



Santa Clara Valley
Urban Runoff
Pollution Prevention Program



California NPS Conference – Hydromodification Workshop

Potential Solutions: Flow Duration Control Approach

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Presentation Overview

- Permit Requirements for Hydromodification Management
- Hydromodification Control Strategies
- The Flow Duration Control Approach
- Flow Duration Controls + LID
- Flow Duration Basin Sizing Examples

Hydromodification Control Requirements

SCVURPPP Permit Provison C.3.f.i.:

- Increases in runoff peak flow, volume, and duration shall be managed for all Group 1 Projects*, where such increased flow and/or volume can cause increased erosion of creek beds and banks...
 - * Group 1 = > 1 acre impervious surface

Hydromodification Control Requirements, continued

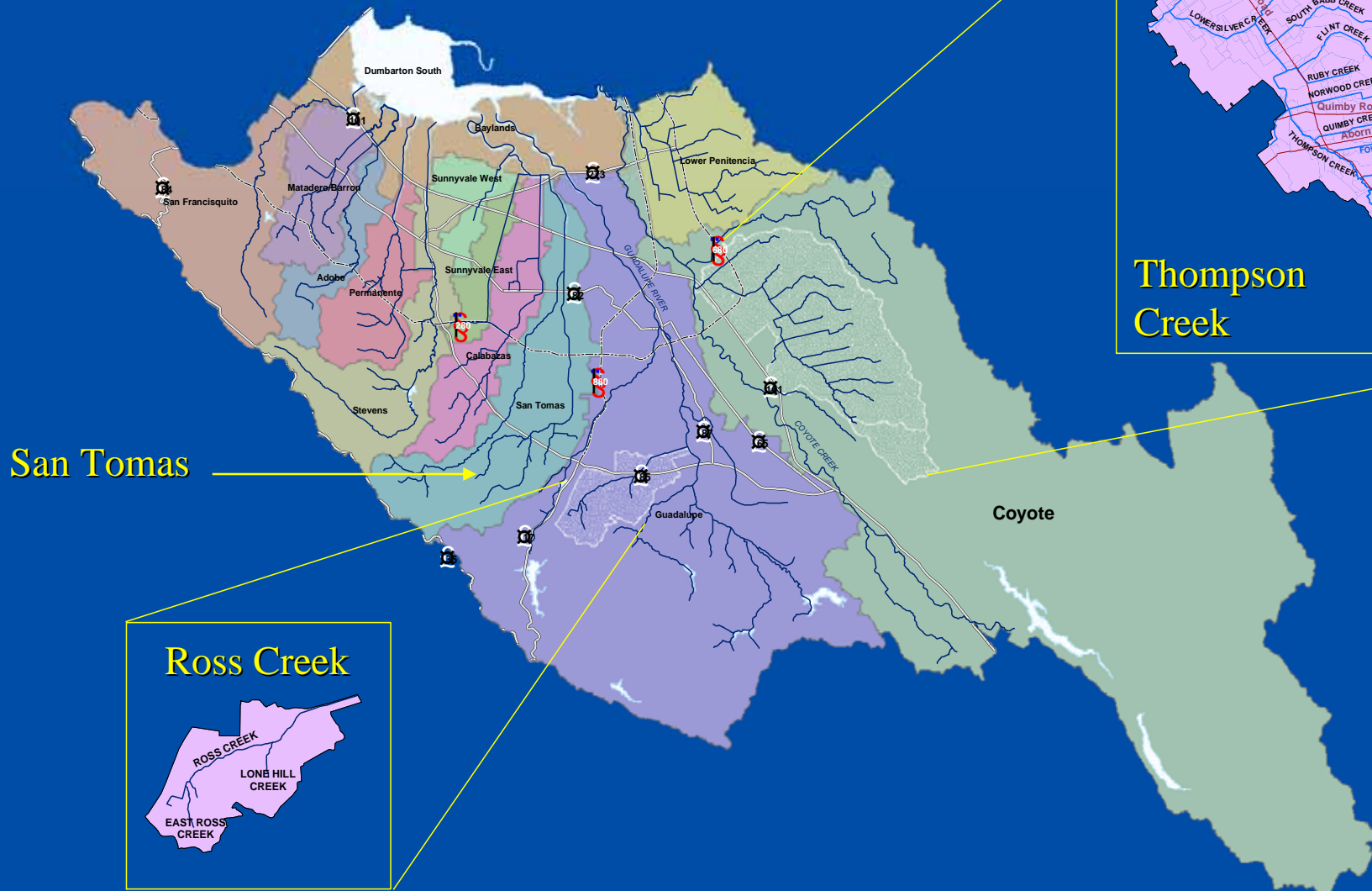
SCVURPPP Permit Provison C.3.f.i.:

- Post-project runoff shall not exceed estimated pre-project rates and/or durations, where the increased stormwater discharge rates and/or durations will result in increased potential for erosion...

Development of Hydromodification Management Plan for Santa Clara Valley

- Conducted literature review
- Developed and applied a watershed assessment methodology to predict stream instability & evaluate controls
- Developed design criteria, control measures, management strategies
- Developed performance criteria and guidance for implementation
- Conducted public outreach

HMP Assessment Subwatersheds



Thompson
Creek

Ross Creek

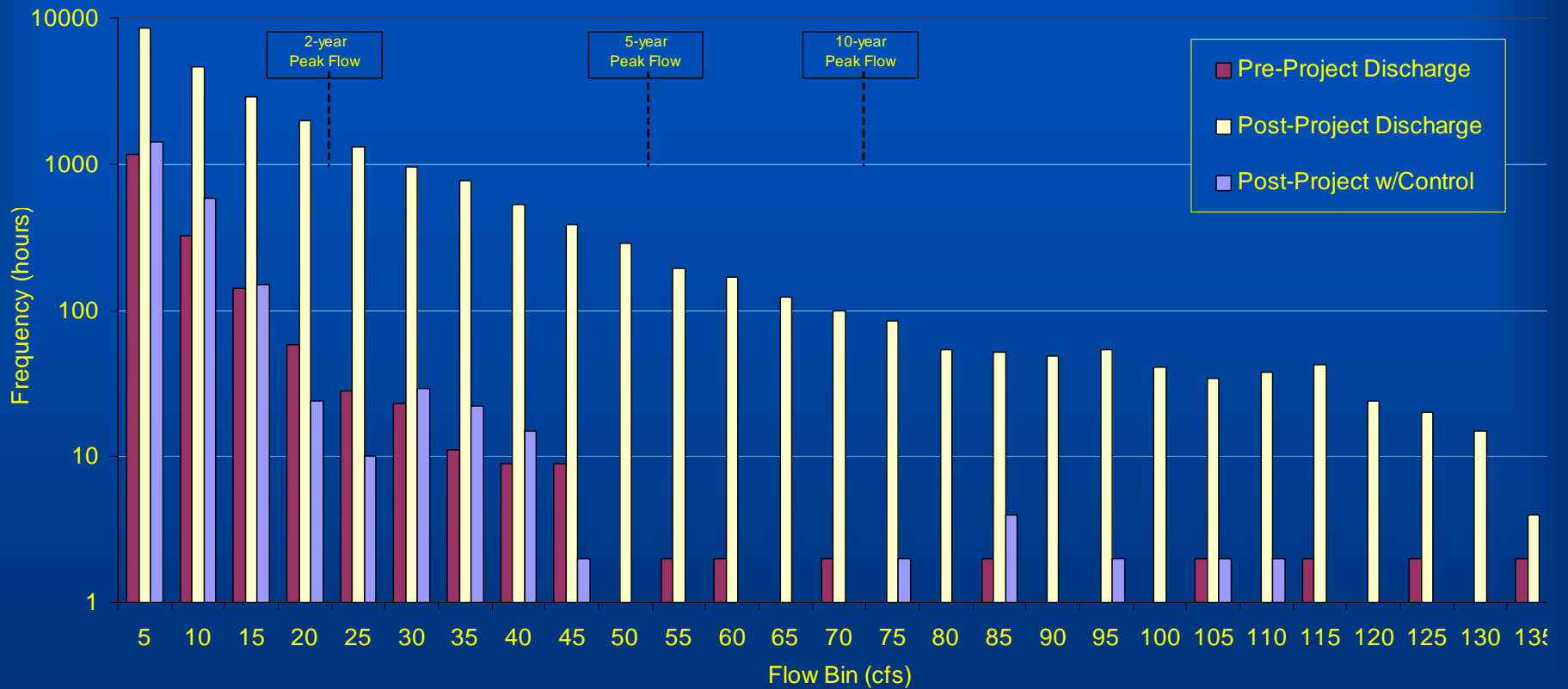
San Tomas

Control Strategies

- Peak flow control - not effective for erosion control (per MacRae's studies)
- Single event/design storm approaches – not adequate hydromod control
- Low flows matter!
- Flow duration control - recommended
 - Maintain magnitude and duration of post-project flows same as pre-project
 - Considers multi-year discharge record

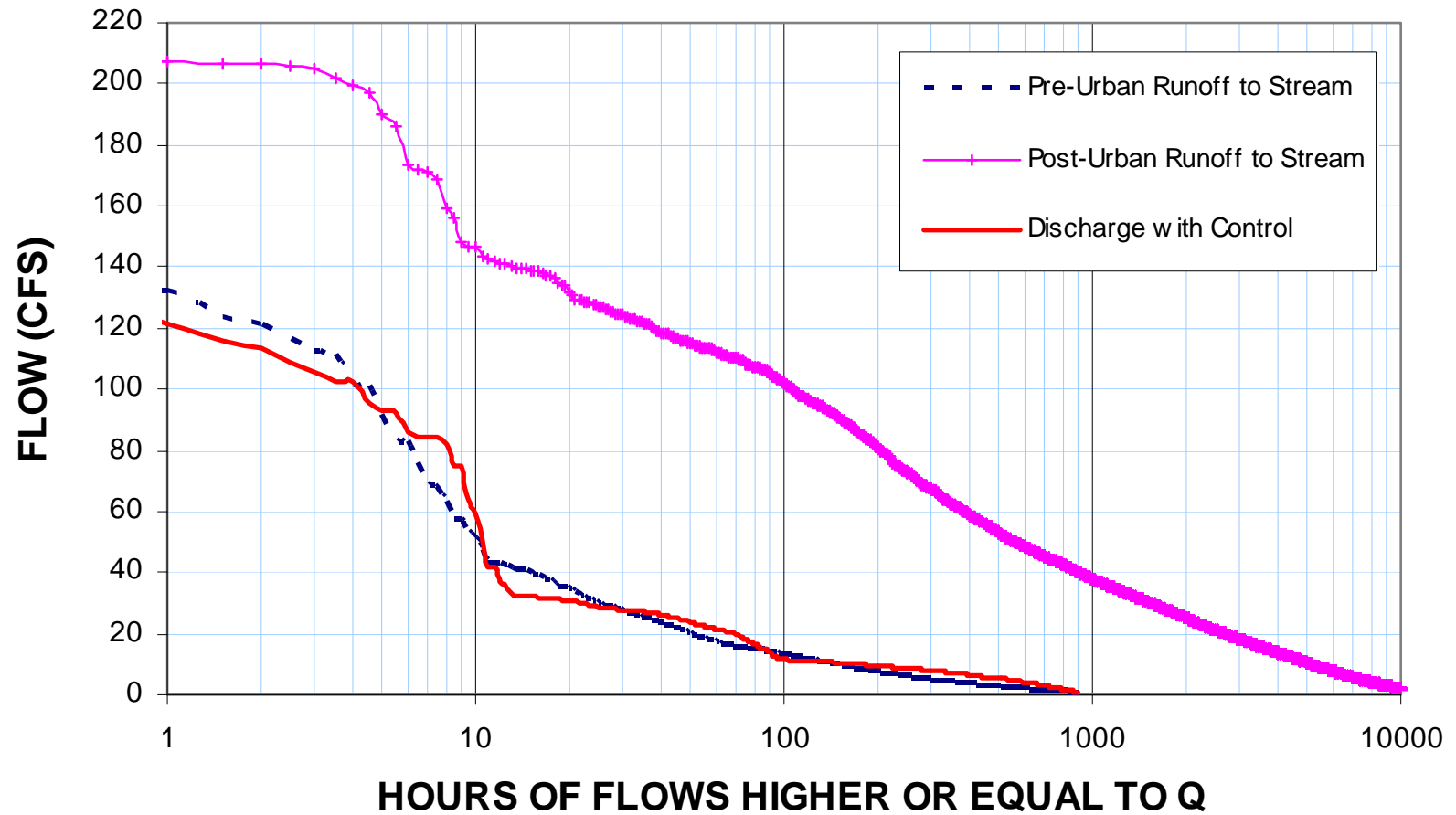
Flow Duration Histograms

Histogram of Discharge from the 716 Acre Test Subcatchment

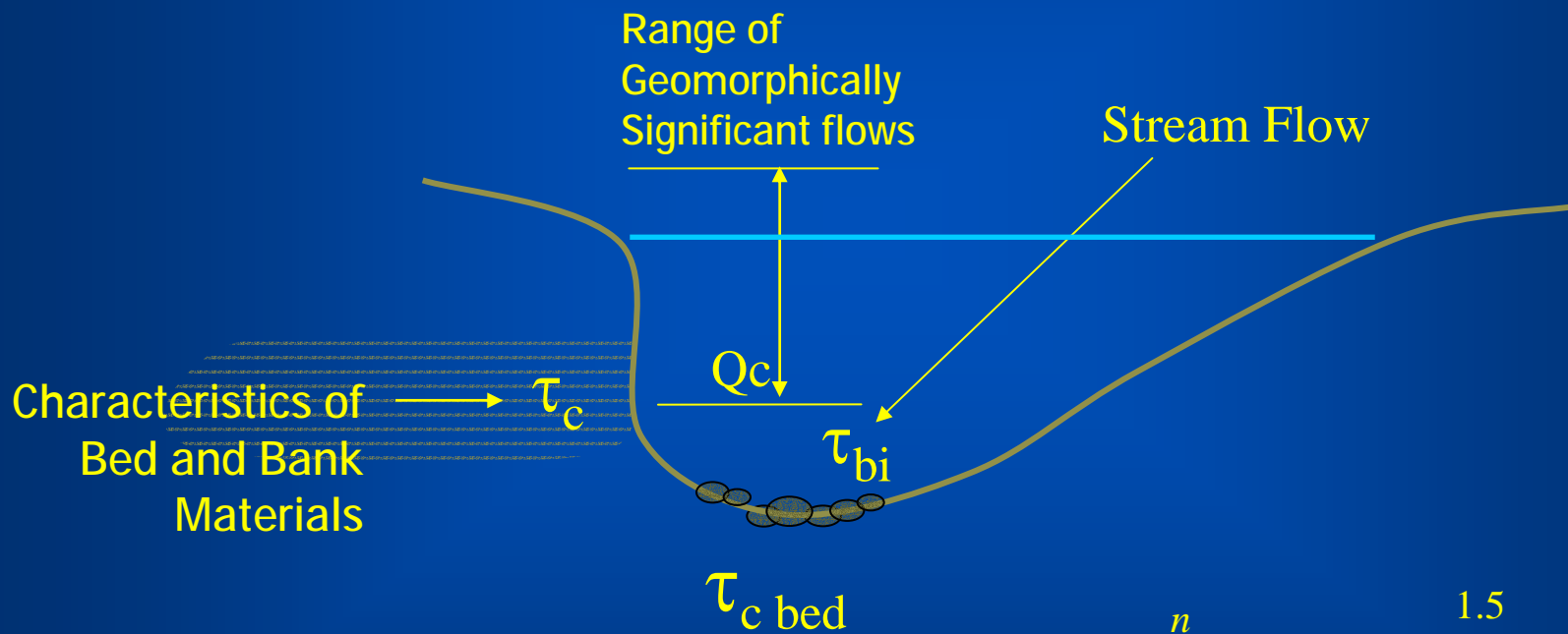


Flow Duration Curves

Thompson Creek
Flow Duration Control Results



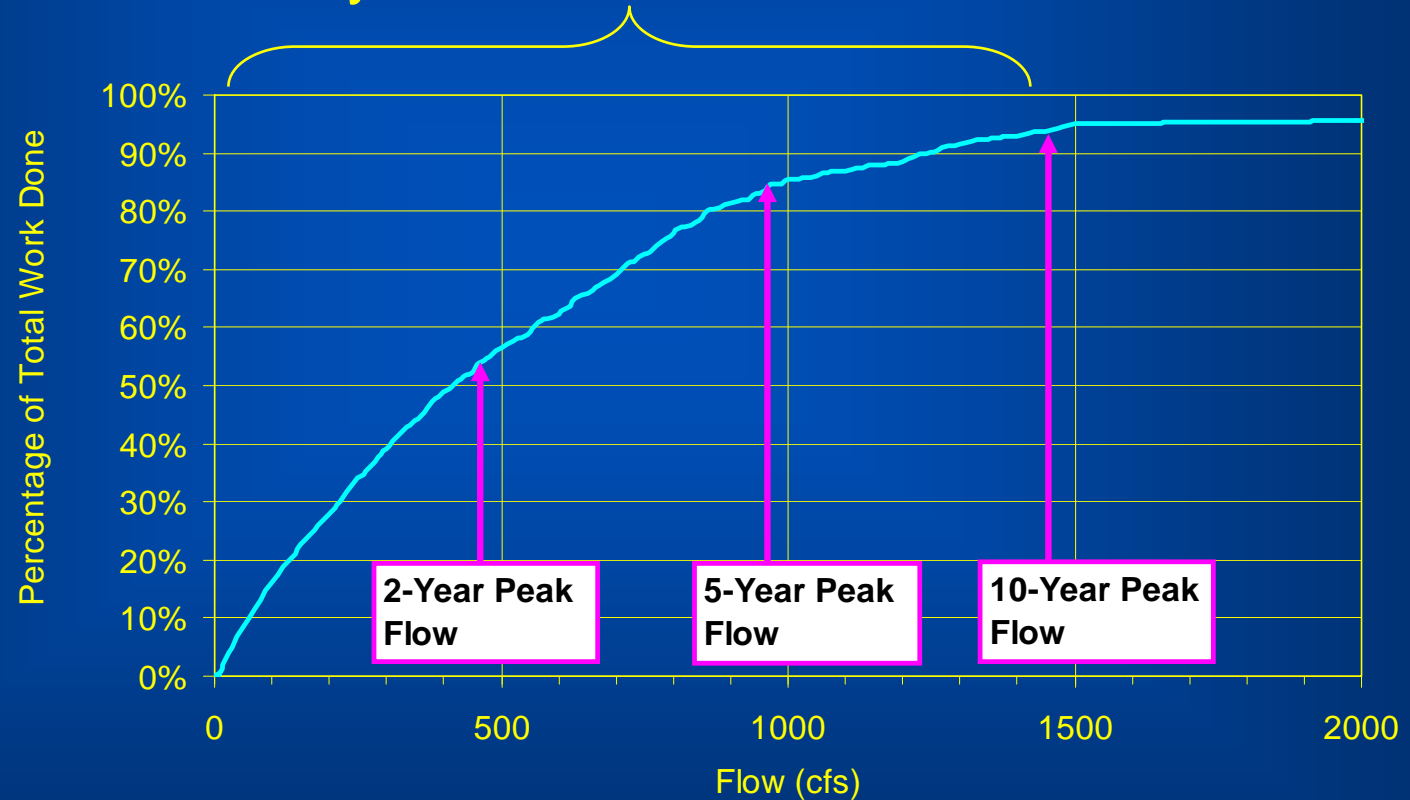
Effective Work Index (W)



$$W = \sum_{i=1}^n (\tau_{bi} - \tau_c)^{1.5} \cdot V \cdot \Delta t$$

Range of Storms to Manage (Set of Design Storms)

- Qc to the 10-year event

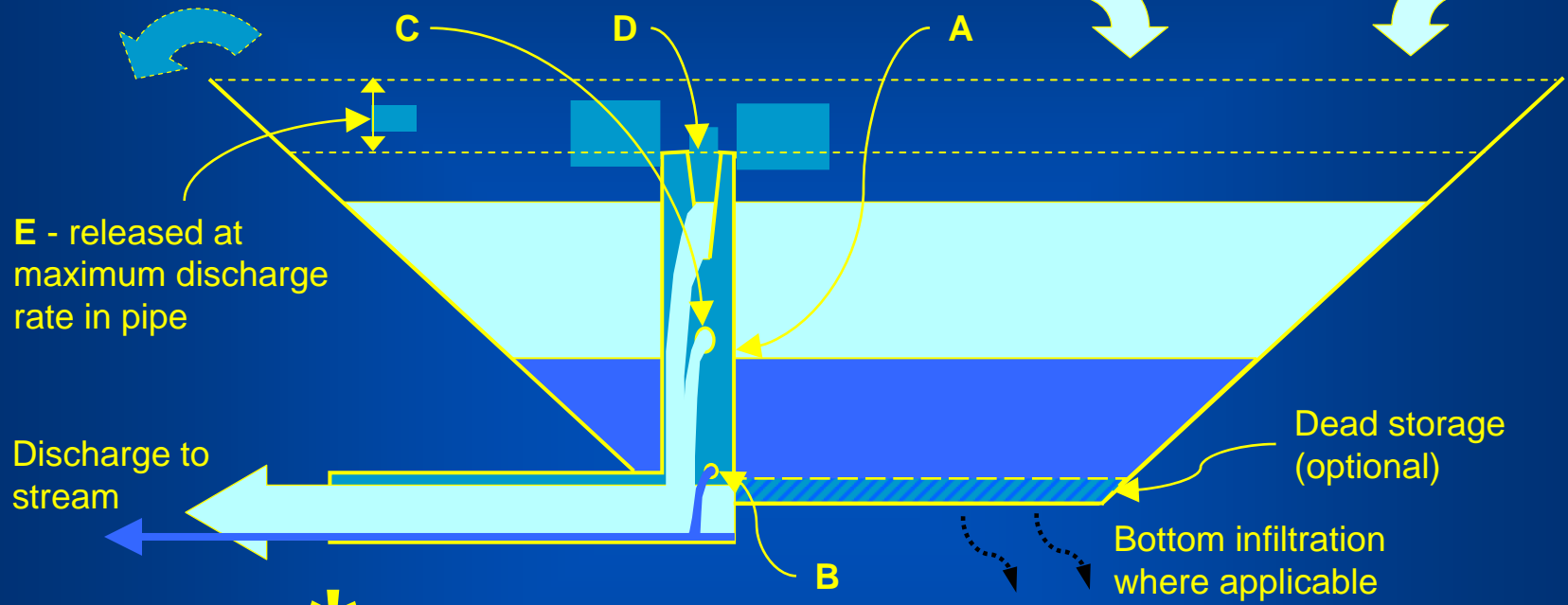


Summary of Estimated Critical Flow Values

Subwatershed and Reach	Critical Flow in Stream (Qc, cfs)	Percent of 2-Year Peak Flow in Stream
<u>Thompson Creek</u>		
J-1	10	18
J-5	3-7	2-4
J-12	40	8
<u>Yerba Buena</u>		
YB-6/7	4-5	6-7
YB-2/4	3-10	5-18
<u>Ross Creek</u>		
J-1	25	12
J-5	15-20	11-14
Estimated Qc		10% of 2-year peak

Overflow provision for peak events (storage may also be increased to meet flood control requirements)

Inflows: site runoff after reductions from site design, infiltration or other retention measures



E - released at maximum discharge rate in pipe

Discharge to stream

Dead storage (optional)

Bottom infiltration where applicable



Point of Compliance: drainage point for comparing post-project and pre-project Flow Duration curves

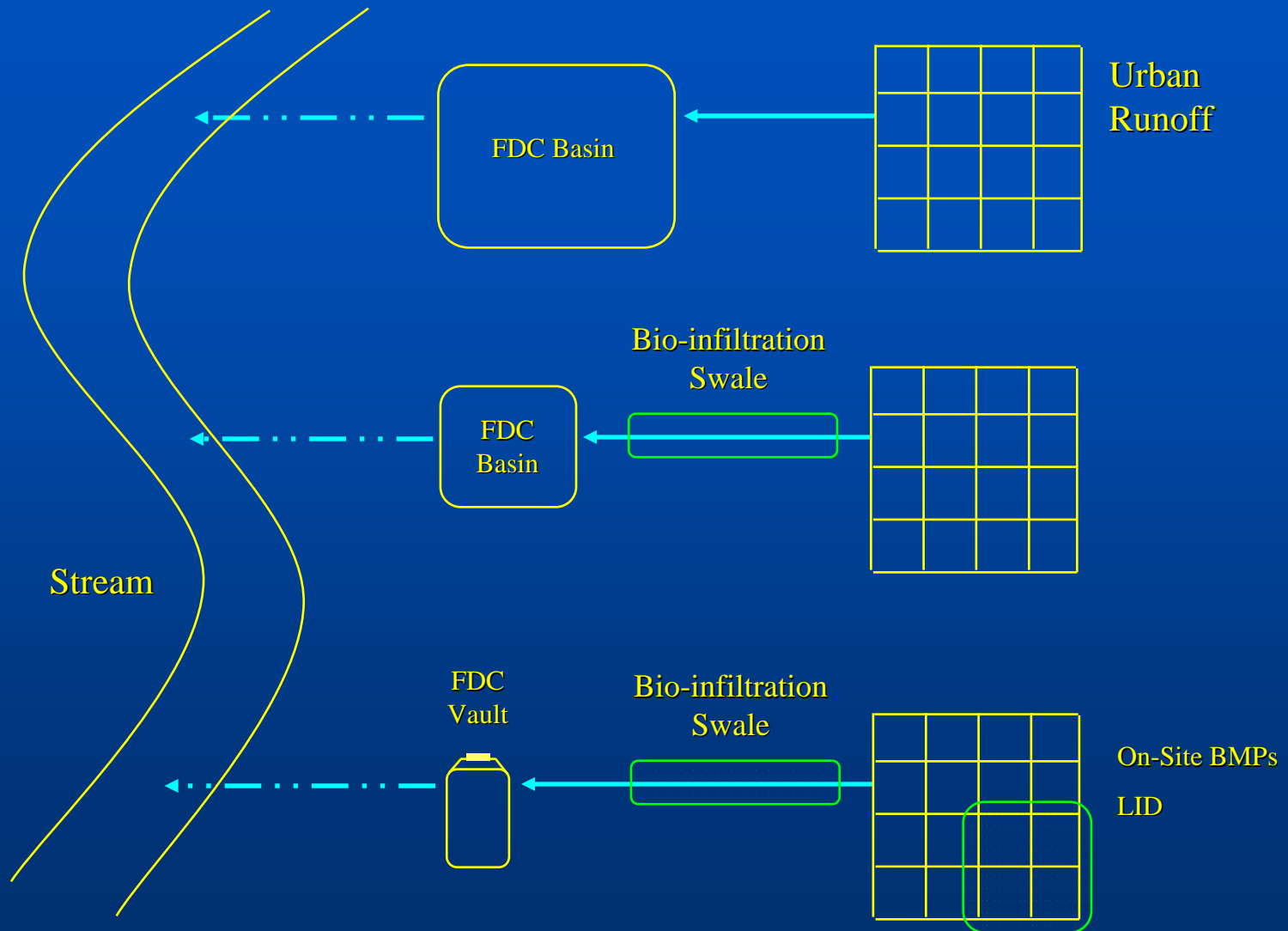
Schematic Design of Flow Duration Control Facility

Types of Flow Duration Controls

- Flow control structures
 - Retention/detention basins
 - Underground vaults/tanks
- Combine flow control with flood control or treatment facilities
 - Detention basins
 - Wet ponds



Integrating Flow Duration Control (FDC) with Other BMPs



Examples of Flow Duration Basin Sizing

- Thompson Creek
 - 716 acres, “D” soils, mixed use, 71% impervious
- San Jose Example
 - 3.6 acres, “D” soils, residential, 45% impervious
- Alameda County Example
 - 12.2 acres, “B” soils, commercial, 67% impervious

Flow Duration Basin Sizing Results

	Thompson	San Jose	Alameda
Basin Depth	4 feet	2.25 feet	2 feet
Basin Area	30 acres	0.06 acres	0.8 acres
Basin Size %DCIA	5.7% (4% catchment)	3.7% (1.7% catchment)	10% (7% catchment)
Drain time	3 days	< 1 day	1 day
Qcp (low flow)	2.4 cfs	0.1 cfs	0.25 cfs
Infiltration Rate	0.2 in/hr (5.5 cfs)	0.2 in/hr (0.012 cfs)	0.5 in/hr (0.4 cfs)

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