ASSESSMENT OF FLOOD REMEDIATION WITH MINIMAL HISTORIC HYDROLOGIC DATA: CASE STUDY FOR A SMALL URBAN STREAM

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Outline

- Problem

- Solution Scheme

- Case Study: Boneyard Creek in Champaign-Urbana, Illinois, USA

- July 9, 2003 flow event

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Problem

Given:

- Flooding is identified as a problem
- A remediation project is designed and implemented
- Sparse "pre-" remediation streamflow and precipitation data exist

Determine:

- Impact of remediation on downstream jurisdictions

Problem

Challenges:

- With sparse streamflow and precipitation data, cannot compare actual streamflow peaks and volumes before and after remediation

Solution Scheme

- Remediation project likely designed and permitted with the aid of a computer model

- Collect adequate streamflow and precipitation data after remediation project completed to allow evaluation of the accuracy of the model

- If model matches or overpredicts the observed streamflow, then design model was conservative with design, thus no adverse impact resulted downstream

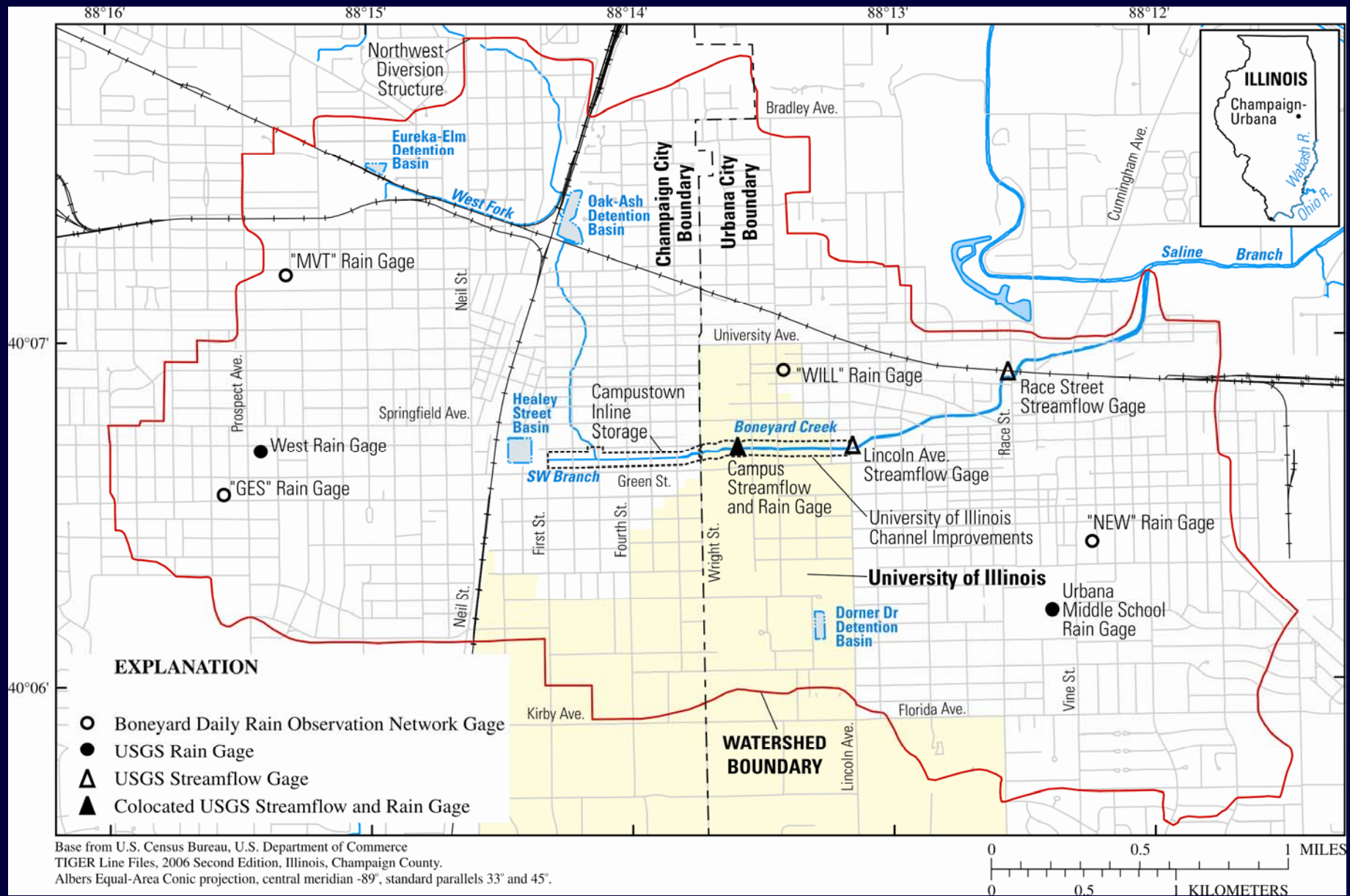# Case Study: Boneyard Creek in Champaign-Urbana, Illinois, USA

Flooding has been a recurrent problem
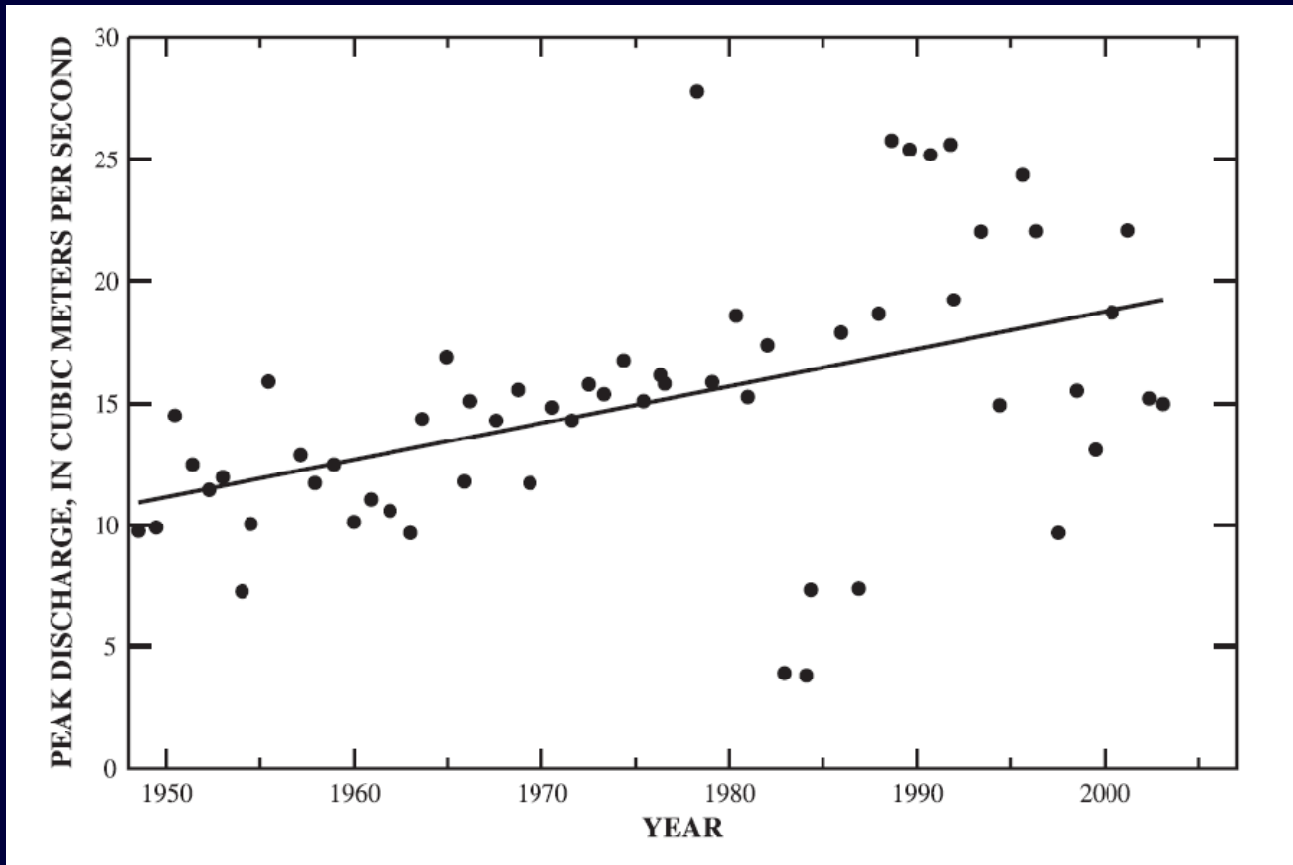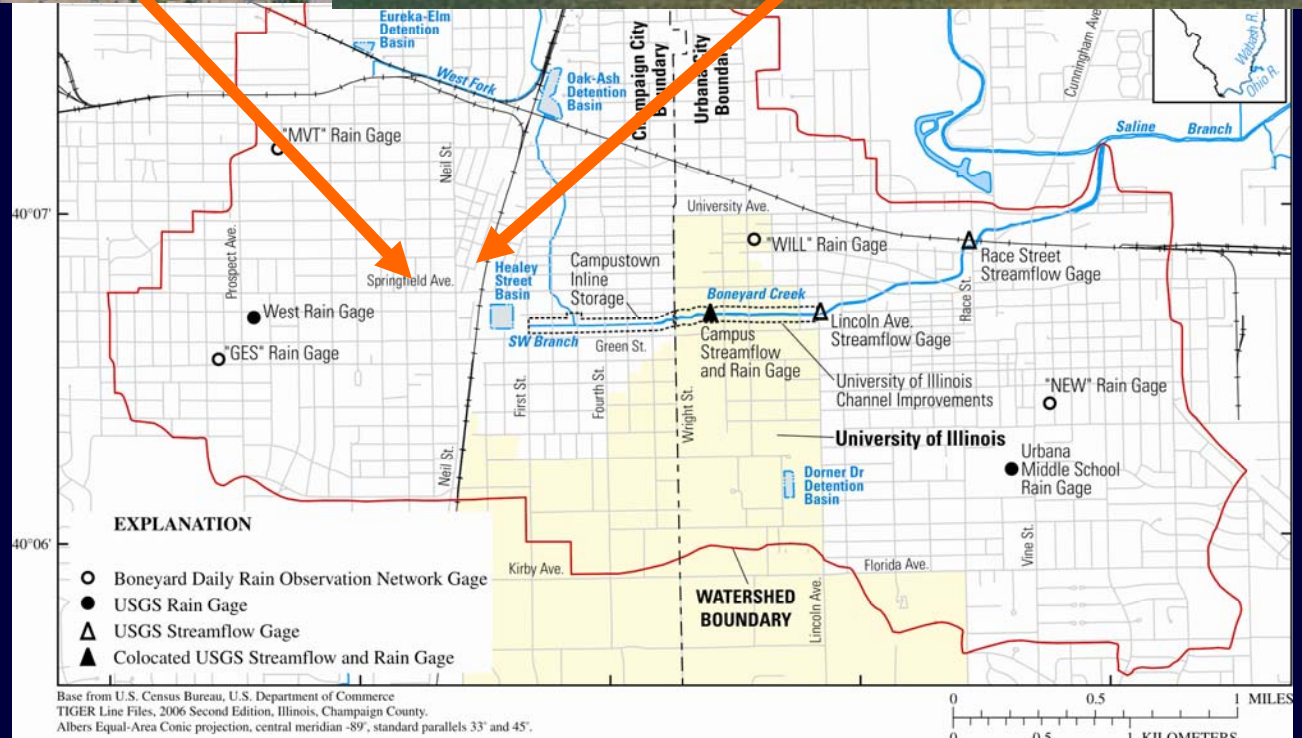
Green St,

July 30, 1979

Remediation

- City of Champaign engaged a consultant to design remediation to increase flood protection in the "Campustown" section (25-year recurrence interval protection)

- University of Illinois retained the same consultant to design a new channel that would provide 100-year flood protection

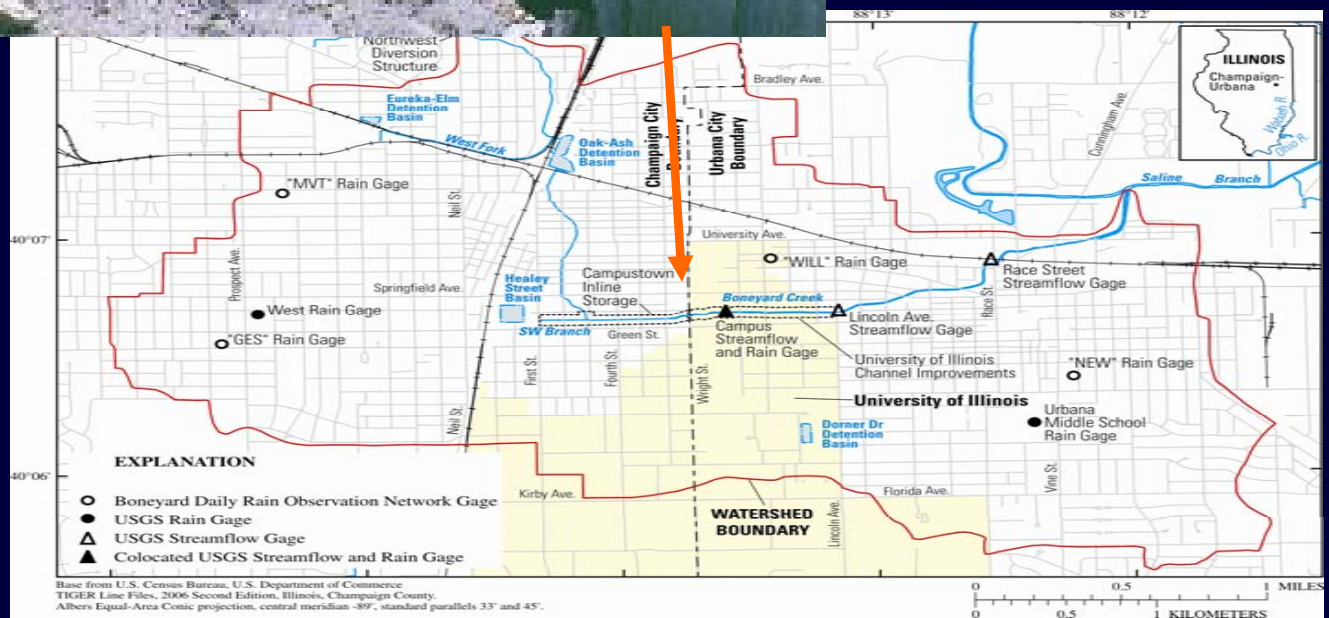- Consultant used U.S. EPA SWMM model for design of the remediation project

Aerial photography by Aerial Mapping Services, Inc.
and Berns, Clancy and Associates © 2003

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Boneyard Creek at USGS Campus Streamgage

EXPLANATION

○ Boneyard Daily Rain Observation Network Gage
● USGS Rain Gage
△ USGS Streamflow Gage
▲ Colocated USGS Streamflow and Rain Gage

Base from U.S. Census Bureau, U.S. Department of Commerce
TIGER Line Files, 2006 Second Edition, Illinois, Champaign County.
Albers Equal-Area Conic projection, central meridian -89°, standard parallels 33° and 45°.

EXPLANATION

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WATERSHED BOUNDARY

Base from U.S. Census Bureau, U.S. Department of Commerce
TIGER Line Files, 2006 Second Edition, Illinois, Champaign County.
Albers Equal-Area Conic projection, central meridian -89°, standard parallels 33° and 45°.

Boneyard Creek at Lincoln Avenue

# Scheme to Assess the Validity of the SWMM for Boneyard Creek

- Install additional precipitation gages and streamgages
- Collect data until at least 3 storm events with a peak streamflow of 19.7 cms occur
  - SWMM model calibrated by consultant for floods, so only fair to evaluate the model in the flow range the model was calibrated on. 19.7 cms is 5-year flood recurrence
- Utilize the design SWMM model to simulate the streamflow in the Boneyard from these 3 events
- Main point of interest is Lincoln Avenue streamgage

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Determining Adverse Impact Downstream

Compare simulated peak with observed peak at Lincoln Avenue

- If Simulated Peak > Observed Peak
  - Conclusion: No adverse impact
- If Simulated Peak < Observed Peak
  - Conclusion: Adverse impact

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July 9, 2003 Storm Event
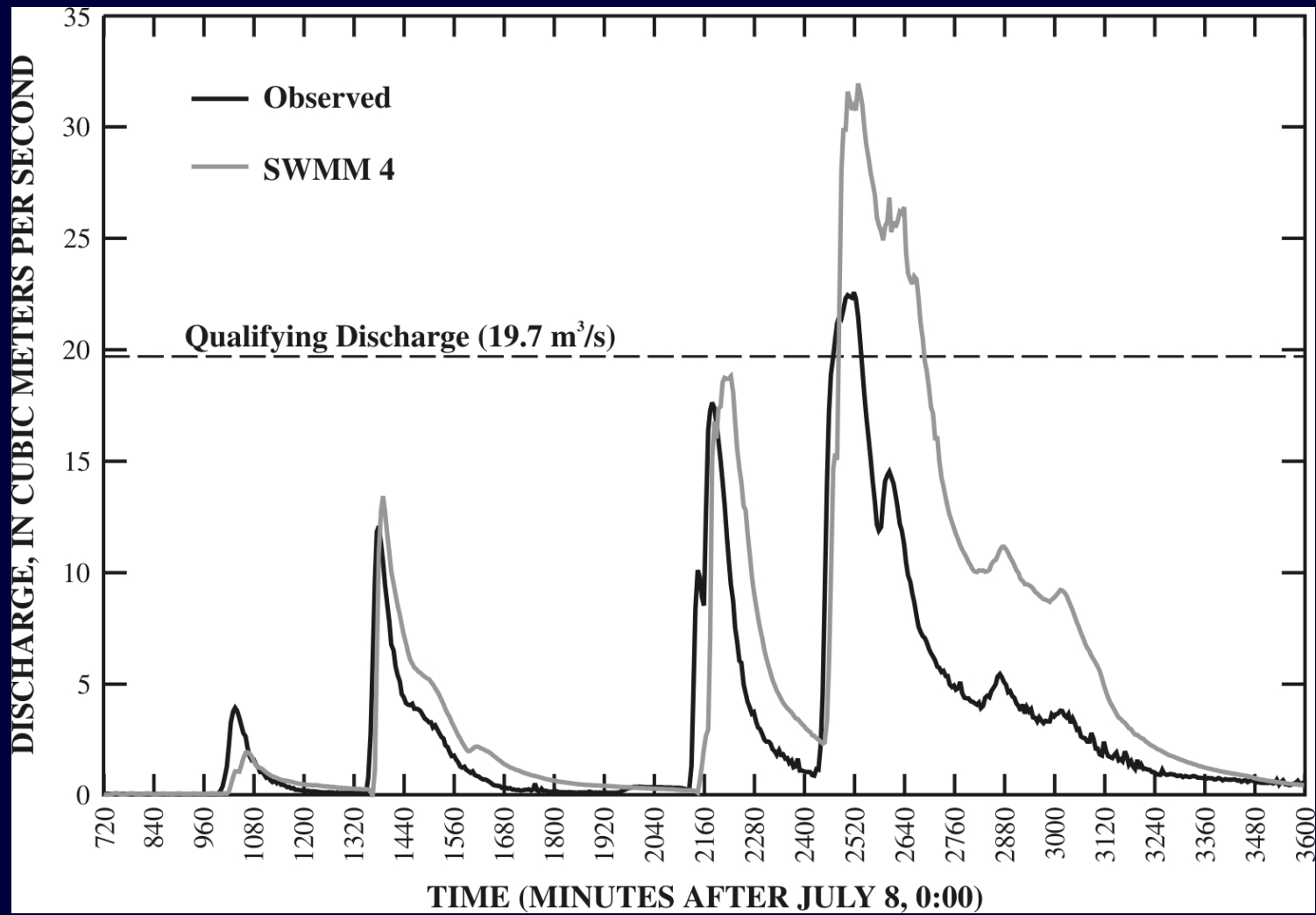
Preliminary Analysis

SWMM model overpredicts the observed peak streamflow for the July 9, 2003 storm event. For this event, the SWMM model was conservative in its simulation of the design. A preliminary finding is that the remediation project has had no adverse impact downstream in Urbana

Questions?

Downstream of Springfield

Downstream of Lincoln
(Left Bank)

Downstream of Wright
Street Restrictor

Restrictor Closeup

USGS
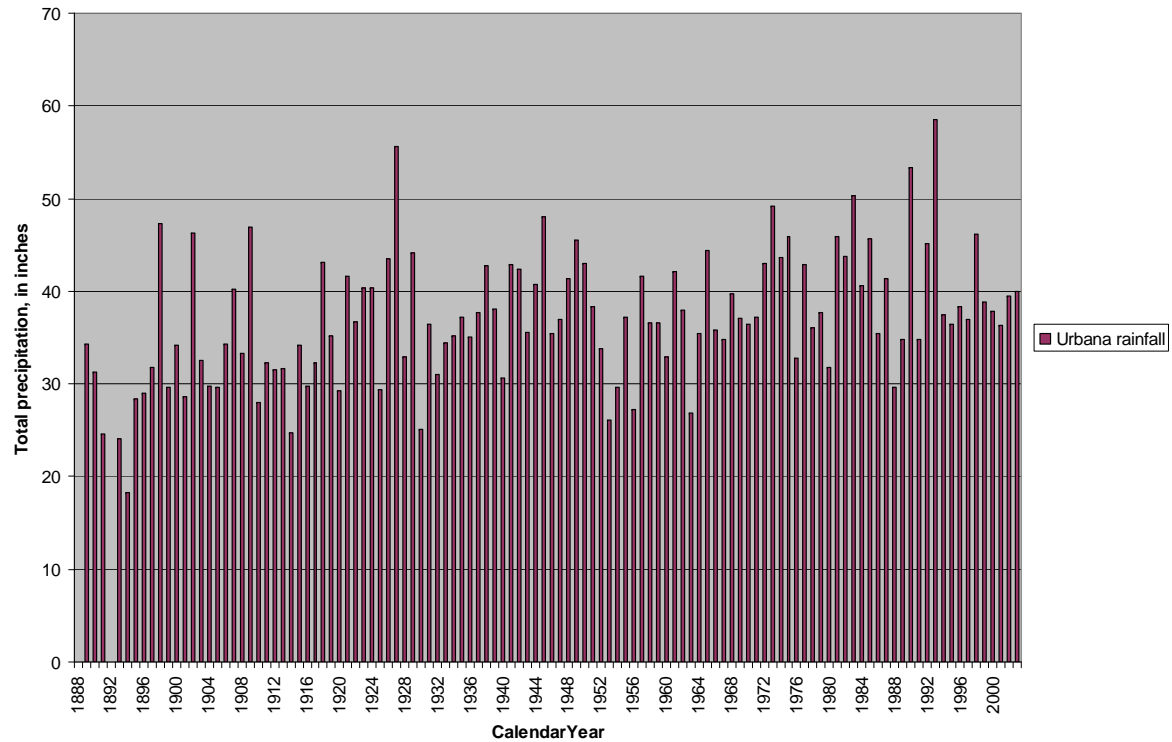
Brief Examination of the Historic Data

Photos from Berns, Clancy and Associates (B. Chaille)

September 2, 1997
844 cfs

July 9, 2003
789 cfs

USGS

Annual precip. data-Urbana (1889-2003)

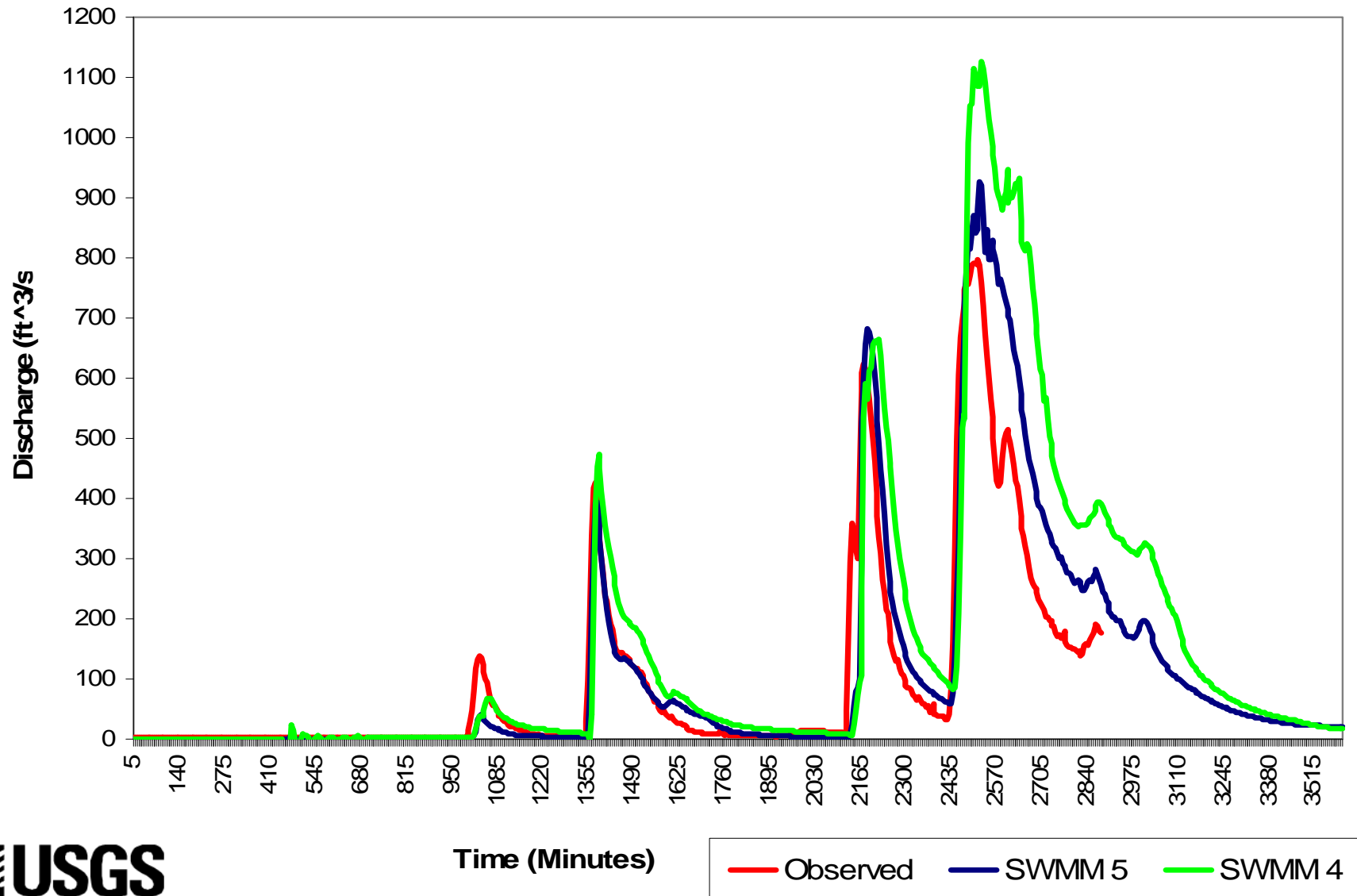# Increasing number of floods on BYC
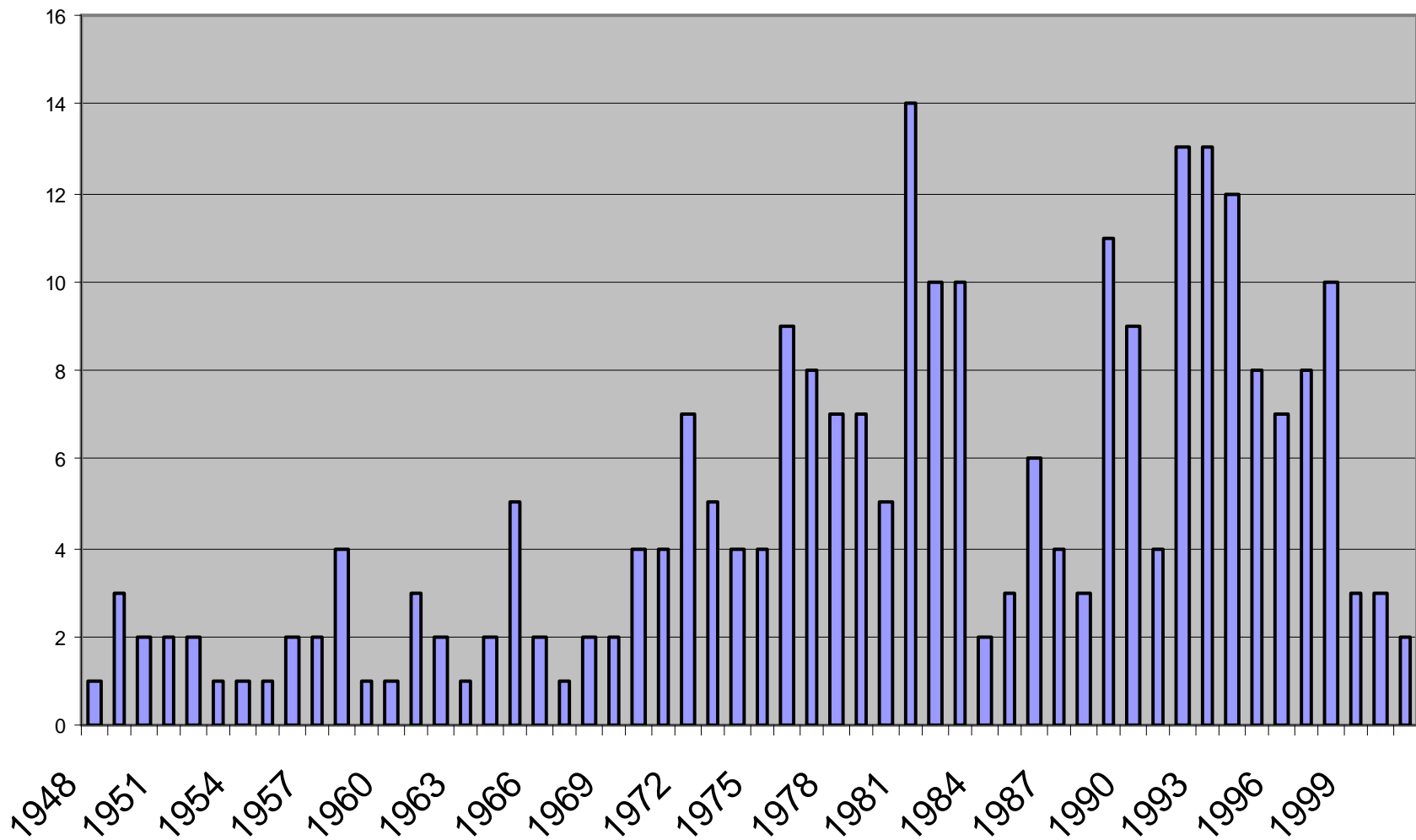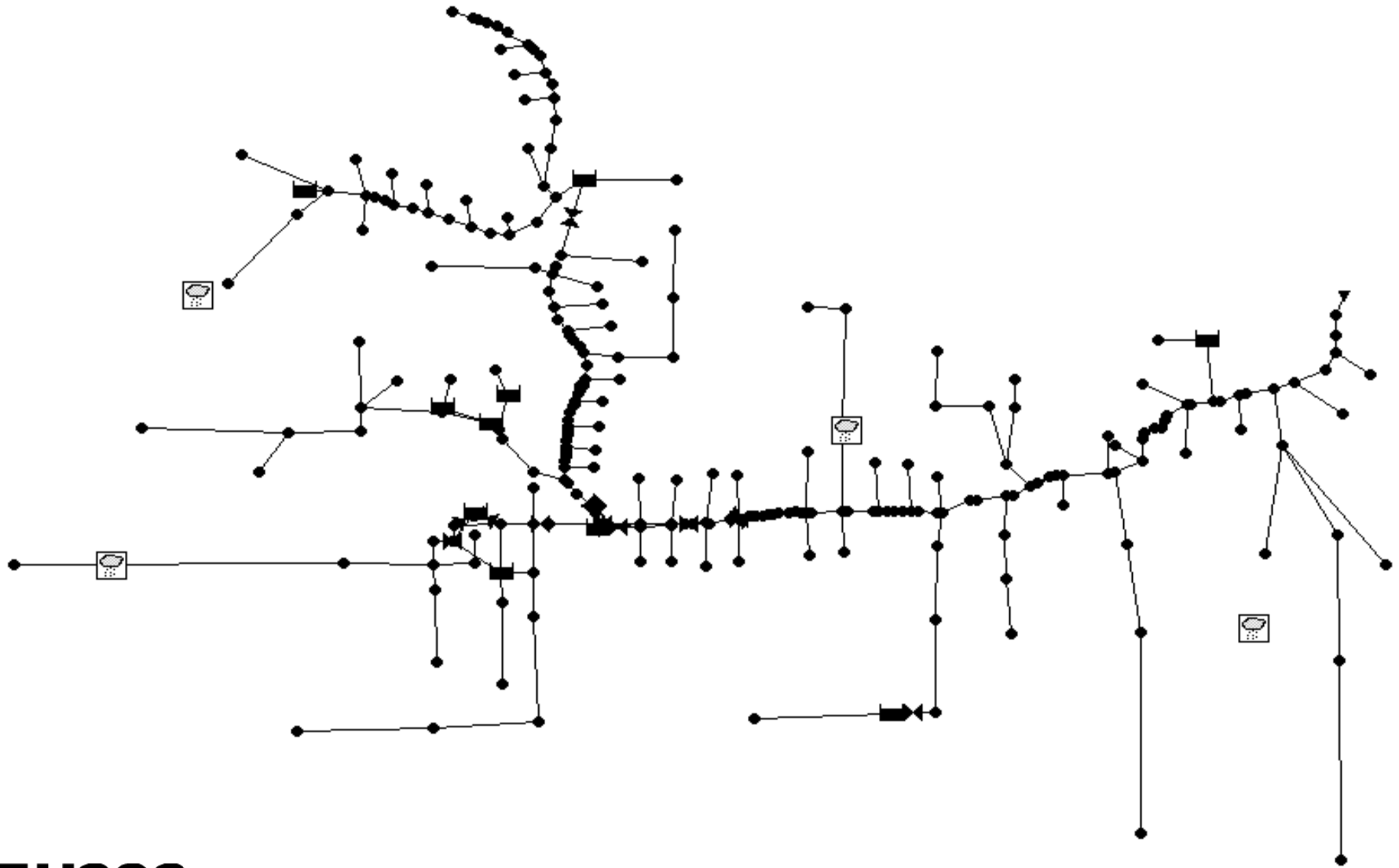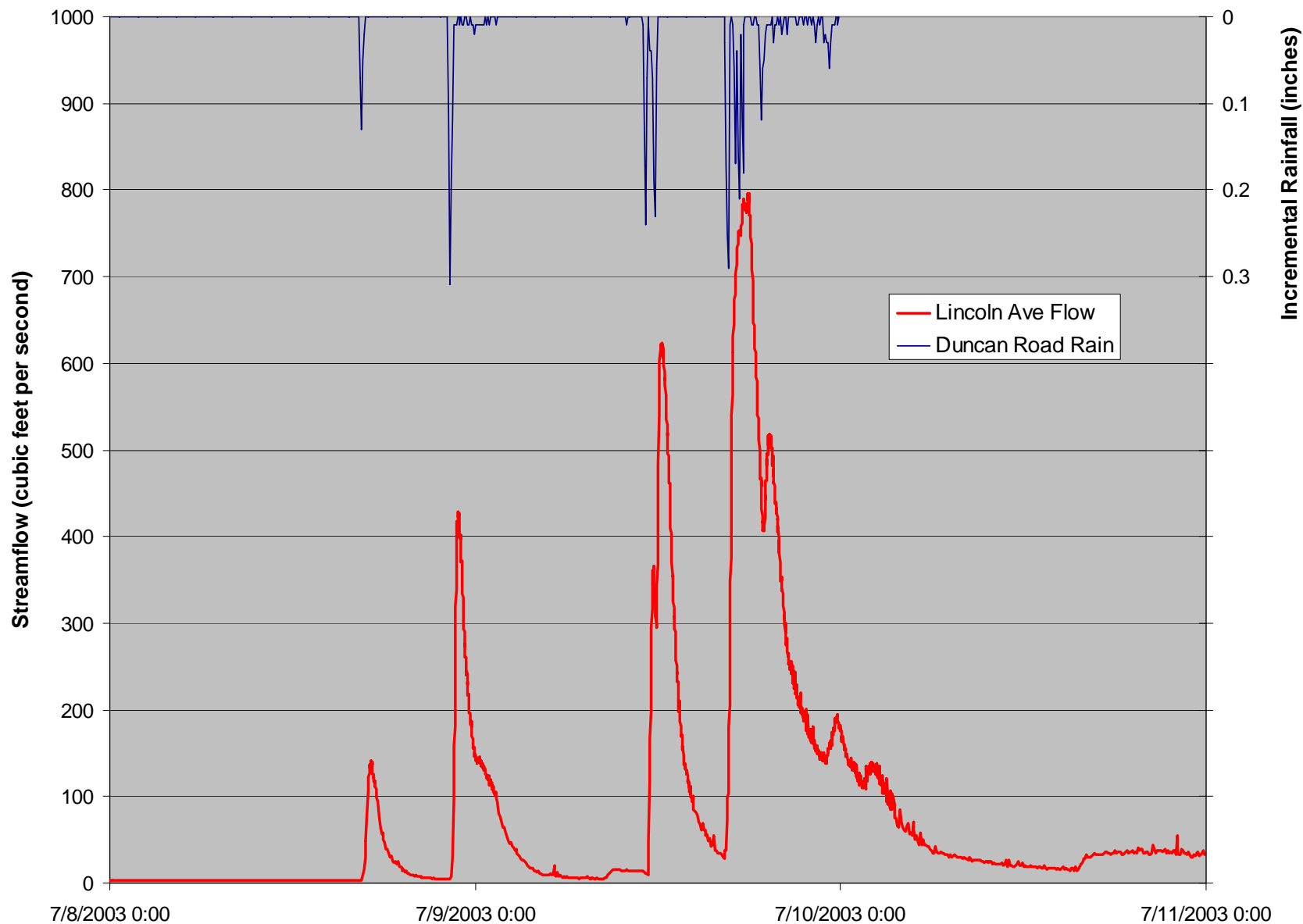
Calibration/Verification Event

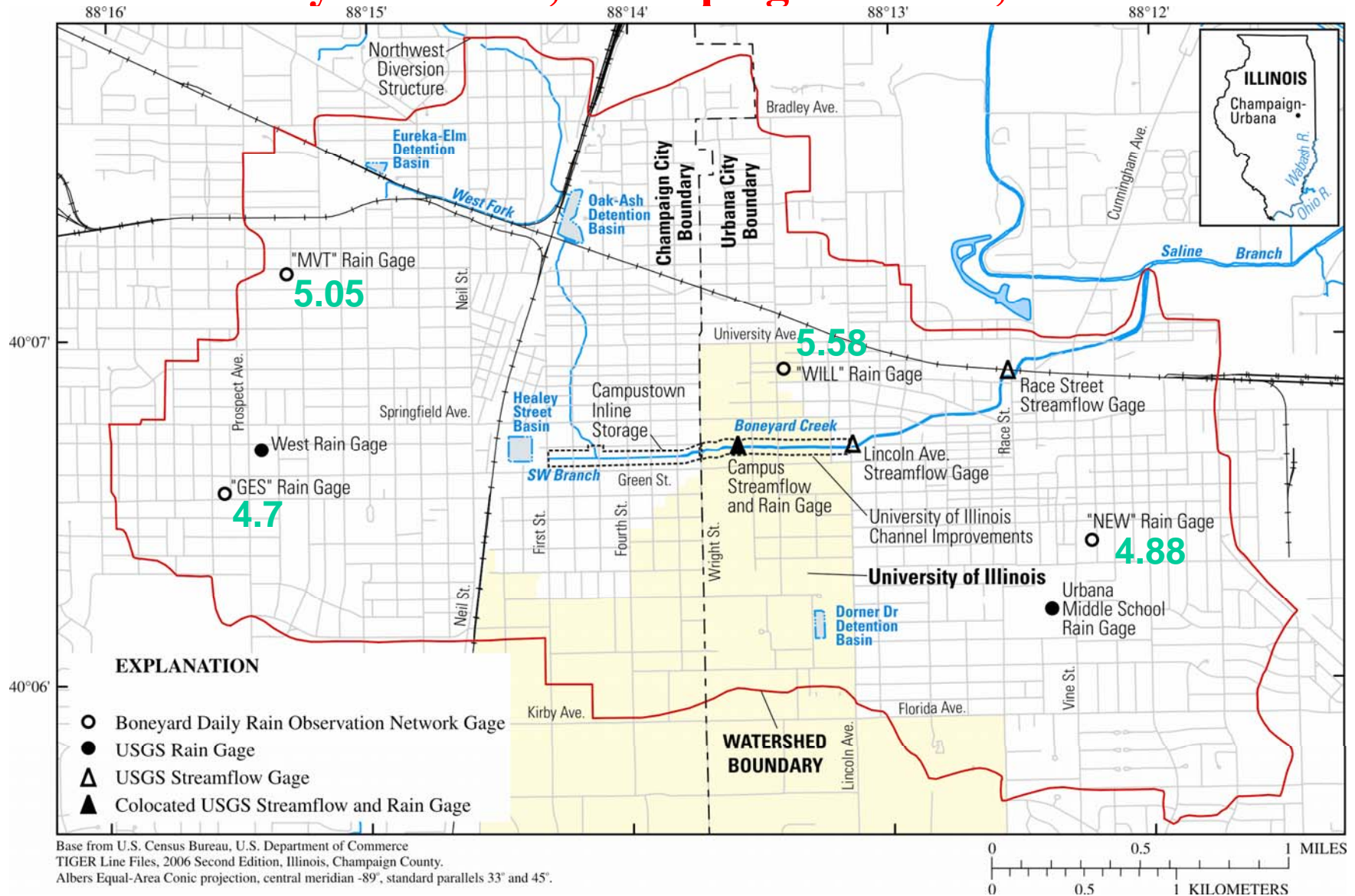**Boneyard Creek at Lincoln Avenue at Urbana, IL (July 8-9, 2003)**

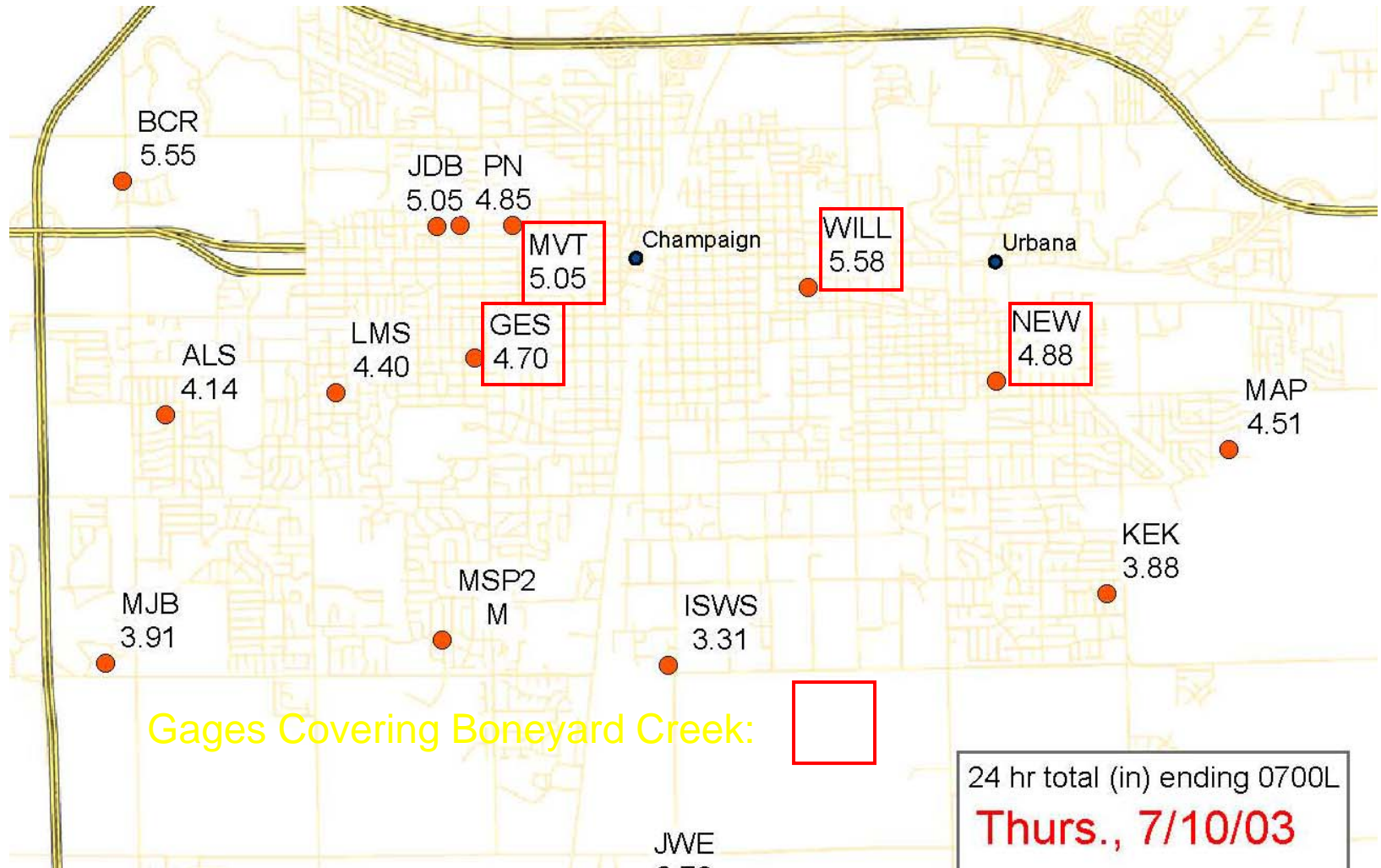# Rain-Runoff Depth Analysis of July 2003 Flood Events on Boneyard Creek

	Units	GES Rain	Average Rain	Observed Discharge	SWMM4 Discharge (GES Rain)
Event "3" (7/9/03, 11:30 - 7/9/03 7:00):					
Average Discharge	m^3/s			5.63	7.60
Discharge Volume	m^3			103038	139017
Depth	mm	32	34.4	10.6	14.2
Runoff Coefficient: Q/P	---			0.308	0.444
Event "4" (7/9/03 17:00 - 7/10/03 7:00):					
Average Discharge	m^3/s			6.57	12.33
Discharge Volume	m^3			341102	640052
Depth	mm	87.4	94	32.3	60.7
Runoff Coefficient: Q/P	---			0.344	0.646

24-hour Rainfall (inches), ending 7:00 7/10/03, Boneyard Creek, Champaign-Urbana, Illinois

Data Source: http://www.sws.uiuc.edu/atmos/boneyard/

24-hour Rainfall (inches) ending 7:00 7/10/03
Champaign-Urbana, Illinois

BCR
5.55

JDB PN
5.05 4.85

MVT
5.05

Champaign

WILL
5.58

Urbana

GES
4.70

LMS
4.40

ALS
4.14

NEW
4.88

MAP
4.51

KEK
3.88

MSP2
M

MJB
3.91

ISWS
3.31

Gages Covering Boneyard Creek:

24 hr total (in) ending 0700L
Thurs., 7/10/03

JWE

Source: http://www.sws.uiuc.edu/atmos/boneyard/