CITY OF FORT WORTH

Feasible Options Study

Central Arlington Heights

Stakeholder Committee Meeting #3
February 23, 2011

Benchmarking Exercise
Review of Other Cities

- City of Tulsa Public Works
- Denver Urban Drainage and Flood Control District
- Metropolitan St. Louis Sewer District
- City of Atlanta Bureau of Watershed Protection
- Also
  - City of Houston
  - Harris County Flood Control District
  - City of Austin
  - San Antonio River Authority

Benchmarking Exercise Questions/Discussion Points

- Video from Carleton Street (2004)
- Review of Program
  - Types of Projects, Costs, Design Criteria
- Similar problems and projects
- Experience with acquisition of properties for projects or for flood mitigation
- Innovative solutions
- How projects are ranked and analyzed

Potential Mitigation Measures Overview

- Objective– Identify solutions to flooding in Central Arlington Heights
- Constraint s
  - Project must be affordable and cost effective
  - Project must be generally acceptable
- Tonight – Review of mitigation measures
- Level of Detail
  - Feasible options study is a cursory review, using approximate engineering methods
  - Options deemed feasible will be evaluated by Freese and Nichols in much greater detail

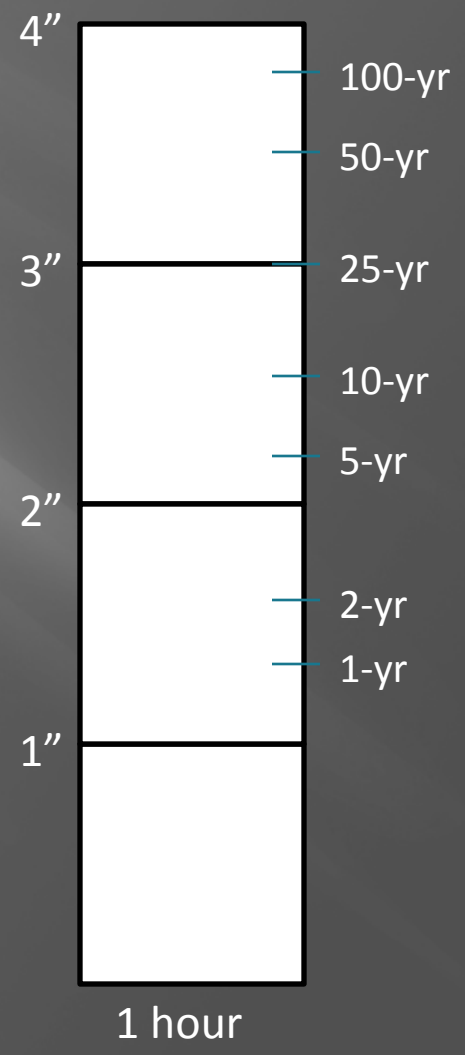
Order of Presentation

- Level of Service
- Economic impacts of flooding and flood damages
  - Based on Corps of Engineers Approach
- Previous Alternative from Freese & Nichols Study
- Other Alternatives
- Comparison

- We can evaluate effectiveness and affordability
- But we need help with acceptability

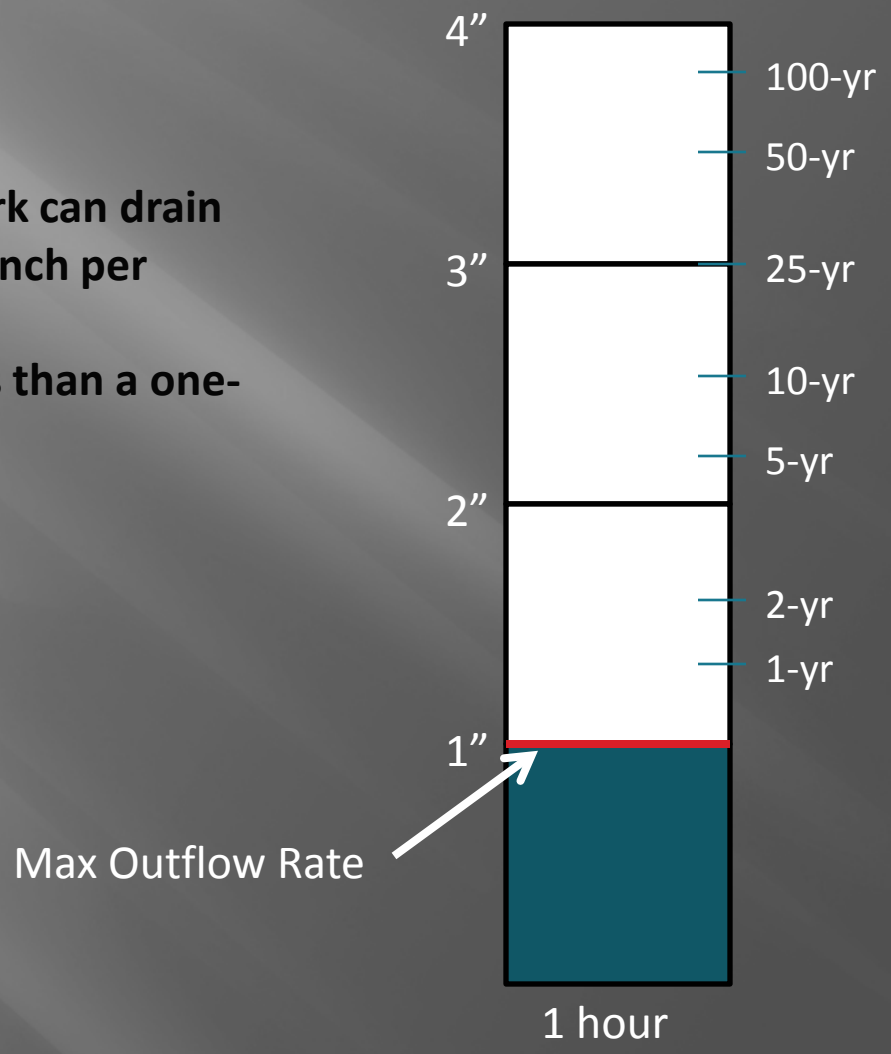
Level of Service: Let's Think in Terms of Inches of Rainfall…

- Not all rainfall becomes runoff, as some is lost to absorption, etc…
- The amount loss is smaller in urbanized areas
- And events are usually more than one hour long, and peak rainfalls typically occur after saturation

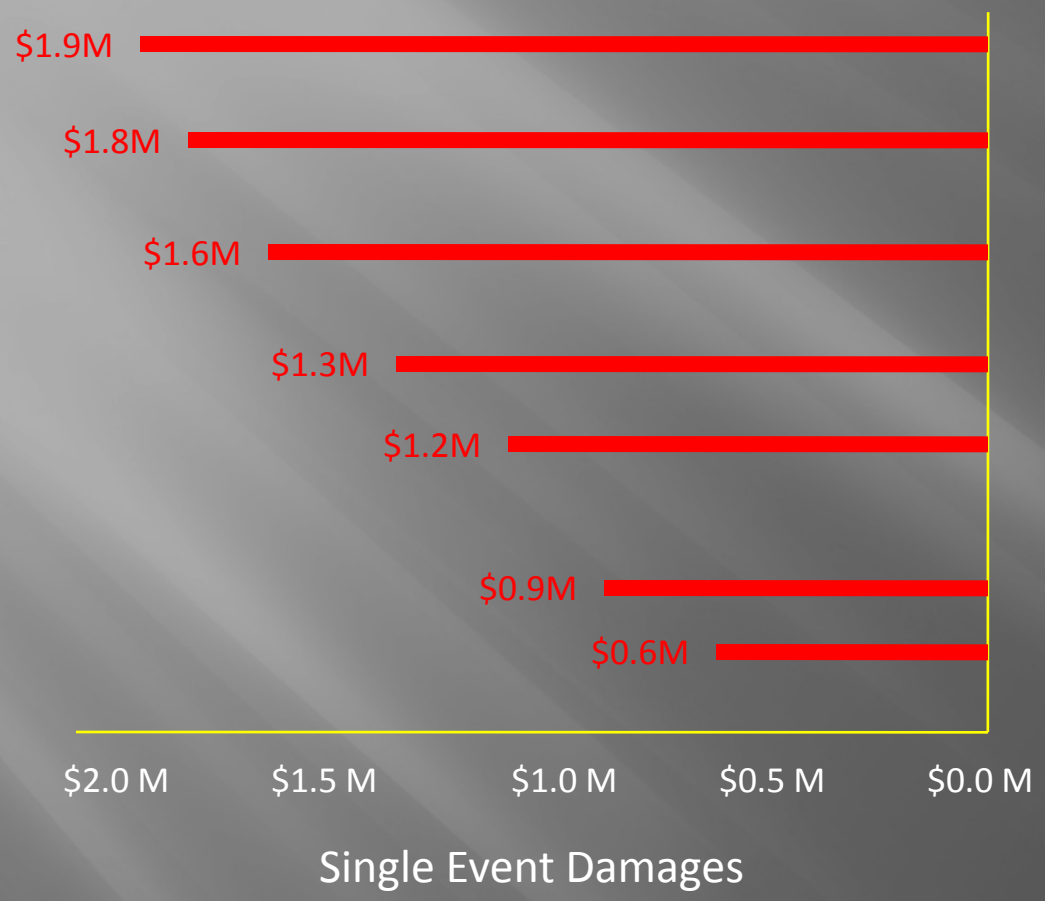


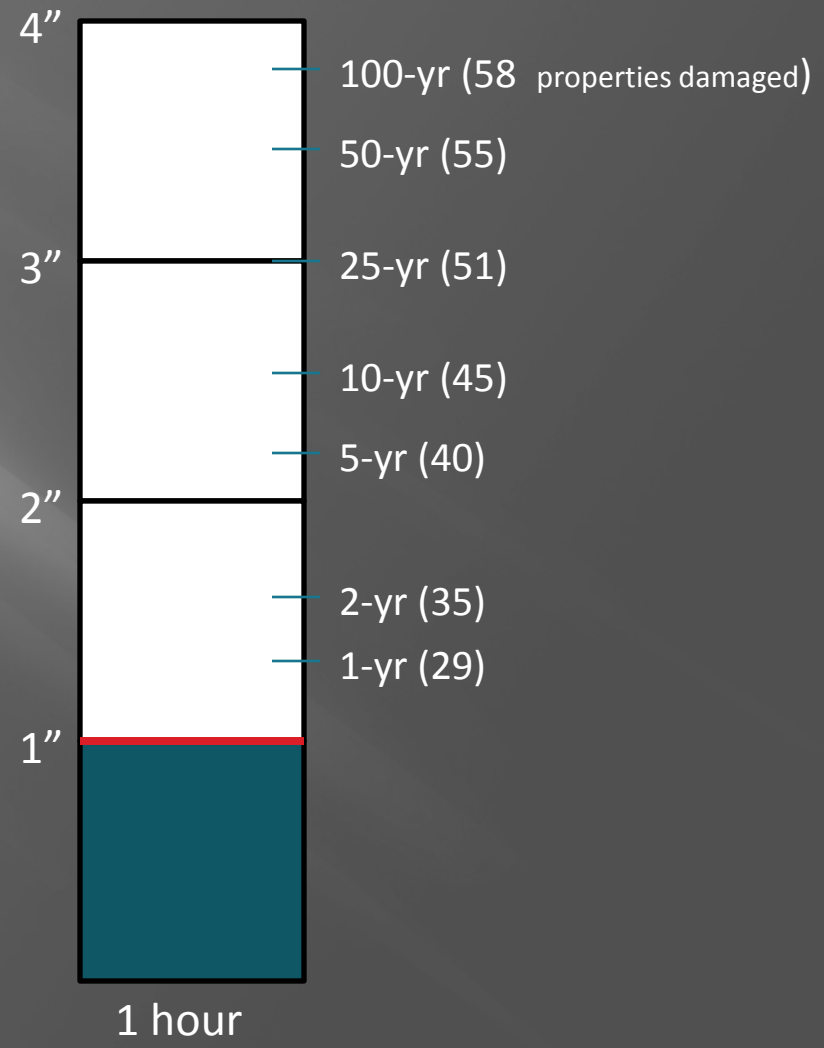
Current System Capacity

- **The current drainage network can drain the equivalent of about one inch per hour**
- **The resultant capacity is less than a one-year event**

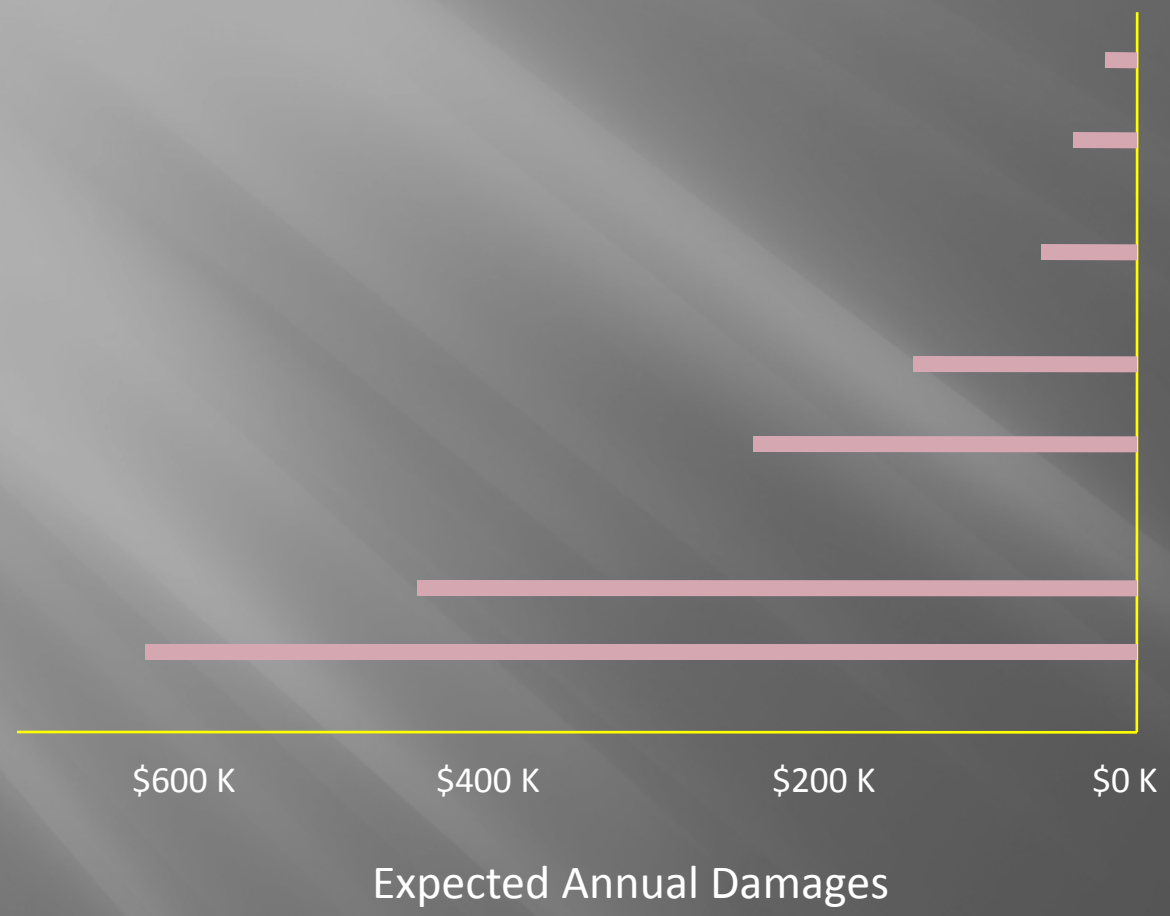


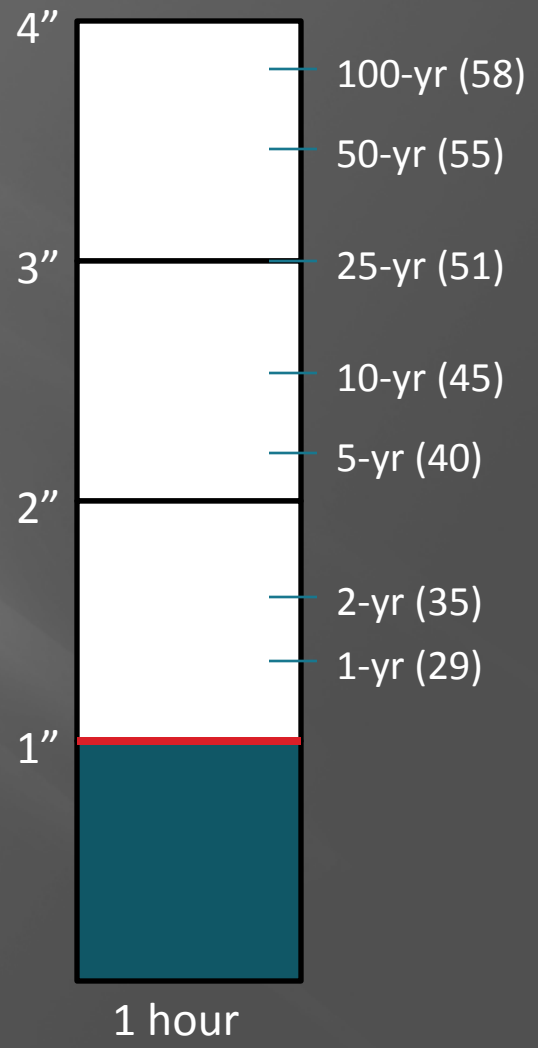
What if it rains more than 1”?





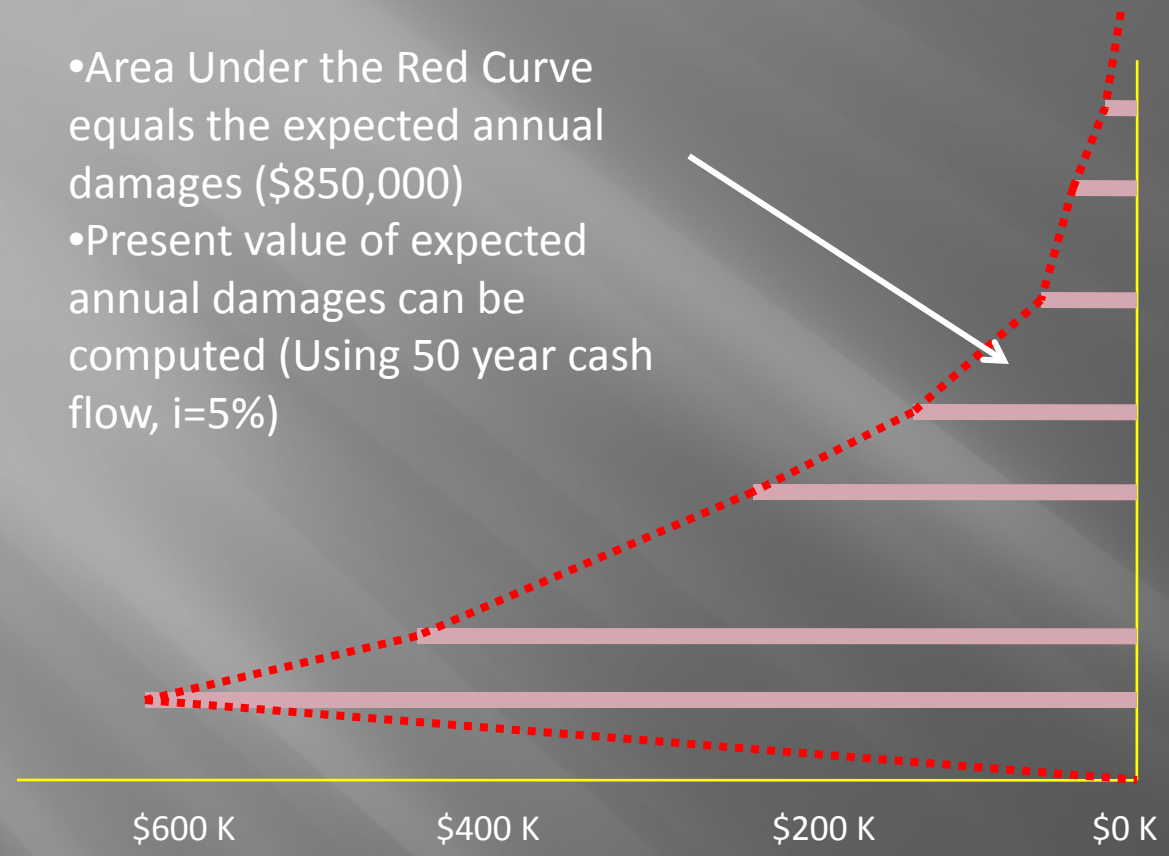
Expected Annual Damage (considers likelihood of event)



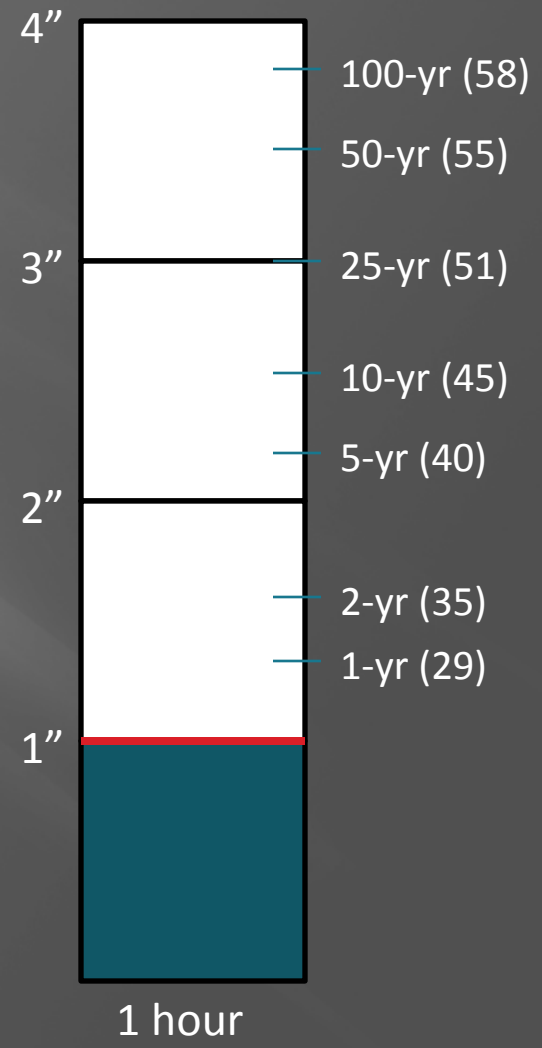


Net Present Value of Damages

- Area Under the Red Curve equals the expected annual damages ($850,000)
- Present value of expected annual damages can be computed (Using 50 year cash flow, i=5%)



Expected Annual Damages

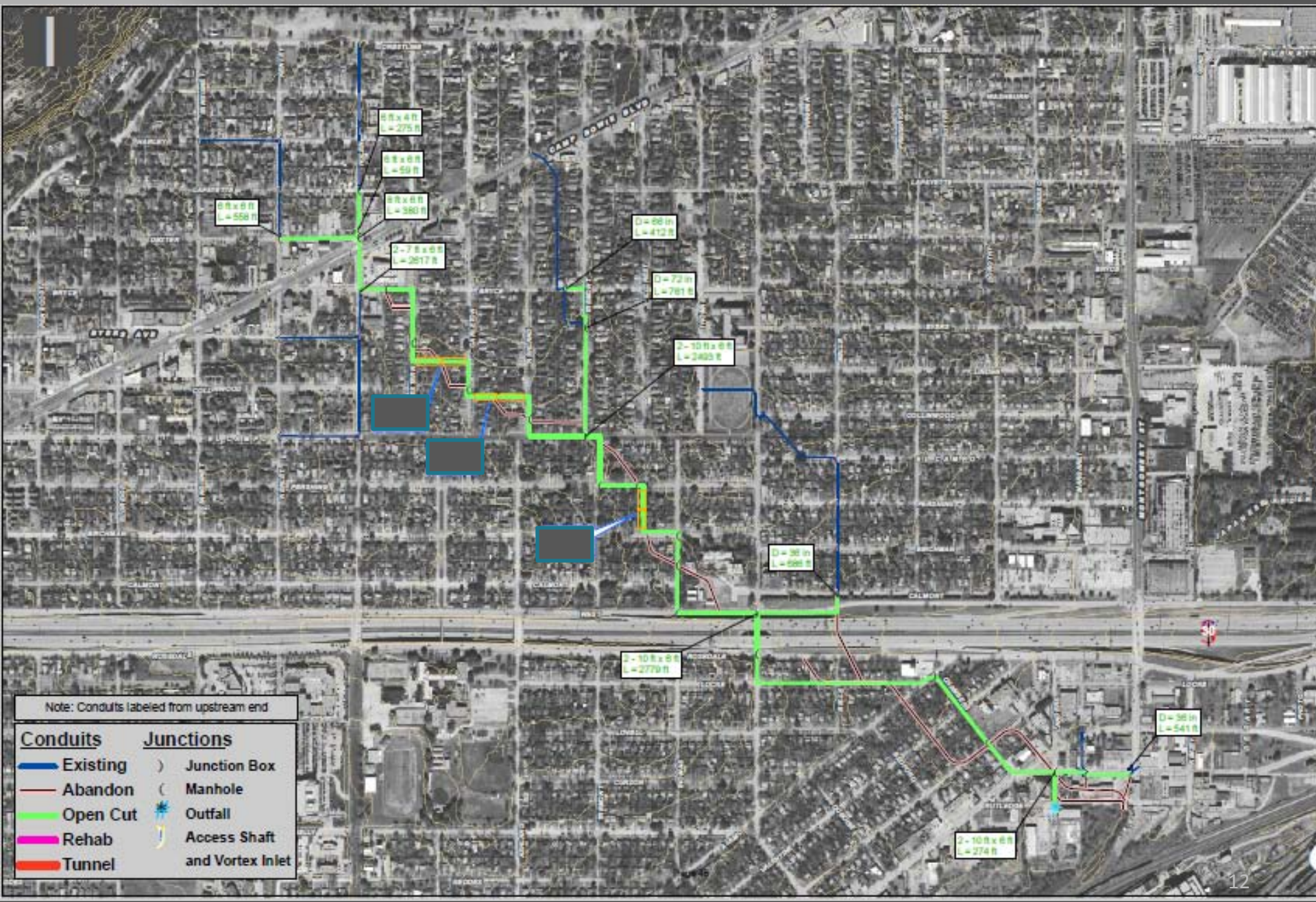


Value = $15,000,000

Mitigation Strategies

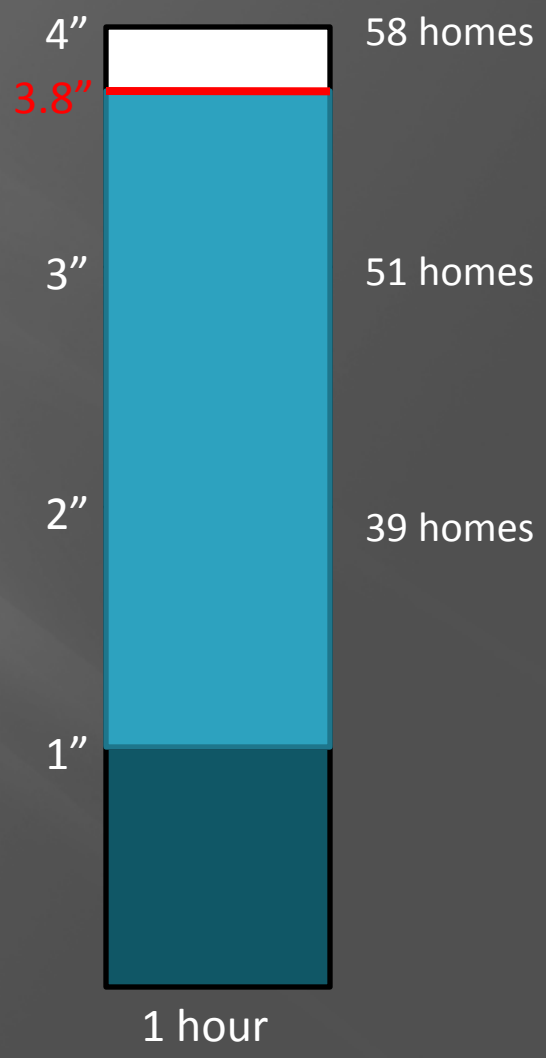
- Measures involve one or more of the following:
  - Increase conveyance (pipes, channels)
  - Increase absorption (LID)
  - Increase storage (detention)
  - Avoidance (floodproof, acquisition)
  - Coping (flood insurance, flood warning)
- Recommendations from stakeholders
  - French Drains
  - More Drains in Street
  - Zoning/Development Controls
  - Detention on Vacant Tracts/Commercial Tracts

1A&B. Freese and Nichols VE Alt 5



1A. Freese and Nichols VE Alt 5

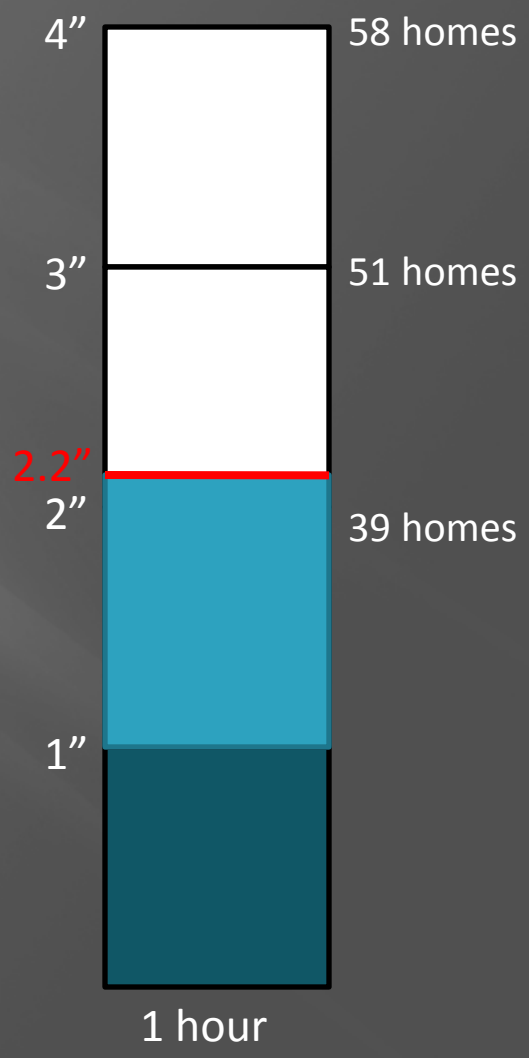
- Additional Pipes to provide 100-year Protection
- Cost = $27,000,000
- Downstream Issues



Damage Reduction = $15,000,000

1B. Freese and Nichols VE Alt 5 Modified

- Additional Pipes to provide 5-year Protection
- Cost = $21,000,000
- Downstream Issues

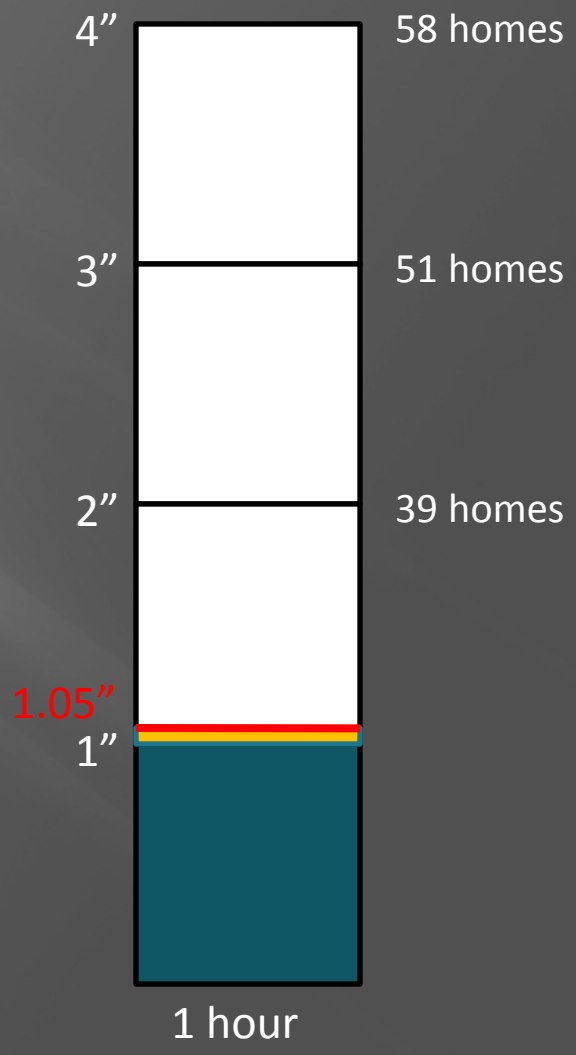


Damage Reduction = $9,500,000

2A&B. Biotention (Rain Gardens)

2A. Bioretention (Rain Gardens) Near Term Implementation

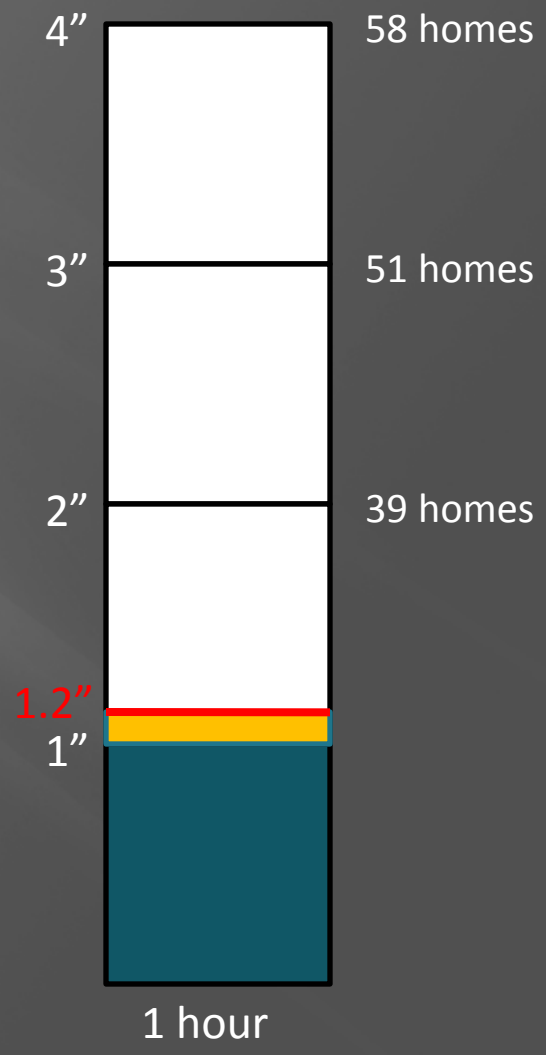
- Depressed gardens with native vegetation that collect and retain runoff
- Implementation by City
- Near Term Goal = 10 acres of draining into bioretention
- Estimated Cost = $700,000



Damage Reduction = $100,000

2B. Bioretention (Rain Gardens) Long Term (20 Year) Implementation

- Depressed gardens with native vegetation that collect and retain runoff
- Policy/Encouragement/Master Planning/Implementation by City
- Aggressive Long Term Goal = 50 acres drain to bio-retention within 20 years
- Includes near term installation from 2A (previous slide) along with initiatives by others
- Estimated Cost $1,500,000

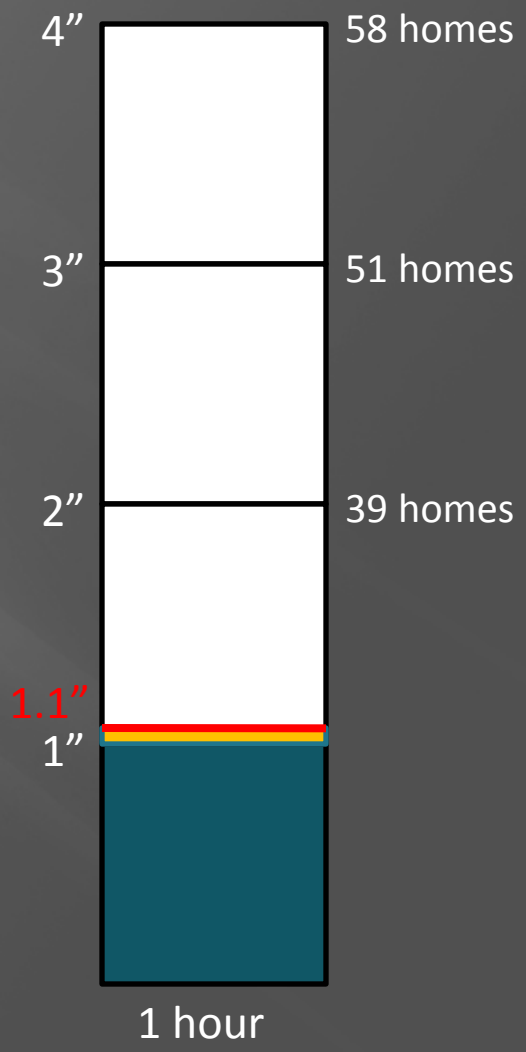


Damage Reduction = $700,000

3. Rain Barrels

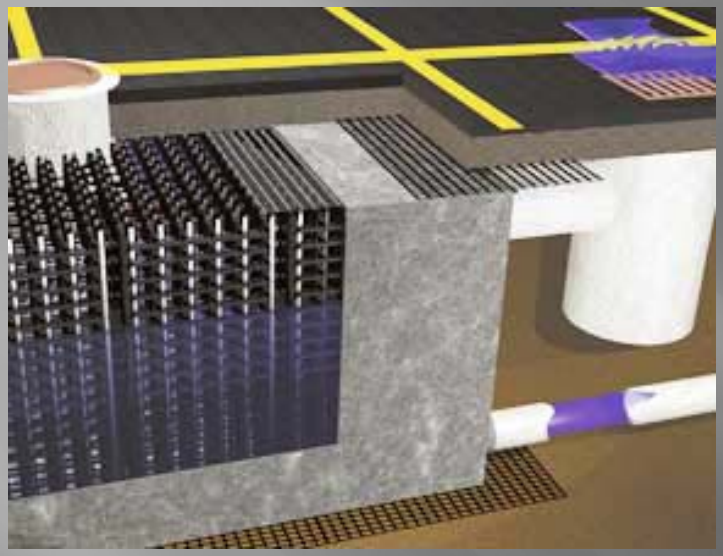
3. Rain Barrel Program

- City subsidizes rain barrels to consumers
- Assume 200 homes with rain barrels
- Large Cisterns required to capture 1” off of roofs
- Cost = $500,000 to $1 million (say $750,000)

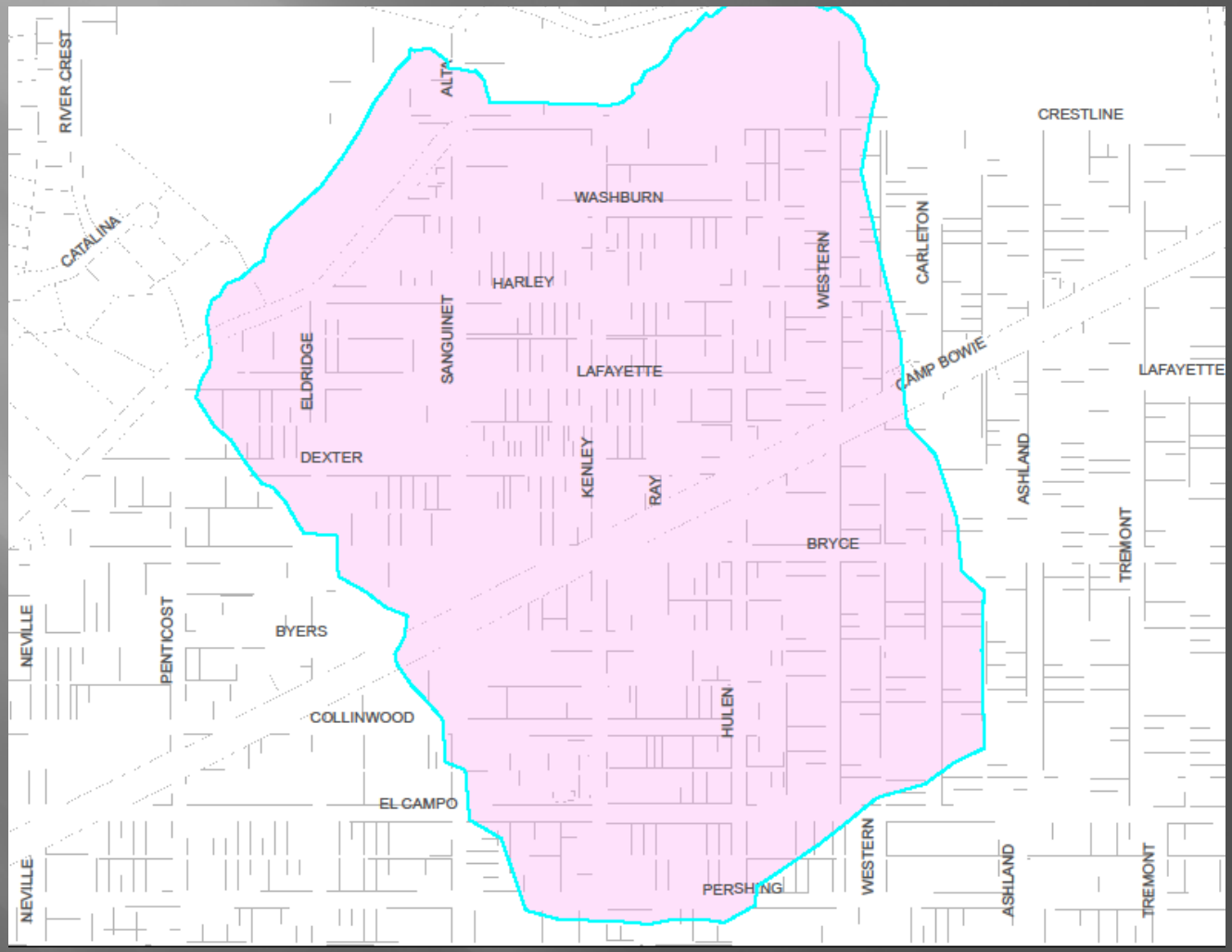


Damage Reduction = $200,000

4. Underground Storage Units



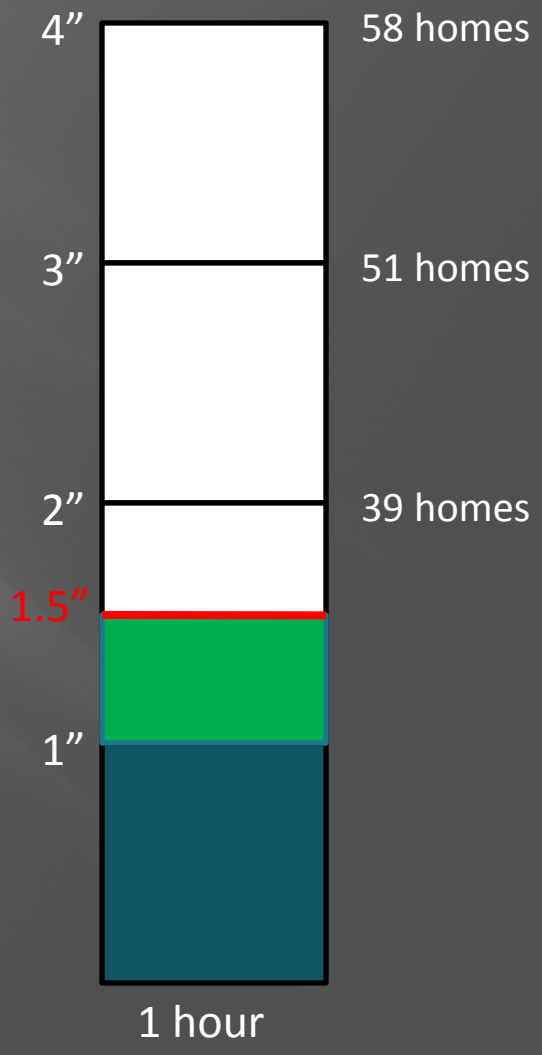
Watershed Area



4. Underground Storage in Public Right-of-Way

- Modular units that can be installed below pavement or athletic fields
- Not recommended for heavy traffic
- Could be installed under parking areas, edge of streets, or athletic fields
- $275-$400 per cubic yard of storage
- Assume installation in roads as part of road maintenance
- Cost to get to 1.5” = $9 million
- Long Term (20 years)

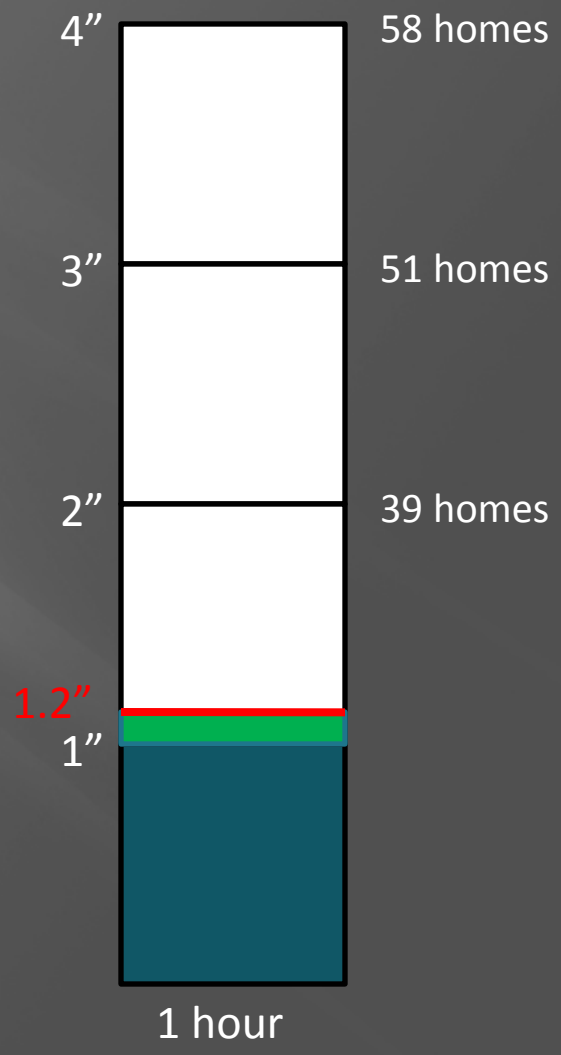
Damage Reduction = $3,800,000



6. Detention on Commercial Sites

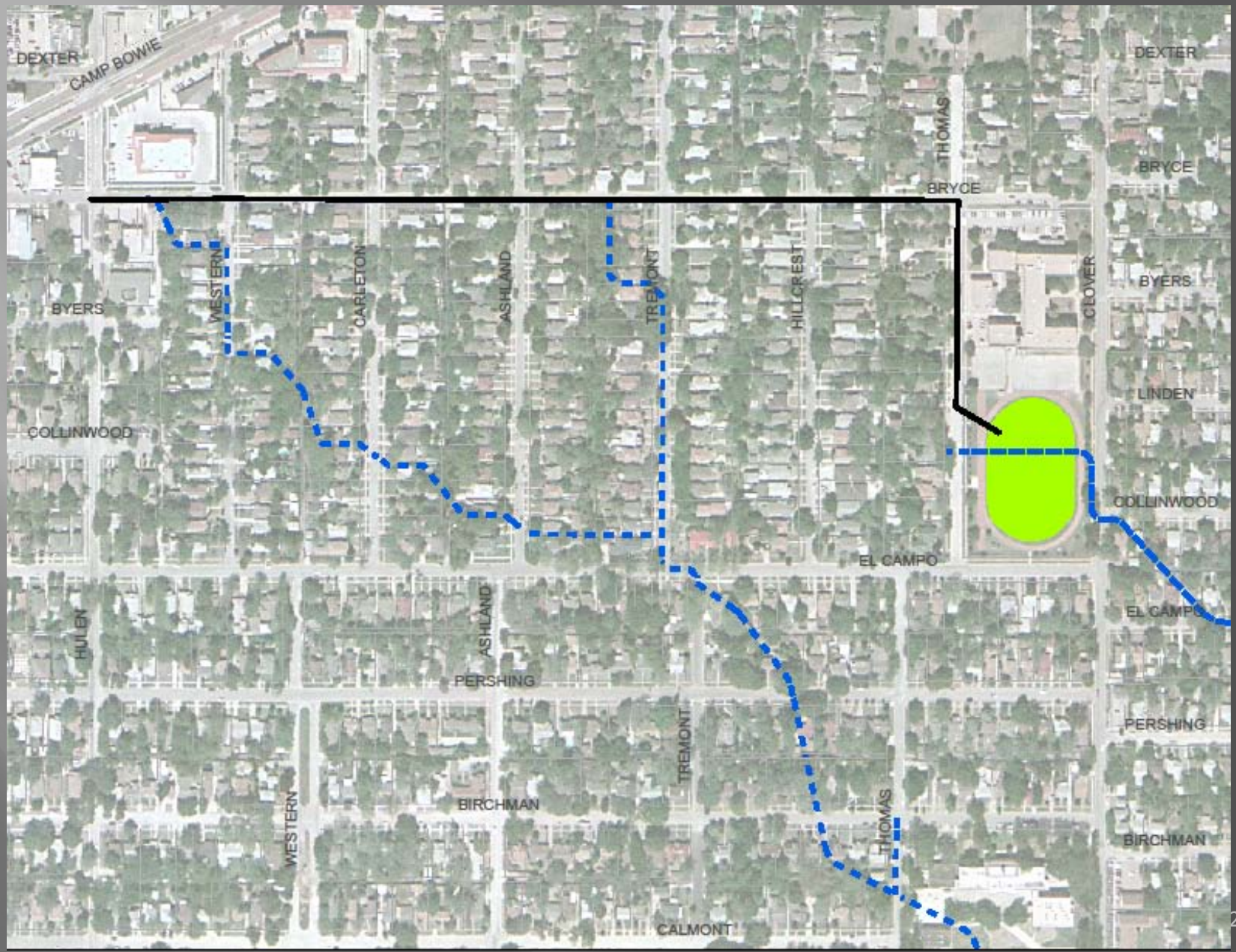
5. Detention on Commercial Sites and Vacant Tracts

- Detention basin on existing vacant tracts and select commercial tracts south of Camp Bowie
- Detention will intercept runoff coming from north
- Risk of filling from initial runoff (before flood flows)
- Cost = $2 million



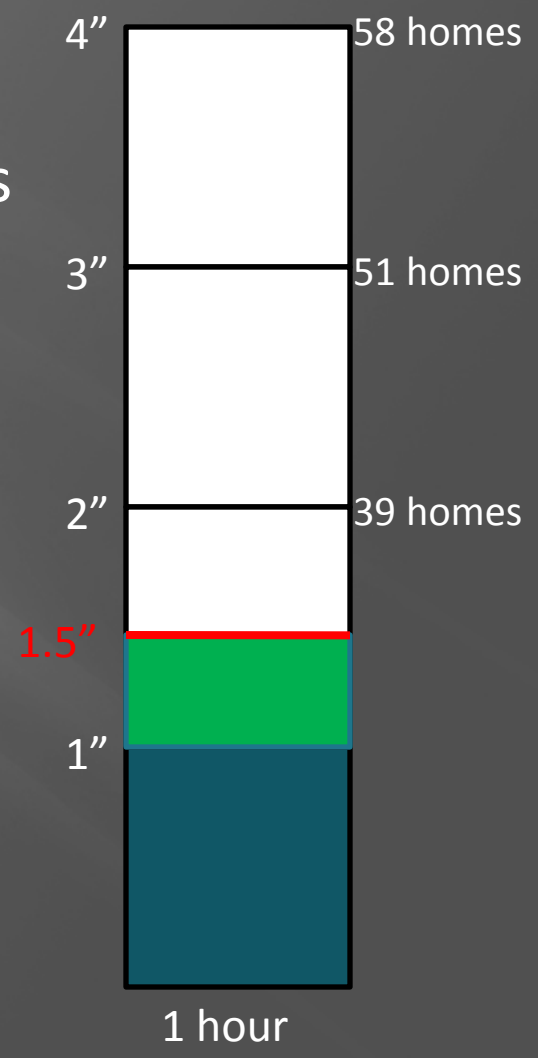
Damage Reduction = $700,000

6A&B. Stripling Detention



6A. Stripling Detention Open Basin inside of Track

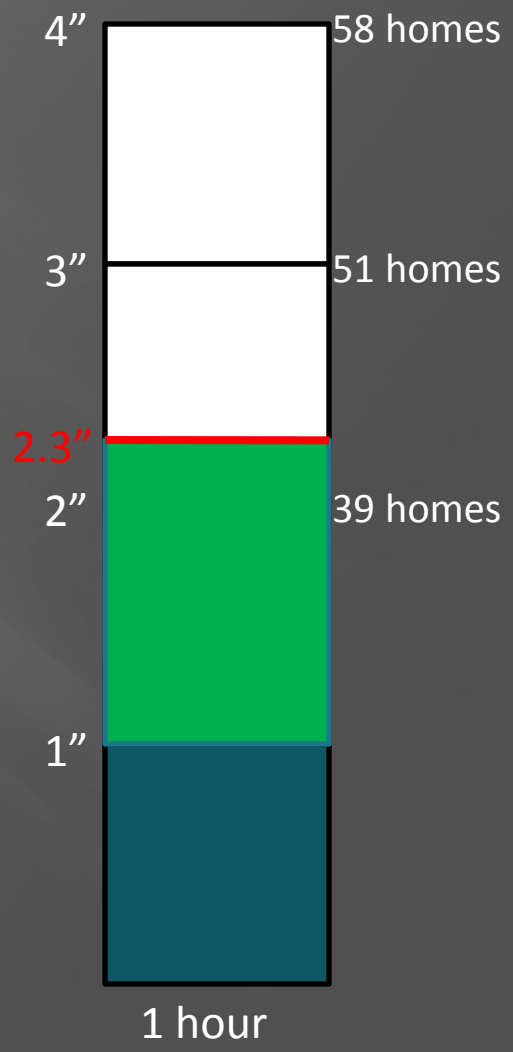
- Construct basin inside of track
- Requires pipe network to deliver excess flow from Western Ave and Carleton
- Operational valve needed to prevent flooding at Stripling
- Estimated Cost = $4,000,000



Damage Reduction = $3,800,000

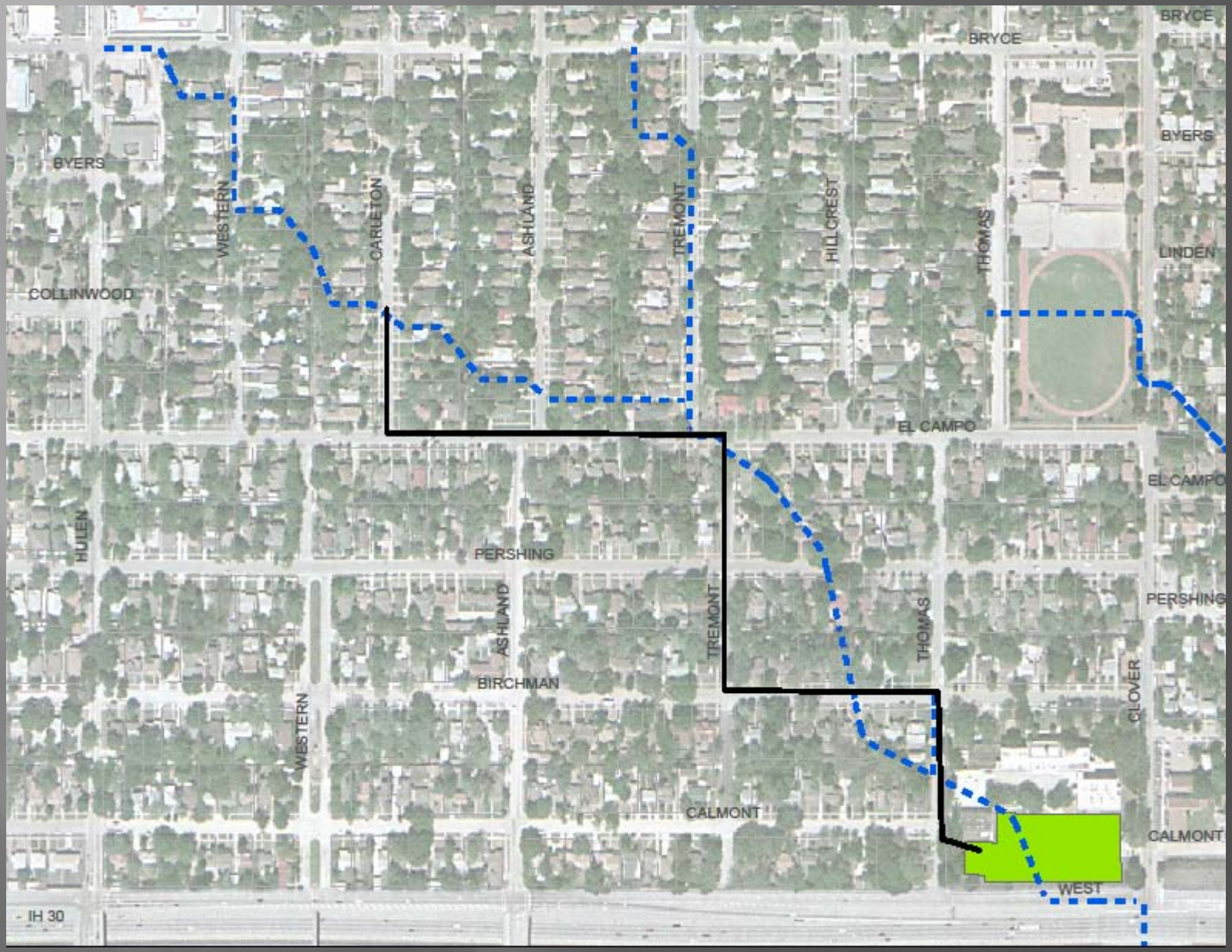
6B. Stripling Detention
Underground Storage Below Athletic Field

- Modular underground detention
- Requires pipe network to deliver excess flow from Western Ave and Carleton, and to drain flow from basin back to system
- Estimated Cost =$15,000,000



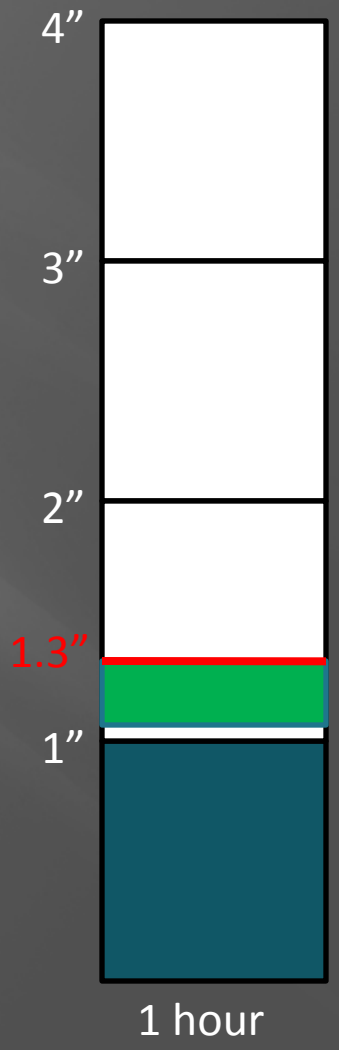
Damage Reduction = $10,500,000

7. South High Mount Detention



7. South High Mount Detention

- Modular underground detention
- Construct along path of pipe network
- Estimated Cost = $5,500,000



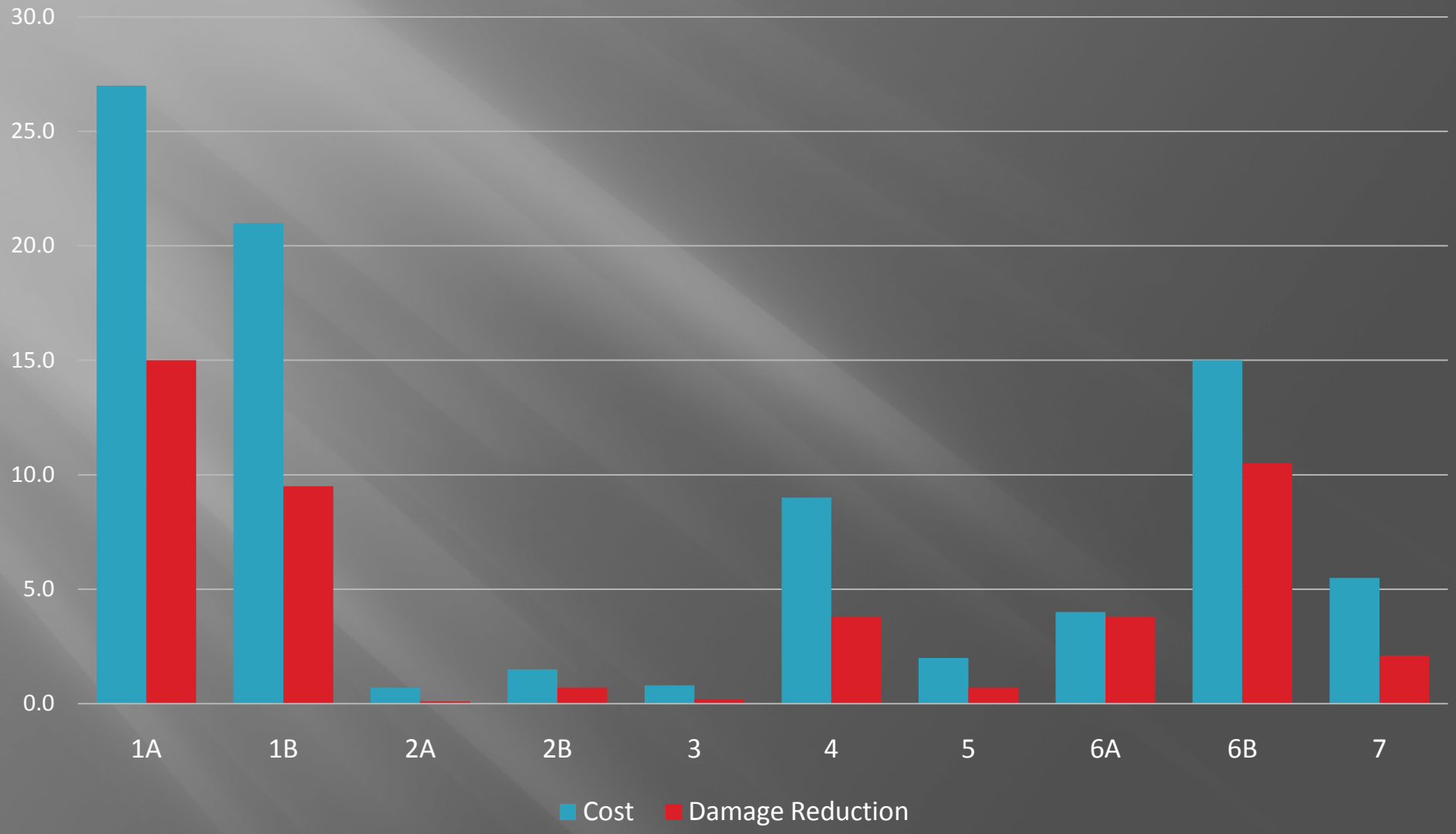
Damage Reduction = $2,100,000

SUMMARY COMPARISON

Summary of Measures

Measure	Level of Service (in/hr)	Cost ($M)	Damage Reduction ($M)	Time	Phasable Benefits
1A. FN Alt 5 VE Modified 100-yr	3.8	27.0	15.0	Long	N
1B. FN Alt 5 VE Modified 5-yr	2.2	21.0	9.5	Long	N
2A. Rain Garden Projects	1.0	0.7	0.1	Short	Y
2B. Rain Garden Projects & Program	1.2	1.5	0.7	Long	Y
3. Rain Barrels	1.1	0.8	0.2	Long	Y
4. Underground Storage	1.5	9.0	3.8	Long	Y
5. Detention on Commercial Sites	1.2	2.0	0.7	Short	Y
6A. Stripling - Surface Detention	1.5	4.0	3.8	Short	N
6B. Stripling - Underground Detention	2.3	15.0	10.5	Short	N
7. High Mount Underground Detention	1.3	5.5	2.1	Short	N

Comparison of Costs and Benefits



Acceptability ?

Measure	Effective	Cost Effective	Acceptable
1A. FN Alt 5 VE Modified 100-yr	High	Low	
1B. FN Alt 5 VE Modified 5-yr	Medium	Low	
2A. Rain Garden Projects	Low	Low	
2B. Rain Garden Projects & Program	Low	Medium	
3. Rain Barrels	Low	Low	
4. Underground Storage	Medium	Low	
5. Detention on Commercial Sites	Low	Low	
6A. Stripling - Surface Detention	Medium	Medium	
6B. Stripling - Underground Detention	Medium	Medium	
7. High Mount Underground Detention	Low	Low	

- Effective – Relates to Level of Service
- Cost Effective – Relates to Damage Reduction/Cost

DISCUSSION