CITY OF MANHATTAN BEACH

Fiber-Optic Master Plan

Agenda

- Introduction
- Why Broadband?
- State of Broadband in Manhattan Beach
- Fiber Master Plan
    1. Business Model Considerations
    2. Residential and Business Services
    3. Other Broadband Opportunities
    4. Network Design and Operations
    5. Financial Considerations
    6. Potential Risks
- Next Steps
- Questions & Comments
- Addenda: Survey Results and MB Current Market Offerings

Why Broadband?

- Broadband is changing the way we live our lives

- Broadband encourages:
    - Better quality of life for the community
    - Economic Growth
    - Increased property values
    - Better, more efficient, most cost effective delivery of community services

- Progressive municipalities are taking a proactive approach to future broadband planning and implementation

Broadband Today and into the Future

What drives demand?
What do and will end users need?

Fast Upload/Download Speeds

Reliable Connectivity

Cloud Storage

Drivers of Demand

Smart cities — Smart homes — Utility metering — Wearables / Fitness — Remote sensors / Actuators — Object tracking — Autonomous vehicles — Robotics — Energy / Smart grid — Industrial automation — Aviation — Medical

Drivers of Demand

Smart City Networks and the **Internet of Things**

Cities are beginning to deploy smart technologies throughout their jurisdictions

- Broadband Internet
- City Wi-Fi
- Smart Grid
- Digital Education
- Sensor Networks
- Safety & Security
- Electronic Healthcare
- Autonomous Vehicles
- Over the Top Video & 4K TV
- Smart Utilities and Lighting Controls
- Intelligent Traffic Control and Information

SMART CITY

Broadband Network Technologies

- Today's broadband networks are built on a mix of different "last mile" technologies including:
  - Digital Subscriber Line (DSL)
  - Dial-up
  - Satellite
  - Fiber
  - Cable
  - Fixed Wireless
  - Cellular
  - Other wireless technologies like Wi-Fi, Bluetooth, Zigbee and ZWave

Broadband Future: Fiber is...

- Most "future proof" of any technology with no foreseeable end in capacity

- Carries the greatest amount of capacity when compared to other technologies

- The foundation for Smart Cities

- Required for backhauling wireless technologies

- Will be the foundation for all future network traffic

- Has the best network latency (best/no delay response times)

- Is deployed and understood worldwide

A Word About Wireless Networks

- Capacity is limited to network design, spectrum availability and technology selected
- Appropriate spectrum is not always available
- RF conditions create challenges for coverage and capacity
- Bandwidth is limited when compared to fiber
- Latency is generally higher
- Capacity is a shared medium (more users, less individual performance)
- Cannot provide FTTH type of service expectations with today's technology and spectrum options
- Extreme weather can have adverse performance ramifications
- All wireless data traffic eventually requires fiber optic cables for backhaul

Wireless provides mobile/untethered solutions and
does have its place in modern networks where mobility is needed.

- Wi-Fi
- 4G/5G
- Fixed Wireless
- Radio Communications
- Smart City options

Benefits of Government in Broadband

- Old Paradigm –
  - Rely on telecom/cable companies to provide service

- New Paradigm –
  - Proactively implement forward looking policies, guidelines and standards that encourage/influence the development and implementation of adequate broadband
  - Facilitate the implementation of broadband
  - Preserve resident and business interests in broadband use

Benefits of Government in Broadband

- Municipalities are not profit oriented
- Municipalities can build networks and provide rates and speeds service providers cannot or will not provide
- Municipal networks can deliver significantly more bandwidth and more flexible business plans at much better rates
- Municipalities can ensure Net Neutrality

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Benefits of Government in Broadband

- Broadband has become another essential utility on par with sewer, water, sanitation and electricity

- Broadband Planning enables municipalities to:
  - Ensure adequate and appropriate broadband now and into the future
  - Be less reliant on 3rd party broadband providers
  - Work on behalf of their citizens and communities
  - Capitalize on an opportunity to deliver cost effective services to its residents, schools and businesses

State Of Broadband
In Manhattan Beach

Assessing Broadband Use Today in MB

- Residential focus group workshop

- Business focus group workshop

- Online surveys for residents and businesses
  - 643 residential responses
  - 121 business responses

- Online market research re: local broadband offerings

- Interviews with internal stakeholders/departments

- Meetings/discussions with external stakeholders
  - Chamber of Commerce

Overwhelming Community Consensus:

There is an unmet demand for faster, more reliable and available broadband in Manhattan Beach by **ALL** respondents, especially for residential services
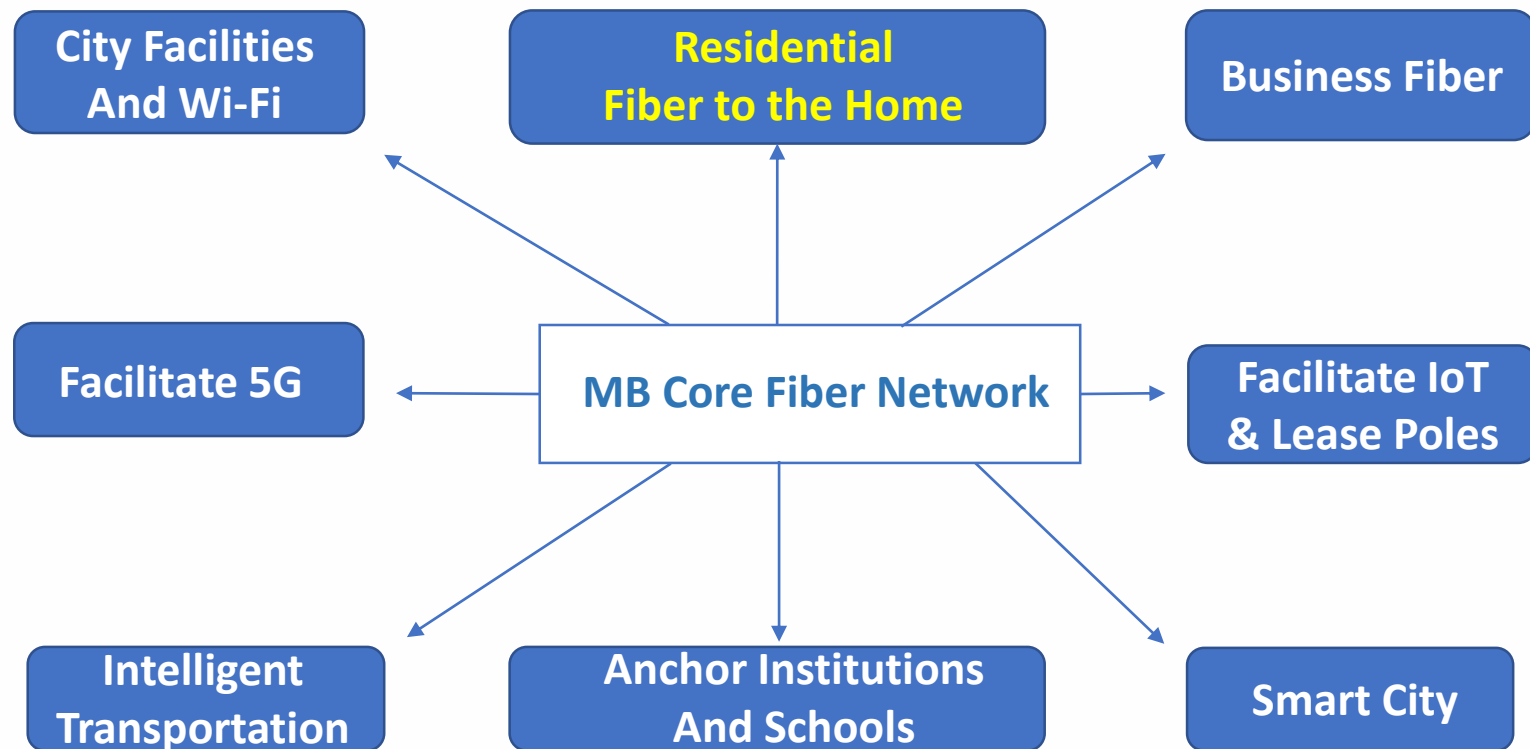
City of Manhattan Beach

FIBER MASTER PLAN

For Broadband

Manhattan Beach Fiber Network Objective

Build, operate and maintain a city-wide fiber optic network that supports:

City Facilities And Wi-Fi

Residential Fiber to the Home

Business Fiber

Facilitate 5G

MB Core Fiber Network

Facilitate IoT & Lease Poles

Intelligent Transportation

Anchor Institutions And Schools

Smart City

Broadband Plan Overview

1. Business Model Considerations

4. Network Design and Operations

2. Residential and Business Services

5. Financial Considerations

3. Other Broadband Opportunities

6. Potential Risks

1. Business Model Considerations

City designs, builds, operates and maintains a world-class fiber optic network that will:

- Connect all City facilities and provides area Wi-Fi
- Save thousands per year on lease costs
- Ensure next generation communications (video, cameras, sensors, etc.) for Fire/Police/EMS/Public works
- Lay foundation for Smart City initiatives
- Prepare for next generation traffic signaling aimed at easing congestion
- Encourage economic development for existing and new enterprises

Business Model Considerations (cont'd)

City provides high fiber capacity to all of its stakeholders

- **Residents** get scalable broadband w/minimum 1 Gbps
- **Businesses** could get up to 100 Gbps
- **Anchor institutions** get multi-gigabit broadband, including schools and libraries, to reduce their operating costs and improve service
- **Cellular providers** get support for new 5G service paradigm with backhaul capacity

Making Manhattan Beach "*A great place to live and work*"

Business Model Considerations (cont'd)

- Assumes a 3-4 year build period

- Extends core network into each neighborhood in phases (zones)

- Take rate is important; ROI is based on assumed take rates
  - The more users that sign up for service, the less the City has to charge each user once the system is built
  - Core network will cost the same to build regardless of how many end users it supports.
  - Current model based on other very successful "like" models but tailored to Manhattan Beach
  - 35%-40% take rate is a reasonable expectation for Manhattan Beach based on other comparable cities
    - Longmont, CO,   Beverly Hills, CA   Sandy, OR   Chattanooga, TN

- Voice and/or video bundles could be added, but are not included in current model. This market is rapidly changing.

2. Residential and Business Services
in Manhattan Beach

Residential Offering

Model demonstrates 1 Gbps speed to all residents for the same price (keep it simple)

- $80-$85 per month with no hidden fees
- No monthly data limits and associated cost increases
- Minimum 1 year contract
- Actual speeds, not an "up-to" speed
  - Symmetrical services of 1Gbps upload and 1Gbps download (1Gbps/1Gbps) minimum with scalability
  - Not a shared medium – great performance regardless of how many simultaneous users
- Will observe net neutrality rules
  - No throttling or network content monitoring

Business Offering

- Suggested Business Pricing
  - 1Gbps Best Effort - $399 per month
  - 1Gbps Dedicated - $1,295 per month
- No monthly data limit
- Dedicated and best effort based internet access
- Symmetrical speed (upload/download)
- Could offer voice services via third party vendor
- Minimum 1 year contract

3. Other Broadband Opportunities
in Manhattan Beach

Connecting City Facilities and Anchor Institutions
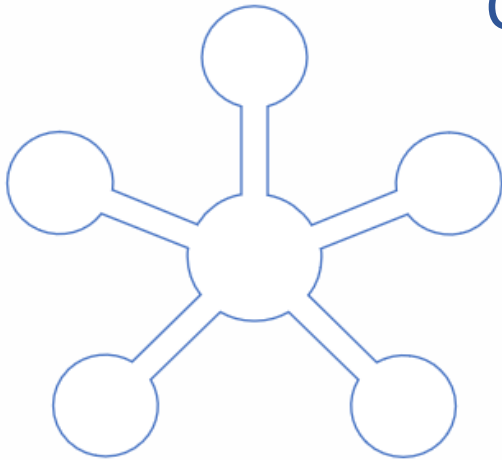
Core network will connect all City facilities

- Includes Police, Fire, City Hall, Public Works, Libraries and Parks Facilities
- Saves the City thousands $$ per year on broadband access fees
- Allows MB to control its own communications "destiny"
- Provides for more efficiencies of services

- Provide schools with advanced broadband services at every campus

- Provides robust broadband between other facilities, organizations and businesses

Streetlight Pole Leasing Opportunity

Due to changes with cellular network designs facilitated by the new upcoming 5G networks, cellular providers will need access to exponentially more cell sites than in previous 4G/3G designs (sites may be every 800ft vs 8000ft)

- Manhattan Beach can provide these assets at lease rates for site access, **and** for fiber backhaul to the cellular providers (e.g, $400 per pole)
- Consider updating wireless ordinance language

Smart City Initiatives
City of Manhattan Beach

Core network designed to be the backbone of future Smart City services

- Community Wi-Fi access
- Smart parking meters, sensors
- Smart appliances
- Smart utilities: sprinklers, lights, power, water
- Smart intelligent traffic
- Community cameras: security
- Autonomous vehicles
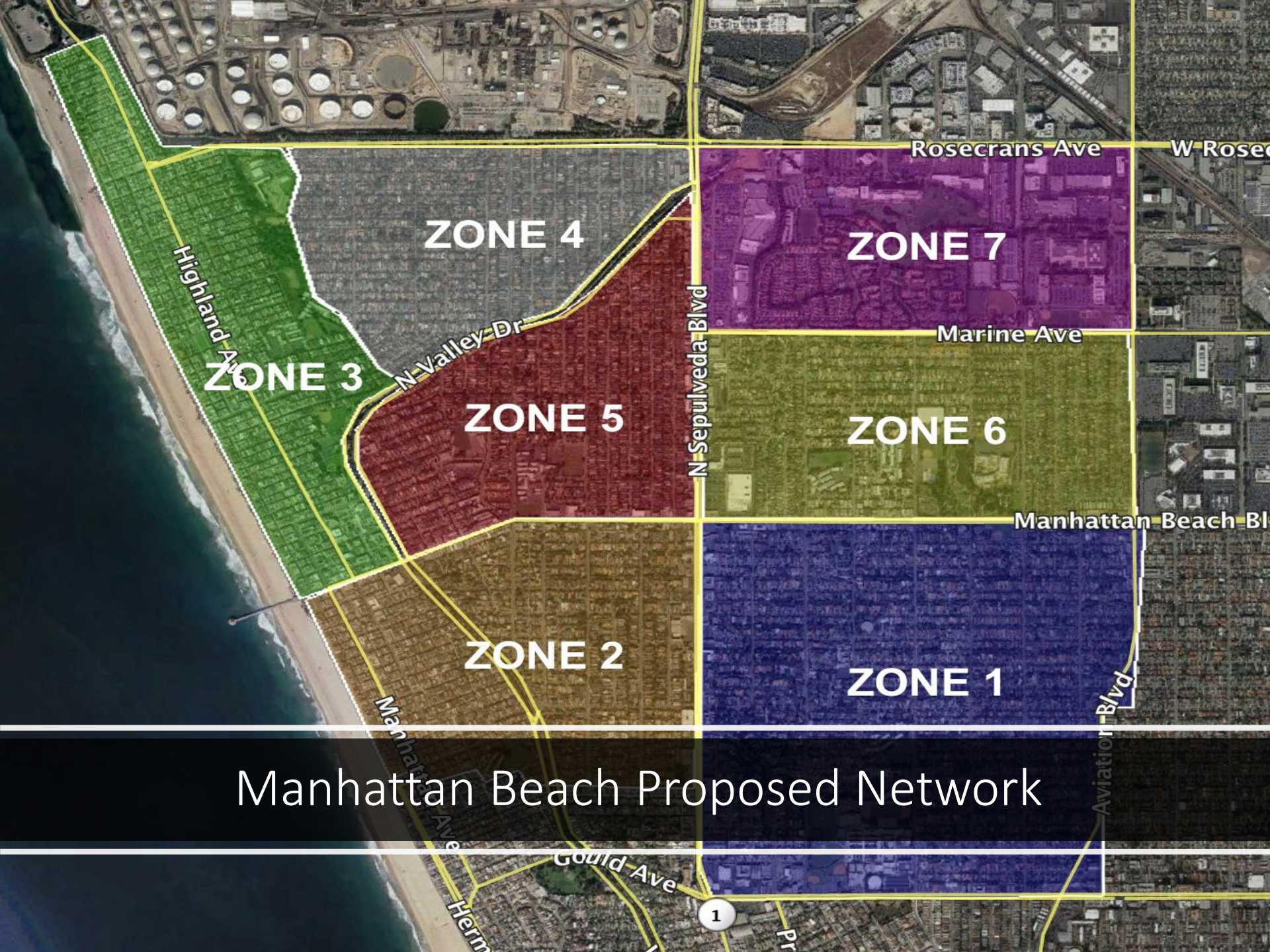- Bus traffic coordination
- Unlimited opportunities

4. Network Design and Operation Considerations
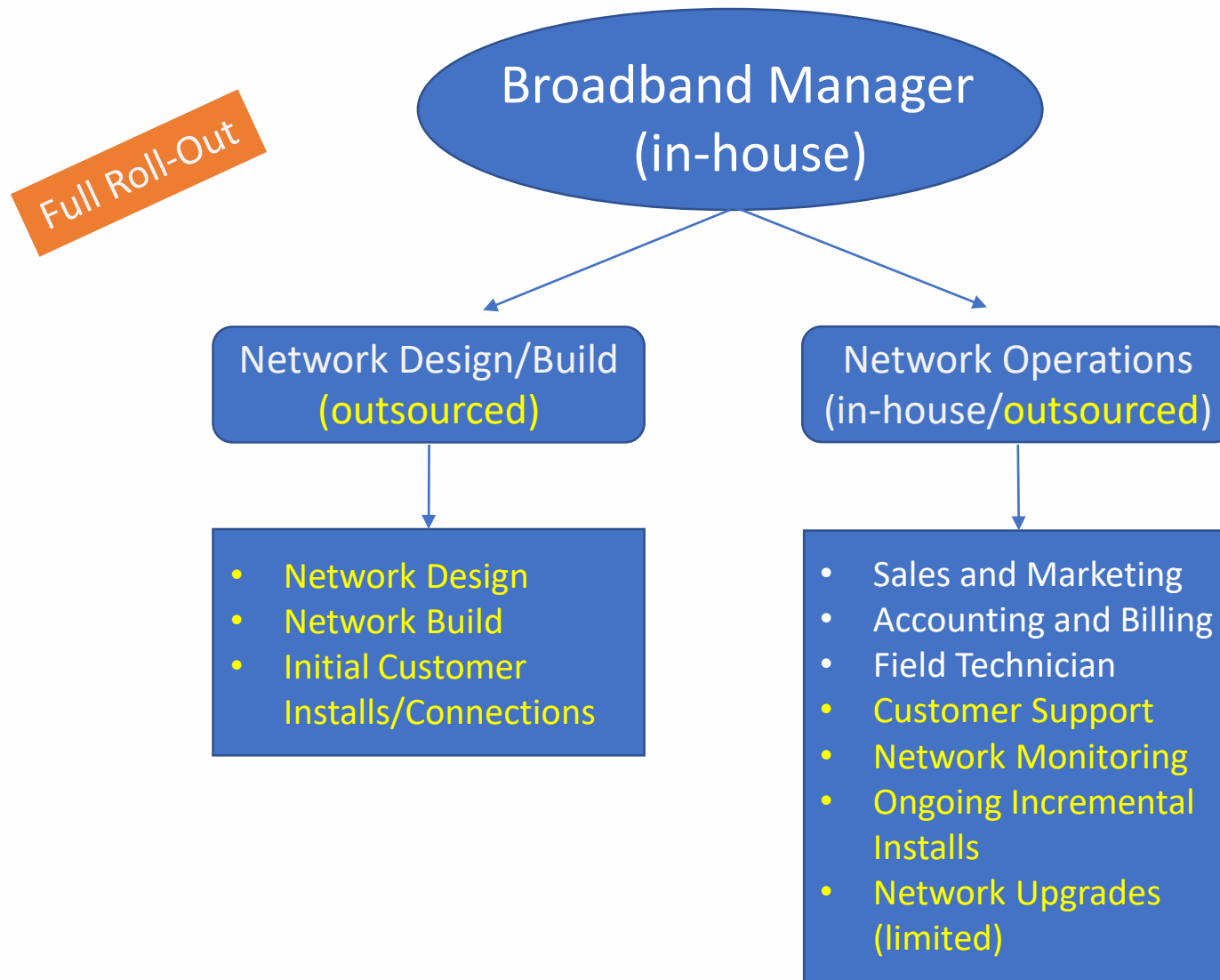
Manhattan Beach Proposed Network

Network Construction Considerations

- Team evaluated several construction options:
  - All underground
  - Micro-trenching
  - Aerial and underground
- Make use of existing assets where available
- Make use of "zones" for phased deployment
- Core network:
  - Connects to a Point-of-Presence (POP) in El Segundo
  - Follows major street arterials and business corridors
  - Connects all City facilities
- Network designed to support marketing requirements

Network Operations Considerations

- Most major operations can be outsourced to experienced vendors: Service, Maintenance, Customer Support, Sales/Marketing, etc.

- Contractors/Vendors would report to IT and/or PW Departments

- Similar to other Enterprise Funds, internal resources could include:
    - Broadband Manager
    - Field Tech
    - Marketing and Outreach Support
    - Accounting and Billing

Full Roll-Out

**Broadband Manager
(in-house)**

**Network Design/Build
(outsourced)**

- Network Design
- Network Build
- Initial Customer
  Installs/Connections

**Network Operations
(in-house/outsourced)**

- Sales and Marketing
- Accounting and Billing
- Field Technician
- Customer Support
- Network Monitoring
- Ongoing Incremental
  Installs
- Network Upgrades
  (limited)

5. Financial Considerations

Financial Model Assumptions

- 20 year forward looking model (long-term view)

- 2.5% interest rates: all funds are borrowed

- 3-4 year construction timeline for entire network

- 100% underground network

- Subscriber enrollment staggered to match build time

- DOES NOT INCLUDE savings from discontinued communications fees currently paid by City

Buildout and Connection Assumptions

Construction Costs: $50,419,355

Lateral Costs: $20,486,400

Equipment Costs: $2,115,000

Total Cost:
$73,020,755
(over 5 years)

Financial pro formas demonstrate Manhattan Beach
CAN get a Return-On-Investment (ROI)
by deploying a fiber optic based network when
offering the services proposed.

Subscriber Assumptions

Price and take assumptions based on local and regional community experiences (Beverly Hills, Rancho Cucamonga, Ontario, West Hollywood)

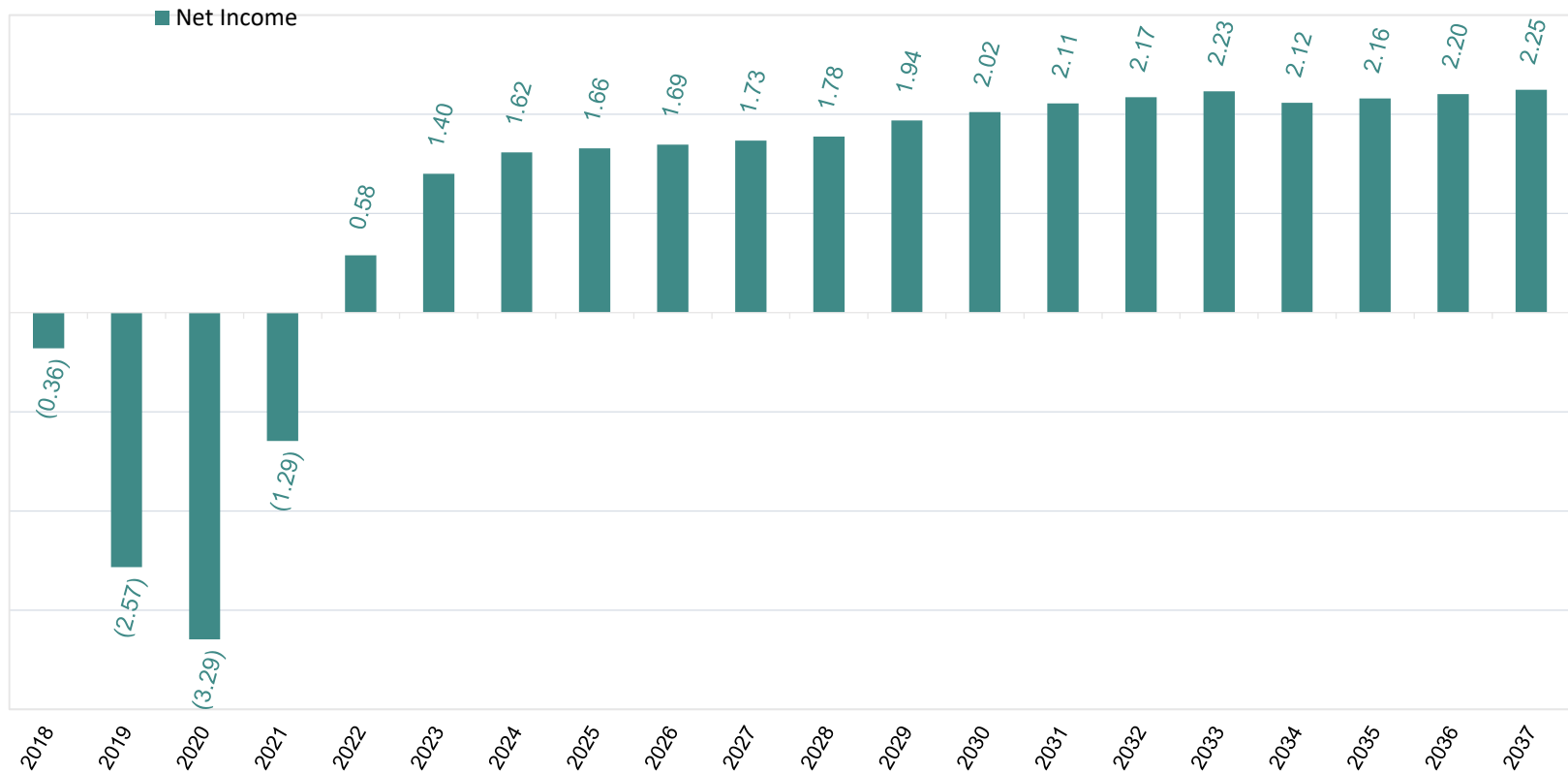| Residential:	Business:	Cellular:
15,000 households	1000 businesses	900 poles
x 40% take rate	x 25% take rate	x 7% take rate
x $85/mo.	x $399/mo.	x $400/mo.
$6.12 Million/yr.	$1.2 Million/yr.	$302,000/yr.

Lateral Connection Costs:

- $1,200 - $4,000 based on setback distance
- Model uses an average of $3,300 per subscriber
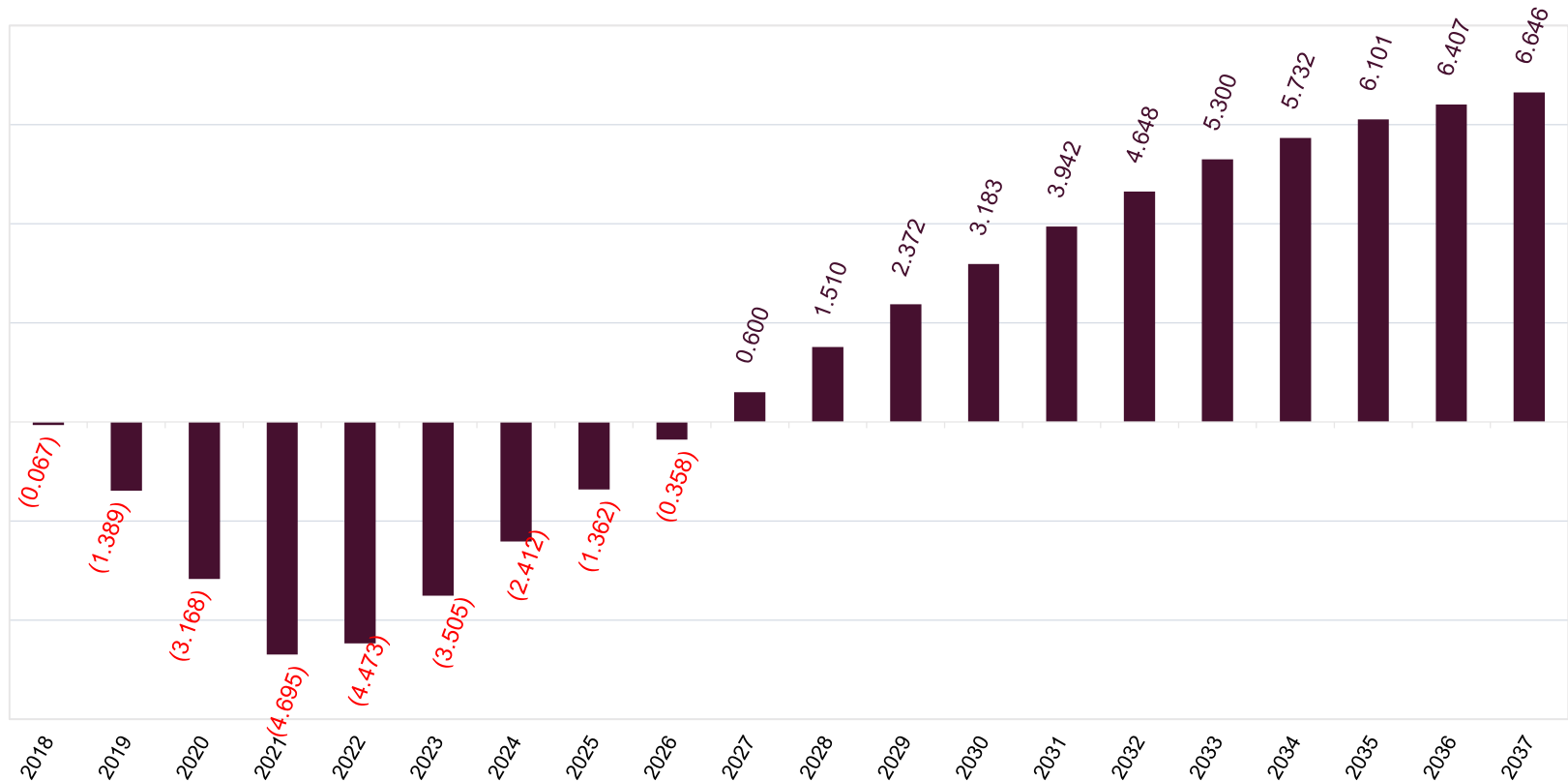- Network ONT/electronics - $325 per subscriber

Net Income

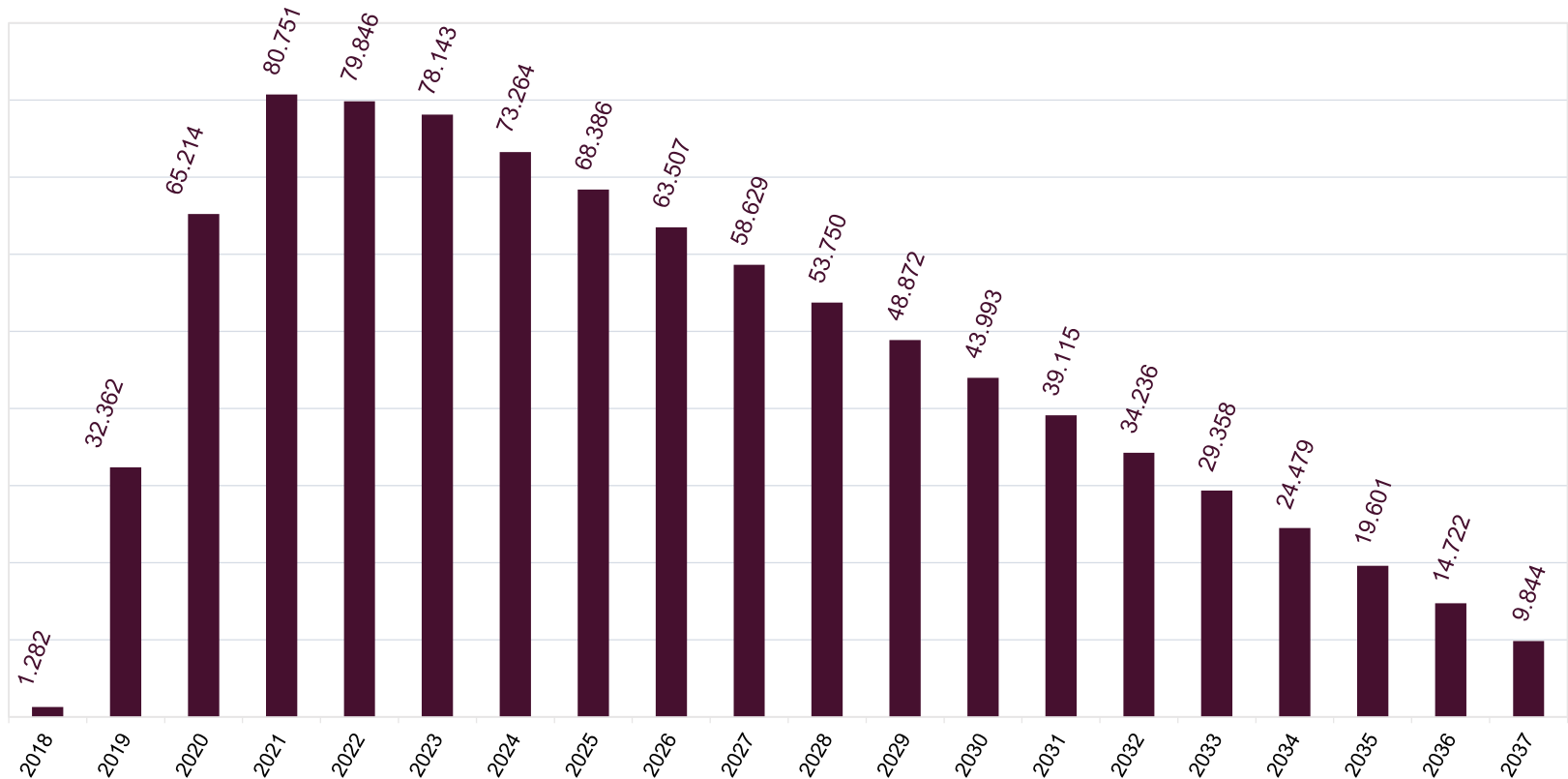Net Income (Millions)

Cumulative Free Cash Flow

40% Take and $85 residential

Cumulative Unrestricted Free Cash Flow (Millions)
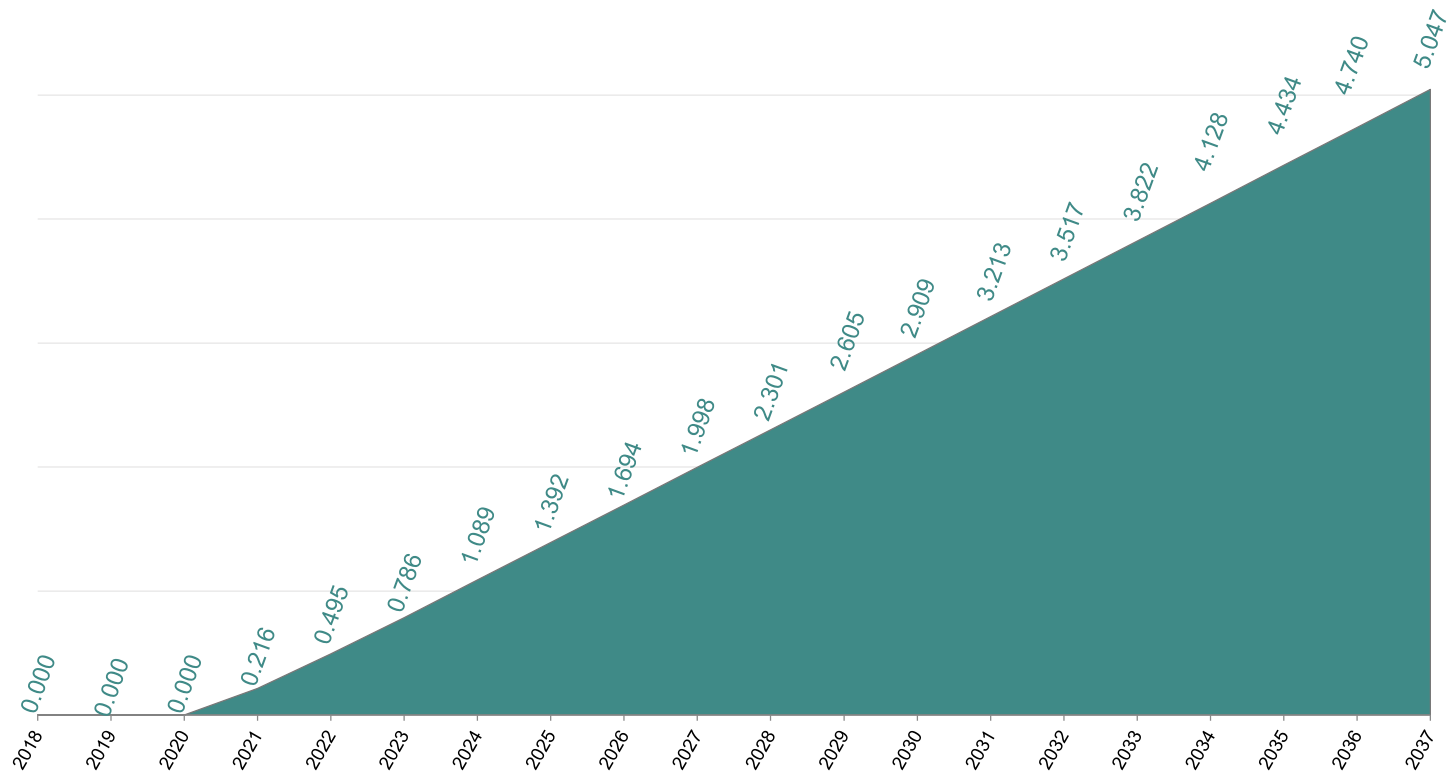
Debt Balance

Debt Balance

Reserve Balance
(in addition to free cash flow)

Total Reserve Balances (Millions)

6. Potential Risks

- Take rates do not meet assumptions
  - 3rd party investments, pricing wars, new services by existing providers
- Network costs become more than financial model projections
- Regulatory environment changes
- Carriers apply political pressure

Fiber Master Plan Insights

- Conservative assumptions used in model

- If model assumptions are met, network can be profitable and cash flow positive

- Actual costs determined in design engineering and bidding phases

- Grant funds may be used to offset the cost of building the network (Measure M, NTIA, DOC)

- Recommend building in phases, starting with a pilot area, to help test the assumptions before committing to entire network build

Citywide Fiber Summary

Manhattan Beach residents, businesses and schools have indicated a strong desire for improved broadband service
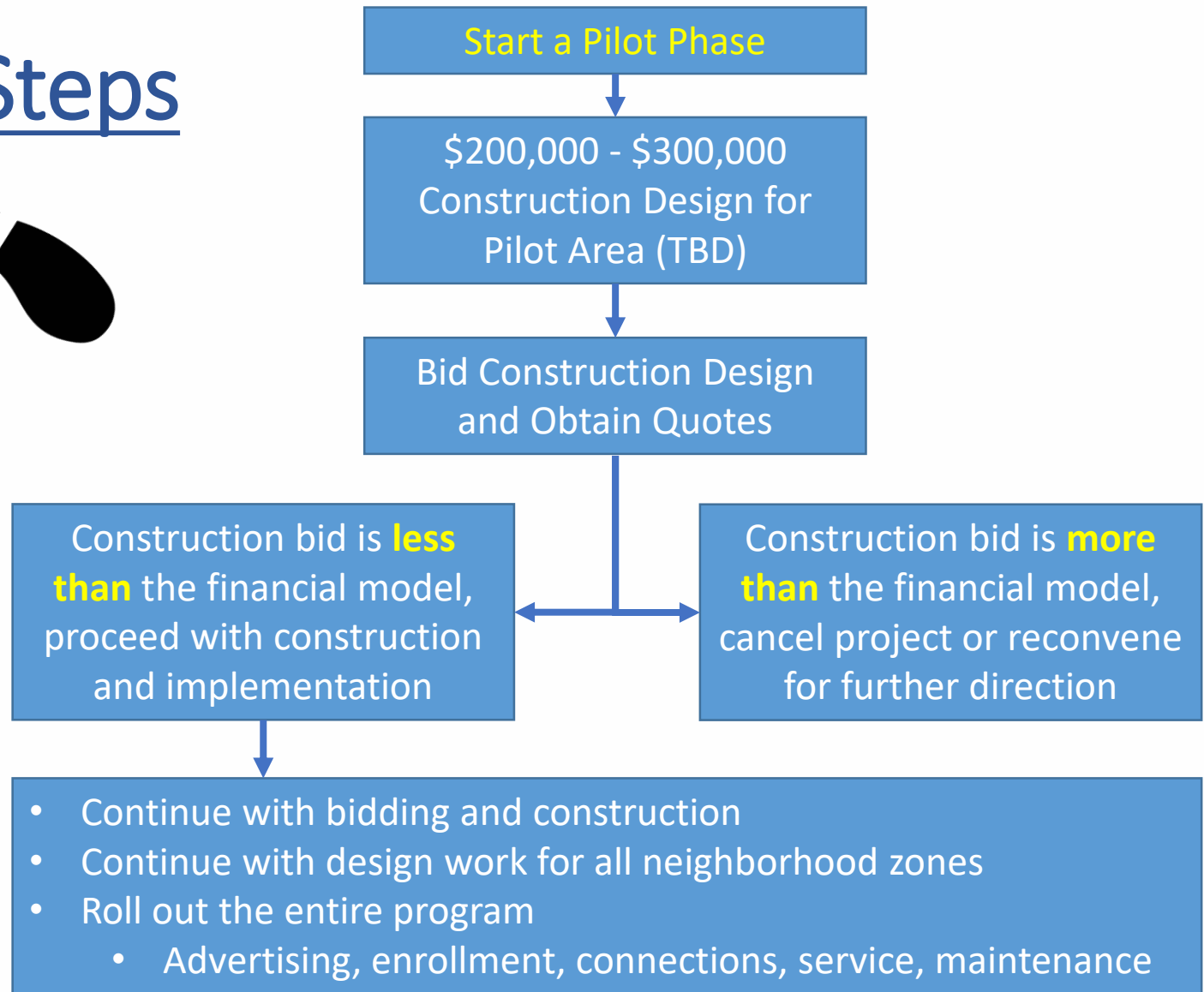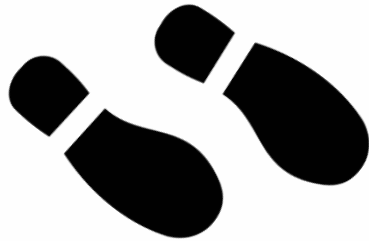
The City can provide a profitable broadband service that meets current and future needs of the community if assumptions are met

Fiber has unlimited upside broadband bandwidth potential, ensuring future end user requirements can be met

Network can be built and managed with a combination of internal and external resources

Broadband service will be among the best in the nation!

Next Steps

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┌─────────────────────────────────────┐
│          Start a Pilot Phase        │
└─────────────────────────────────────┘
                   │
                   ▼
┌─────────────────────────────────────┐
│        $200,000 - $300,000          │
│      Construction Design for        │
│         Pilot Area (TBD)            │
└─────────────────────────────────────┘
                   │
                   ▼
┌─────────────────────────────────────┐
│       Bid Construction Design       │
│         and Obtain Quotes           │
└─────────────────────────────────────┘
```

Construction bid is **less than** the financial model, proceed with construction and implementation

Construction bid is **more than** the financial model, cancel project or reconvene for further direction

- Continue with bidding and construction
- Continue with design work for all neighborhood zones
- Roll out the entire program
  - Advertising, enrollment, connections, service, maintenance

Questions?

Next Steps Discussion?

Survey Results Detail

Needs Assessment, Outreach
Businesses & Community Anchors (Survey Results)

- Business Survey (121 Survey Monkey (SM) responses; closed Nov 16, 2017)

- Summary of 121 SM Respondents – all but a handful small businesses
  - 68 in Health & Wellness; Legal, Management, Professional and Technical Services; Medical, Health Care and Social Assistance; Real Estate Trade, Development; Restaurants & Food Service; Retail.
  - 116 (96%) subscribe to internet today
    - 4 access elsewhere; 1 needs no internet
  - Of 85 responses re technology, 67 (79%) use fiber (45; 53%) or cable (22; 26%)
    - Dominant providers are Frontier; Spectrum; Verizon; some Charter, DirecTV, AT&T
  - Of 55 responses which reported advertised download / upload speeds,
    - 47 (86%, or all but 8) met or exceeded FCC broadband definition of 25 Mbps download
    - 53 (96%, or all but 2) met or exceeded FCC broadband definition of 3 Mbps upload
  - Of 57 responses which reported measured download / upload speeds,
    - Only 39 (68%, or all but 18) met or exceeded FCC broadband definition of 25 Mbps download
    - 54 (94%, or all but 3) met or exceeded FCC broadband definition of 3 Mbps upload

Needs Assessment, Outreach
Businesses & Community Anchors (Survey Results) (cont'd)

- Summary of 121 SM Responses (cont'd)
  - Of 80 responses which reported monthly costs
    - 18 (23%) reported monthly recurring costs (MRC) of $50 or less
    - 23 (29%) reported MRC of $51 to $80
    - 7 (9%) reported MRC of $81 to $100
    - 32 (40%) reported MRC of $100 or more (14 > $250 MRC; 4 > $500 MRC) (large businesses)
  - Of 74 responses which reported service disruption, 12 (16%) reported severe disruption of > 1 day / month.
  - Of 74 satisfaction responses which reported "Very" or "Completely" Satisfied:
    - On reliability, 35 (47%); on speed as advertised, 21 (28%);
    - On price-to-value, 10 (13%); on customer and technical support, 10 (13%).
  - Fewer than 50% of respondents feel internet is meeting their business internet needs.
    - Most concerns related to speed; reliability; costs; and price-to-value.
  - Of 69 responses, 58 (84%) indicated they would (p>50% likelihood) consider switching to internet offered by City
  - Of 78 responses, 15 (<20%) would have concerns over using internet provided by City; 26 (33%) were not sure or had no opinion.

Needs Assessment, Outreach
Residents (Survey Results)

- Residents Survey (643 SM responses; closed Nov 16, 2017)
  - Of 640 responses, 636 (99%) subscribe to internet today
    - Those 7 who don't subscribe indicate services too expensive, too slow, or unreliable
    - "Too expensive" and "too unreliable" are primary reasons
    - They access internet at schools, libraries, or via mobile phone
  - Of 503 responses re technology, 444 use fiber (282; 58%) or cable (162; 32%)
    - Dominant providers are Frontier; Spectrum; Time Warner; Verizon; some Charter, DirecTV, AT&T
  - Of 408 responses which reported <u>advertised</u> download / upload speeds,
    - 394 (96%, or all but 14) met or exceeded FCC broadband definition of 25 Mbps download
    - 401 (98%, or all but 7) met or exceeded FCC broadband definition of 3 Mbps upload
  - Of 376 responses which reported <u>measured</u> download / upload speeds,
    - 326 (87%, or all but 50) met or exceeded FCC broadband definition of 25 Mbps download
    - 362 (96%, or all but 15) met or exceeded FCC broadband definition of 3 Mbps upload
  - Of 459 responses which reported monthly costs
    - 163 (35%) reported monthly recurring costs (MRC) of $50 or less
    - 195 (43%) reported MRC of $51 to $80
    - 63 (14%) reported MRC of $81 to $100
    - 38 (8%) reported MRC of $100 or more (12 > $200 MRC)

Needs Assessment, Outreach

Residents (Survey Results) (cont'd)

- Summary of 643 Survey Monkey Responses – (cont'd)
  - Of 404 responses, 399 (>98%) have a wireless router or other WiFi access point.
  - 402 responses reported an average of more than 10(!) devices (laptops, computers, tablets, smartphones, smart TVs, appliances) connected.
    - High variability, from a handful to highs of up to more than 4 dozen.
  - Of 400 respondents which reported service disruption, 48 (<12%) 12 reported severe disruption of > 8 hours/ month.
  - Of 402 satisfaction responses which reported "Mostly" or "Completely" Satisfied:
    - On service reliability, 213 (52%);
    - On speed as advertised, 193 (48%);
    - On price and value, 79 (20%);
    - On service offerings, 103 (26%).
  - Of 403 respondents, only 198 (49%) of respondents feel internet is meeting their home internet needs; 42 (10%) were unsure.
    - Most concerns related to speed, reliability, price-to-value, and customer support.
  - Of 203 respondents, 50 (25%) haven't upgraded due to cost; and 141 (69%) due to lack of choice or uncertainty over provider offerings.

Needs Assessment, Outreach
Residents Usage – Survey Results (cont'd)

- Summary of 643 Survey Monkey Responses – (cont'd)
  - Of 395 responses on internet usage, as "occasionally" or "frequently"
    - 343 (87%) consume movies or television online
    - 378 (96%) shop online   - 295 (75%) use social media
    - 315 (79%) download or stream music   - 131 (33%) play online games
    - 208 (53%) connect to a remote computer   - 269 (68%) access healthcare information
    - 388 (98%) use email   - 142 (36%) use "smart home" applications
    - 288 (73%) access educational materials   - 168 (43%) use security or remote monitoring
    - 384 (97%) research information or browse online
  - 96% use an internet-based phone service; 31% have landline
  - Of 393 responses,
    - 236 (60%) telecommute or occasionally work from home for outside employer
    - 198 (50%) regularly work from home
    - 219 (56%) perform schoolwork or training tasks
  - Cutting the cord (Q24)
  - TV viewing (Q23)
  - Of 364 responses, 334 (91%, or all but 30) indicated they would (p >= 50% likelihood) consider switching to competitively-priced internet offered by City.

Fiber Network
Construction Options

City of
Manhattan Beach
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Five Installation Options

1. Overhead

Access and Ownership Challenges

2. Open Trench

Effective but Costly

3. Micro-Trench

Effective and Less Costly

4. Directional Bore

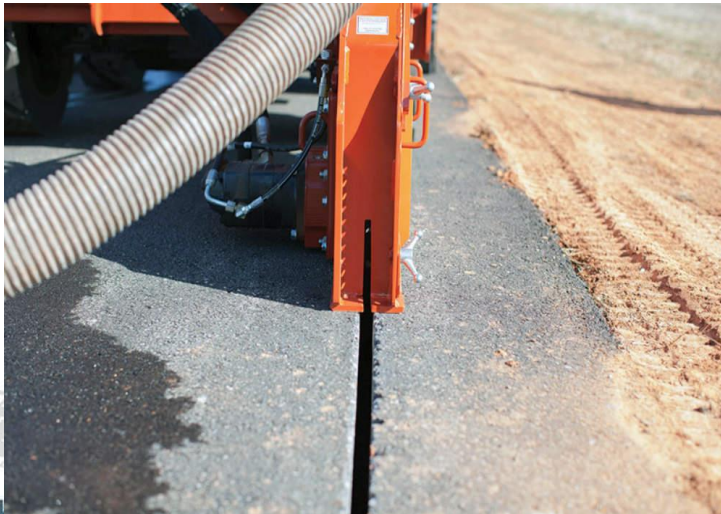Effective and Less Costly; Alignment Challenges

5. Direct Burial

Less Costly but Unprotected

City of **Manhattan Beach**
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Micro-trenching Concept

City of
Manhattan Beach
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Micro-trenching

- Faster to Install
- Less Invasive on Residents
- Utilizes Available Space
- Less Expensive than Open Trench
- Better Protection Than Direct Burial
- Better than Directional Boring for Shorter Runs
- https://www.youtube.com/watch?v=RKfzRwVG7sI
- https://www.youtube.com/watch?v=klWIuvLc5cI