

Optimizing Design to Balance Cost & Maintenance for Peak Flow Offsite Storage

Texas Association of Clear Water
Agencies

September 18, 2020

Matt Richart, PE
Project Manager

Cary Duchene, PE
Wet Weather National Practice Leader



Agenda

- **Overflow Strategies**
- **Storage Basin Sizing**
- **Basin Alternatives**
- **Solids Management**
- **Odor Control**
- **Tank Cleaning/Flushing**
- **Operation/Dewatering**
- **Post-event Maintenance**

Overflow Control Strategy Components

Planning & Assessment Goals

- Basis for Long-Term Design Capacity
- Regulatory Requirements
- Wet Weather Planning Flows
- Establish Performance Objectives

Source Characterization & Control

- Define Service Areas
- Characterize Service Areas
- Quantify Dry & Wet Weather Flows
- Estimate Future Flows
- Flow Reduction to or in Conveyance Systems
- Minimize Infiltration/Inflow
- Reduce Sediment Intrusion

Conveyance

- Determine Component and System Capacity
- Gravity Sewers & Inverted Siphons
- Pumping Stations and Force Mains
- Flow Control Devices
- Improving Sediment Transport
- Maximizing Flow in System

Conveyance – cont'd

- Blockage Resistance
- Maintenance
- Optimize Hydraulics of Connections
- Optimize Hydraulic Transitions

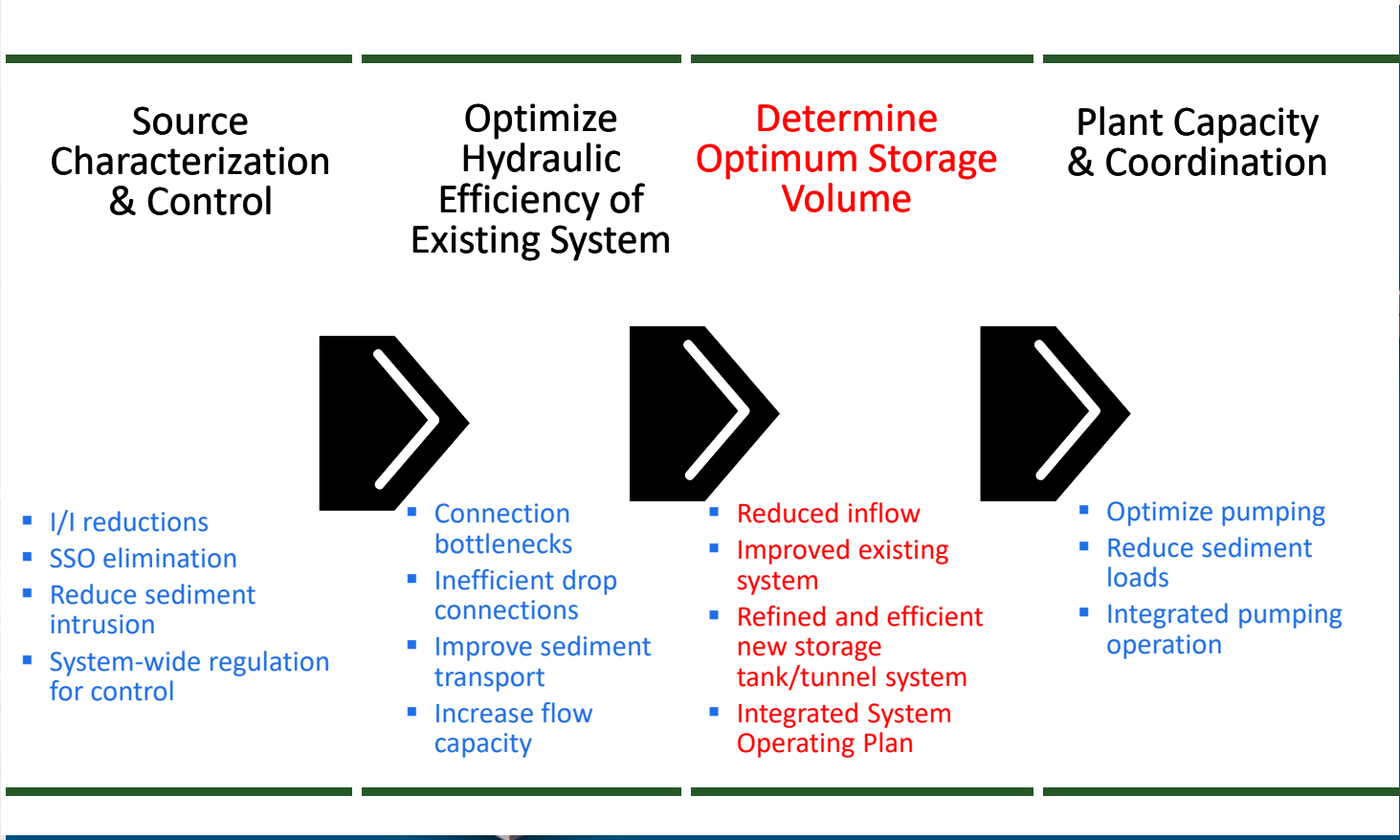
System Storage

- Conveyance System Capacity
- Retaining Flow in System
- In-line Distributed Storage
- Tunnels

Treatment

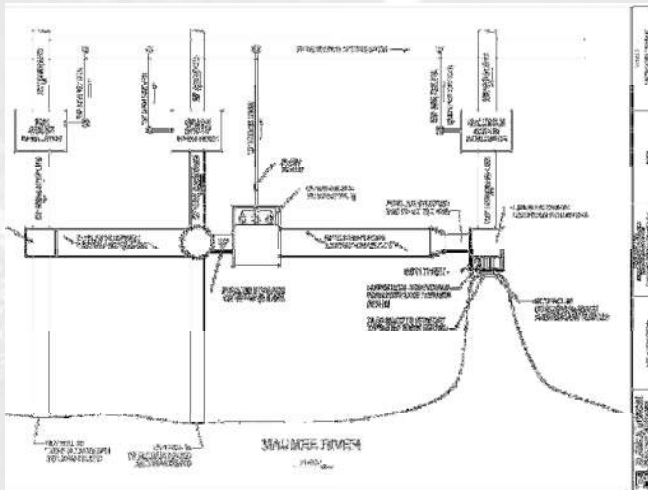
- Quantify Flows and Loads
- Bacteria or Pathogen Reductions
- Predict Water Quality Effects
- Maintaining Design Capacity
- Alternatives to Optimize Wet Weather Flows
- In-Facility Flow Rerouting
- New or Expanded Existing Components
- O&M Related Capacity Increases
- Operational Flexibility

Key Control Strategies Impacting Storage Considerations



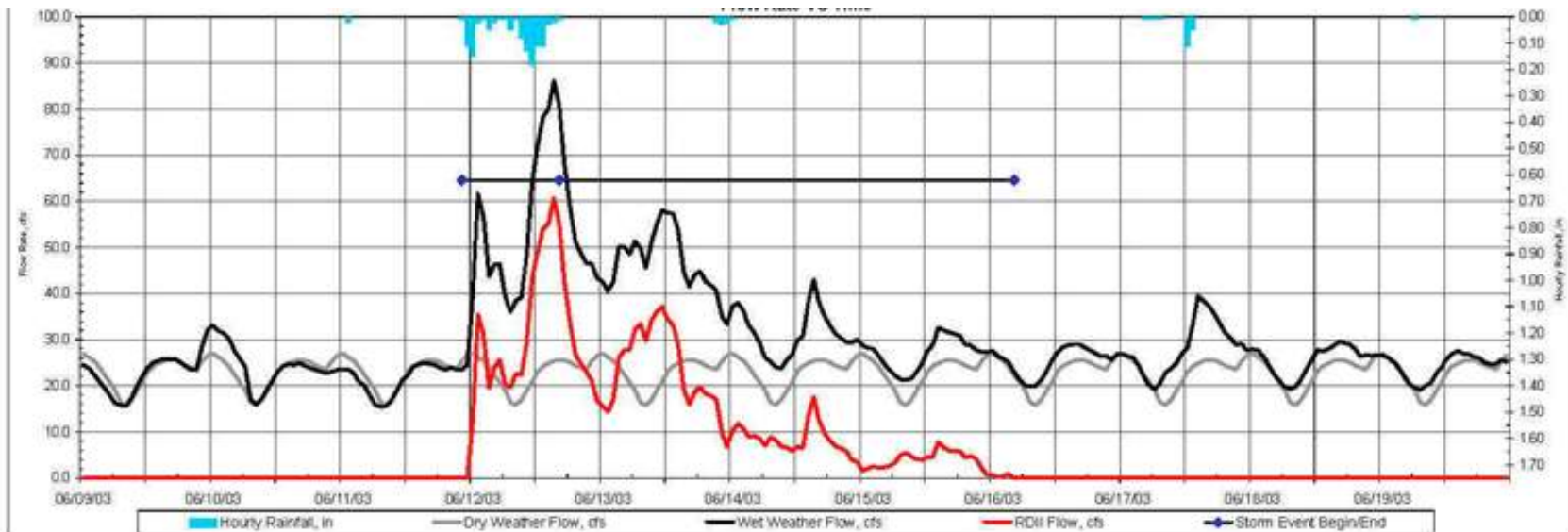
Storage Alternatives

- Inline (max existing capacity)
- Offline
 - Tunnels
 - Near surface (tank/basin)



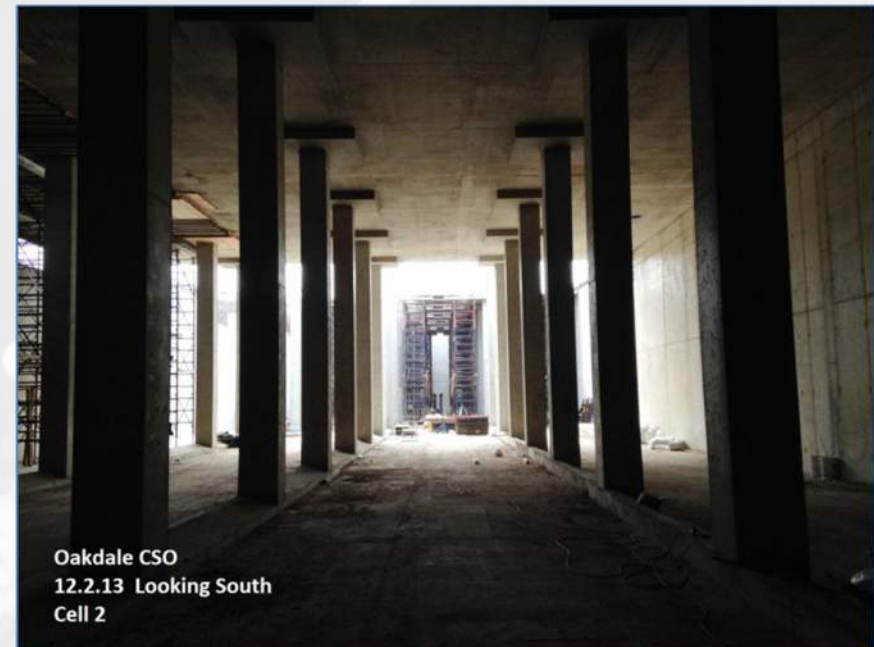
Storage Volume Determination

- Hydraulic Modeling
- Long Term Model Simulation
- Back-to-Back Events often control
- Tank Dewatering (drain) Cycles
 - Difficult to recover in 24-hours



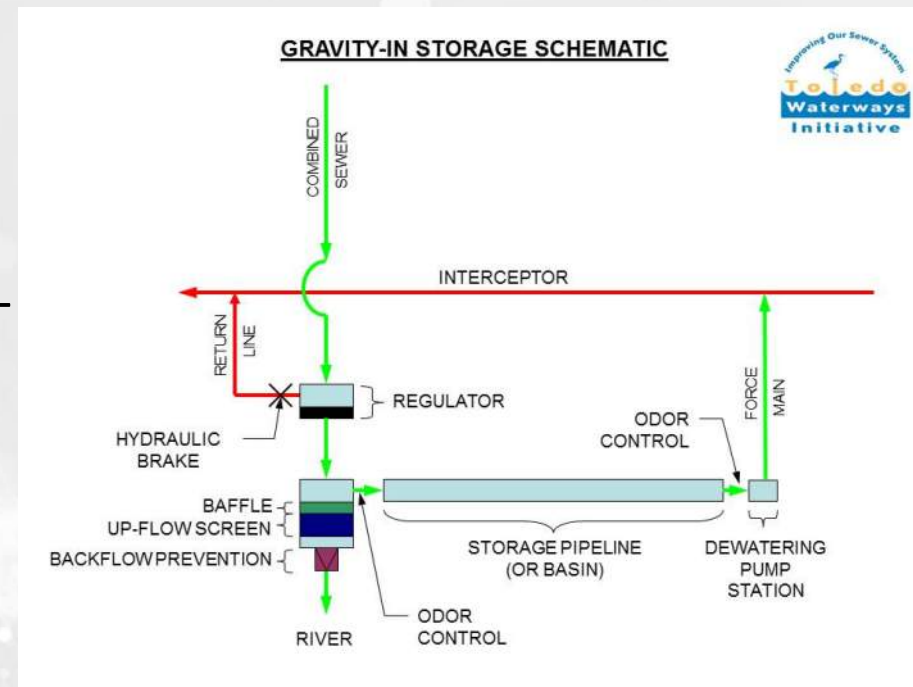
Tank Volume Determination

- Storage Volume
 - Contingency
 - Precipitation in open structures
- WaPUG Model Calibration Standards
 - DWF: $\pm 10\%$ Volume
 - DWF: $\pm 10\%$ Peak Flow
 - WWF: -10% to +20% Volume
 - WWF: -15% to +25% Peak Flow



Storage Basin Schemes

- Gravity-In/Pump-Out
 - Robust Fail-safe Operation
 - Smaller Dewatering PS
 - Hydraulic Envelope below Sewer HGL
- Pump-In/Gravity-Out
 - Pump Peak Flows
 - Reduces Tank Depth/Excavation
- Gravity-In/Gravity-Out
 - Occasionally Hydraulically Feasible



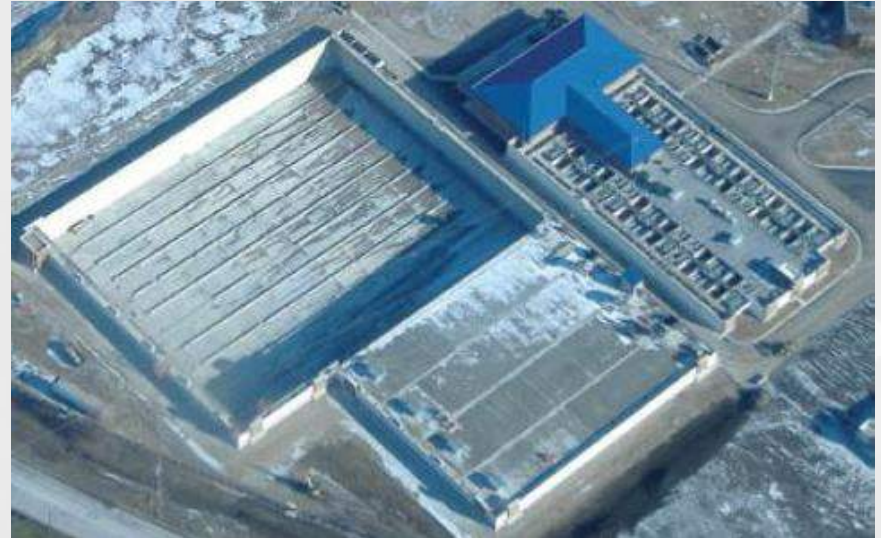
Tank Types

- Closed-Top
 - Venting
 - Odor Control
 - Longer Design Life
- Open-Top
 - Post-event Cleaning
 - Public Perception



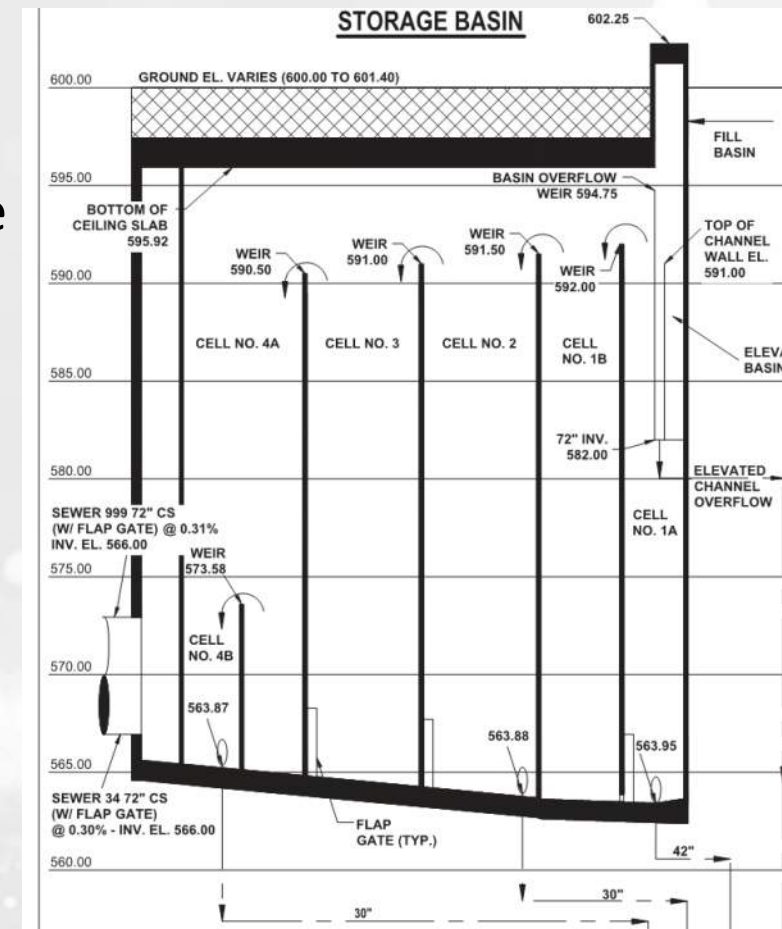
Tank Types

- Earthen basins
 - Combination earth/concrete
- Reinforced CIP Concrete
- Pre-stressed Concrete Tanks
 - AWWA D110 (Wire-Wounds)
 - AWWA D115 (Tendon)



What to do with Solids?

- Remove Grit/Screenings Ahead of Storage
 - Grit removal
 - Mechanical Screening
- Remove After Storage, Before pumping
- Chop/Grind and Pump
- Sludge
 - Flush & Pump
- Multi-Cell Tanks
 - Most Solids in Cell 1



Tank Cleaning & Flushing

- Stored SSO/CSO Water
 - Flushing Gates
 - (<https://youtu.be/2sjYBiLU0Hg>)
 - Vacuum Lift
- NPW/Rainwater
 - Tipping Buckets
 - Water Cannons



Operation / Dewatering

- Pumped Dewatering
 - Typ. 3 Constant Speed Pumps
 - 2 Firm dewater in ± 24 hours
 - + 1 Standby
 - Control: Level Sensor
- Gravity Dewatering
 - Throttled Sluice Gate



Odor Control

- Adsorptive media (carbon)
 - Media replacement
- Wet scrubbers
 - Chemical storage
- Ferrous/ferric feed
- Odor masking technology



Diversion Structure Design

- Hydraulics
 - Passive weir overflow
 - Throttling gate/forced diversion
- Minimize Screenings & solids
 - Side overflow weir
- Maintenance

Operational Controls

- Dewatering Permissives
 - Local Interceptor Capacity
 - Downstream PS Capacity
 - Downstream Plant Capacity
- Control - Local PLC/SCADA
- Prioritize Multiple Storage Tanks/Tunnel
 - Real-Time Control
 - Operator Experience/Override Prioritization

PRIORITY	STORAGE FACILITY	TRIB. INT SEWER	STATUS	STORAGE (MG)	TYPE	LEVEL OF SERVICE
01	Parkside Basin	TMCI	In Service	3.0	SSD	0 OF
02	Detroit Basin	WSI	In Service	8.0	SSD	0 OF
03	River Road Basin	WSI	In Service	3.0	SSD	0 OF
04A	Ottawa Basin / Cell 4	TMCI	12/2017	36.3	CSO	0.4 OF/TY (2 OF/5 YRS) @ CSO 61, 62 & 65
04B	Ottawa Basin / Cell 3	TMCI	12/2017		CSO	0.4 OF/TY (2 OF/5 YRS) @ CSO 61, 62 & 65
04C	Ottawa Basin / Cell 2	TMCI	12/2017		CSO	0.4 OF/TY (2 OF/5 YRS) @ CSO 61, 62 & 65
04D	Ottawa Basin / Cell 1B	TMCI	12/2017		CSO	0.4 OF/TY (2 OF/5 YRS) @ CSO 61, 62 & 65
04E	Ottawa Basin / Cell 1A	TMCI	12/2017		CSO	0.4 OF/TY (2 OF/5 YRS) @ CSO 61, 62 & 65
04F	Ayers/Monroe Pipeline	TMCI via Ottawa	In Service	1.1	CSO	0.4 OF/TY (2 OF/5 YRS) @ CSO 65
05	Ash/Columbus Pipeline	WSI	In Service	2.1	CSO	0.4 OF/TY (2 OF/5 YRS) @ CSO 23
06	Oakdale Basin	ESI	In Service	8.0	CSO	2.6 OF/TY (13 OF/5 YRS) @ CSO 9
07A	Swan Creek South Tunnel	WSI	In Service	4.2	CSO	3.0 OF/TY (15 OF/5 YRS) @ CSO 69 (TUNNEL) 1 OF/TY (5 OF/5 YRS) @ CSO 46 & 48
07B	Swan Creek South In-System Storage	WSI	In Service	0.24*	CSO	SAME AS 07A
08A	Downtown Tunnel	WSI	In Service	5.8	CSO	3 OF/TY (15 OF/5 YRS) @ CSO 68 (TUNNEL) 1 OF/TY (5 OF/5 YRS) @ CSO 27-31
08B	Downtown Basin	WSI	05/2020	12.0*	CSO	SAME AS 08A
09	Maumee Basin	WSI via Hawley	In Service	2.7	CSO	3 OF/TY (15 OF/5 YRS) @ CSO 33
10	International Park Pipeline	ESI	11/2018	6.9	CSO	3 OF/TY (15 OF/5 YRS) @ CSO 6 & 7
11	Dearborn Pipeline	ESI	11/2016	1.6	CSO	3 OF/TY (15 OF/5 YRS) @ CSO 5
12A	Swan Creek North Tunnel	WSI	In Service	9.6	CSO	3.8 OF/TY (19 OF/5 YRS) @ CSO 43 (TUNNEL) 1 OF/TY (5 OF/5 YRS) @ CSO 42, 45 & 47
12B	Swan Creek North Tunnel Extension	WSI	Sewer Separation	0.0	CSO	SAME AS 12A
13	Bay View EQ Basin	WWTF	In Service	25.0	BF	N/A
	Total System Storage			129.5		

Post-Event Maintenance

- Dewatering
- Flushing (re-flush?)
- Solids/Floatables Deposition
 - Vactor
 - Grit Box
 - Floatables
- Facility Preparedness
- Instrument Calibration
- Equipment Maintenance



Discussion.



Contact Us

Building a World of Difference

+1 913 458 2000

info@bv.com