Blending

Flow Surge

I&I

Flow Rate

Average Daily

Wastewater Flow Considerations

Design Capacity

Peak Hourly

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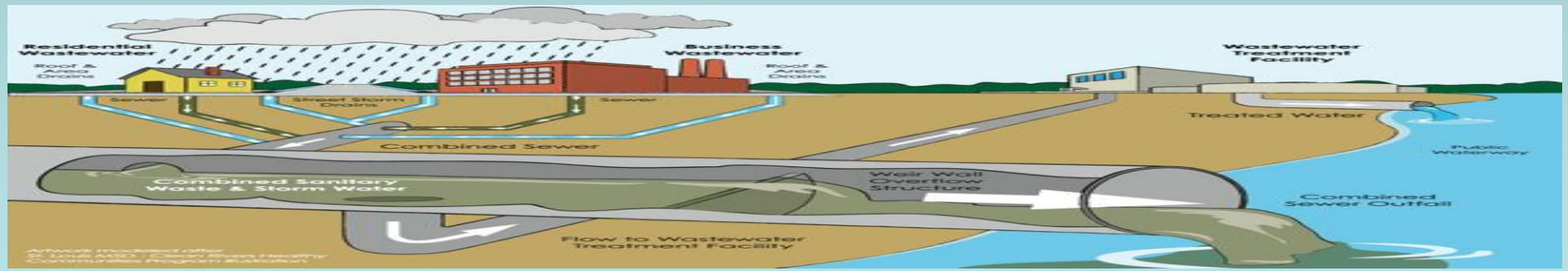
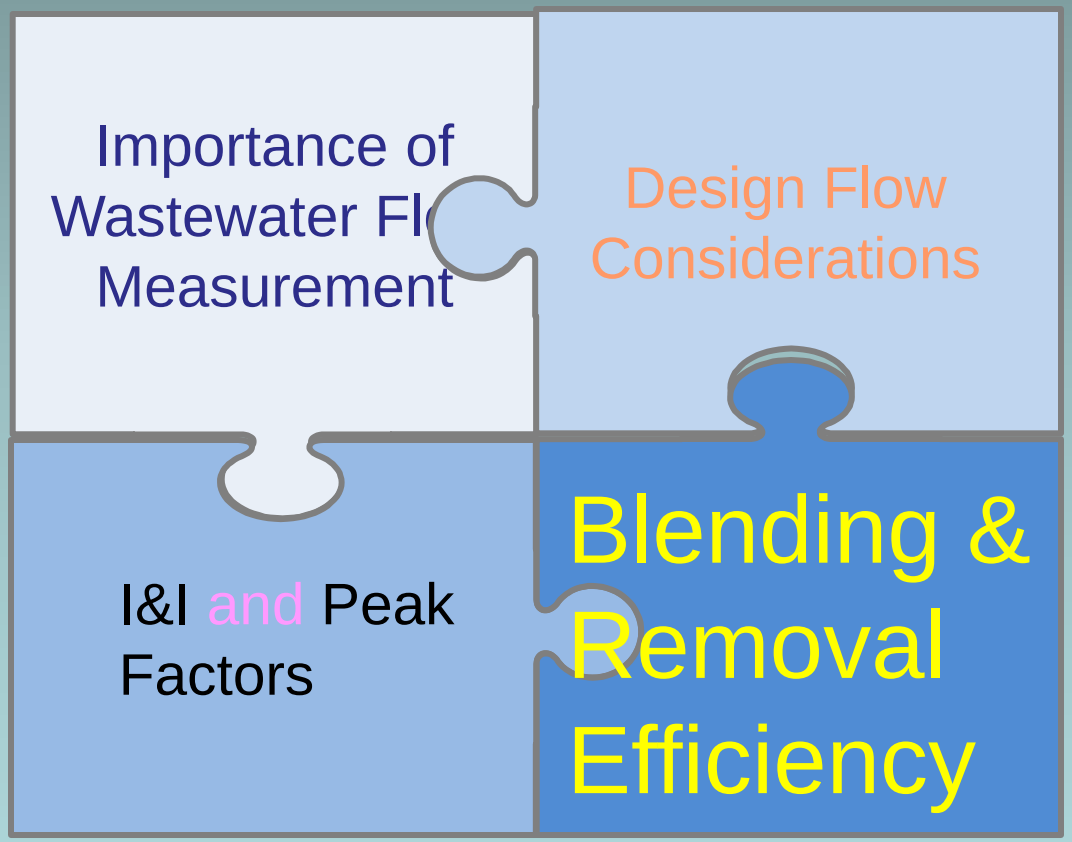


Which of the options would be economically feasible to reduce peak stormwater flows?

- Increase design capacity of an existing treatment
- Peak flow storage
- More I & I reduction (*pipes before plants*)
- Blend

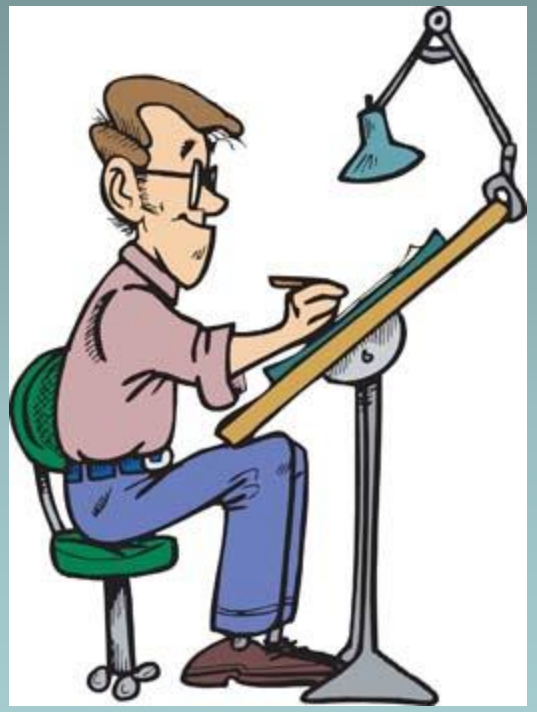
Discussions



Importance of Wastewater Flow Measurement

- Provides data for pollutant mass loading calculations
- Provides operating and performance data on the wastewater treatment plant
- Computes treatment costs, based on wastewater volume
- Obtains data for long-term planning of plant capacity, versus capacity used
- Provides information on Infiltration and Inflow (I/I) conditions, and the need for cost-effective I/I correction

Design Flow Considerations



Components of Wastewater Flows

- Domestic wastewater discharges
  - Residential
  - Commercial
  - Institutions
- Industrial Wastewater, and
- Infiltration/inflow

Wastewater Flow Measurement

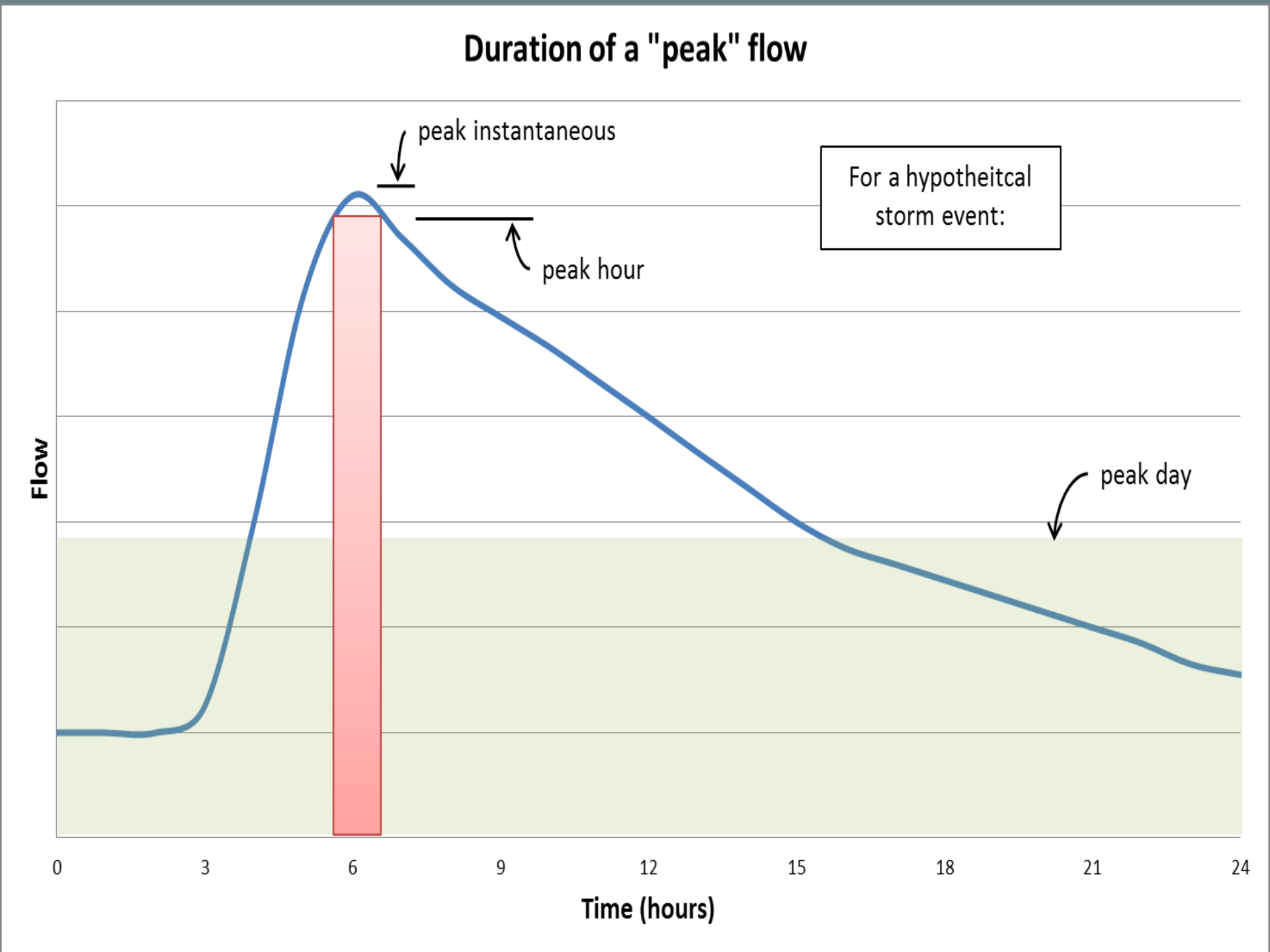
- Is a fundamental step in the design of
  - Wastewater Collection,
  - Treatment Facility, and
  - Disposal Facilities
- Literature/Design guides estimates for new discharges
- When flow is not available, use water consumption records

Variation in Wastewater Flow Rates

- Hydraulic design of both collection and treatment facilities are affected by variation in wastewater flow. Therefore, flowrate characteristics have to be analyzed carefully from existing records.
- At least two years of the most recent data should be analyzed.
- Long term records are analyzed for trend and relative changes in the flow.

Critical Flow Conditions

- Low flow conditions must be evaluated in the design to minimize operation problem with freezing, Septicity, solid dropout
- The peak hourly flows must be considered in evaluating unit processes, pumping, piping, etc.


Duration of a "peak" flow
peak instantaneous
peak hour
For a hypotheitcal storm event:
peak day
Flow
0
3
6
9
12
15
18
21
24
Time (hours)

Plant Capacity (Hydraulic)

The plant design flow selected shall meet the appropriate effluent and water quality standards that are set forth in the discharge permit.

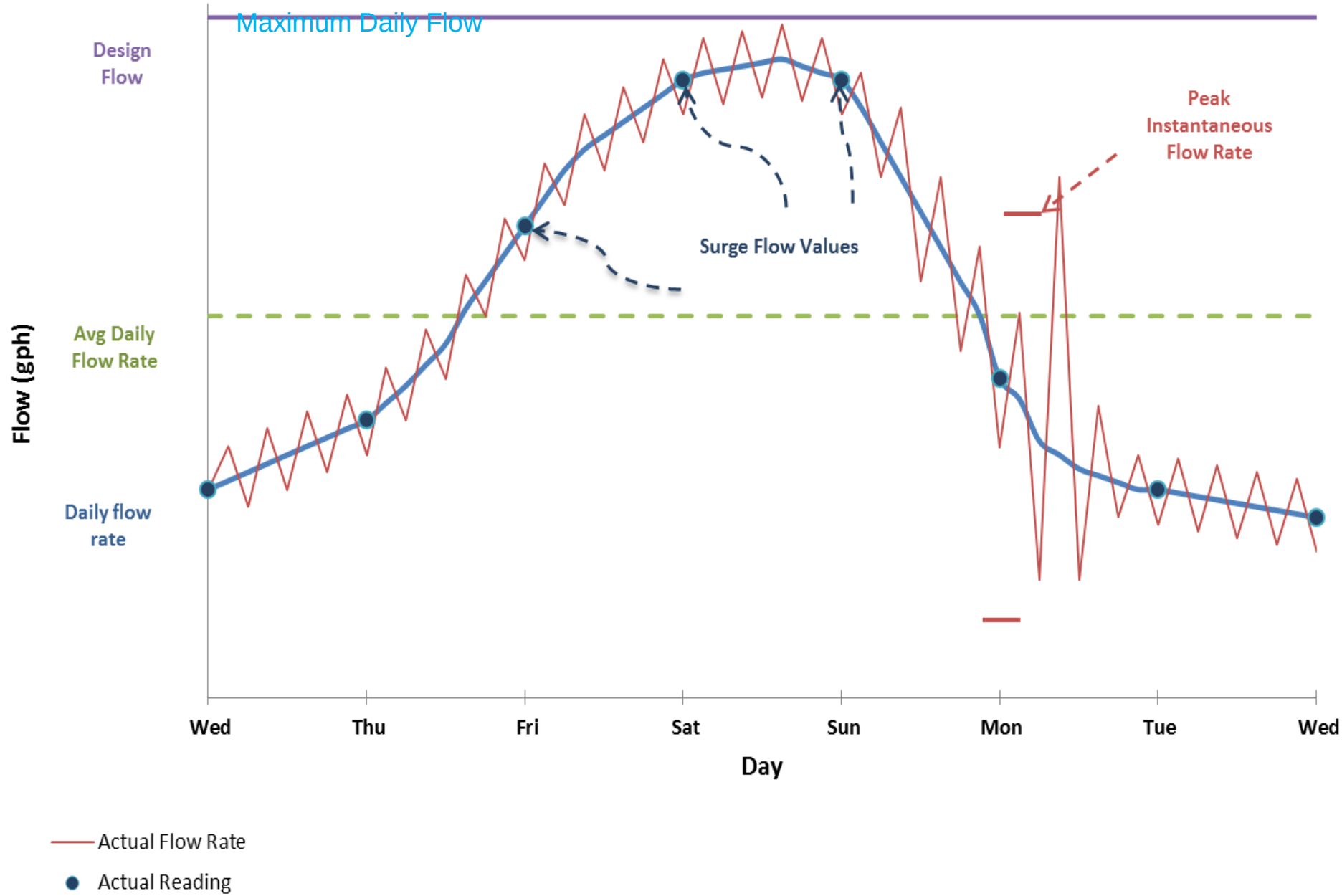
Design Average Flow

The design average flow is the average of the daily volumes to be received for a continuous twelve (12)-month period expressed as a volume per unit time.

Design Maximum Daily Flow

The design maximum daily flow is the largest volume of flow to be received during a continuous twenty-four (24)-hour period expressed as a volume per unit time.

Flow Rates Varies Significantly



Infiltration/Inflow
Excessive
Determination

Infiltration/Inflow (I/I)

- Infiltration: waters that enters the sewer system through leaking joints, cracks and breaks
- Inflow: storm water that enters the sewer system from storm drain leaders, or manhole covers

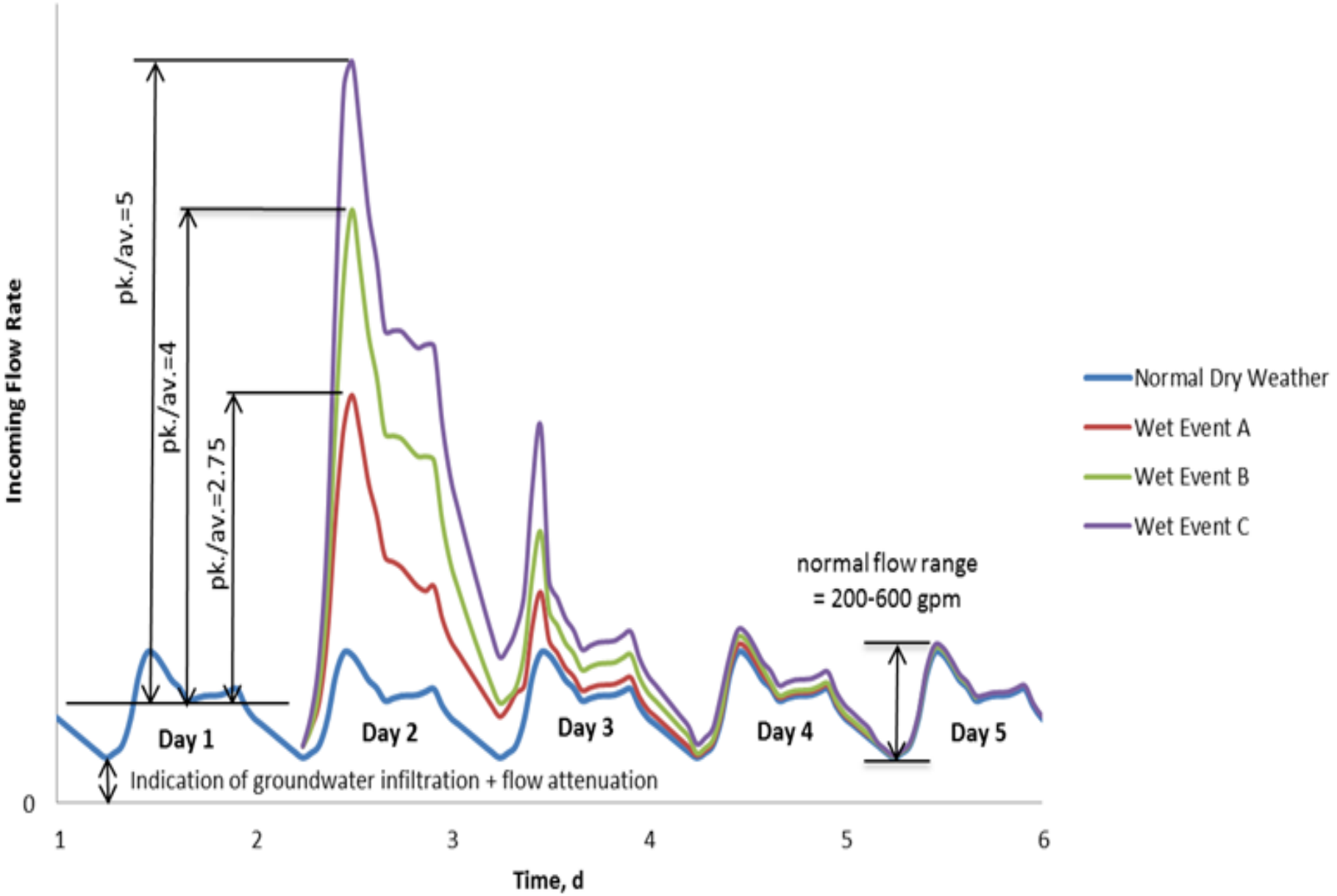
Excessive I & I criterion for sanitary sewer systems

- Excessive I & I is defined as the quantities of I & I that can be economically eliminated from a sewer system
- A total flow (wastewater plus inflow plus infiltration) with less than 275 gpcd is considered non-excessive.

Peaking Factors

Average Peaking factor is equal to maximum hourly flow divided by the average flow for each dry day

Peak Incoming Flow Events



What is Blending?

Blending is the practice of diverting a part of peak wet-weather flows at wastewater treatment plants (WWTPs), after primary treatment, around biological treatment units and combining effluent from all processes prior to teritury treatment and subsequent discharge from a permitted outfall.

Types of Blending

- Side treatment (Peak flow Clarifier)
- Direct Blending- Bypass ?

Blending- Factors to consider

- Practical way to manage wet weather flows
- Protects wastewater treatment infrastructure
- Protect the biological systems
- Prevent basement backups
- Prevents overflows in the collection system
- Pump back from storage reduces design capacity of a treatment facility

Cont; Blending

- Storage requires large footprint
- Pathogens if not fully treated could harm public health
- Flow increases as a community grows
- Blending is not a long term solution to excessive peak flows.
- Difficult to meet removal efficiency
- Must be authorized in a permit
- Permits likely to require more monitoring during the event.

Removal efficiency

- 40 CFR 133.103 (d) allows lower removal when the POTW has a less concentrated influent.

Conditions for lower efficiency

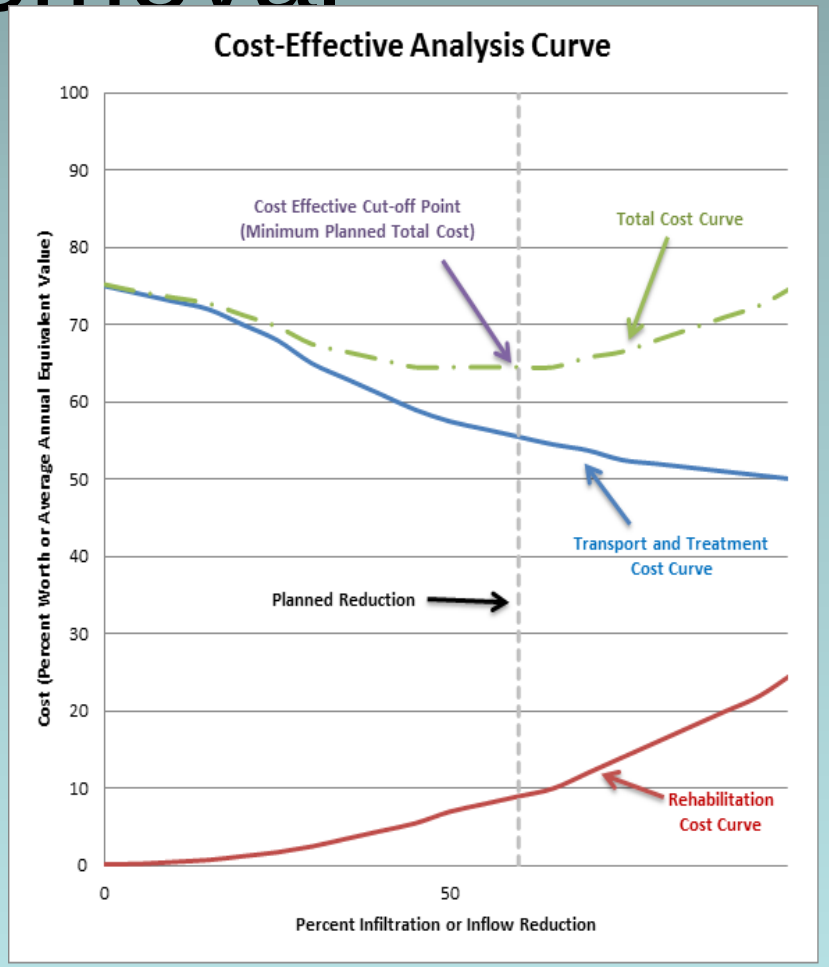
- Must constantly meet effluent limits
- Treatment would have to meet significantly more stringent limitations than otherwise be required.
- Less concentrated influent wastewater to the treatment works is not the result of excessive I/I

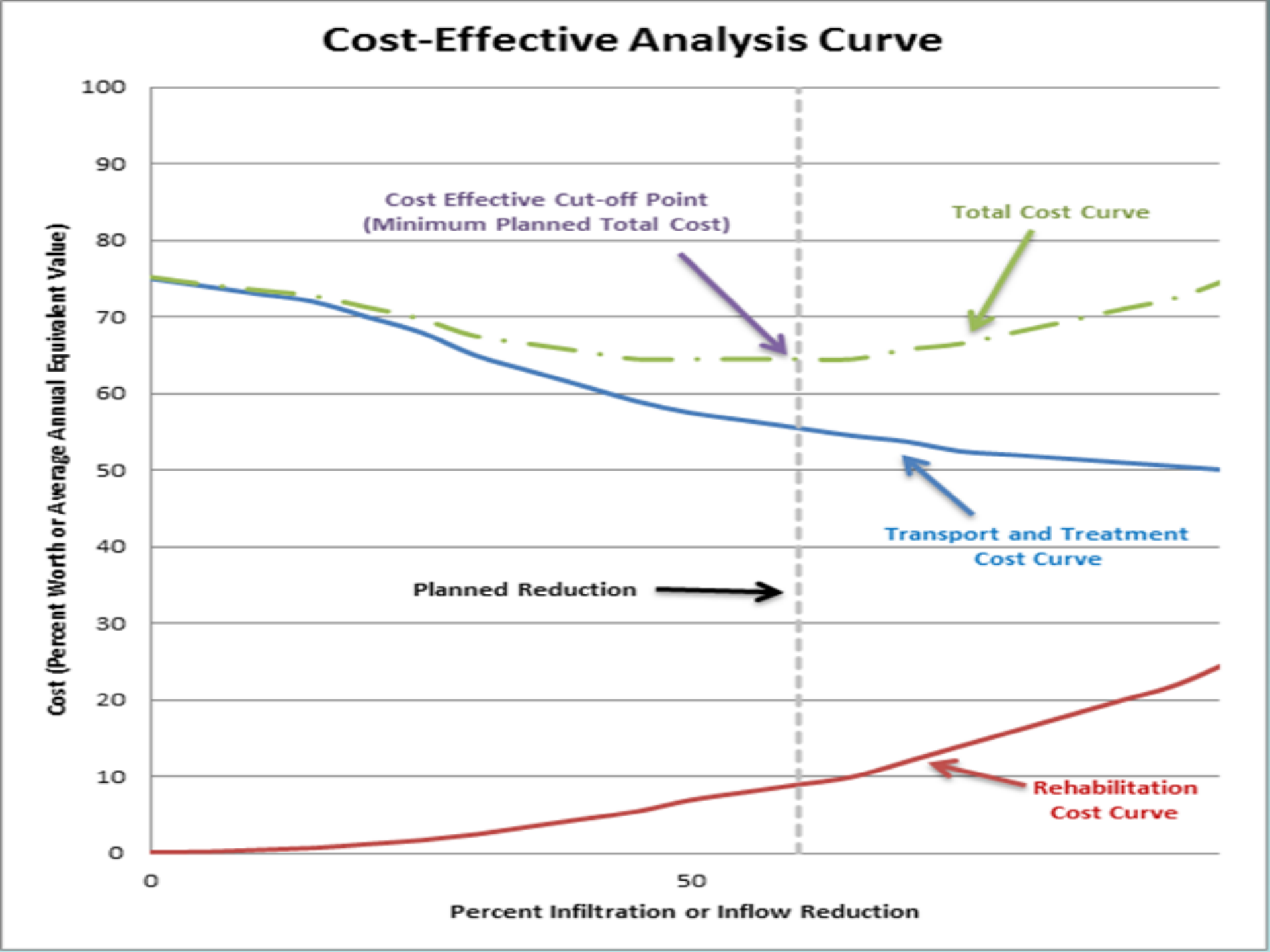
EPA definition of excessive flow

- 40 CFR Part 35.2005(b)(16) *Excessive infiltration/inflow*. The quantities of infiltration/inflow which can be economically eliminated from a sewer system as determined in a cost-effectiveness analysis that compares the costs for correcting the infiltration/inflow conditions to the total costs for transportation and treatment of the infiltration/inflow.

Cost effectiveness analysis at varies level of I/I removal

- Cost of treating existing I/I
- Cost of I/I reduction- Include rehabilitation, repair, replacement and engineering.




Cost-Effective Analysis Curve
Cost (Percent Worth or Average Annual Equivalent Value)
100
90
80
70
60
50
40
30
20
10
0
0
50
Percent Infiltration or Inflow Reduction
Cost Effective Cut-off Point
(Minimum Planned Total Cost)
Total Cost Curve
Transport and Treatment
Cost Curve
Planned Reduction
Rehabilitation
Cost Curve

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It depends. Start with sewer system evaluation survey

Questions?