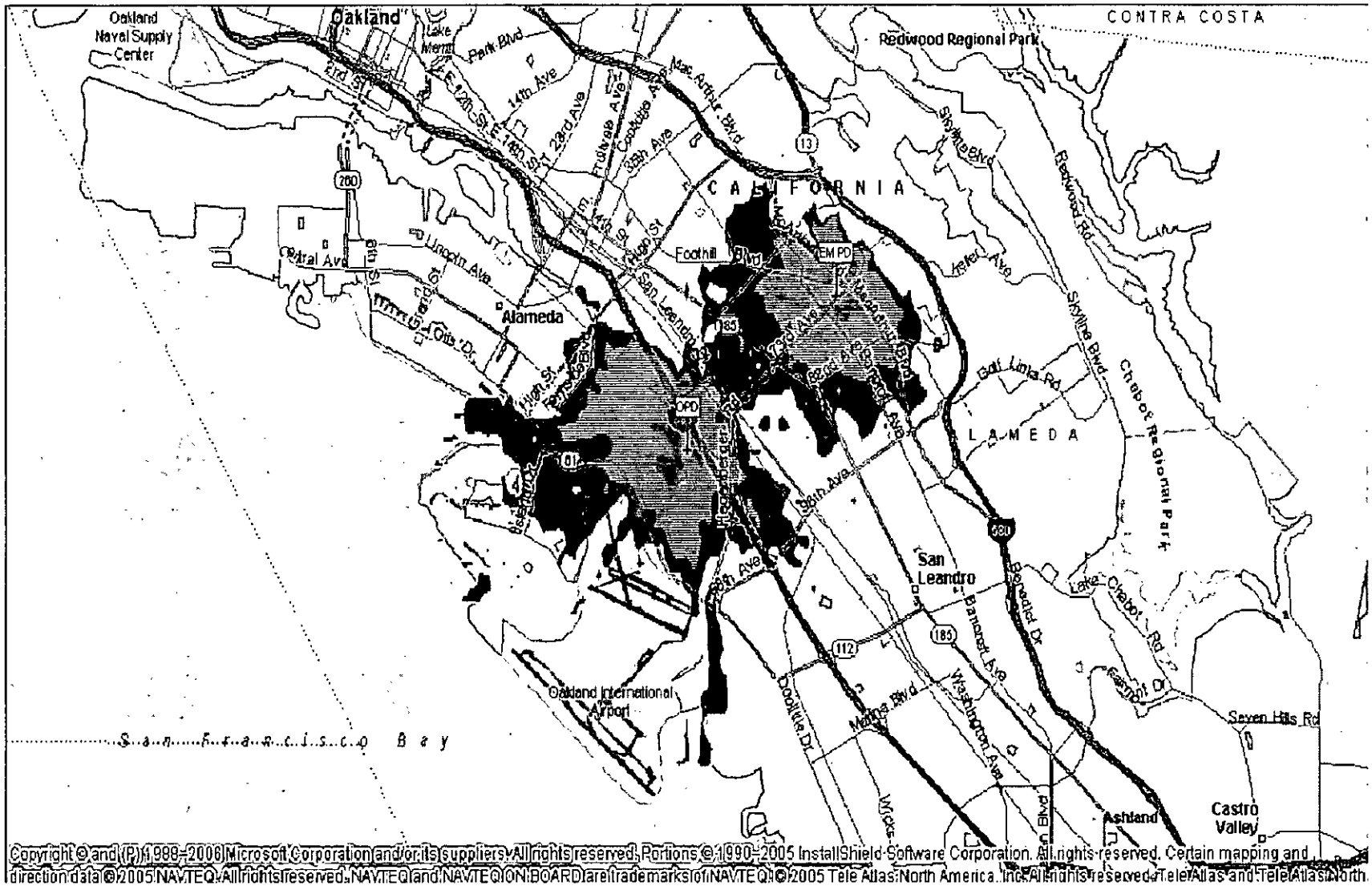
Seneca - 4.9 GHz



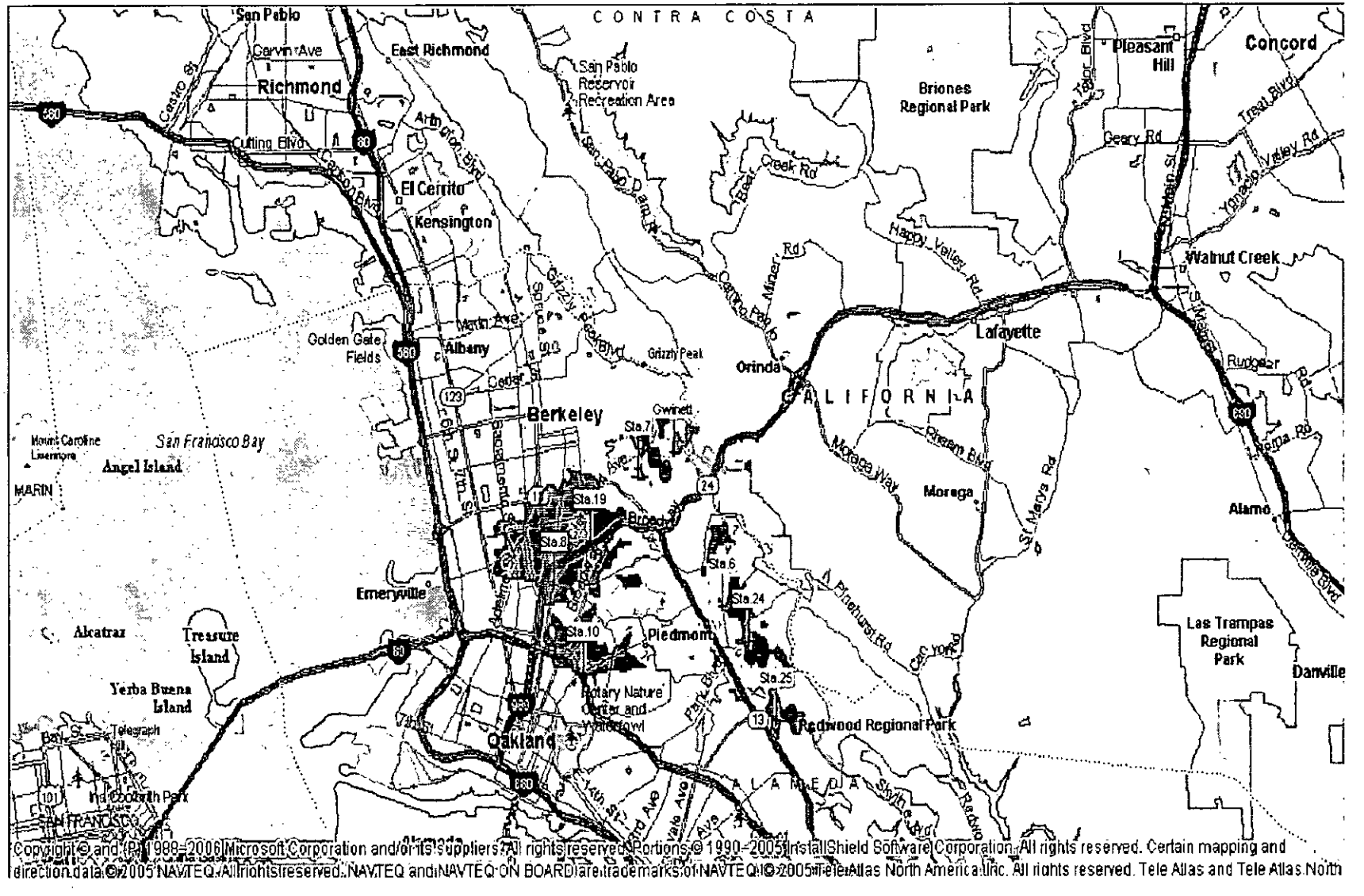
FS 28 - 4.9 GHz


Emeryville
Piedmont
Oakland
Alameda
Oakland International Airport
San Francisco Bay
Moraga
Las Trampas Regional Park
CONTRA COSTA
CALIFORNIA
Danville
Diablo
Mount Diablo State Park
San Ramon
Dublin
Pleasanton
Chabot Regional Park
San Leandro
Ashland
Castro Valley
San Lorenzo
Hayward
Powell Ranch Rodeo Park
Sta.21
Sta.29
Sta.26
FS-28
Sta.27
Copyright © and (P) 1988-2006 Microsoft Corporation and its suppliers. All rights reserved. Portions © 1990-2005 InstallShield Software Corporation. All rights reserved. Certain mapping and direction data © 2005 NAVTEQ. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2005 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North

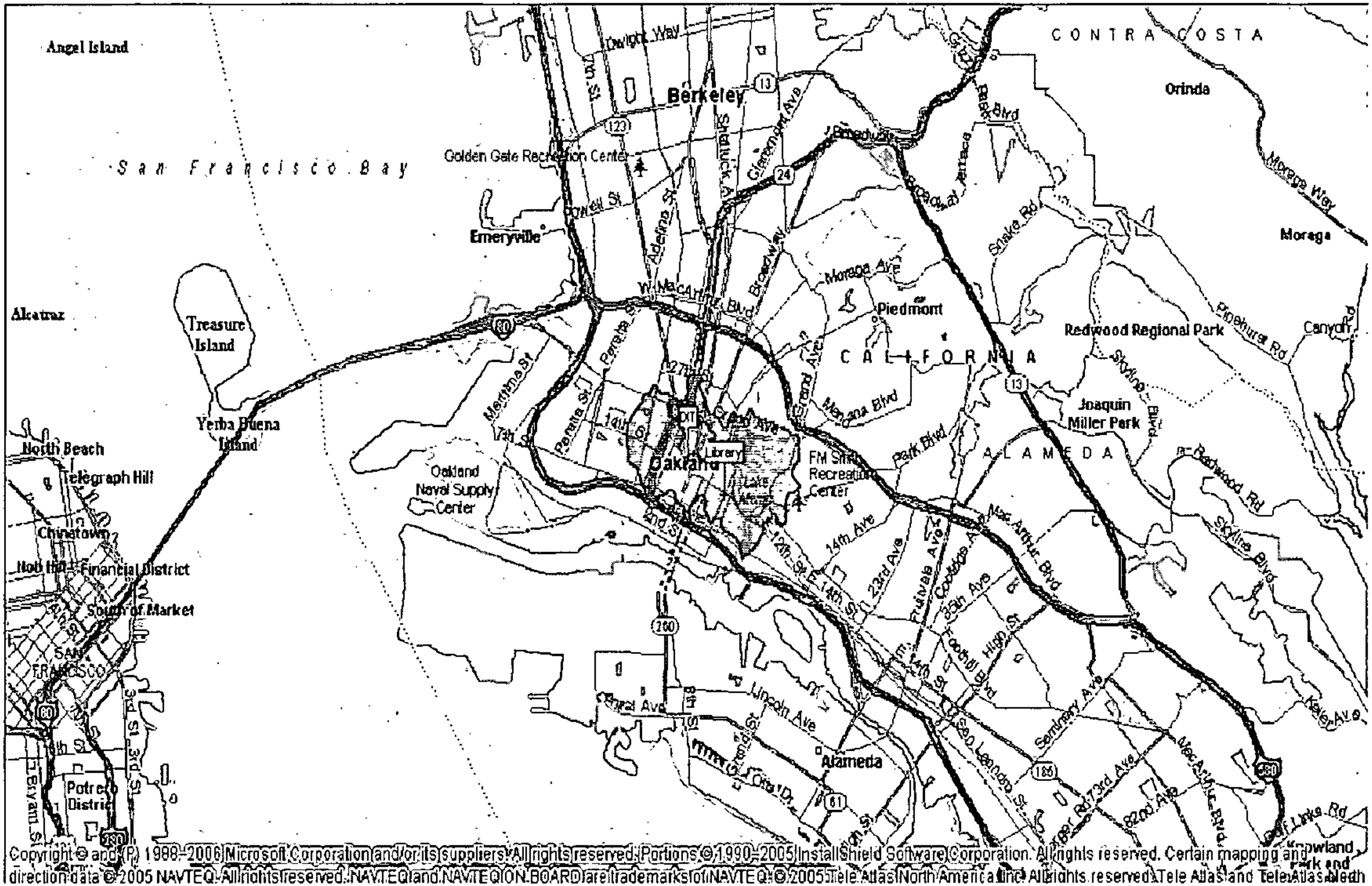
OPD - 4.9 GHz


Oakland
Oakland Naval Supply Center
Lake Merritt
Park Blvd
14th Ave
23rd Ave
MacArthur Blvd
35th Ave
CONTRA COSTA
Redwood Regional Park
Skyline Blvd
Redwood Rd
CALIFORNIA
Foothill Blvd
EMPD
Keller Ave
Central Ave
Lincoln Ave
Alameda
Otis Dr
High St
San Leandro
OPD
Golf Links Rd
LAMEDA
Chabot Regional Park
Davis St
Bancroft Ave
Benedict Dr
Lake Chabot Rd
Seven Hills Rd
Oakland International Airport
Doolittle Dr
Washington Ave
Ashland
Castro Valley
San Francisco Bay
Copyright © and (P) 1988-2006 Microsoft Corporation and/or its suppliers. All rights reserved. Portions © 1990-2005 InstallShield Software Corporation. All rights reserved. Certain mapping and direction data © 2005 NAVTEQ. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2005 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North

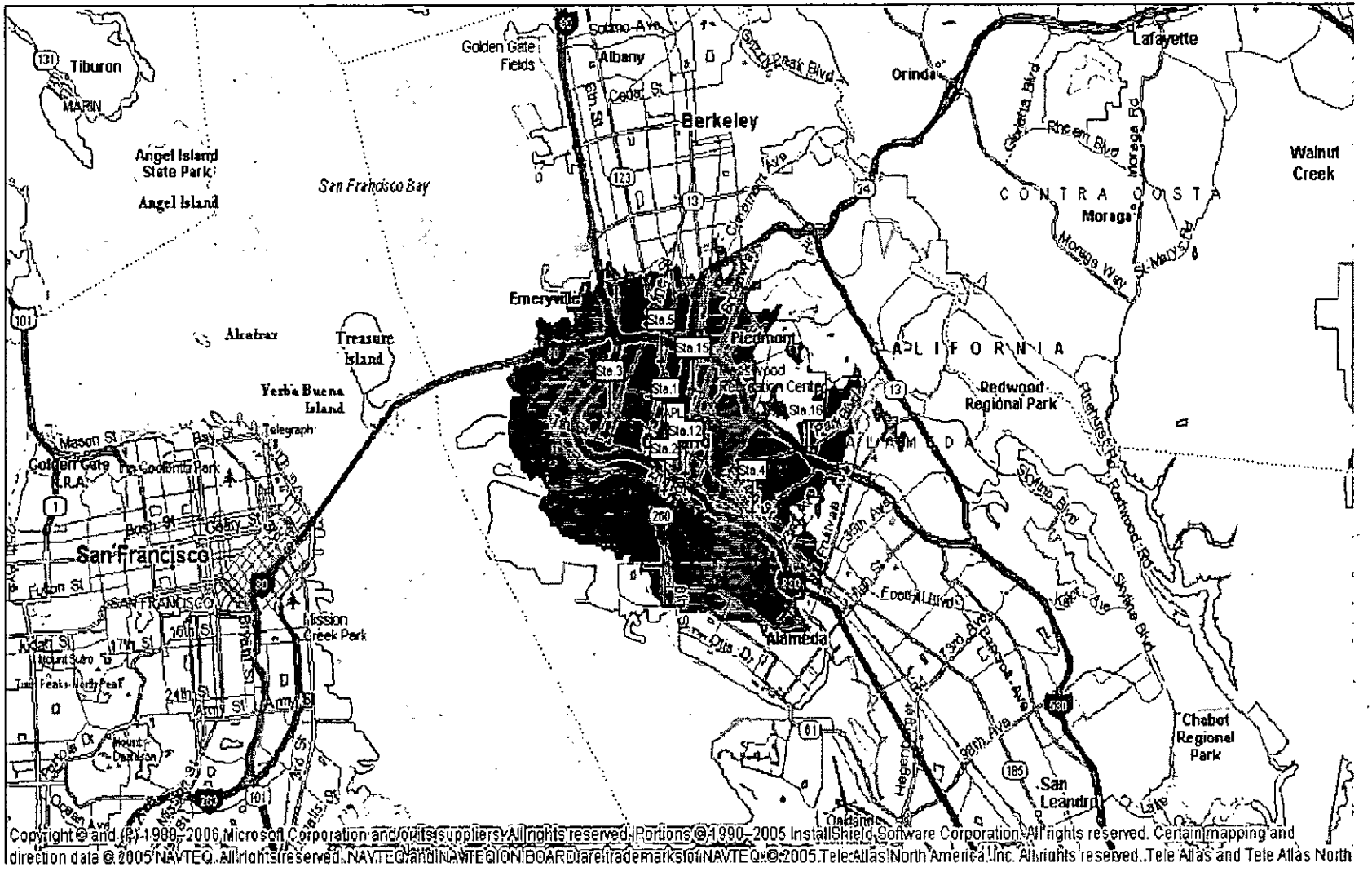
Gwinnett - 2.4 GHz



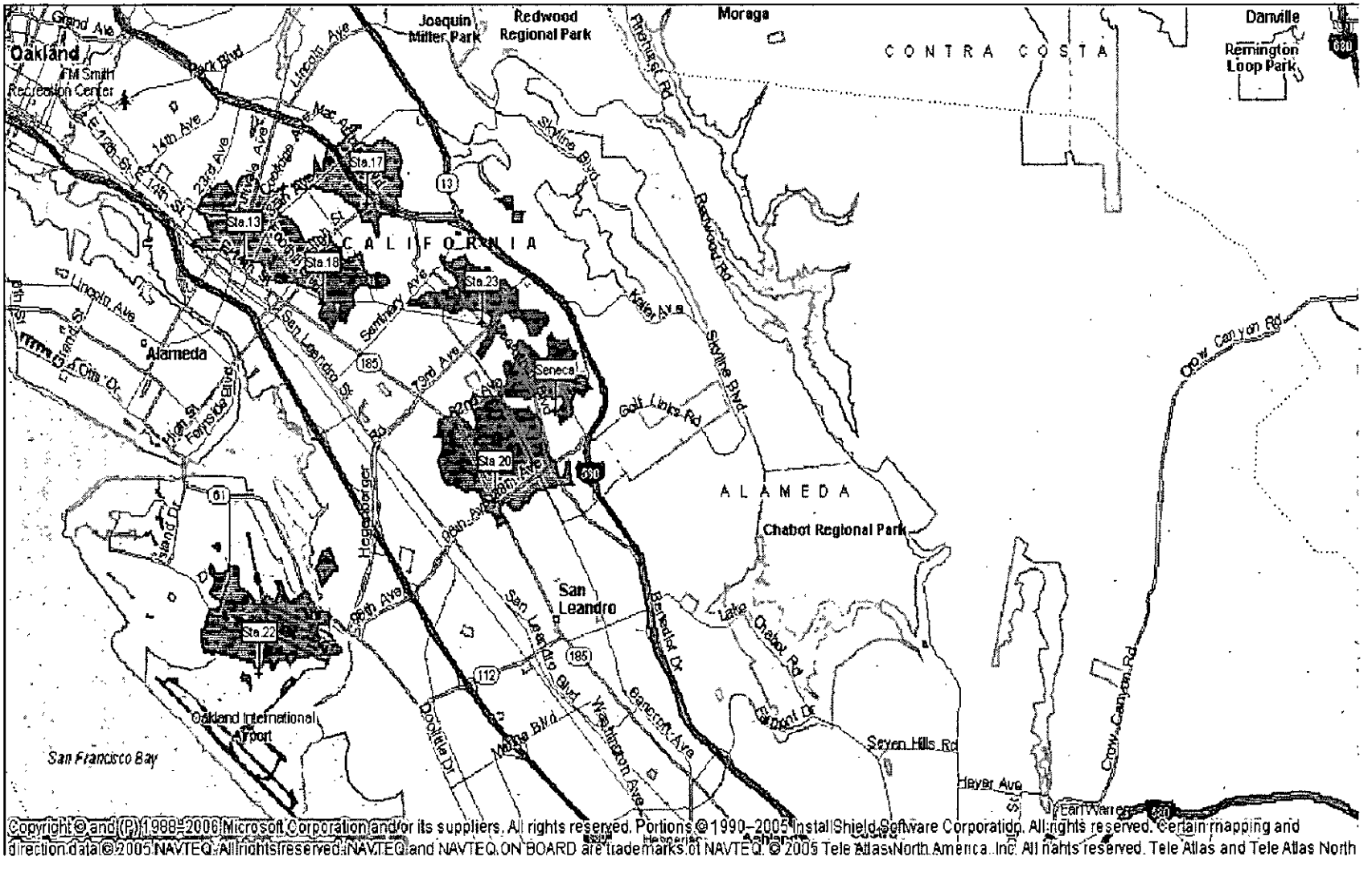
DIT - 2.4 GHz


Angel Island
San Francisco Bay
Alcatraz
Treasure Island
Yerba Buena Island
North Beach
Telegraph Hill
Chinatown
Nob Hill
Financial District
South of Market
San Francisco
Potrero District
Berkeley
Emeryville
Golden Gate Recreation Center
Oakland
DIT
Library
Oakland Naval Supply Center
Alameda
Piedmont
CALIFORNIA
ALAMEDA
CONTRA COSTA
Orinda
Moraga
Redwood Regional Park
Joaquin Miller Park
FM Smith Recreation Center
Dwight Way
Powell St
Adeline St
Shattuck Ave
Claremont Ave
Broadway
Moraga Ave
W MacArthur Blvd
Grand Ave
Park Blvd
14th Ave
23rd Ave
Fruitvale Ave
MacArthur Blvd
Seminary Ave
Lincoln Ave
Skyline Blvd
Snake Rd
Moraga Way
Pinehurst Rd
Redwood Rd
Keller Ave
Golf Links Rd
Copyright © and (P) 1988–2006 Microsoft Corporation and/or its suppliers. All rights reserved. Portions © 1990–2005 InstallShield Software Corporation. All rights reserved. Certain mapping and direction data © 2005 NAVTEQ. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2005 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North

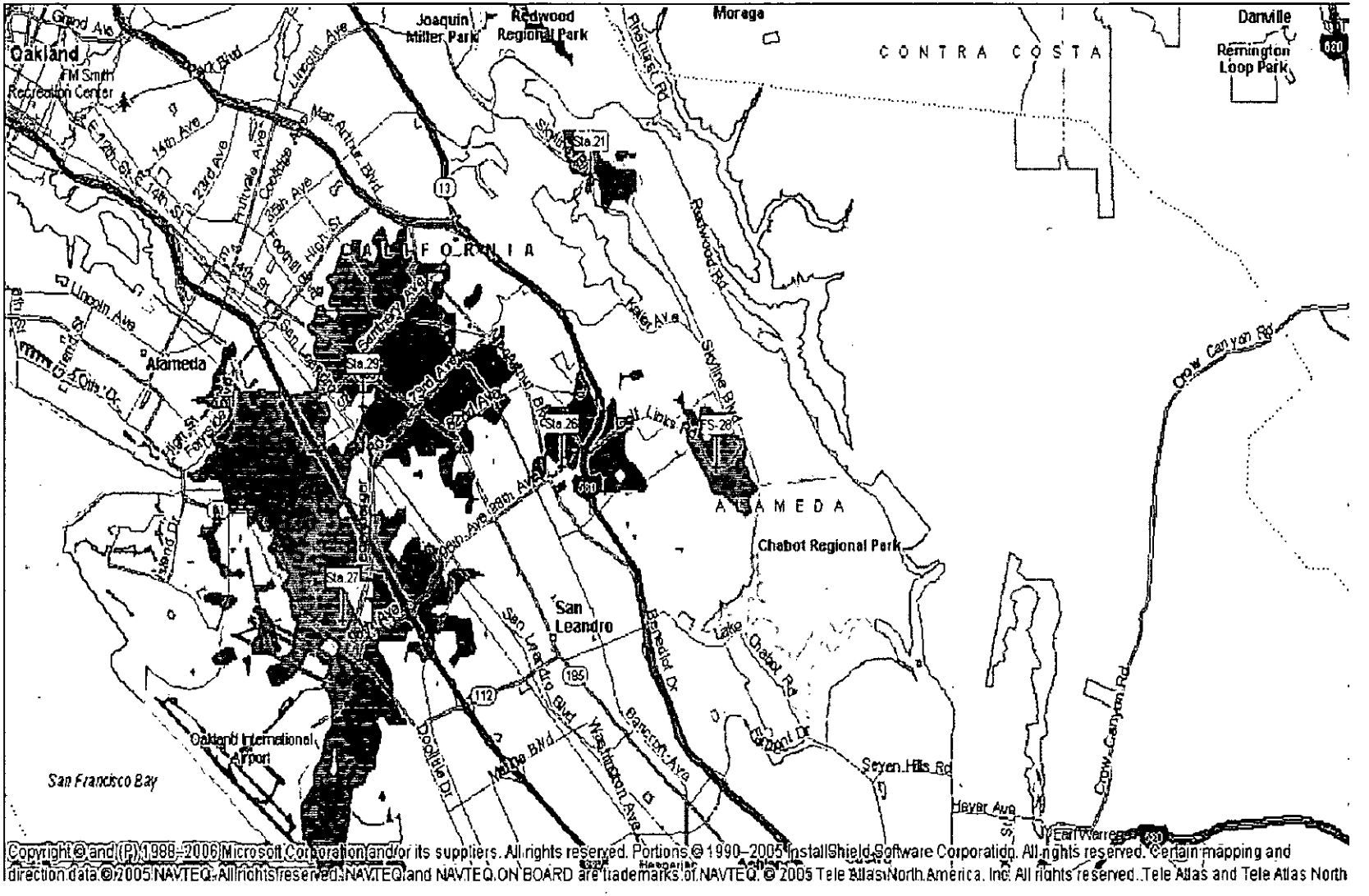
APL - 2.4 GHz


Tiburon
MARIN
Angel Island State Park
Angel Island
San Francisco Bay
Golden Gate Fields
Albany
Berkeley
Orinda
Lafayette
Walnut Creek
CONTRA COSTA
Moraga
Emeryville
Piedmont
Alcatraz
Treasure Island
Yerba Buena Island
Redwood Regional Park
Golden Gate N.R.A.
San Francisco
Mission Creek Park
Alameda
Chabot Regional Park
San Leandro
Sta.5
Sta.15
Sta.3
Sta.1
APL
Sta.12
Sta.2
Sta.4
Sta.16
Copyright © and (P) 1988-2006 Microsoft Corporation and/or its suppliers. All rights reserved. Portions © 1990-2005 InstallShield Software Corporation. All rights reserved. Certain mapping and direction data © 2005 NAVTEQ. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2005 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North

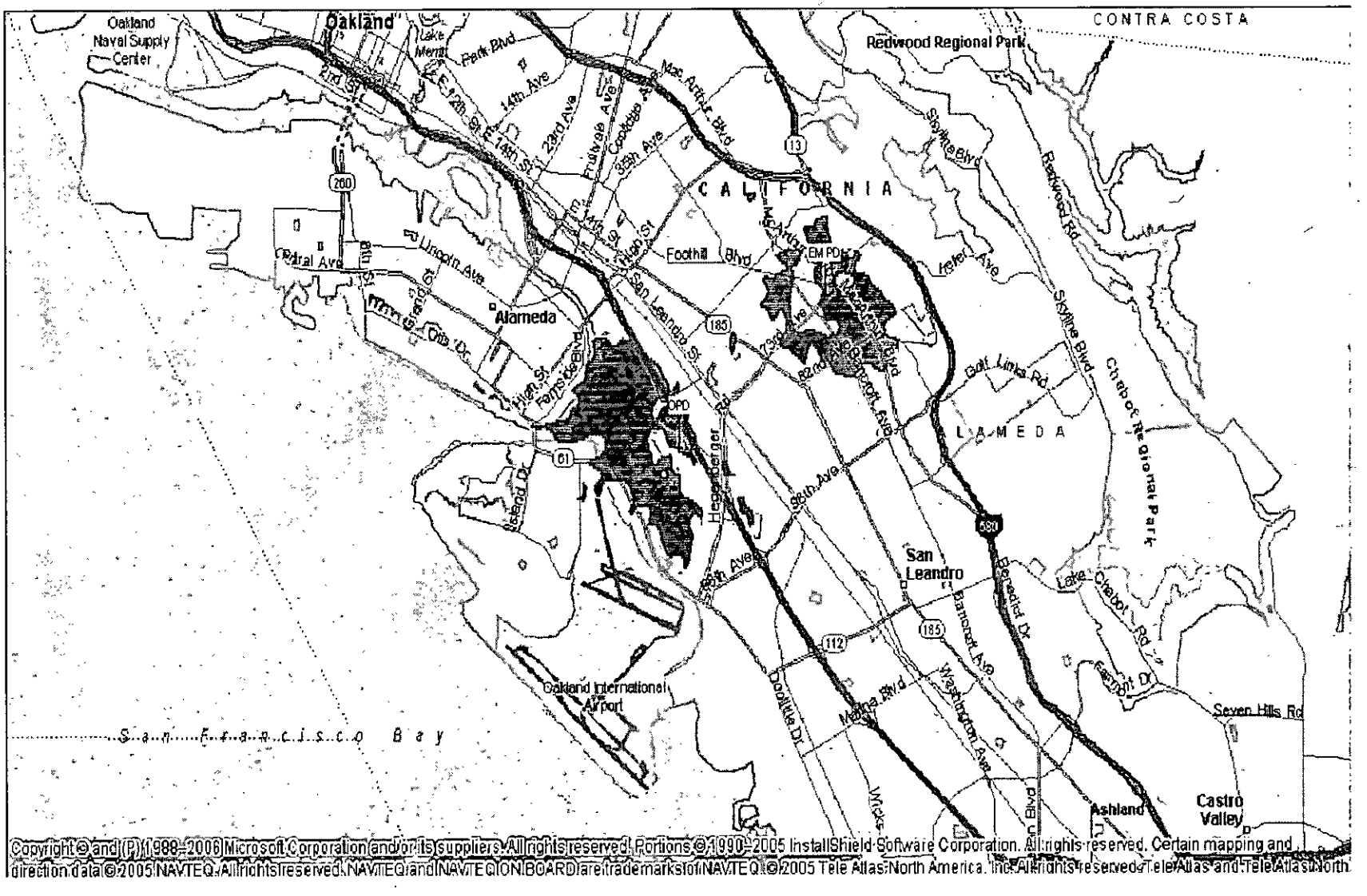
Seneca - 2.4 GHz



FS 28 - 2.4 GHz


Oakland
Joaquin Miller Park
Redwood Regional Park
Moraga
CONTRA COSTA
Danville
Remington Loop Park
CALIFORNIA
Alameda
Sta 21
Sta 29
Sta 26
FS-28
ALAMEDA
Chabot Regional Park
Sta 27
San Leandro
Oakland International Airport
San Francisco Bay
Seven Hills Rd
Crow Canyon Rd
Copyright © and (P) 1988–2006 Microsoft Corporation and/or its suppliers. All rights reserved. Portions © 1990–2005 InstallShield Software Corporation. All rights reserved. Certain mapping and direction data © 2005 NAVTEQ. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2005 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North

OPD - 2.4 GHz



Oakland Reference Architecture

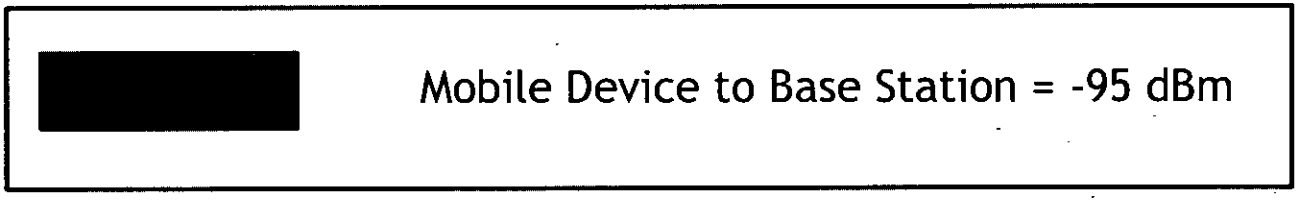
Coverage Maps

700 MHz

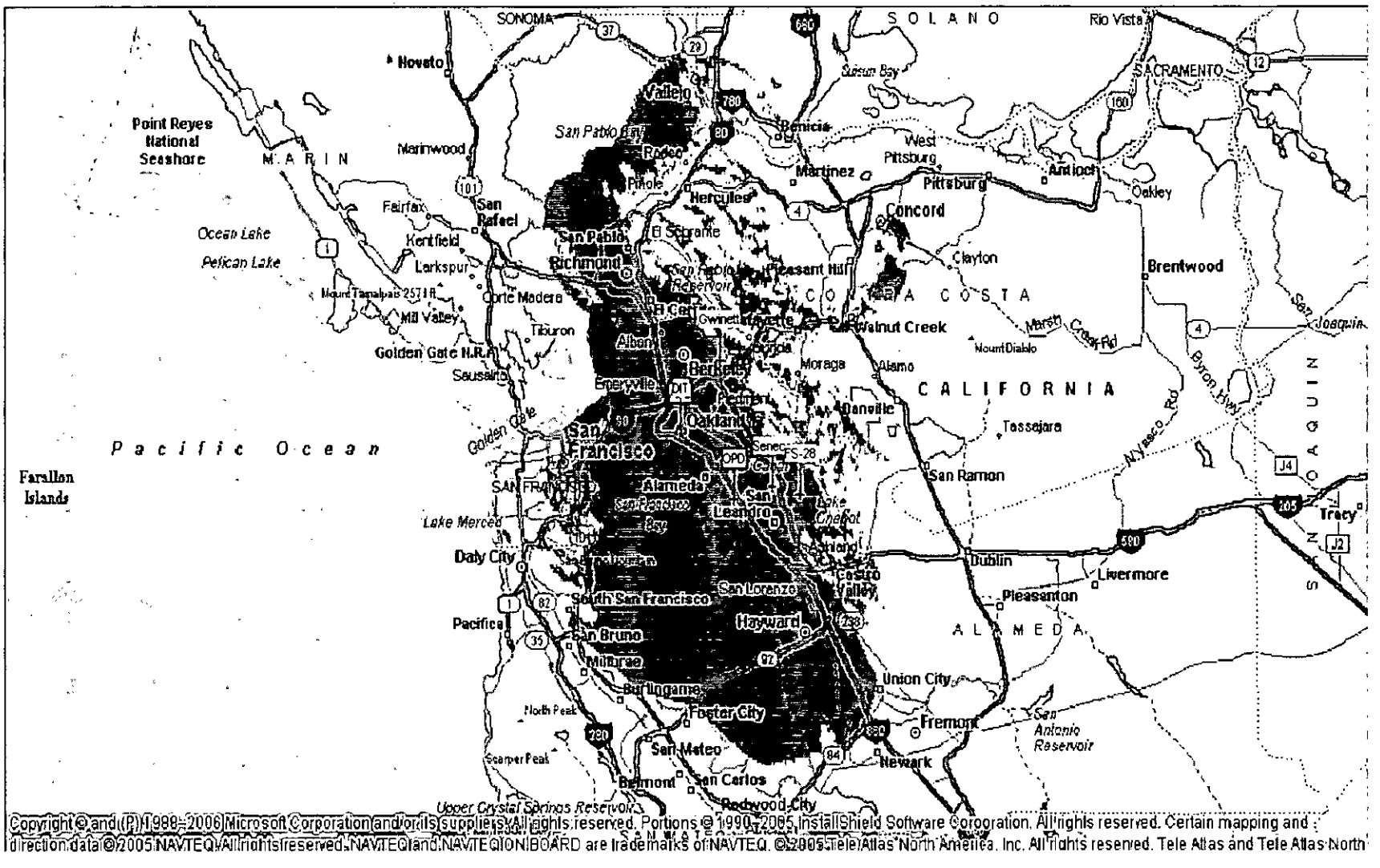
700 MHz Assumptions

- Maps are for informational purposes only.
- Do not assume a particular system design, other than frequency band.
- Maps do not account for subscriber density or multi channel access points.
- Maps are based on Talk Back - Subscriber Unit to Base Station.
- All maps are based upon a reliability of approximately 95% Area Reliability.

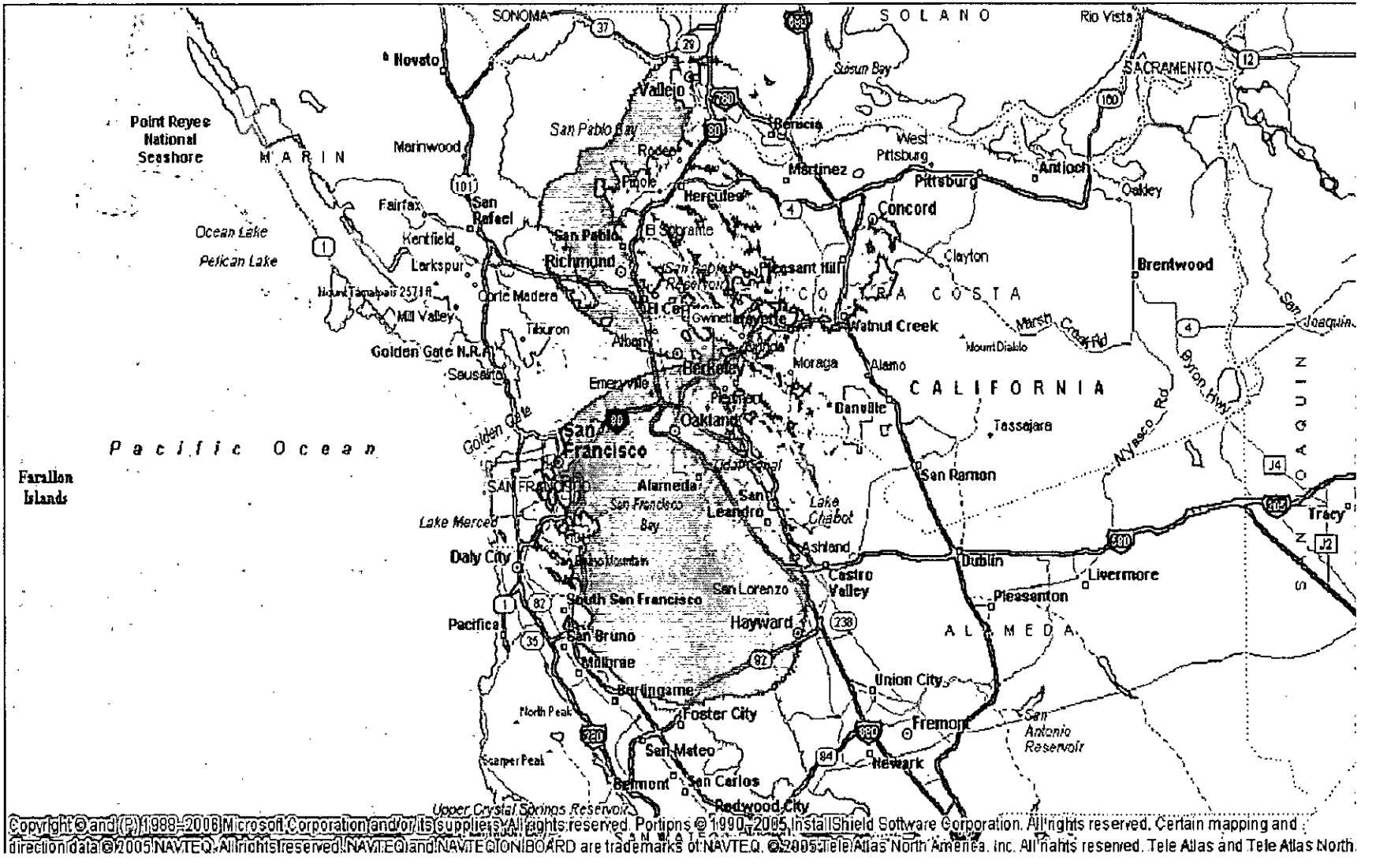
Map Legend – 700 MHz



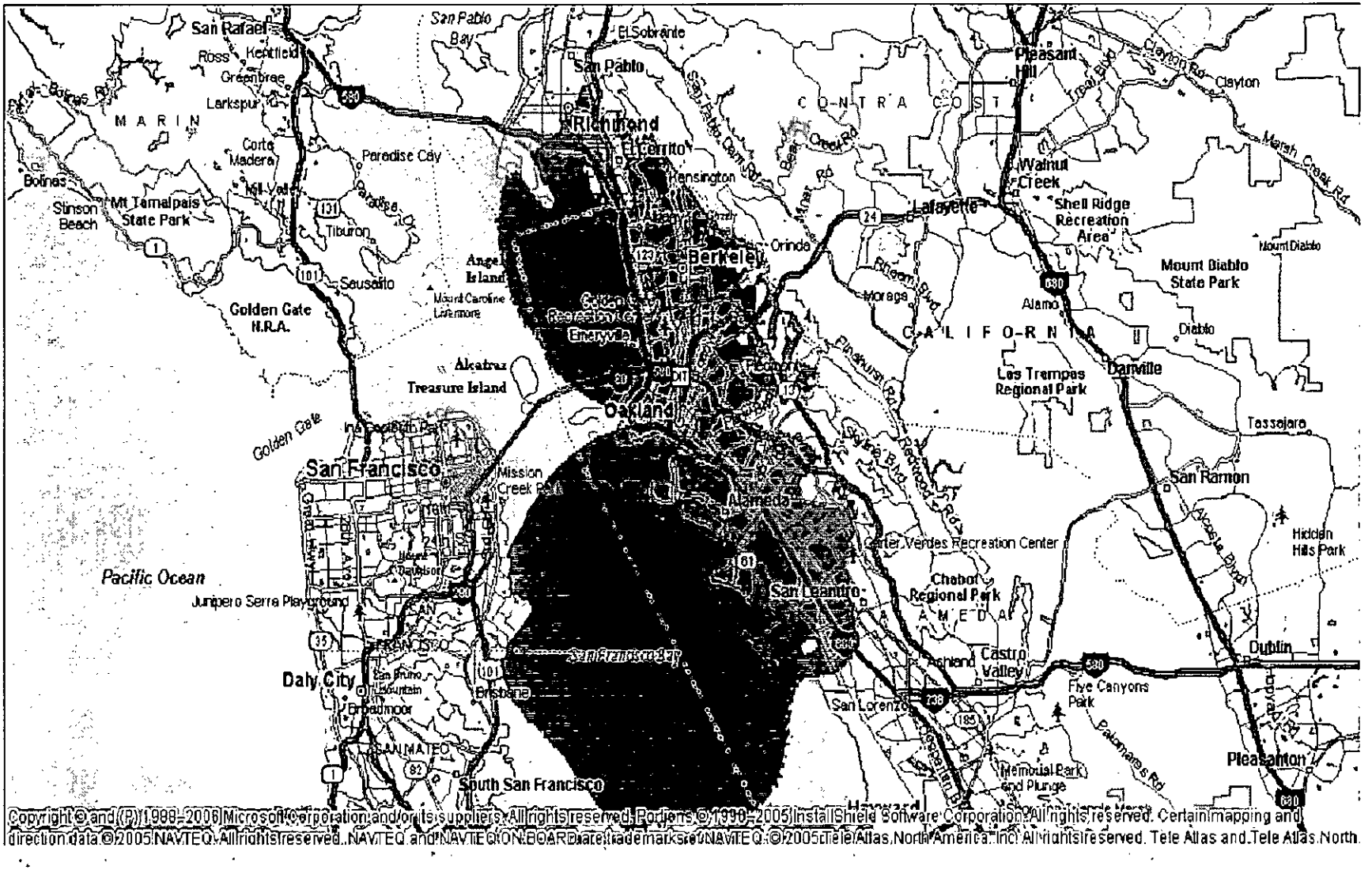
Composite - 700 MHz



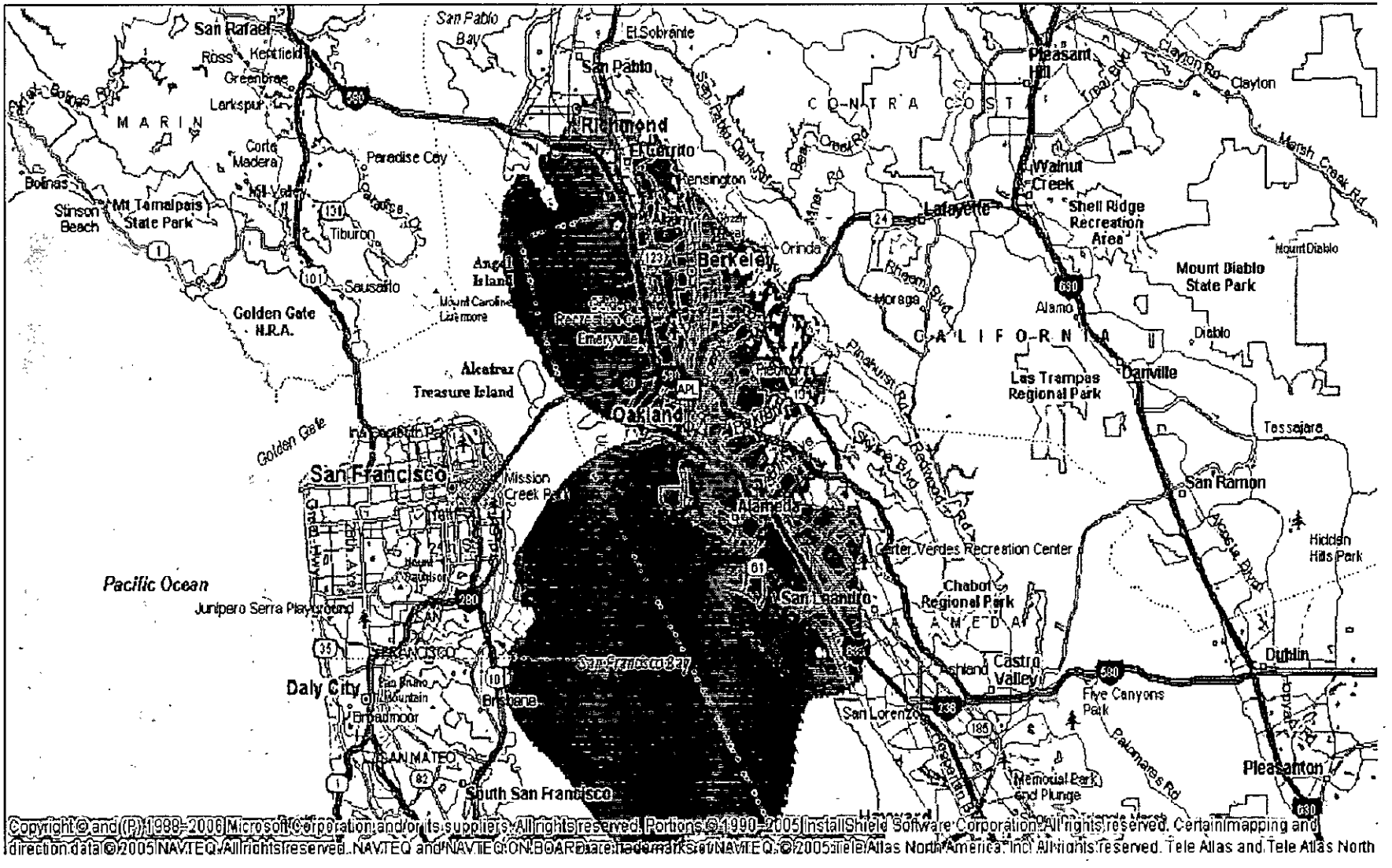
Gwinnett - 700 MHz



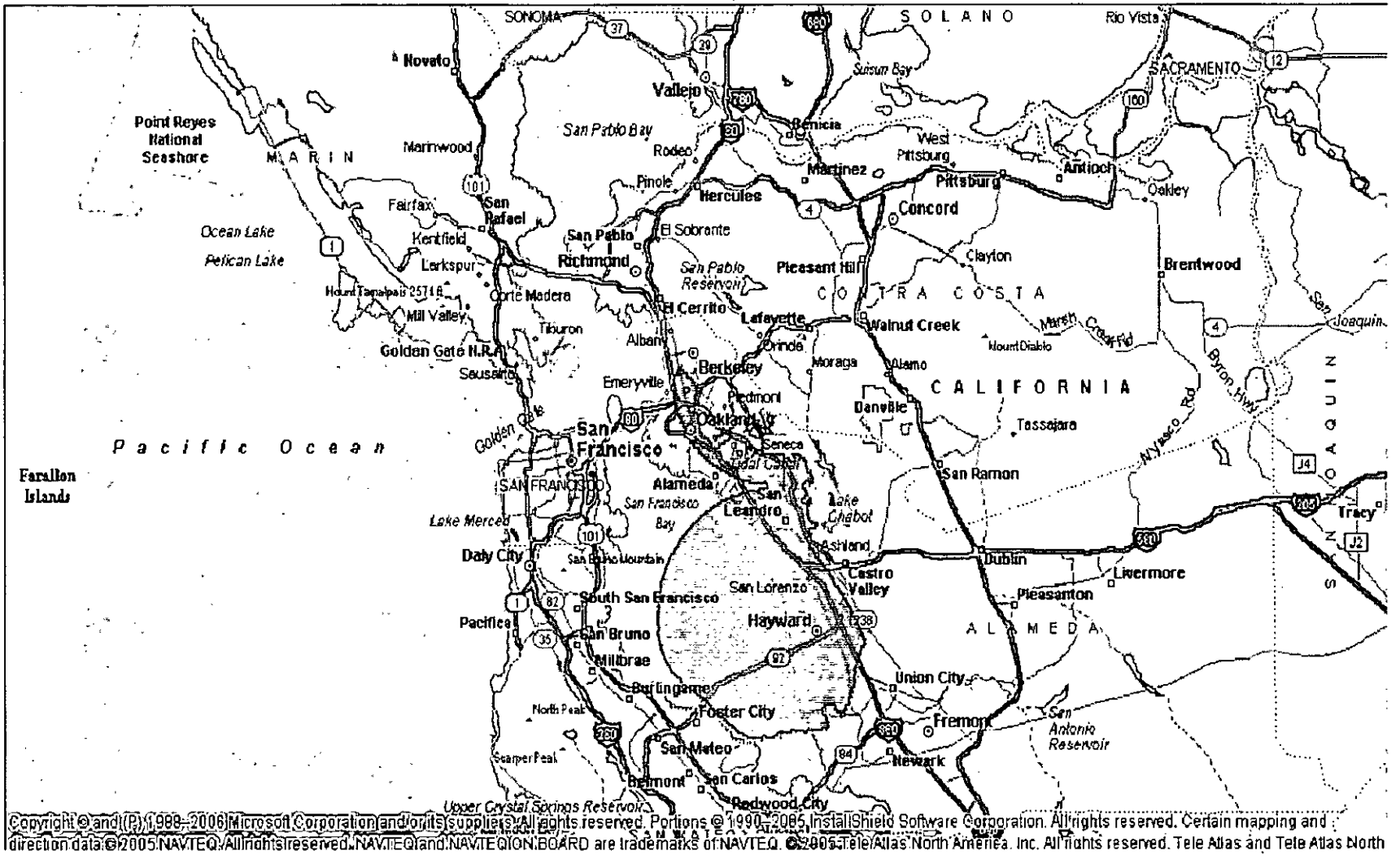
DIT - 700 MHz


San Rafael
Ross
Kentfield
Greenbrae
Larkspur
MARIN
Corte Madera
Paradise Cay
Bolinas
Stinson Beach
Mt Tamalpais State Park
Tiburon
Sausalito
Golden Gate N.R.A.
Angel Island
Mount Caroline Livermore
Alcatraz
Treasure Island
Golden Gate
San Francisco
Pacific Ocean
Junipero Serra Playground
Daly City
San Bruno Mountain
Broadmoor
Brisbane
SAN MATEO
South San Francisco
San Pablo Bay
El Sobrante
San Pablo
Richmond
El Cerrito
Kensington
Berkeley
Albany
Emeryville
Oakland
Mission Creek Park
Alameda
San Leandro
Bay Farm Island
San Francisco Bay
San Lorenzo
Ashland
Castro Valley
CONTRA COSTA
Pleasant Hill
Clayton
Clayton Rd
Marsh Creek Rd
Walnut Creek
Shell Ridge Recreation Area
Lafayette
Orinda
Moraga
Rheem Blvd
Mount Diablo
Mount Diablo State Park
Alamo
Diablo
CALIFORNIA
Danville
Las Trampas Regional Park
Tassajara
San Ramon
Hidden Hills Park
Center Verdes Recreation Center
Chabot Regional Park
ALAMEDA
Five Canyons Park
Dublin
Pleasanton
Memorial Park and Plunge
Pinehurst Rd
Skyline Blvd
Redwood Rd
Crow Canyon Rd
Palomares Rd
Copyright © and (P) 1988-2006 Microsoft Corporation and/or its suppliers. All rights reserved. Portions © 1990-2005 InstallShield Software Corporation. All rights reserved. Certain mapping and direction data © 2005 NAVTEQ. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2005 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North

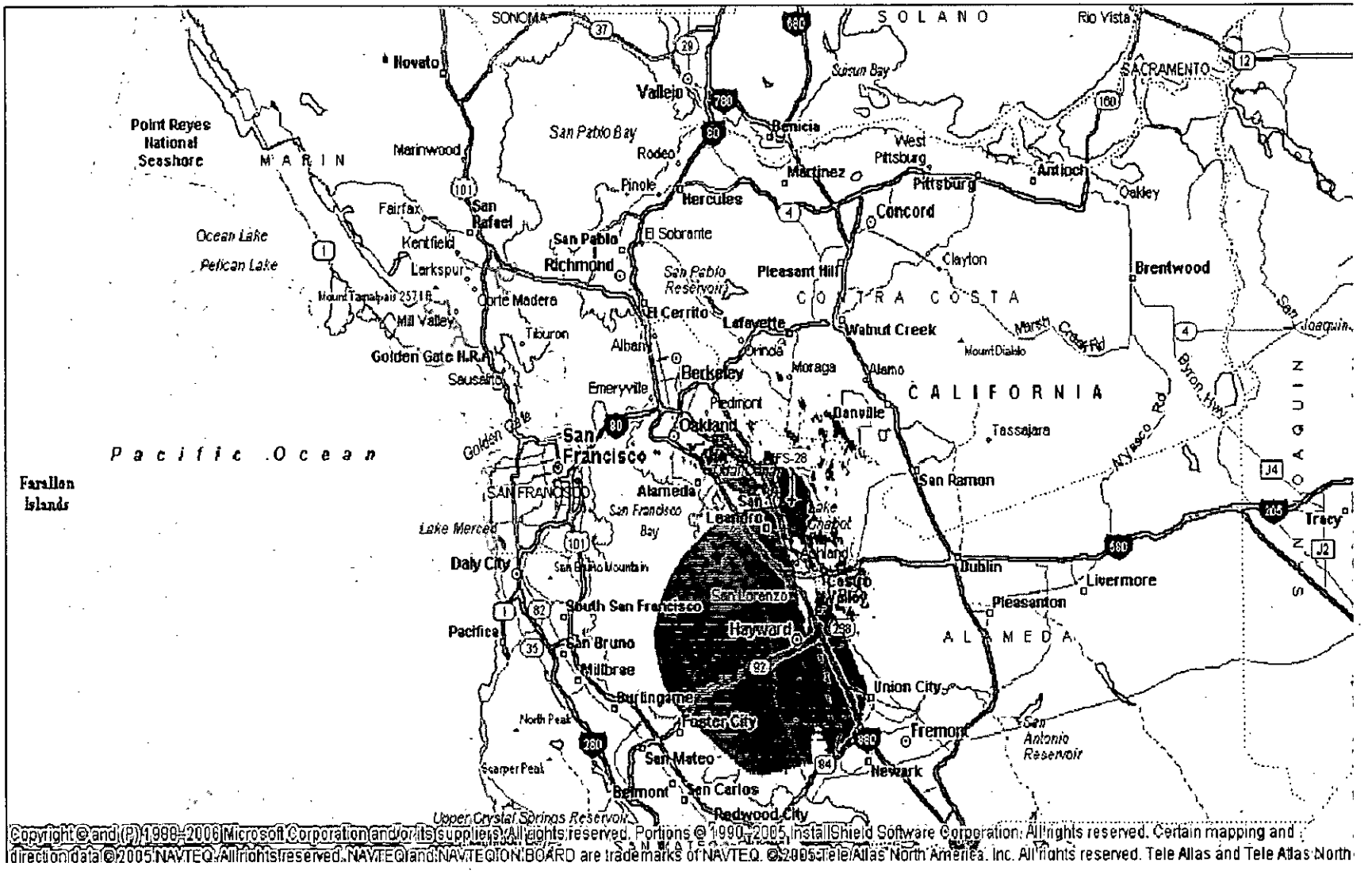
APL - 700 MHz


San Rafael
Ross
Kentfield
Greenbrae
Larkspur
MARIN
Corte Madera
Paradise Cay
Bolinas
Stinson Beach
Mt Tamalpais State Park
Mill Valley
Tiburon
Sausalito
Golden Gate N.R.A.
Angel Island
Mount Caroline Livermore
Alcatraz
Treasure Island
Golden Gate
San Francisco
Pacific Ocean
Junipero Serra Playground
Daly City
San Bruno Mountain
Broadmoor
Brisbane
SAN MATEO
South San Francisco
San Pablo Bay
El Sobrante
San Pablo
Richmond
El Cerrito
Kensington
Berkeley
Albany
Emeryville
Oakland
APL
Mission Creek Park
Alameda
San Leandro
Ashland
Castro Valley
San Lorenzo
Hayward
Pleasant Hill
Clayton
CONTRA COSTA
Walnut Creek
Lafayette
Orinda
Moraga
Shell Ridge Recreation Area
Mount Diablo
Mount Diablo State Park
Alamo
Diablo
CALIFORNIA
Danville
Las Trampas Regional Park
Tassajara
San Ramon
Hidden Hills Park
Chabot Regional Park
Dublin
Five Canyons Park
Pleasanton
Memorial Park and Plunge
Copyright © and (P) 1988-2006 Microsoft Corporation and/or its suppliers. All rights reserved. Portions © 1990-2005 InstallShield Software Corporation. All rights reserved. Certain mapping and direction data © 2005 NAVTEQ. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2005 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North

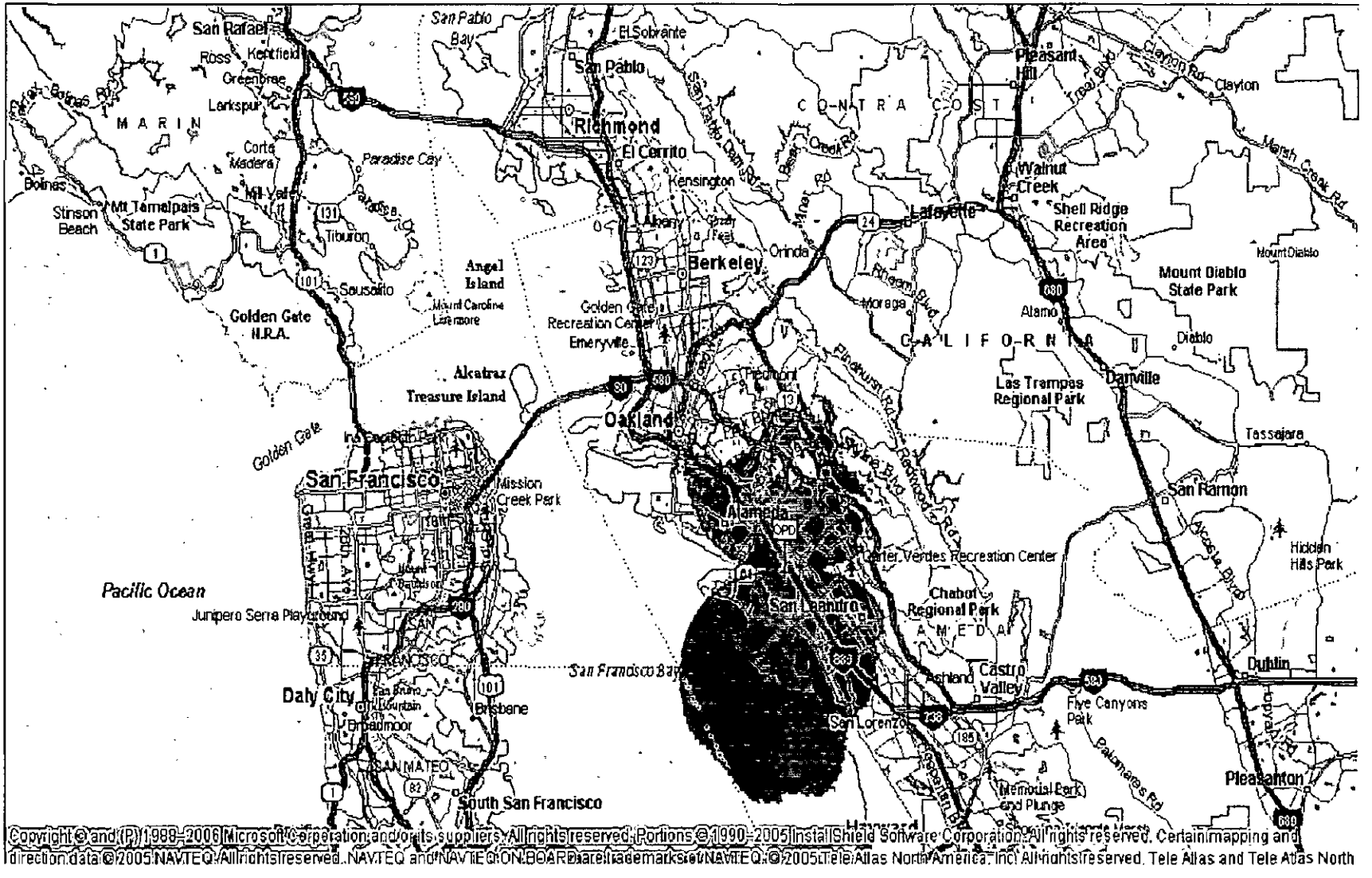
Seneca - 700 MHz



FS 28 - 700 MHz



OPD - 700 MHz


San Rafael
Ross
Kentfield
Greenbrae
Larkspur
MARIN
Corte Madera
Paradise Cay
Bolinas
Stinson Beach
Mt Tamalpais State Park
Mill Valley
Tiburon
Sausalito
Golden Gate N.R.A.
Angel Island
Mount Caroline Livermore
Alcatraz Island
Treasure Island
Golden Gate
San Francisco
Mission Creek Park
Pacific Ocean
Junipero Serra Playground
San Francisco Bay
Daly City
Broadmoor
Brisbane
SAN MATEO
South San Francisco
San Pablo Bay
El Sobrante
San Pablo
Richmond
El Cerrito
Kensington
Albany
Berkeley
Emeryville
Oakland
Piedmont
Alameda
Alameda NAS
Golden Gate Recreation Center
Orinda
Moraga
Lafayette
Walnut Creek
Pleasant Hill
Clayton
Concord
Shell Ridge Recreation Area
Mount Diablo State Park
Mount Diablo
Alamo
Diablo
Danville
Las Trampas Regional Park
Tassajara
San Ramon
Hidden Hills Park
Carter Verdes Recreation Center
Chabot Regional Park
San Leandro
Ashland
Castro Valley
San Lorenzo
Five Canyons Park
Dublin
Pleasanton
Memorial Park and Plunge
Hayward
Copyright © and (P) 1988-2006 Microsoft Corporation and/or its suppliers. All rights reserved. Portions © 1990-2005 InstallShield Software Corporation. All rights reserved. Certain mapping and direction data © 2005 NAVTEQ. All rights reserved. NAVTEQ and NAVTEQ ON BOARD are trademarks of NAVTEQ. © 2005 Tele Atlas North America, Inc. All rights reserved. Tele Atlas and Tele Atlas North

10. Appendix C: Spreadsheets

Oakland Business Model Summary

Business Model Summary	Year 1	Year 2	Year s	Year 4	Year s	Year 6	Year 7	Year s	Year 9	Year 10	Year 15	Year 20
Operating Results												
Funding Source												
Backbone Segment (15 Mbps Base)	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728
Public Safety Fixed/Nomadic Segment	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200
Total	$722,928	$722,928	$722,928	$722,928	$722,928	$722,928	$722,928	$722,928	$722,928	$722,928	$722,928	$722,928
Operating Expense												
Backbone Segment (15 Mbps Base)	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145
Backbone Segment (100 Mbps Increment)	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175
Public Safety Fixed/Nomadic Segment	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065
Total	$292,385	$292,385	$292,385	$292,385	$292,385	$292,385	$292,385	$292,385	$292,385	$292,385	$292,385	$292,385
Operating Surplus/(Deficit)												
Backbone Segment (15 Mbps Base)	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583
Backbone Segment (100 Mbps Increment)	($29,175)	($29,175)	($29,175)	($29,175)	($29,175)	($29,175)	(529,175)	($29,175)	(529,175)	($29,175)	($29,175)	($39,175)
Public Safety Fixed/Nomadic Segment	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135
Total	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543
Capital Expense												
Backbone Segment (15 Mbps Base)	$1,198,697	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Backbone Segment (100 Mbps Increment)	$482,998	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Public Safety Fixed/Nomadic Segment	$1,693,428	$0	$0	$0	$0	$0	$0	50	$0	$0	$0	$0
Total	$3,375,122	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cash Flow Analysis												
Cumulative												
Backbone Segment (15 Mbps Base)	($1,168,113)	(51,137,530)	($1,106,947)	($1,076,364)	($1,045,781)	($1,015,197)	($984,614)	($954,031)	($923,448)	($892,865)	($739,949)	($587,033)
Backbone Segment (100 Mbps Increment)	($481,590)	($480,182)	($478,774)	($477,366)	($475,958)	($474,551)	($473,143)	($471,735)	($470,327)	($468,919)	($461,880)	($454,841)
Public Safety Fixed/Nomadic Segment	($1,264,293)	($835,159)	($406,024)	$23,111	$452,245	$881,380	$1,310,515	$1,739,650	$2,168,784	$2,597,919	$4,743,592	$6,889,266
Total	($2,913,996)	($2,452,871)	($1,991,745)	($1,530,519)	($1,069,494)	($608,368)	($147,242)	$313,884	$775,009	$1,236,135	$3,541,764	$5,847,392
Net Present Value	($2,775,235)	($5,000,061)	($6,720,605)	($7,979,849)	($8,817,825)	(59,271,799)	(59,376,441)	($9,163,992)	($8,664,414)	($7,905,535)	($1,062,547)	$9,100,705

Capital Equipment Replacement	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
Accumulated Equipment												
Backbone Segment (15 Mbps Base)	$557,274	$557,274	$557,274	$557,274	$557,274	$557,274	$557,274	$557,274	$557,274	$557,274	$557,274	$557,274
Backbone Segment (100 Mbps Increment)	$310,778	$310,778	$310,778	$310,778	$310,778	$310,778	$310,778	$310,778	$310,778	$310,778	$310,778	$310,778
Public Safety Fixed/Nomadic Segment	$797,280	$797,280	$797,280	$797,280	$797,280	$797,280	$797,280	$797,280	$797,280	$797,260	$797,280	$797,280
Total	$1,665,332	$1,665,332	$1,665,332	$1,665,332	$1,665,332	$1,665,332	$1,665,332	$1,665,332	$1,665,332	$1,665,332	$1,665,332	$1,665,332
Accumulated replacement needs	$166,533	$333,066	$499,600	$666,133	$832,666	$999,199	$1,165,732	$1,332,266	$1,498,799	$1,665,332	$2,497,998	$3,330,664
Net Present Value	($2,775,235)	($5,000,061)	($6,720,605)	($7,979,849)	($8,817,825)	($9,271,799)	($9,376,441)	($9,163,992)	($8,664,414)	($7,905,535)	($1,062,547)	$9,100,705
Nominal surplus/(deficit)	($2,941,768)	($5,333,127)	($7,220,205)	($8,645,982)	($9,650,491)	($10,270,998)	($10,542,174)	($10,496,258)	($10,163,213)	($9,570,867)	($3,560,545)	$5,770,041

Cash Flow Analysis Detail	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
Backbone Segment (15 Mbps Base)												
Funding Source	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728
Operating Expense	$85,145	$85,145	585,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145
Operating Surplus/(Deficit)	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583
Capital Expense	$1,198,697	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	($1,168,113)	$30,583	$30,583	$30,583	530,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583
Cumulative Cash Flow	($1,168,113)	(51,137,530)	(51,106,947)	($1,076,364)	($1,045,781)	($1,015,197)	($984,614)	($954,031)	($923,448)	($892,865)	($739,949)	($587,033)
Net Present Value	($1,112,489)	(51,084,749)	(51,058,330)	($1,033,169)	($1,009,207)	($986,385)	($964,650)	($943,950)	($924,236)	($905,461)	($824,173)	($760,482)
Backbone Segment (100 Mbps Increment)												
Base Surplus/(Deficit)	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583
Operating Expense	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175
Operating Surplus/(Deficit)	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408
Capital Expense	$482,998	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	($481,590)	$1,408	$1,408	51,408	$1,408	$1,408	$1,408	51,408	$1,408	$1,408	$1,408	$1,408
Cumulative Cash Flow	($481,590)	($480,182)	($478,774)	($477,366)	($475,958)	(5474,551)	(5473,143)	($471,735)	($470,327)	($468,919)	($461,880)	($454,841)
Net Present Value	(5458,657)	($457,380)	($456,164)	($455,006)	(5453,902)	(5452,852)	($451,851)	($450,898)	($449,991)	($449,127)	($445,385)	($442,453)
Public Safety Fixed/Nomadic Segment												
Funding Source	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200
Operating Expense	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065
Operating Surplus/(Deficit)	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135
Capital Expense	$1,693,428	$0	$0	$0	$0	$0	S0	$0	$0	$0	$0	$0
Total	($1,264,293)	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135
Cumulative Cash Flow	($1,264,293)	($835,159)	(5406,024)	$23,111	$452,245	$881,380	$1,310,515	$1,739,650	$2,168,784	$2,597,919	$4,743,592	$6,889,266
Net Present Value	($1,204,089)	($814,851)	(5444,148)	(591,098)	$245,140	$565,367	$870,345	$1,160,800	$1,437,424	$1,700,876	$2,841,483	$3,735,178

Operating Results Detail	Year 1	Year 2	Year 3	Year 4	Year s	Year 6	Year 7	Year s	Year 9	Year 10	Year 15	Year 20
Backbone Segment (15 Mbps Base)												
Funding Source												
Commercial carrier cost offsets	$115,728	$115,728	$115,728	$115,728	$115,726	$115,728	8115,728	$115,728	$115,728	$115,728	$115,728	$115,728
Total	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728	$115,728
Operating Expense												
Equipment maintenance	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385
Site support & power	$3,680	$3,680	$3,680	$3,680	$3,680	$3,680	$3,680	$3,680	$3,680	$3,680	$3,680	$3,680
NOC operations	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385	$11,385
IT support services	$3,795	$3,795	$3,795	$3,795	$3,795	$3,795	$3,795	$3,795	$3,795	$3,795	$3,795	$3,795
Engineering support	$1,518	$1,518	$1,518	$1,518	$1,518	$1,518	$1,518	$1,518	$1,518	$1,518	$1,518	$1,518
Legal & regulatory	$759	$759	$759	$759	$759	$759	$759	$759	$759	$759	$759	$759
General & administrative	$759	$759	$759	$759	$759	$759	$759	$759	$759	$759	$759	5759
Equipment replacement	$47,264	$47,264	$47,264	$47,264	$47,264	$47,264	$47,264	$47,264	$47,264	$47,264	$47,264	$47,264
Software upgrades & licensing	$4,600	$4,600	$4,600	$4,600	$4,600	$4,600	$4,600	$4,600	$4,600	$4,600	$4,600	$4,600
Total	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	$85,145	585,145	$85,145	$85,145	$85,145	$85,145
Operating Surplus/(Deficit)	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583	$30,583
Backbone Segment (100 Mbps Increment)												
Operating Expense												
Equipment maintenance	$863	$863	$863	$863	$863	$863	$863	$863	$863	$663	$863	$863
Site support & power	$575	$575	$575	$575	$575	$575	$575	$575	$575	$575	$575	$575
NOC operations	5863	$863	$863	$863	$863	$863	$863	$863	$663	$863	$863	$863
IT support services	$288	$286	$288	$288	$288	$288	$288	$288	$288	$288	$288	5288
Engineering support	$115	$115	$115	$115	$115	$115	$115	$115	$115	$115	$115	$115
Legal & regulatory	$58	$58	$58	$58	$58	$58	$58	$58	$58	$58	$58	$58
General & administrative	$58	$58	$58	$58	$58	$58	$58	$58	$58	$58	$58	$58
Equipment replacement	$26,358	$26,358	$26,358	$26,358	$26,358	$26,358	$26,358	$26,358	$26,358	$26,358	$26,358	$26,358
Software upgrades & licensing	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175	$29,175
Operating Surplus/(Deficit)	$1,406	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408	$1,408

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
Public Safety Fixed/Nomadic Segment												
Funding Source												
Commercial carrier cost offsets	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200
Total	5607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200	$607,200
Operating Expense												
Equipment maintenance	$33,810	$33,810	$33,810	$33,810	$33,810	$33,810	$33,810	$33,810	$33,810	$33,810	$33,810	$33,810
Site support & power	$22,540	$22,540	$22,540	$22,540	$22,540	$22,540	$22,540	$22,540	$22,540	$22,540	$22,540	$22,540
NOC operations	$33,810	$33,810	$33,810	$33,810	533,810	533,810	$33,810	$33,810	$33,810	$33,810	$33,810	$33,810
IT support services	$11,270	$11,270	$11,270	$11,270	$11,270	511,270	$11,270	$11,270	$11,270	$11,270	$11,270	$11,270
Engineering support	$4,508	54,508	$4,508	$4,508	$4,508	$4,508	$4,508	$4,508	$4,508	$4,508	$4,508	$4,508
Legal & regulatory	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254
General & administrative	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254	$2,254
Equipment replacement	$67,619	$67,619	$67,619	$67,619	$67,619	$67,619	$67,619	$67,619	$67,619	$67,619	$67,619	$67,619
Total	$178,065	$178,065	$178,065	$178,065	$178,065	$178,065	5178,065	5178,065	$178,065	$178,065	$178,065	$178,065
Operating Surplus/(Deficit)	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135	$429,135

General Government Alternatives	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
Funding Source												
General Government Fixed Segment	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019
General Government Nomadic Segment	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866
Total	$5,370,885	$5,370,885	$5,370,885	$5,370,885	$5,370,885	$5,370,885	$5,370,885	$5,370,885	$5,370,885	$5,370,885	$5,370,885	$5,370,885
Operating Expense												
General Government Fixed Segment	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,957	$222,967	$222,967	$222,967
General Government Nomadic Segment	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	584,529	$84,529	$84,529	$84,529
Total	$307,496	$307,496	$307,496	$307,496	$307,496	$307,496	$307,496	$307,496	$307,496	$307,496	$307,496	$307,496
Operating Surplus/(Deficit)												
General Government Fixed Segment	$401,052	$401,052	$401,052	$401,052	$401,052	S401,052	5401,052	$401,052	$401,052	$401,052	$401,052	$401,052
General Government Nomadic Segment	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337
Total	$5,063,389	$5,063,389	$5,063,389	$5,063,389	$5,063,389	$5,063,389	$5,063,389	$5,063,389	55,063,389	$5,063,389	$5,063,389	$5,063,389
Capital Expense												
General Government Fixed Segment	$1,966,369	$0	$0	$0	S0	$0	$0	$0	$0	$0	$0	$0
General Government Nomadic Segment	5751,113	$0	$0	$0	S0	$0	$0	$0	$0	$0	$0	$0
Total	$2,717,482	$0	50	$0	$0	$0	$0	$0	$0	$0	$0	$0
Cash Flow Analysis												
General Government Fixed Segment	($1,565,316)	(51,164,264)	($763,212)	($362,160)	$38,893	$439,945	$840,997	$1,242,050	$1,643,102	$2,044,154	$4,049,416	$6,054,677
General Government Nomadic Segment	$3,911,223	$8,573,560	$13,235,897	$17,898,234	$22,560,570	$27,222,907	$31,885,244	$36,547,581	$41,209,917	$45,872,254	$69,183,938	$92,495,621
Total	$2,345,907	$7,409,296	$12,472,685	517,536,074	$22,599,463	$27,662,852	$32,726,241	$37,789,630	$42,853,019	$47,916,408	$73,233,353	$98,550,208
Net present value	$2,234,197	$8,954,647	$19,729,022	$34,155,993	$51,863,264	$72,505,710	$95,763,639	$121,341,148	$148,964,586	$178,381,104	$344,801,636	$527,920,340
Cash Flow Analysis Detail												
General Government Fixed Segment												
Funding Source	$624,019	5624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019
Operating Expense	$222,967	$223,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967	5222,967	$222,967	$222,967
Operating Surplus/(Deficit)	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052
Capital Expense	$1,966,369	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	($1,565,316)	$401,052	5401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052
Cumulative Cash Flow	(51,565,316)	($1,164,364)	($763,212)	($362,160)	$38,893	$439,945	$840,997	$1,242,050	$1,643,102	$2,044,154	$4,049,416	$6,054,677
Net Present Value	(51,490,778)	($1,127,011)	($780,567)	($450,621)	($136,386)	5162,886	$447,906	$719,354	$977,876	$1,224,087	$2,290,054	$3,125,266

Oakland Business Model Summary

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
General Government Nomadic Segment												
Funding Source	$4,746,866	$4,746,866	$4,746,866	$4,746,866	54,746,866	$4,746,866	$4,746,866	$4,746,866	54,746,866	$4,746,866	54,746,866	$4,746,866
Operating Expense	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	584,529	584,529	$84,529	$84,529
Operating Surplus/(Deficit)	$4,662,337	$4,662,337	$4,662,337	54,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337
Capital Expense	$751,113	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	$3,911,223	54,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	54,662,337	$4,662,337
Cumulative Cash Flow	$3,911,223	$8,573,560	$13,235,897	$17,898,234	$22,560,570	$27,222,907	$31,885,244	$36,547,581	$41,209,917	$45,872,254	$69,183,938	$92,495,621
Net Present Value	$3,724,975	$7,953,852	$11,981,353	$15,817,069	$19,470,132	$22,949,240	$26,262,675	$29,418,328	$32,423,712	$35,285,982	$47,678,115	$57,387,675
Operating Results Detail												
General Government Fixed Segment												
Funding Source												
Commercial carrier cost offsets	$88,981	$88,981	$88,981	$88,981	588,981	$88,981	$88,981	$88,981	$88,981	588,981	$88,981	$88,981
Market value of new facilities	$230,124	$230,124	5230,124	$230,124	$230,124	S230,124	$230,124	$230,124	$230,124	$230,124	$230,124	$230,124
Performance measure & efficiency gains	$304,914	$304,914	5304,914	$304,914	$304,914	$304,914	$304,914	$304,914	$304,914	$304,914	$304,914	$304,914
Total	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019	$624,019
Operating Expense												
Equipment maintenance	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923
Site support & power	$34,615	$34,615	$34,615	$34,615	$34,615	$34,615	$34,615	$34,615	$34,615	$34,615	$34,615	$34,615
NOC operations	$51,923	$51,933	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923	$51,923
IT support services	$17,308	$17,308	$17,308	$17,308	$17,308	$17,308	$17,308	$17,308	$17,308	$17,308	$17,308	$17,308
Engineering support	$6,923	$6,923	$6,923	$6,923	$6,933	S6,923	$6,923	$6,923	$6,923	$6,923	$6,923	$6,923
Legal & regulatory	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462
General & administrative	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462	$3,462
Equipment replacement	$53,353	$53,353	$53,353	$53,353	$53,353	$53,353	$53,353	$53,353	$53,353	$53,353	$53,353	$53,353
Total	$222,967	5222,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967	$222,967
Operating Surplus/(Deficit)	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052	$401,052

Oakland Business Model Summary

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
General Government Nomadic Segment												
Funding Source												
Market value at new facilities	$53,400	$53,400	$53,400	$53,400	$53,400	$53,400	$53,400	$53,400	$53,400	$53,400	$53,400	$53,400
Tax revenue enhancement	$2,504,252	$2,504,252	$2,504,252	$2,504,252	$2,504,252	$2,504,252	$2,504,252	$2,504,252	$2,504,252	$2,504,252	$2,504,252	$2,504,252
Performance measure & efficiency gains	$2,189,214	$2,189,214	$2,189,214	$2,189,214	$2,189,214	$2,189,214	$2,189,214	$2,189,214	$2,189,214	$2,189,214	$2,189,214	$2,189,214
Total	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866	$4,746,866
Operating Expense												
Equipment maintenance	$14,835	$14,835	$14,835	$14,835	$14,835	$14,835	$14,835	514,835	$14,835	$14,835	$14,835	$14,835
Site support & power	$9,890	$9,890	S9,890	$9,890	$9,890	$9,890	$9,890	$9,890	$9,890	$9,890	$9,890	$9,890
NOC operations	$14,835	$14,835	$14,835	S14,835	$14,835	$14,835	$14,835	$14,835	$14,835	$14,835	$14,635	$14,835
IT support services	$4,945	$4,945	$4,945	$4,945	$4,945	$4,945	$4,945	$4,945	$4,945	$4,945	$4,945	$4,945
Engineering support	51,978	$1,978	$1,978	$1,978	$1,978	$1,978	$1,978	$1,978	$1,978	$1,978	$1,978	$1,978
Legal & regulatory	$989	$989	$989	$969	$989	$989	$989	$989	$989	$989	5989	$989
General & administrative	$989	$989	$989	$989	$989	$989	$989	5989	$989	$989	$989	$989
Equipment replacement	$36,068	$36,068	$36,068	$36,068	$36,068	$36,068	$36,068	$36,068	$36,068	$36,068	$36,068	$36,068
	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529	$84,529
Operating Surplus/(Deficit)	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337	54,662,337	$4,662,337	$4,662,337	$4,662,337	$4,662,337

BayRICS 700 MHz Scenarios	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
Total network operating surplus/deficit	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543	$430,543
Operating Expense	$55,032	$55,032	$55,032	$55,032	$55,032	$55,032	$55,032	$55,032	$55,032	$55,032	$55,032	$55,032
Operating Surplus/(Deficit)	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511
Total network capex	$3,375,122	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
BayRICS 700 MHz scenario capex	$934,275	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total capex	$4,309,397	50	$0	$0	$0	$0	$0	50	$0	$0	$0	$0
Total	($3,933,886)	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511	$375,511
Cumulative Cash Flow	($3,933,886)	($3,558,376)	($3,182,865)	($2,807,354)	($2,431,844)	($2,056,333)	(51,660,822)	($1,305,311)	($929,801)	($554,290)	$1,323,264	53,200,817
Net Present Value	($3,746,559)	($3,405,959)	($3,081,579)	($2,772,645)	($2,478,423)	($2,198,211)	(51,931,343)	(51,677,182)	(51,435,125)	(51,204,594)	(5206,515)	$575,506
Business & Entrepreneurship Scenario												
Business and Entrepreneurship Opportunities												
Wholesale service income	$108,000	$108,000	$108,000	5108,000	$108,000	$108,000	$108,000	$108,000	$108,000	$108,000	$108,000	$108,000
Operating Expense	$94,209	$94,209	$94,209	594,209	$94,209	$94,209	$94,209	$94,209	$94,209	$94,209	$94,209	$94,209
Operating Surplus/(Deficit)	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791
BEO capex	$129,164	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	($116,373)	513,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791	$13,791
Cumulative Cash Flow	(5115,373)	(5101,582)	($87,792)	($74,001)	($60,210)	($46,420)	(532,629)	($18,838)	($5,048)	$8,743	$77,696	$146,650
Net Present Value	($109,879)	($97,371)	($85,458)	($74,112)	($63,307)	($53,016)	(543,215)	($33,881)	($24,991)	($16,525)	$20,129	$48,849

Public Access Scenarios	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 15	Year 20
Drinking Fountain Model 1												
Discounted Market Value of New Facilities E	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400
Operating Expense	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059
Operating Surplus/(Deficit)	($35,659)	($35,669)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)
DFM capex	$593,193	$790,924	$593,193	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	($628,852)	($826,583)	($628,852)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)
Cumulative Cash Flow	($628,852)	($1,455,435)	($2,084,287)	($2,119,946)	($2,155,605)	($2,191,264)	($2,226,923)	($2,262,581)	($2,298,240)	($2,333,899)	($2,512,194)	($2,690,488)
Net Present Value	($598,907)	($1,348,642)	($1,891,868)	($1,921,205)	($1,949,144)	($1,975,753)	($2,001,095)	($2,025,231)	($2,048,217)	($2,070,108)	($2,164,887)	($2,239,148)
Drinking Fountain Model 2												
Discounted Market Value of New Facilities E	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400	$752,400
Operating Expense	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059	$788,059
Operating Surplus/(Deficit)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)
DFM capex	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)	($35,659)
Cumulative Cash Flow	($35,659)	($71,318)	($106,977)	($142,635)	($178,294)	($213,953)	($249,612)	($285,271)	($320,930)	($356,589)	($534,883)	($713,177)
Net Present Value	($33,961)	($66,304)	($97,108)	($126,445)	($154,384)	($180,993)	($206,336)	($230,471)	($253,457)	($275,348)	($370,127)	($444,388)

Expense Summary

Capital Expense Core Segments	Units	Units Cost	Installation	Licensing	Towers	Tower Cost	Installation	Network	Installation	Total
Backbone Segment (15 Mbps Base)	66	$613,267	$157,680	$74,400	35	$77,438	$31,500	$208,713	$35,700	$1,198,697
Backbone Segment (100 Mbps Increment)	41	$367,685	$0	$0	0	$0	$0	590,713	$24,600	$462,998
4.9 GHz Public Safety Fixed/Nomadic Segment	196	$1,175,988	5282,240	$235,200	0	$0	$0	$0	$0	$1,693,428
Scenarios & alternatives										
General Government Fixed Segment	301	5682,294	5435,600	$190,800	111	$245,588	$99,900	$345,588	$66,600	$1,966,369
General Government Nomadic Segment	B6	$627,273	$123,640	$0	0	$0	$0	$0	$0	$751,113
BayRICS 700 MHz Scenario	6	$885,000	$1e,000	$14,400	0	$0	$0	$13,275	$3,600	$934,275
Business and Entrepreneurship Opportunities	32	583,084	$46,080	$0	0	$0	$0	$0	$0	$129,164
Drinking Fountain Model Public Access	647	$927,130	$931,680	$0	20	$44,250	$18,000	$44,250	$12,000	51,977,310
Total	1,375	$5,361,731	$1,995,120	$514,800	166	$367,375	$149,400	$602,538	$142,500	$9,133,353

Operating Expense Core Segments	Annual
Backbone Segment (15 Mbps Base)	$85 145
Backbone Segment (100 Mbps Increment)	$29,175
4.9 GHz Public Safety Fixed/Nomadic Segment	$178,065
Scenarios & alternatives	
General Government Fixed Segment	$222,967
General Government Nomadic Segment	$64,529
BayRICS 700 MHz Scenario	$55,032
Business and Entrepreneurship Opportunities	$94,209
Drinking Fountain Model Public Access	$788,059
Total	$1,537,161

Backbone Segment (15 Mbps Base)

Point 1	Point 2	Bandwidth	Units		Units Cost	Installation	Licensing	Towers		Tower Cost	Installation	Network	Installation	Total
DIT	APL	106		1	$14,642	$3,000	$2,000		2	$3,000	$1,500	$1,500	$500	$26,142
DIT	Gwinett	106		1	$14,642	$3,000	$2,000		2	$3,000	$1,500	$1,500	$500	$26,142
DIT	Seneca	108		1	$14,642	$3,000	$2,000		2	$3,000	$1,500	$1,500	$500	$26,142
DIT	FS-28	108		1	$14,642	$3,000	$2,000		2	$3,000	$1,500	$1,500	$500	$26,142
DIT	Edgewater	108		1	$14,642	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$23,692
DIT	Eastmont PD	108		1	$14,642	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$23,692
DIT	FS-1/EOC	108		1	$14,642	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$23,692
APL	Station 2	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
APL	Station 3	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
APL	Station 4	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
APL	Station 5	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
APL	Station 12	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
APL	Station 15	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
APL	Station 16	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Gwinett	Station 6	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Gwinett	Station 7	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Gwinett	Station 8	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Gwinett	Station 10	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Gwinett	Station 19	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Gwinett	Station 24	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Gwinett	Station 25	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Seneca	Station 13	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Seneca	Station 17	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Seneca	Station 18	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Seneca	Station 20	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Seneca	Station 22	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Seneca	Station 23	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
FS-28	Station 21	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
FS-28	Station 26	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
FS-28	Station 27	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
FS-28	Station 29	15		1	$6,460	$3,000	$2,000		1	$1,500	$750	$1,500	$500	$15,710
Backbone WiFi access	2.4 GHz - access point			32	$156,240	$36,400	$0		0	$0	$0	$0	$0	$196,640
NOC hardware	Terminals & networking			1								$55,000	$2,750	$57,750
NOC software	OSS			1								$10,000	$10,000	$20,000
Test equipment	Test equipment			1								$30,000	$1,500	$31,500
														$0
Sub-total		1,116		66	$415,774	$131,400	$62,000		35	$52,500	$26,250	$141,500	$29,750	$859,174
Furnish					$20,789					$2,625		$7,075		$30,489
Engineering design					$41,577					$5,250		$14,150		$60,977
Project management					$41,577	$13,140	$6,200			$5,250	$2,625	$14,150	$2,975	$85,917
Acceptance & documentation					551,972					$6,563		$17,688		$76,222
Security					$41,577	$13,140	$6,200			$5,250	$2,625	$14,150	$2,975	$85,917
Total		1,116		66	5613,267	$157,680	$74,400		35	$77,438	$31,500	$208,713	$35 700	$1,198,697

Backbone Segment (100 Mbps Increment)

	Bandwidth	Units	Units Cost	Installation	Licensing	Towers	Tower Cost	Installation	Network	Installation	Total
Option key upgrade (existing)	311	7	$7,000	$0	$0	0	$0	$0	$10,500	$3,500	$21,000
Hardware upgrade (to 108)	108	24	$106,368	$0	$0	0	$0	$0	$36,000	$12,000	$244,368
New radios (108)	106	5	$40,910	$0	$0	0	$0	$0	$7,500	$2,500	$50,910
Option key upgrade (new)	311	5	$5,000	$0	$0	0	$0	$0	$7,500	$2,500	$15,000
Other	0	0	$0	$0	$0	0	$0	$0	$0	$0	$0
Other	0	0	$0	$0	$0	0	$0	$0	$0	$0	$0
Sub-total		41	$249,378	$0	$0	0	$0	$0	$61,500	$20,500	$331,278
Furnish			$12,464				$0		$3,075		$15,539
Engineering design			$34,928				$0		$6,150		$31,076
Project management			$24,928	$0	$0		$0	$0	$6,150	$2,050	$33,126
Acceptance & documentation			$31,160				$0		$7,688		$38,847
Security			$34,928	$0	$0		$0	$0	$6,150	$2,050	$33,128
Total		41	$367,685	$0	$0	0	$0	$0	$90,713	$24,600	$482,998

4.9 GHz Public Safety Fixed/Nomadic Segment

Location	Type	Bandwidth	Units		Units Cost	Installation	Licensing	Towers	Tower Cost	Installation	Network	Installation	Total
DIT	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
APL	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Gwinett	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Seneca	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
FS-28	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Edgewater	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Eastmont PD	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
FS-1/EOC	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 2	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 3	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 4	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 5	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 6	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 7	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 8	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 10	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 12	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 13	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 15	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 16	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 17	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 18	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 19	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 20	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 21	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 22	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 23	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 24	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$34,390
Station 25	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 26	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 27	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Station 29	4.9 GHz - Base station			3	$17,790	$3,600	$3,000	0	$0	$0	$0	$0	$24,390
Vehicle-mounted units	4.9 GHz - Nomadic Sub Units			100	$228,000	$120,000	$100,000	0	$0	$0	$0	$0	$448,000
Security monitoring sites	4.9 GHz - Outdoor CPE			0	$0	$0	$0	0	$0	$0	$0	$0	$0
Sub-total				196	$797,280	$235,200	$196,000	0	$0	$0	$0	$0	$1,228,480
Furnish					$39,864				$0		$0		$39,664
Engineering design					$79,728				$0		$0		$79,738
Project management					$79,728	$23,520	$19,600		$0	$0	$0	$0	$122,848
Acceptance & documentation					$99,660				$0		$0		$99,660
Security					$79,728	$23,520	$19,600		$0	$0	$0	$0	$122,648
Total				196	$1,175,988	$282,340	$235,200	0	$0	$0	$0	$0	$1,693,428

General Government Fixed Segment

Location(s)	Type	Bandwidth	Units		Units Cost	Installation	Licensing	Towers	Tower Cost	Installation	Network	Installation	Total
DIT-Main Library DS-3	18 GHz - 106 Mbps	108		1	$14,642	$3,000	$2,000	1	$1,500	$750	$1,500	$500	$23,892
Security monitoring sites	4.9 GHz - Outdoor CPE			157	$177,253	$168,400	$157,000	0	$0	$0	$0	$0	$522,653
Base stations	3.65 GHz - Access point			33	$179,487	$39,600	$0	0	$0	$0	$0	$0	$219,087
Library - T1 replacement	3.65 GHz - Outdoor CPE			16	$13,264	$19,200	$0	16	$24,000	$12,000	$24,000	$8,000	$100,464
Other - T1 replacement	3.65 GHz - Outdoor CPE			25	$20,725	$30,000	$0	25	$37,500	$18,750	$37,500	$12,500	$156,975
Parks & Rec - T1 replacement	3.65 GHz - Outdoor CPE			6	$4,974	$7,200	$0	6	$9,000	$4,500	$9,000	$3,000	$37,674
Perks & Rec unwired sites	3.65 GHz - Outdoor CPE			32	$26,528	$38,400	$0	32	$48,000	$24,000	$48,000	$16,000	$200,928
Human Services unwired sites	3.65 GHz - Outdoor CPE			31	$25,699	$37,200	$0	31	$46,500	$23,250	$46,500	$15,500	$194,649
Sub-total				301	$462,572	$363,000	$159,000	111	$166,500	$83,250	$166,500	$55,500	$1,456,322
Furnish					$23,129				$8,325		$8,325		$39,779
Engineering design					$46,257				$16,650		$16,650		$79,557
Project management					$46,257	$36,300	$15,900		$16,650	$8,325	$16,650	$5,550	$145,632
Acceptance & documentation					$57,822				$20,813		$20,613		$99,447
Security					$46,257	$36,300	$15,900		$16,650	$8,325	$16,650	$5,550	$145,632
Total				301	$662,294	$435,600	$190,800	111	$245,588	$99,900	$245,568	$66,600	$1,966,369

General Government Nomadic Segment

Location(s)	Type	Bandwidth	Units		Units Cost	Installation	Licensing	Towers	Tower Cost	Installation	Network	Installation	Total
Library network sites	2.4 GHz - access point			17	$84,065	$20,400	$0	0	$0	$0	$0	$0	$104,465
Parks & Rec sites	2.4 GHz - access point			38	$187,910	$45,600	$0	0	$0	$0	$0	$0	$233,510
Human Services sites	2.4 GHz - access point			31	$153,295	$37,200	$0	0	$0	$0	$0	$0	$190,495
Sub-total				86	$425,270	$103,200	$0	0	$0	$0	$0	$0	$528,470
Furnish					$21,264				$0		$0		$21,264
Engineering design					$42,527				$0		$0		$42,527
Project management					$42,527	$10,320	$0		$0	$0	$0	$0	$52,847
Acceptance & documentation					$53,159				$0		$0		$53,159
Security					$42,537	$10,320	$0		$0	$0	$0	$0	$52,847
Total				86	$627,273	$123,840	$0	0	$0	$0	$0	$0	$751,113

BayRICS 700 MHz Scenario

Location(s)	Type	Bandwidth	Units		Units Cost	Installation	Licensing	Towers	Tower Cost	Installation	Network	Installation	Total
Hub locations	700 MHz - base station			6	$600,000	$15,000	$12,000	0	$0	$0	$9,000	$3,000	$639,000
	700 MHz - base station			0	$0	$0	$0	0	$0	$0	$0	$0	$0
	700 MHz - base station			0	$0	$0	$0	0	$0	$0	$0	$0	$0
	700 MHz - base station			0	$0	$0	$0	0	$0	$0	$0	$0	$0
Sub-total				6	$600,000	$15,000	$12,000	0	$0	$0	$9,000	$3,000	$639,000
Furnish					$30,000				$0		$450		$30,450
Engineering design					$60,000				$0		$900		$60,900
Project management					$60,000	$1,500	$1,200		$0	$0	$900	$300	$63,900
Acceptance & documentation					$75,000				$0		$1,125		$76,125
Security					$60,000	$1,500	$1,200		$0	$0	$900	$300	$63,900
Total				6	$885,000	$18,000	$14,400	0	$0	$0	$13,275	$3,600	$934,275

Business and Entrepreneurship Opportunities

Location(s)	Type	Bandwidth	Units		Units Cost	Installation	Licensing	Towers	Tower Cost	Installation	Network	Installation	Total
Hub facility	3.65 GHz - Access point			2	$10,876	$2,400	$0	0	$0	$0	$0	$0	$13,278
T-1 equivalent business circuit	3.65 GHz - Outdoor CPE	5		25	$20,725	$30,000	$0	0	$0	$0	$0	$0	$50,725
Hotspot service	2.4 GHz - access point	5		5	$24,725	$6,000	$0	0	$0	$0	$0	$0	$30,725
Sub-total				32	$56,328	$38,400	$0	0	$0	$0	$0	$0	$94,728
Furnish					$2,816				$0		$0		$2,816
Engineering design					$5,633				$0		$0		$5,633
Project management					$5,633	$3,840	$0		$0	$0	$0	$0	$9,473
Internet bandwidth													$0
Acceptance & documentation					$7,041				$0		$0		$7,041
Security					$5,633	$3,840	$0		$0	$0	$0	$0	$9,473
Total				32	$83,084	$46,080	$0	0	$0	$0	$0	$0	5129,164

Drinking Fountain Model Public Access

Location(s)	Type	Bandwidth	Units		Units Cost	Installation	Licensing	Towers	Tower Cost	Installation	Network	Installation	Total
Additional base stations	3.65 GHz - Access point			20	$108,780	$24,000	$0	20	$30,000	$15,000	$30,000	$10,000	$217,760
Schools & educational facilities	3.65 GHz - Outdoor CPE		5	200	$165,800	$240,000	$0	0	$0	$0	$0	$0	$405,800
Community organizations	3.65 GHz - Outdoor CPE		5	60	$66,320	$96,000	$0	0	$0	$0	$0	$0	$162,320
Neighborhood partnerships	3.65 GHz - Outdoor CPE		5	60	$66,320	$96,000	$0	0	$0	$0	$0	$0	$162,320
Community housing	3.65 GHz - Outdoor CPE		5	267	$221,343	$320,400	$0	0	$0	$0	$0	$0	$541,743
Sub-total				647	$628,563	$776,400	$0	20	$30,000	$15,000	$30,000	$10,000	$1,469,963
Furnish					$31,428				$1,500		$1,500		$34,426
Engineering design					$62,856				$3,000		$3,000		$68,856
Project management					$62,856	$77,640	$0		$3,000	$1,500	$3,000	$1,000	$148,996
Internet bandwidth													$0
Acceptance & documentation					$78,570				$3,750		$3,750		$86,070
Security					$62,856	$77,640	$0		$3,000	$1,500	$3,000	$1,000	$148,996
Total				647	$927,130	$931,680	$0	20	$44,250	$18,000	$44,250	$12,000	$1,977,310

[redacted]

Capex Data

	Basic Unit	Antenna	Power Suppl	Mount	Cable	Unit Total	Installation	License
Paired Links (2 points)								
18 GHz - 15 Mbps	$4,780	$1,500	$0	$125	$55	$6,460	$3,000	$2,000
18 GHz - 108 Mbps	$12,056	$1,526	$880	$125	$55	$14,642	$3,000	$2,000
Option key (311 Mbps)	$1,000	$0	$0	$0	$0	$1,000	$0	$0
Single Units (1 point)								
4.9 GHz - Base station	$5,190	$560		$125	$55	$5,930	$1,200	$1,000
4.9 GHz - Outdoor CPE	$649	$300		$125	$55	$1,129	$1,200	$1,000
4.9 GHz - Indoor CPE	$599	$300		$125	$55	$1,079	$1,200	$1,000
4.9 GHz - Nomadic Sub Units	$1,610	$490		$125	$55	$2,260	$1,200	$1,000
3.65 GHz - Base station	$5,190	$560		$125	$55	$5,930	$1,200	$0
3.65 GHz - Access point	$4,699	$560		$125	$55	$5,439	$1,200	$0
3.65 GHz - Outdoor CPE	$649	$0		$125	$55	$829	$1,200	$0
3.65 GHz - Indoor CPE	$599	$0		$125	$55	$779	$1,200	$0
3.65 GHz - Nomadic CPE	$1,610	$490		$125	$55	$2,280	$1,200	$0
3.65 GHz - USB unit	$500	$0				$500	$0	$0
2.4 GHz - access point	$4,595	$0	$0	$250	$100	$4,945	$1,200	$0
2.4 GHz - mesh access point								
2.4/3.65 GHz - access point								
2.4/4.9 GHz - access point	$5,595	$0	$0	$250	$100	$5,945	$1,200	$0
700 MHz - base station	$100,000	$0	$0	$0	$0	$100,000	$2,500	52,000
Towers								
50 foot Rohn 25 g	$1,500					$1,500	$750	$0
Network								
Cisco switch	$1,500					51,500	$500	$0
Network total	51,500	$0	$0	$0	$0	51,500	$500	$0
NOC & Maintenance								
Terminals & networking	$50,000				$5,000	555,000	$2,750	$0
OSS	510,000					510,000	$10,000	$0
Test equipment	$30,000					$30,000	$1,500	$0

Other Capex Data

Furnish & commissioning	5%
Engineering design	10%
Project management	10%
Acceptance $ documentation	12.5%
Security	10%

Capital Expense Annual Rollout	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Core Segments										
Backbone Segment (15 Mbps Base)	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Backbone Segment (100 Mbps Increment)	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4.9 GHz Public Safety Fixed/Nomadic Segment	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
General Government Fixed Segment	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
General Government Nomadic Segment	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Scenarios & alternatives										
BayRICS 700 MHz Scenario	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Business and Entreprenaurship Opportunities	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Drinking Fountain Modal Public Access	30%	40%	30%	0%	0%	0%	0%	0%	0%	0%

Capital Equipment Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Core Segments										
Backbone Segment (15 Mbps Base)	$557,274	$0	$0	$0	$0	$0	$0	$0	$0	$0
Backbone Segment (100 Mbps Increment)	$310,778	$0	$0	$0	$0	$0	$0	$0	$0	$0
4.9 GHz Public Safety Fixed/Nomadic Segment	$797,280	$0	$0	$0	$0	$0	$0	$0	$0	$0
General Government Fixed Segment	$629,072	$0	$0	$0	$0	$0	$0	$0	$0	$0
General Government Nomadic Segment	$425,270	$0	$0	$0	$0	$0	$0	$0	$0	$0
Scenarios & alternatives										
BayRICS 700 MHz Scenario	$609,000	$0	$0	$0	$0	$0	$0	$0	$0	$0
Business and Entrepr$neurship Opportunities	$56,328	$0	$0	$0	$0	$0	$0	$0	$0	$0
Drinking Fountain Modal Public Access	$197,569	$263,425	$197,569	$0	$0	$0	$0	$0	$0	$0

Cost of Capital	5.0%
Anticipated equipment lifetime (years)	10

Operating Expense

Backbone Segment (1S Mbps Base)

Item	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		66	$150	15%	$11,385	0%
Site support & power	Site fee		32	$100	15%	$3,680	0%
NOC operations	Op support per node		66	5150	15%	$11,385	0%
IT support services	IT per node		66	$50	15%	53,795	0%
Engineering support	Engineering per node		66	$20	15%	51,516	0%
Legal & regulatory	Legal per node		66	510	15%	5759	0%
General & administrative	G&A per node		66	$10	15%	5759	0%
Equipment replacement	Percent of hardware capex	5%		$821,979	15%	$47,364	0%
Software upgrades & licensing	Percent of software capex	20%		$20,000	15%	54,600	0%
Total						$65,145	

Backbone Segment (100 Mbps Increment)

Item	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		5	5150	15%	5863	0%
Site support & power	Site fee		5	$100	15%	5575	0%
NOC operations	Op support per node		5	$150	15%	5863	0%
IT support services	IT per node		5	$50	15%	$286	0%
Engineering support	Engineering per node		5	520	15%	5115	0%
Legal & regulatory	Legal per node		5	510	15%	$56	0%
General & administrative	G&A per node		5	$10	15%	$56	0%
Equipment replacement	Percent of hardware capex	5%		$458,398	15%	$26,358	0%
Software upgrades & licensing	Percent of software capex	20%		$0	15%	$0	0%
Total						$29,175	

4.9 GHz Public Safety Fixed/Nomadic Segment

Item	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		196	$150	15%	$33,810	0%
Site support & power	Site fee		196	$100	15%	$22,540	0%
NOC operations	Op support per node		196	$150	15%	$33,810	0%
IT support services	IT per node		196	550	15%	$11,270	0%
Engineenng support	Engineering per node		196	520	15%	$4,508	0%
Legal $ regulatory	Legal per node		196	510	15%	$2,254	0%
General & administrative	G$A per node		196	$10	15%	$2,254	0%
Equipment replacement	Percent of hardware capex	5%		$1,175,988	15%	$67,619	0%
Total						$178,065	

General Government Fixed Segment

Item	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		301	$150	15%	$51,923	0%
Site support & power	Site fee		301	$100	15%	$34,615	0%
NOC operations	Op support per node		301	$150	15%	$51,923	0%
IT support services	IT per node		301	$50	15%	$17,308	0%
Engineering support	Engineering per node		301	$20	15%	$6,923	0%
Legal & regulatory	Legal per node		301	$10	15%	$3,462	0%
General & administrative	G&A per node		301	$10	15%	$3,462	0%
Equipment replacement	Percent of hardware capex	5%		$927,881	15%	$53,353	0%
Total						$222,967	

General Government Nomadic Segment

Item	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		86	$150	15%	$14,835	0%
Site support & power	Site fee		86	$100	15%	$9,890	0%
NOC operations	Op support per node		86	$150	15%	$14,835	0%
IT support services	IT per node		86	550	15%	$4,945	0%
Engineering support	Engineering per node		86	$20	15%	$1,976	0%
Legal & regulatory	Legal per node		86	$10	15%	$989	0%
General & administrative	G&A per node		86	510	15%	5989	0%
Equipment replacement	Percent of hardware capex	5%		$627,273	15%	536,066	0%
Total						$84,529	

BayRICS 700 MHz Scenario

Item	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		6	$150	15%	$1,035	0%
Site support & power	Site fee		6	$100	15%	5690	0%
NOC operations	Op support per node		6	$150	15%	51,035	0%
IT support services	IT per node		6	$50	15%	5345	0%
Engineering support	Engineering per node		6	$20	15%	5138	0%
Legal & regulatory	Legal per node		6	$10	15%	$69	0%
General & administrative	G&A per node		6	$10	15%	$69	0%
Equipment replacement	Percent of hardware capex	5%		$898,275	15%	$51,651	0%
Total	Standard					$55,032	0%

Business and Entrepreneurship Opportunities

Item	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		32	$150	15%	$5,520	0%
Site support & power	Site fee		32	$100	15%	$3,680	0%
NOC operations	Op support per node		32	$150	15%	$5,520	0%
IT support services	IT per node		32	$50	15%	$1,840	0%
Engineering support	Engineering per node		32	$20	15%	$736	0%
Legal & regulatory	Legal per node		32	$10	15%	$366	0%
General & administrative	G&A per node		32	$10	15%	$368	0%
Internet bandwidth	DS-3		1	$60,000	10%	$66,000	0%
Equipment replacement	Percent of hardware capex	5%		$83,084	15%	$4,777	0%
Franchise & facilities fee	Percent of revenue	5%		$108,000	0%	$5,400	0%
Total	Standard					$94,209	0%

Drinking Fountain Model Public Access

Item	Unit Type	Annual Rate Units		Unit Cost	Overhead	Total	Annual +
Equipment maintenance	Maintenance per node		647	$150	15%	$111,606	0%
Site support & power	Site fee		647	$100	15%	$74,405	0%
NOC operations	Op support per node		647	$150	15%	$111,606	0%
IT support services	IT per node		647	$50	15%	$37,203	0%
Engineering support	Engineering per node		647	$20	15%	$14,881	0%
Legal & regulatory	Legal per node		647	$10	15%	$7,441	0%
General & administrative	G&A per node		647	$10	15%	$7,441	0%
Internet bandwidth	DS-3		5	$60,000	10%	$330,000	0%
Equipment replacement	Percent of hardware capex	5%		$971,380	15%	$55,854	0%
Franchise & facilities fee	Percent of revenue	5%		$752,400	0%	$37,620	0%
Total	Standard					$786,059	0%

[redacted]

Opex Data

	Unit Type		Unit Cost	Overhead	Annual +
Equipment maintenance	Maintenance per node		$150	15%	0%
Site support & power	Site fee		$100	15%	0%
NOC operations	Op support per node		$150	15%	0%
IT support services	IT per node		$50	15%	0%
Engineering support	Engineering per node		$20	15%	0%
Legal & regulatory	Legal per node		$10	15%	0%
General & administrative	G&A per node		$10	15%	0%
Internet bandwidth	DS-3		$60,000	10%	0%
		Annual Rate		**Overhead**	**Annual +**
Equipment replacement	Percent of hardware capex	5%		15%	0%
Software upgrades & licensing	Percent of software capex	20%		15%	0%
Franchise & facilities fee	Percent of revenue	5%		0%	0%
Totals	Standard			15%	0%

[redacted]

Annual Funding Sources

Notes

Summary

	Annual +	Base Annual
Backbone Segment		
Commercial carrier cost offsets	0%	$115,728
Sub-total		$115,728
Public Safety Fixed/Nomadic Segment		
Commercial carrier cost offsets	0%	$607,200
Sub-total		$607,200
General Govemment Fixed Segment		
Commercial carrier cost offsets	0%	$88,981
Market value of new facilities	0%	$230,124
Perfonnance measure & efficiency gains	0%	$304,914
Sub-total		$624,019
General Govemment Nomadic Segment		
Market value of new facilities	0%	$53,400
Tax revenue enhancement	0%	$2,504,252
Performance measure & efficiency gains	0%	$2,169,214
Sub-total		$4,746,866
Total Annual Funding		$6,093,813

Commercial Carrier Cost Offsets

Backbone Segment

	Units	Monthly	Annual	Total	
Fire Department - T1	26	$115	$1,380	$35,880	DIT
EOC - DS3	1	$1,424	$17,088	$17,088	DIT - EOC to Internet
Police Department - T1	2	$115	$1,380	$2,760	DIT
Police Department - DS3	2	$2,500	$30,000	$60,000	Eastmont & Edgewater to DIT
Total	31			$115,728	Calc

General Govemment Fixed Segment

	Units	Monthly	Annual	Total	
Library - T1	16	$115	$1,380	$22,080	DIT
Library - DS3	1	$1,424	$17,088	$17,088	DIT - Main Library to Internet
Parks & Rec fixed lines	1	$1,276	$15,313	$15,313	DIT

Other - T1	25	$115	$1,380	$34,500	DIT
Other - DS3	0	$0	$0	$0	
Total	43			$88,981	Calc

Public Safety Nomadic

	Units	Monthly	Annual	Total	
Police department - data cards	842	$50	$600	$505,200	DIT
Fire department - data cards	50	$50	$600	$30,000	OIT
Public works - data cards	120	$50	$600	$72,000	DIT
Total				$607,200	Calc

Market Value of New Facilities Enabled

General Government Fixed Segment

	Units	Monthly	Annual	Total	
Unwired Parks & Rec facilities	32	$115	$1,380	$44,160	Reference
Unwired Human Services facilitie	31	$115	$1,380	$42,780	
Security monitoring	157	$76	$912	$143,184	DIT data, FY07-09 Budget
			$0	$0	
Total				$230,124	Calc

General Government Nomadic

	Units	Monthly	Annual	Total	
FMA - parking enforcement	6	$50	$600	$3,600	FY07-09 Budget
FMA - tax auditors & officers	20	$50	$600	$12,000	FY07-09 Budget
Human Services - case workers	16	$50	$600	$9,600	FY07-09 Budget
Human Services - outreach	2	$50	$600	$1,200	FY07-09 Budget
CEDA - field inspectors	45	$50	$600	$27,000	Reference
Other	0	$50	$600	$0	
				$53,400	

Tax Revenue Enhancement

General Government Nomadic

Field auditors	26				Calc
Per capita program cost	$192,635				Reference
Efficiency gain	12.5%				Reference
Budgetary value of efficiency gai	$626,063				Calc
City Auditor revenue/cost ratio	4				Calc
Tax revenue enhancement				$2,504,252	Calc

Perfonnance Measure & Efficiency Gains

General Government Fixed Se	Sites	Hours/week	FTE	FTE Value	
Parks & Rec locations	32	64	1.6	$140,451	Calc/reference
Human Services locations	31	62	1.6	$80,694	Calc/reference
Security monitoring locations	157	39	1.0	$83,768	Calc/reference
Total				$304,914	

General Government Nomadic

CEDA			
Additional permit inspections	5,625		Calc
Additional code inspections	4,375		Calc
Permit inspector FTE gain	2.8		Calc
Code inspector FTE gain	- 2.7		Calc
Value of FTE gain		$678,455	Calc
Human Services			
Additional clients served	94		Calc
Case manager FTE gain	1.7		Calc
Value of FTE gain		$87,853	Calc
PWA			
Per capita personnel cost (overal	$94,860		Calc
Personnel with laptops	120		Reference
Value of efficiency gain		$1,422,906	Calc
Total (general government nomadic)		$2,189,214	Calc

Calculations & Data

Efficiency Gain Estimates		
Remote access - average daily ti	1	Estimate
Average work day (hours)	8	Estimate
Efficiency gain	12.5%	Calc
New fixed service - average weel	2	Estimate
Average work week (hours)	40	Estimate
Efficiency gain	5.0%	Calc
New security monitoring - averag	0.25	Estimate
Average work week (hours)	40	Estimate
Efficiency gain	0.6%	Calc
CEDA - Development Permit & Code Enforcement Inspections		
Permit inspections performed	45,000	FY07-09 Budget
Code inspections performed	35,000	FY07-09 Budget
Inspections/permit inspector	2,000	FY07-09 Budget
Inspections/code inspector	1,600	FY07-09 Budget

Permit inspectors	23	Calc
Code inspectors	22	Calc
Total	44	Calc
Total budgeted inspectors	45	FY07-09 Budget
Unfilled inspector positions	10	OSCS report
Personnel budget 08-09	$9,968,512	FY07-09 Budget
FTE 08-09	81.5	FY07-09 Budget
Average per position	$122,313	Calc

Human Services			
Case managers	10.5		FY07-09 Budget
Nurse case managers	3		FY07-09 Budget
Case management clients	750		FY07-09 Budget
Clients per case manager	56		Calc
Program personnel budget 08-09	$5,802,710		FY07-09 Budget
FTE 08-09	111.5		FY07-09 Budget
Average per position	$52,061		Calc
Parks & Recreation - Central Administration			
Personnel budget 08-09	$1,729,307		
FTE 08-09	19.7		
Average per position	$87,782		
PWA - Overall			
Personnel budget 08-09	$65,577,014		FY07-09 Budget
FTE 08-09	691.3		FY07-09 Budget
Field FTE 08-09	400		DIT
Average per position	$94,860		Calc
PWA - Facilities & Management			
Personnel budget 08-09	$13,110,882		FY07-09 Budget
FTE 08-09	153.6		FY07-09 Budget
Average per position	$85,368		Calc
Finance & Management Agency - Financial Management Program			
Personnel budget 08-09	$16,127,420		FY07-09 Budget
FTE 08-09	135.0		FY07-09 Budget
Average per position	$119,462		Calc
O&M budget 08-09	$9,878,270		FY07-09 Budget
Average per position	$73,172		Calc
Total per capita program cost	$192,635		Calc
Total revenue 08-09	$512,413,998		FY07-09 Budget
	Rev source	% City rev	
Business license tax 06-09	$49,139,920	4.6%	FY07-09 Budget
Transient occupancy tax 08-09	$13,031,524	1.2%	FY07-09 Budget

Parking tax 08-09	$17,695,438	1.7%		FY07-09 Budget
Percent of parking tax from airport			50%	FY07-09 Budget
Non airport parking rev	$8,847,719	0.8%		Calc
Field-auditable revenue	$71,019,163	6.6%		Calc
FAR as percent of program	13.9%			Calc
Rev return/audit cost metric:				
FMA	1			FY07-09 Budget
City Auditor	4			FY07-09 Budget

PWA Personnel Summary		
Administration	$3,698,847	FY07-09 Budget
Electrical	$2,278,790	FY07-09 Budget
Environmental	$706,116	FY07-09 Budget
Facilities	$13,110,882	FY07-09 Budget
Fleet	$6,378,003	FY07-09 Budget
Clean	$10,769,990	FY07-09 Budget
Grounds	$8,310,874	FY07-09 Budget
Recycling	$1,326,975	FY07-09 Budget
Safety	$319,082	FY07-09 Budget
Sewer	$7,956,534	FY07-09 Budget
Streets	$5,351,096	FY07-09 Budget
Transponation	$2,202,446	FY07-09 Budget
Trees	$3,165,379	FY07-09 Budget
	$65,577,014	Calc

Business and Entrepreneurship Opportunities

Wholesale Services

	Units	Monthly	Annual	Total
T-1 equivalent business circuit	25	$300	$3,600	$90,000
New installation & maintenance	1	$500	$6,000	$6,000
Hotspot service	5	$200	$2,400	$12,000
Total				$108,000

Annual + 0%

Drinking Fountain Model Public Access

Discounted Market Value of New Facilities Enabled

	Units	Monthly	Annual	Total	
Schools & educational facilities	200	$100	$1,200	$240,000	T-1 equivalent service
Community organizations	80	$100	$1,200	$96,000	
Neighborhood partnerships	80	$100	$1,200	$96,000	
Community housing	267	$100	$1,200	$320,400	
Total	627			$752,400	

Parks & Recreation

	Facility	Address	Phone	Lines	Monthly Cos	Termination
Recreation Centers	Allendale Recreation Center	3711 Suter Street	(510) 535-5635			
	Arroyo Viejo Recreation Center	7701 Krause Avenue	(510) 615-5755			
	Brookdale Recreation Center	2535 High Street	(510) 535-5632			
	Bushrod Recreation Center	560 59th Street	(510) 597-5031			
	Carmen Flores	1637 Fruitvale Avenue	(510) 535-5631			
	DeFremery Recreation Center	1651 Adeline Street	(510) 238-7739			
	Dimond Recreation Center	3860 Hanly Road	(510) 482-7831			
	Discovery Center – East	2521 High Street	(510) 535-5657			
	Discovery Center – West	935 Union Street	(510) 832-3314			
	FM Smith Recreation Center	1969 Park Boulevard	(510) 238-7742			
	Franklin Recreation Center	1010 East 15th Street	(510) 238-7741			
	Golden Gate Recreation Center	1075 62nd Street	(510) 597-5032			
	Ira Jinkins Recreation Center	9175 Edes Avenue	(510) 615-5959			
	Lincoln Square Recreation Center	250 10th Street	(510) 238-7738			
	Manzanita Recreation Center	2701 22nd Street	(510) 535-5625			
	Montclair Recreation Center	6300 Moraga Avenue	(510) 482-7812	1	$210	150 FOP
	Mosswood Recreation Center	3612 Webster Street	(510) 597-5038			
	Poplar Recreation Center	3131 Union Street	(510) 597-5042			
	Rainbow Recreation Center	5800 International Boulevard	(510) 615-5751	1	$76	Sonitrol
	Redwood Heights Recreation Center	3883 Aliso Avenue	(510) 482-7827	1	$210	150 FOP
	San Antonio	1701East 19th Street	(510) 535-5608			
	Sheffield Village Recreation Cntr	247 Marlow Drive	(510) 638-7190			
	Studio One Arts Center	365 45th Street	(510) 597-5027	2	$400	150 FOP, Int
	Tassataronga Recreation Center	975 85th Avenue	(510) 615-5764			
	Verdese Carter Recreation Center	9600 Sunnyside Street	(510) 615-5758			
Swimming Pools	Castlemont	8601 MacArthur Boulevard	(510) 879-3642			
	DeFremery	1269 18th Street	(510) 238-2205			
	Fremont	4550 Foothill Boulevard	(510) 535-5614			
	Lions	3860 Hanly Road	(510) 482-7852	1	$210	150 FOP
	Live Oak	1055 MacArthur Boulevard	(510) 238-2292			
	McClymonds	2607 Myrtle Street	(510) 879-8050			
	Temescal	371 45th Street	(510) 597-5013			
Rental Facilities	Joaquin Miller Community Center	3594 Sanborn Drive	(510) 238-3187			
	Lake Merritt Sailboat House	568 Bellevue Avenue	(510) 238-3187	1	$170	150 FOP
	Leona Lodge	4444 Mountain Boulevard	(510) 238-3187			
	Marsha J. Corprew Garden Center	666 Bellevue Avenue	(510) 238-3187			
	Morcom Rose Garden	700 Jean Street	(510) 238-3187			
	Sequoia Lodge	2666 Mountain Boulevard	(510) 238-3187			
				7	$1,276	

	Unwired facilities		32
	Wired facilities		6
Community Gardens	Arroyo Viejo	79th Ave & Arthur St cul de sac	
	Bushrod	564 - 59th Street	
	Golden Gate	1068 - 62nd Street	
	Lakeside Kitchen Garden	666 Bellevue Ave	
	Marston Campbell	Btwn 16th & 18th St. and Market & West St.	
	Temescal	876 - 47th Street	
	Verdese Carter	Corner 96th Ave & Bancroft Ave	

Human Services

	Facility	Address	Phone	Lines	Monthly Cos Termination
Head Start/Early Head Start	85th Avenue	8501 International Blvd.	510-544-3389		
	92nd Avenue	9202 International Blvd.	510-568-1057		
	Anoyo Viejo	7701 Krause Ave.	510-615-5944		
	Brookfield	9600 Edes Ave.	510-615-5736		
	City Towers	1050 7th Street	510-238-5230		
	De Colores	1155 35th Avenue	510-533-1271		
	Eastmont Mall	7200 Bancroft Ave. #203	510-562-1790		
	Fannie Wall	647 55th Street	510-597-5044		
	Foothill Square	10700 MacArthur Blvd #10	510-553-9926		
	Frank G. Mar	274 12th Street	510-832-5042		
	Franklin	1010 E. 15th Street	510-238-1304		
	Manzanita	2701 22nd Ave.	510-535-5624		
	San Antonio CDC	2228 E. 15th Street	510-534-6189		
	San Antonio Park	1701 E. 19th Street	510-535-5609		
	Seminary	5818 International Blvd	510-615-5924		
	Sungate	2563 International Blvd.	510-535-5648		
	Tassataronga	975 85th Ave.	510-639-0580		
	Thurgood-Marshall	1117 10th Street	510-836-0543		
	Virginia	4335 Virginia Ave.	510-261-1484		
	West Grand	1058 West Grand Avenue	510-238-2267		
Senior Centers	Downtown Oakland Senior Center	200 Grand Avenue	510-238-3284		
	East Oakland Senior Center	9255 Edes Avenue	510-615-5731		
	Fruitvale/San Antonio Senior Center	3301 E. 12th Street	510-535-6123		
	Hong Lok Senior Center	275 7th Street	510-763-9017		
	North Oakland Senior Center	5714 Martin Luther King Jr Way	510-597-5085		
	West Oakland Senior Center	1724 Adeline Street	510-238-7017		
Shelters	Covenant House	2781 Telegraph Ave	510.625.7800		
	East Oakland Community Project	5725 International Blvd.	510.532.3211		
	Health Care for the Homeless	1900 Fruitvale Ave., Suite 3E	510.533.4663		
	Henry Robinson Multi-Service Center	559 16th St	510.419.1010		
	Oakland Army Base Temporary Winter Shelter	1145 Midway St.	510.839.8005		
				0	0
	Unwired facilities			31	
	Wired facilities			0	

Other

Public Safety	31
General	43
Total facilities	300
Unaccounted for locations	157

Oakland Unified School District

Acorn Woodland Cdc	(510) 879-0861	1029 81st Ave
Acorn Woodland Elementary	(510) 879-0190	1025 81st Ave
Adult Ed - Abe/Ase	510-879-4040	2455 Church Street
Adult Ed - Awd	510-879-4090	920 53rd Street
Adult Ed - Cte	510-879-8620	2455 Church Street, Rm. 106
Adult Ed - Esl	510-879-4020	750 International Blvd
Adult Ed - Oa	510-879-4090	920 53rd Street
Adult Ed - Pfca/Cbet	510-879-2944	750 International Blvd
Adult Education Administrative Office	(510) 879-3036	2607 Myrtle Street
Alice Street Cdc	(510) 879-0856	250 17th Street
Allendale Elementary	(510) 879-1010	3670 Penniman Ave
Alliance Academy	(510) 879-2733	1800 98th Ave
Alternative Learning Community		9736 Lawlor Street
Arroyo Viejo Cdc	(510) 879-0802	1895 78th Avenue
Ascend Elementary	(510) 879-3140	3709 E 12th St
Bella Vista Cdc	(510) 879-1657	2410 10th Avenue
Bella Vista Elementary	(510) 879-1020	1025 E 28th St
Best At Mcclymonds	(510) 879-3030	2607 Myrtle St
Bret Harte Middle School	(510) 879-2060	3700 Coolidge Ave
Bridges Academy At Melrose	(510) 879-1410	1325 53rd Ave
Brookfield Pre-K	(510) 879-0806	401 Jones Avenue
Brookfield Village Elementary	(510) 879-1030	401 Jones Ave
Bunche Academy	(510) 879-1730	1240 18th St
Burckhalter Elementary	(510) 879-1050	3994 Burckhalter Ave
Business & Information Technology High Schoc	(510) 879-3010x443	8601 Macarthur Blvd
Carl Munck Elementary	(510) 879-1680	11900 Campus Dr
Castlemont Community Of Small Schools	(510) 879-3010	8601 Macarthur Boulevard
Centre Infantil Annex Cdc	(510) 879-081	314 East 10th Street
Centro Infantil De La Raza Cdc	(510) 879-1521	2660 East 16th Street
Chabot Elementary	(510) 879-1060	6686 Chabot Rd
Claremont Middle School	(510) 879-2010	5750 College Ave
Cleveland Elementary	(510) 879-1080	745 Cleveland St
Cole Middle School	(510) 879-1091	1011 Union St
Coliseum College Prep Academy	(510) 879-2456	1390 66th Ave
College Prep & Architecture Academy	(510) 879-1131	4610 Foothill Blvd
Community Day Hs	(510) 879-8450	4917 Mountain Blvd
Community United Elementary School	(510) 879-1340	6701 International Blvd
Cox Ece Center	(510) 879-0807	9860 Sunnyside Street
Crocker Highlands Elementary	(510) 879-1110	525 Midcrest Rd
Dewey Academy	(510) 879-3100	1111 2nd Avenue
East Oakland Pride		8000 Birch Street

East Oakland School Of The Arts	(510) 879-3010x498	8601 Macarthur Blvd
Edna M Brewer Middle School	(510) 879-2100	3748 13th Ave
Edward Shands Adult Education Center	(510) 879-4040	2455 Church Sreet
Elmhurst Community Prep	(510) 879-2021	1800 98th Ave
Emerson Cdc	(510) 879-0811	4801 Lawton Avenue
Emerson Elementary	(510) 879-1150	4803 Lawton Ave
Encompass Academy	(510) 879-0207	1025 81st Ave
Esperanza Academy	(510) 879-1551	10315 E St.
Excel At Mcclymonds	(510) 879-8490	2607 Myrtle St
Explore College Preparatory Middle	(510) 879-1040	3550 64th Avenue
Far West	(510) 879-1580	5263 Broadway Ten ace
Franklin Elementary	(510) 879-1160	915 Foothill Blvd
Fred T. Korematsu Discovery Academy	(510) 879-2795	10315 E St.
Fremont Federation	(510) 879-3020	4610 Foothill Blvd
Frick Middle School	(510) 879-2030	2845 64th Ave
Fruitvale Cdc	(510) 879-2825	3200 Boston Ave.
Fruitvale Elementary	(510) 879-1170	3200 Boston Ave
Futures Elementary		6701 International Blvd
Garfield Elementary	(510) 879-1180	1640 22nd Ave
Glenview Elementary	(510) 879-1190	4215 La Cresta Ave
Global Family School		2035 40th Ave.
Golden Gate Cdc	(510) 879-0814	6232 Herzog Street
Golden Gate Pre-K	(510) 879-0813	6200 San Pablo Avenue
Grass Valley Cdc		4720 Dunkirk Ave.
Grass Valley Elementary	(510) 879-1220	4720 Dunkirk Ave
Greenleaf Elementary		6328 East 17th Street
Harriet R Tubman Cdc	(510) 879-0825	800 33rd Street
Highland Campus	(510) 879-1260	8521 A St
Highland Cdc	(510) 879-0815	1322 86th Avenue
Hillcrest Elementary	(510) 879-1270	30 Marguerite Dr
Hintil Kuu Ka Cdc	(510) 879-0840	11850 Campus Drive
Hoover Elementary	(510) 879-1700	890 Brockhurst St
Horace Mann Elementary	(510) 879-1360	5222 Ygnacio Ave
Howard Cdc	(510) 879-0816	8755 Fontaine Street
Howard Elementary	(510) 879-1660	8755 Fontaine St
International Cdc	(510) 879-4293	2825 International Boulevard
International Comm. Elementary	(510) 879-4286	2825 International Blvd
James Madison Middle School	(510) 879-2150	400 Capistrano Dr
Jefferson Cdc	(510) 879-0817	1975 40th Avenue
Jefferson Elementary	(510) 879-1280	2035 40th Ave
Joaquin Miller Elementary	(510) 879-1420	5525 Ascot Dr
Kaiser Elementary	(510) 549-4900	25 S Hill Ct

La Escuelita Elementary	(510) 879-1210	1100 3rd Ave
Lafayette Elementary	(510) 879-1290	1700 Market Sl
Lakeview Cdc	(510) 879-0857	746 Grand Avenue
Lakeview Elementary	(510) 879-1300	746 Grand Ave
Laurel Cdc	(510) 879-0820	3825 California Street
Laurel Elementary	(510) 879-1310	3750 Brown Ave
Lazear Elementary	(510) 879-1320	824 29th Ave
Leadership Preparatory High School	(510) 879-3010x457	8610 Macarthur Blvd
Learning Without Limits		2035 40th Ave
Life Academy	(510) 534-0282	2101 35th Avenue
Lincoln Elementary	(510) 879-1330	225 11th St
Lockwood Cdc	(510) 879-0823	1125 69th Avenue
Lockwood Elementary	(510) 879-1340	6701 International Blvd
Lockwood School Preschool	(510) 879-0827	6701 E.14th SL
M L King Jr Elementary	(510) 879-1820	960 10th St
Mandela High School	(510) 879-1141	4610 Foothill Blvd
Manzanita Campus	(510) 879-1370	2409 E 27th St
Manzanita Cdc	(510) 879-0829	2618 Grand Vista
Manzanita Community School	(510) 879-1370	2409 E 27th St.
Manzanita Seed	(510) 879-1373	2409 E. 27th St
Markham Elementary	(510) 879-1380	7220 Krause Ave
Marshall Elementary	(510) 879-1740	3400 Malcolm Ave
Maxwell Park Elementary	(510) 879-1390	4730 Fleming Ave
Mcclymonds Community Of Small Schools	(510) 879-3030	2607 Myrtle St
Media College Prep	(510) 879-1597	4610 Foothill Blvd
Melrose Leadership Academy	(510) 879-1530	5328 Brann Street
Met West	(510) 879-0235	314 E 10th St
Ml King Cdc	(510) 879-0322	960A 10th Street
Montclair Elementary	(510) 879-1430	1757 Mountain Blvd
Montera Middle School	(510) 879-2110	5555 Ascot Dr
Neighborhood Centers	(510) 879-4020	750 International Blvd
New Highland Academy	(510) 879-1260	8521 A St
Oakland High School	(510) 879-3040	1023 Macarthur Blvd
Oakland International High School		4521 Webster St
Oakland Technical High School	(510) 879-3050	4351 Broadway
Parker Cdc	(510) 879-0828	7901 Ney Avenue
Parker Elementary	(510) 879-1440	7929 Ney Ave
Peralta Cdc	(510) 879-0858	460 63rd Street
Peralta Creek Middle School	(510) 879-8465	2101 35th Ave
Peralta Elementary	(510) 879-1450	460 63rd Street
Piedmont Avenue Cdc	(510) 879-0832	86 Echo Avenue
Piedmont Avenue Elementary	(510) 879-1460	4314 Piedmont Ave

Pleasant Valley Adult School	(510) 879-4090	920 53rd Street
Preparatory Literary Academy Of Cultural Exce	(510) 879-1470	920 Campbell St
Prescott Cdc	(510) 879-0835	800 Campbell Street
Reach Academy	(510) 879-1100	9660 Sunnyside St.
Redwood Heights Elementary	(510) 879-1480	4401 39th Ave
Rise Community School	(510) 879-2553	8521 A St
Robeson School Of Visual & Performing Arts	(510) 879-1237	4610 Foothill Blvd
Roosevelt Middle School	(510) 879-2120	1926 19th Ave
Roots International Academy	(510) 879-2625	1390 66th Ave
Rudsdale Continuation	(510) 879-4237	1180 70th Avenue
Sankofa Academy	(510) 879-1610	581 61st St
Santa Fe Cdc	(510) 879-0637	5380 Adeline Street
Santa Fe Elementary	(510) 879-1500	915 54th St
Sequoia Cdc	(510) 879-0846	3730 Lincoln Avenue
Sequoia Elementary	(510) 879-1510	3730 Lincoln Ave
Skyline High School	(510) 879-3060	12250 Skyline Blvd
Sobrante Park Elementary	(510) 879-1540	470 El Paseo Dr
Sojourner Tmth Independent Study	(510) 879-2980	9736 Lawlor SL
Stonehurst Campus	(510) 879-1550	10315 E St
Stonehurst Cdc	(510) 879-0838	901 105th Avenue
Street Academy	(510) 879-3130	417 29th St
Think College Now	(510) 879-1490	2825 International Blvd
Thornhill Elementary	(510) 879-1570	5880 Thornhill Dr
Tilden Elementary	(510) 879-1560	4551 Steele St
Tilden Pre-K	(510) 879-0841	4655 Steele Street
United For Success Academy	(510) 879-1494	2101 35th Ave
Urban Promise Academy	(510) 879-1640	3031 E. 18th Street
Washington Cdc	(510) 879-0839	6097 Racine Street
Webster Academy	(510) 879-1620	8000 Birch St
Webster Academy Ece	(510) 879-0842	7980 Plymouth Street
West Oakland Middle School		991 14th Street
Westlake Middle School	(510) 879-2130	2629 Harrison St
Whitlier Elementary	(510) 879-1630	6328 E 17th St
Yes, Youth Empowerment School	(510) 879-8877	8251 Fontaine St
Yuk Yau Cdc	(510) 879-0824	291 10th Street
Yuk Yau-Annex	(510) 879-0821	314 East 10th Street

Other Schools

California College of Arts & Crafts
California State University, Hayward
Holy Names University
Mills College
Patten University
Alameda College
Laney College
Merritt College
Vista College
Samuel Merritt College
San Francisco State University - Extended Learning
Holy Names High School

City Statistics		
Land area (sq. mi.)	53.8	FY07-09 Budget
Lake area (sq. mil.)	3.5	FY07-09 Budget
Total area	57.3	
Miles of Streets	835.8	FY07-09 Budget
Population	411,600	FY07-09 Budget
Number of businesses	19,720	FY07-09 Budget

Network Specifications		
Access points/sq. mi.	16	Estimate

11. Appendix D: Communications

11.1. Communications Outline

I. Communications Objectives

A. Awareness. Build brand public awareness of the Wireless Oakland Initiative (WOI) project in the Oakland Metropolitan Area amongst its diverse population. The goal is to have 60% of the constituent community be aware of the WOI within the first six months.

B. Education/Buy-in. Educate the public on the key details of the WOI program and the benefits it will provide the citizens of Oakland – both short and long term. The goal w to educate as many people as the budget permits.

C. Image/Reputation. Increase Oakland's reputation as a smart, progressive city; one that is on the forefront of technology. Increase favorable image of Oakland as a great place to visit, live and do business.

II. Key Communications Strategies

A. A. Positioning. Position the WOI program as a major initiative (versus other City initiatives) by "branding" the program with its own unique image.

B. Elements of a "Branded Initiative"

- Name
- Logo (City of Oakland logo)
- Positioning
- Vision
- Personality
- Brand promise
- Value proposition
- Core brand message
- Theme (e.g., "Building a Digital Future Today")

C. Continuity of Messaging. All initiative messaging should be consistent across all communications channels so they reinforce the key elements of the brand.

III. Key Communications Tactics

A. The communications plan will include both an introductory phase (first 90 days) and an ongoing support phase. The plan will use the most cost-effective communication tools available to reach the various target audiences.

B. The communications tactics recommended are an integrated mix of traditional media, Web media and the new social media.

C. The current thinking on the elements that should be involved include:

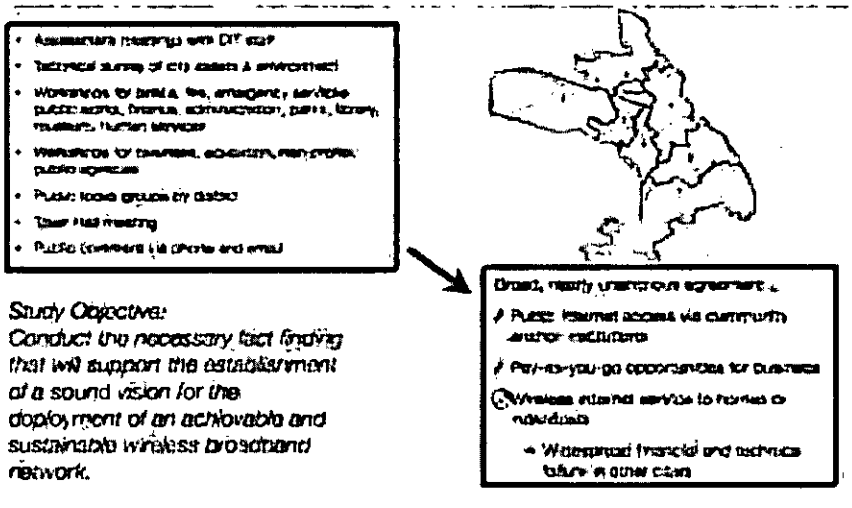
1. Fact sheet (several languages).
2. Q and A document (both printed ad online).
3. Community meetings.
4. Presentation to community groups and service clubs.
5. Media Relations Kit: Introductory and Ongoing.
6. A micro-site as part of the City's master Web site.
7. Quarterly e-mail newsletter campaign.
8. A social media presence (blog, Twitter, Facebook) to reach the digital generation.
9. Optional: Special Education and Teaching Module, budget permitting.

11.2. Presentation

City of Oakland Wireless Broadband Feasibility Study

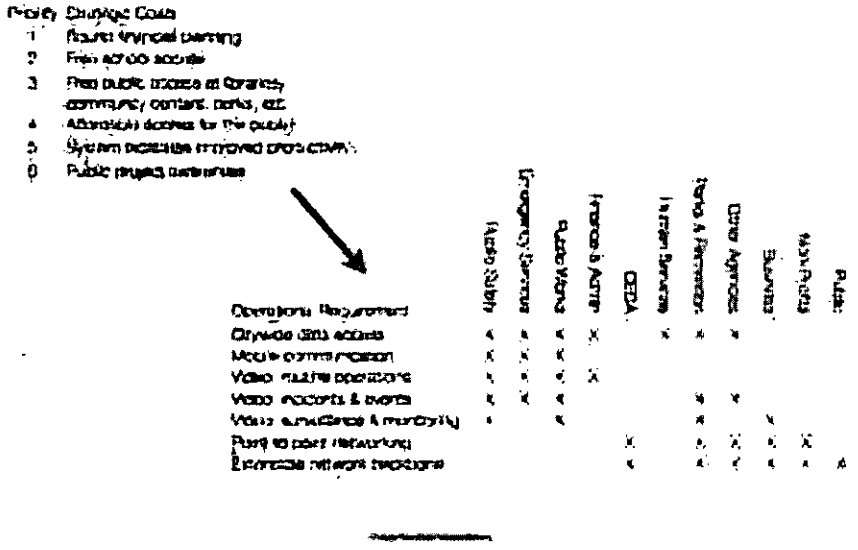
Tellus Venture Associates

Comprehensive assessment of needs, goals & priorities



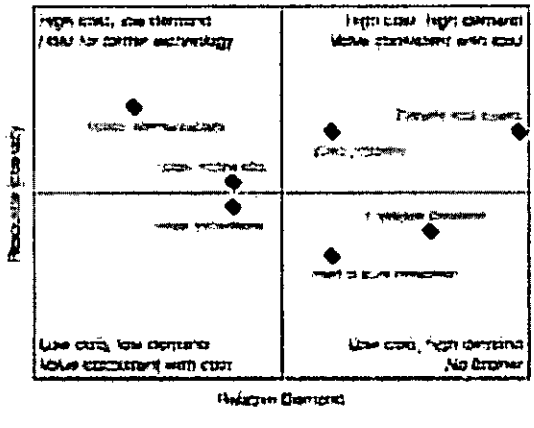
Study Objective:
Conduct the necessary fact finding that will support the establishment of a sound vision for the deployment of an achievable and sustainable wireless broadband network.

Needs, goals & priorities led to operational requirements

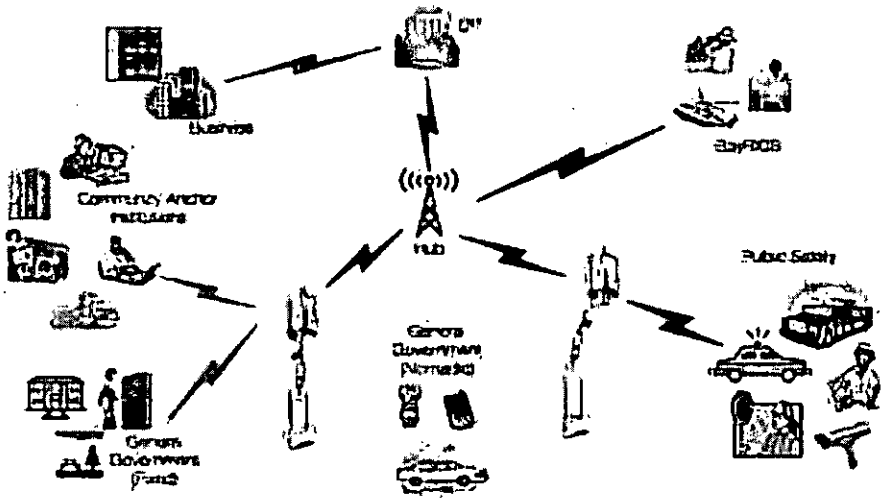


Is desire consistent with cost?

Setting operational requirement priorities for the City of Oakland

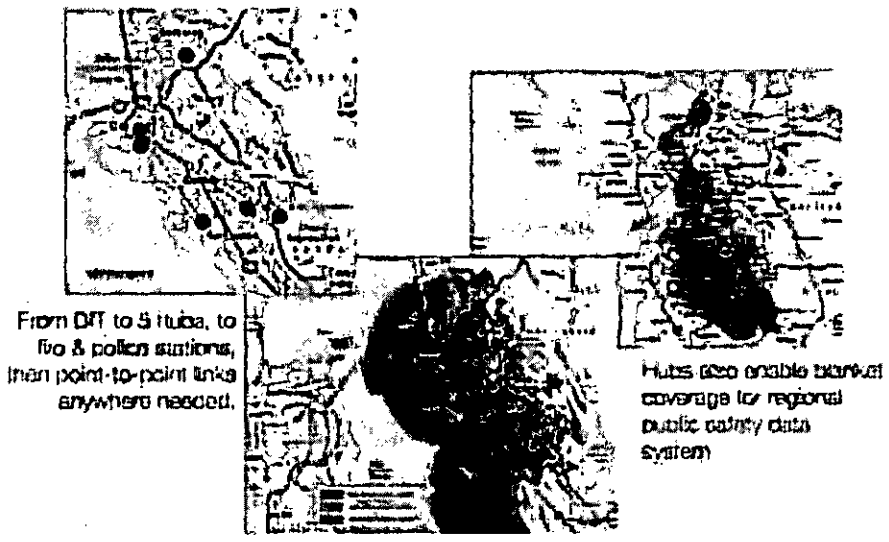


1. Extensible network backbone
2. Point to point networking
3. Citywide data access
4. Video: incidents
5. Video: surveillance
6. Video: routine operations
7. Mobile communications



Requirements drive design of reference architecture

Can it be done?

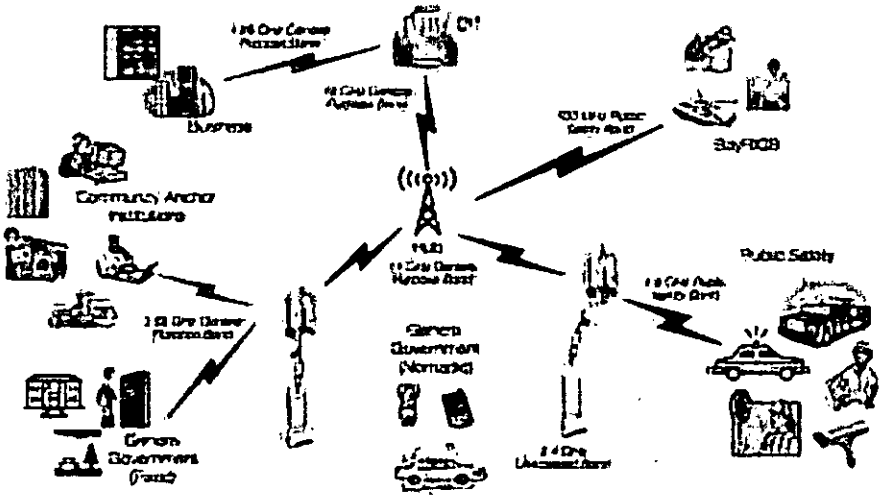


From DT to 5 hubs, to five 5 police stations, then point-to-point links anywhere needed.

Hubs also enable blanket coverage for regional public safety data system

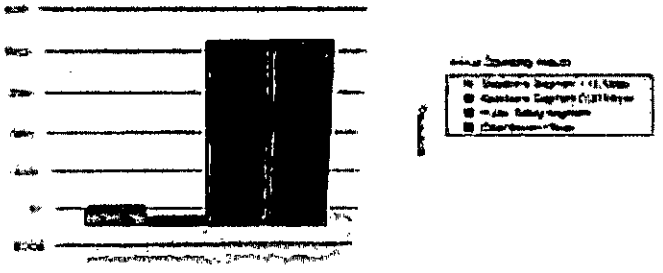
Backbone enables flexible, citywide coverage for diverse applications

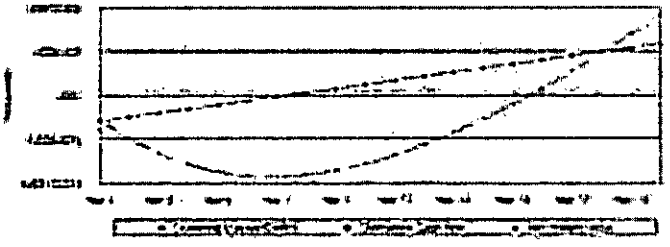
Yes, it can be done



Coverage, service levels technically feasible

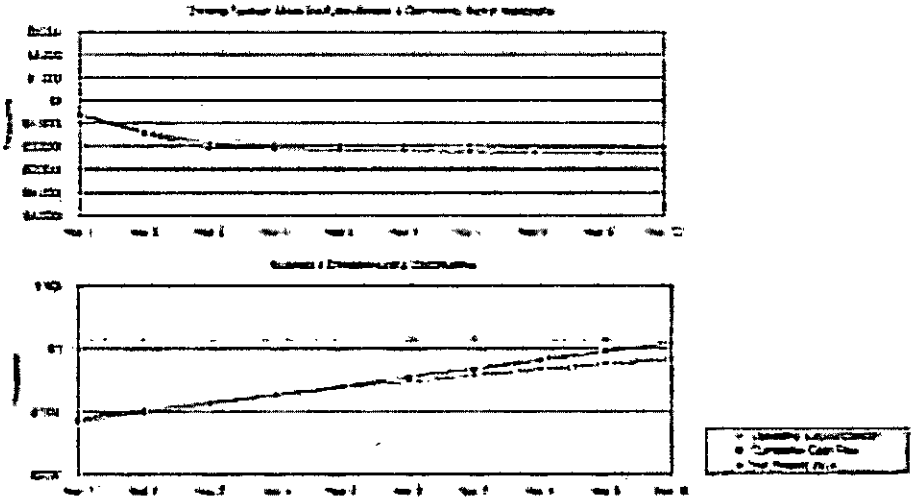
Reference architecture and economic flow





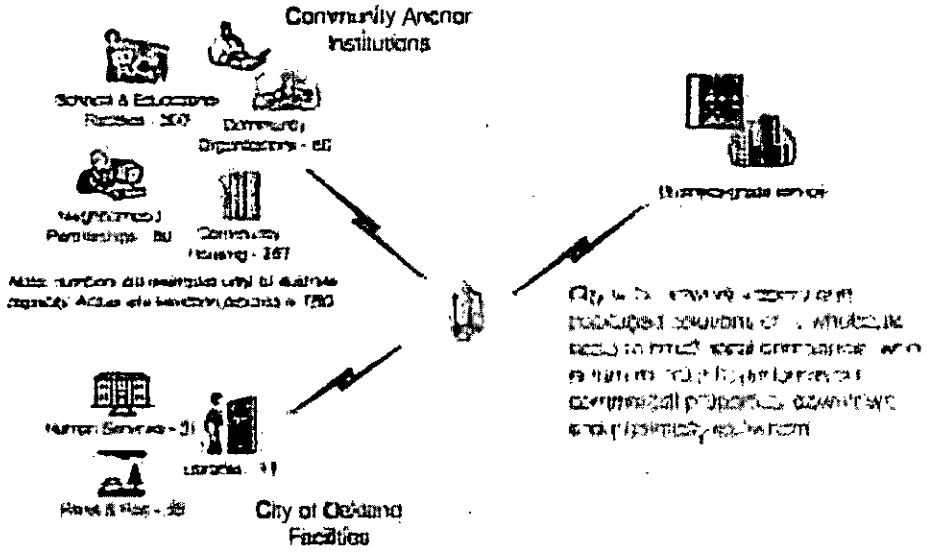
Core system operates at a surplus, pays full cost over time

Higher capacity, and huge savings on current leased lines



Core supports community anchor institutions, businesses

Business service pay-as-you-go. community service returns value



Model supports hundreds of potential public access sites

Creates opportunities for local entrepreneurs

Next steps

Stimulus program application deadline sets immediate agenda

- Determine which broadband grant programs are available to the City.
- Develop an implementation plan that meets schedule requirements and criteria for "shovel-ready" projects.
- Identify complementary stimulus program-funded projects and potential partners, per application guidelines.
- Determine the source for the required 20% matching funds, including making any necessary applications to State of California agencies.
- Prepare and submit grant applications covering as many categories as practical by the 14 August 2009 deadline.
- Release an RFP to support the grant applications as soon as possible.

Creating and implementing fundable business plans for community broadband projects is a speciality of Tellus Venture Associates.

Since 1996, our clients have built, funded, launched and managed wireless, fiber optic and satellite networks that serve consumers and communities around the world. Our experience includes:

- Financial and technical feasibility studies
- Primary market research to determine demand and community support
- Business case assessment
- Business model and funding development
- Public/private partnerships
- Reference designs
- RFP development and support

Stephen Blum, the president of Tellus Venture Associates, has led many successful projects and served in several senior executive posifions on a consulting basis, including...

- Principal consultant for a successful $5 million grant application for a regional broadband consortium.
- Chief operating officer of a wireless ISP.
- Due diligence lead for an NGO delegation to Angola
- Team leader for an NGO project in the Philippines.
- Principal negotiator for a cable system sale to a top tier MSO.
- Managing consultant for a public/private WiMAX network deployment.
- Principal consultant for comprehensive feasibility studies for municipal wireless broadband systems.
- Management advisor for satellite broadcasting systems in North and South America, Asia, the Pacific Rim, Africa, the Middle East, and Europe, including most recently Italy, Cambodia and New Zealand.

Contact information:

Stephen Blum
Tellus Venture Associates
+1-831-582-0700
steveblum@tellusventure.com
www.tellusventure.com