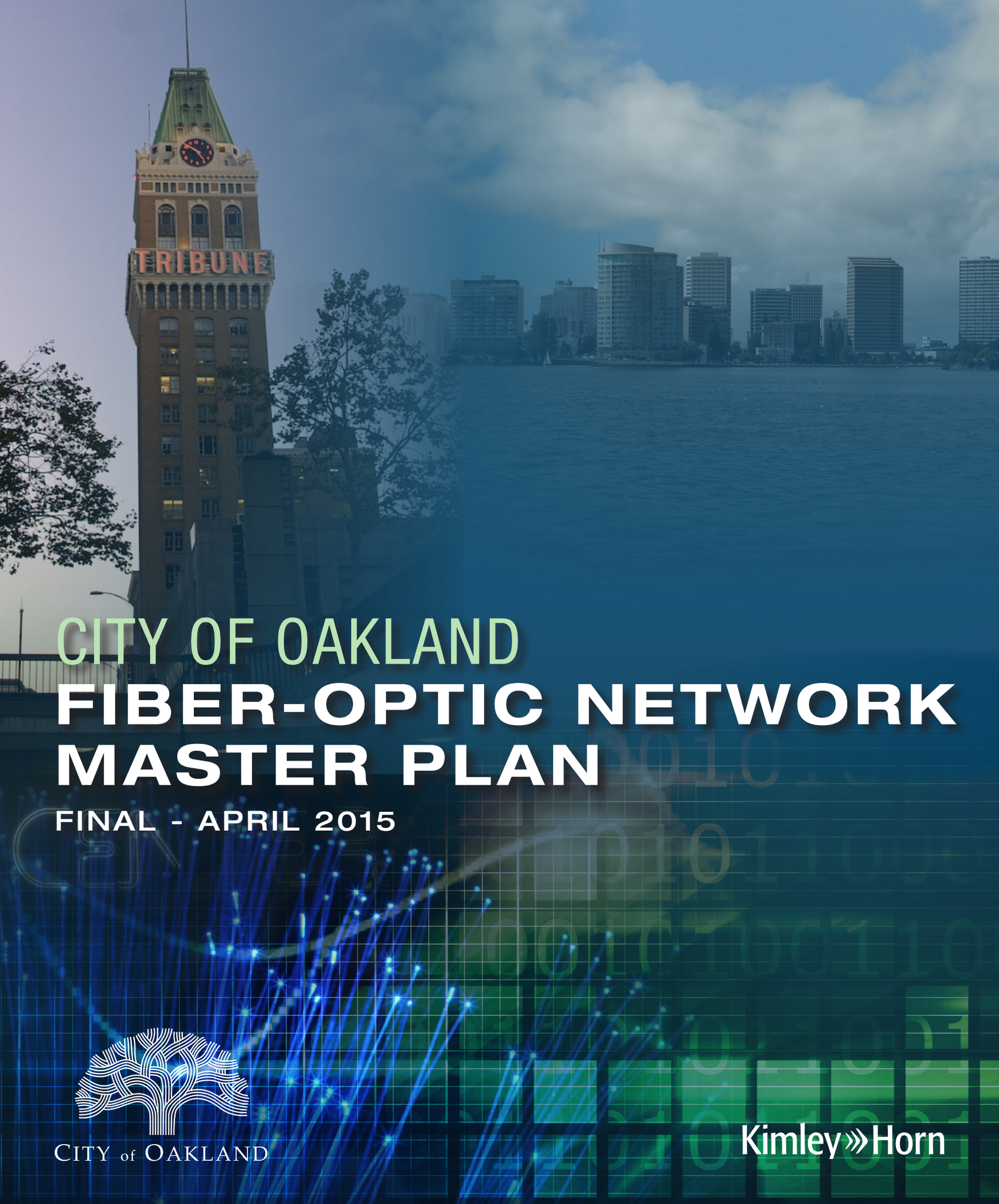

CITY OF OAKLAND
FIBER-OPTIC NETWORK MASTER PLAN

FINAL - APRIL 2015

CITY of OAKLAND

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Executive Summary

The City of Oakland's Fiber Optic Network Vision:

> *A reliable and redundant network that provides high-speed connectivity to essential City facilities and supports future growth.*

High-speed connectivity is an essential part of a modern City to deliver information necessary for various City services and the public. Fiber-optic cables are currently the fastest and most efficient way to provide these high-speed connections and the City needs to create a broad fiber-optic network infrastructure that supports its vision. Various City divisions have led their own fiber-optic cable installation projects over the past 10 years, but these projects have not been coordinated with each other. The result is a disjointed fiber-optic network infrastructure with some parts are constrained or isolated from the rest of the City because they are not fully integrated. The *City of Oakland Fiber-Optic Network Master Plan* documents and evaluates the existing City fiber-optic infrastructure and network, and establishes priorities for a strategic approach to implementing projects and policies that will strengthen the City's IT network, and position the City for strategic and methodical expansion of the system in the future.

This report finds that there is a lack of fiber-optic cable connections in use to several key City buildings, including a downtown Information Technology Department (ITD) network that is reaching capacity and only has a few connections to regional agencies. On the positive side, the Port of Oakland and Transportation Services Division installed fiber-optic cables have current unused capacity, and there are current and upcoming fiber projects in the City of Oakland (led by both City divisions and other agencies) that would address City needs. This construction should be harnessed to meet the City's vision.

Identified short-term priorities include the following:

- Supporting and improving coordination among various City fiber projects and private-public partnerships.
- Providing fiber connections to key City buildings, including Downtown Area, Eastmont Substation, and 911 Center

Recommended Short-term Projects and their benefits are summarized below

No.	Project	Benefits
1	City Fiber-Optic Coordination Committee	• Improve coordination among City divisions • Single unit to coordinate fiber sharing, buildout, and policy
2	City Policy to automatically include fiber and conduit installation in construction projects	• Raises profile of fiber-optic network installation • Improve coordination among City divisions
3*	**Eastmont Substation fiber connection**	• **Improve network redundancy** • **Reduce leased communication costs**
4	MSC/ 911 Center fiber connection	• Improve network redundancy • Reduce leased communication costs
5	City Hall to Police Administration Building alternate fiber connection	• Improve network redundancy • Alternate path away from AT&T manhole at City Hall
6	Caltrans-East Bay Smart Corridor fiber connection	• Improve Regional connectivity

**** High Priority Project***

Contents

Introduction

The City of Oakland's Fiber Optic Network Vision:

> *A reliable and redundant network that provides high-speed connectivity to essential City facilities and supports future growth.*

High-speed connectivity is an essential part of a modern City to deliver information necessary for various City services and the public. The City of Oakland's Information Technology Department manages a complex network of high-speed network connections that connects essential facilities throughout the City, including the following:

- Key City of Oakland Public Safety buildings
- Major City of Oakland Data Centers
- Major business centers
- Neighborhood Fire Stations
- City Libraries
- Connectivity to regional partners (BART, Caltrans, etc)

Connectivity to the facilities listed above has historically been done on an as needed basis by various departments. Some of the items listed above are currently connected by leased broadband services (e.g. Comcast, AT&T) or wireless connections (leased and City-owned), while others are not connected at all, or do not have such services available to them. Fiber-optic cables are currently the fastest and most efficient way to deliver these connections. In addition, other City Divisions (Transportation Services Division, Port of Oakland) have also led their own fiber-optic projects. These projects have typically not been coordinated with each other, resulting in a disjointed fiber-optic infrastructure, and some of the facilities are constrained or isolated from the rest of the City because they are not fully integrated.

In order to continue supporting the network demands of these critical facilities and to increase network reliability and redundancy, the City needs to create a broad fiber-optic network that supports high-speed connectivity and future growth.

To implement this vision, the City must develop a strategy for enhancing and expanding the current fiber-optic network. This *City of Oakland Fiber-Optic Network Master Plan* will present documentation and evaluation of the existing City fiber-optic infrastructure. This report lays the groundwork for developing a strategic approach to implementing projects and policies that will:

- strengthen the City's IT fiber-optic network;
- expand the capacity of the fiber-optic network;
- integrate and connect City facilities;
- establish system redundancy; and,
- position the City for strategic and methodical expansion of the system in the future.

Existing Conditions

The following key City stakeholders were identified as having fiber-optic cable and/or conduits that could be used for installation of future fiber optic cable. Interviews with key staff from each were held from November 2013 through January 2014 to gather information on existing cables and review proposed plans. A summary of these findings is summarized below for each stakeholder. **Figure 1A** and **Figure 1B** shows the locations of key hubs and fiber in the City. **Table 1** provided additional detail regarding the strand assignments for each fiber-optic cable.

There are several fiber-optic projects currently in design or construction within City limits and these are identified in **Figure 2A** and **Figure 2B**.

Information Technology Department (ITD)

ITD has fiber-optic cables connecting key City buildings to the City data centers located at the Emergency Operations Center (EOC) at 1605 Martin Luther King, Jr. Way and at 150 Frank H. Ogawa Plaza (FHOP). Other key City buildings include 250 FHOP, Police Administration Building (PAB), and Oakland Main Public Library. Key fiber junction points include City Hall and the “Old Fire Alarm” building. Other regional communication links include Alameda County Administration Building and the Oakland Museum.

Many of the fiber-optic connections between these buildings utilize multi-mode fiber-optic cable (MMFO) instead of single-mode fiber-optic cable (SMFO). SMFO is generally preferred over MMFO because of the increased capacity and range. ITD has limited (typically 12-strand or 24-strand) SMFO connections between the buildings and these links are essentially at capacity without room for further expansion. ITD is currently evaluating upgrades to the existing IT infrastructure that would require additional SMFO.

ITD is considering utilizing private data center facilities to host City services, particularly in the downtown area. Possible downtown facilities include centers located on Broadway near 20th Street, 16th Street near Franklin Ave (Cogent) and 2nd Street near Jack London Square (Digital Realty).

Transportation Services Division (TSD)

By themselves or in partnership with other agencies, TSD has installed 96-strand and 144-strand SMFO cables along several key corridors for communications to traffic signal controllers and traffic monitoring cameras, including on Broadway, San Pablo Avenue, Grand Avenue, West Grand Avenue, Edgewater Street, Hegenberger Avenue, 98th Avenue. These controllers and cameras are connected to TSD’s traffic signal server and video management server located at the EOC Data Center.

TSD is also coordinating with several upcoming projects that will install SMFO cables in the City of Oakland. These projects include AC Transit’s Line 51 project (Broadway, 7th Street, 8th Street) and East Bay Bus Rapid Transit Project (International Blvd, 12th Street, 11th Street, San Leandro Street), as well as BART’s Oakland Airport Connector project (Hegenberger Avenue).

In addition, TSD has existing conduit used for copper signal interconnect cable (SIC) communications between traffic signal controllers. These conduits could also could be utilized for SMFO cables which have increased bandwidth and range over SIC cables. TSD also requested other City projects to include empty conduit on streetscape and repaving projects when they learn of them (e.g. Maritime Street, 7th Street, 17th Street). However, because of the informal nature of this coordination, there have been some missed opportunities.

Electrical Services Division (ESD)

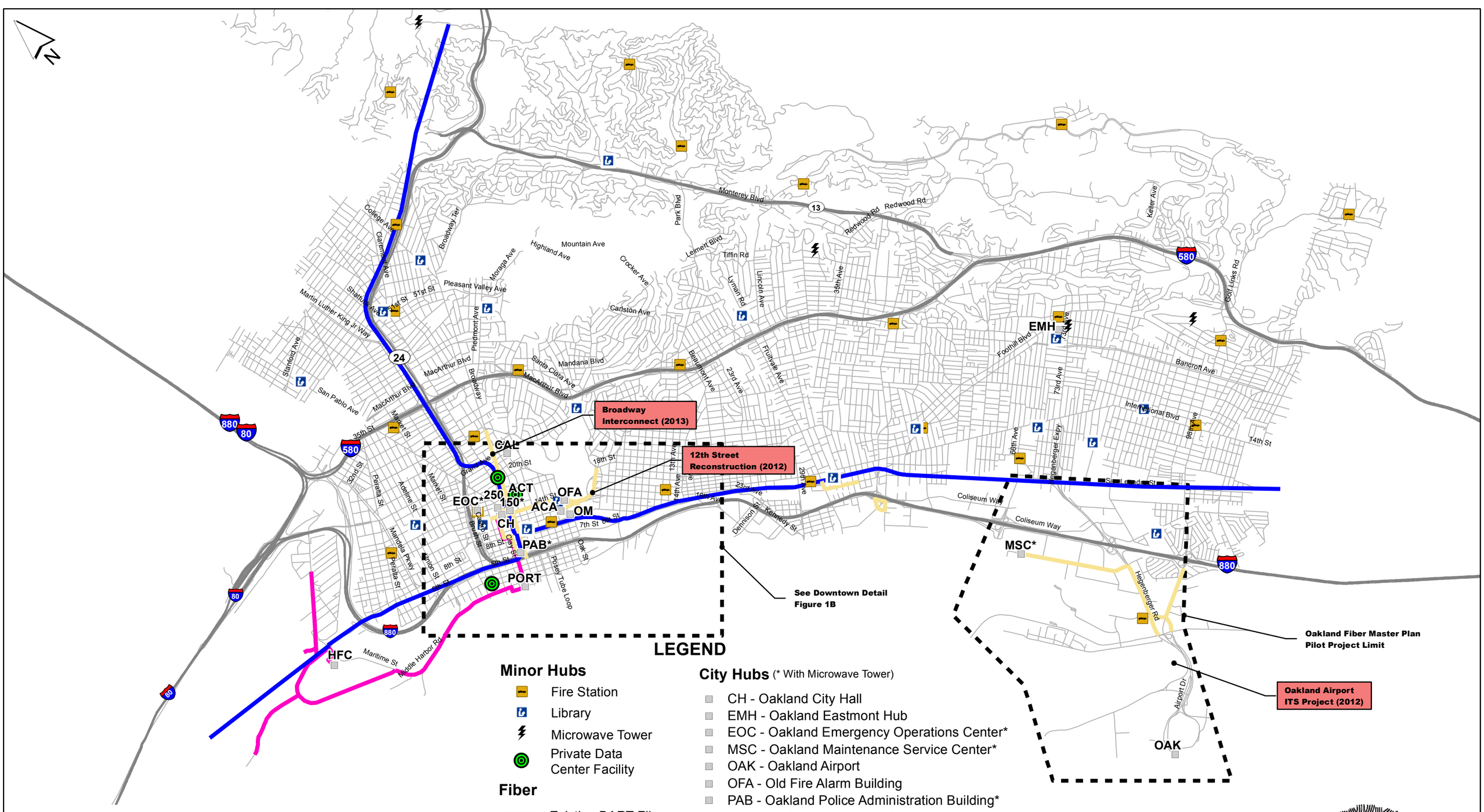
ESD does not have any fiber-optic cable installed, but has a network of street lighting conduit and old fire-alarm wire throughout the City. ESD conduits were evaluated as possible fiber-optic cable routes since some cities have installed 12-strand or 24-strand fiber-optic cable in street lighting conduits. The majority of ESD street light conduits are older, metal, and are 1-inch in diameter. The conduits also tend to be shallow and the fiber-optic cable would be exposed at each street lighting pull box (typically at each street light. Due to these considerations, it would be preferred to utilize a dedicated communications conduit rather than street light or fire alarm conduits for fiber-optic cable. (Use of street light or fire alarm wire could be considered during the design phase on a case-by-case basis.)

Port of Oakland (PORT)

PORT has installed a 144-strand SMFO cable to support Port communications and security on Port property and a 48-strand SMFO cable to connect Port Administration Offices (PAO) building with City Hall. PORT is currently installing a redundant fiber-optic ring between PAO and EOC (utilizing BART right-of-way) and connecting EOC and City Hall. This project will also provide 36-strands between EOC and 150 FHOP (with a drop at 150 FHOP), and 24-strands between EOC and City Hall for use by ISD.

Bay Area Rapid Transit (BART)

BART has available SMFO cable installed within its right-of-way that it leases out to various entities. The PORT is currently installing a 144-strand SMFO cable within BART row between the San Francisco Bay Tube Portal and Oakland City Center/ 12th Street BART station as part of their Port Administration Office (PAO) to EOC connection. There is an existing 144-strand SMFO cable between City Hall and the Oakland City Center/ 12th Street BART station that is currently unused. The City has agreements with BART to use their fiber for connections to City Hall.



LEGEND

Minor Hubs
- Fire Station
- Library
- Microwave Tower
- Private Data Center Facility

Fiber
- Existing BART Fiber
- Existing Oakland Fiber
- Existing Port Fiber

City Hubs (* With Microwave Tower)
- CH - Oakland City Hall
- EMH - Oakland Eastmont Hub
- EOC - Oakland Emergency Operations Center*
- MSC - Oakland Maintenance Service Center*
- OAK - Oakland Airport
- OFA - Old Fire Alarm Building
- PAB - Oakland Police Administration Building*
- 150 - 150 Frank H. Ogawa Plaza*
- 250 - 250 Frank H. Ogawa Plaza

Regional Hubs
- ACA - Alameda County Administration Building
- ACT - AC Transit
- CAL - Caltrans
- OM - Oakland Museum
- PORT - Port of Oakland Offices

CITY OF OAKLAND FIBER-OPTIC NETWORK MASTER PLAN

Figure 1A: Existing Fiber and Hubs - Full City

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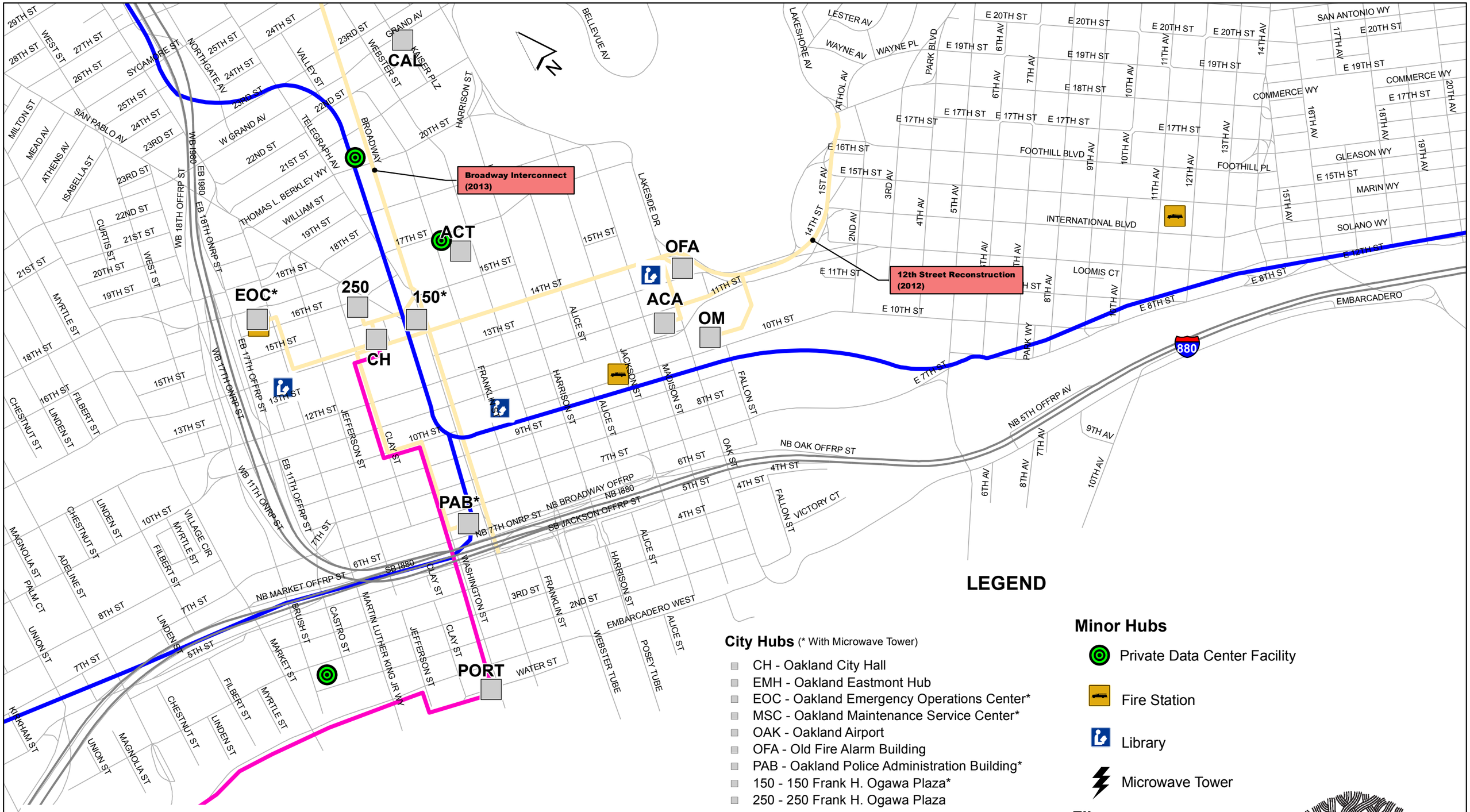

CITY OF OAKLAND FIBER-OPTIC NETWORK MASTER PLAN

Figure 1B: Existing Fiber and Hubs - Downtown

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LEGEND

City Hubs (* With Microwave Tower)

- CH - Oakland City Hall
- EMH - Oakland Eastmont Hub
- EOC - Oakland Emergency Operations Center*
- MSC - Oakland Maintenance Service Center*
- OAK - Oakland Airport
- OFA - Old Fire Alarm Building
- PAB - Oakland Police Administration Building*
- 150 - 150 Frank H. Ogawa Plaza*
- 250 - 250 Frank H. Ogawa Plaza

Regional Hubs

- ACA - Alameda County Administration Building
- ACT - AC Transit
- CAL - Caltrans
- OM - Oakland Museum
- PORT - Port of Oakland Offices

Minor Hubs

- Private Data Center Facility
- Fire Station
- Library
- Microwave Tower

Fiber

- Existing BART Fiber
- Existing Oakland Fiber
- Existing Port Fiber

CITY OF OAKLAND

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Oakland Fiber-Optic Network Master Plan
April 2015

Table 1: Existing Single-Mode Fiber Optic Cable Strand Assignments

Cable ID	End 1	End 2	Cable Size	Installed by	Strand	Group - Strand Use	Cable Path/ Comments
1	EOC	City Hall	24-strand	ISD	1-24	ISD - network (at capacity)	City Hall Access in AT&T 14th St manhole utilizes AT&T conduits to EOC EOC access through City vault
2	EOC	City Hall	144-strand	TSD	1-4 5-8 9-14 15-18 19-24 25-132 133-140 141-144	TSD - 250 FHOP connection TSD - Broadway signals TSD - I-80 signals* TSD - Caltrans/ EBSC connection* TSD - Spare TSD - Spare (unterminated) TSD - Spare PORT - DAC connection	Same conduit route at Cable No. 1 Only strands 1-24 and 133-144 have been terminated at EOC and City Hall; strands 25-133 are unterminated.
3	EOC	City Hall	96-strand*	PORT	1-6 7-10 11-12 13-72 73-96	PORT - EOC/PAB connection PORT - EOC/BART connection ISD - EOC/PAB conneciton PORT - Spare ISD - Spare (with drop at 250 FHOP)	New conduit EOC to 250 FHOP
4	EOC	PORT (HFC)	144-strand*	PORT	1-4 5-108 109-144	PORT - HFC connection PORT - Spare ISD - 150 FHOP connection (with drop at 250 FHOP)	New conduit EOC to 250 FHOP (same as Cable No. 3) New conduit 150 FHOP to BART 12th St Existing BART ROW for BART 12th St to HFC
5	150 FHOP	250 FHOP	24-strand	ISD	1-24	ISD - network (at capacity)	
6	City Hall	150 FHOP	24-strand	ISD	1-24	ISD - network (at capacity)	
7	City Hall	250 FHOP	24-strand	ISD	1-24	ISD - network (at capacity)	
8	City Hall	250 FHOP	96-strand	TSD	1-4 5-24 25-96	TSD - 250 FHOP connection TSD - Spare TSD - Spare (unterminated)	Only strands 1-24 have been terminated at City Hall and 250 FHOP; strands 25-96 are unterminated.
9	City Hall	PORT	48-strand	PORT	1-4 5-8 9-36 37-38 39-48	PORT - PAB/DAC connection PORT - PAB/DAC alt. connection PORT - Spare ISD - EOC/PAB connection* PORT- Spare	City Hall Access in AT&T 14th St manhole Utilizes AT&T conduits and pull boxes PAB Access in AT&T vault
10	City Hall	BART (12th St)	144-strand	BART	1-144	ISD - Spare	City Hall Access in AT&T 14th St manhole
11	City Hall	PAB	24-strand	TSD	1-24	ISD - network (at capacity) TSD - MSC wireless connection (2-strands)	City Hall Access in AT&T 14th St manhole Utilizes AT&T conduits and pull boxes PAB Access in AT&T vault
12	City Hall	OFA	12-strand	ISD	1-12	ISD - network (at capacity)	City Hall Access in AT&T 14th St manhole Utilizes AT&T conduits and pull boxes

* In construction, subject to change

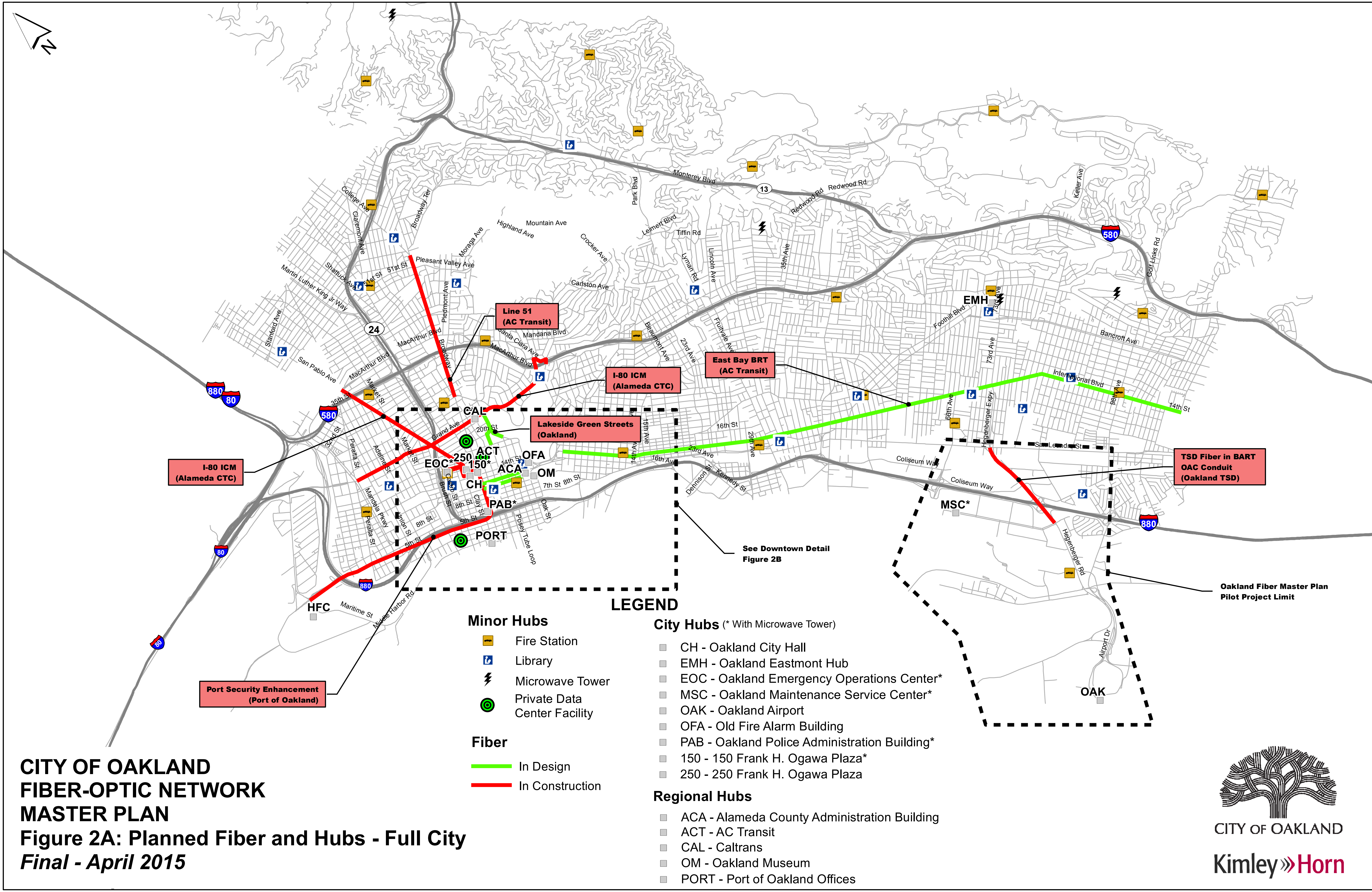
Oakland Fiber-Optic Network Master Plan

April 2015

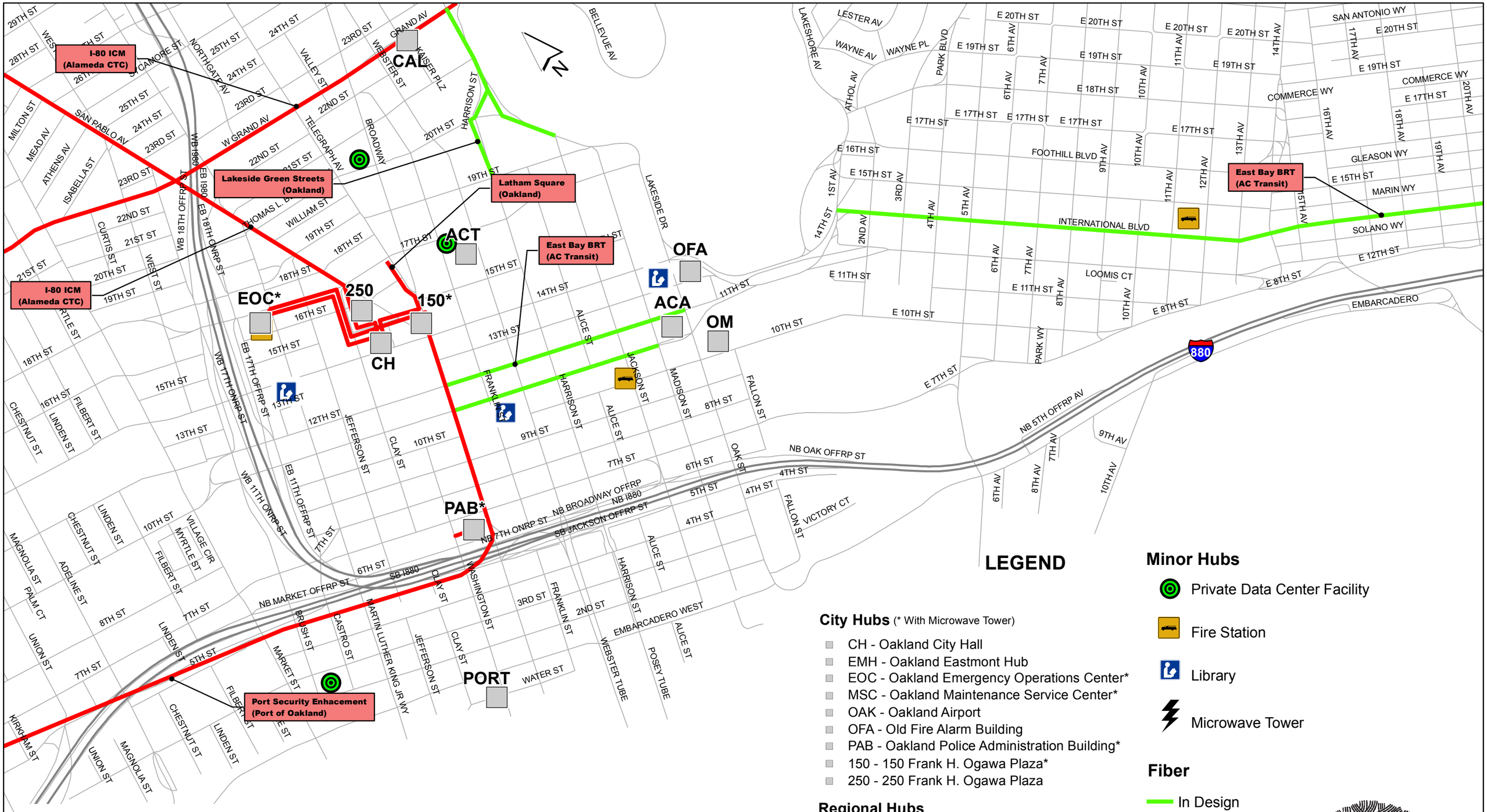
Table 1: Existing Single-Mode Fiber Optic Cable Strand Assignments

Cable ID	End 1	End 2	Cable Size	Installed by	Strand	Group - Strand Use	Cable Path/ Comments
13	City Hall	Broadway- 5th St	96-strand	TSD	1-4 5-96	TSD - Traffic field network TSD - Spare	
14	City Hall	Broadway- 27th St	96-strand	TSD	1-4 5-96	TSD - Traffic field network TSD - Spare	
15	City Hall	San Pablo Ave-W. Grand Ave (field splice)	72-strand	TSD	1-4 5-7 8-11 12-13 14-28 29-31 32-52 53-55 56-72	TSD - Spare TSD - Traffic field network - I-80 ICM Cable "B" TSD - Caltrans/ EBSC connection* TSD - AC Transit-Caltrans connection (future)* TSD - Spare TSD - Traffic field network - I-80 ICM Cable "C" TSD - Spare TSD - Traffic field network - I-80 ICM Cable "D" TSD - Spare	*Spliced to 3- 24 strand cables at San Pablo Grand* Cable "B" - West Grand to Adeline - 24-strand 1-4: TSD - Spare 5-7: TSD - Traffic field network 8-24: TSD - Spare Cable "C" - West Grand to MacArthur - 24-strand 1-4: TSD - Spare 5-7: TSD - Traffic field network 8-11: TSD - Caltrans/ EBSC connection* 12-13: TSD - AC Transit-Caltrans connection (future)* 14-24: TSD - Spare Cable "D"- San Pablo Avenue to MacArthur - 24-strand 1-4: TSD - Spare 5-7: TSD - Traffic field network 8-24: TSD - Spare
16	12 St- Oak St	1st Ave- 18th Ave	144-strand	TSD	1-4 5-144	TSD - Traffic field network TSD - Spare	
17	MSC	98th Ave - Bigge St	96-strand	TSD	1-4 5-96	TSD - Traffic field network TSD - Spare	Route: Edgewater St, Hegenberger Rd, Aiport Access Rd, 98th Ave
18	BART (Colesium)	Hegenberger Rd - Edgewater Dr	12-strand*	BART	TBD	TBD	
19	Broadway- 27th St	Broadway-College Ave	96-strand*	AC Transit	TBD	TBD	
20	7th St- Broadway	7th St- Webster St	12-strand*	AC Transit	TBD	TBD	
19	8th St- Broadway	8th St- Webster St	12-strand*	AC Transit	TBD	TBD	

* In construction, subject to change



CITY OF OAKLAND
FIBER-OPTIC NETWORK
MASTER PLAN
Figure 2A: Planned Fiber and Hubs - Full City
Final - April 2015



CITY OF OAKLAND
FIBER-OPTIC NETWORK MASTER PLAN
Figure 2B: Planned Fiber and Hubs - Downtown
Final - April 2015

LEGEND

City Hubs (* With Microwave Tower)
- CH - Oakland City Hall
- EMH - Oakland Eastmont Hub
- EOC - Oakland Emergency Operations Center*
- MSC - Oakland Maintenance Service Center*
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- ACA - Alameda County Administration Building
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- OM - Oakland Museum
- PORT - Port of Oakland Offices

Minor Hubs
- Private Data Center Facility
- Fire Station
- Library
- Microwave Tower

Fiber
- In Design
- In Construction

CITY OF OAKLAND

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Network Assessment

As can be seen by **Figure 1** and **Figure 2** above, the City of Oakland has a substantial fiber-optic network (existing and planned) connecting many of the locations listed in the project objectives. However, the following gaps were identified:

- Lack of fiber connection to Maintenance Service Center/ 911 Facility (MSC/911) located at 7101 Edgewater Drive. This location is currently connected to the City network by a combination of 150 Mbps AT&T switched Ethernet connection and 1 wireless link.
- Lack of fiber connection to Eastmont Substation Hub (EMH) located at 2651 73rd Avenue. This location also serves as a wireless backhaul hub (e.g., microwave data transmission are collected here and brought back to the City's EOC.) This location is currently connected to the City network by a combination of 2x T-1 and 1x DS-3 connections.
- Single-mode fiber connections between downtown buildings is at capacity. This capacity mostly impacts the ITD fiber-optic cable. As noted in the existing conditions above, most of the existing single mode fiber links are 12-strand and 24-strand.
- Some fiber-optic cables utilizing AT&T infrastructure. Existing connections between City Hall, EOC, PAB, PAO, ACA, OFA, and OM currently utilize the manholes, vaults and/or trenches owned by AT&T. There are on-going City discussions looking for ways to transfer City fiber-optic cables into non-AT&T facilities.
- Lack of fiber connection to Caltrans, AC Transit, BART Alameda CTC's I-80 ICM project (in construction) will provide a fiber connection between the City and Caltrans D4 TMC (111 Grand Ave). and AC Transit's East Bay BRT project (in design) plans to connect the City to AC Transit Administrative Offices (1800 Harrison). As noted in the existing conditions, the existing BART to City Hall fiber connection is not currently being utilized and there do not appear to be any plans for this.
- Lack of fiber connection to Fire Stations. Existing city network connections provided by T-1 (AT&T)
- Lack of fiber connection to City libraries. Existing connections for public Wi-Fi are currently leased by Comcast. Existing city network connections provided by 5Mbps AT&T switched Ethernet connection
- Lack of fiber connection to San Francisco Public Safety/ Muni. Discussions on-going for a regional or sub-regional public safety network.

Recommended Projects

Considering the Project objectives, existing conditions, and the network assessment above, the following priorities have been developed for the short-term (0-2 years), medium term (2-5 years), and long-term (5+ year) time frames. For short-term projects, additional details and costs are provided.

Project Priorities

Short-term (0-2 years)

The priority for the short-term (0-2 years) projects include:

- Improve coordination among various City projects where SMFO cable or conduits could be installed
- Support on-going fiber connection projects (in construction or in design)
- Interface with Private-Public Partnerships (*East Bay Broadband Consortium*)
- Provide fiber connection to 911 Center and Eastmont Substation Hub
- Improve fiber connection for key downtown buildings

Medium-term (2-5 years)

The priorities for the medium-term (2-5 years) project include:

- Fiber connections to City fire stations, City libraries
- Fiber connections to all City wireless repeater sites.
- Increased regional connectivity in East Bay (East Bay Public Safety Network, BART, AC Transit)
- Private-Public Partnerships (East Bay Broadband Consortium)

Long-term (5+ years)

The priority for long-term (5+ years) project include

- Increased regional connectivity (San Francisco hospitals, MUNI)

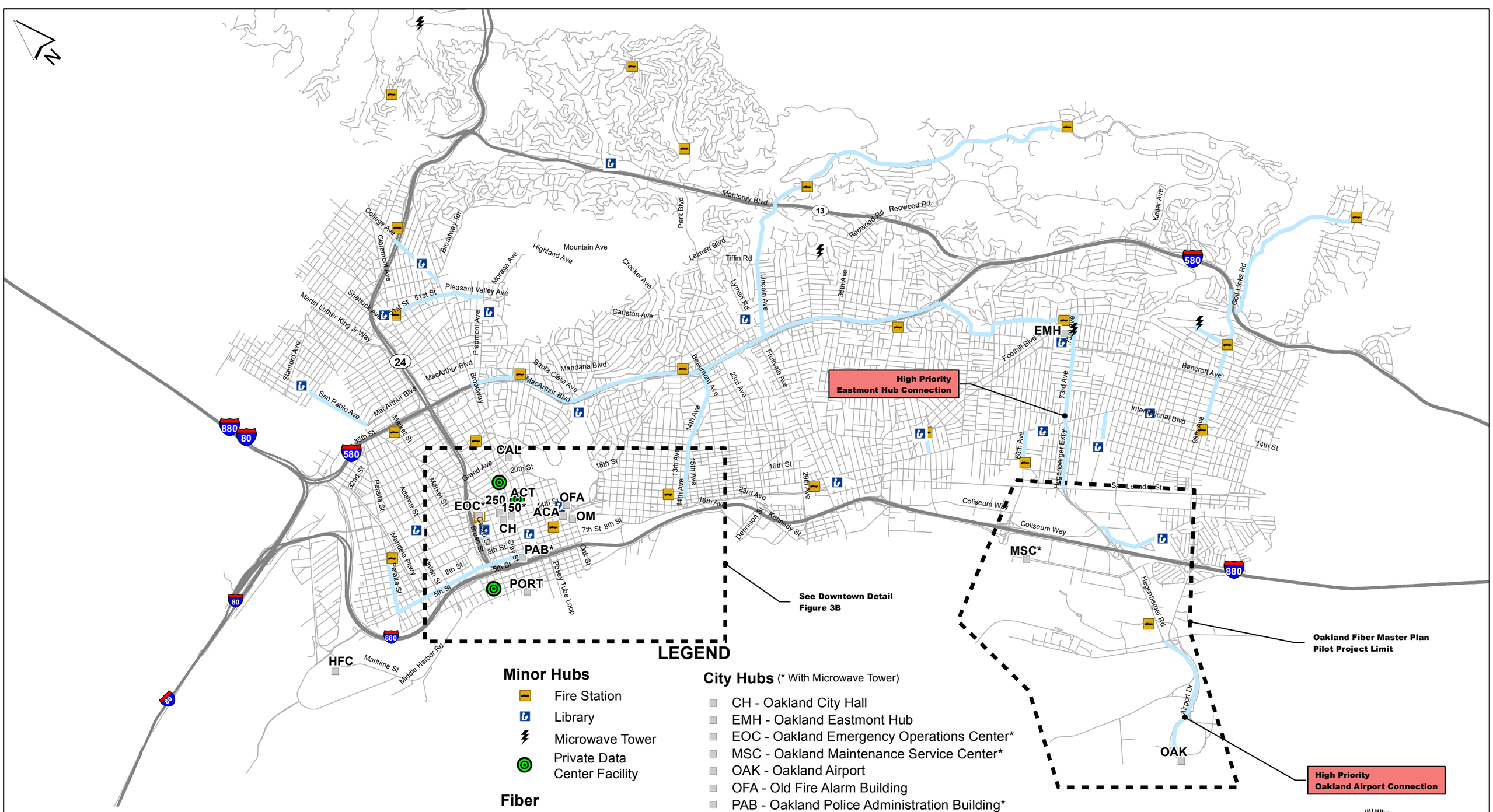
Short-Term Projects

Considering the short-term priorities listed above, the following projects have been developed. **Table 2** provides a summary of these projects with High Priority projects identified. Additional details for each project are provided below. Figure 3A and Figure 3B show the limits of High Priority Projects

Table 2: Proposed Short-term project summary

No.	Project	Benefits	Cost
1	Formation of City Fiber-Optic Coordination Committee	• Improve coordination among City divisions • Single unit to coordinate fiber sharing, buildout, and policy	Staff time
2	Implementation of City Policy to automatically include fiber and conduit installation in construction projects	• Raises profile of fiber-optic network installation • Improve coordination among City divisions	Staff time
3*	**Eastmont Substation fiber connection**	• **Improve network redundancy** • **Reduce leased communication costs**	**$1,000,000**
4	MSC/ 911 Center fiber connection	• Improve network redundancy • Reduce leased communication costs	Low
5	City Hall to Police Administration Building alternate fiber connection	• Improve network redundancy • Alternate path away from AT&T manhole at City Hall	$70,000
6	Caltrans-East Bay Smart Corridor fiber connection	• Improve Regional connectivity	Staff time

**** High Priority Project***



CITY OF OAKLAND
FIBER-OPTIC NETWORK MASTER PLAN
Figure 3A: Proposed Fiber and Hubs - Full City
Final - April 2015

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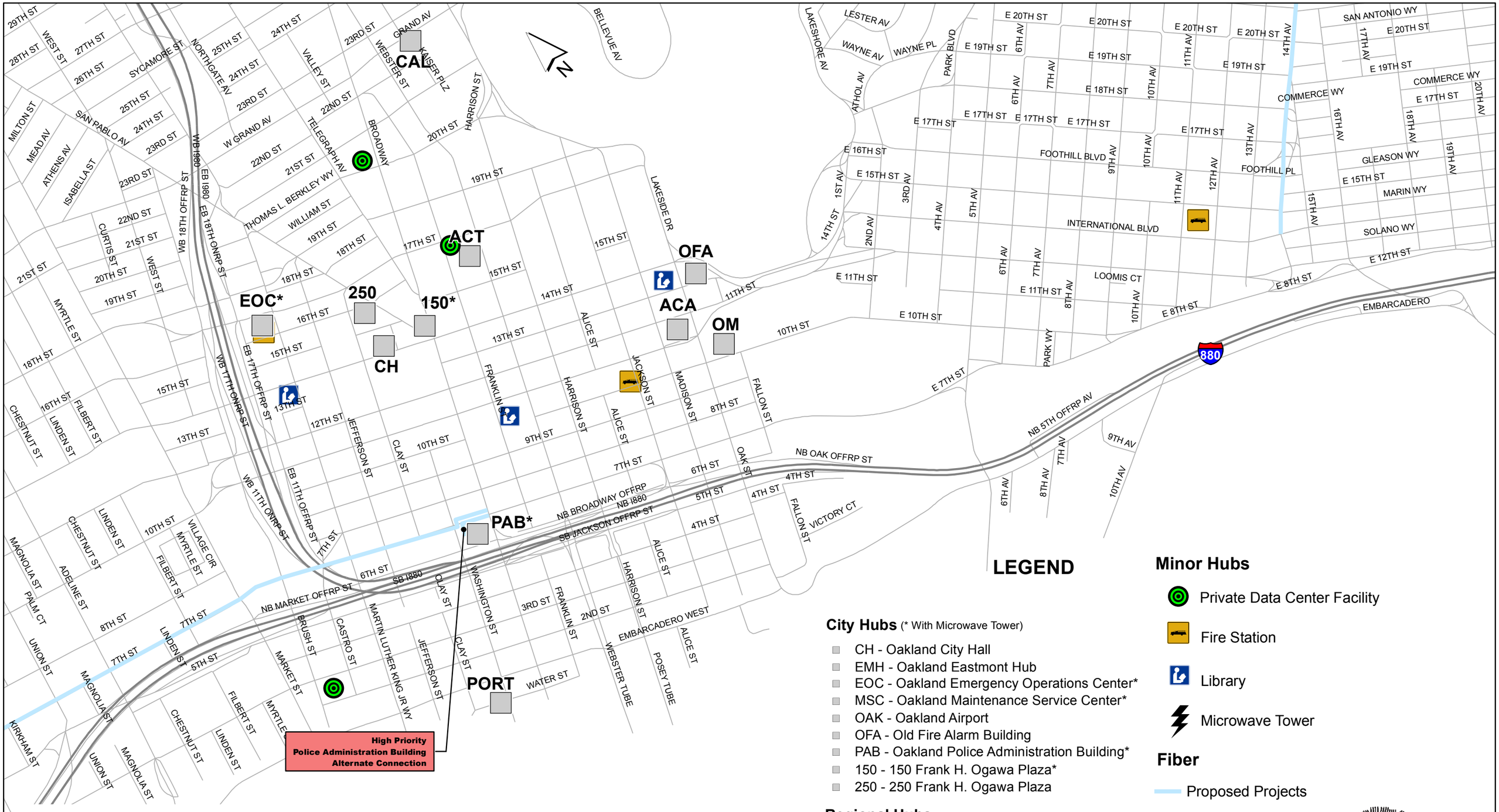

CITY OF OAKLAND
FIBER-OPTIC NETWORK MASTER PLAN
Figure 3B: Proposed Fiber and Hubs - Downtown
Final - April 2015

LEGEND

City Hubs (* With Microwave Tower)
- CH - Oakland City Hall
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- OAK - Oakland Airport
- OFA - Old Fire Alarm Building
- PAB - Oakland Police Administration Building*
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Minor Hubs
- Private Data Center Facility
- Fire Station
- Library
- Microwave Tower

Fiber
- Proposed Projects

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Project #1 –Formation of City Fiber-Optic Coordination Committee

This project would form a City of Oakland fiber-optic coordination committee to coordinate sharing of various City fiber-optic cables and design input into upcoming projects. The committee also serves as single point for outside entities to interface with. It is recommended that this committee be made up of key City stakeholders that will use or benefit from fiber:

- Information Technology Department (ITD)
- Electrical Services Division (ESD)
- Transportation Services Division (TSD)
- Economic Development (would also serve as conduit for public-private partnerships)
- Public Safety

As currently envisioned, this committee would have the following duties:

- Responsible for maintenance and expansion of network.
- Determines division and use of City-owned fiber strands
- Reports to City Administrator and provides information regarding funds needed
- Enter into Memorandum of Understanding (MOU) with non-City agencies (current fiber sharing agreement with BART on-going – could be a model for future projects.)

Project #2 – Implementation of City Policy for fiber and conduit installation

This project would work with City Council to implement a new City policy to mandate the automatic installation of fiber-ready conduit (and possibly fiber) on appropriate projects. Suggested projects include roadway, sidewalk, utilities, and street-lighting. The review of City projects could be coordinated through the City fiber-optic coordination committee (Project #1) or through the current review by key stakeholders. This committee could also identify key corridor for installation of fiber-optic cable to build out the City network.

Project #3- Fiber connection between Eastmont Substation Safety Hub and City Network (via BART fiber)

Currently, the Oakland Eastmont Hub (EMH) is connected to city Hall via DS-3 and T-1 lease lines through a third party carrier. This connection is expensive for the city and the advantages of connecting this hub with fiber cable would create a cost savings over time. The EMH is located at the crossing of MacArthur Blvd. and 73rd Avenue. This project would propose to install a 144-strand cable, conduit and pullbox system from The EMH down 73rd Avenue, crossing International Blvd and heading down Hegenberger Expressway to San Leandro Street. This project would then connect to the BART fiber system at BART Coliseum Station. (City has connection to BART fiber at BART 12th St station.)

This project has many advantages. Currently, EMH is connected with expensive lease lines. This proposed fiber path will save money each year and also provide fiber connectivity to this region for other city communication initiatives. With the ability to connect to the BART fiber, the city will be able to complete this eastern ring in the future with an additional connection between EMH and City Hall via MacArthur. Below is an estimated probable cost for this fiber connection.

Cost Estimate: Fiber connection between EMH and City Network (via BART fiber)			
Material	**Amount**	**Price per**	**Cost**
Trench, Conduit, pullbox	9,000 feet	$100/foot	$900,000
Install 144 Fiber cable	10,000 feet	$10/foot	$100,000
Install Fiber terminations	2	$4,000	$8000
		TOTAL COST	**$1,008,000**

Project #4- Fiber connection between Maintenance Service Center/ 911 Center and City Network

Currently, the Oakland Maintenance Service Center (MSC) is connected utilizing leased line communications and a wireless link from MSC to the Police Administration Building (PAB). It would be advantageous to the City to have a fiber link between MSC and City Hall. In combination with the EMH connection, the reduction in leased line costs would be financially beneficial. The approach for this project would be to utilize existing fiber from MSC to Hegenberger Rd which goes east on Edgewater Drive. TSD is currently coordinating to have the Oakland Airport Project install fiber between the BART Coliseum Station to the existing fiber at the Hegenberger Road – Edgewater Dr intersection. The BART fiber would be utilized to connect to City Hall. This connection could alleviate the need for leased line communications to MSC/911 or provide additional redundancy. Assuming that the project could utilize spare fibers on the TSD fiber cable on Edgewater and BART OAC cable, this project would have minimal additional cost.

Project #5- Alternate fiber connection between PAB and City Hall

Currently, City Hall (CH) and the Police Administration Building (PAB) are connected by existing 24-strand cable and 2-strands of the existing 48-strand Port fiber cable (in construction). Both of these cables enter City Hall through the disputed AT&T manhole on 14th Street. It would be advantageous to the City to have an alternate route between City Hall and PAB by utilizing the 96 strand fiber that leaves City Hall and passes through 150 FHOP, continuing south on Broadway. The approach for this project would be to create a splice point at 7th Street and Broadway where new conduit would be installed west down 7th Street to Washington Street. At this point, the conduit system would turn south on Washington and enter the existing manhole and conduit system on Washington Street that would give access to the Police Administration building via the building conduit entry point.

This project has several advantages. Most of the fiber is already in place, only needing the last 500 feet to be installed. It will also connect Broadway and Washington streets at the PAB essentially completing a fiber ring for the downtown Building Hub configuration. Below is an estimated probable cost for this fiber connection.

Cost Estimate: Alternate fiber connection between PAB and City Hall			
Material	**Amount**	**Price per**	**Cost**
Trench and Conduit	500 feet	$100/foot	$50,000
Install Fiber cable	1000 feet	$10/foot	$10,000
Install Fiber terminations	1	$2,000	$2,000
Splice enclosure and splice	1	$2,000	$2,000
		TOTAL COST	**$64,000**

Project #6- SMFO connection to Caltrans and East Bay Smart Corridor (EBSC)

As part of the current I-80 Integrated Corridor Mobility (I-80 ICM), a fiber connection is currently being constructed between City of Oakland and Caltrans District 4 Building. This project will utilize existing City fiber on Grand Ave and San Pablo Avenue. Caltrans will also serve as a data hub for Oakland's connection to East Bay Smart Corridor. These improvements are being paid for by Alameda CTC.

While the current construction is specifically focused on the exchange of traffic-related information, the City may wish to explore whether this connection could be expansion for other regional initiatives that the City and Caltrans are part of. CHP has officer stations at the Caltrans TMC, and the Caltrans TMC serves as a coordination point for regional emergencies. An expanded fiber-optic link between the Caltrans TMC and EOC could help support emergency response and the East Bay Public Safety Network.