

Getting the Locals to Go Along

Keys to Tulsa's Successful Floodplain Management



Rock River Coalition

Sept. 17th, 2015

Presented by:

Ronald D. Flanagan, CFM

Principal Planner

Flanagan & Associates, LLC

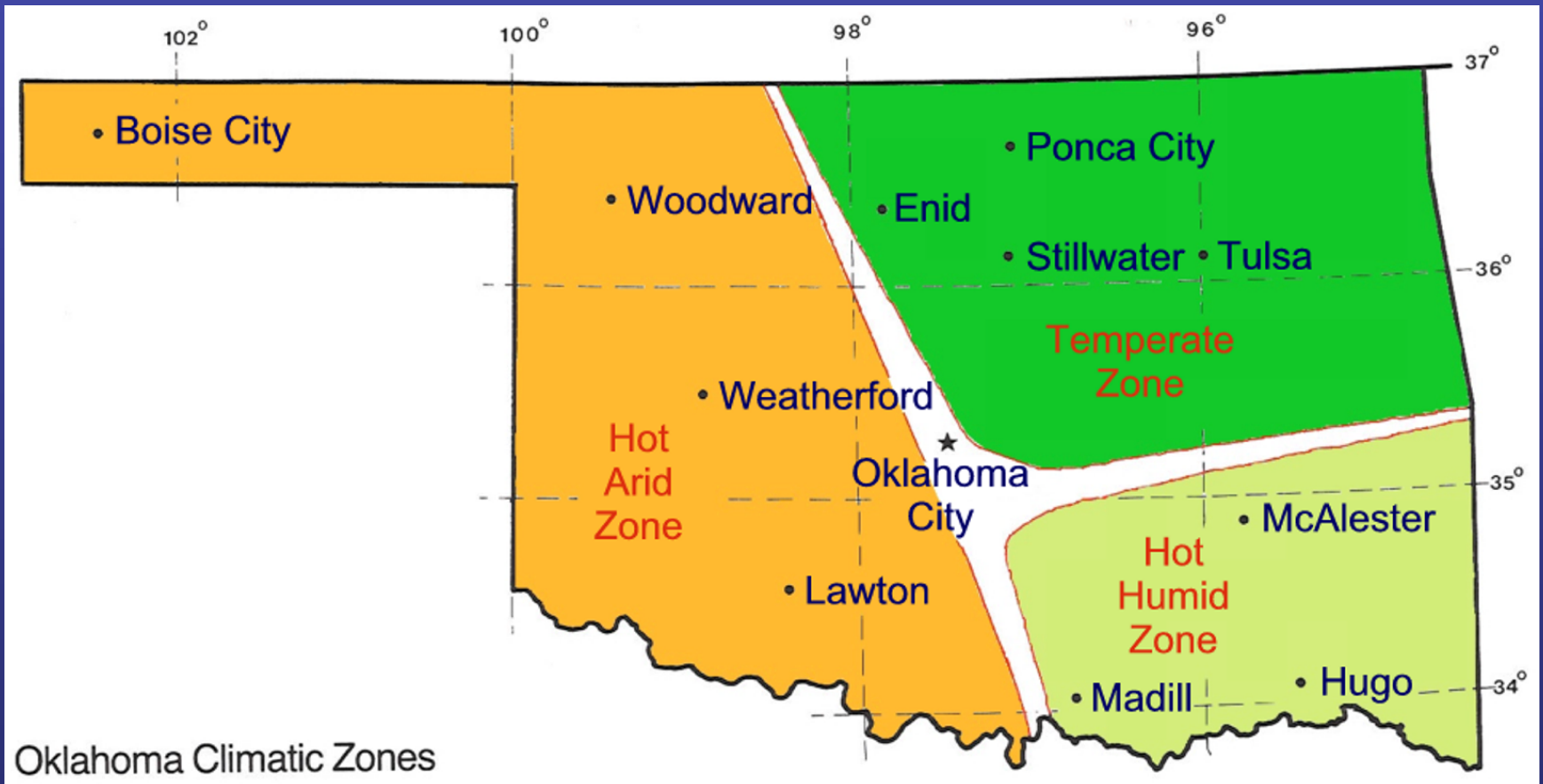
**Land-Use & Natural Hazards Planning Consultants
Tulsa, Oklahoma**

The Keys to Tulsa's (Anybody's) Successful Floodplain Management Program:

- 1. History - 1898-1970**
- 2. Events/Disasters**
- 3. Media / Public Info. Ed.**
- 4. Citizen Involvement**
- 5. Local Champions**
- 6. Partnerships**
- 7. Vision / CRS**
- 8. Programs / Implementation**
- 9. Higher Regulatory Standards**
- 10. Funding- Utility Fee**

History

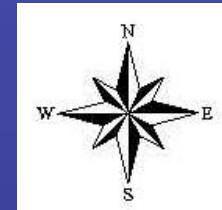
1898 - 1970



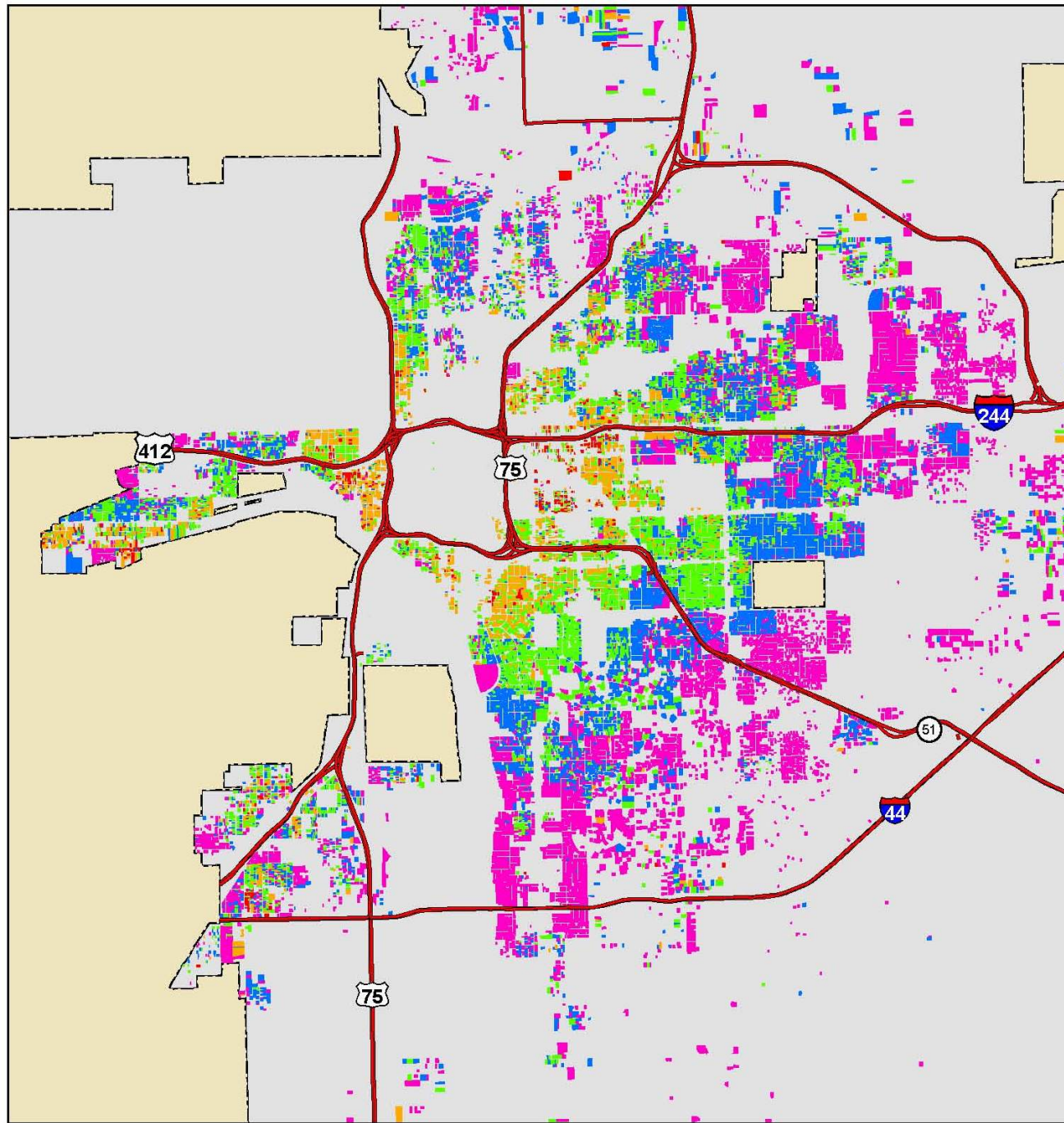
Oklahoma is at the Convergence of the Three Climatic Zones, Making for Extreme Weather Patterns



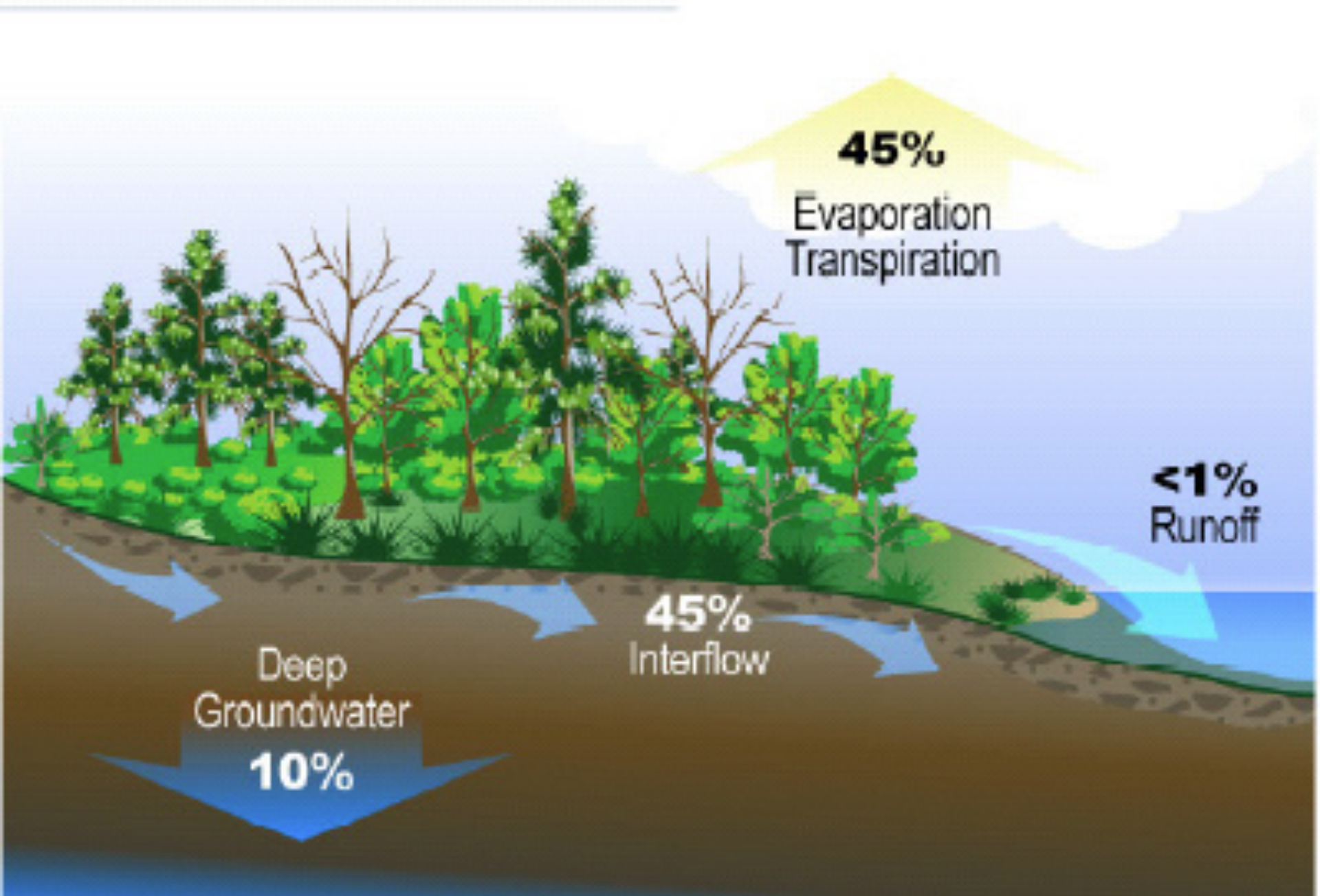
May 23, 1908



Tulsa's Development Pattern



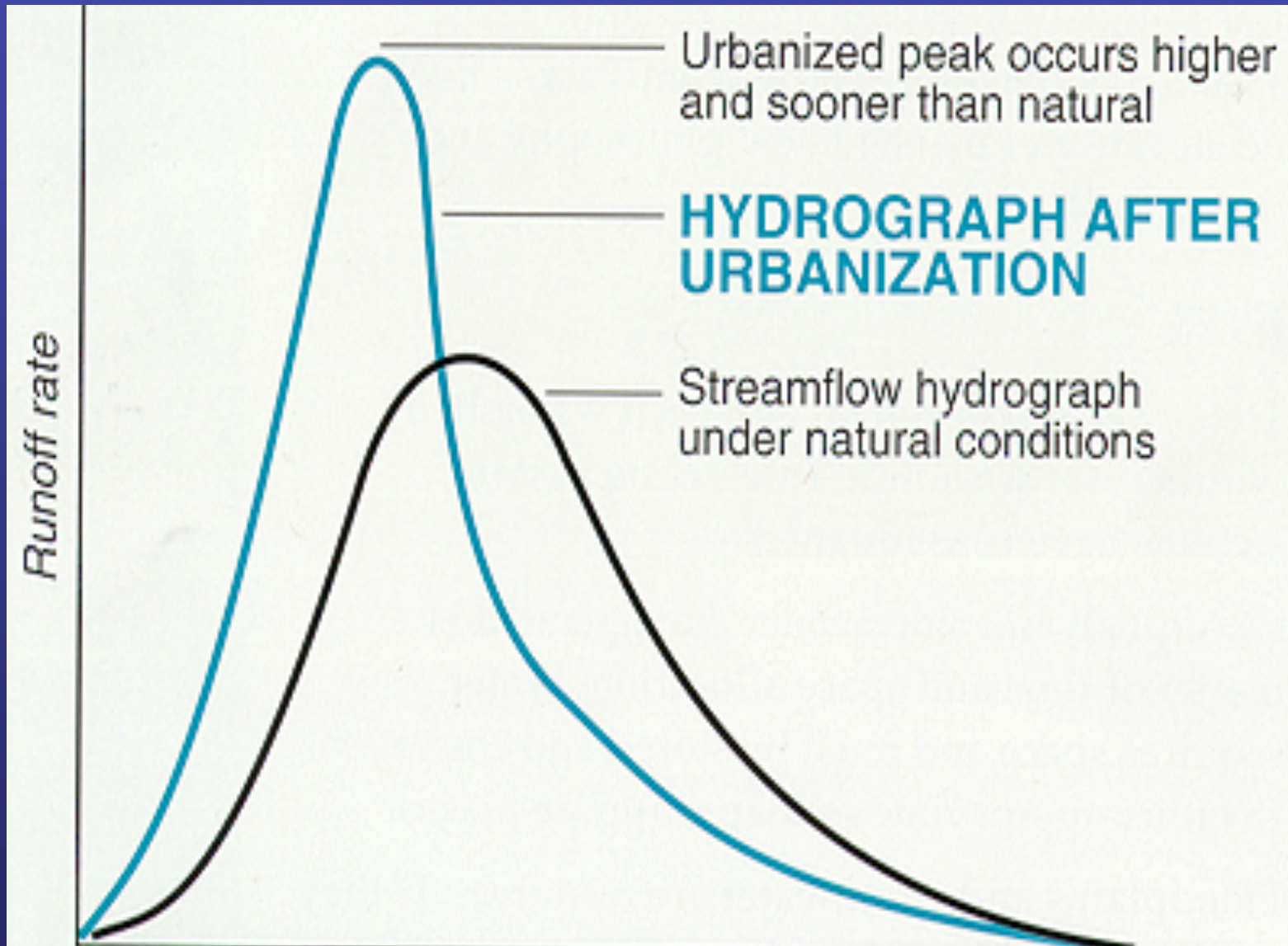
LEGEND	
Year Built	
1901-1911	1933-1942
1912-1921	1943-1952
1922-1932	



Rainwater Runoff Under Natural Conditions



Stormwater Runoff under Urbanized Conditions



Urban Hydrograph



The Promise of Urbanization

Arkansas River Flooding

1908

1923

1943

1957

1959







Typical Urban Drainage Channel



Concrete-Lined Single Purpose Urban Drainage Channel

Events

The 1970's



Flooding Every 2 To 4 Years



\$163,000 Damages

Tulsa Joins The NFIP

Mother's Day Flood of 1970



**\$18 Million Damages
More Than 120 Injured**

June 8, 1974 Flood



Three Killed!

\$40 Million Damages

Memorial Day Flood Of 1976

Media

**Communications,
Public Information &
Education**

THOUSANDS FLEE AREA HOMES



—World Staff Photo by G. LeRoy Reed

Many Evacuate Brookside, Garden City; More Rains Swell Oklahoma Streams

DAMAGE RUNS HIGH; RECORD CRESTS MOUNT

Many Roads Closed, Bridges Out; Worst Rampage on Cimarron

From World Wire Service
Floodwaters drove hundreds more Oklahomans from their homes Friday as new deluges fed rivers and streams, already swollen by torrential rains of 18 to 20 inches since Wednesday night.

Residents were evacuated from a half-dozen towns in the state Friday and jittery Tulsa braced for possibly its worst flood in history Saturday.

Damage ran into the millions and there seemed to be no stopping of the spring rains which brought an abrupt end to one of the state's worst droughts.

Seven persons have died in the flood. Three others, believed to be missing, were found while another man was reported missing.

Missing Located
Lokized near Hennessy were Dr. and Mrs. Charles Hobbs of Ringdasher, Earl Hamill, Lovell was reported safe at Hennessy.

The missing man is Roland Bullock, about 35, of near Lindsay. He fell into Turner creek, site of a flash flood near his home southwest of Hobbs. He

Arkansas Expected to Reach Peak Here Tonight; Some in Imperiled Region Resist Evacuation Pleas

By TRAVIS WALSH

More than 1,000 Tulsans moved to higher ground Friday and early Saturday as the debris-laden waters of the Arkansas river slowly rose toward a record crest expected to flood Garden City and much of Brookside.

Hundreds of others in the area classed as "critical" went optimistically to bed Friday night without making an attempt to move to safety.

The Arkansas was expected to reach the flood stage of 19 feet before dawn and crest at between 23 and 26 feet by 10 p. m. Saturday.

The reading at the 11th st. bridge at 12:20 a. m. Saturday was 16 1/4 feet. Forecast levels were for 22.5 feet by 6 a. m. and 24.5 by noon.

Sheriff Glenn Brown and Joe Morris, civil defense director, Friday afternoon began urging evacuation of Garden City and the section of Brookside generally between 36th and 51st st. and Riverside dr. and Peoria ave.

Some Friday night police estimated 25 per cent of the residents in the affected Brookside area had left their homes. They estimated about half the residents of Garden City had moved.

Less Unhappily Close
At midnight, rising waters in the Curtis creek area, north of the 51st st. bridge, loomed ominously close to the Garden City area and sheriff's officers early Saturday sounded sirens and loudspeakers in an effort to get the people to move out.

"Once the water gets into that area, even if the river has not gone out of its banks, we can't get any trucks in there," Sheriff

CD AND OTHER AGENCIES AID IN EMERGENCY

Red Cross, Firemen, Police, Guard Begin Flood Relief Work

By JOHN CLAYTON

Emergency evacuation efforts by the Civil Defense Administration in Tulsa—and coordinated agencies—were set in motion at 8 p. m. Friday for

School Authorities Pitch In

Large crews of volunteer workers moved rapidly at Bixby Friday afternoon at the city's high school to construct barricades keeping them from the building's basement where boilers are located. Efforts were directed by Ray Tucker,

superintendent of schools, and Ernest Garrett, school board president. Teachers and nearby residents pitched in to handle the necessary chore. (Related evacuation map, photos on Page 2 and stories, photo on Page 1, Sec. 2.)

Boy Rescued Alive After 23 1/2 Hours Buried in Well

Gary's Flood Area Flight DOCTORS SAY

Bixby Is Hoping for Best, Grimly Ready for Worst

By FRANK LESLIE

BIXBY, May 17—Oft-flooded residents of this lowland community were hoping for the best, but looking for the worst Friday as they prepared for the Arkansas' onslaught of flood



Ann Patton
Reporter
Author

**Assistant to the
Commissioners**

**Citizens
Involvement
&
Participation**



Citizen Leaders Converge on City Hall to Demand Action on Flooding Problems

Developers Vs Concerned Citizens

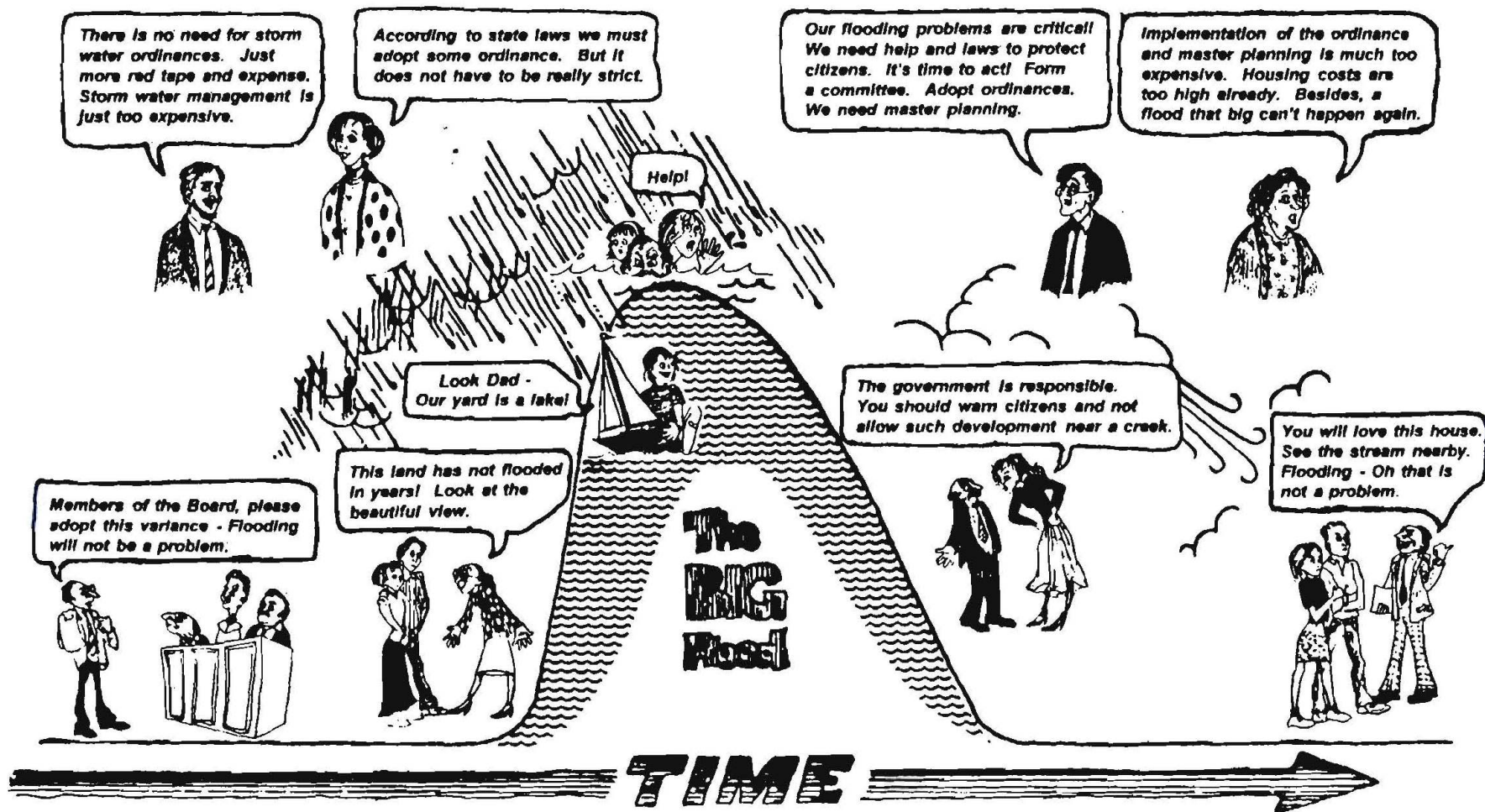


Figure 4-2 Citizen And Government Interest And Involvement Hydrograph

Flood Wars Of The 70's & 80's

Local Champions



**Stan Williams
&
Commissioner
Norma
Eagleton**

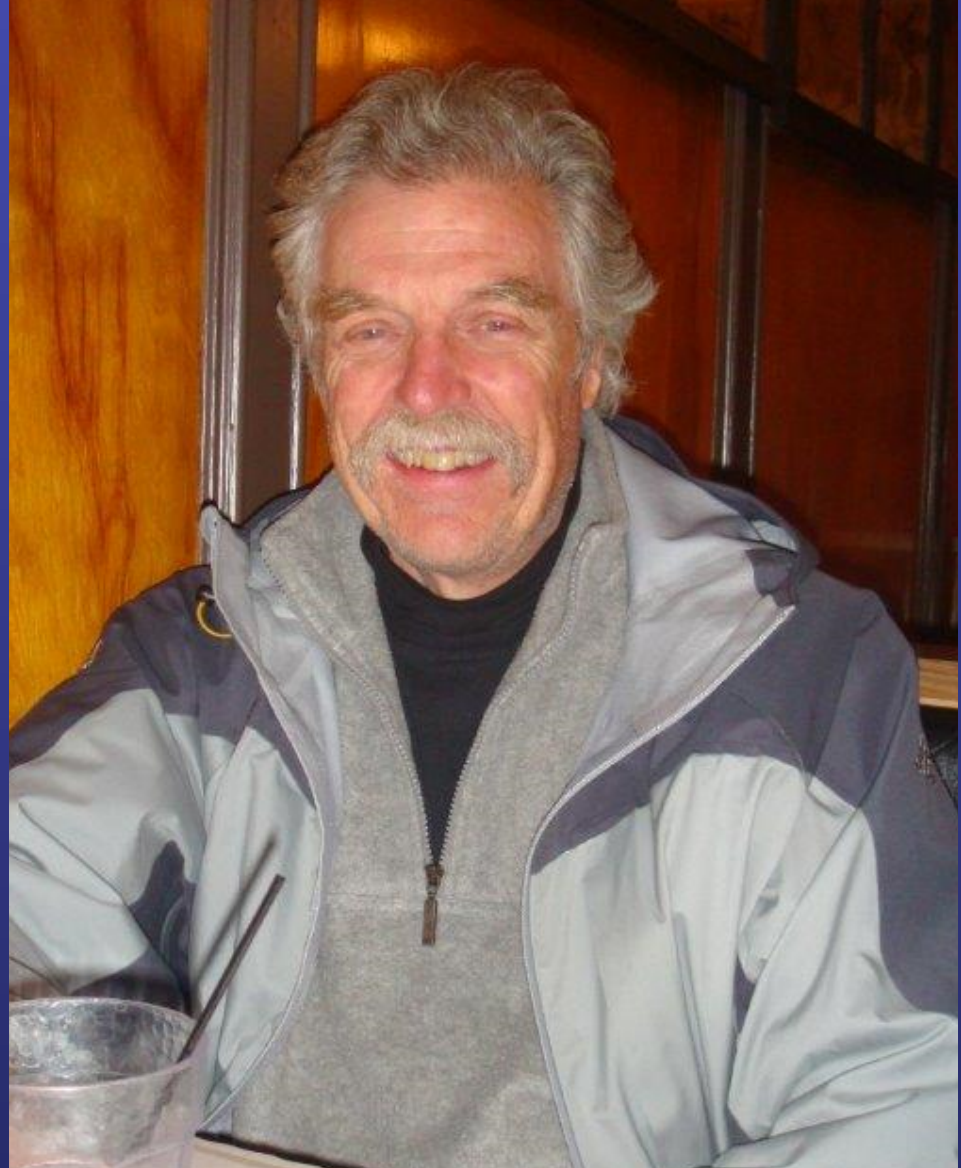


Honoring Charles Hardt, Tulsa's Floodplain Management Guiding Light

Partnerships



**Larry Larsen, Director,
Association of State Floodplain Managers**



Dr. Jon Kusler
Association of State Wetland Managers
A Lifetime of Service



OFMA & U.S. Army Corps of Engineers



ASFPM & U.S. Army Corps of Engineers



**Denver's Urban Drainage & Flood Control District,
Wright Water Engineers, Ann Patton**



**Commissioner Metcalfe & Gilbert White at
ASFPM**

What is Influencing the Trend of Increased Property at Risk

Current National Policy:

- Promotes intensification in risk areas**
- Ignores changing conditions**
- Ignores adverse impacts to existing properties**
- Undervalues natural floodplain functions**

TWO TYPES OF FLOODPLAIN

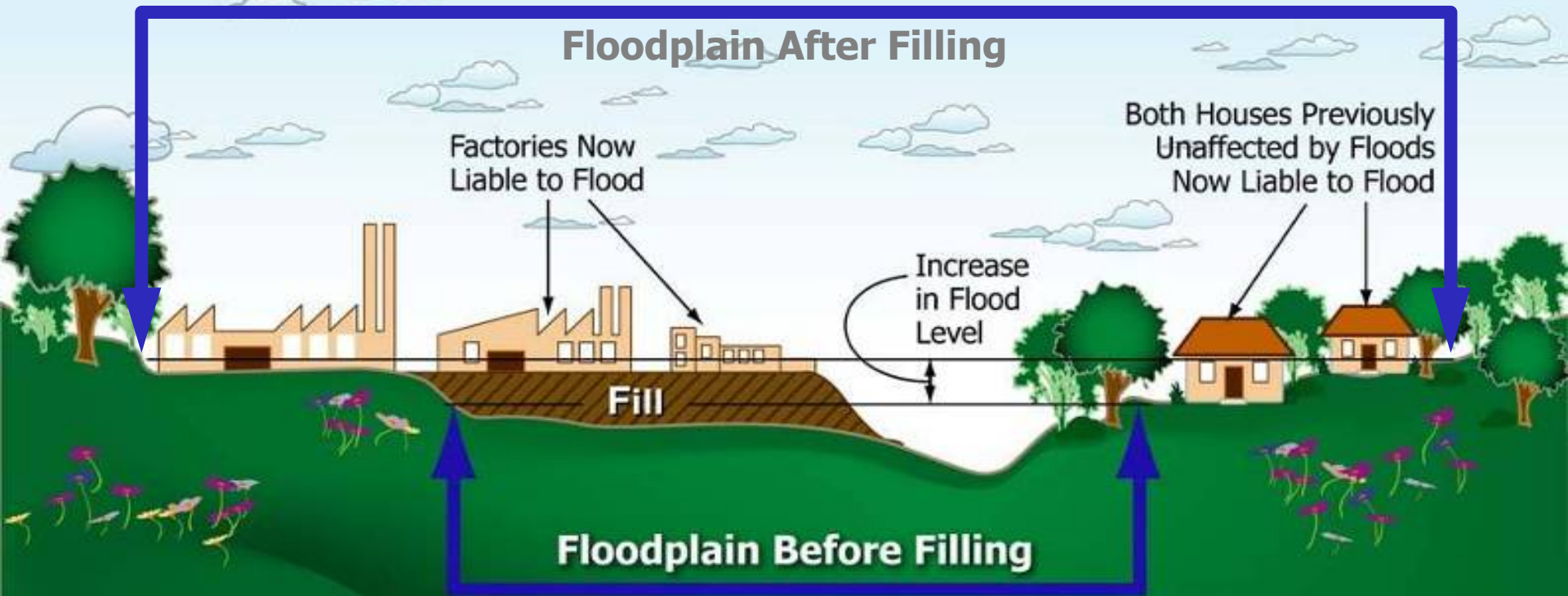
- **1. Natural**
 - Prevention
 - Preservation
- **2. Developed**
 - Remedy
 - Mitigation

DEVELOPED FLOODPLAIN:

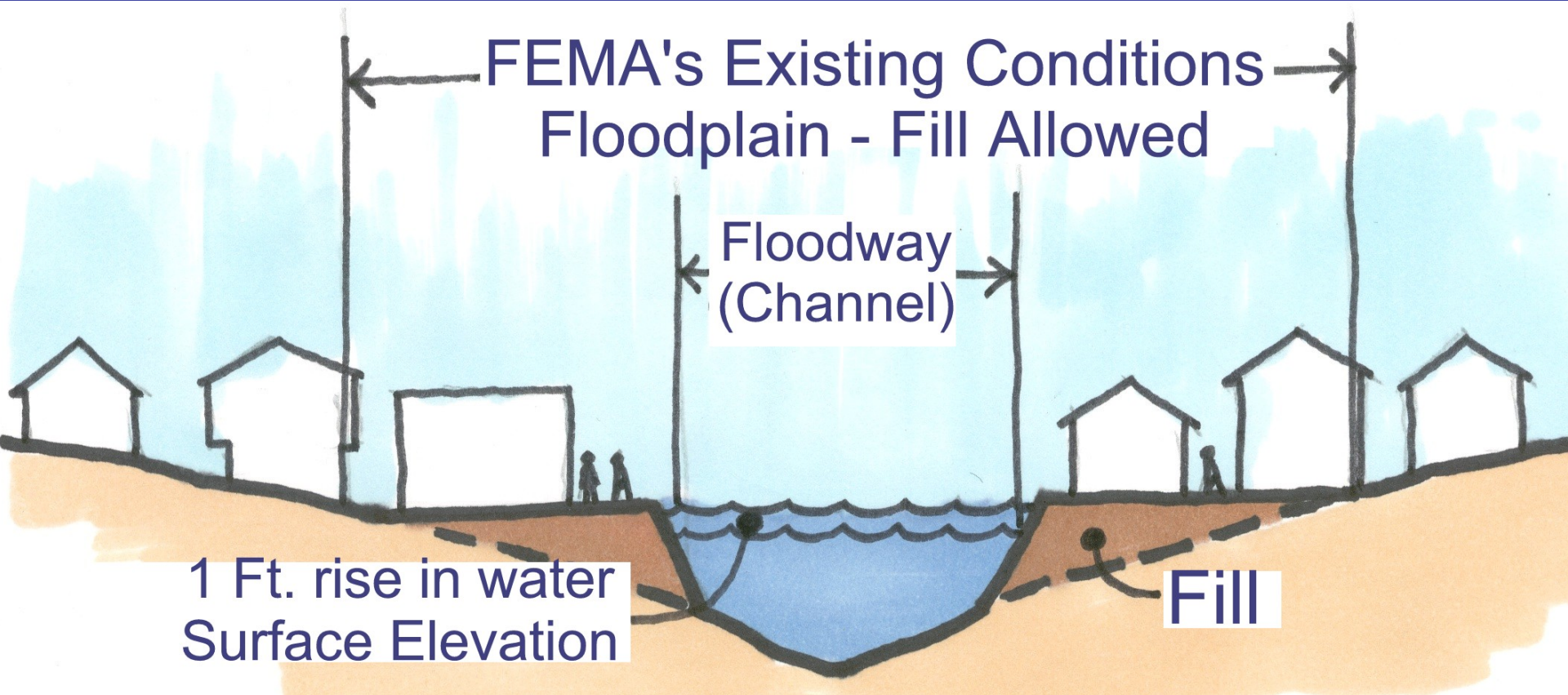
Only 2 approaches available:

- 1. Remove buildings from the floodplain (Non-Structural)**
- 2. Remove the floodplain from the buildings (Structural)**

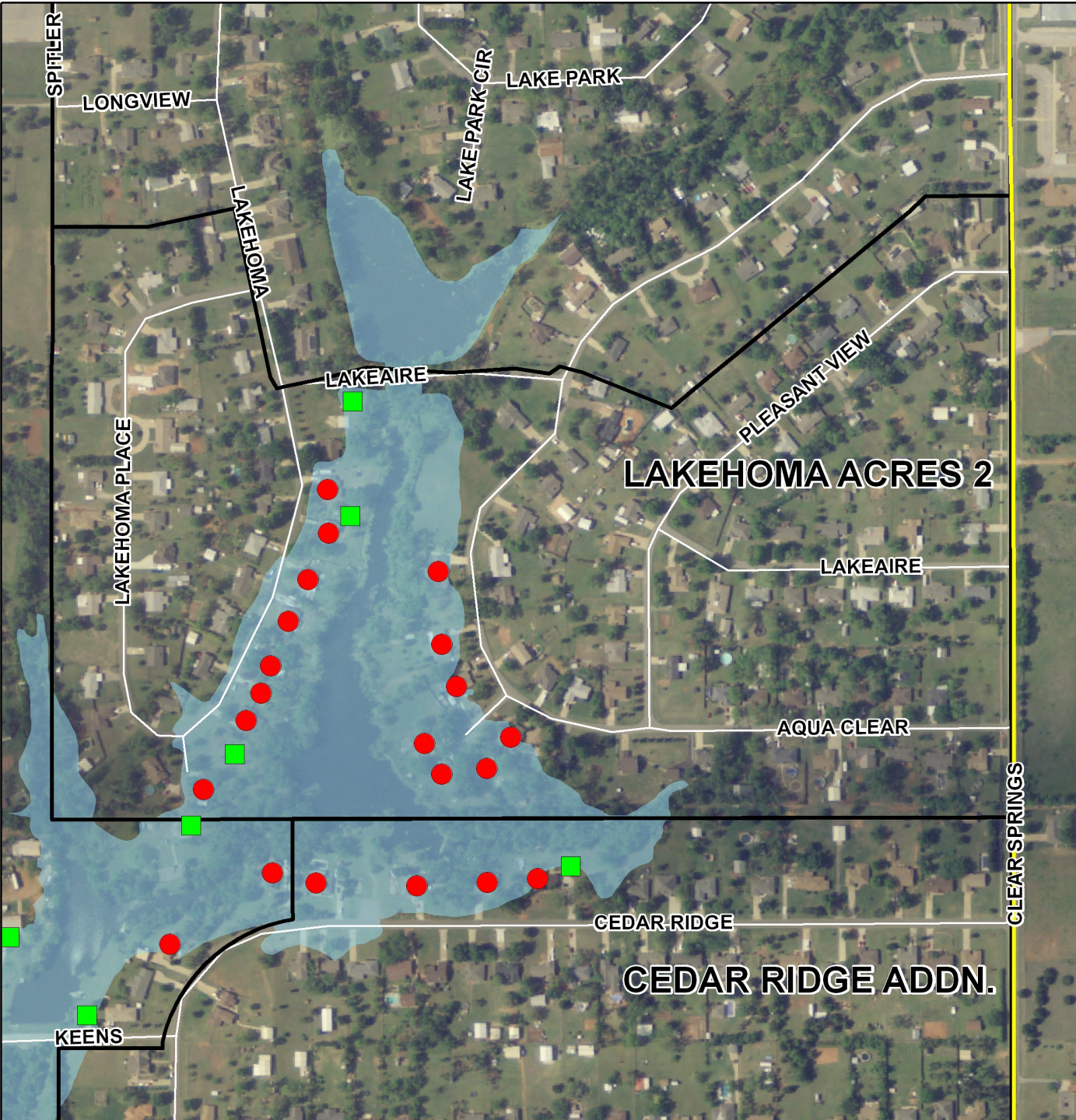
Today's Floodplain Is Not Necessarily Tomorrow's Floodplain



If large areas of the floodplain are filled, then there will be an increase in the land area needed to store flood waters. This means your home or business may be impacted.



FEMA's NFIP Floodplain



**Legally
Permitted
Development
after Basin
Urbanization**

A Different Approach

Basin-wide Master Drainage Plans

Floodplain Acquisitions

Multi-Use Facilities

Stricter Floodplain Regulations

No Increase In Runoff

Onsite Detention

Fully Urbanized 1% Storm Designs



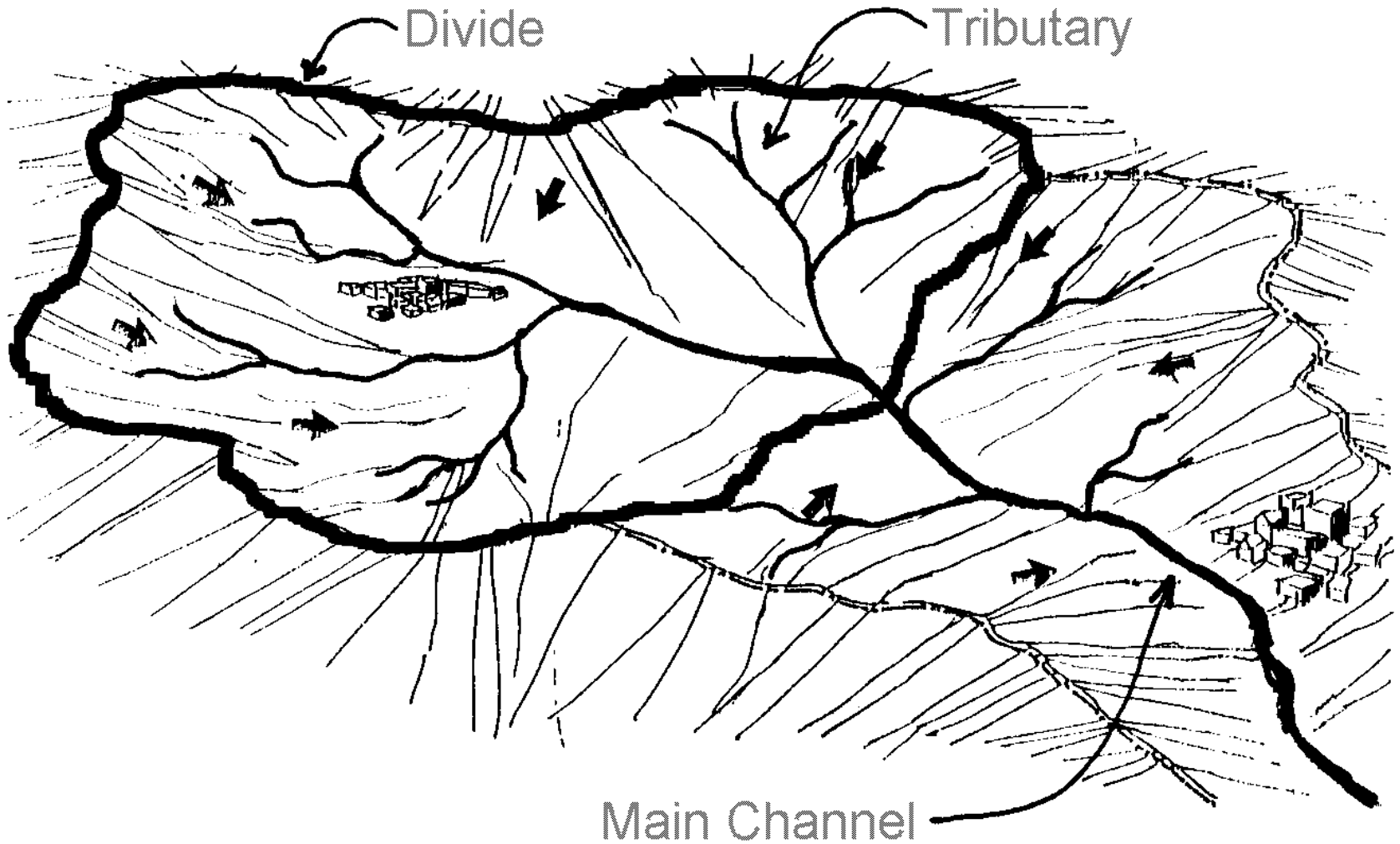
- Use a comprehensive watershed approach
- CRS can provide a guide and Framework for going beyond the NFIP's minimum requirements

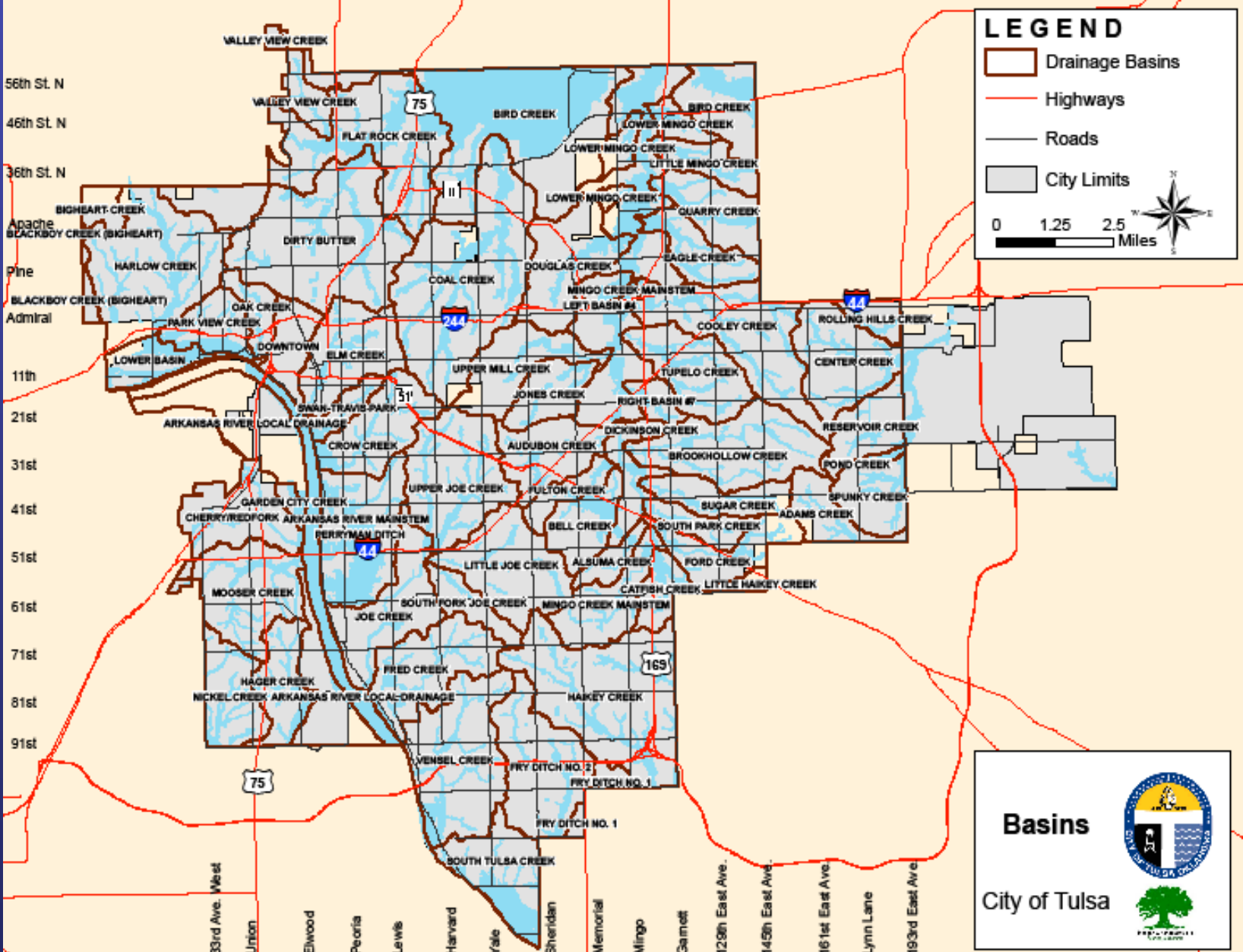
**Comprehensive
Watershed
Planning**

Master Drainage Plan

A Comprehensive planning and hydrologic study of the Watershed, including identification of existing and future land-use, hydrology, drainage and floodplain conditions and problems, and recommendations for improvements and mitigation.

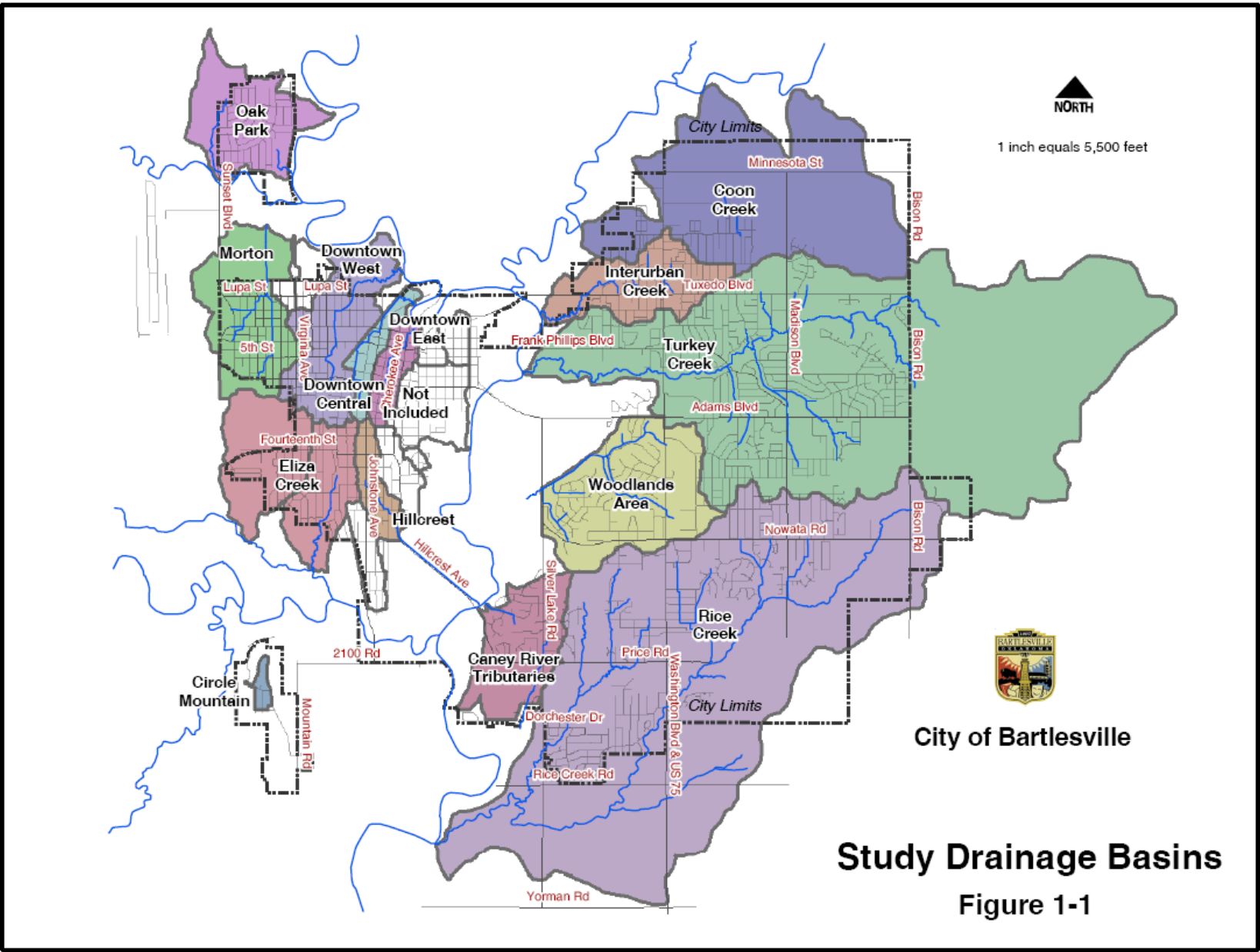
Stormwater Management



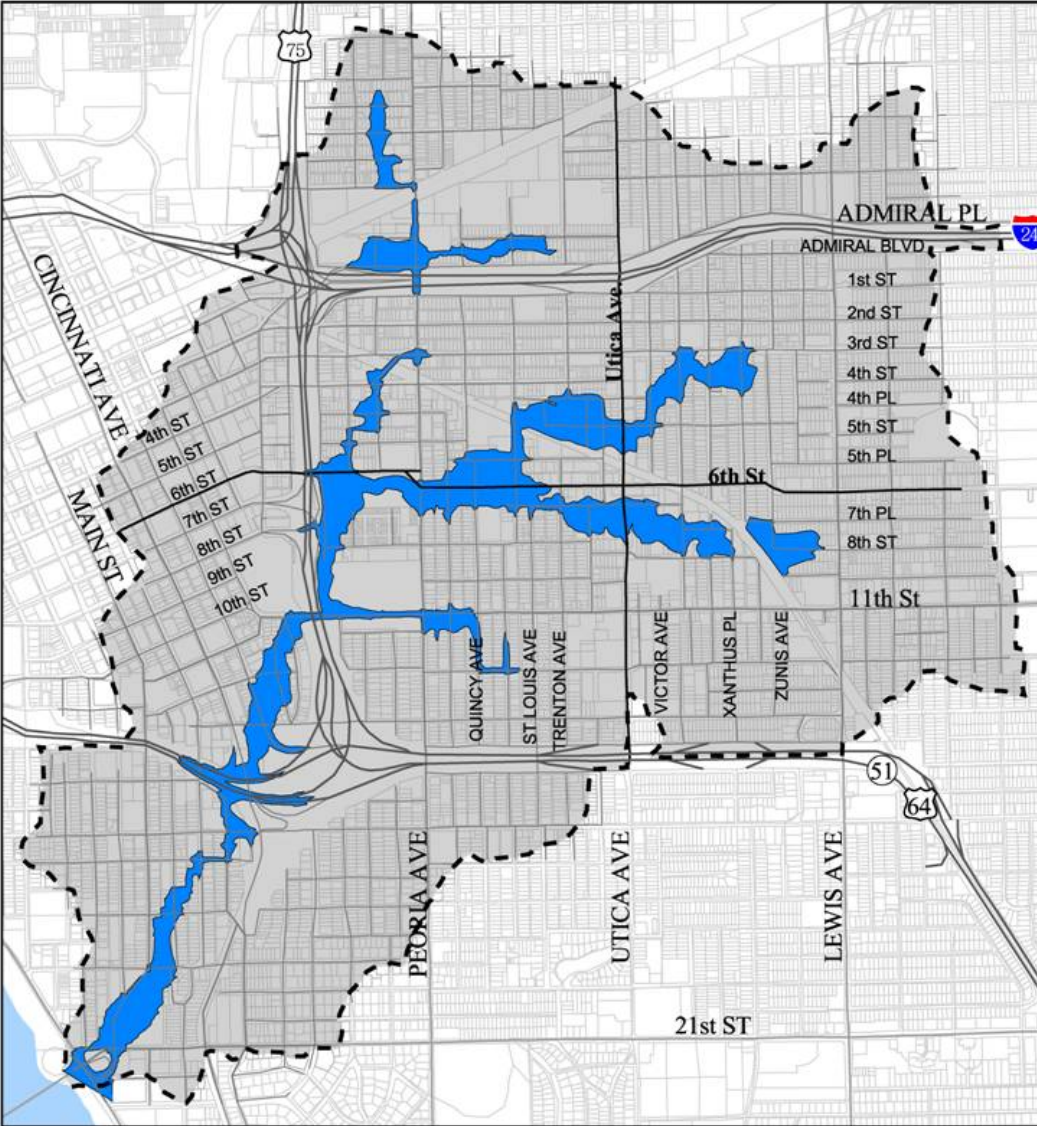


Tulsa's Drainage Basins & Master Drainage Plans

Bartlesville, OK Master Drainage Plans



Study Drainage Basins
Figure 1-1



Basin-wide Comprehensive Master Drainage Plan

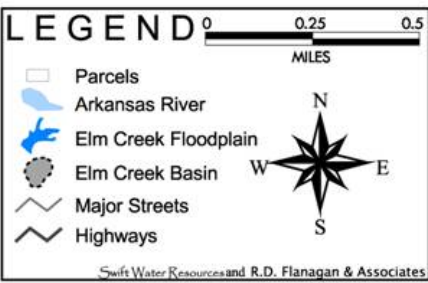


Figure 2
*Elm Creek
Master Drainage Plan*
Elm Creek Basin

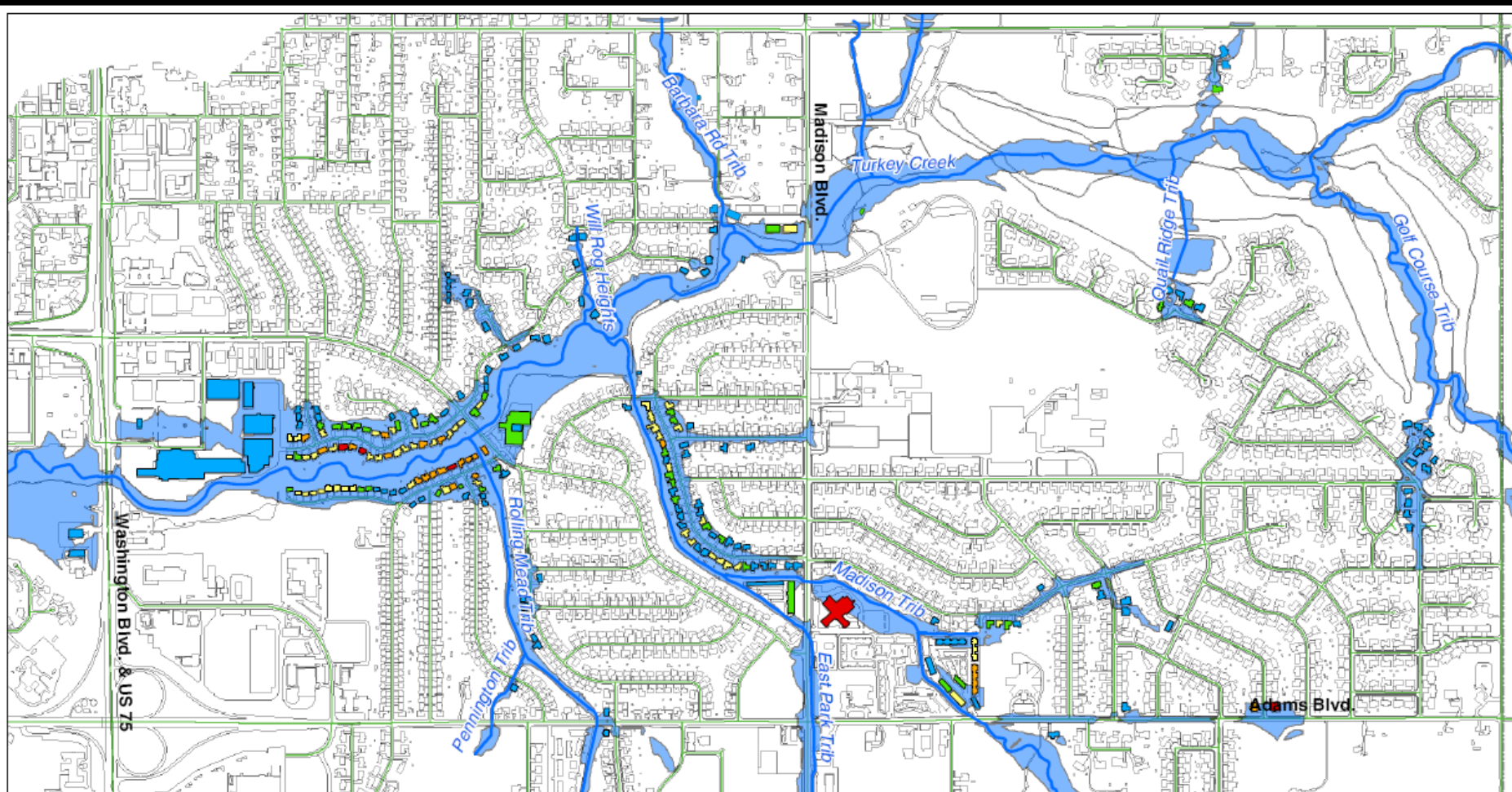


**Multi-Disciplinary Design Team-
Engineers, Planners, Architects, Landscape Architects**



Public Meetings during the Planning Process

Bartlesville, Master Drainage Plans

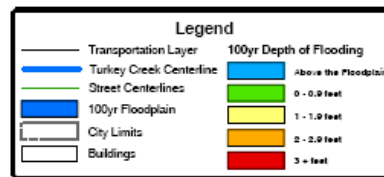
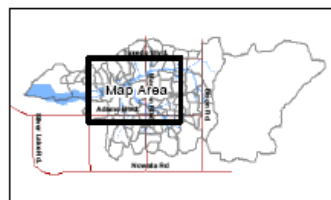


Turkey Creek Master Drainage Plan

Property Flooding for 100yr Storm

Map # 1 of 1

Map Date: Feb 06, 2004



1 in equals 800 ft

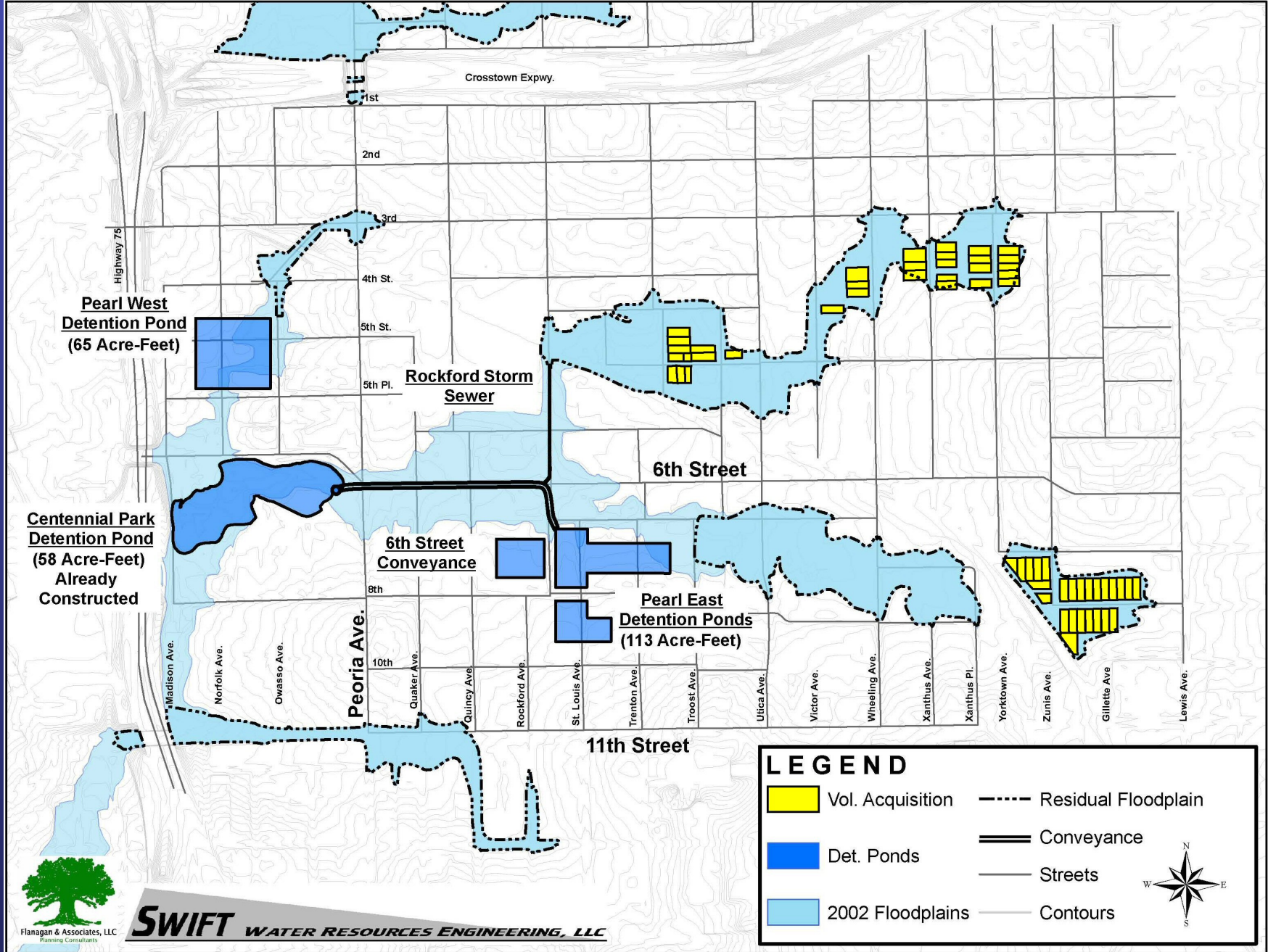


City of Bartlesville
Turkey Creek Master Drainage Plan

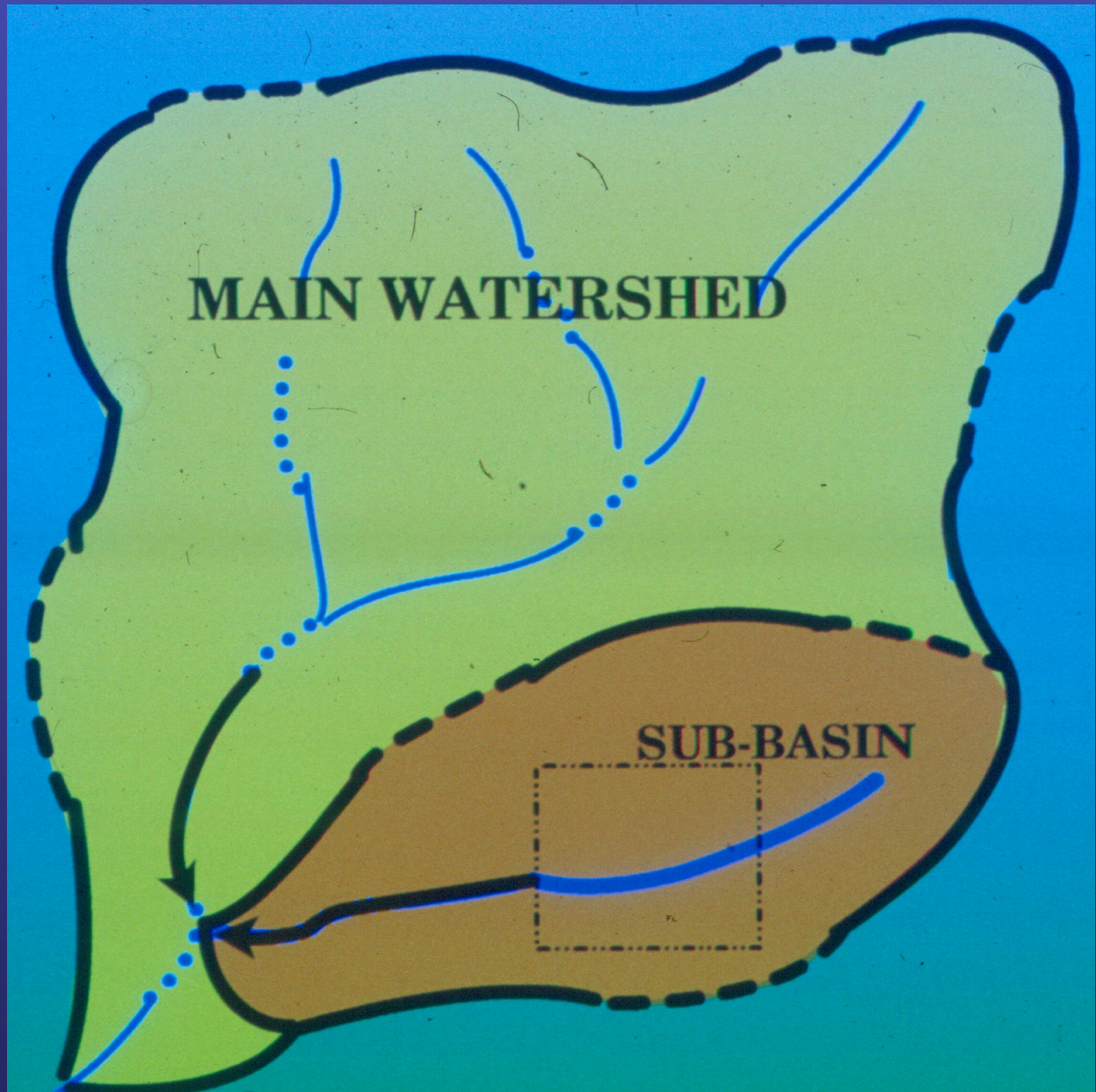
Master plan and mapping by
Meehek & Associates, Inc.
Civil & Water Resource Engineers and
Geographic Information Systems

20 West 2nd Street - Suite 200
Sand Springs, OK 74003
(018) 241-2803

Figure 11



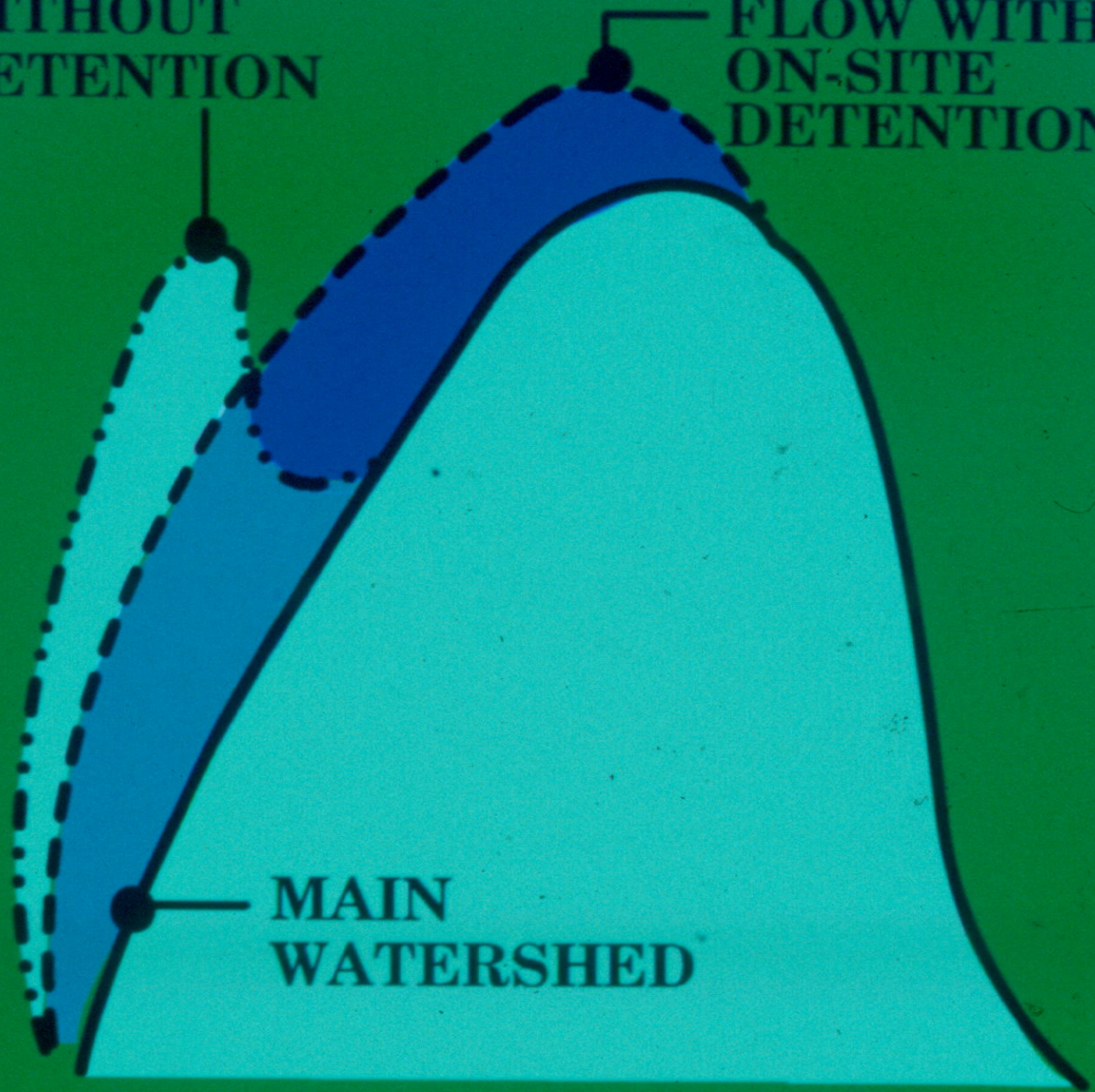
Recommended Plan- A Mix of Structural and Non-Structural Solutions



Random Detention

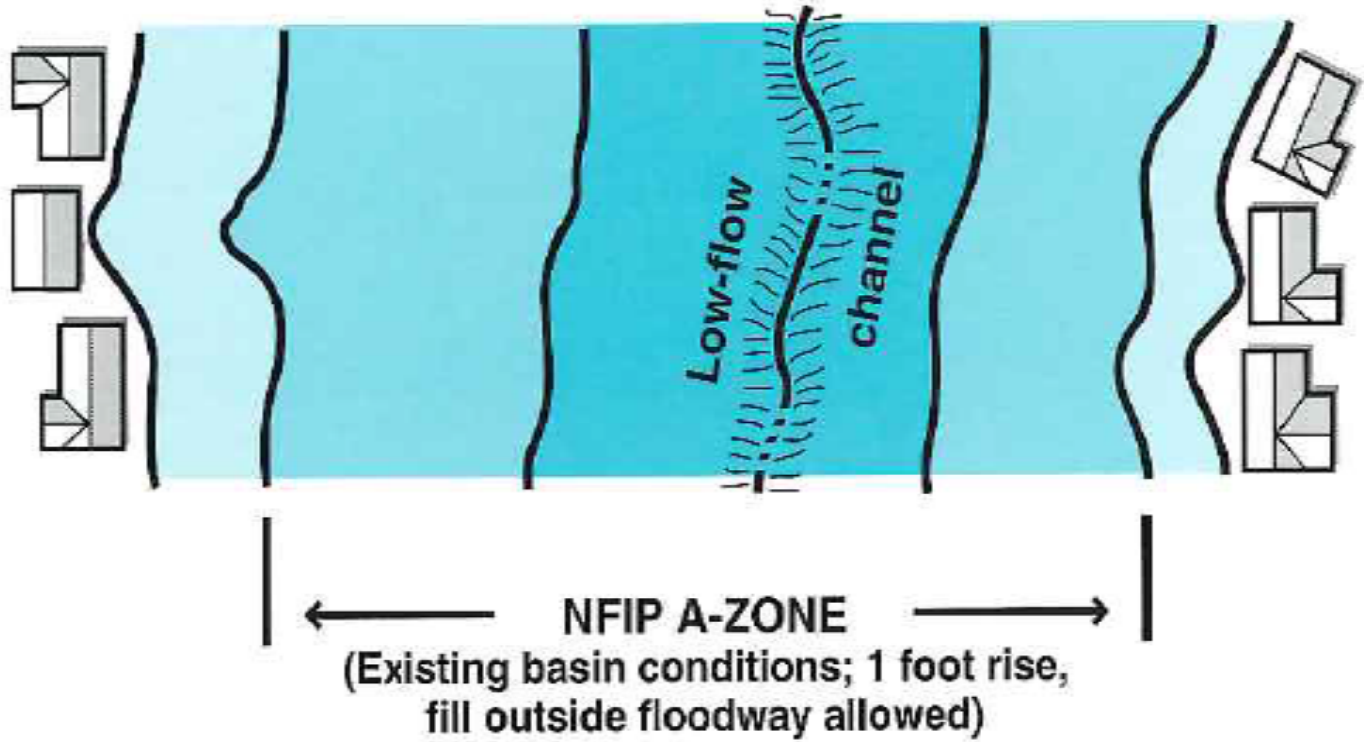
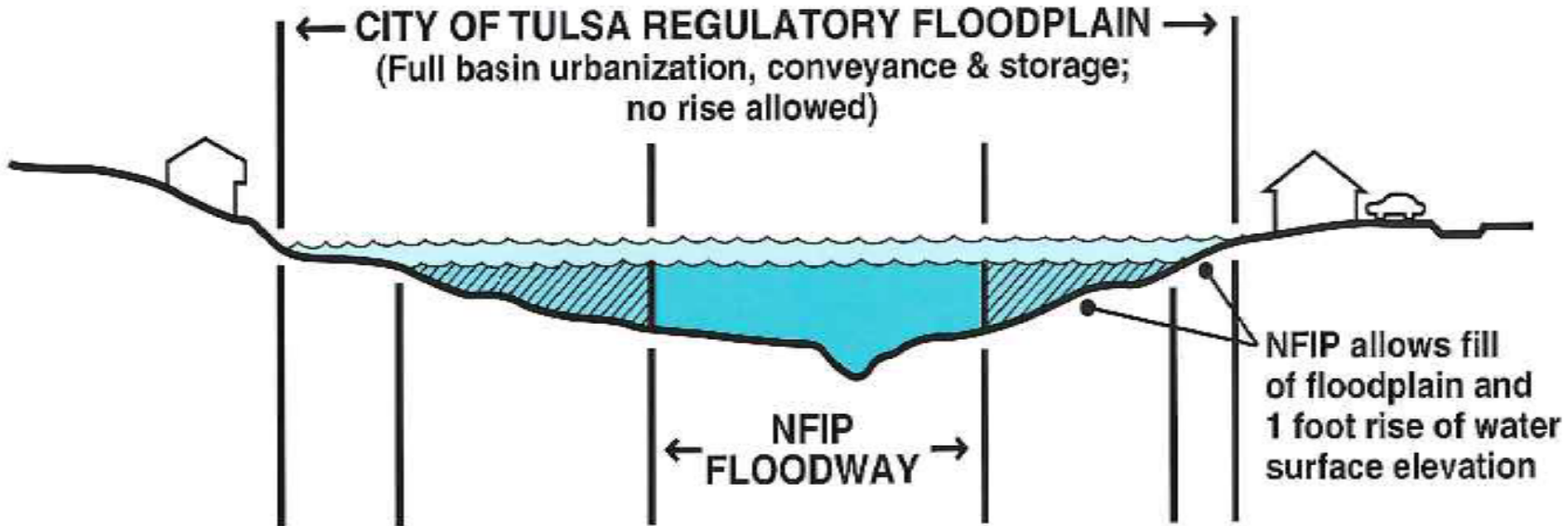
COMBINED FLOW
WITHOUT
DETENTION

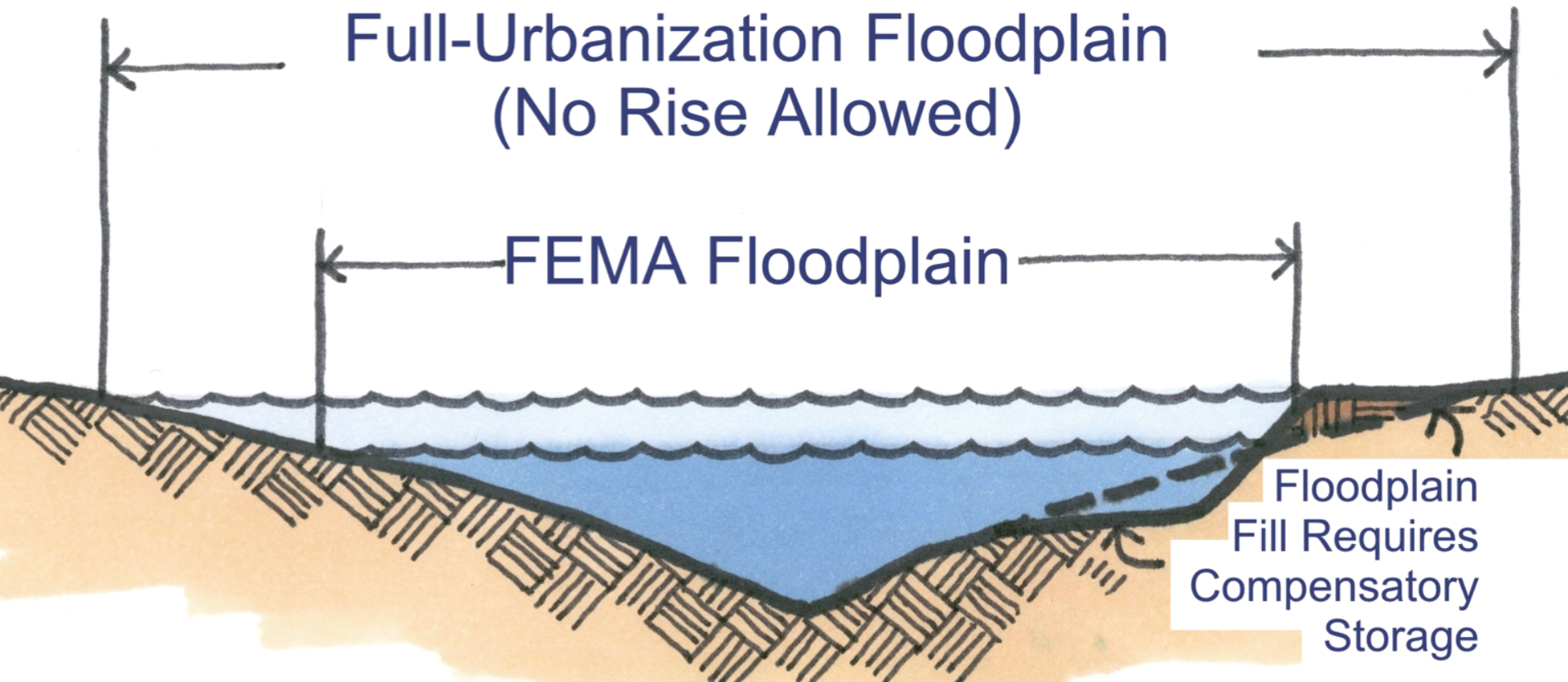
COMBINED
FLOW WITH
ON-SITE
DETENTION



MAIN
WATERSHED

Increased
Flood
Heights
with
Improper
Detention
Location





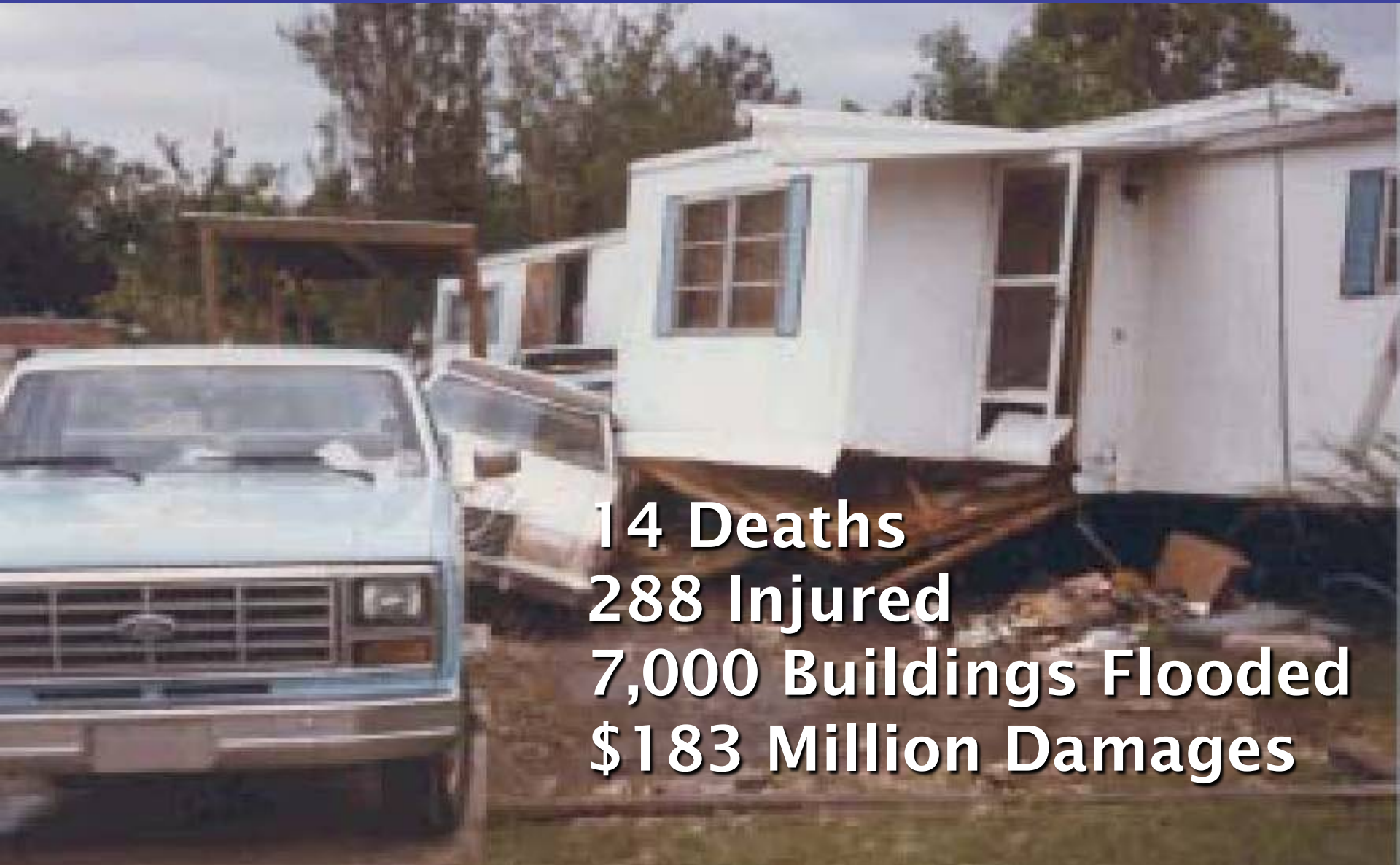
Tulsa's Regulatory Floodplain-

**Full Urbanization of the Basin
No Increase of Peak Discharges
No Rise in Flood Elevation
No Net Loss of Floodplain Storage**

Progress & Implementation

1984 - 1990

Memorial Day Flood Of 1984



14 Deaths

288 Injured

7,000 Buildings Flooded

\$183 Million Damages



1984 Flood Damages to Residential Neighborhoods

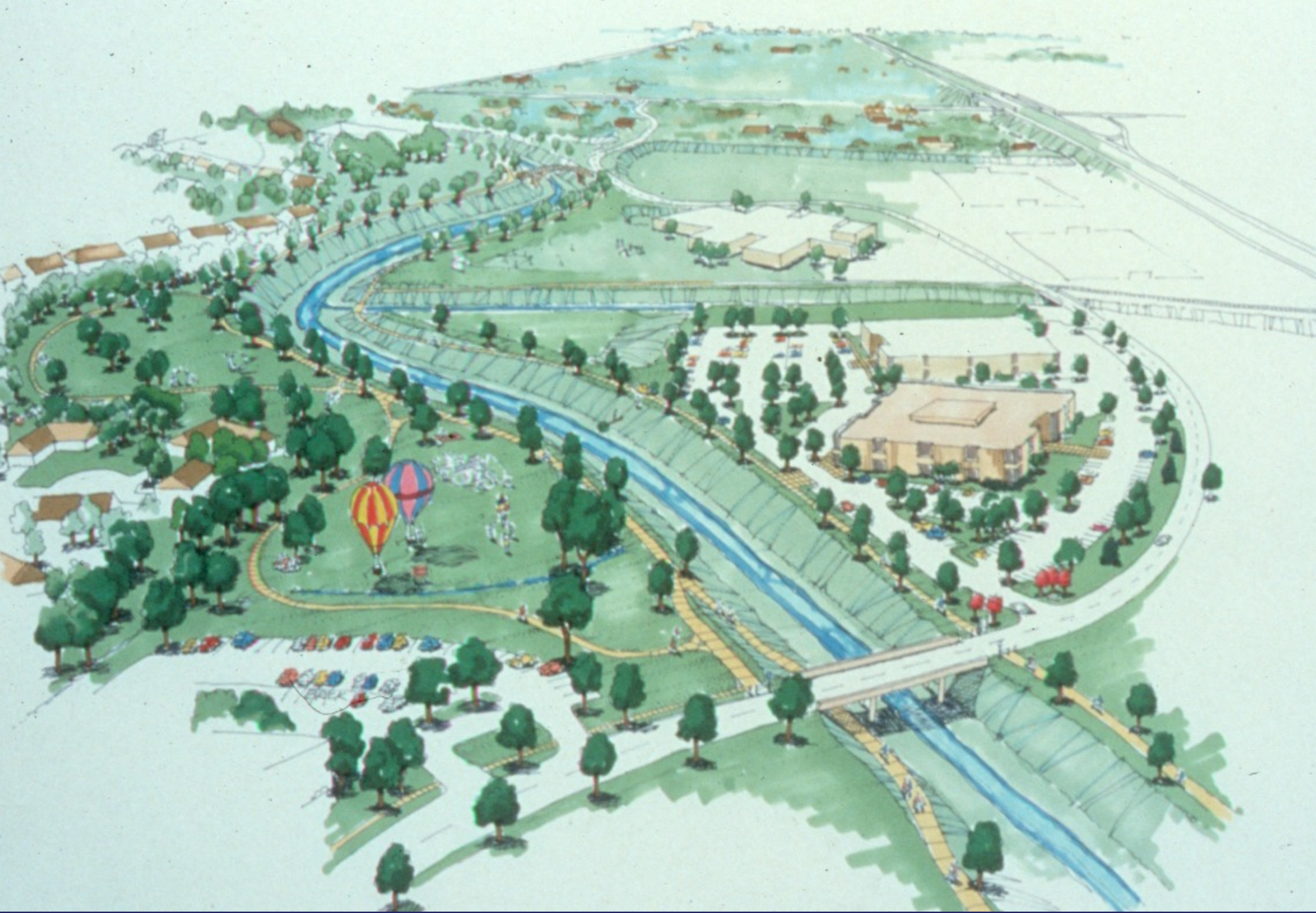
f Oklahoma



Courageous Mayor Terry Young



Moving a Flooded House from the Mingo Creek Acquisition Area (1985)



Our 1984 Vision for the Mingo Creek Floodplain



Plan for Metcalfe Detention Pond



Mingo Creek Detention Pond During Flooding Event



McClure Multi-Use Park & Stormwater Detention Facility

CRS

Higher Standards

Beyond the Minimum- CRS Credit Activities

- Hazard Identification
- Education and Outreach
- Planning
- Regulations and Standards
- Mitigation Actions
- Infrastructure
- Emergency Services

4 Series of CRS Activities

300 Public Information

400 Mapping and Regulatory

500 Flood Damage Reduction

600 Flood Preparedness



French Wetmore – CRS Consultant



**Tulsa, Nation's First CRS Class 3
Community
October, 2000**



**2003 – Tulsa Receives Nation's
First CRS Class 2 Designation**

City of Tulsa 2014 Official Notice

Flood Hazard Information About Your Property



CITY OF
Tulsa
A New Kind of Energy.

Your property is located in or near an area subject to flooding. It may be within a FEMA Special Flood Hazard Area (SFHA), or the City of Tulsa Regulatory Floodplain within the City of Tulsa.

The FEMA SFHA is an area subject to inundation by the base (one percent annual chance) flood.

**What does this mean for you?
Please read on.**

Flood Insurance Available for All Properties in Tulsa

The Federal Emergency Management Agency says that if your home is located in a high-risk flood zone, there is a 26 percent chance it will flood during the life of a 30-year mortgage. Up to 25 percent of all National Flood Insurance Program claims come from structures outside of high-risk areas. Did you know the City of Tulsa has a 40 percent discount for homeowners in a SFHA on flood insurance, and a 10 percent discount for all other properties? Most homeowners' policies do not cover flood losses. You can protect your home and contents through the National Flood Insurance Program.

You should obtain coverage for structure and contents. There can be more damage to the contents than the structure. Renters can buy contents coverage even if the owner does not insure the structure. There is a 30-day waiting period before the policy becomes effective.

Flood insurance is required by law in order to obtain federally secured financing to buy, build, or renovate a structure located in a FEMA SFHA. This financing includes federal grants, FHA and VA loans, and most conventional mortgage loans.

To find out more about flood insurance, contact any licensed property/casualty agent or broker—the same person who sells your home and auto policies. All agencies charge the same premiums.

Official City of Tulsa Floodplain Notice

Sent to all Floodplain Properties Annually



Tulsa's Arkansas River Parks Trail



Brookwood Regional Stormwater Detention Facility



Mingo Creek Multi-Use Regional Stormwater Detention Pond



Centennial Park Stormwater Detention Pond



Multi-Use Greenways along Tulsa's Urban Streams

Funding

Storm Drainage Utility Fee

Administration

Planning & Engineering

Maintenance & Operations

Small Drainage Projects



**Sustained Funding
Allows Improvements
& Ongoing
Maintenance**

LID

**Low Impact
Development**



**Testing the Porosity of the various Pervious Concrete Types/
Mixes**



Pervious Paver Parking Lot



Apartment Parking Lot BioSwale



Guthrie Green Rain Garden





Creating a more Natural Approach to the City's Streams



Creating Multi-Use Places where Families can enjoy Nature

Challenges:

Complacency

Apathy

Urban Natural Channels

Implementation of LID

Lessons Learned:

**Learn from
Others**



The
End