



Houston's Drainage System



Status of progress since
Tropical Storm Allison

May 18, 2009

Michael S. Marcotte, P.E.,
DWRE, BCEE, Director



Today's Agenda



- City's Role
- April 27-28, 2009 Event
- Flooding Complaints since TS Allison
- Operations & Maintenance Update
- Updated Regulations
- Local Drainage Projects
- Capital Improvements
- Regional Detention Program
- Future CIP Prioritization
- Community Rating System



City of Houston Role



- Establish Level of Service and Design Criteria
- Current Design Standards (2005 Revisions)
 - Pipes carry 2-year storm (1-2" of rainfall in one hour)
 - Street Right-of-Way to hold and convey 100-year storm (4-5" in one hour)
- Build and Maintain Improvements
- Permit and Regulate Development
 - Both Public and Private
 - Citywide standards
 - Floodplain regulations



City of Houston Role



- Comply with FEMA requirements to participate in the National Flood Insurance Program
- Participate in the Community Rating System
- Flooding & Drainage Committee
 - Stakeholder Advisory Group
- Partner with other entities to address flooding on a regional bases



April 27-28, 2009 Event



- Ground saturated from previous rains
- Heaviest rainfall centered over Addicks Reservoir and Buffalo Bayou
 - 2.9 inches in 30-minutes at Addicks Dam
 - 4.2 to 4.8 inches in 60-minutes over Addicks, Upper Brays Bayou and Upper Buffalo Bayou
 - Heaviest rainfall in this reach of Buffalo Bayou since before 1980 (extent of detailed records)
 - Estimated higher than 1% probability (100-year) event on Buffalo Bayou at BW 8 and over Addicks Reservoir



April 27-28, 2009 Event



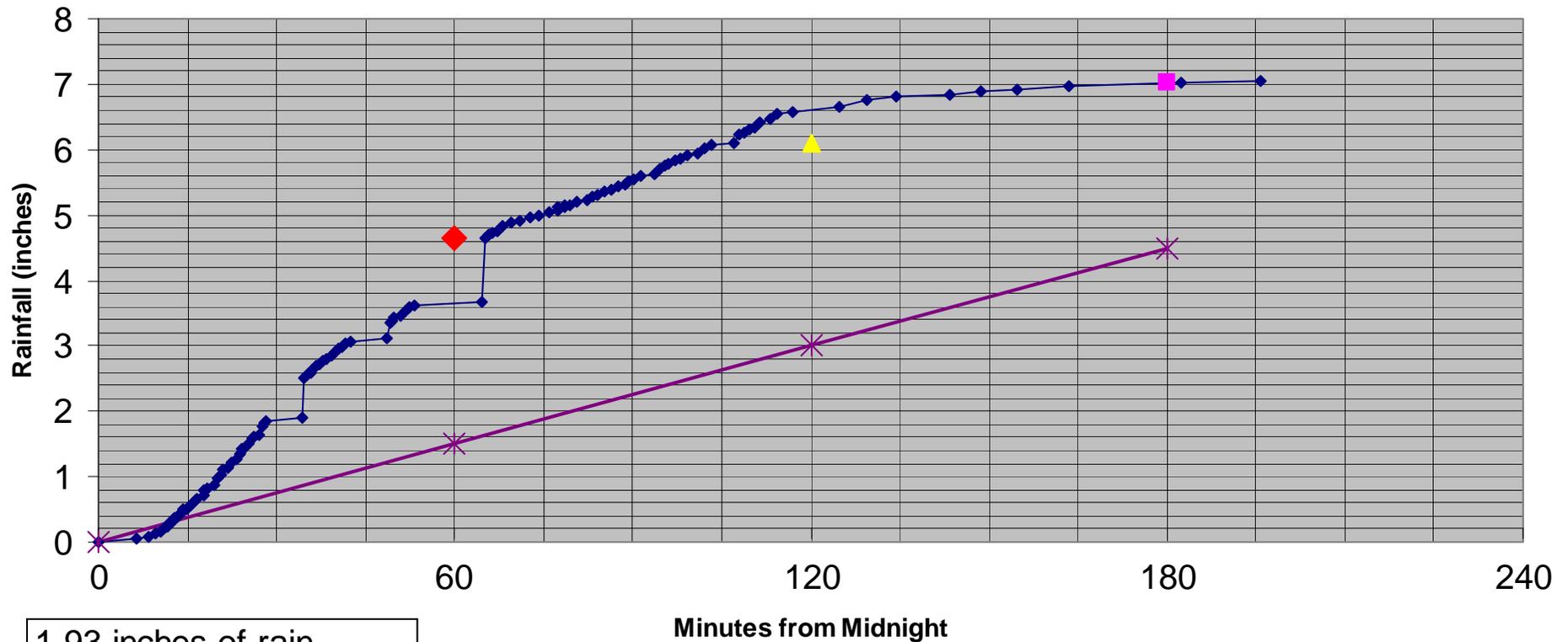
- 4th Largest number of flooded homes
 - TS Allison (June 2001) – 73,000
 - June 19, 2006 – 3370
 - October 1994 – 3248
 - April 28, 2009 – approximately 2200
 - October 2002 - 1999
- Homes previously bought-out that would have flooded (Harris County)
 - White Oak Bayou – estimated 900 homes
 - San Jacinto River – estimated 400 homes



Rainfall versus Design Capacity



4/28/09 Storm
Buffalo Bayou at Beltway 8 Rain Gage

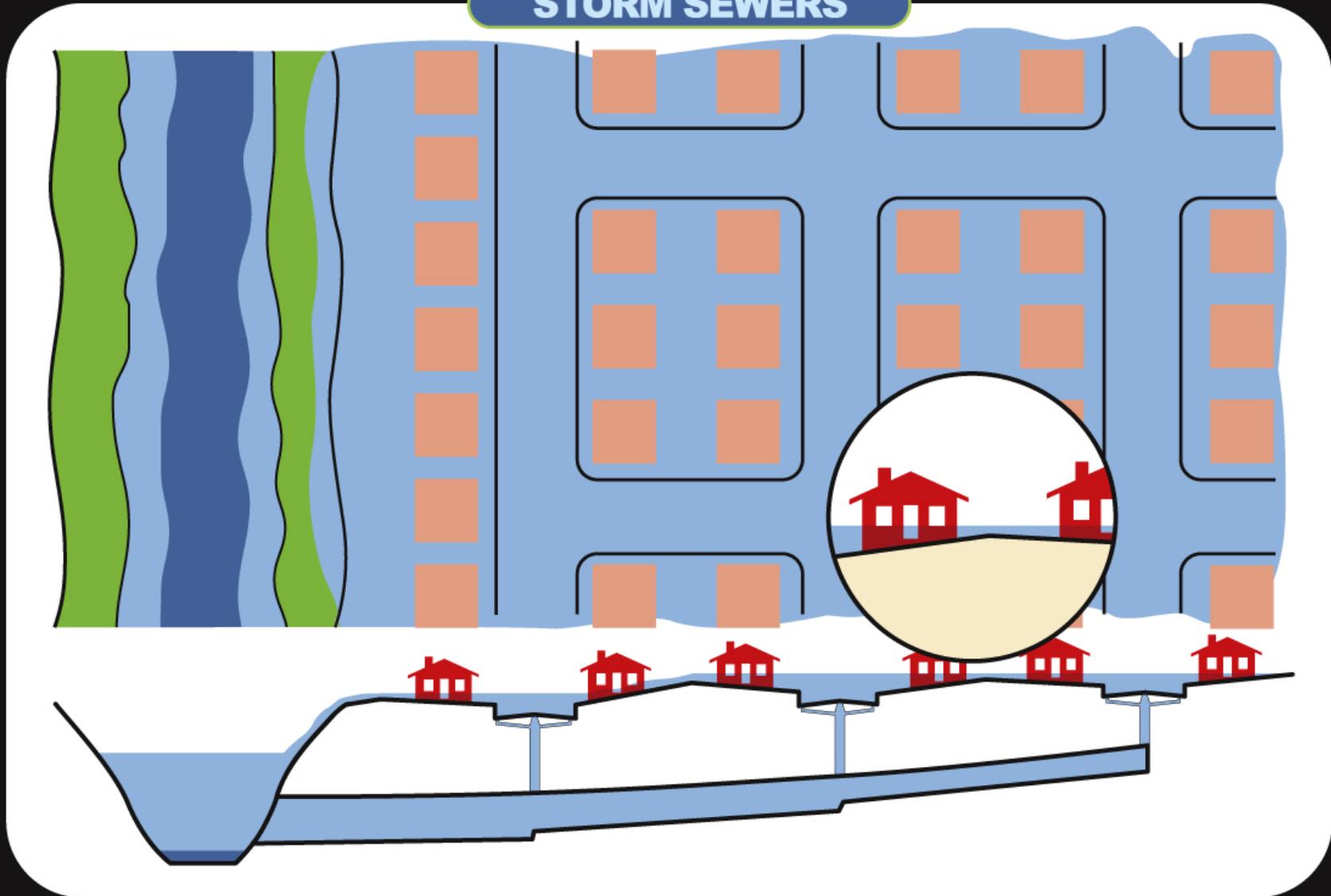


1.93 inches of rain
between 6 pm &
midnight on 4/27/08

- 4/28/09 storm
- 100-year, 1-Hour
- 100-Year, 3-Hour
- 100-Year, 2-Hour
- 2-year Design

Ponding & Sheet Flow Flooding

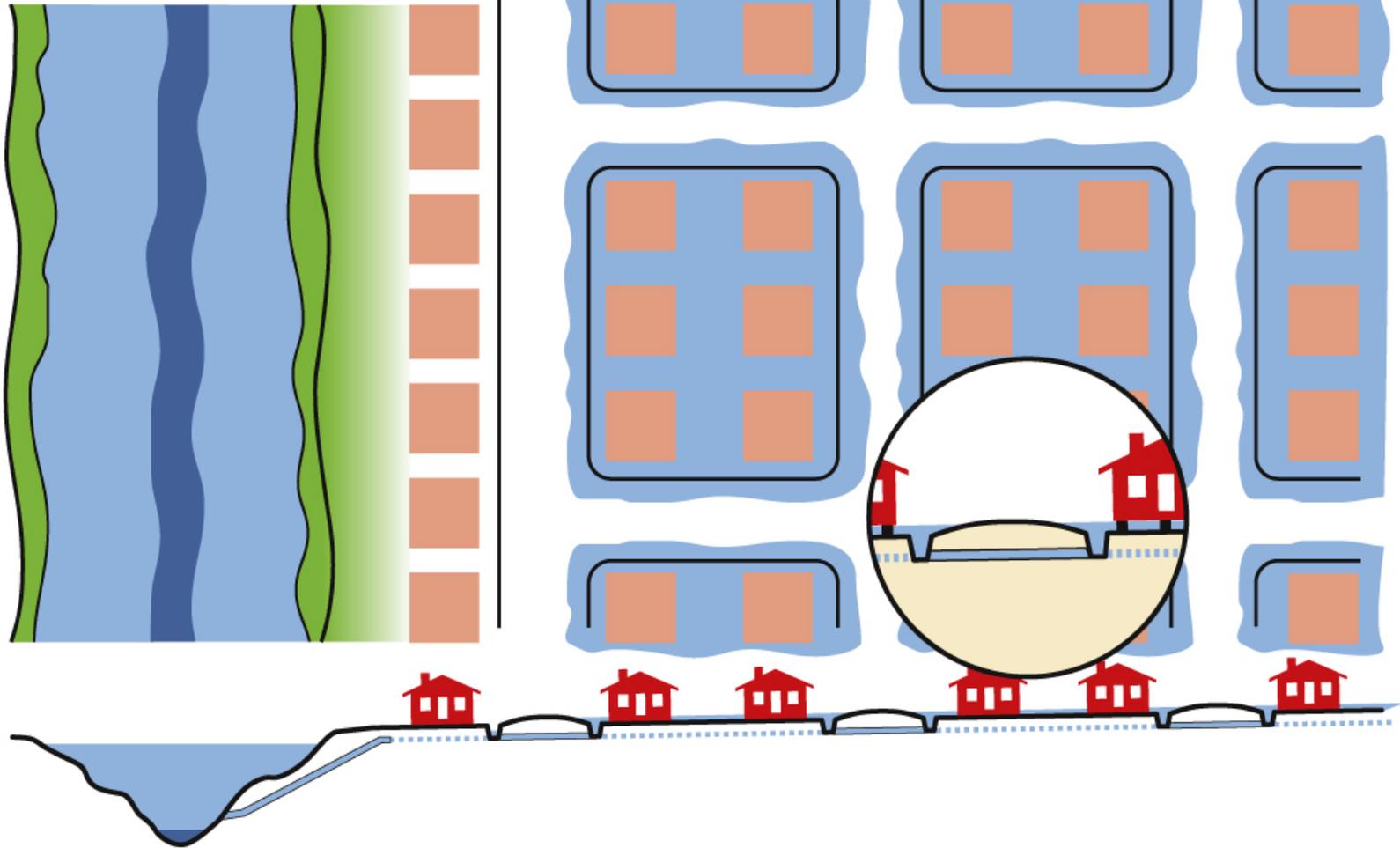
STORM SEWERS



FLOODING FROM INTENSE LOCAL RAINFALL
(Longer Duration)

Ponding & Sheet Flow Flooding

ROADSIDE DITCHES



FLOODING FROM INTENSE LOCAL RAINFALL
(Longer Duration)

Legend

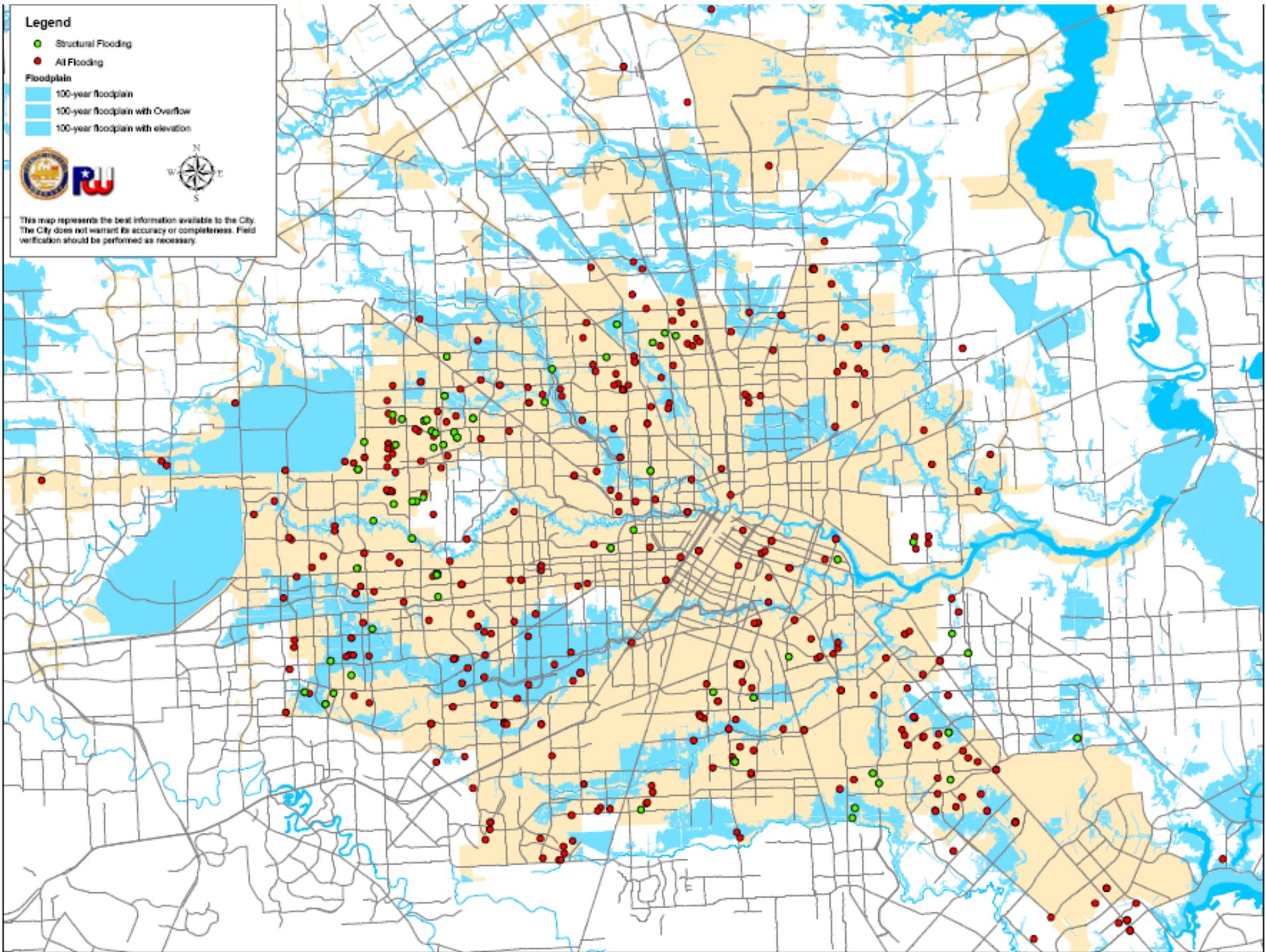
- Structural Flooding
- All Flooding

Floodplain

- 100-year floodplain
- 100-year floodplain with Overflow
- 100-year floodplain with elevation

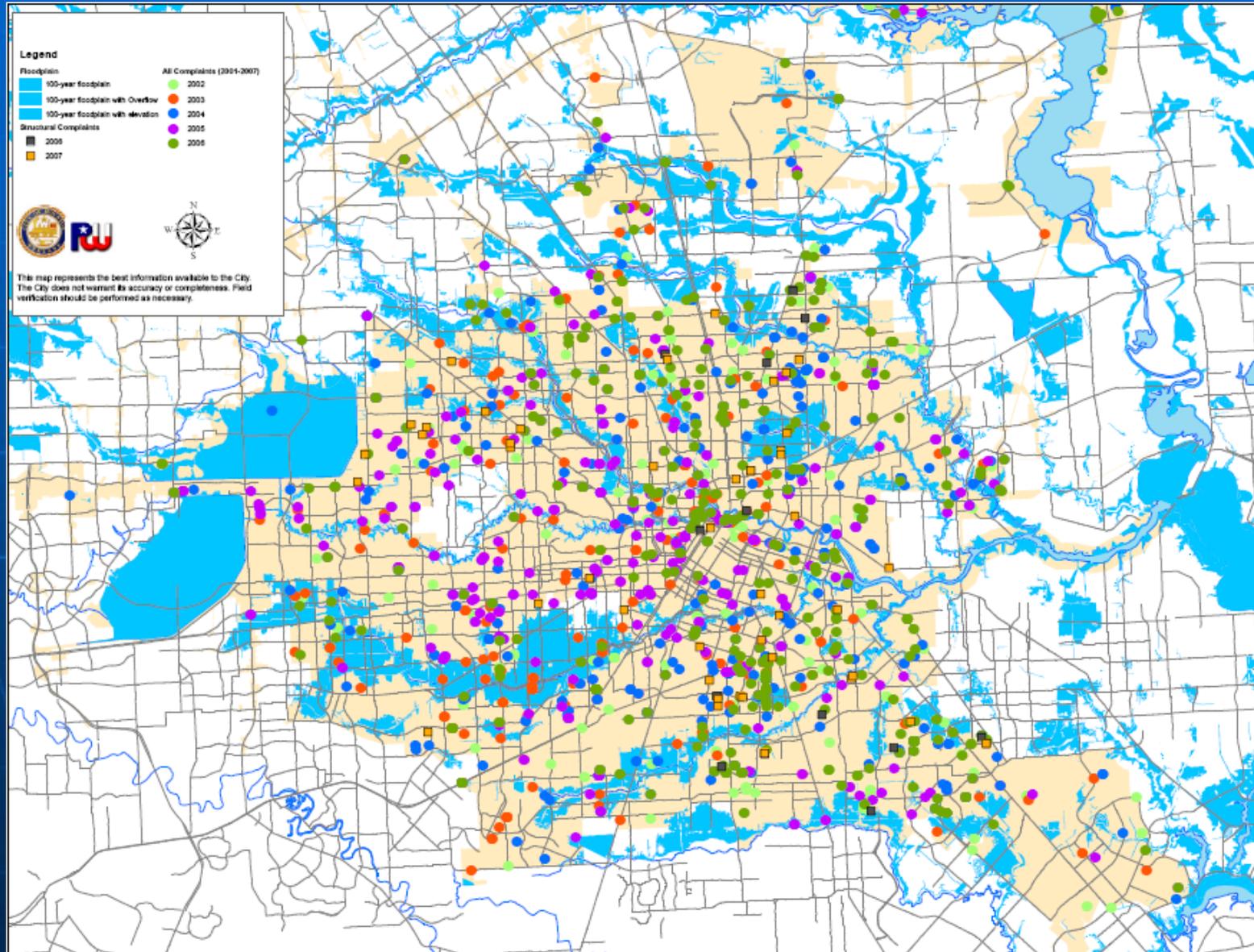


This map represents the best information available to the City. The City does not warrant its accuracy or completeness. Field verification should be performed as necessary.





2002-2007 Flooding Complaints





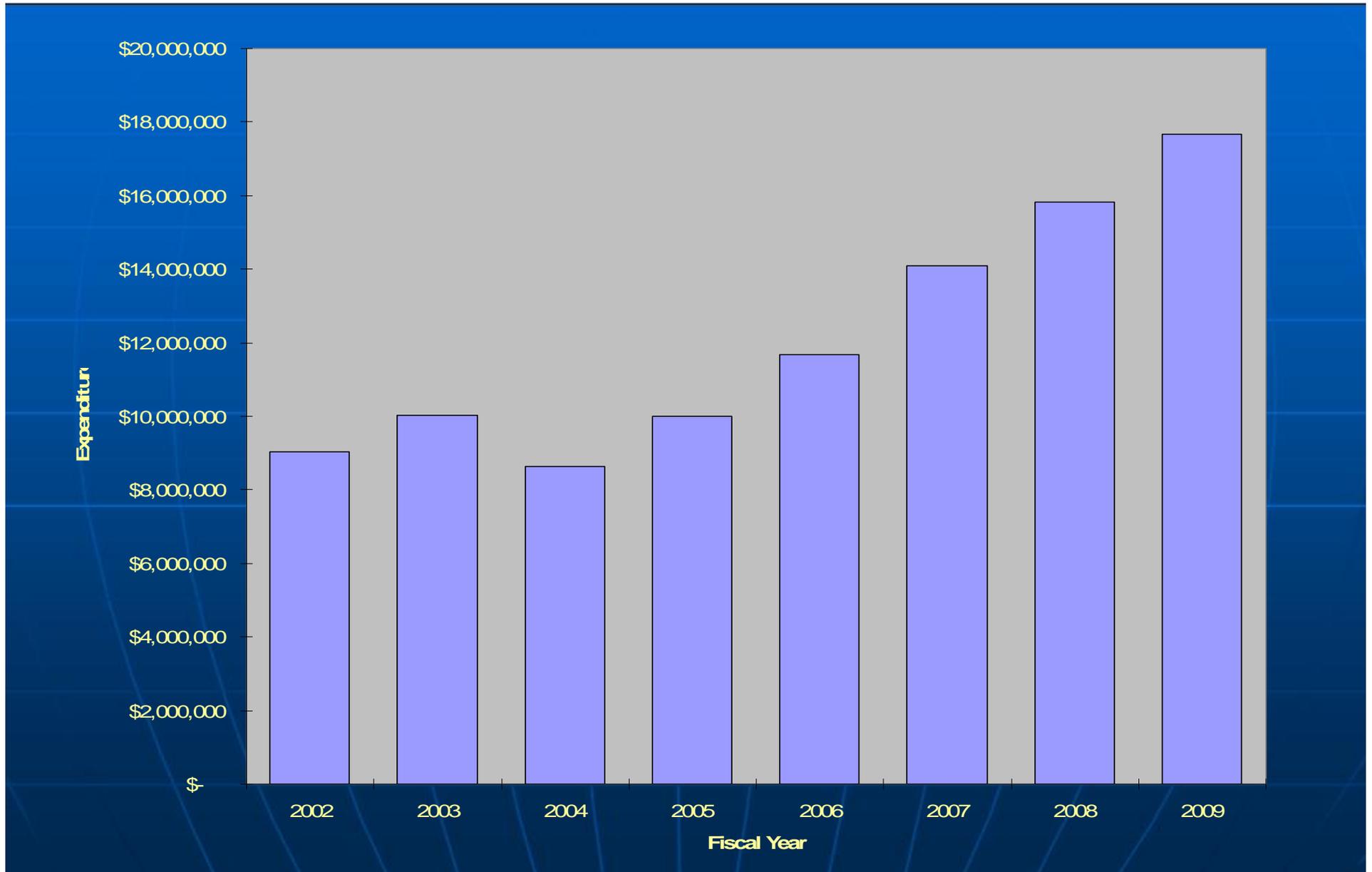
Operations & Maintenance



- Inspect, desilt and remove blockages
 - Inlets & Manholes (~60,000/year)
 - Roadside Ditches/Culverts (>500 miles/year)
 - Off-Road Ditches (~245 miles/year)
- Mowing (~11,000 miles/year)
- Televise and Evaluate Storm Sewer Lines (~240 miles/year – new program in FY2009)
- Street Sweeping of Major Thoroughfares (>25,000 miles/year)

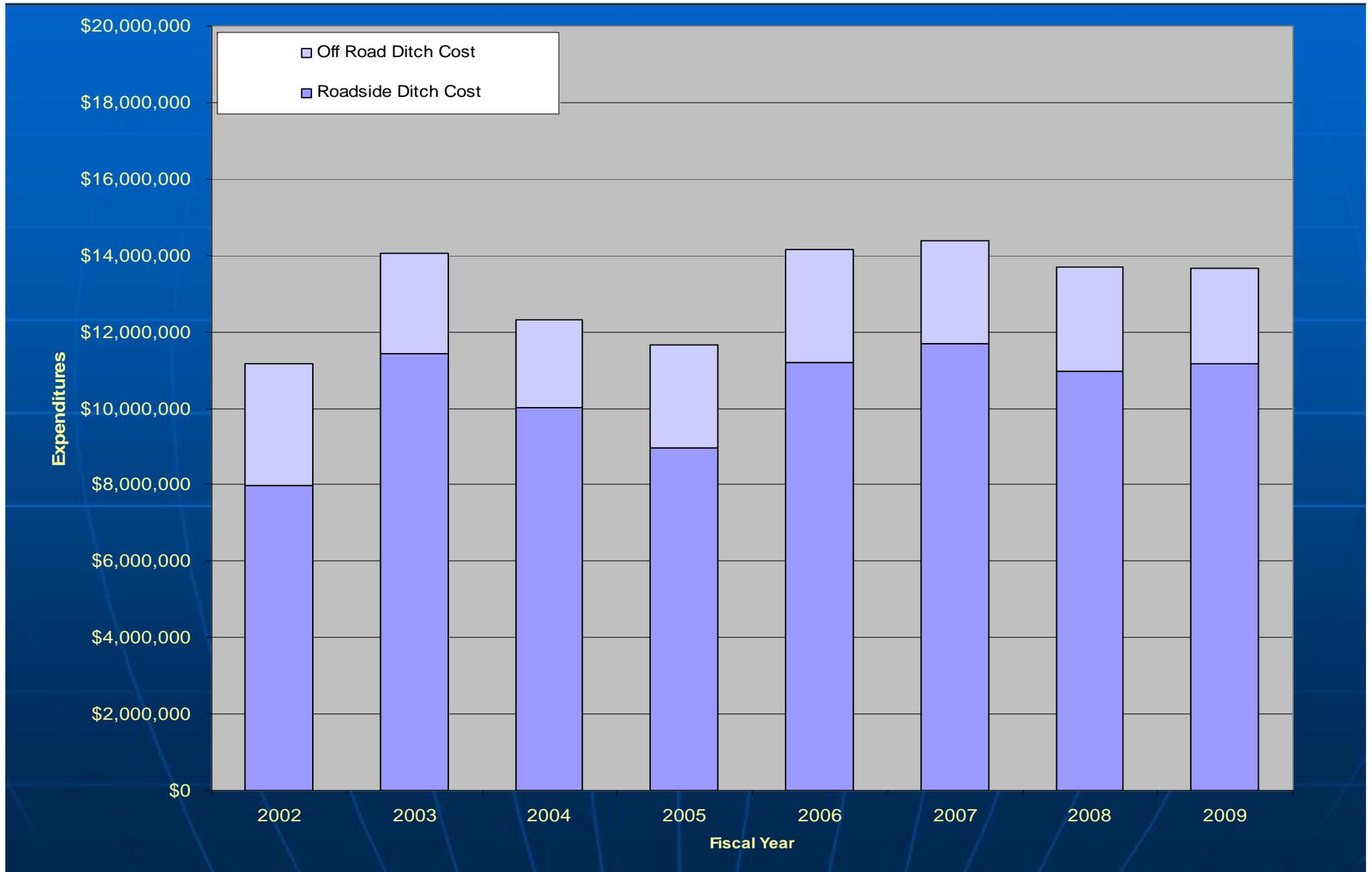


Storm Sewer Maintenance





Ditch Maintenance





Updated Regulations



- Chapter 19 – Special Flood Hazard Areas
 - Performance requirements in Floodway
 - Consider Conveyance as well as Storage in the Floodplain
 - Permits now expire if not constructed
- Chapter 42 - Open Space Ordinance
 - Set aside green-space for high-density development
 - Based on dwelling units
 - Can pay fee “in- lieu”



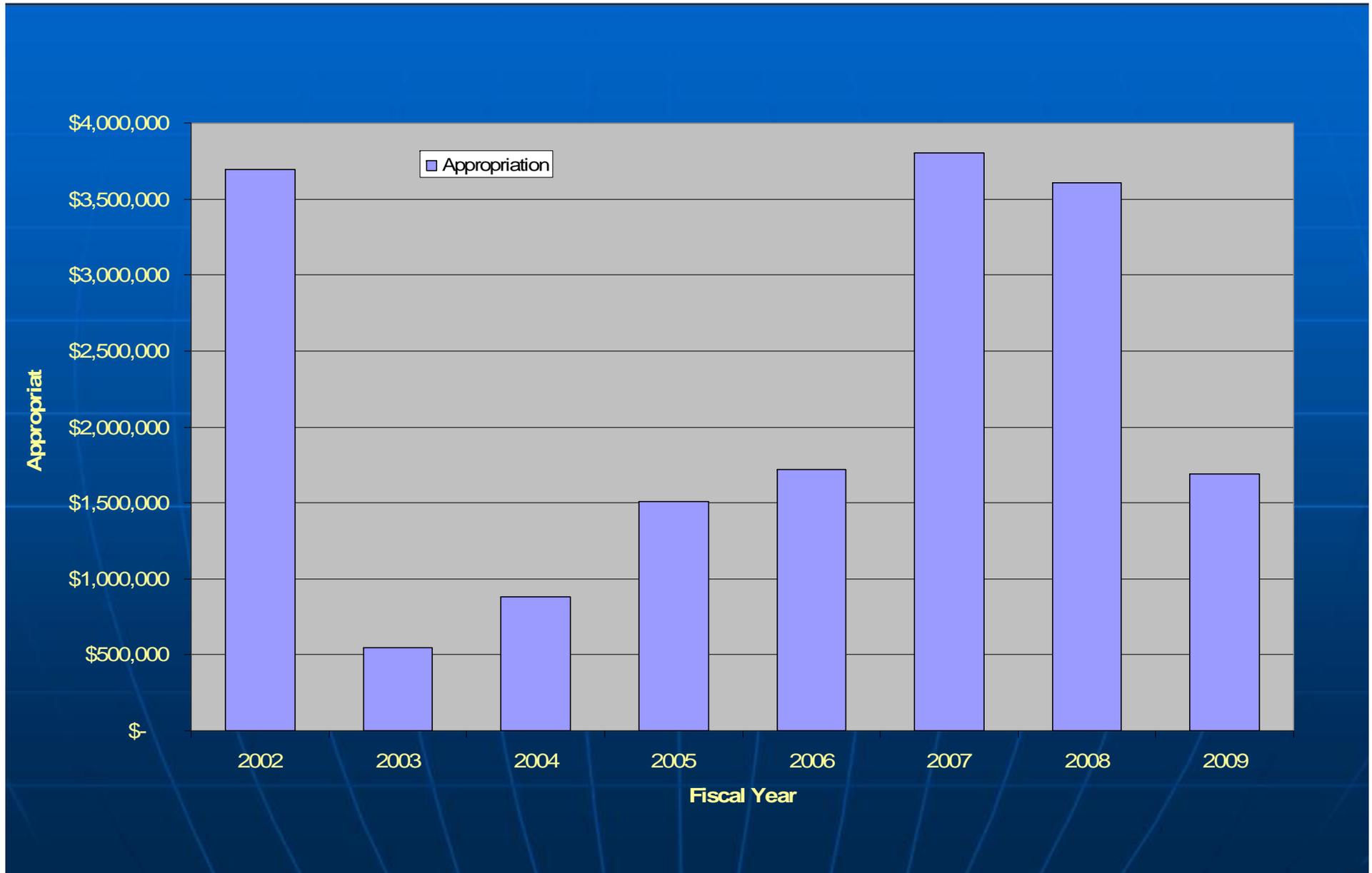
Local Drainage Projects



- Larger than routine maintenance
- Smaller than traditional Capital Improvement
- Shorter design and construction time frame
- Both City of Houston and outside contractors can perform projects



Local Drainage Projects





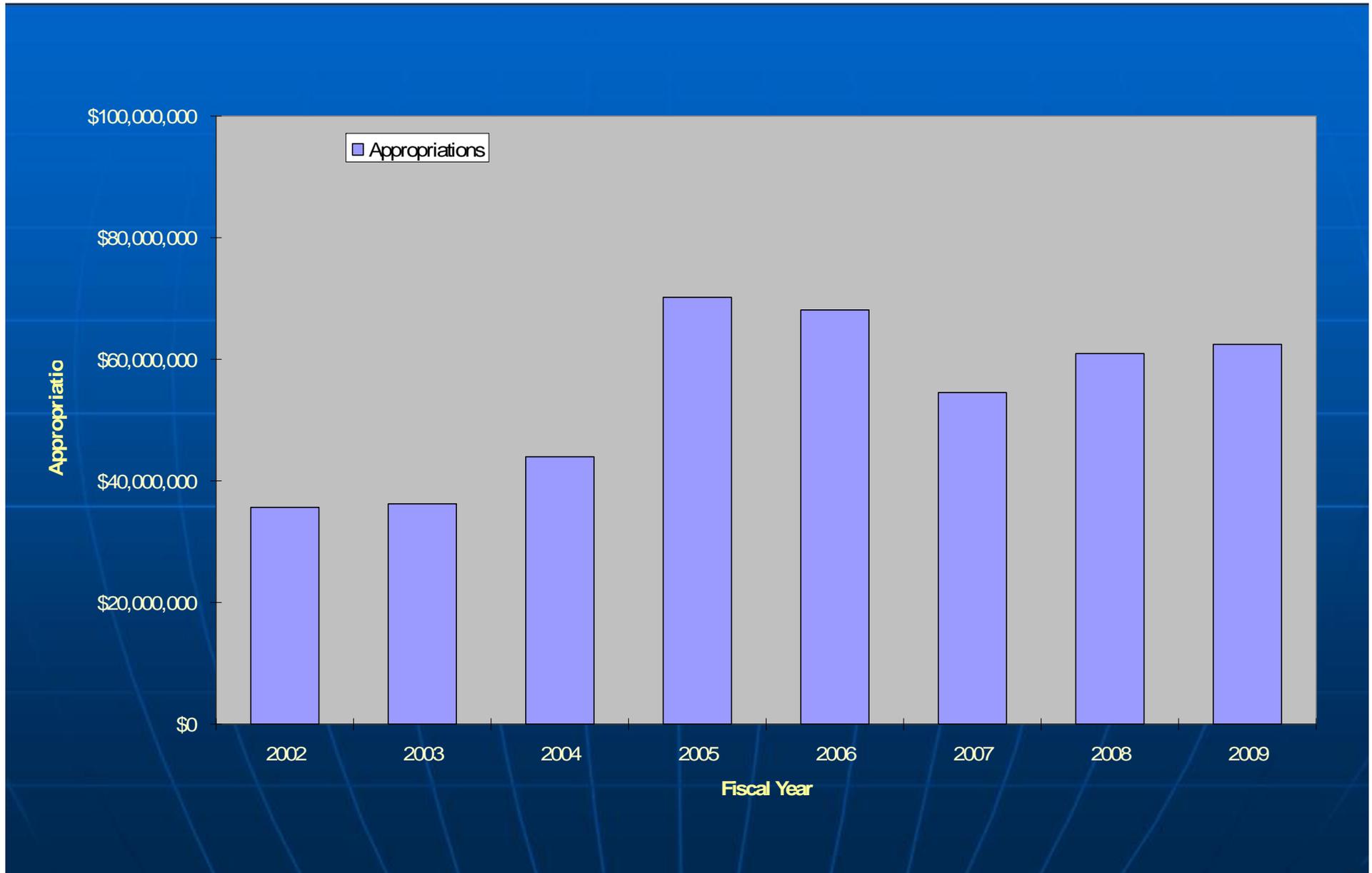
Capital Improvements



- Large storm sewer construction
 - Sections of subdivisions
 - Associated with Major Thoroughfare
 - Detention or Mitigation
 - Stormwater pump stations at underpasses
- Design usually lasts 1-2 years
- Construction generally lasts 1 -2 years
- Construct 8-10 large projects per year

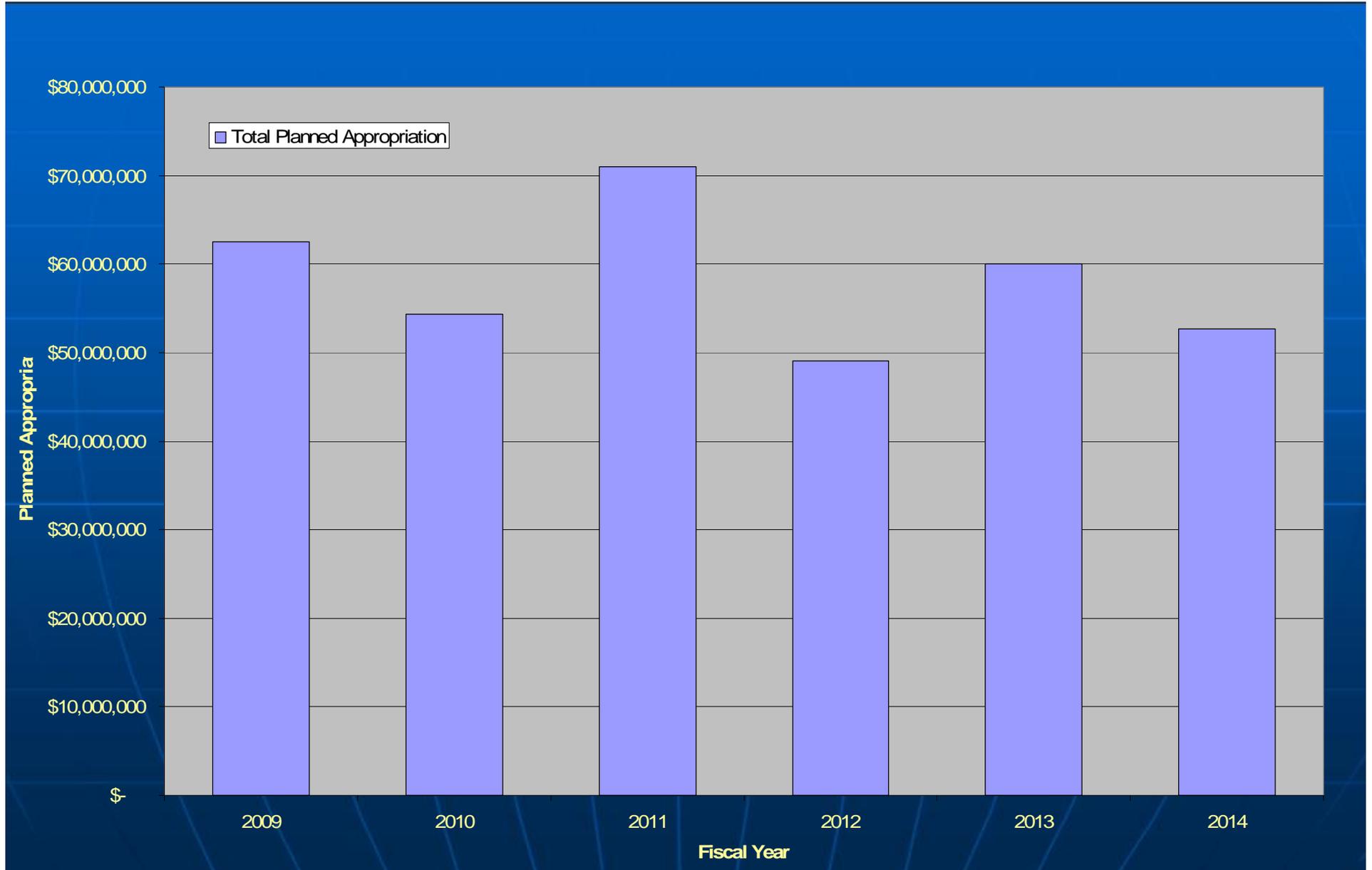


Capital Improvements History





Capital Improvements Planned

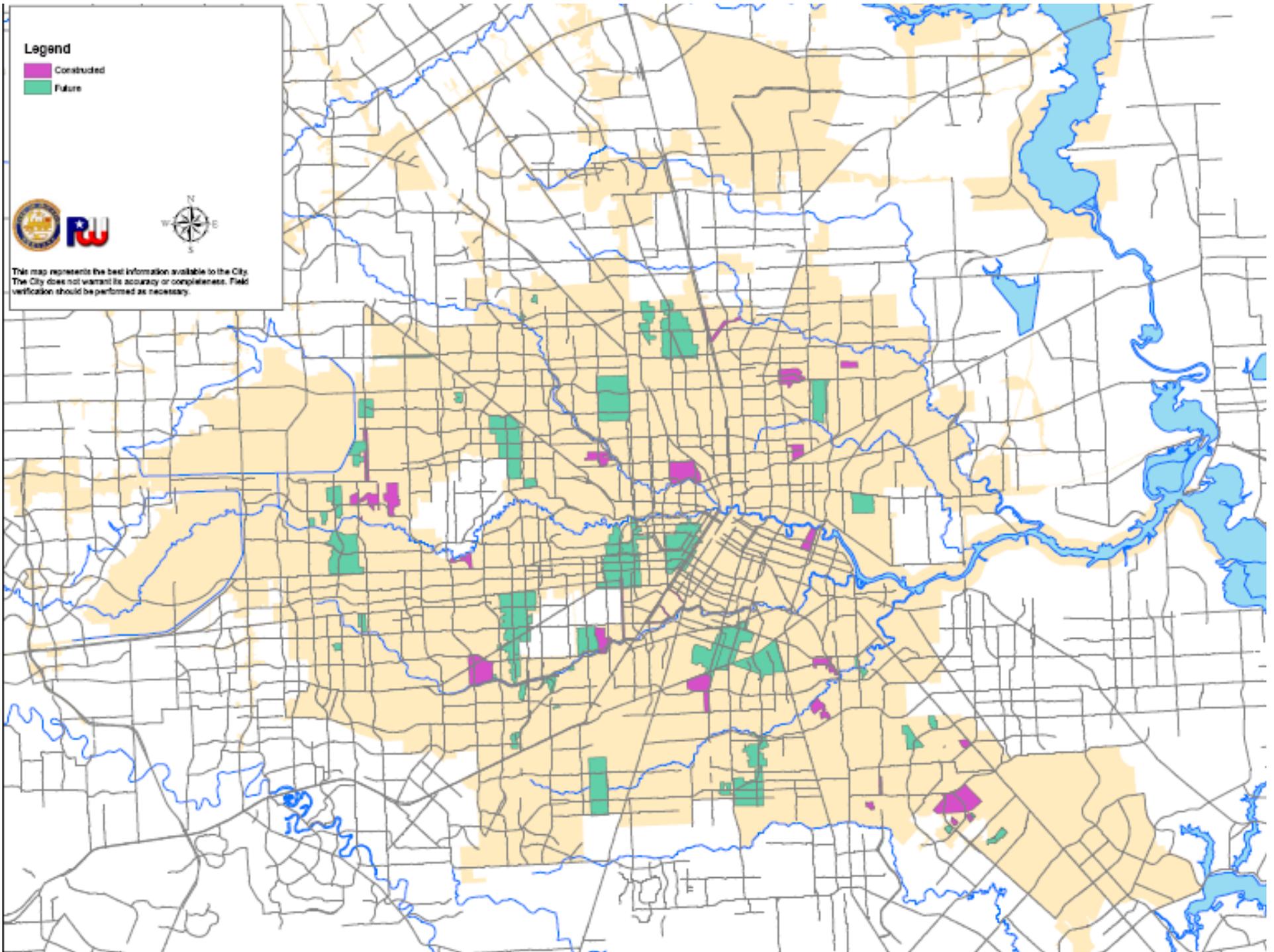


Legend

- Constructed
- Future



This map represents the best information available to the City. The City does not warrant its accuracy or completeness. Field verification should be performed as necessary.





Regional Detention Program



- Increase detention efficiency – larger basins on one site use less land than multiple basins at multiple sites
- Reduce maintenance costs
- Ability to address storm water quality as well as detention requirements
- Create large open space areas for other uses when detention volume is not being used



Keith Wiess Park Detention Basin



- More than 900 acre-feet of detention by developing 112 of underutilized park space
- Partnership with Harris County Flood Control District



Regional Detention



- Brays Bayou
 - Meyer Basin – 200 acre-feet existing
- Halls Bayou
 - Up to 1,500 acre-feet
 - Links up to 5 City Parks
- Hunting Bayou
 - Up to 1,000 acre-feet
- Greens Bayou
 - Up to 1,500 acre-feet
- White Oak Bayou
 - Up to 1,000 acre-feet
 - Utilize existing buyout areas and former golf course



Future CIP Prioritization



- Incorporate additional prioritization criteria:
 - Overland flooding paths
 - Emergency access routes and critical facilities
 - Future Development and Re-Development
 - Water quality and habitat enhancement
- Continue to update known flooding problems to guide project development
- Seek leveraging opportunities with related CIP projects (both COH and other agencies)



Community Rating System



On October 1, 2009 – City of Houston is a Class 5 Community

- CRS recognizes and encourages floodplain management activities that exceed the minimum standards of the NFIP by:
 - Reducing Flood Losses
 - Facilitate Accurate Insurance Ratings
 - Promote the Awareness of Flood Insurance

City of Houston Policy Summary:

- 140,000 total policies
- 50,000 SFHA policies
- \$2M savings per 5% reduction for SFHA policies
- \$10M annual premium savings for Class 5 Rating

| Premium Reduction | | |
|-------------------|-------|----------|
| Class | SFHA* | Non-SFHA |
| 10 | 0 | 0 |
| 9 | 5% | 5% |
| 8 | 10% | 5% |
| 7 | 15% | 5% |
| 6 | 20% | 10% |
| 5 | 25% | 10% |

* Special Flood Hazard Area

