

# Memorandum



DATE December 9, 2011

TO Honorable Members of the Quality of Life Committee: Angela Hunt (Chair),  
Sandy Greyson (Vice Chair), Monica R. Alonzo, Dwaine R. Caraway, Carolyn R.  
Davis

SUBJECT Pavement Markings Briefing

On Monday, December 12, 2011, you will be briefed on Pavement Markings.  
The material is attached for your review.

If you have questions or need additional information, please let me know.



Forest E. Turner  
Assistant City Manager

Attachment

cc: Honorable Mayor and Members of the City Council  
Mary K. Suhm, City Manager  
Rosa A. Rios, Acting City Secretary  
Thomas P. Perkins, Jr., City Attorney  
Craig D. Kinton, City Auditor  
C. Victor Lander, Administrative Judge  
A.C. Gonzalez, First Assistant City Manager  
Ryan S. Evans, Assistant City Manager  
Jill A. Jordan, P.E., Assistant City Manager  
Joey Zapata, Assistant City Manager  
Jeanne Chipperfield, Chief Financial Officer  
Frank Libro, Public Information Office  
Stephanie Pegues-Cooper, Assistant to the City Manager

# Department of Street Services

## Pavement Markings

Presented to:

- Transportation and Environment Committee
- Quality of Life Committee

December 12, 2011

# Briefing Purpose and Overview

- ❑ Provide information on the current street striping program
- ❑ Provide information on costs to stripe bike lanes as a part of the striping program
- ❑ Discuss requirements prior to bike route implementation

# Pavement Markings

## Inventory

- ❑ Lane lines
  - 7.7 M linear feet of stripes over 1,011 miles of roadways
- ❑ 7,400 Crosswalks
  - Most are at traffic signals
  - 3,400 school related
- ❑ 5,500+ Stop bars
- ❑ 2,700+ pavement legends (left and right turn arrows)



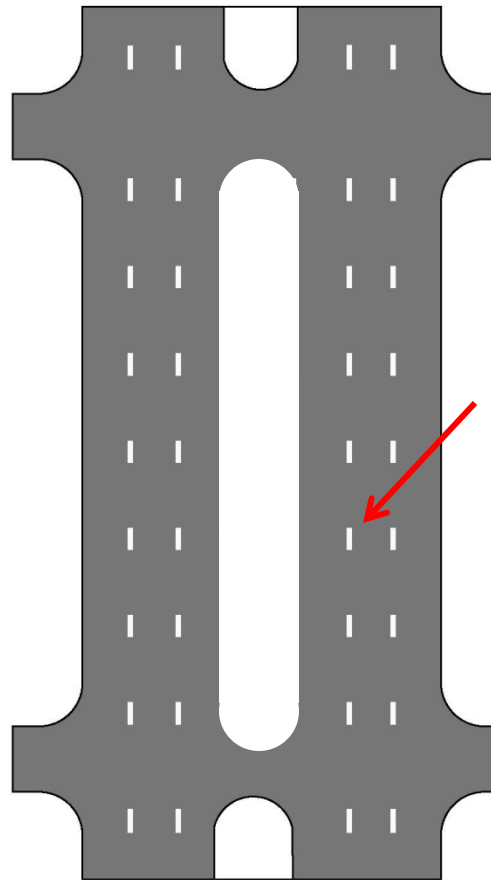
Street Striping Machine



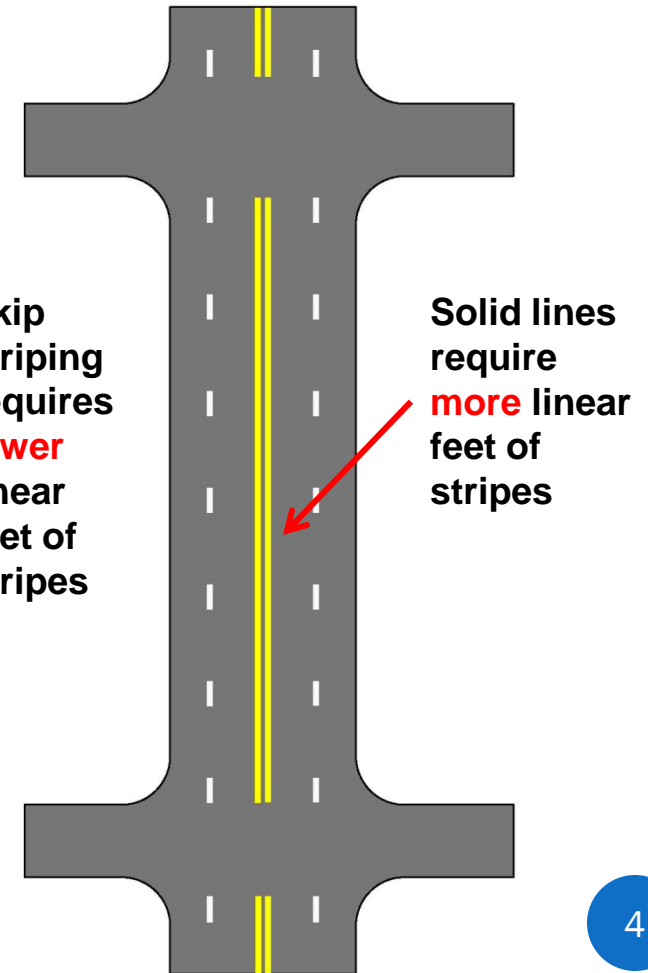
# Examples of Striping Quantities

- ❑ Staff reports linear miles of stripes installed each year not lane miles
- ❑ Quantities per mile each street varies depending on street type
  - More lanes do not necessarily result in higher striping quantities per mile

6 Lane Divided Street  
5,280 Linear Feet of Stripes per Mile



4 Lane Undivided Street  
15,840 Linear Feet of Stripes per Mile



# Installation and Materials

- All street striping is installed by contractors
  - Seasonal work
  - Markings should be applied to dry surfaces with temperatures greater than 50 degrees to allow markings to properly adhere
  - Majority of maintenance striping is completed between March and October
  
- Materials Used
  - City uses specifications developed by TxDOT based on research and statewide committee input
  - Materials available:
    - Thermoplastic (2 to 4 years)
    - Water based (six months to 1 year)
    - Pre-formed Tape (4 to 6 years)
    - Epoxy (under test by TxDOT)

# Cost Comparison of Striping Materials

- ❑ City uses mostly thermoplastic material since it is the most cost effective over time
- ❑ Problem spots with high traffic volumes or constant weaving may warrant use of pre-formed tape

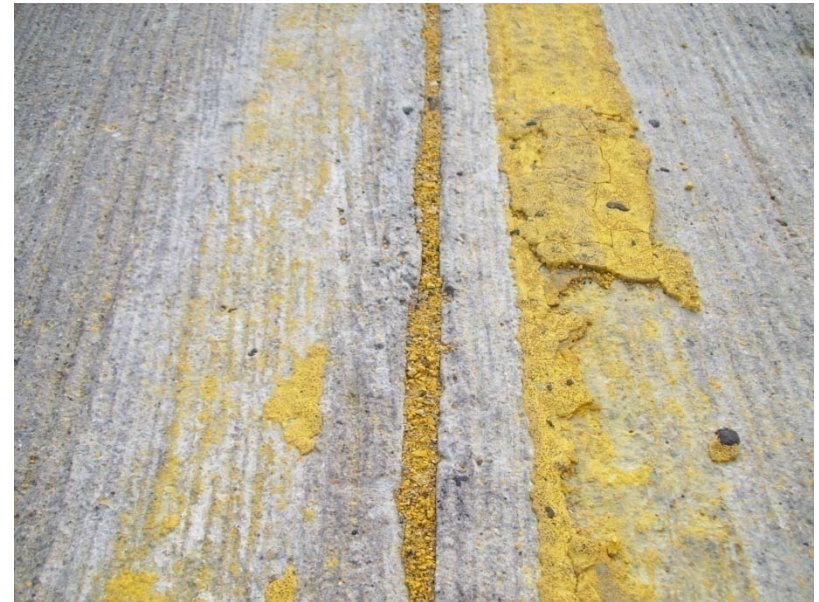
## Example

for Major Street with **30,000** Vehicles per Day

Marking Material	Life (1) Street with 30,000 vehicles per day	4 Inch Lane Line Cost	Average Cost over 10 years
Thermoplastic	3 years <sup>(1)</sup>	\$0.33 LF	\$1.09 LF
Water-based	1 year <sup>(1)</sup>	\$0.22 LF	\$2.20 LF
Pre-formed Tape	5 years <sup>(1)</sup>	\$2.60 LF	\$5.20 LF

(1) Life of markings vary based on traffic volume, pavement surface and weather conditions. Higher traffic volumes will result in shorter life and higher average cost over 10 years.

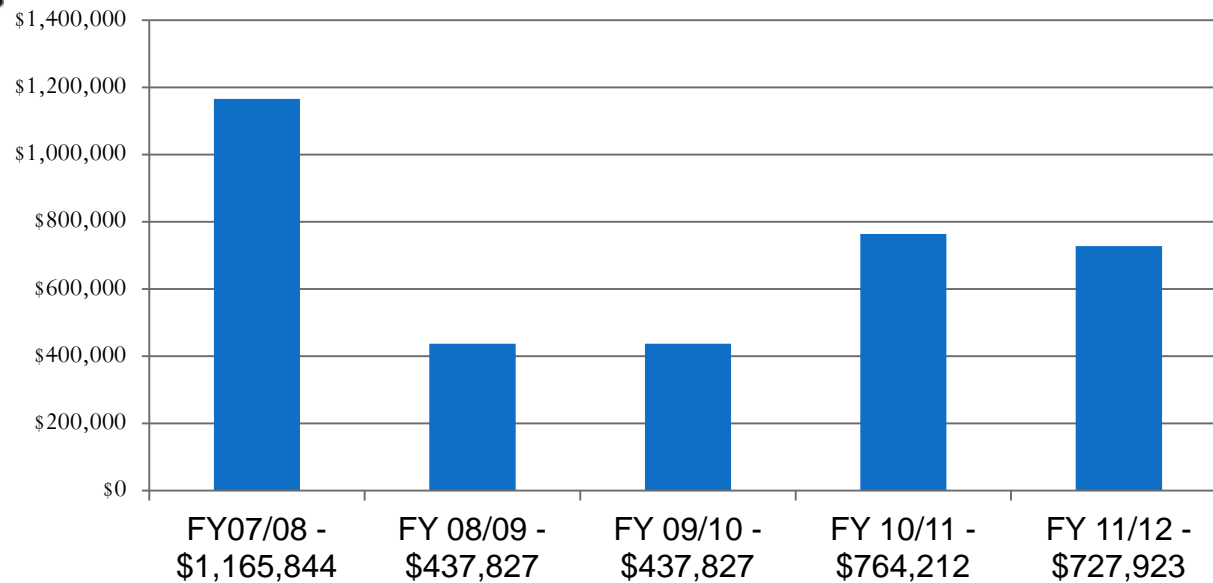
# Factors Affecting Visibility and Life of Markings



- ❑ Average daily traffic volume
- ❑ Type of pavement surface (concrete or asphalt)
- ❑ Weather conditions
- ❑ Application methods and thickness of stripe



# Budget History



- ❑ Budget determines number of miles striped per year
- ❑ Staff implemented cost efficiencies to allow more streets to be striped with lane lines:
  - Reduced lane line width from 6 inches to 4 inches
  - No surface preparation
  - Installation or maintenance of raised reflective buttons not funded
  - Installation or maintenance of edge lines not funded
  - Maintenance of crosswalks at traffic signals not funded

## Annual Inspection for Visibility

- ❑ 1,011 miles of roadway segments inspected and rated each year for lane line visibility
- ❑ Lane Line Ratings (A, B or C)
  - A - 467 miles (visible)
  - B - 337 miles (visible but worn)
  - C - 207 miles (little to no visibility)
- ❑ FY11/12 budget funds striping on worst condition streets
  - All 207 miles of “C” rated streets funded and 115 miles of “B” rated streets funded
- ❑ \$510,000 required to stripe remaining 222 miles of “B” rated streets
  - Striping “B” rated streets allows striping to be installed before visibility is lost

# Annual Inspection for Visibility

- ❑ Crosswalks = 7,388 total
  - 2,807 (38%) rated A – Visible
  - 1,405 (19%) rated B - Visible but worn
  - 3,176 (43%) rated C - Little to no visibility
- ❑ Currently budgeted to repaint 100 crosswalks per year
- ❑ Staff only approves restriping of crosswalks that are school related or safety-related sites; all other requests put on hold
- ❑ Additional **\$2.3 M** required to repaint all crosswalks rated “C” = little to no visibility



# Striping for Bikes

- ❑ Bike Plan adopted by Council in June of 2011
  - Defines routes
  - Recommends type of bike facility for each route
- ❑ 840 miles total “on-street” bike route miles
  - \$15.8 M to install bike markings & signage citywide
    - **Currently program is not funded**
    - Staff seeking grant fund opportunities
    - Includes contract inspection and engineering
  - **\$ 3.2+ M** annual O&M after full plan implemented
    - Restriping **every 4 years on average**
    - Sign maintenance (knockdowns, graffiti)

# Striping for Bikes

- ❑ The Bike Plan recommends a phased strategy to implement bike routes:
  - **Demonstration/Early Implementation (Priority)**
  - Near-term
  - Mid-term
  - Long-term
  
- ❑ 2006 Bond Program
  - Street Reconstruction Projects – Some of the routes defined in the **Demonstration/Early Implementation phase** overlay with 2006 bond program street reconstruction projects. Depending on individual project savings, bike markings may be included as part of these projects
  - Resurfacing Projects – All resurfacing projects not completed will not have savings available for the added cost of bike lanes

# Bike Marking Types



Shared Lane



Bike Lane (No Buffer)

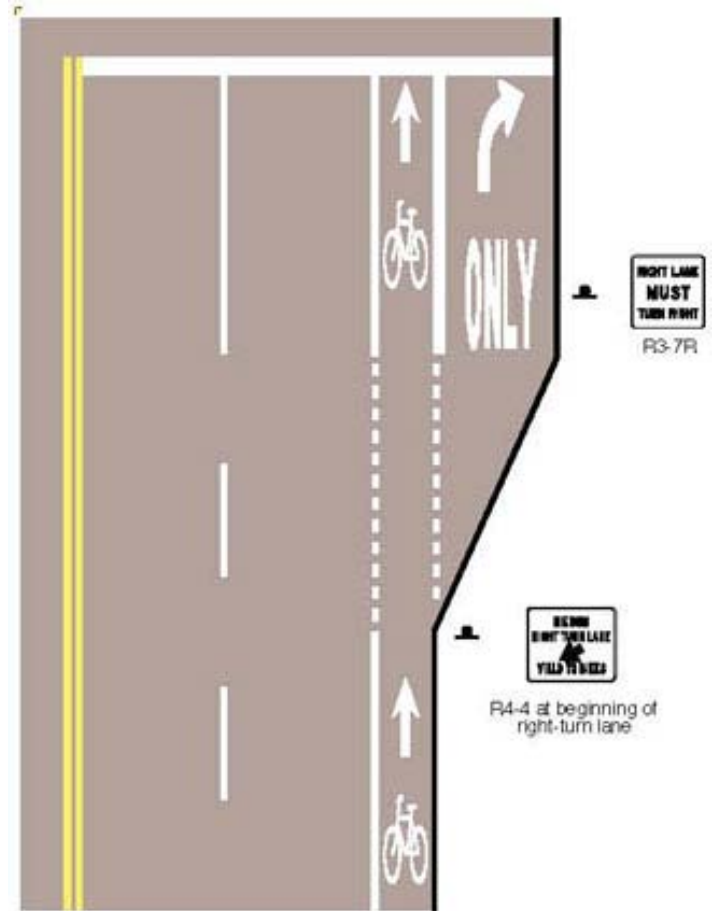


Buffered Bike Lane

Facility Type	Estimated Miles
Shared Lanes	206
Bike Lanes (No Buffer)	123
Bike Lanes Buffered	132
Paved Shoulders	19
To be determined	360
<b>Total</b>	<b>840</b>

- Painted bike symbols and signs recommended every 250 feet
- Some streets may require “No Parking” signs every 250 feet
- Thoroughfare Amendment required for many routes prior to implementation

# Typical Bike Markings



## ❑ Dotted Extensions

- Used to reduce conflicts between bikes and turning vehicles
- Used at intersections where bike lane passes through intersection
- Creates awareness and designates space for bikes



City of Dallas

# Bike Marking Enhancements



30 foot by 4 foot  
Color Conflict Zone  
Cost = \$600

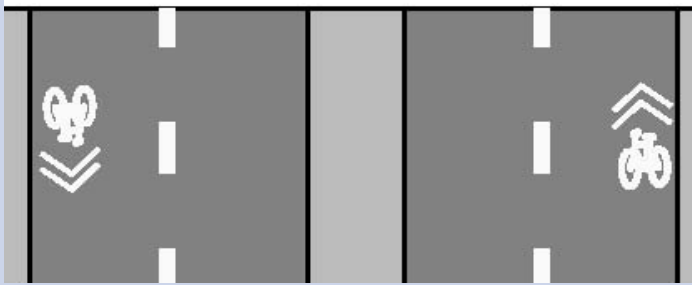



## Colored Lanes (\$4 cost per square foot)

- Enhancement to dotted extensions at right turn lanes
- Color creates awareness and designates space
- Used in problem areas (not a standard installation)

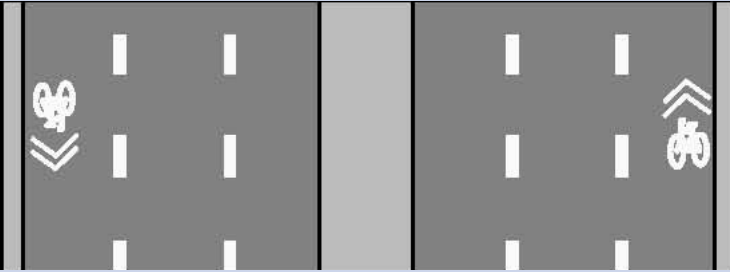
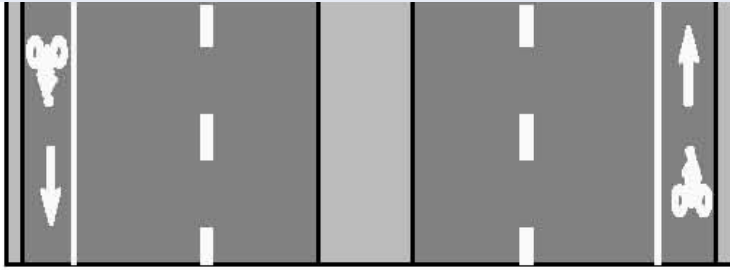
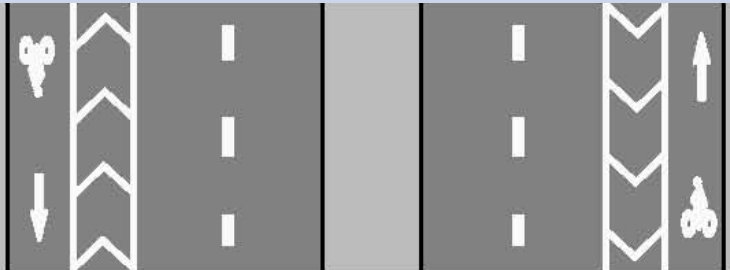


# Example Per Mile Costs

	4 Lane Divided Street	Standard Striping	Cost to Add Bike Lanes
Shared Bike Lane		\$871	\$17,400
Buffered Bike Lane		\$871	\$24,500

- ❑ Standard striping on divided roadways uses mostly “Skip” striping (10 foot stripe spaced 30 feet apart) and results in lower quantities
- ❑ Bike markings result in much higher lane line quantities since they require two solid stripes and bike legends and signs every 250 feet

# Example Per Mile Costs

	6 Lane Divided Street	Standard Striping	Cost to Add Bike Lanes
Shared Lane		\$1,742	\$17,400
5 foot Bike Lane		\$1,742	\$21,500
Buffered Bike Lane		\$1,742	\$24,500

# Implementation Scenarios

	Scenario	Increase to Annual Budget
1	Increase annual budget to add bike lanes during routine striping maintenance	\$3.9 M
2	Trade maintenance striping miles for bike lane miles	\$0 M
3	Increase annual budget to add 10-20 bike miles per yr	\$174 K-\$490 K
4	Increase annual budget to add bike markings citywide over the next 10 years	\$1.58 M

# Implementation Scenarios

- ❑ Scenario 1 – Add bike lanes during routine striping maintenance
  - **\$3.9 M** additional funding required per year to add bike markings and signs while striping street segments with low-visibility stripes
  - Only portions of routes will be completed leaving bicyclists without guidance or protection when striped/signed portion ends
  - No cost savings by simultaneously striping bike lanes with standard lane lines
    - Contractor charges by linear foot with no mobilization fee
    - Markings for legends and cross-hatching are installed with different machines



# Implementation Scenarios



## Scenario 2 – Trade maintenance striping miles for bike lane miles

- Trade miles of bike lanes for miles of lane line striping and maintain \$727K budget
- The disproportionately high cost of bike markings quickly reduces miles funded for standard lane line striping

Examples of Bike Mile Increases	Resulting Miles For Maintenance Striping
Existing Budget - 0 miles of bike markings	322
Add 10 miles of Shared Lanes	245
Add 10 miles of 5' Bike Lanes	227
Add 10 miles of Buffered Bike Lanes	214
Add 20 miles of Shared Lanes	168
Add 20 miles of 5' Bike Lanes	132
Add 20 miles of Buffered Bike Lanes	105

# Implementation Scenarios

- Scenario 3 – Increase current budget to add 10 to 20 miles of bike routes year

Examples of Bike Mile Increases for different facilities	Standard Striping (miles)	Bike Striping (miles)	Added Cost to Budget
Existing Budget (1)	322	0	\$0
Add 10 miles of Shared Lanes	322	10	\$174 K
Add 10 miles of 5' Bike Lanes	322	10	\$215 K
Add 10 miles of Buffered Bike Lanes	322	10	\$245 K
Add 20 miles of Shared Lanes	322	20	\$348 K
Add 20 miles of 5' Bike Lanes	322	20	\$430 K
Add 20 miles of Buffered Bike Lanes	322	20	\$490 K

(1) Existing budget for Lane Line Striping = \$727K

# Implementation Scenarios

- ❑ Scenario 4 – Increase annual budget to add bike markings citywide over the next 10 years
  - \$15.8 M = Total Bike Plan implementation cost with signage and engineering
  - Annual Cost of 10 years = \$1.58 M
    - Add approximately 80 to 100 miles per year depending on cost of facility types in each implementation phase
    - Bike route miles implemented using phases defined in Bike Plan

# Future O&M Costs

- ❑ Ideal annual striping budget to properly maintain stripes for all modes of transportation
  - \$6.5 M will be required annually to keep vehicle lane lines, crosswalks and bike markings visible (**once entire bike system is in place**)
    - Vehicle and crosswalk striping
      - \$727 K = **Current** annual maintenance for vehicle lane lines and crosswalk markings
      - \$3.3 M = **Ideal** budget to keep vehicle lanes lines and crosswalks visible (using a 3 year average striping life)
    - Bike lane striping
      - \$0 = **Current** annual budget
      - \$3.2 M = **Ideal** budget to keep bike markings visible once entire bike route system is in place (using 4 yr. average bike marking life)



# Actions Required Prior to Bike Route Implementation

1. Identify funding
2. Public meetings and amendment to Thoroughfare Plan if the bike markings will change street operations along the route
3. Public meetings and notification for routes not on Thoroughfare Plan

Note: Presentation today on Thoroughfare Plan

# Department of Street Services

Questions / Comments?