

# Memorandum



CITY OF DALLAS

DATE 22 May 2015

TO The Honorable Members of the Transportation and Trinity River Project Committee:  
Vonciel Jones Hill (Chair), Lee Kleinman (Vice Chair), Deputy Mayor Pro Tem Monica Alonzo,  
Mayor Pro Tem Tennell Atkins, Sandy Greyson, and Sheffie Kadane

SUBJECT Traffic Signal System Plan Program Development and Implementation Strategies

On Tuesday, 26 May 2015, you will be briefed on the Traffic Signal System Plan Program Development and Implementation Strategies. Attached you will find the briefing materials for your information.

Please feel free to contact me if you need additional information.

A handwritten signature in blue ink, appearing to read 'Jill A. Jordan'.

Jill A. Jordan, P.E.  
Assistant City Manager

## Attachment

c: Honorable Mayor and Members of the City Council  
A.C. Gonzalez, City Manager  
Warren M.S. Ernst, City Attorney  
Craig D. Kinton, City Auditor  
Rosa A. Rios, City Secretary  
Daniel F. Solis, Administrative Judge  
Ryan S. Evans, First Assistant City Manager

Eric D. Campbell, Assistant City Manager  
Mark McDaniel, Assistant City Manager  
Joey Zapata, Assistant City Manager  
Jeanne Chipperfield, Chief Financial Officer  
Sana Syed, Public Information Officer  
Elsa Cantu, Assistant to the City Manager – Mayor & Council



# Traffic Signal System Plan

## Program Development and Implementation Strategies

**Transportation and Trinity River Project Committee**  
**26 May 2015**



# Background

- In November 2013, staff briefed Council on the state of the City's traffic signal system. Council was informed that:
  - Older traffic signals have structural and operational deficiencies
  - Almost 80 percent (80%) of the City's 1,500+ traffic signals were obsolete
  - The City has never had a program to comprehensively upgrade signals



# Briefing Purpose

Since the briefing, staff has developed a potential program to upgrade the City's obsolete traffic signals.

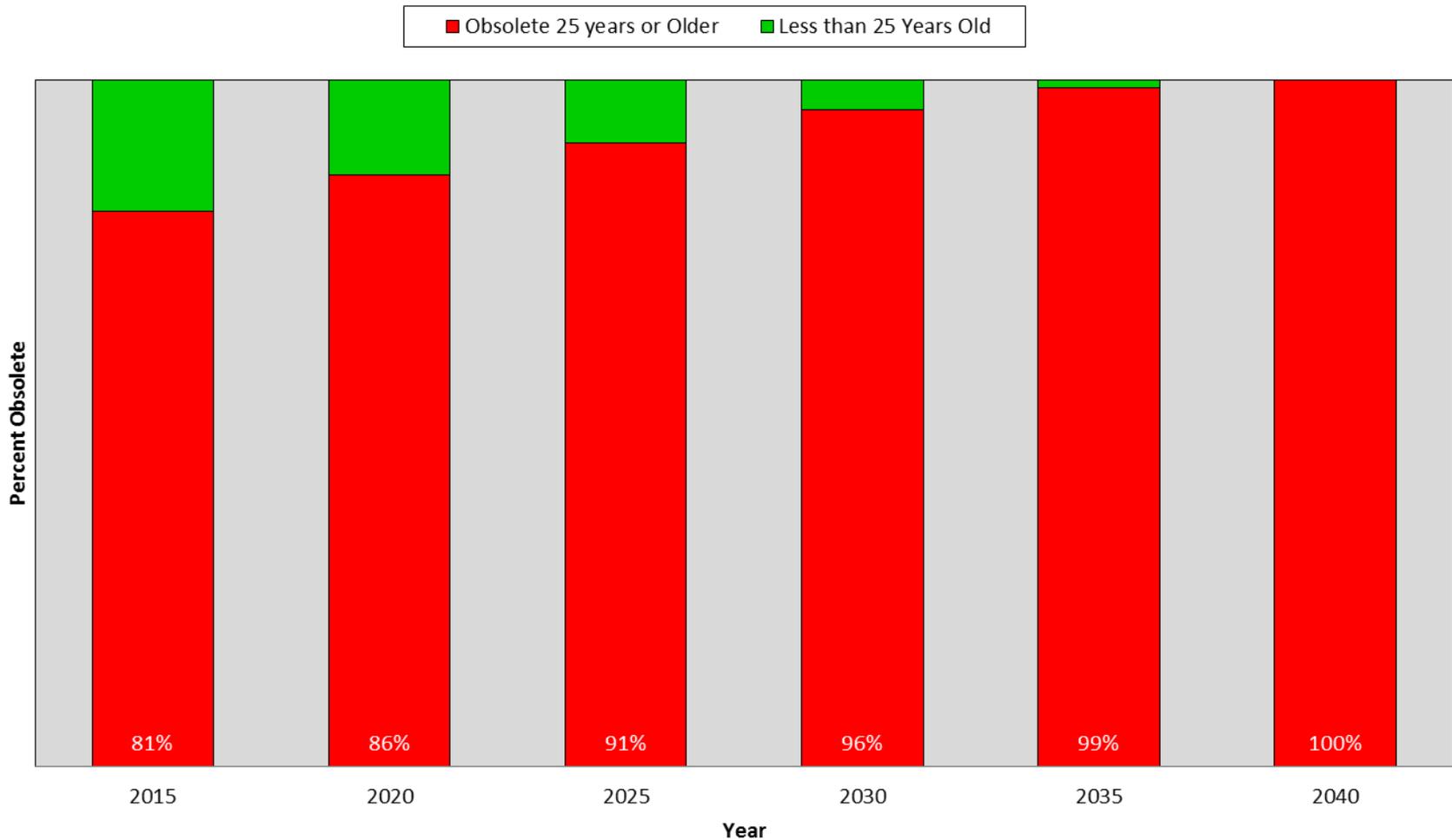
The purpose of this briefing is to:

- Discuss criteria to identify and prioritize critical signals for replacement
- Develop a program implementation strategy
- Seek Committee input and direction on the above

# We Need to Start Now

- 80% of the City's 1,500+ traffic signals need upgrade **today**
- Without a maintenance program, over 90% of signals will be obsolete by 2025
- Replacement costs for traffic signals that are currently obsolete - \$ 290 Million\*
- Not practical to upgrade all obsolete signals in a short time
- Need an annual program that will upgrade and maintain all signals to industry standard
- Estimated Cost - \$362 Million\* over 25 years
- *Costs have been updated based on recently opened bids for signal construction master agreement – previous estimates were based on 2005 signal price agreement.*

# City of Dallas Traffic Signal System without an Upgrade Program



# Benefits of Upgrade

Upgrading traffic signals has several benefits. It will:

- Enhance safety through reduced accidents
- Enhance mobility and reduce congestion
- Reduce signal malfunction during weather events
- Provide ability to add left-turn phasing
- Be compliant with Americans with Disabilities Act [“ADA”] requirements
- Meet current Federal operational, structural and wind-load standards

# PROGRAM IMPLEMENTATION

## Step 1 – Developing Selection Criteria

- With over 1,200 obsolete traffic signals, it is important to establish selection criteria to identify critical signals for replacement that are equitable and acceptable to all stakeholders
- Staff suggests the following criteria to identify signals in critical need for upgrade:
  1. **Age of Signal Hardware** (Causes structural failures and shorts during weather events; unable to provide left-turn phasing)
  2. **Number of Accidents** (Operational deficiencies, detection)
  3. **Number of Service Requests** (Operational deficiencies, detection)
  4. **Type of Signal Hardware** (Spanwire signals - sagging or rotated signal heads; downed signals are electrocution risk; operational issues)

# Storm Damaged Signal Pole



# Wind Damage to Span-Wire Signal





1960 -70s era signal – left turn phasing not possible

# Signal Pole Damage from High Winds



# Step 2 - Developing a Shortlist

- Using evaluation criteria on slide 7, an initial shortlist could be developed to identify signals in critical need of upgrade
- The initial list could be further refined based on:
  - input from stakeholders
  - other known issues and deficiencies
  - availability of outside funds
- A final shortlist of critical signals citywide could then be developed
- Staff could prepare individual lists by Council District showing the distribution of the above signals in each district

# Step 3 - Replacing Signals

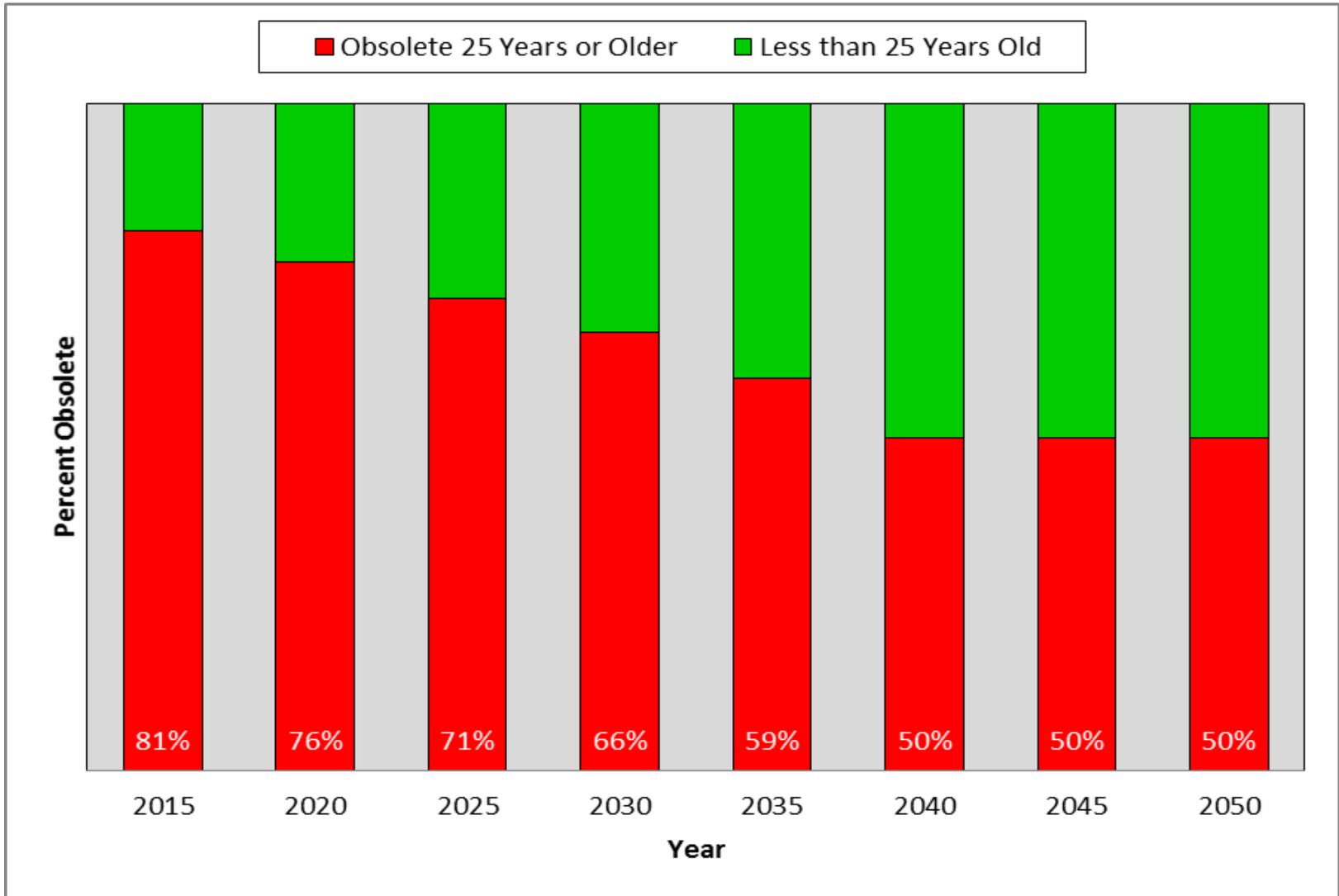
Once a shortlist is established:

- Staff could commence preparation of design and construction documents for the signals on the list
- The number of signals upgraded will depend on availability of funds
- At least one signal in each Council District will be upgraded (subject to availability of adequate funding)

# Program Scope

- An effective program would replace sixty (60) signals annually. This will put the City's traffic signals on a 25 year replacement schedule. 20-25 years is the industry standard for useful life of a signal
- If funding levels are lower:
  - Number of signals replaced annually will be reduced
  - Replacement of currently obsolete signals will take longer
  - Portions of the City's traffic signal system will be in obsolete condition perpetually

# 50% Signals Perpetually Obsolete (Replacing 30 signals /year)



# Funding Levels and Deliverables

Program Amount \$ Million per year	Approx. No. of signals replaced per year	No. of years to replace currently obsolete signals	No. of years to replace signal system citywide
<b>14.5</b>	<b>60</b>	<b>20</b>	<b>25</b>
10.9	45	27	34
7.3	30	40	50
4.3	18	67	84

# Program Funding Options

A traffic signal upgrade program that will replace sixty (60) signals annually, is needed to maintain the City's traffic signal system to industry standards. Subject to availability of funds, the program could be funded:

- On a “Pay As You Go” basis from the General Fund
- Through Bond Funds from future Bond Issues
- By dedicating revenues from potential public-private partnerships leveraging City assets to generate income
- Through a combination of the above

# Recommended Funding Strategy

It is recommended that:

- “Pay as You Go” funding option be adopted for upgrading signals in the short term – next two to three years (see slide 20 for associated costs)
- Staff continue to investigate public-private partnership opportunities
- Medium to long term funding shortfall be addressed as part of development of the next bond program
- The signal upgrade program be included as a project in future bond programs

# Short Term Implementation Strategy

While sixty (60) traffic signals need to be upgraded annually to maintain the City's traffic signal system to industry standards, an upgrade program needs to be started at a smaller scale initially for the following reasons:

- Currently, an average of fifteen (15) signals are constructed in the City of Dallas each year (includes all signals - new; reconstructs; public and private)
- Signal contractors need to hire and train additional staff to effectively implement a program that will be four times current work loads

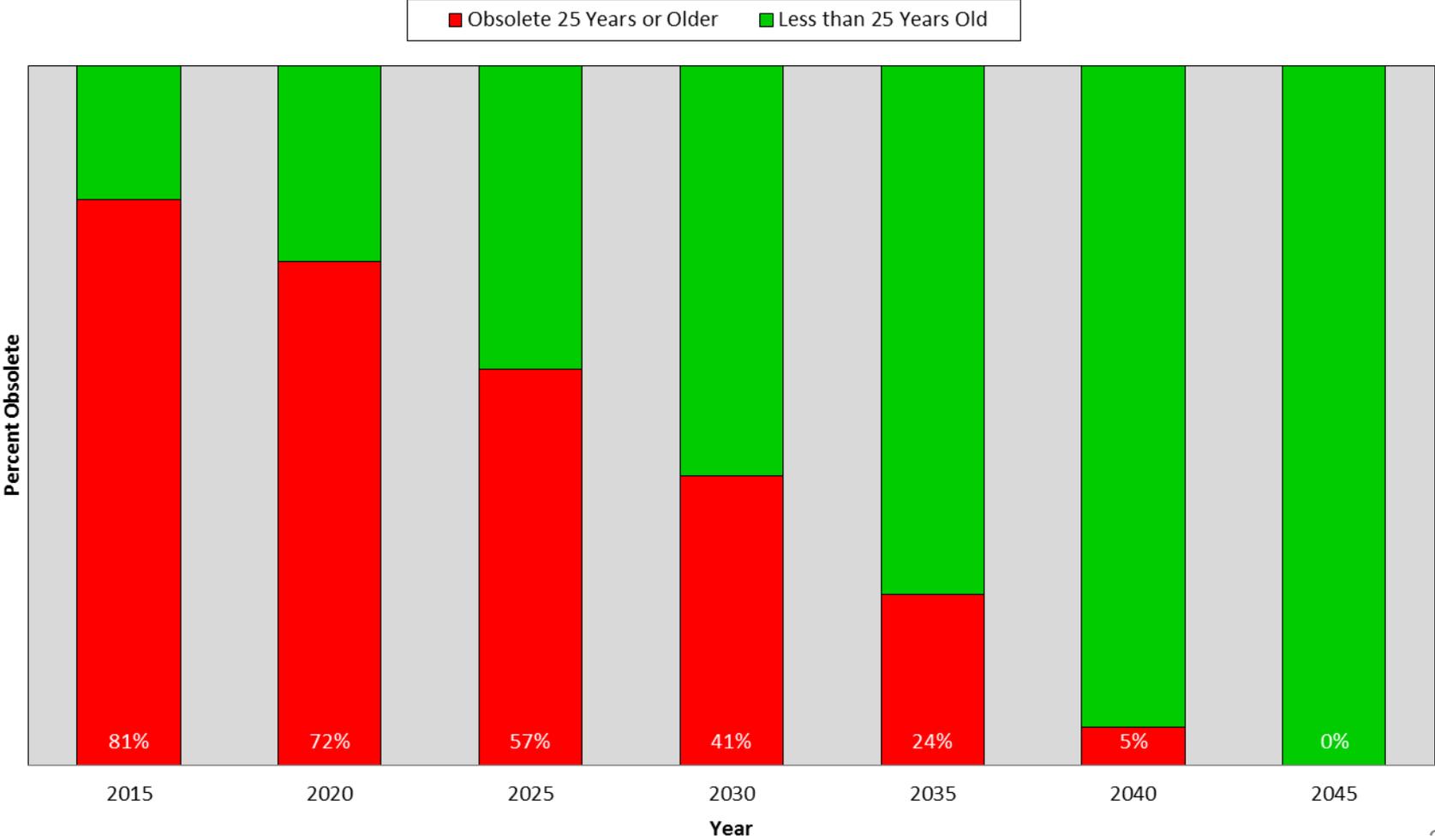
An incremental build-up to the program that will eventually replace sixty (60) signals annually is recommended (next slide)

# Incremental Signal Replacement Schedule

In order to provide time for signal contractors to build up the capacity to implement a full replacement program, staff recommends the following incremental replacement schedule for the traffic signal upgrade program:

- Year 1 : 18 signals - \$ 4.3 M
- Year 2 : 30 signals - \$ 7.3 M
- Year 3 : 45 signals - \$ 10.9 M
- Year 4 and beyond : 60 signals - \$14.5 M

# Traffic Signal System Conditions with Recommended Replacement Schedule



**QUESTIONS?**

# APPENDIX A

# Limitations of Existing Traffic Signals

- Over 80% of the City's traffic signals are past industry standard of useful life and are therefore obsolete
  - Increased structural failures
  - Electrical hardware failures during weather events
  - Shorted wires may result in conflicting indications
  - Hardware does not support left-turn signals
- 70% of all signalized intersections have broken vehicle detectors
  - Congestion during peak travel times due to default preset times
  - Increased potential for accidents due to drivers' impatience with extended red lights

# Operational Limitations of older signals

- In addition to the structural deficiencies, older traffic signals do not meet:
  - Current Federal operational standards
  - Current Federal structural standards
  - Current Federal wind-loading standards
- Many older signals are not Americans with Disability Act [“ADA”] compliant
- Due to hardware constraints of existing signals, staff is unable to program signals to turn green as vehicles approach them

# Why Upgrade?

- Enhanced safety and cost savings
  - An average injury accident costs over \$100,000; an average fatality costs \$6 million<sup>(1)</sup>
  - Dallas averages over 50 fatalities and 400 injury accidents every year at or near signalized intersections
  - Upgraded signals help reduce accidents<sup>(2)</sup>
- Reduced travel time and enhanced mobility
  - Economic impacts of congestion the United States is over \$121 billion annually<sup>(3)</sup>
  - A traffic signal retiming program saved San Antonio travelers over \$167,000 per signal per year

(1) Source: American Automobile Association [“AAA”]

(2) Source: Federal Highway Administration [“FHWA”]-SA-10-005

(3) Source: 2012 Urban Mobility Report, Texas Transportation Institute

# **APPENDIX B**

## **Advanced Traffic Management System [“ATMS”] Upgrade Project**

# Six Components of Traffic Signal System



Traffic Signal



Vehicle Detectors

**This Briefing**



Controller cabinet



Central Computer System



Communication Link



Traffic Signal Controller

**ATMS Upgrade Project**

# Currently Underway – ATMS Upgrade Project



- The on-going ATMS Upgrade project will completely replace the Computer and Communications System components of Dallas' traffic signal system
- Estimated cost - \$12.5 Million
  - \$6.1 M Bond Funds
  - \$5.1 M Grant Funds - Texas Department of Transportation ["TxDOT"]; North Central Texas Council of Governments ["NCTCOG"]
  - \$1.3 M General Fund

# ATMS tasks accomplished to date

- Hardware and Software contract for Advanced Traffic Controllers [“ATC”] approved by Council in May 2013
- Software testing and validation for ATC on-going
- 800 ATCs have been ordered
- Several ATCs have been deployed for testing at various locations throughout the City
- Consultant Contract for Central Computer System [“CCS”] specification development approved by Council in May 2014
- Specifications for CCS and Digital Modems (communications) have been finalized and are being advertised

# ATMS – Moving Forward

- Select System Integrator to develop Graphic User Interphase [“GUI”] and provide applications solution for CCS
- Procurement contract for Digital Modems
- Continue validation of ATC software
- Develop and deploy auxiliary communications solutions
- Continue to field deploy ATC
- Install final system by the first quarter of FY 2017

# APPENDIX C

# Needed: Upgraded Traffic Signal Field Infrastructure System



**Signal**



**Vehicle Detectors**



**Controller Cabinet**

- Traffic Signal Field Infrastructure includes:
  - Signal heads, poles, mast arms, electrical conduit
  - Vehicle detectors
  - Controller cabinets

# Upgrade Options

Upgrades could be either comprehensive or partial:

1. Comprehensive option would replace all three (3) components of the system simultaneously
2. Partial option would replace selected components of the system

# 1. Comprehensive Replacement Option

- Comprehensive replacement option would replace all three (3) components of the traffic signal field infrastructure system including:
  - Traffic signals: mast arms, signal poles, underground conduits, electrical cables and similar field components
  - Vehicle detectors
  - Controller cabinets
- This option will address current system deficiencies most comprehensively
  - Costs are higher than the partial options
  - Implementation time frame is longer

# 1. Upgrade all three (3) system components

## Advantages

- Will upgrade deteriorated electrical components and significantly reduce malfunctions during storm events
- Will address current structural and operational deficiencies
- Will provide for protected left-turn movements at intersections
- Will address ADA deficiencies
- Will provide for better detection

## Disadvantages

- Most expensive option
- Will take twenty-five (25) years or more to implement

## 2. Partial Replacement Options

Partial replacement option would replace one or more of the following traffic signal components:

- A. Traffic signals (mast arms, signal poles, underground conduits, cables and similar components)
- B. Controller cabinets
- C. Vehicle detectors

## 2 A. Upgrade Traffic Signal Components Only

### Advantages

- Will upgrade deteriorated electrical components and significantly reduce malfunctions during storm events
- Will address most structural and operational deficiencies
- Will provide for protected left-turn movements at many intersections where current signal mast arms are short
- Will address ADA deficiencies

### Disadvantages

- Will not address the lack of active detection at 70% of intersections
- Will require twenty (20) years or more to implement
- Upgrade costs are over 80% of comprehensive replacement costs

## 2 B. Upgrade Controller Cabinets Only

### Advantages

- Upgrade costs are less than 5% of comprehensive replacement
- Will provide for a more conducive environment for the new controllers and their operations
- Will provide for more programming and phasing options
- Enables installation at more locations

### Disadvantages

- Will not address deteriorated electrical components and malfunctions during storm events
- Will not address detection failure at 70% of the intersections
- Will not address structural deficiencies of older signals
- Will not provide for left-turn movements at signals
- Will not address ADA deficiencies

## 2 C. Upgrade Vehicle Detectors Only

### Advantages

- Upgrade costs are less than comprehensive replacement - \$50M for the entire system
- Will provide for active detection
- Will provide for vehicle actuated green lights

### Disadvantages

- Will not address deteriorated electrical components and malfunctions during storm events
- Will not address structural deficiencies of older signals
- Will not provide for left-turn movements at signals
- Will not address ADA deficiencies
- Will require up to ten (10) years to implement

# Summary - Comprehensive vs. Partial Options

- Comprehensive Option – Will address all current deficiencies: structural, operational, ADA and detection
  - Estimated cost: \$362 million
- Partial Options – Replacing vehicle detectors most viable option:
  - Will provide active detection
  - Will not address:
    - Structural deficiencies
    - Signal malfunctions during weather events
    - ADA issues
    - Operational deficiencies
  - Estimated cost: \$50 million

# APPENDIX D

# Number of Traffic Signals by Council District

Council District	Number of Signals	Percentage of Total
1	84	6%
2	258	17%
3	50	3%
4	72	5%
5	44	3%
6	143	10%
7	81	5%
8	53	4%
9	64	4%
10	79	5%
11	101	7%
12	66	4%
13	121	8%
14	286	19%

# Bond Fund Allocation for Traffic Signals in Prior Years

BOND PROGRAM	NO. OF SIGNALS FOR UPGRADE	COST	WARRANTED (NEW) SIGNALS AND SCHOOL FLASHERS
2003	20	\$2.6 M	\$1.2M
2006	5	\$626K	\$3.5M
2012	0	0	0