Lower Mississippi River WMO

Allowable Flow:

- Introduction/Joint Powers Agreement
- History
- Principles
- Description
- Examples

Introduction

Why does the Lower Mississippi River WMO (LMRWMO) use allowable flow?

Answer: Because the Joint Powers Agreement says they will!

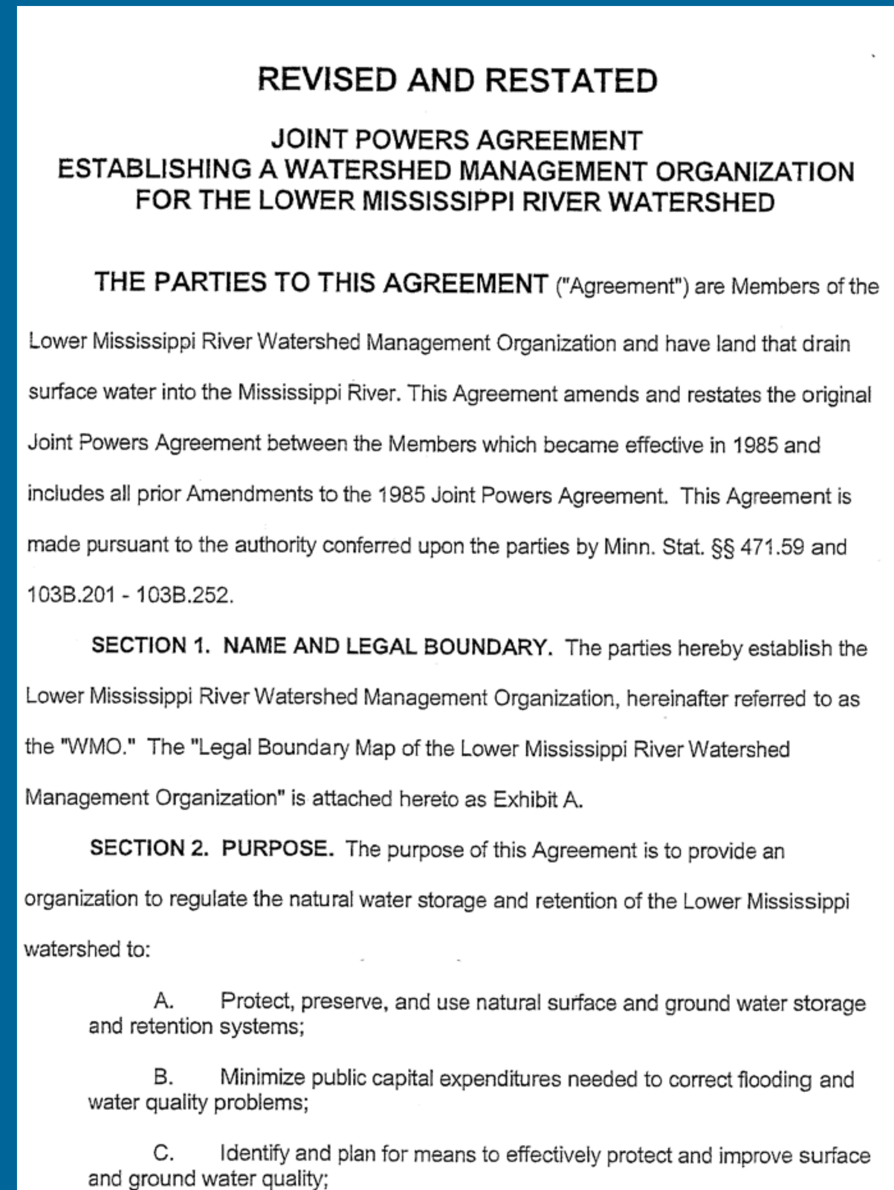
And, there is a need for a mechanism to apportion costs between cities

Joint Powers Agreement (JPA)

1985 – 1st JPA

2001 – 2nd/most recent JPA

Both included allowable flow



REVISED AND RESTATED

JOINT POWERS AGREEMENT
ESTABLISHING A WATERSHED MANAGEMENT ORGANIZATION
FOR THE LOWER MISSISSIPPI RIVER WATERSHED

THE PARTIES TO THIS AGREEMENT ("Agreement") are Members of the Lower Mississippi River Watershed Management Organization and have land that drain surface water into the Mississippi River. This Agreement amends and restates the original Joint Powers Agreement between the Members which became effective in 1985 and includes all prior Amendments to the 1985 Joint Powers Agreement. This Agreement is made pursuant to the authority conferred upon the parties by Minn. Stat. §§ 471.59 and 103B.201 - 103B.252.

SECTION 1. NAME AND LEGAL BOUNDARY. The parties hereby establish the Lower Mississippi River Watershed Management Organization, hereinafter referred to as the "WMO." The "Legal Boundary Map of the Lower Mississippi River Watershed Management Organization" is attached hereto as Exhibit A.

SECTION 2. PURPOSE. The purpose of this Agreement is to provide an organization to regulate the natural water storage and retention of the Lower Mississippi watershed to:

A. Protect, preserve, and use natural surface and ground water storage and retention systems;

B. Minimize public capital expenditures needed to correct flooding and water quality problems;

C. Identify and plan for means to effectively protect and improve surface and ground water quality;

JPA

- The JPA (Sec. 10 Subd. 7) lays out cost apportionment according to type of project:
  - Water quality: based on allowable flow, tributary area and/or phosphorus loading
  - Water quantity: based on allowable flow only

JPA

Allowable Flow Definition (from JPA):

- Amount of flow a city can discharge without financial obligation
- Rate or volume-based
- Assumes “natural” conditions
- Assumes topography on “enactment date” (1985 JPA)

History

- Allowable flow concept developed (1984-1985) by:
  - Jim Danielson, Mendota Heights
  - Skip Stefaniak, West St. Paul
  - Bill Price, consultant
- Multiple meetings held and memos written (1988, 1991, 1992) to define and apply allowable flow principles

Principles

- Upstream communities have the right to discharge some flow downstream without cost
- Upstream communities should share in downstream costs of handling their excess flows
- Upstream communities could hold back enough water to bring cost-sharing to 0%

Allowable Flow
Description

Not Predevelopment Flow

Cost sharing is based on excess water.

PIPES

Excess Flow = Total Flow – Allowable Flow

$$Q_E = Q_T - Q_A$$

PONDS

Excess Volume = Total Volume – Allowable Volume

$$V_E = V_T - V_A$$

Total (Flow or Volume) is calculated using design conditions:

- Land use (fully developed)
- Design drainage system
- Includes ponds
- Storm event (i.e., 10-year or 100-year storm)

Allowable =

- Hypothetical land use
- Hypothetical drainage system
- No ponds
- Same storm as total/design conditions

Allowable Flow = Q_A

Q_A = C I A

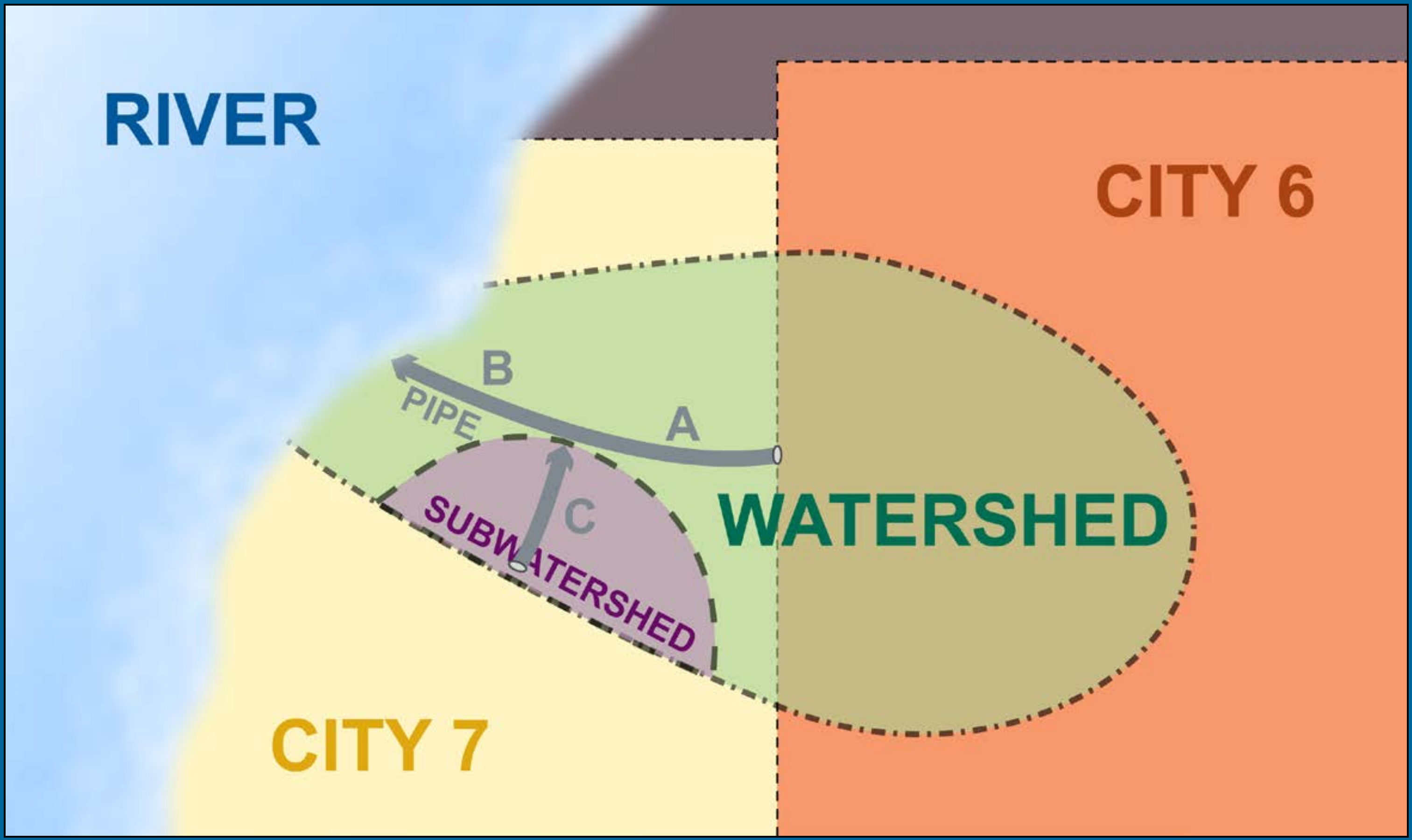
C = runoff factor, 0.15

I = rainfall intensity, in inches per hour

A = watershed area, in acres

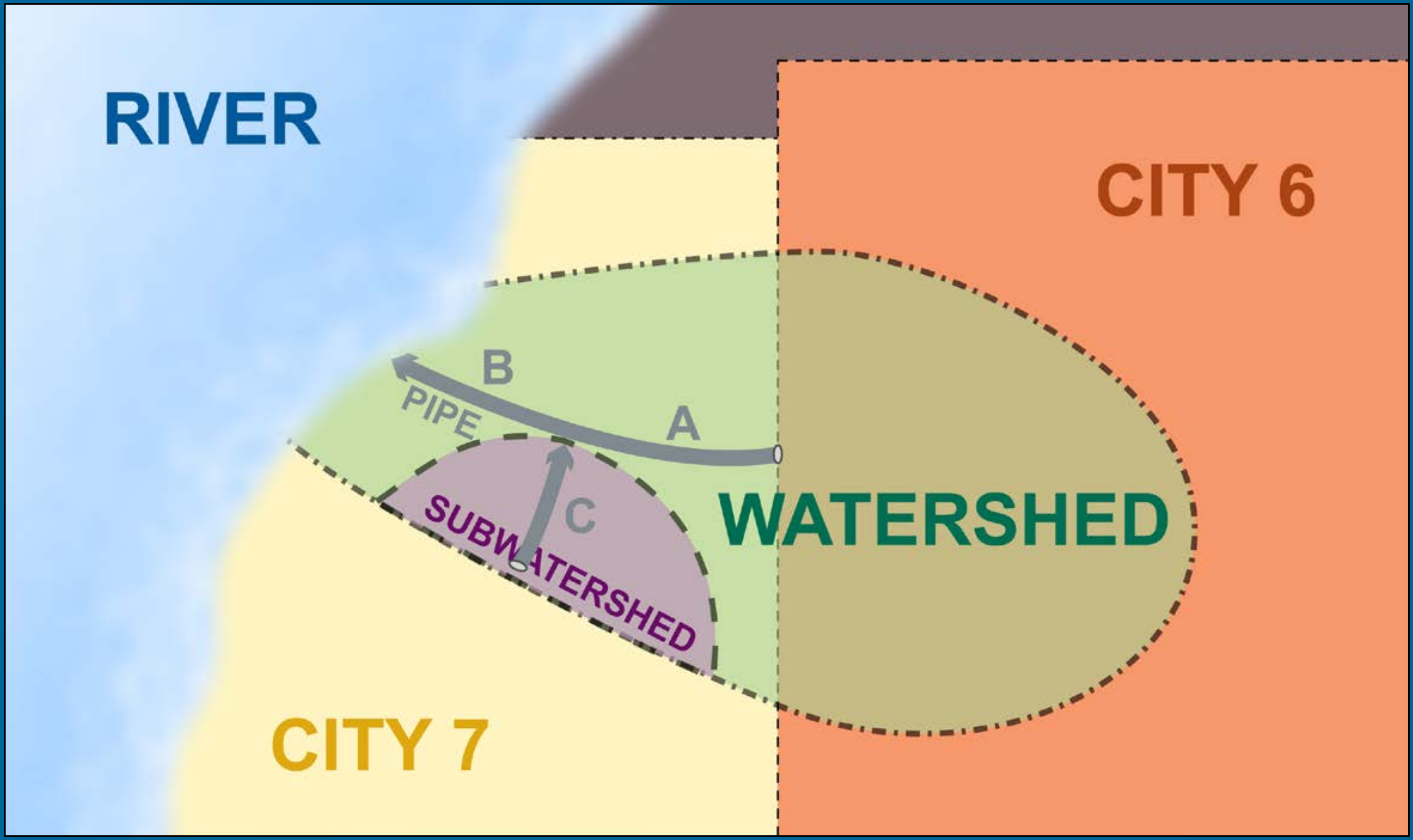
Allowable FLOW

Cost share on pipe



Allowable FLOW

Easy: Segment C = City 6 has no cost share



Allowable FLOW

Easy: Segment A $Q = C\ I\ A$

City 6: $Q_T = 140$ cfs $= 0.4 \times 2 \times 175$

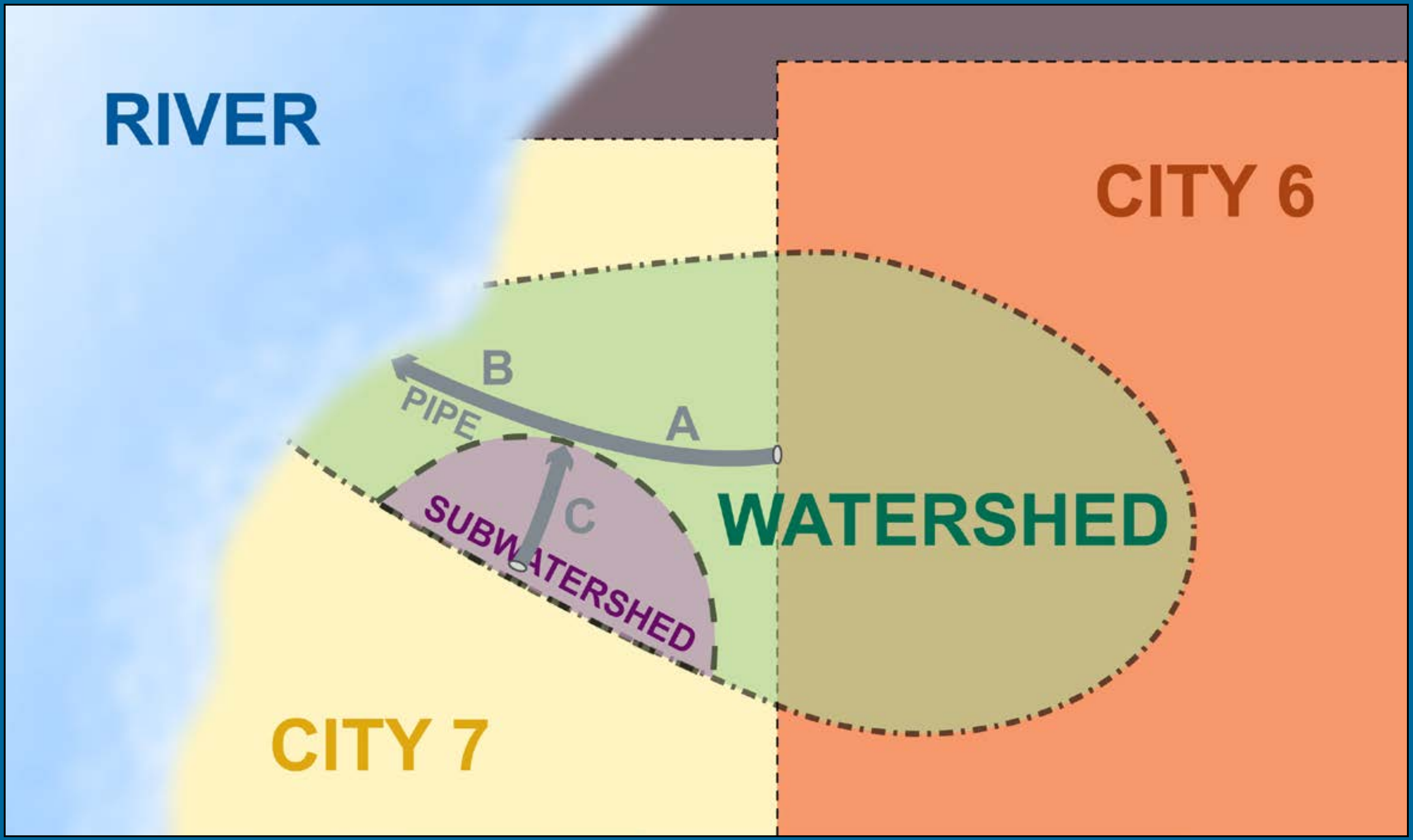
$Q_A = 52.5$ cfs $= 0.15 \times 2 \times 175$

Q_{Excess} 87.5 cfs

$$\text{City 6 Cost Share} = \frac{Q_{Excess}}{Q_T} = \frac{87.5}{140} = 63\%$$

Allowable FLOW

Trickier: Segment B



Allowable FLOW

Trickier: Segment B

Pipe A: Q_T = 140 cfs

Pipe C: Q_T = 225 cfs

Pipe B: Q_T = 365 cfs

City 6 = Q_{Excess} = 87.5 cfs

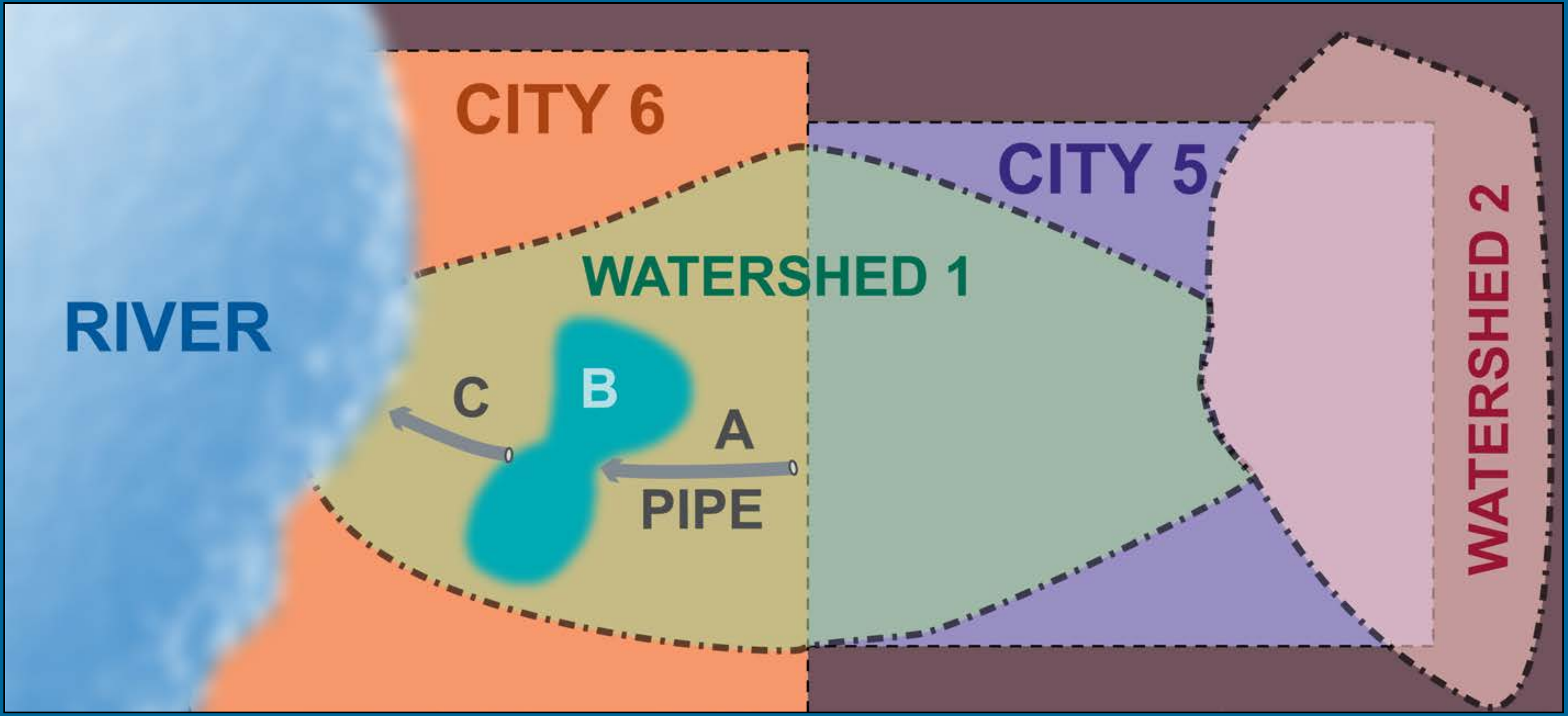
City 6 Cost Share $= \frac{Q_{Excess}}{Q_{T\ at\ B}} = \frac{87.5}{365} = 24\%$

Allowable Volume

- No formula
- It gets complicated
  - Ponds straddling city borders
  - Design storm (usually 100-year)
  - Effects of upstream ponds

Allowable VOLUME

Cost share on pond



Allowable VOLUME

City 5: Cost share for pond = $\frac{V_{E5}}{V_T}$

V_{E5} = excess volume of runoff from City 5

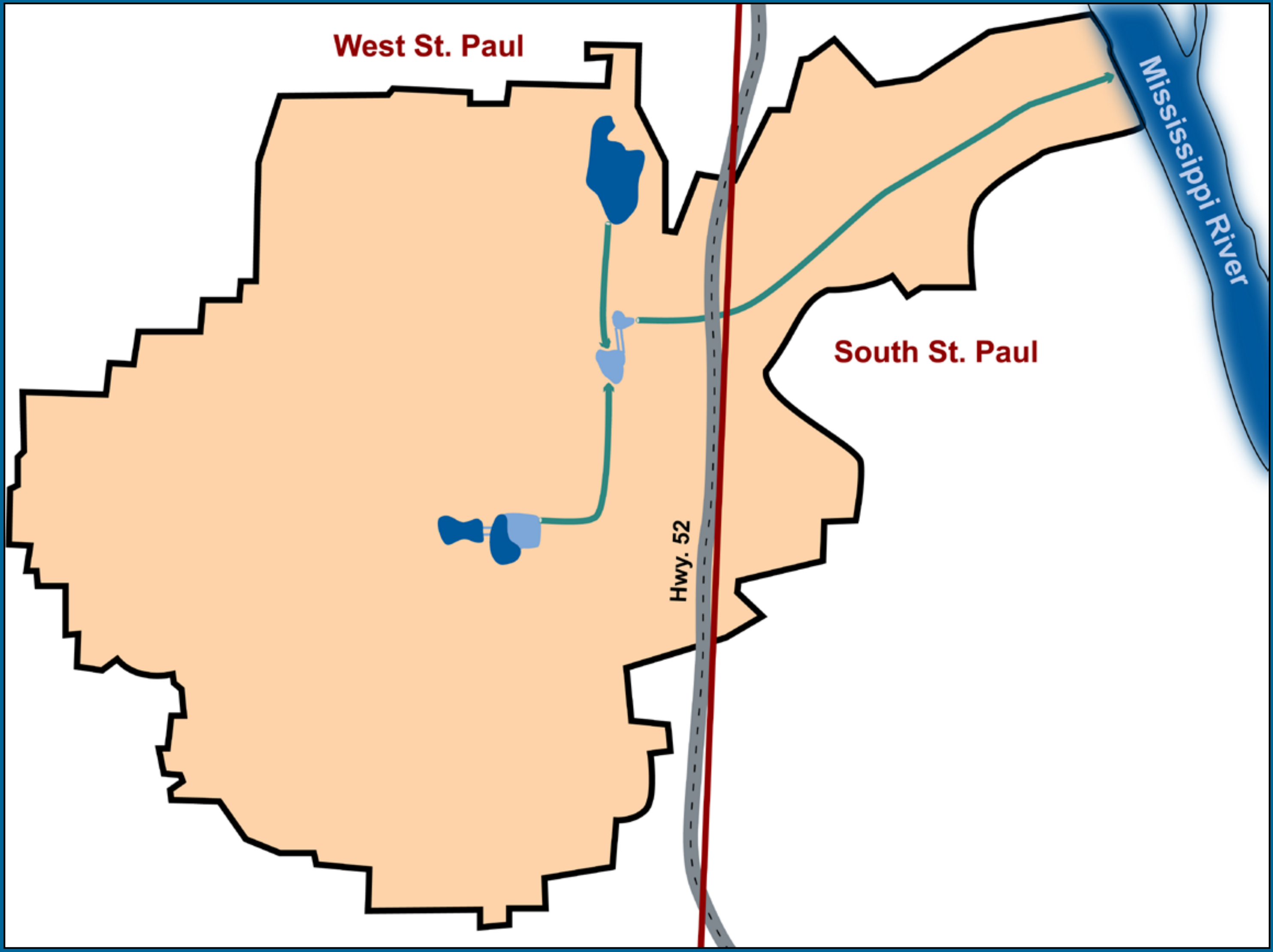
V_T = design volume of pond

Note: no guidance on how to calculate V_{E5}.

Examples

- Unique Result – Cities share in Cost – Simon's Ravine
- Unique Result – Cities do not share in Cost – Marie Creek
- Ambiguous Result – Seidls Lake Outlet (designation of "owner" makes a big difference in cost allocation)

Example: Simon's Ravine



Example: Simon's Ravine

- **Alternative 1:** High Flow Rate
  - 720 cfs
  - No storage increase: 6' pipes in ravine
- **Alternative 2:** Intermediate Flow Rate
  - 220 cfs
  - Upstream storage increase: 45 AF; 3.5' pipes in ravine
- **Alternative 3:** Low Flow Rate
  - 100 cfs
  - Upstream storage increase: 95 AF; 2.5' pipes in ravine

Example: Simon's Ravine

Cost Sharing ($2.3 million project)

Alternative 2.5	West St. Paul	South St. Paul

Example: Simon's Ravine

Cost Sharing ($2.3 million project)

Alternative 2.5	West St. Paul	South St. Paul
Total Flow	158 cfs	-

Example: Simon's Ravine

Cost Sharing ($2.3 million project)

Alternative 2.5	West St. Paul	South St. Paul
Total Flow Allowable Flow	158 cfs 172 cfs w/ponds or 365 cfs w/o ponds	- -

Example: Simon's Ravine

Cost Sharing ($2.3 million project)

Alternative 2.5	West St. Paul	South St. Paul
Total Flow	158 cfs	-
Allowable Flow	172 cfs w/ponds or 365 cfs w/o ponds	-
Excess Flow	0 cfs	-

Example: Simon's Ravine

Cost Sharing ($2.3 million project)

Alternative 2.5	West St. Paul	South St. Paul
Total Flow	158 cfs	-
Allowable Flow	172 cfs w/ponds or 365 cfs w/o ponds	-
Excess Flow	0 cfs	-
Cost Shares		
Work in West St. Paul	100%	0%

Example: Simon's Ravine

Cost Sharing ($2.3 million project)

Alternative 2.5	**West St. Paul**	**South St. Paul**
Total Flow	158 cfs	-
Allowable Flow	172 cfs w/ponds or 365 cfs w/o ponds	-
Excess Flow	0 cfs	-
Cost Shares		
Work in West St. Paul	100%	0%
Work in South St. Paul	0%	100%

Example: Simon's Ravine

Cost Sharing ($2.3 million project)

Alternative 2.5	West St. Paul	South St. Paul
Total Flow	158 cfs	-
Allowable Flow	172 cfs w/ponds or 365 cfs w/o ponds	-
Excess Flow	0 cfs	-
Cost Shares		
Work in West St. Paul	100%	0%
Work in South St. Paul	0%	100%
System Upgrade Cost	$1.1 million	$1.2 million

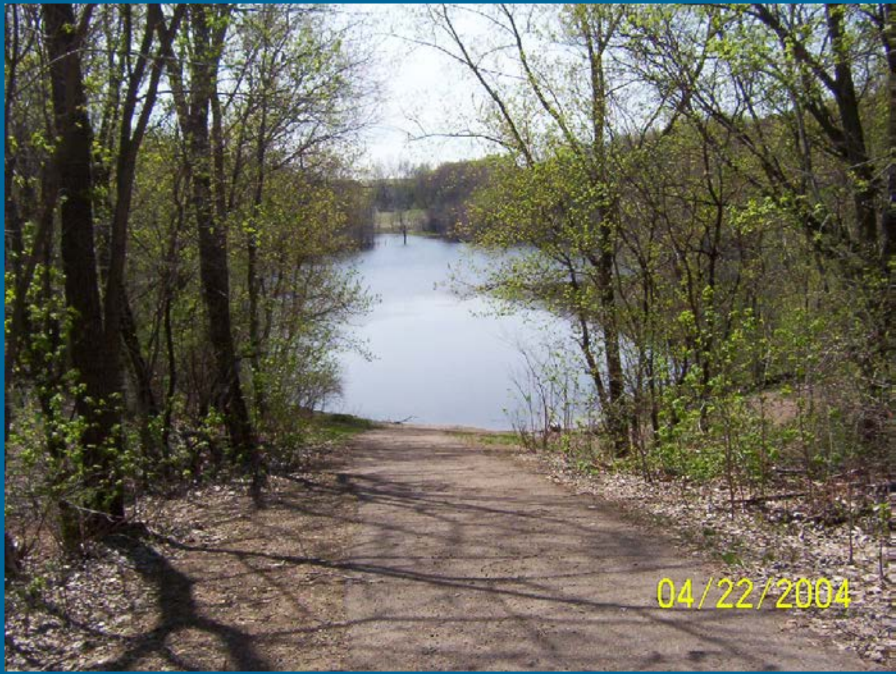
Marie Creek Example

- JPA Examples A, E and G used as guidelines
- Cost allocation for the base flow enhancement (added ponding) based on allowable volume – West St. Paul not contributing excess volume to Mendota Heights.
- Cost allocation for the stream bank erosion protection based on allowable flow – West St. Paul not contributing excess flow to Mendota Heights.
- City of West St. Paul not obligated to participate.

Seidls Lake Example

Three new cost allocation examples created:

1. Rainfall runoff volume
2. Snowmelt runoff volume
3. Rainfall runoff rate



Seidls Lake Example (cont'd)

Cost allocation examples resulted in the following ranges in participation:

City	Cost Share
Inver Grove Heights	10% - 60%
South St. Paul	26% - 76%
West St. Paul	6% - 21%

Conclusions

- “Allowable Flow”
  - Works best for simple “water in pipe” situations
  - Is more complicated for volume-driven situations, which require methods not defined in JPA examples
  - Has been used in some cases to set cost-share percentages
  - Has been used in other cases to develop a range of cost shares; then cities mutually agree upon percentages