



Session 26
Stormwater 3: Sustainable Stormwater
Management, Green Infrastructure,
and Other Innovative Ideas

Satellite Treatment as an Anchor for Green Space

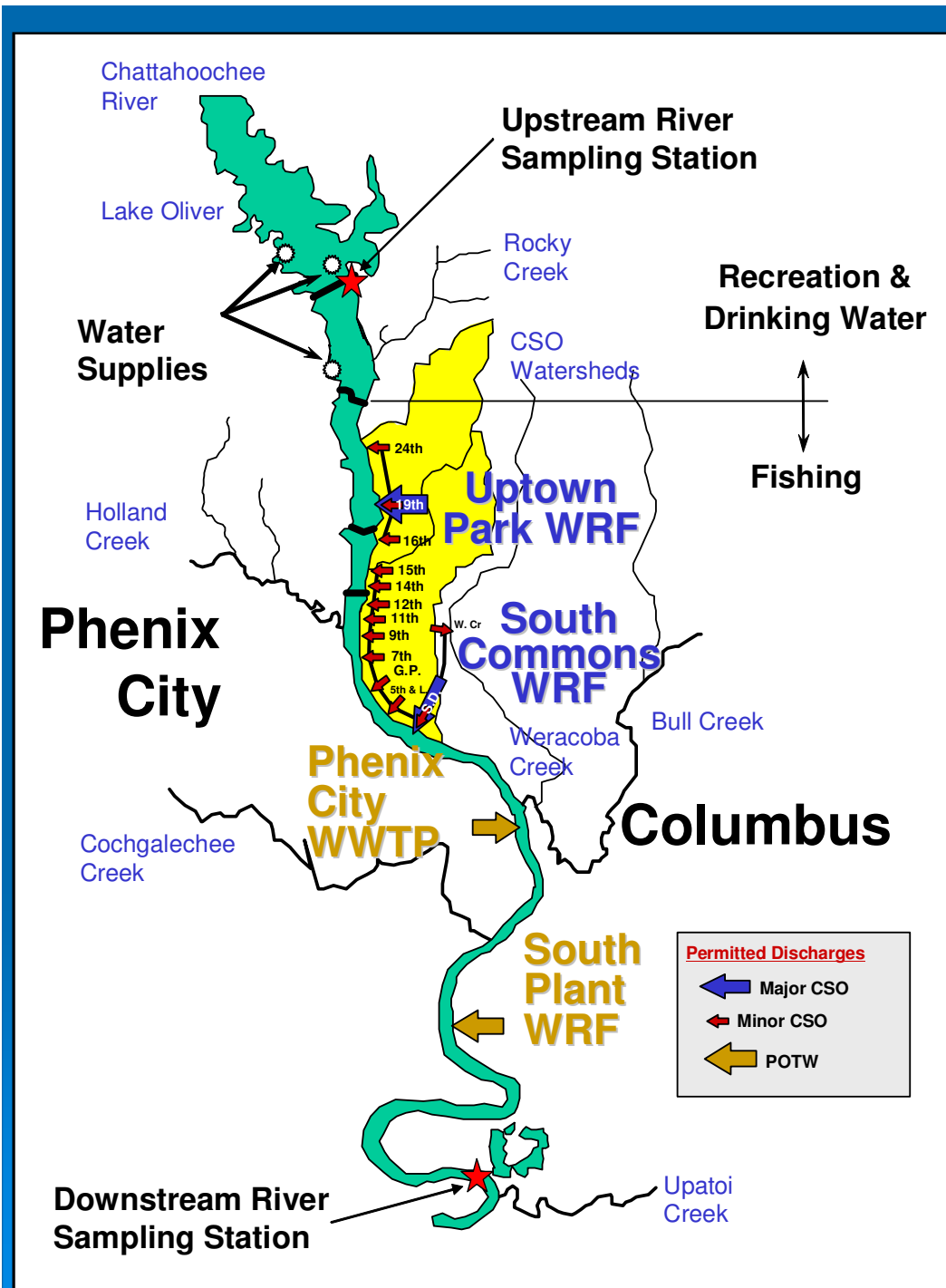
Mark Boner, WesTech Engineering
Matthew Williams
Brian Mitchell

NEWWEA 2018
ANNUAL CONFERENCE & EXHIBIT
WH₂O'S WITH US?

JANUARY 21 – 24 | Boston Marriott Copley Place, Boston, Massachusetts

Agenda

- Columbus, GA CSO & Stormwater Program
 - Springfield, OH CMF for CSO & Tertiary Treatment
 - Charleroi, PA Satellite CSO Facility
 - Somerset, NJ Satellite SSO Facility
 - Welsh Water, Wales CSO Facilities
 - New Jersey Studies for Satellite CSO Treatment
- 



CSO Control Program

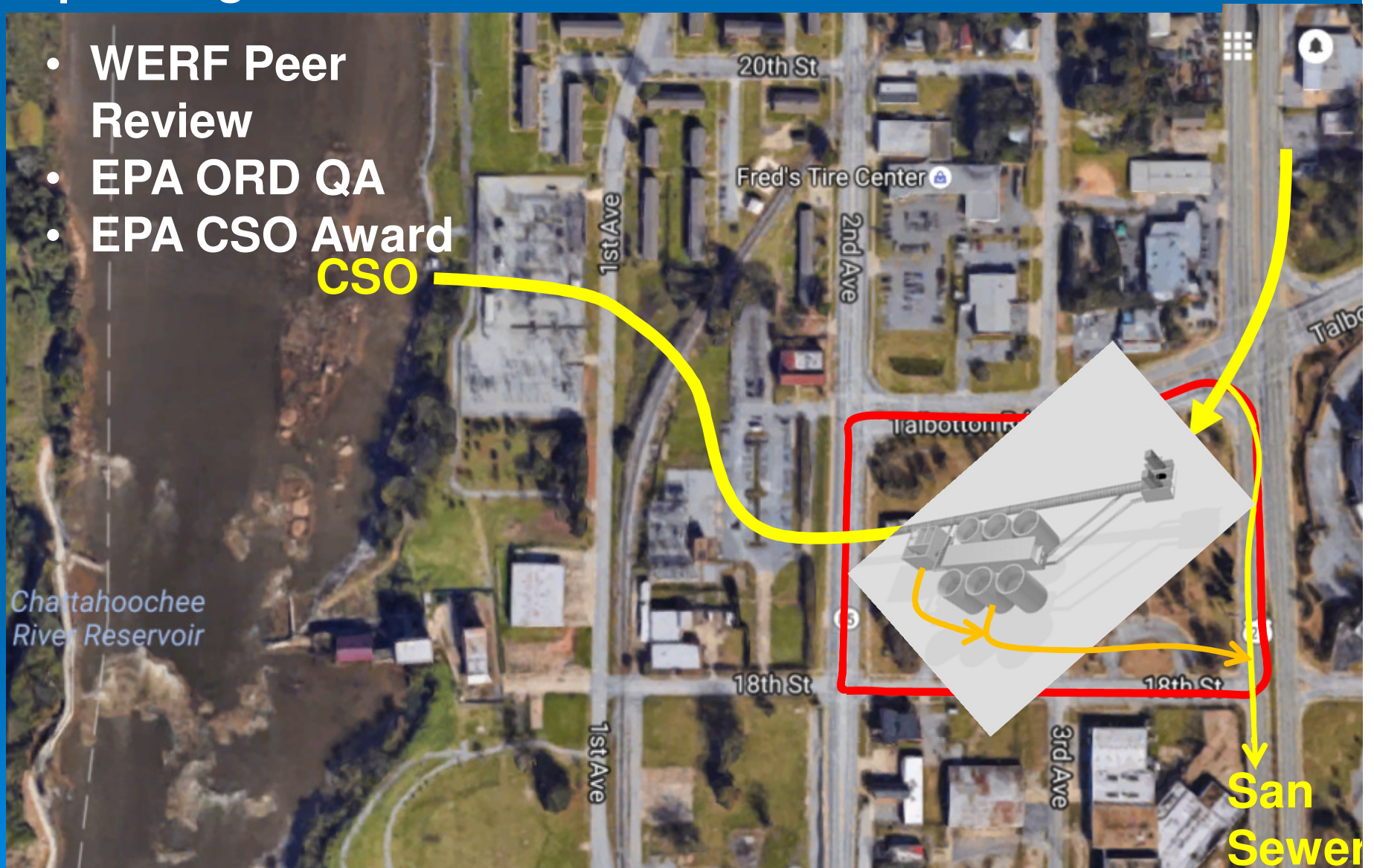
- Consolidation of 16 outfalls into 2 satellite treatment facilities
- Riverwalk, Parks and Trails, & Education Center
- Dam removal & 2-1/2 miles Whitewater
- Comprehensive Regional Watershed Study to Determine Compliance

South Commons Water Resource Facility



Uptown Park Satellite CSO Treatment Operating since 1995

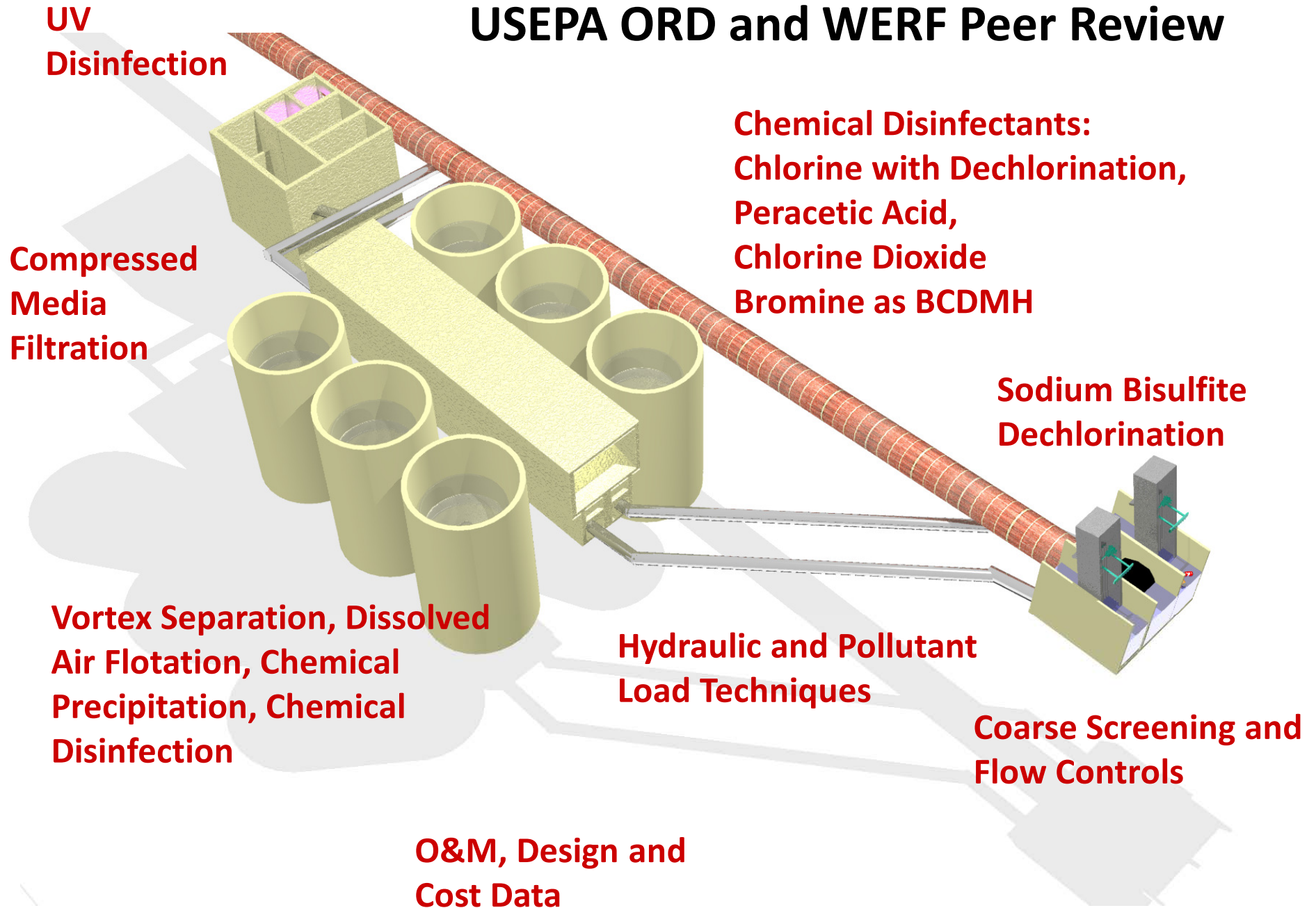
- WERF Peer Review
 - EPA ORD QA
 - EPA CSO Award
- CSO**



Uptown Park Water Resource Facility



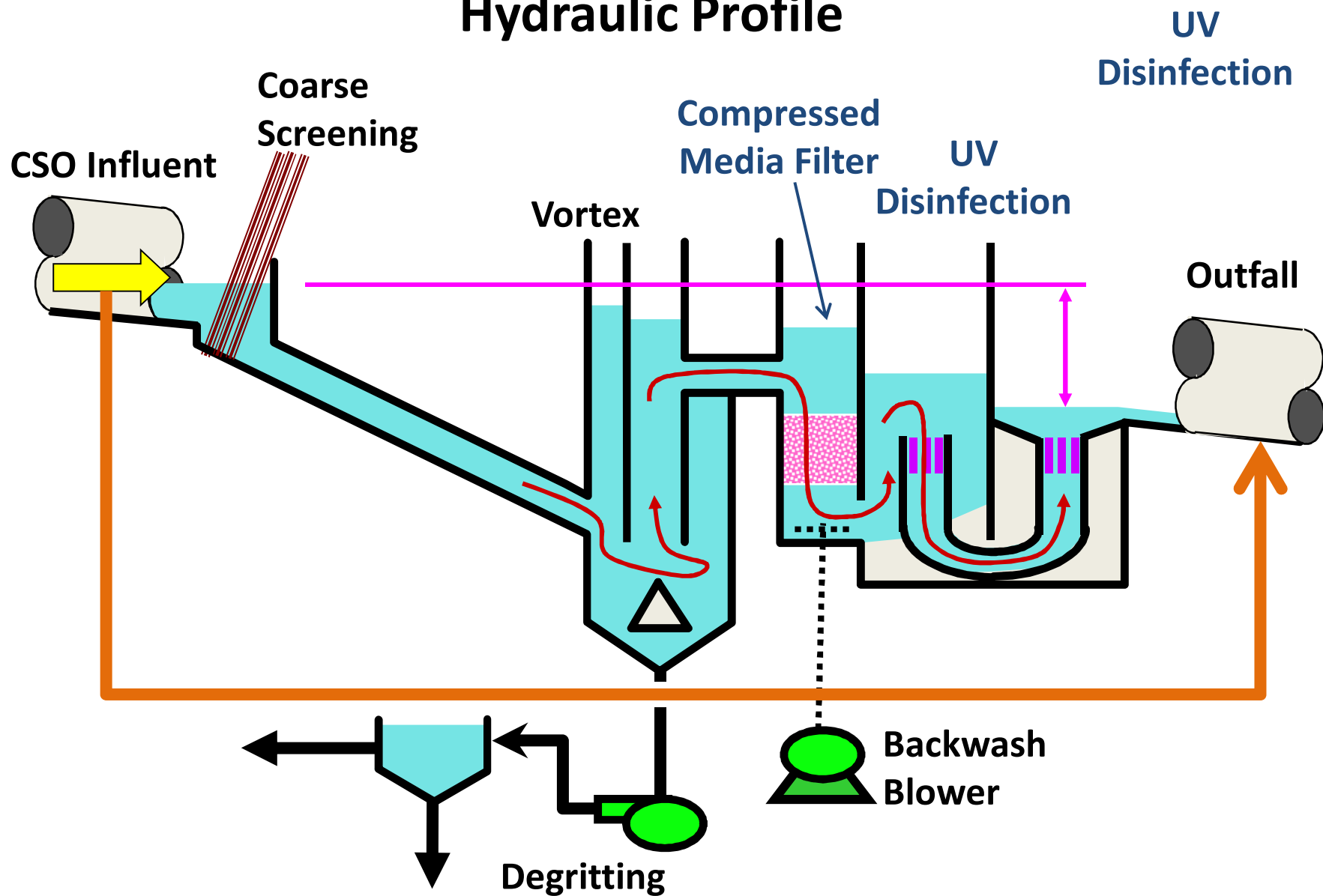
Technology Demonstration Testing under USEPA ORD and WERF Peer Review

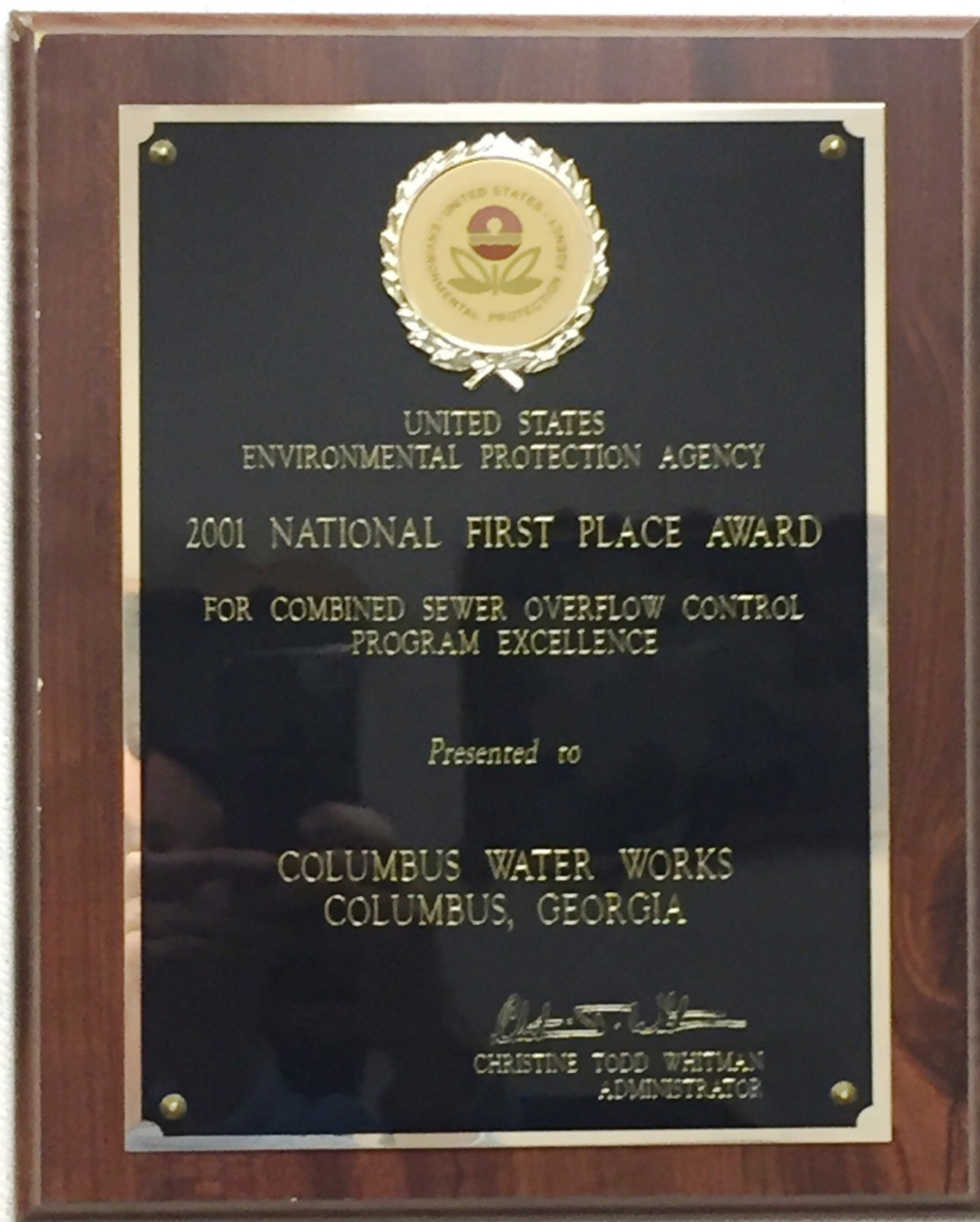


Columbus, GA

Satellite CSO Treatment Facilities

Hydraulic Profile





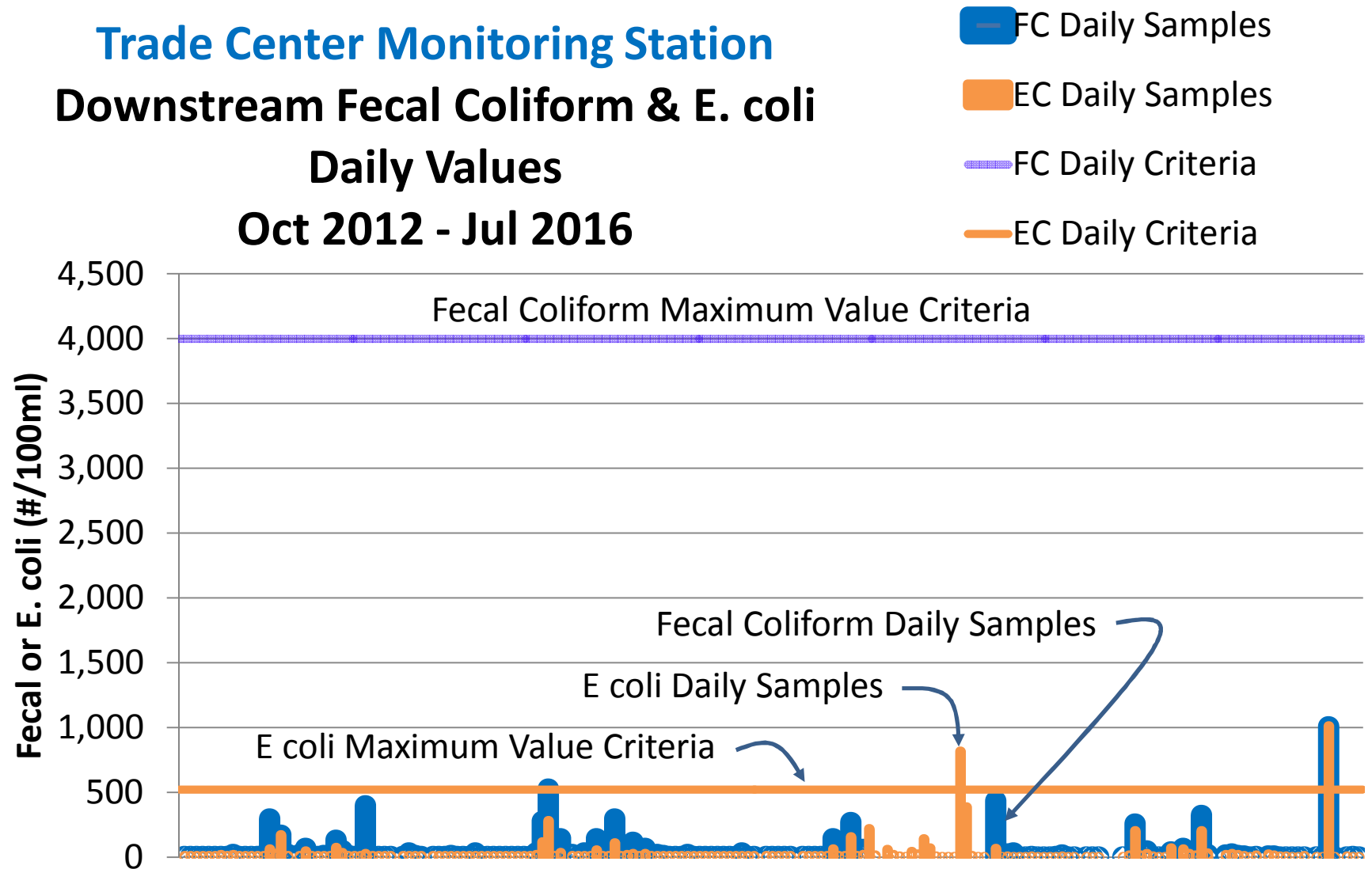
EPA
2001 National
First Place Award
for CSO Control
Program
Excellence

Trade Center Monitoring Station

Downstream Fecal Coliform & E. coli

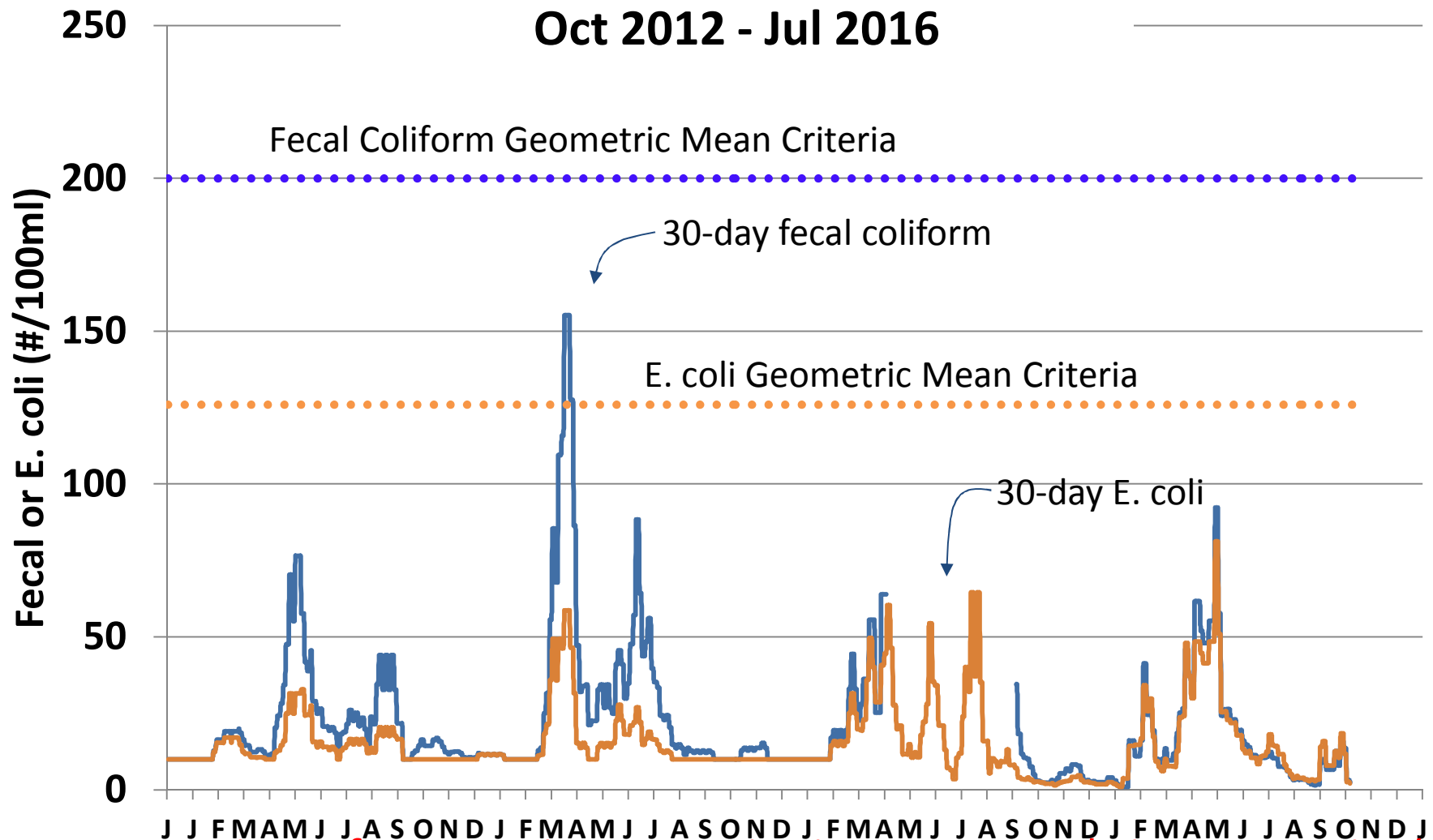
Daily Values

Oct 2012 - Jul 2016



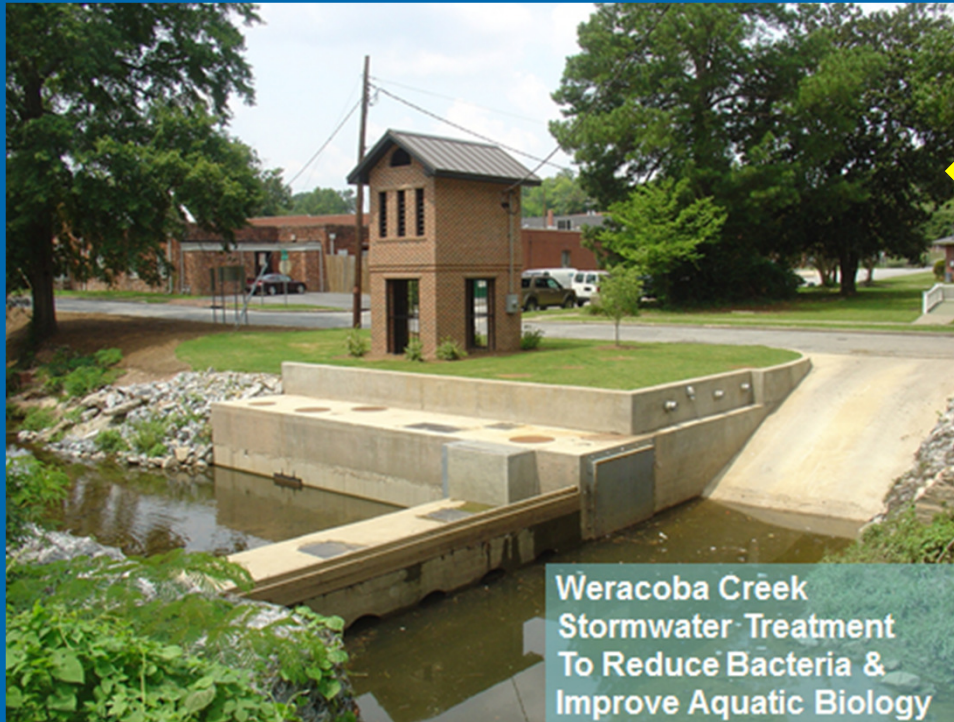
No Digressions of Fecal Coliform Criteria – Water Body is Not Impaired
E. Coli criteria digressions are within the 10% frequency threshold –
Water Body is Not Impaired

Trade Center Monitoring Station
Downstream Fecal Coliform & E. coli
Rolling 30-day Geometric Mean
Oct 2012 - Jul 2016



No Excursions of Geometric Mean Criteria – Water Body is Not Impaired

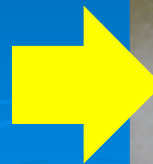
Reduce Velocity and Flushed Organics



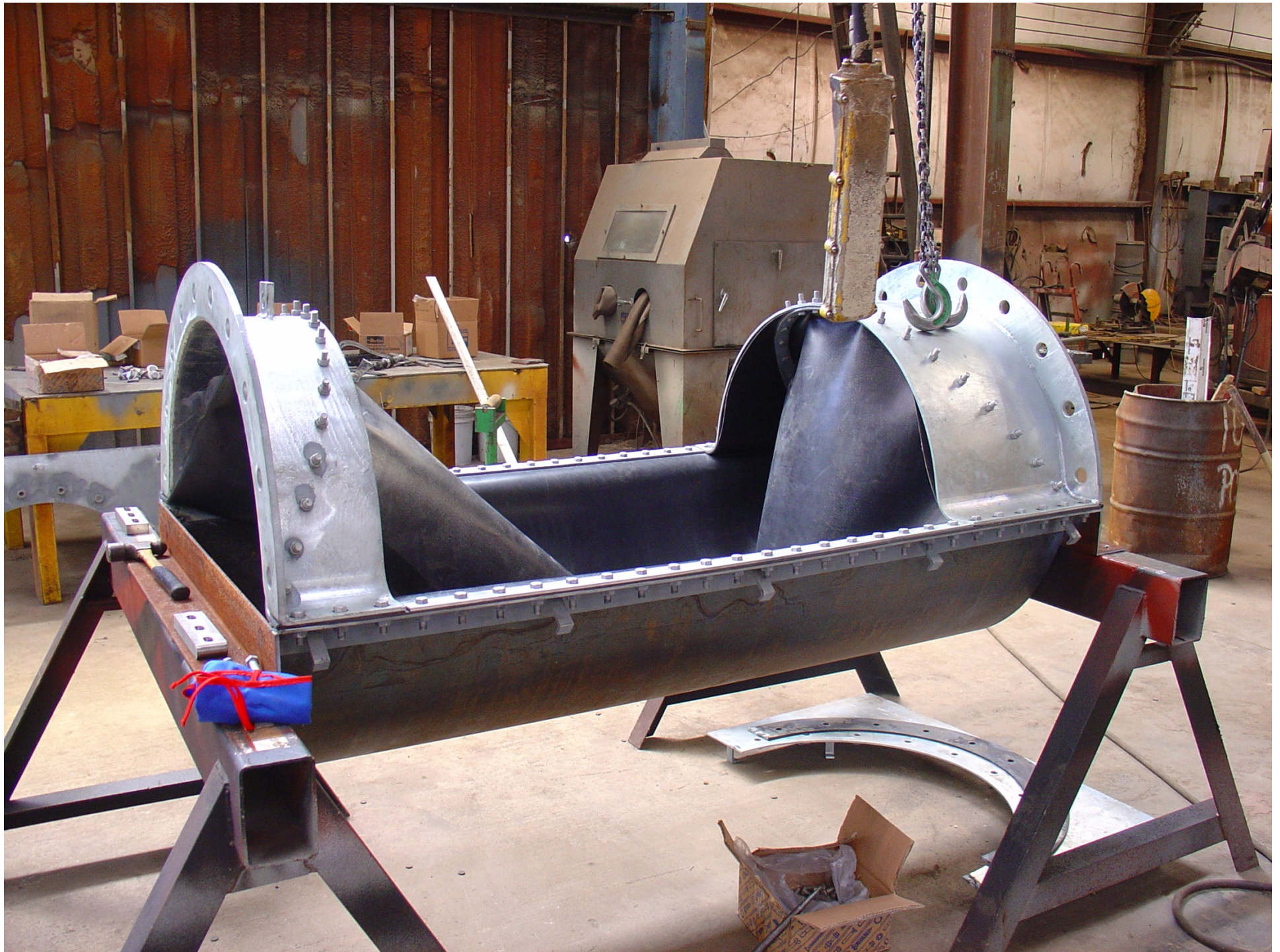
Weracoba Creek
Stormwater Treatment
To Reduce Bacteria &
Improve Aquatic Biology

60-Fold Increase in
Macro-Invertebrates in
6-weeks

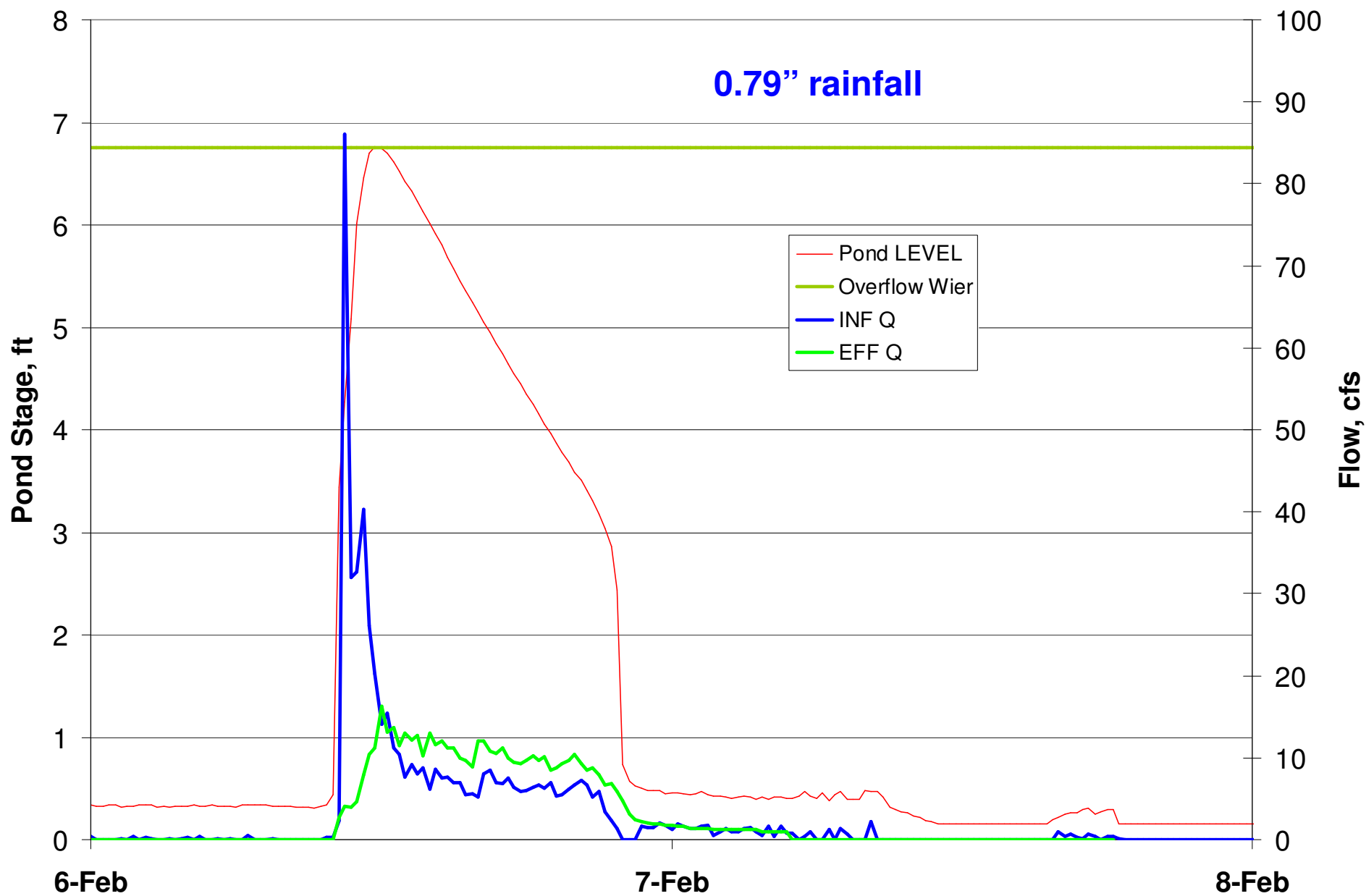
100-Fold Increase in
Macro-Invertebrates in
6-weeks



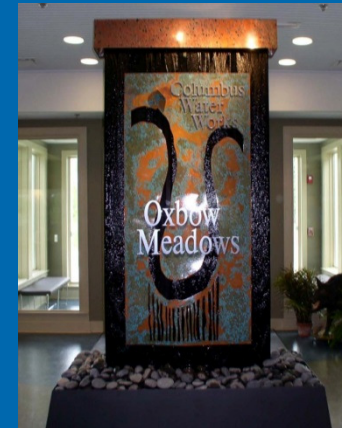
Bradley Park
Stormwater Attenuation
For Aquatic Biology
Improvements and
Source Water Protection



Influent/Effluent Hydrographs and Storage Event 2-6-08



Oxbow Environmental Learning Center



Formerly a solid waste landfill, Oxbow demonstrated how damaged land can be reclaimed using environmentally sound practices.



Environmental & Community Benefits

- The implementation of the Columbus CSO program was used to leverage the construction of a number of community projects including:

Riverfront Before



Riverwalk After



Community Benefits

- These developments in turn fostered investments along the river by other corporations and agencies (“Can do” Spirit):

- Space Science Center
- Naval Museum
- TSYS Campus
- Mead Corporate Headquarters
- Phenix City Amphitheater
- South Commons Sports Complex
- New Civic Center
- River trails and walks expansion on both sides of the river



➤ “Can do” Spirit Continues:

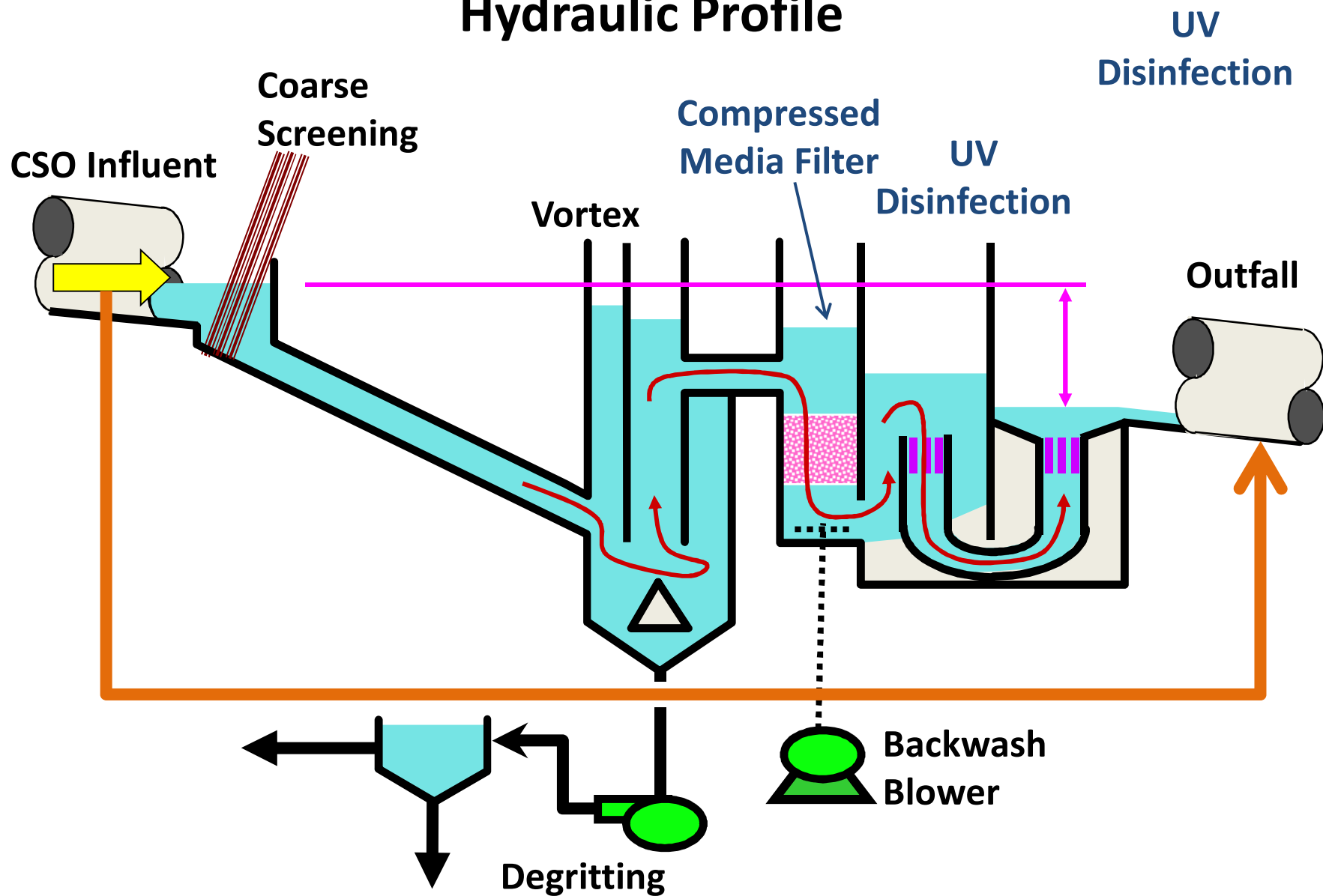
- CSU expansion into Uptown
- 14th Street Pedestrian Bridge connects both sides of river
- Whitewater !!!
- And on into the future...



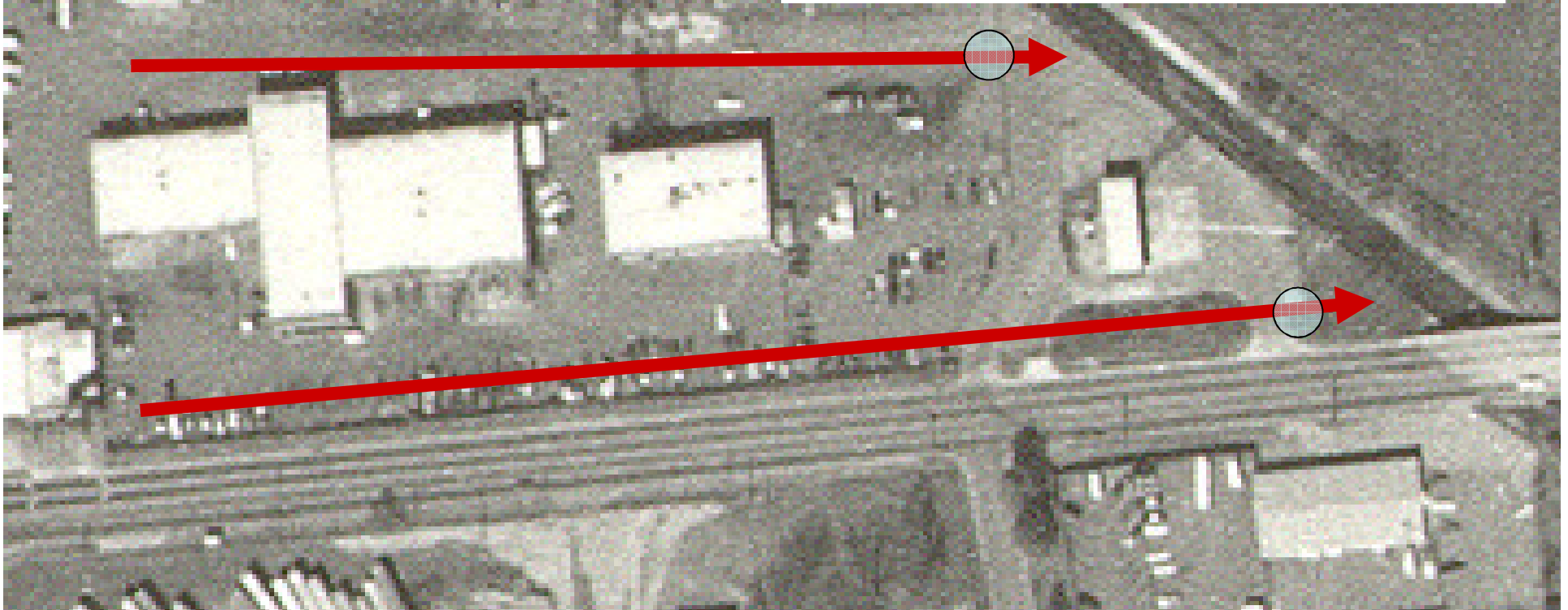
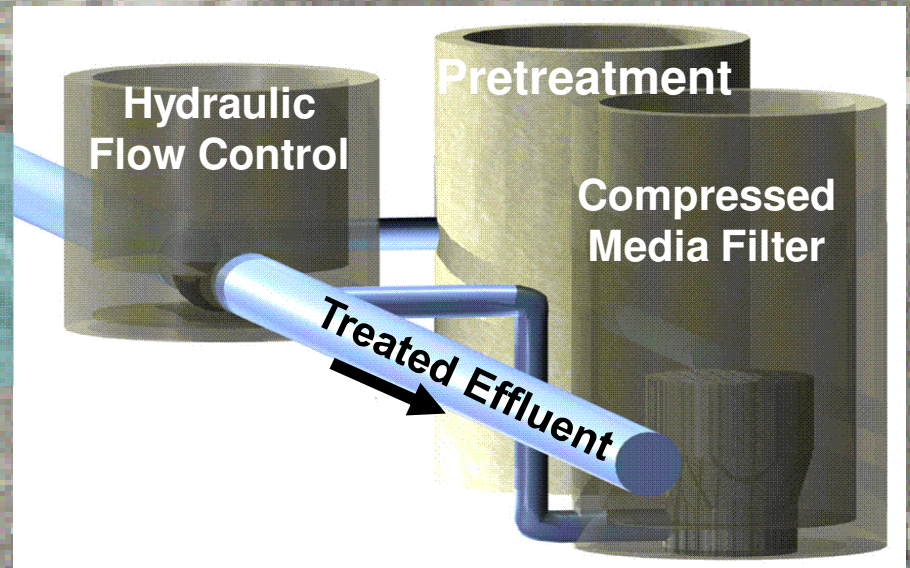
Columbus, GA

Satellite CSO Treatment Facilities

Hydraulic Profile

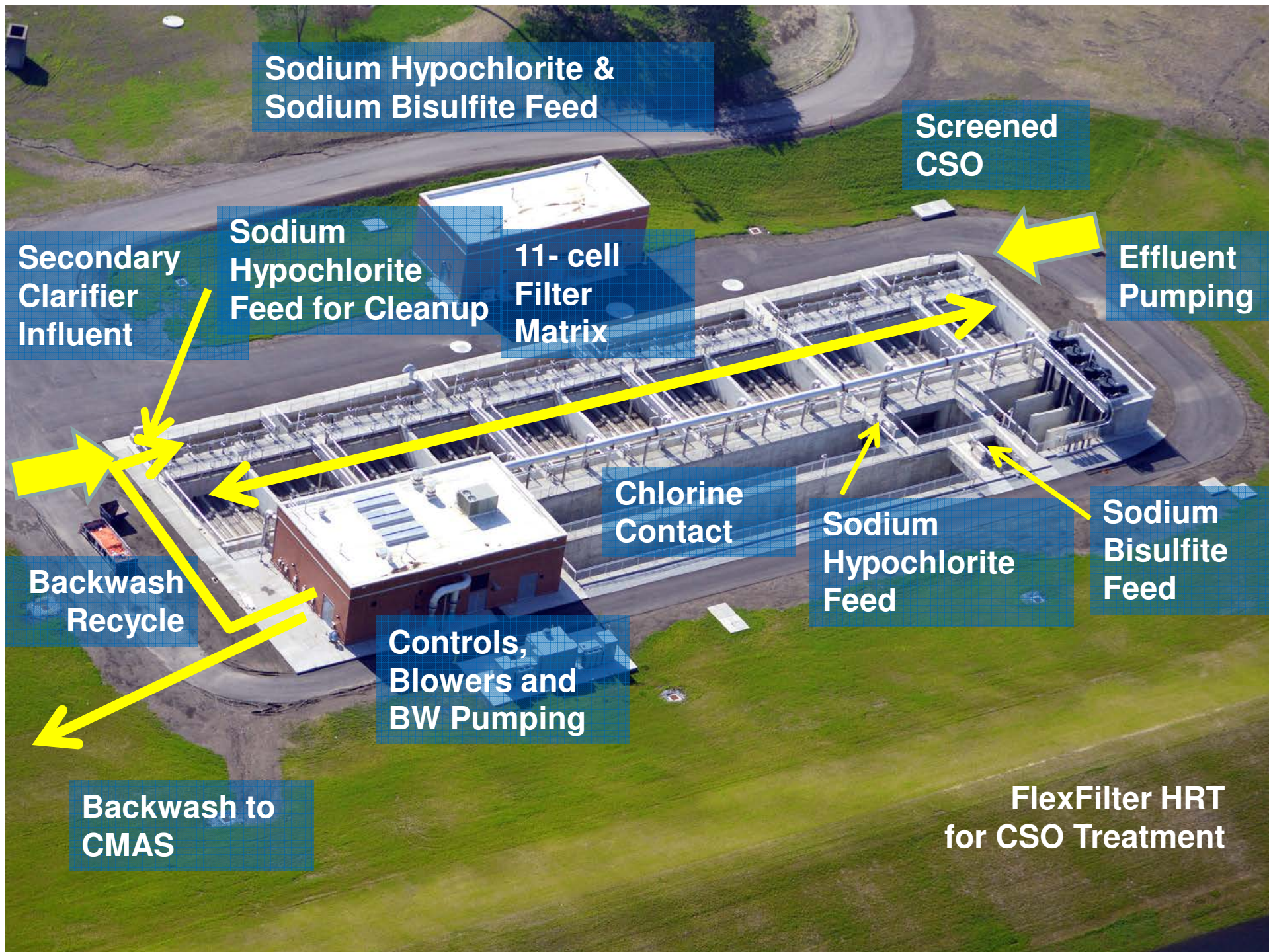


City Vehicle Maintenance Yard BMPs to Remove Flushed Stormwater Contaminants

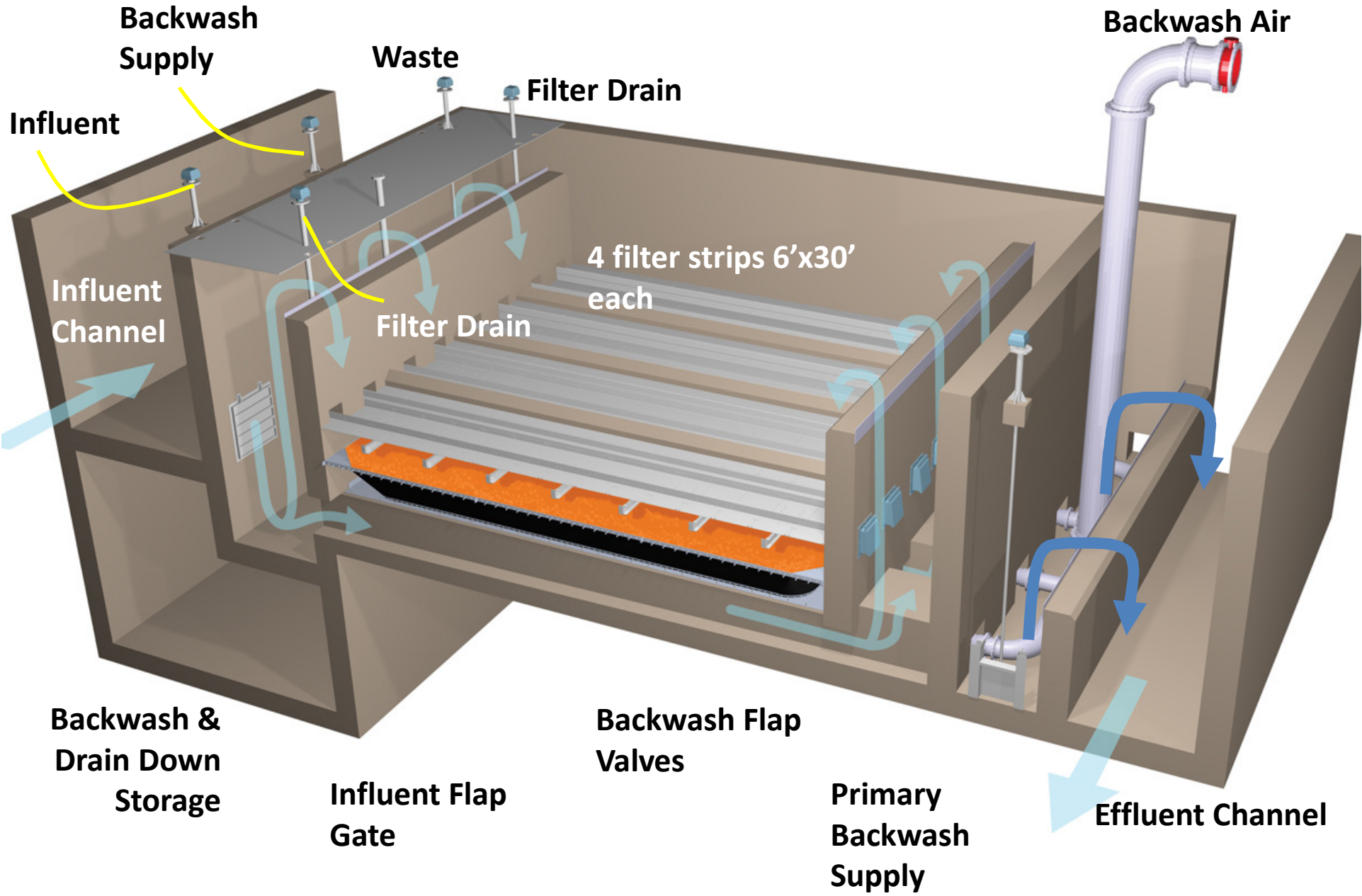


**Columbus GA
10 MGD WWETCO Filter
Urban Creek
Stormwater Treatment
2 MGD UV disinfection**

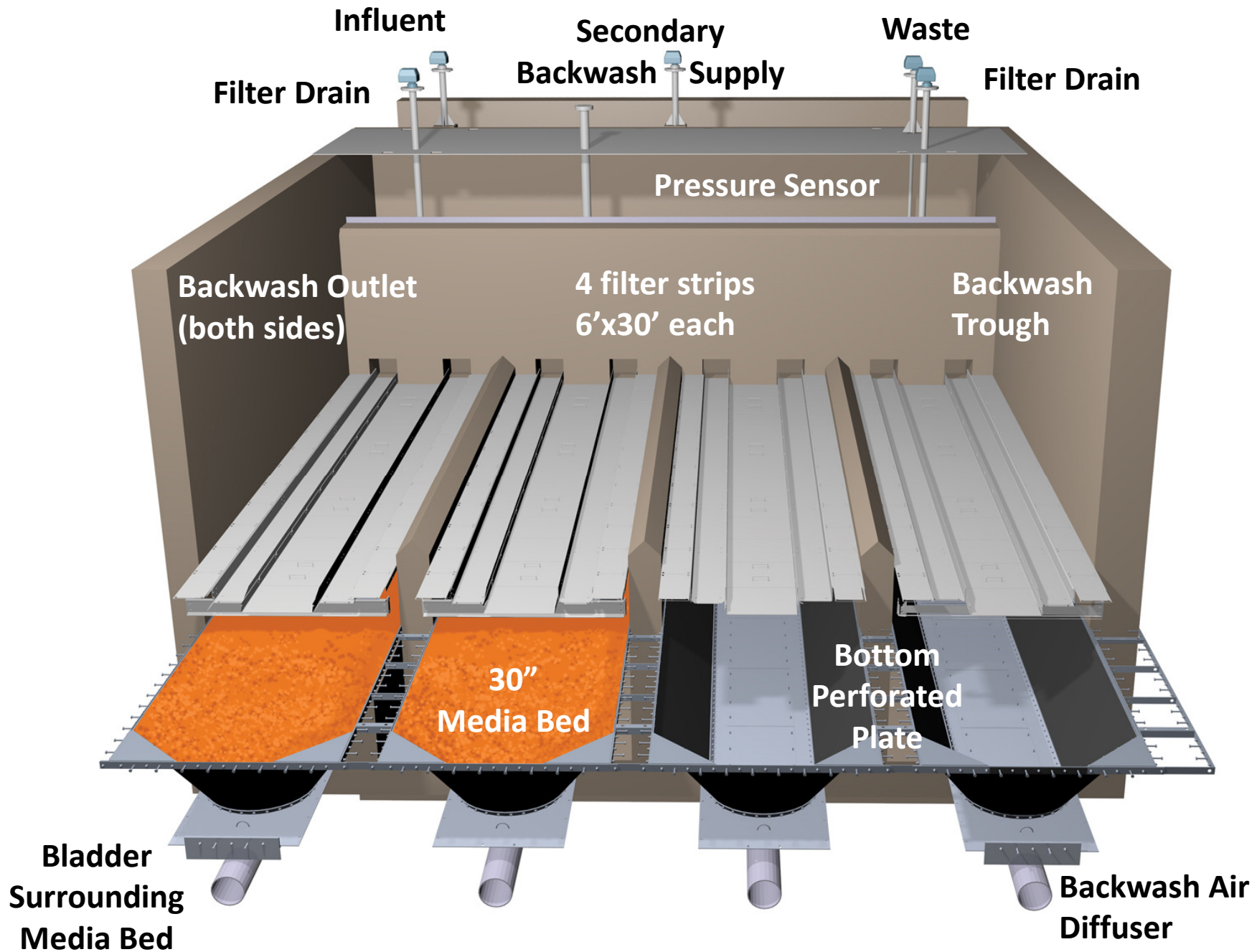




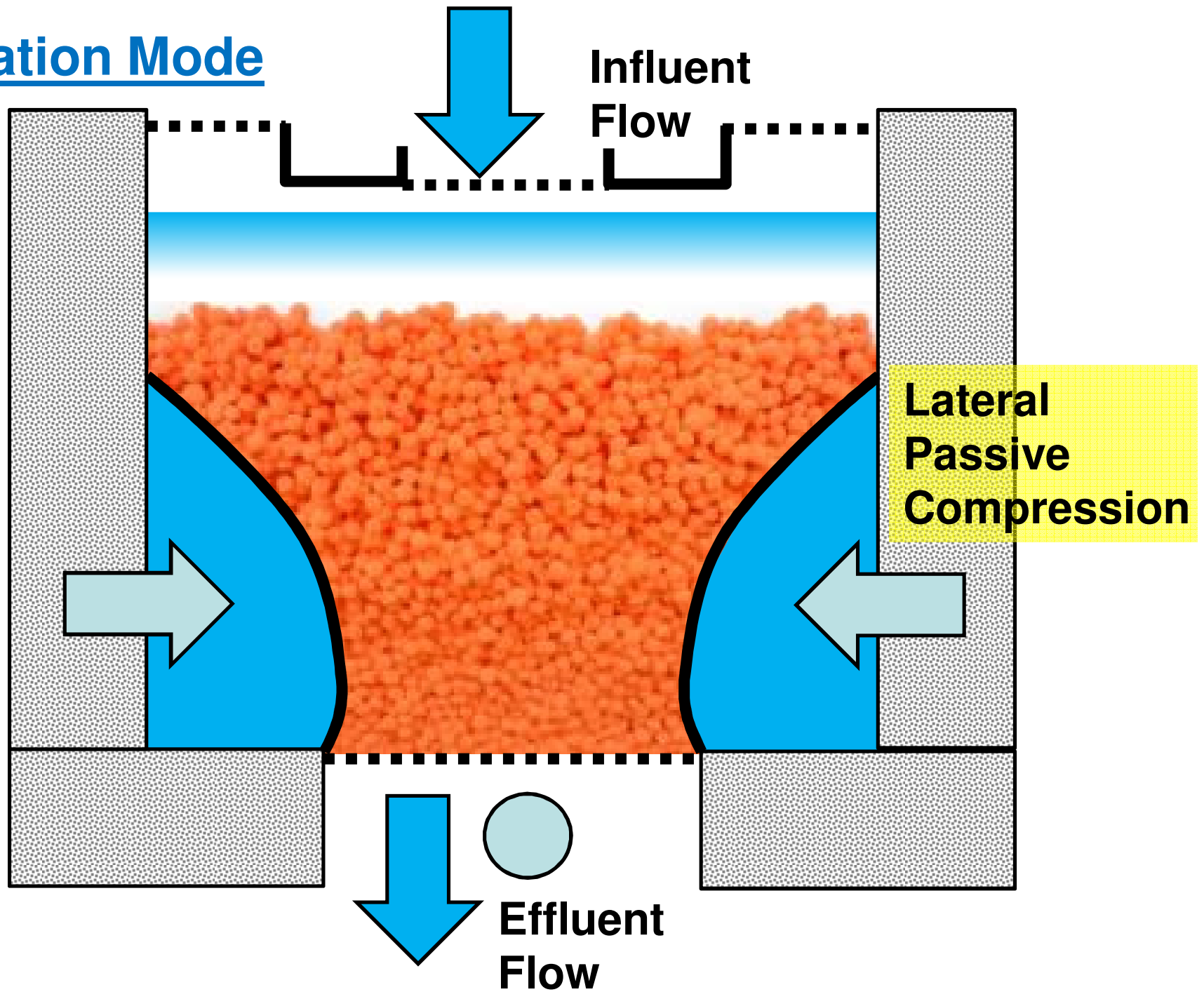
10 MGD FlexFilter Cell – Longitudinal Elevation



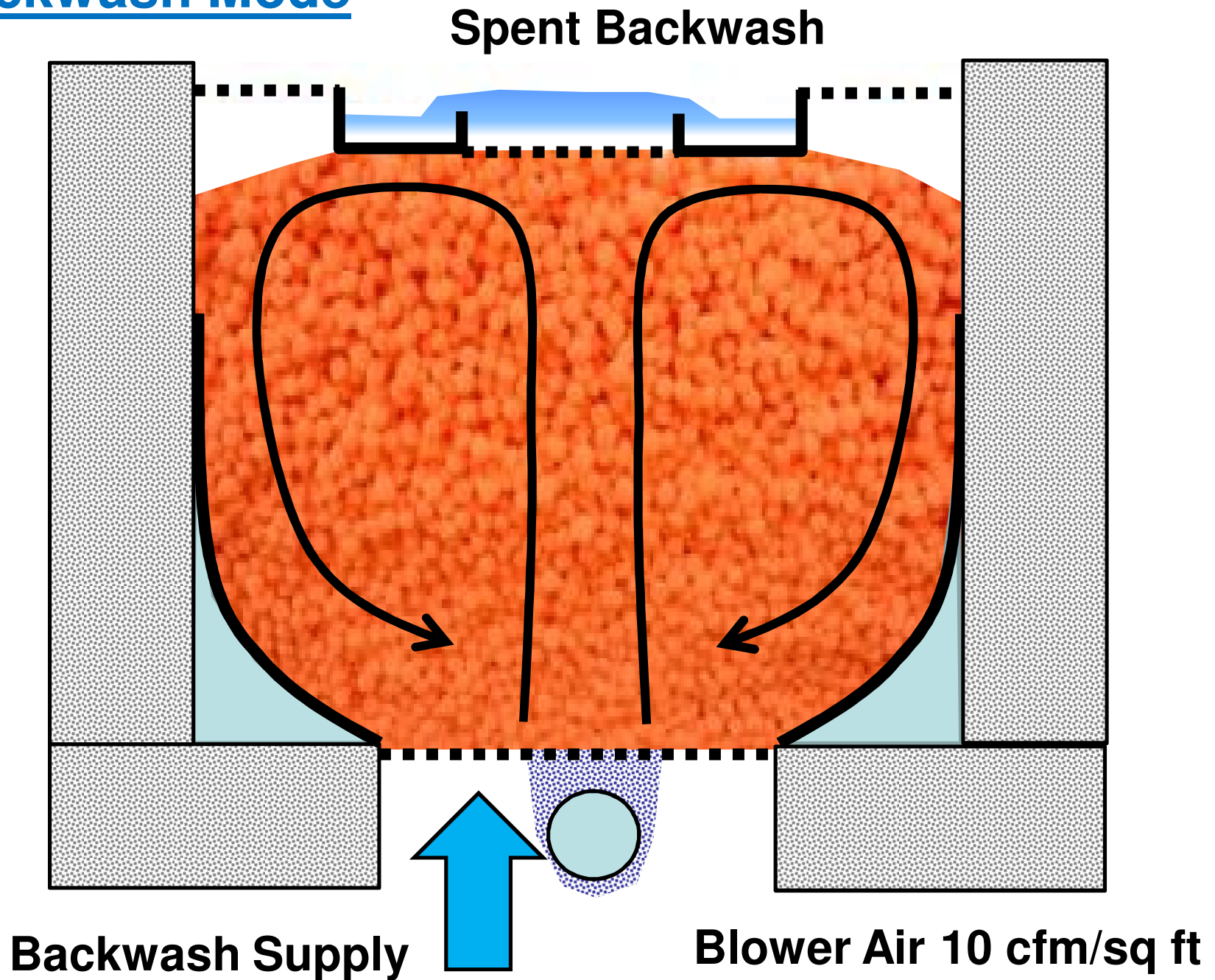
10 MGD FlexFilter Cell – Sectional Elevation



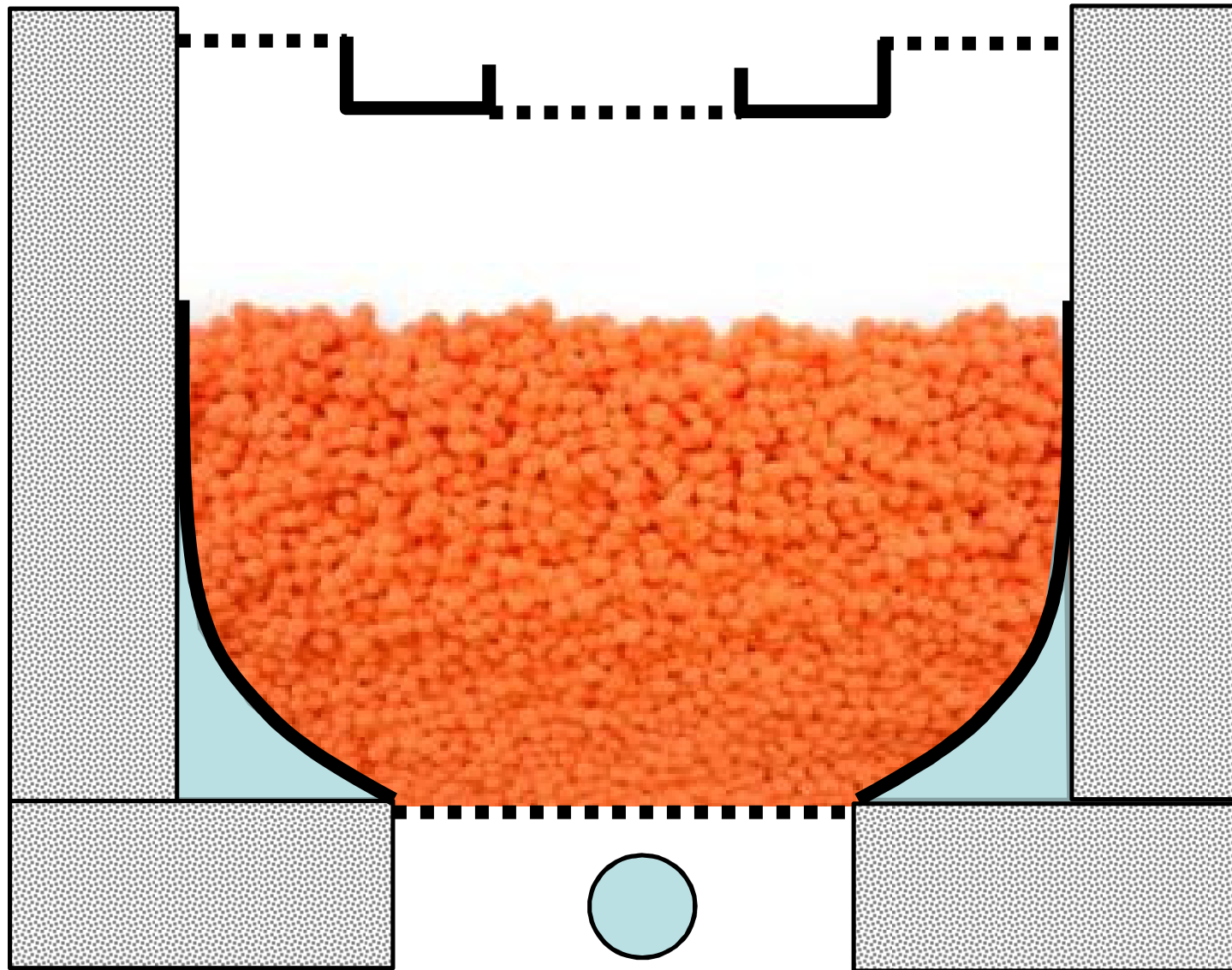
Filtration Mode




Backwash Mode



Drain Mode



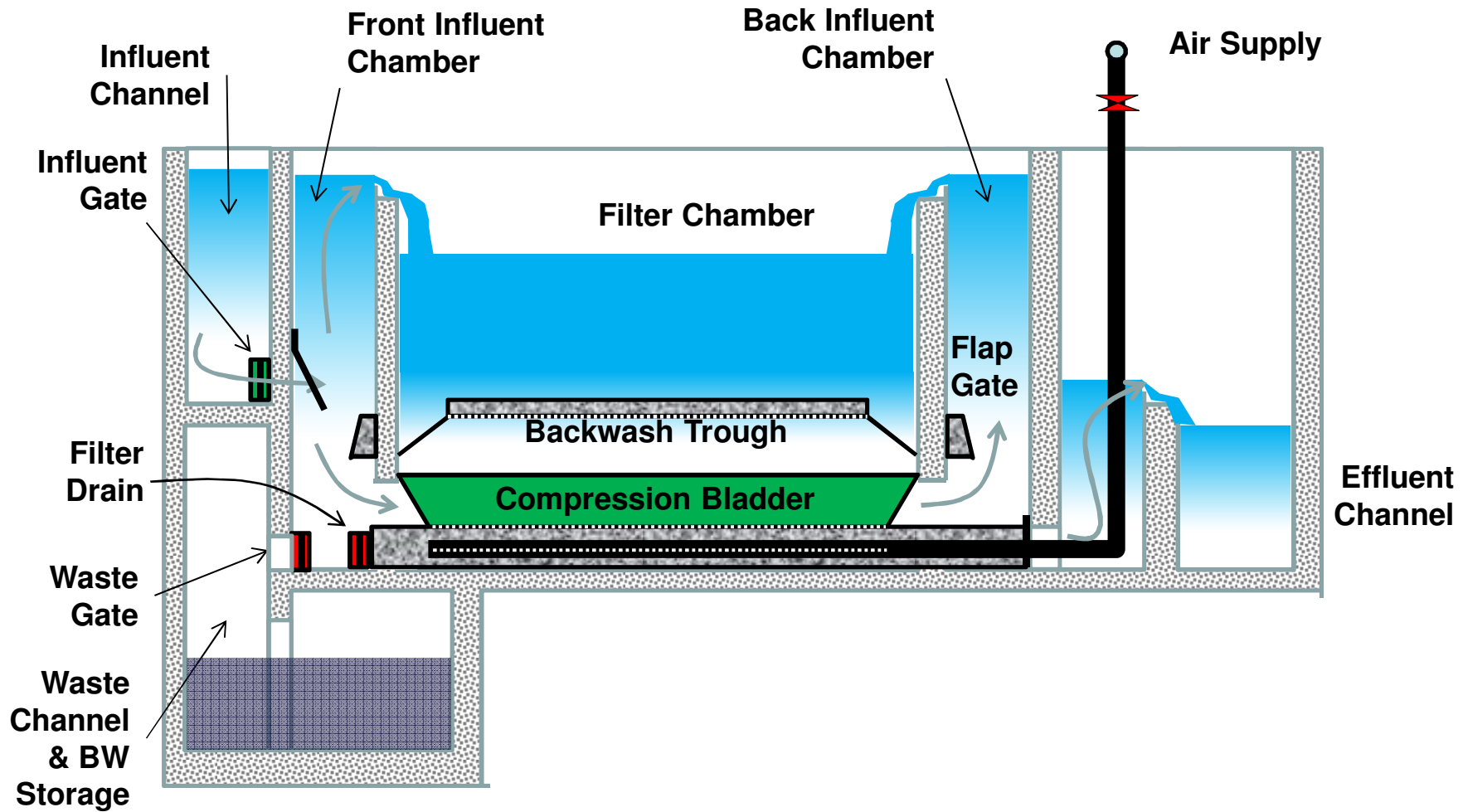
A photograph of a large industrial tank containing a large pile of uncompressed filter media. The media is a reddish-brown, granular material. The tank has a metal frame with horizontal and vertical supports. The background shows the interior walls of the tank, which are dark and appear to be made of metal or concrete. The lighting is somewhat dim, highlighting the texture of the filter media.

**Uncompressed
Filter Media**

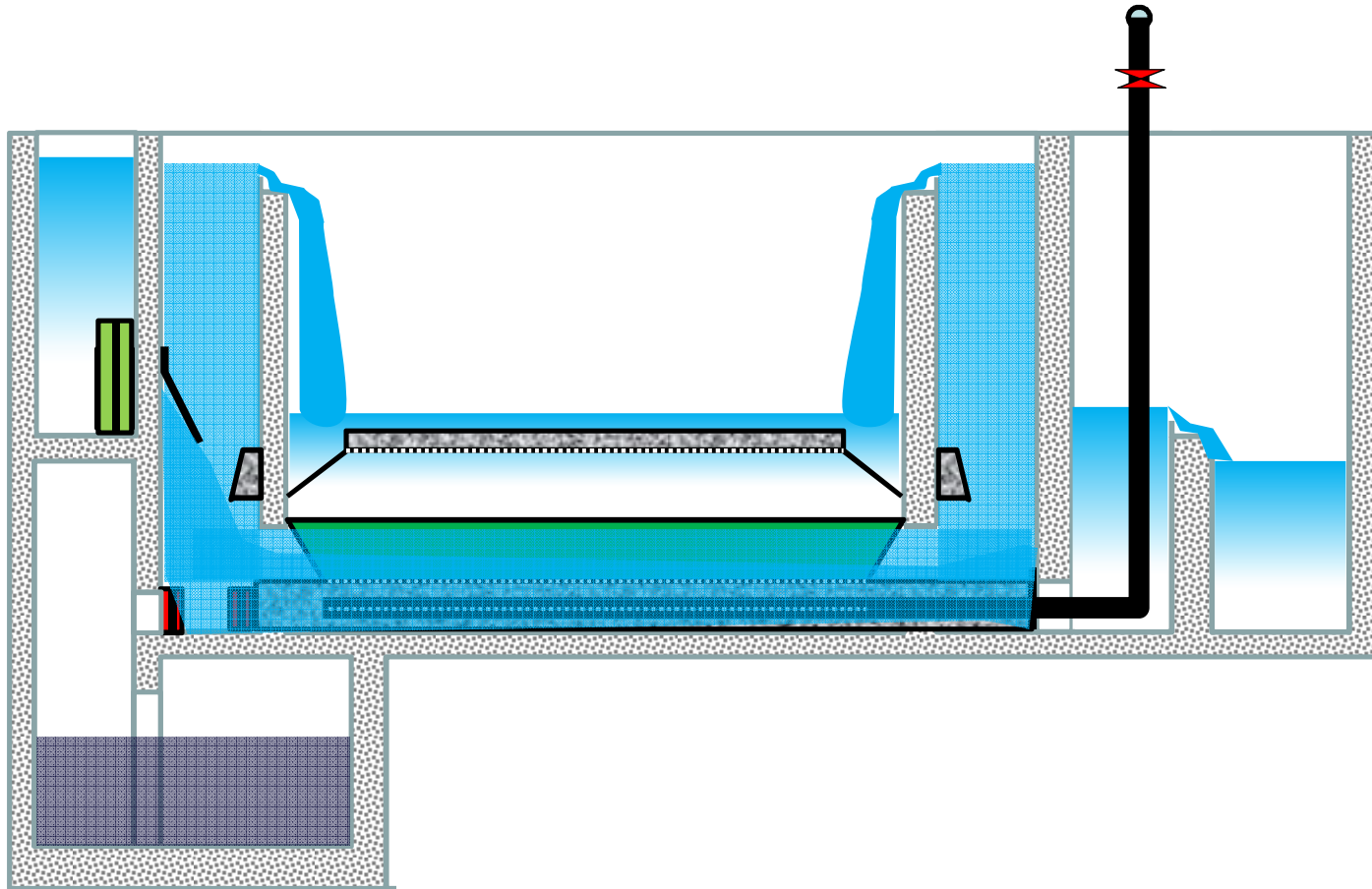


**Compressed
Filter Media**

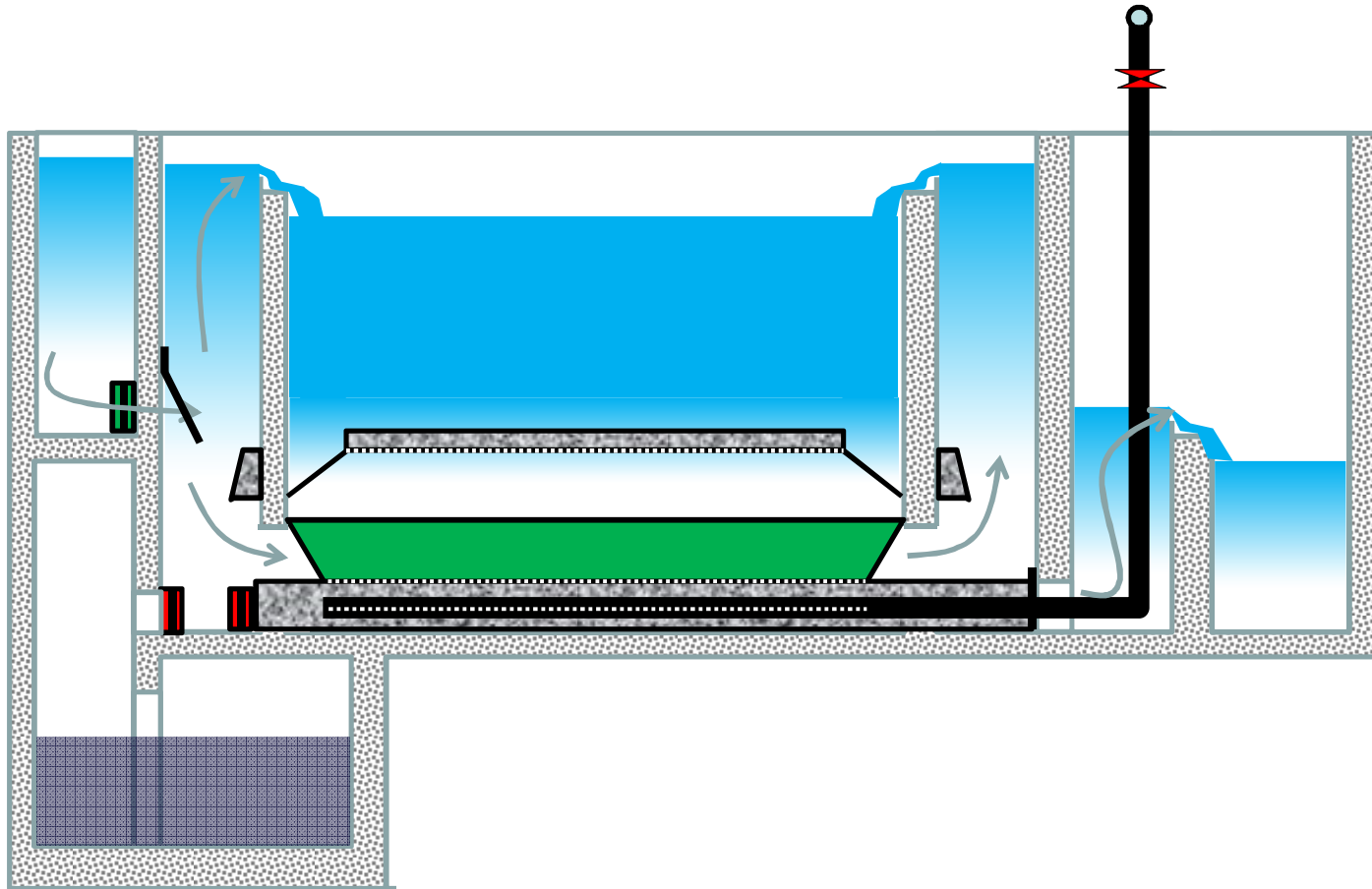
Cross-Section of a Typical Filter Cell



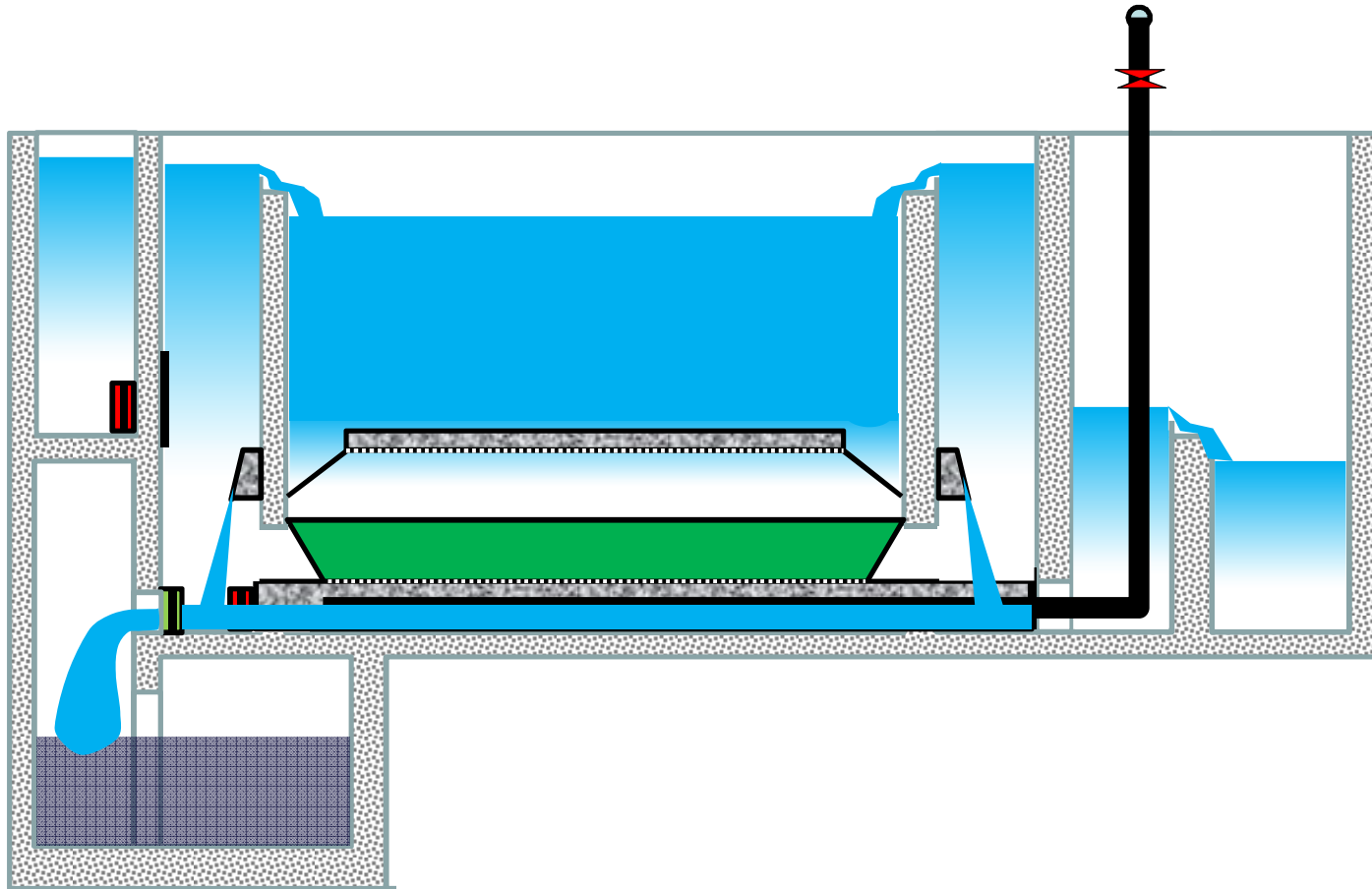
Cell called on-line – bladder compresses and filtration begins



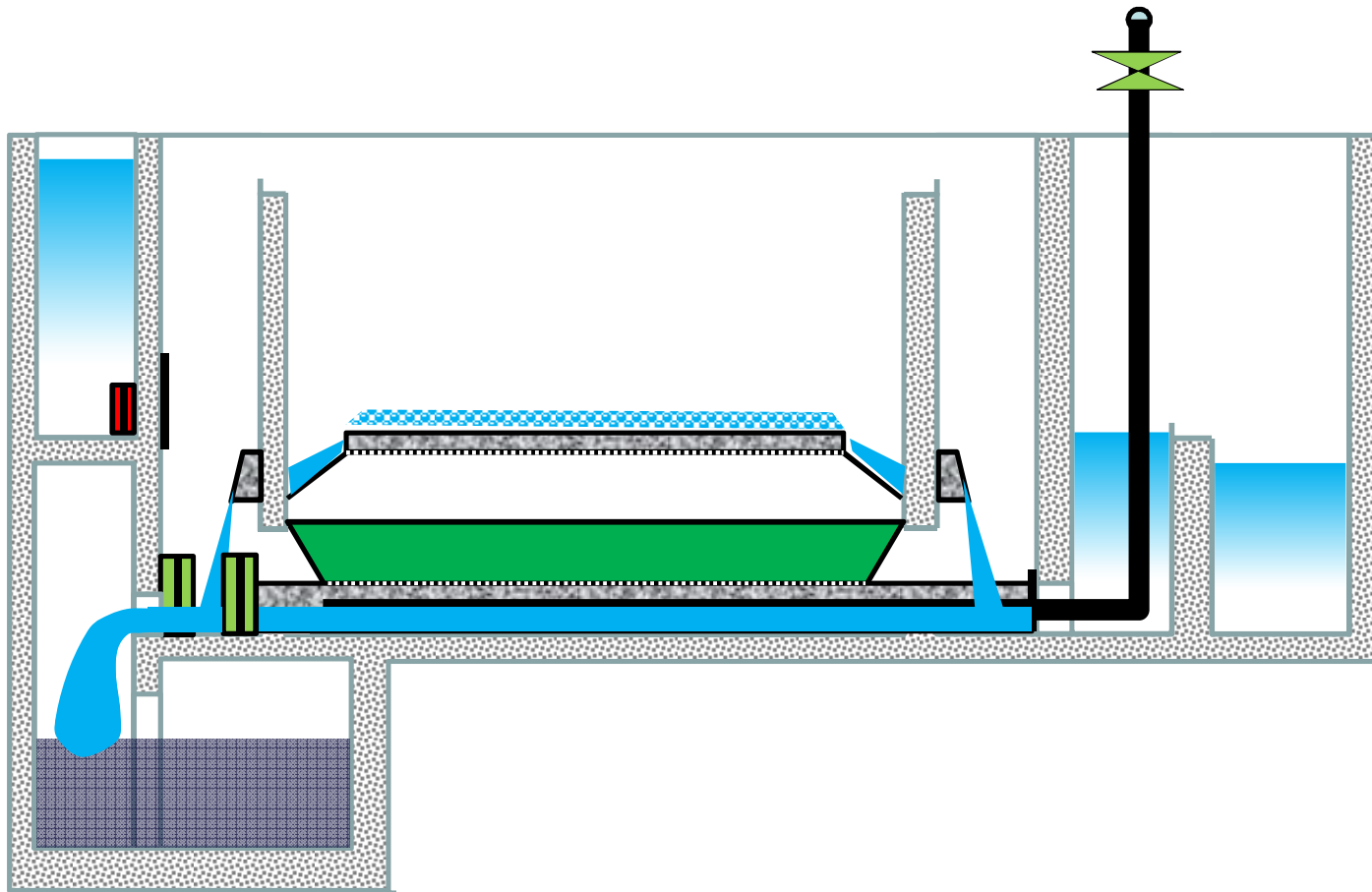
Filtration – As solids are removed head builds



Cell goes off-line and initial drain-down

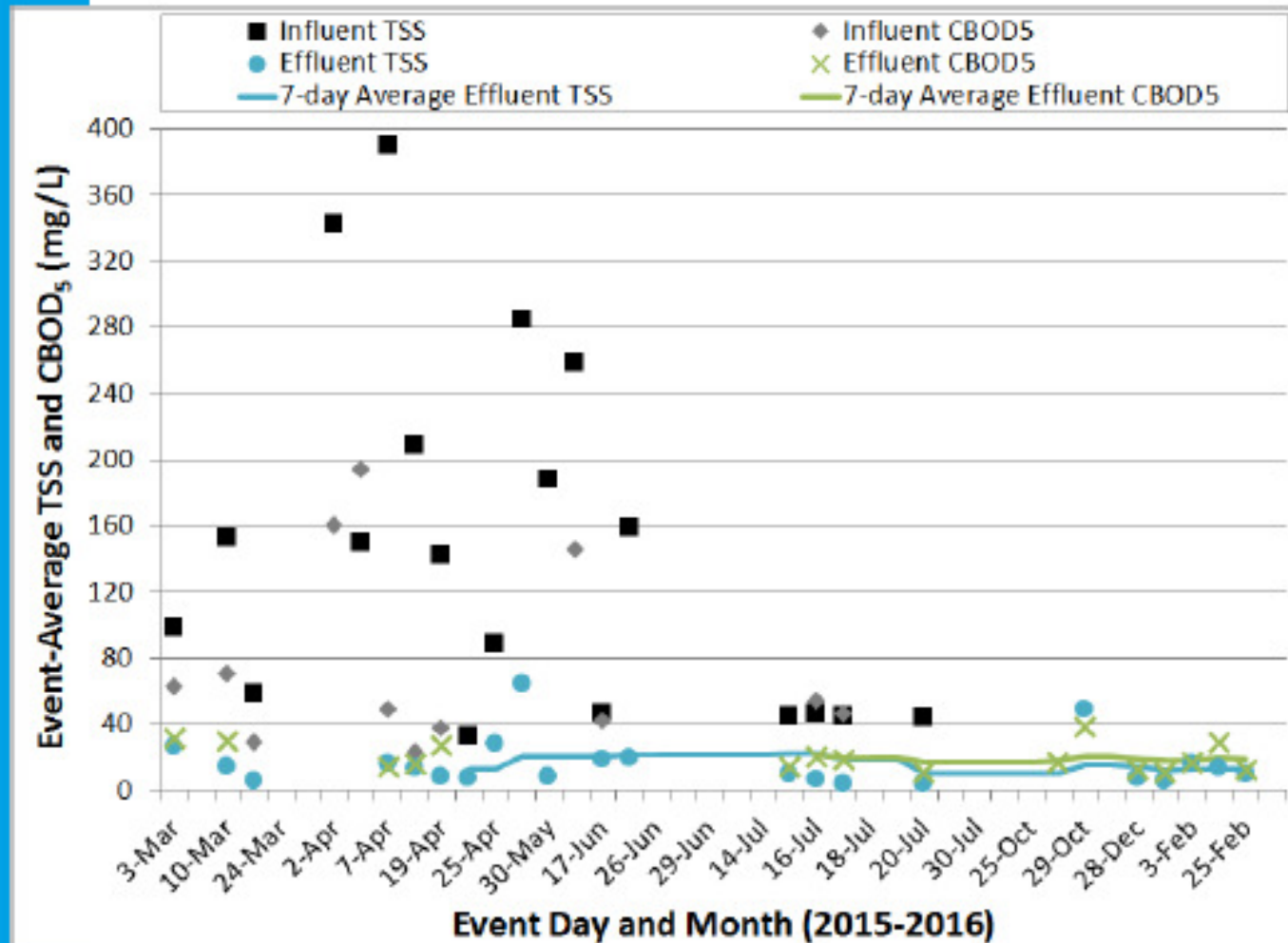


Backwash and final drain-down



Courtesy of Black & Veatch

Performance of Auxiliary EHRT Facilities



Effluent Averages *

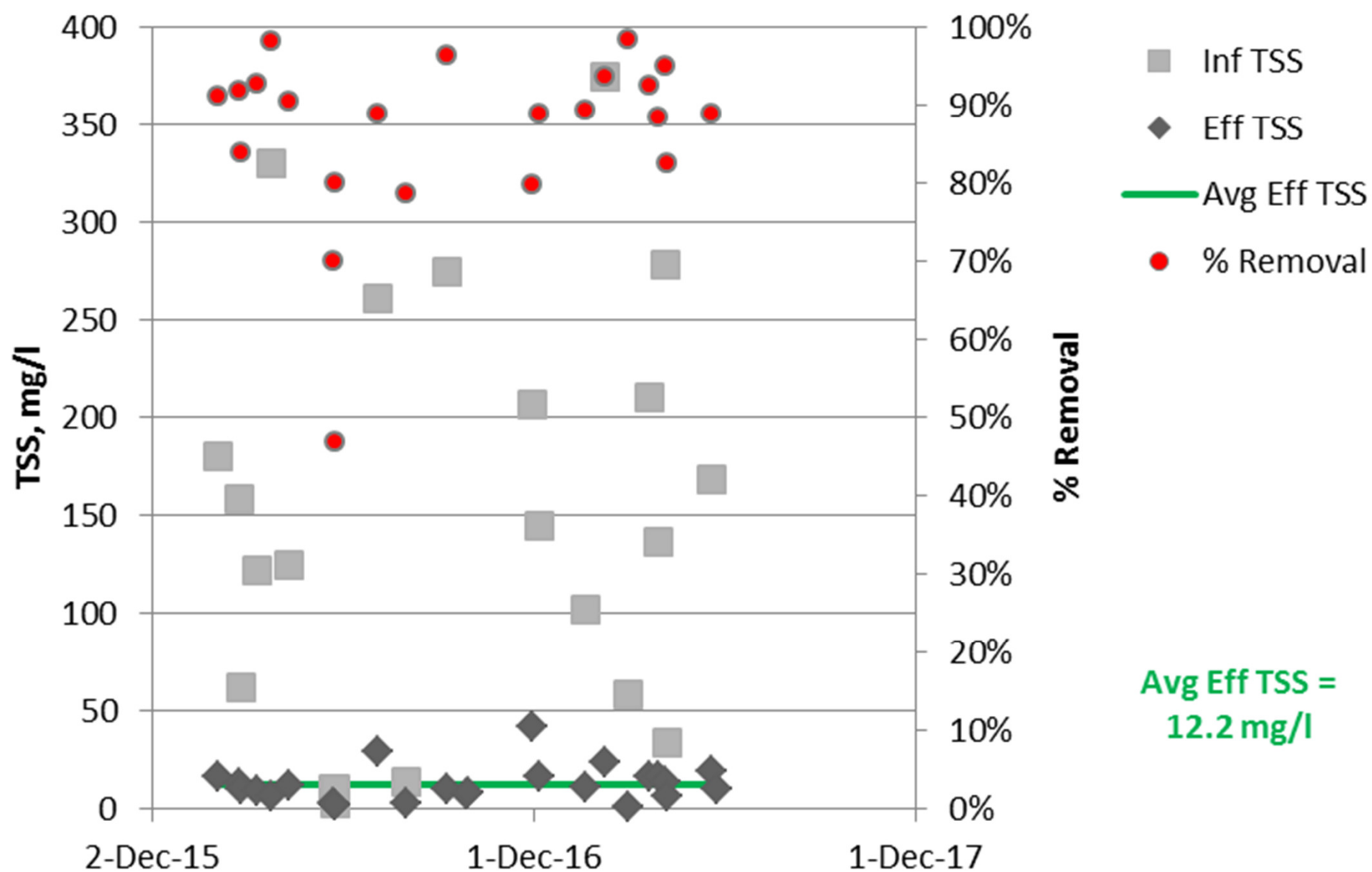
TSS	mg/L	16
CBOD ₅	mg/L	20
NH ₃ -N	mg/L	2.5
TP	mg/L	0.6
DO	mg/L	8.7
TRC **	mg/L	0.02
<i>E. Coli</i>	#/100 mL	56

* 41 events 3/3/15 – 2/25/16

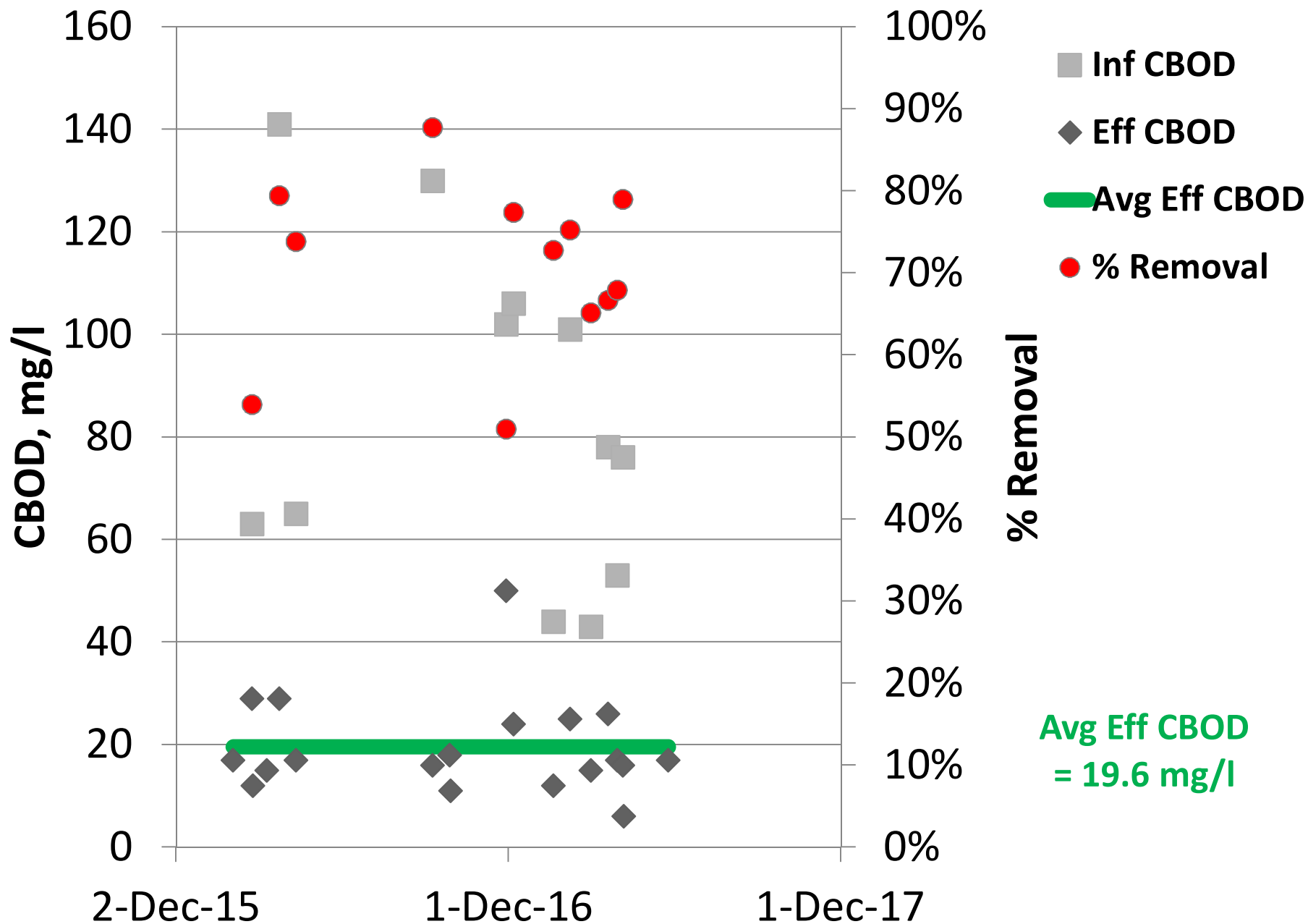
** 1.0 – 8.4 mg/L NaOCl dose

Excellent effluent quality and disinfection

TSS Results - February 2016 to June 2017



CBOD Results - February 2016 to June 2017



Video of Filtration Mode at Mid-level Over Filter





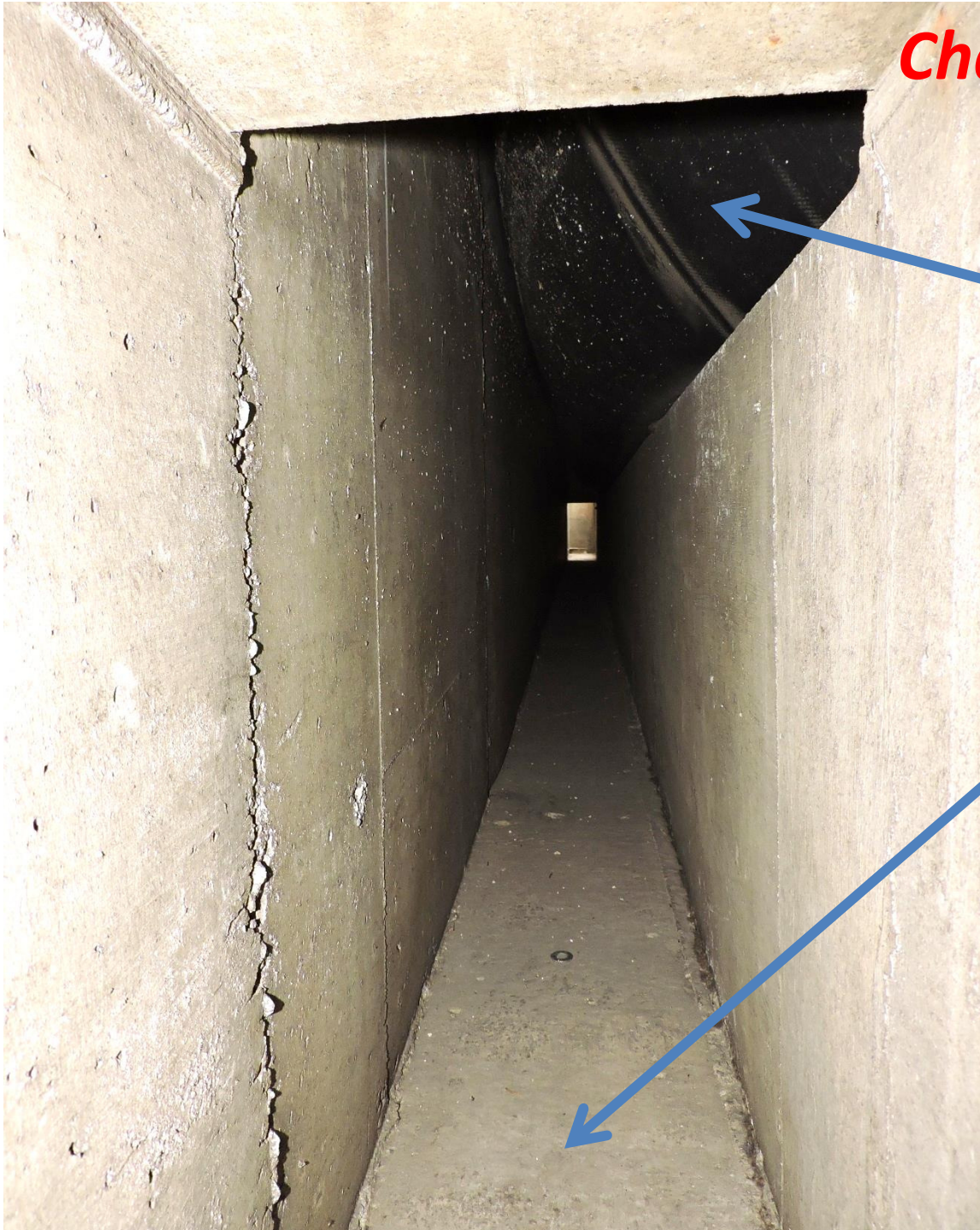
Video of Influent Chamber (East Side)



Channel Behind Bladder

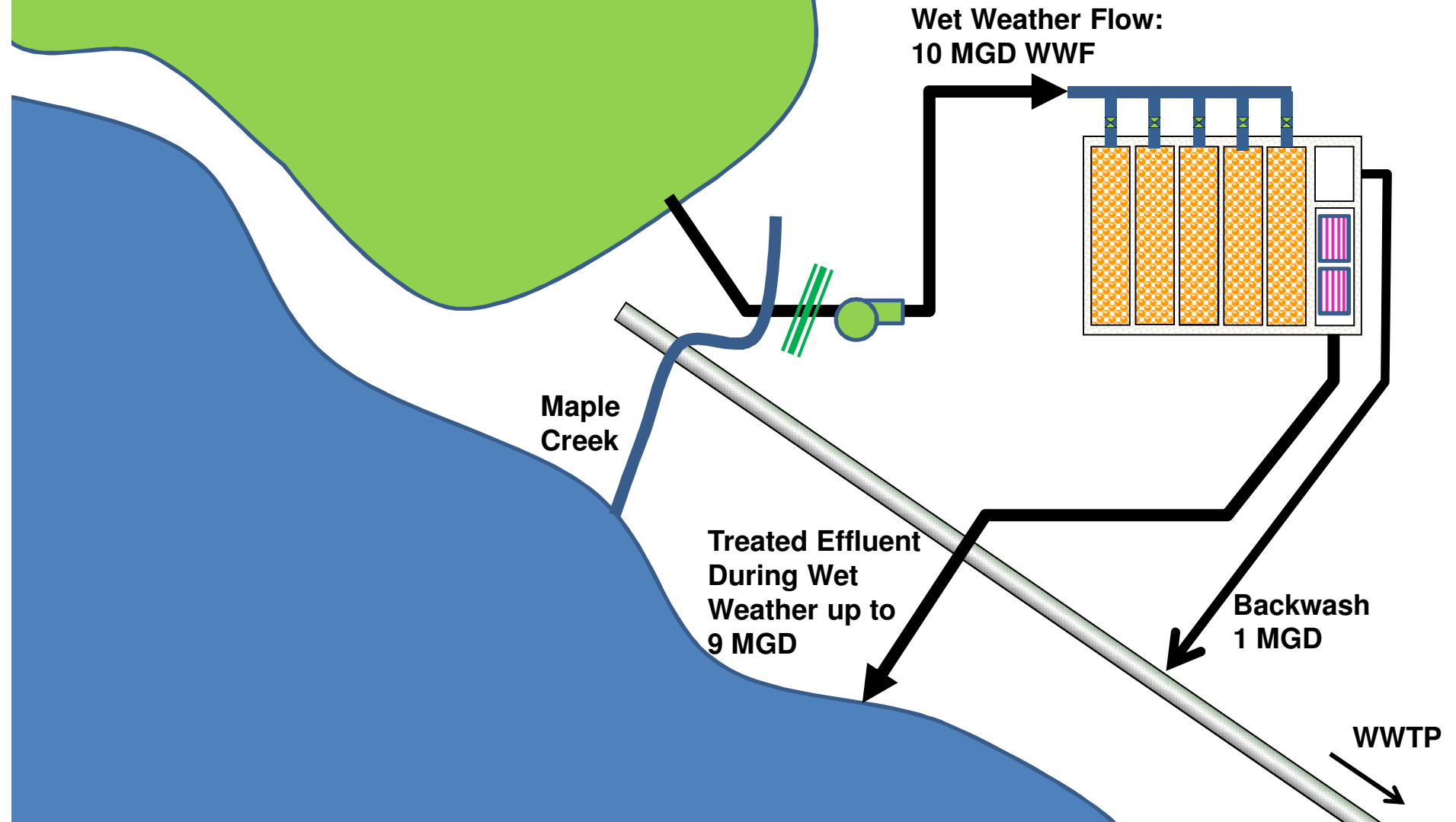
**Compression
Bladder**

**After 10 months
of operation
bladder
compression
channels are free
of debris**



Combined Sewer System Watershed

Charleroi, PA Satellite CSO Treatment



Effluent Pumping

Re
Pu

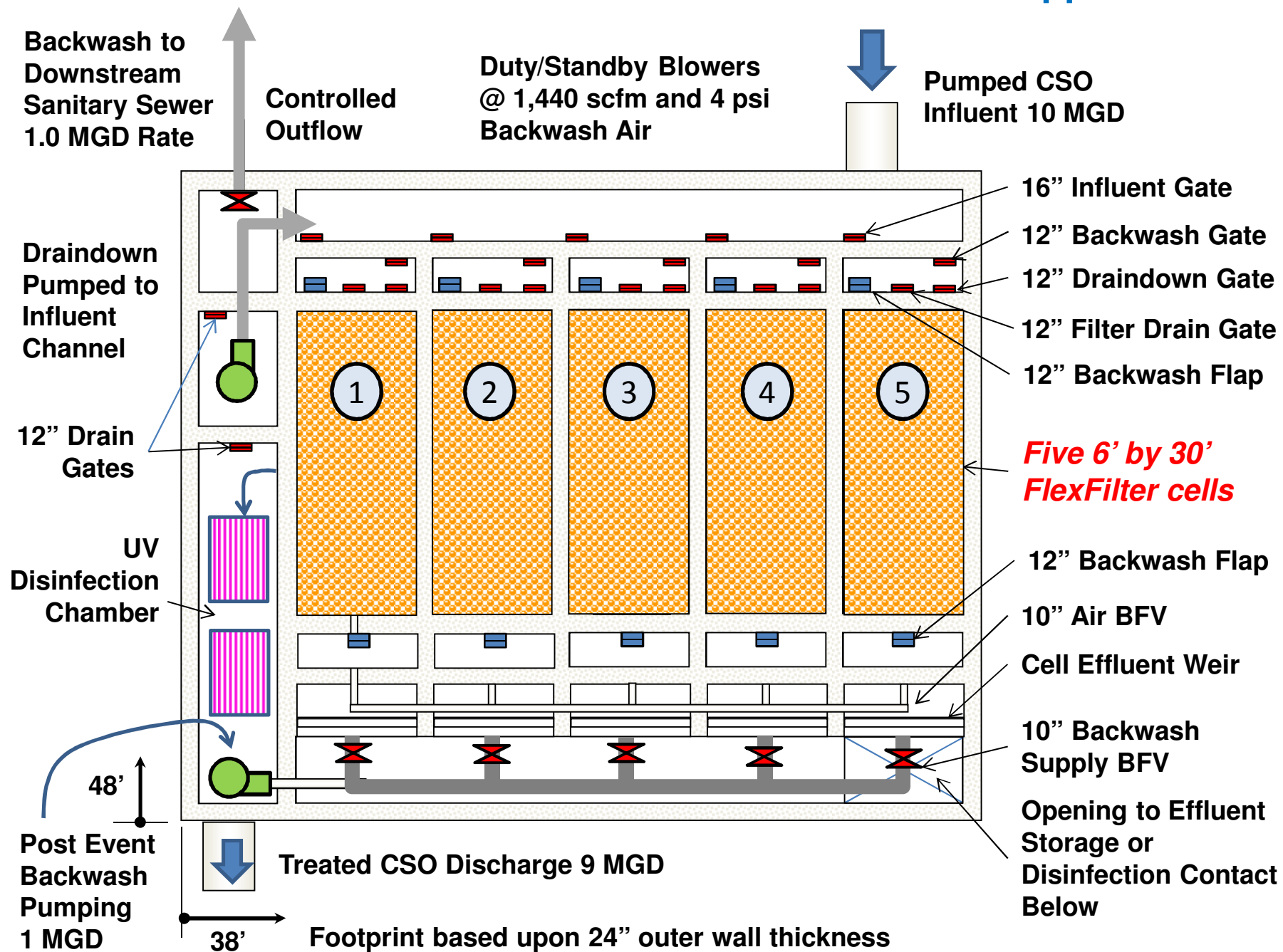
Backwash Blowers

5-Cell FlexFilter Matrix

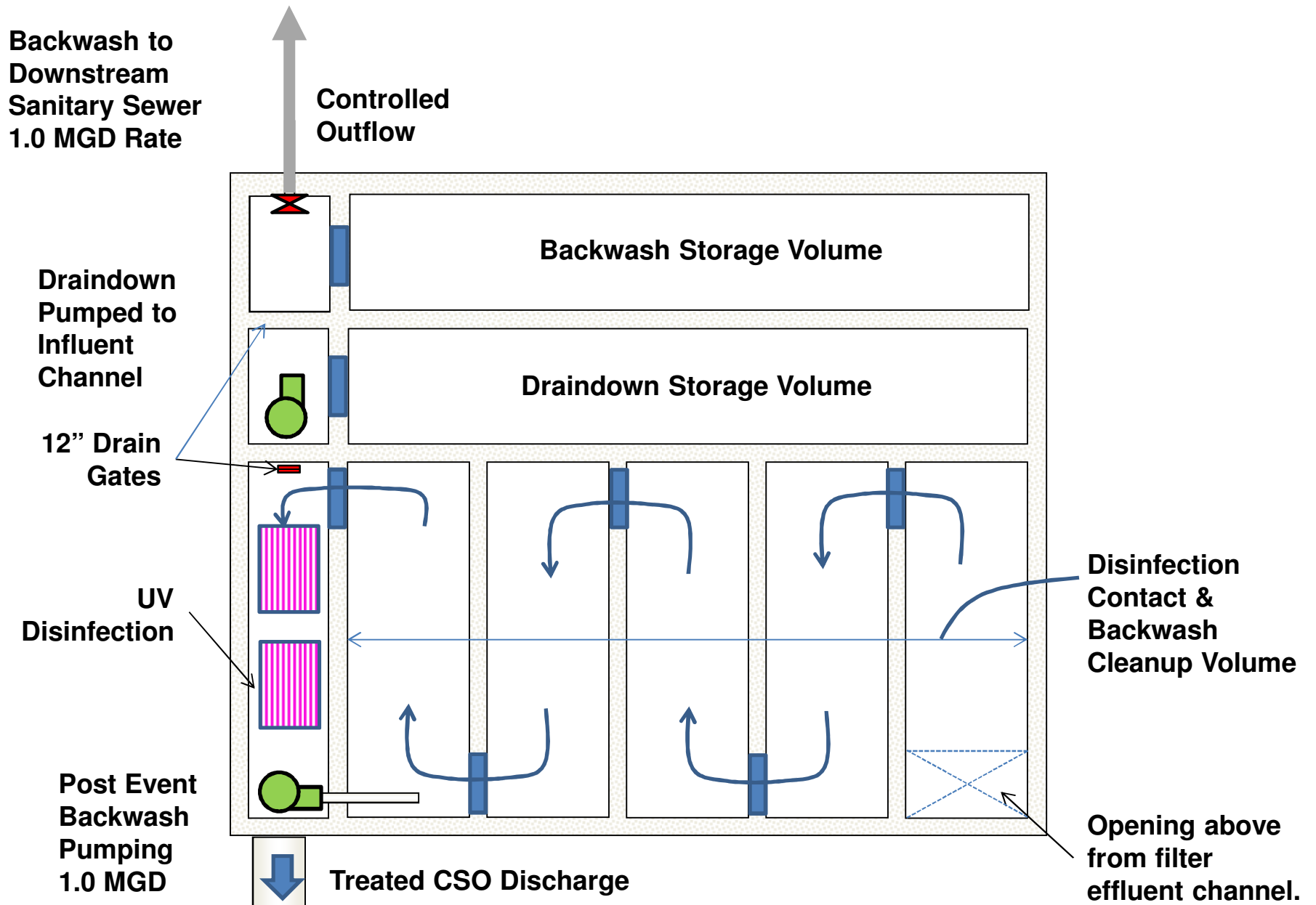
Post Event Backwash Pumping

Coarse Screening

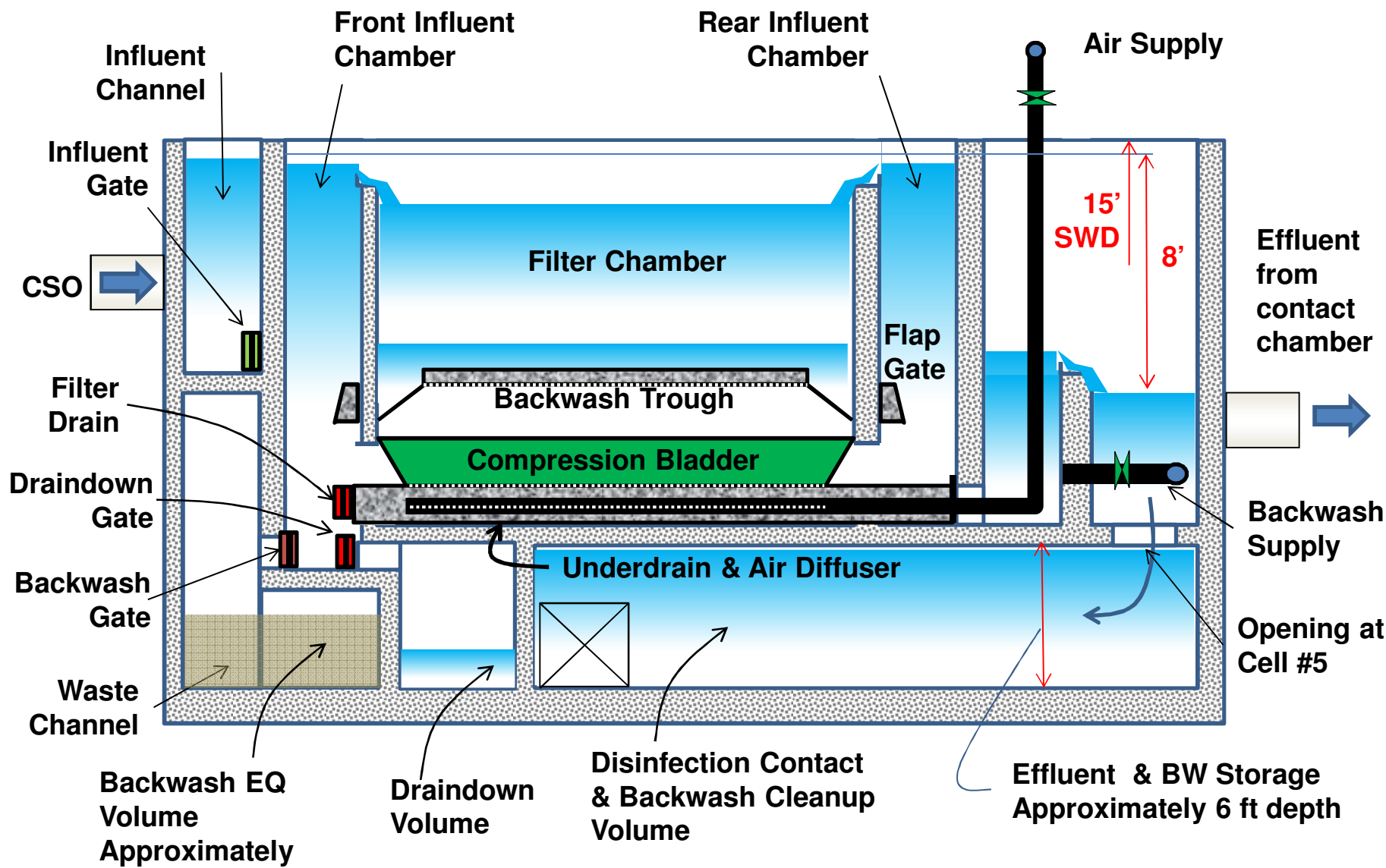
WWETCO 10 MGD FlexFilter™ Satellite CSO Treatment – Upper Plan



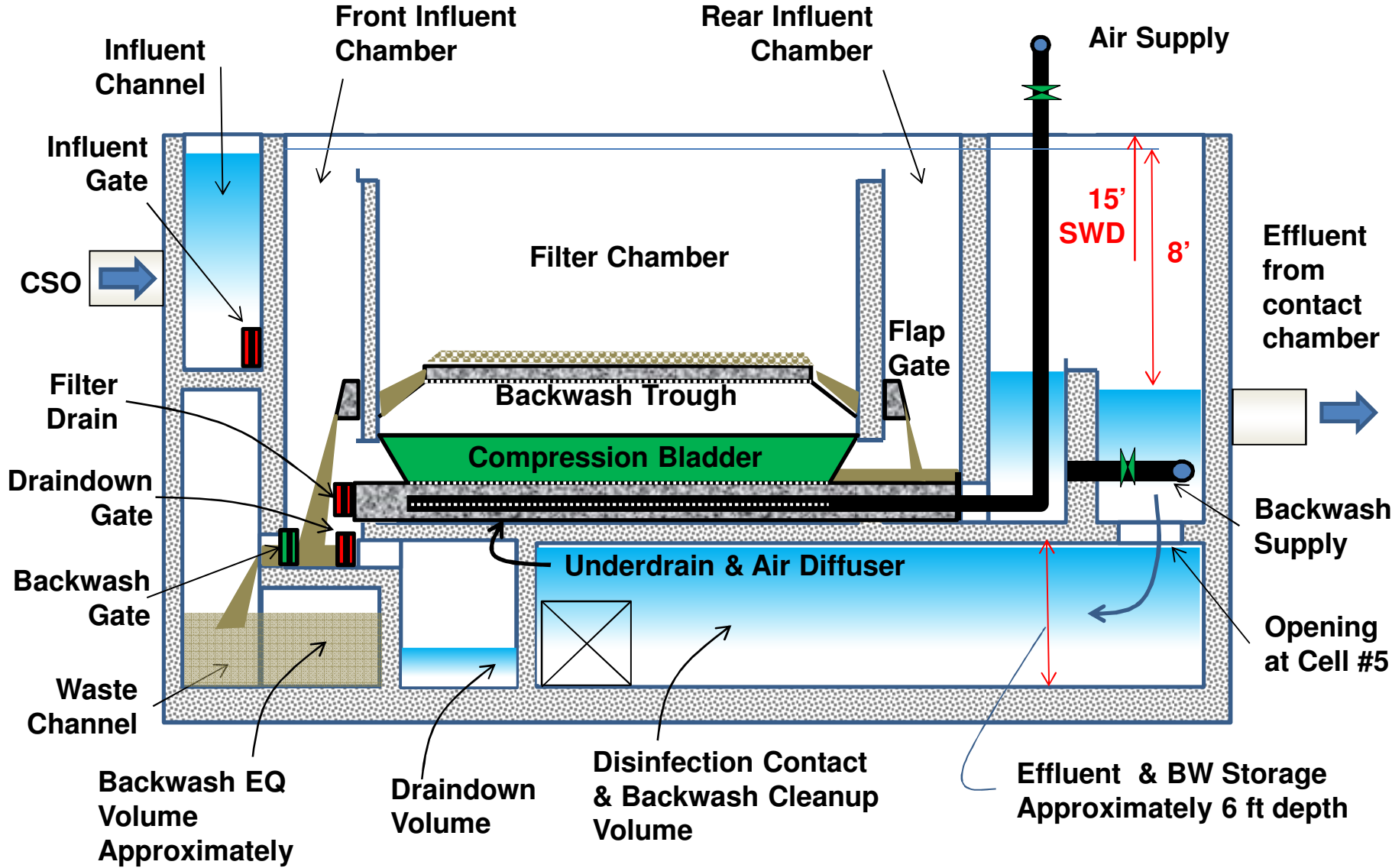
Lower Plan



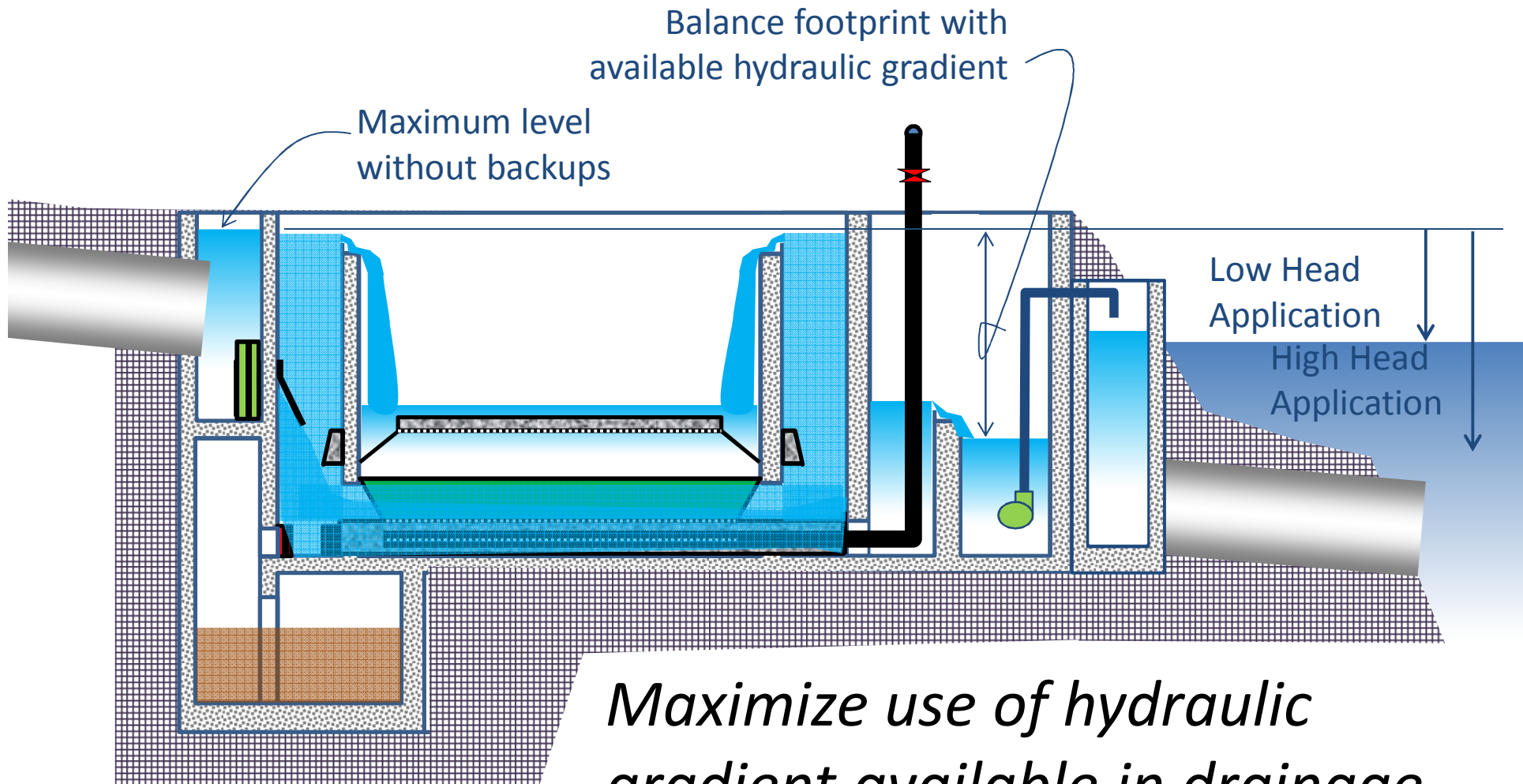
Filtration Mode Section



Backwash Mode Section



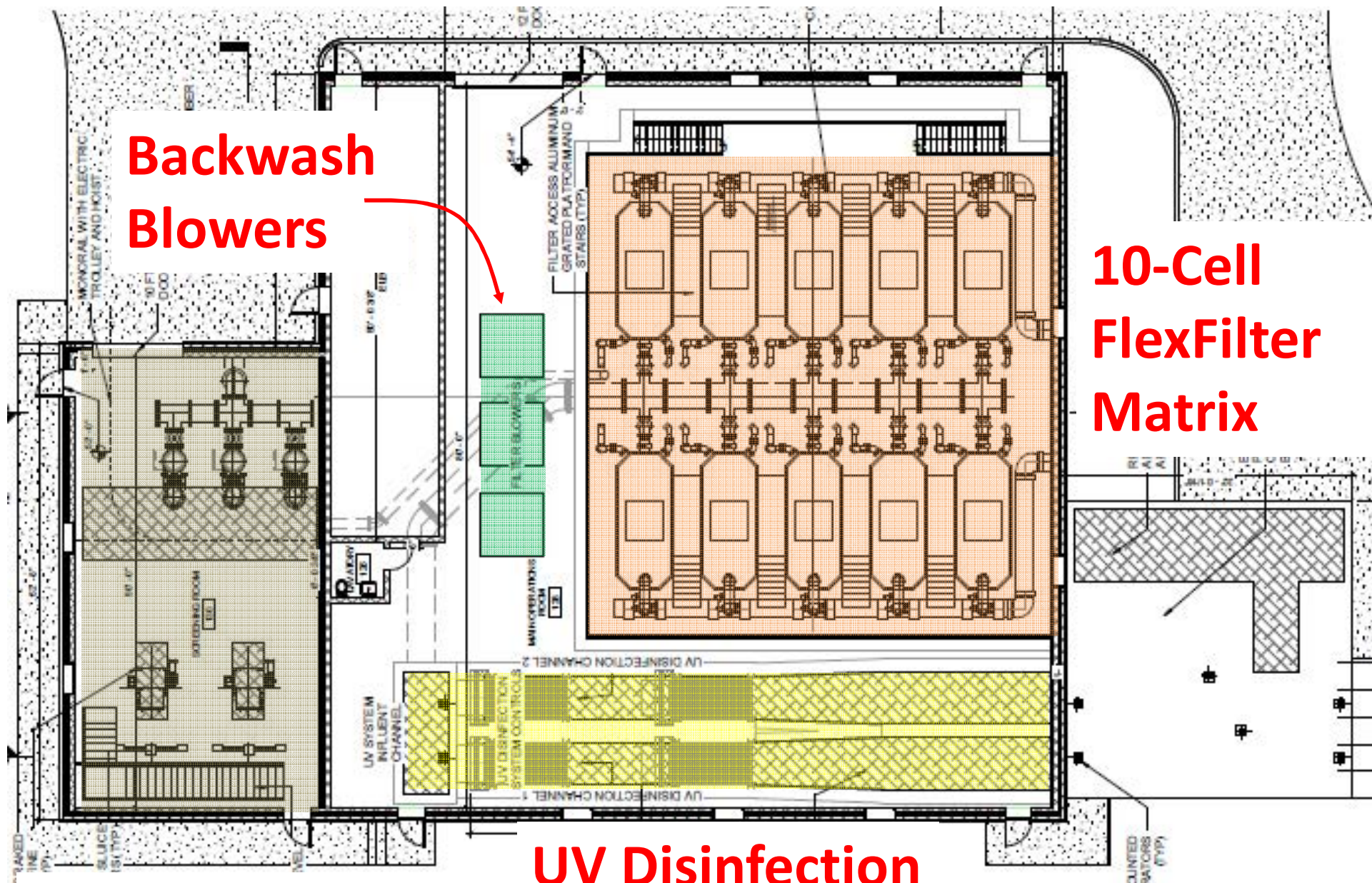
Satellite Facility Hydraulics



Maximize use of hydraulic gradient available in drainage system... low-head effluent pumping when needed

Sommerset, NJ- Satellite SSO Treatment





**Coarse Screening
& Pumping**

UV Disinfection

**10-Cell
FlexFilter
Matrix**

**Backwash
Blowers**

Welsh Water CSO Treatment 2 HRT Facilities

Coarse
Screening

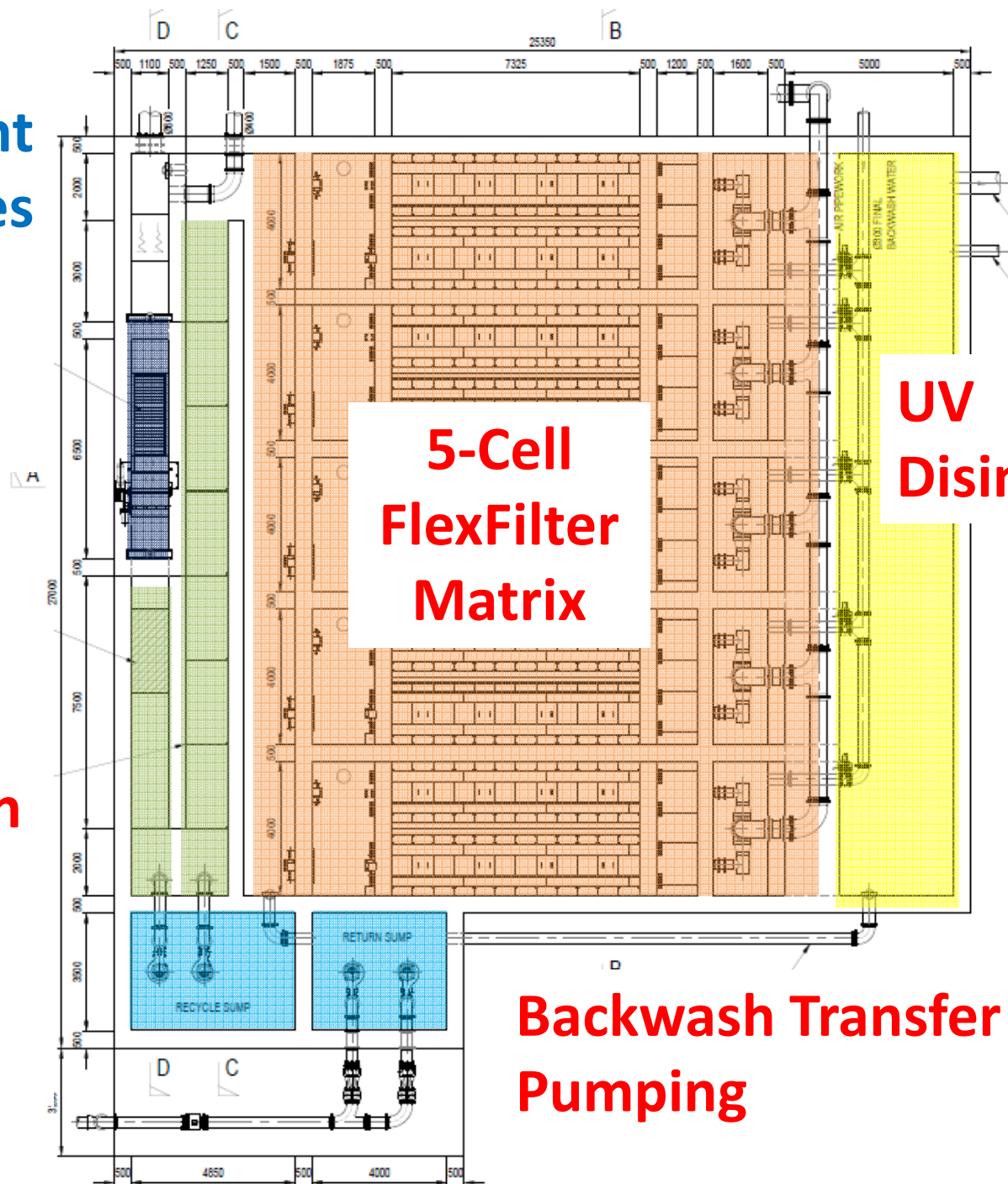
Metal Salt
Mixing and
Coagulation

Recycle
Pumping

5-Cell
FlexFilter
Matrix

UV
Disinfection

Backwash Transfer
Pumping



REPORT

Wet Weather Flow Treatment and Disinfection Demonstration Project

Bayonne Municipal Utilities Authority
City of Bayonne, Hudson County, NJ

August 2017



This report was funded, in part, with Grants from the United States Environmental Protection Agency (USEPA) and the New Jersey Department of Environmental Protection (NJDEP). The report was developed and implemented in cooperation and in consultation with USEPA and NJDEP.

Multi-Year Study to test and evaluate specific satellite treatment

High-performance satellite end-of-pipe treatment can:

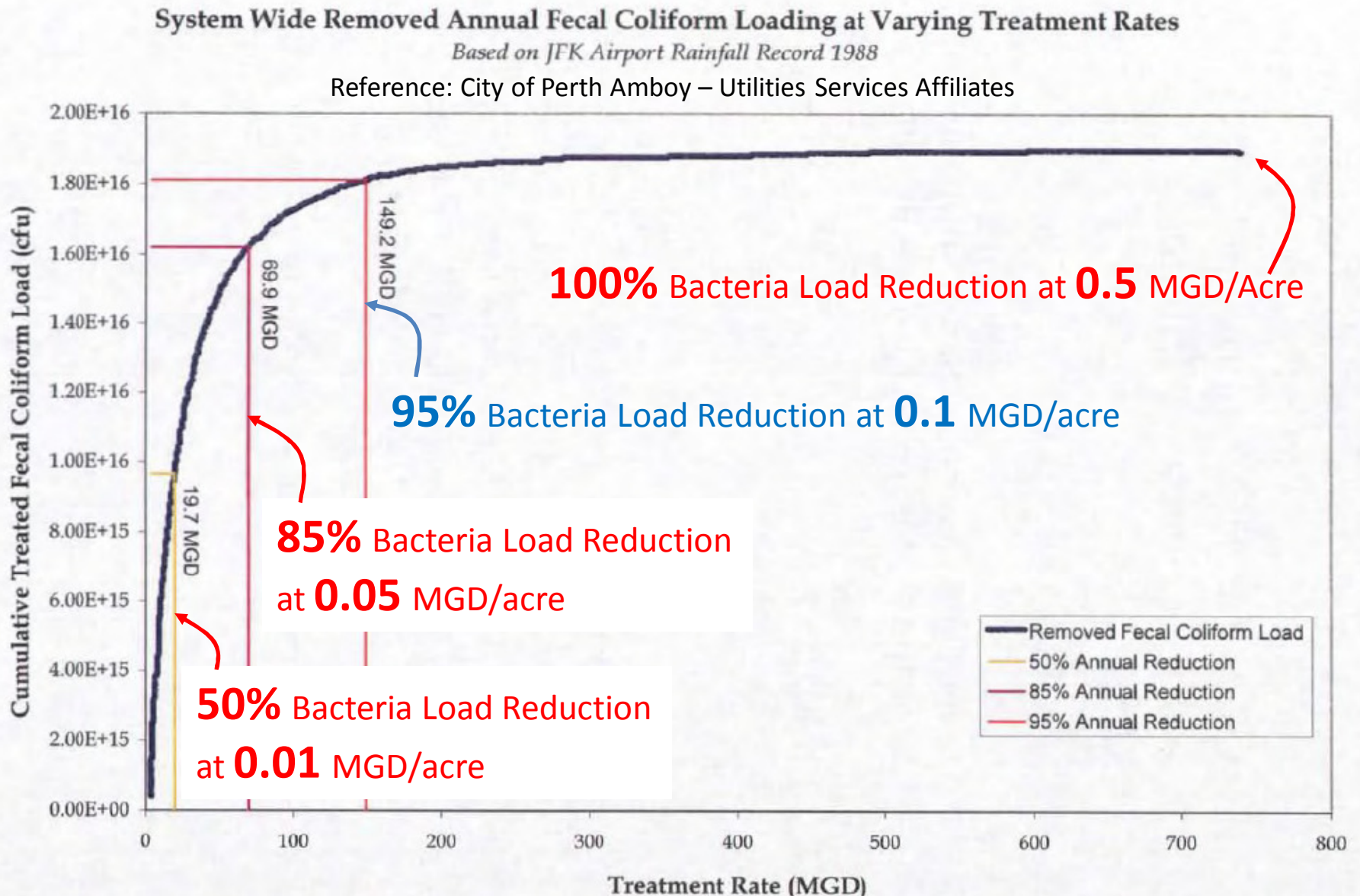
- be used to protect public health and aquatic biology
- be a cost effective alternative
- provide incremental CSO reductions
- offer green spaces & other community amenities

Satellite Treatment facilities can be:

- Unmanned
- Odor free
- Adaptable to multiple locations
 - Small footprint
 - Below grade

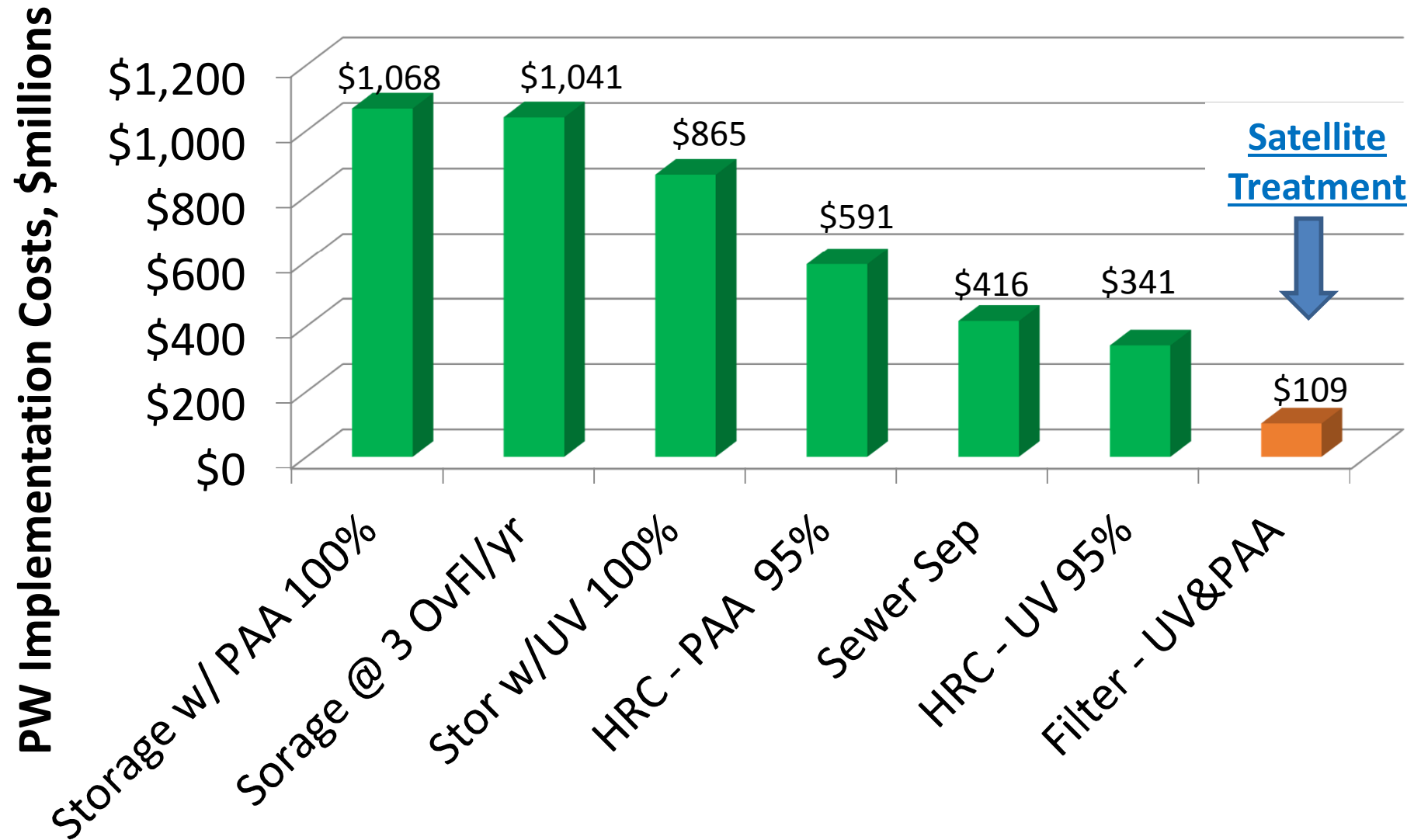
Design Approach to Satellite Treatment

Example shows treatment rate based upon 95% bacteria load reduction equates to 0.1 MGD per acre of combined sewer drainage area.



Comparison of Satellite Treatment with Previous Regional Solutions

Present Worth Cost Estimates



Satellite Concepts for Perth Amboy

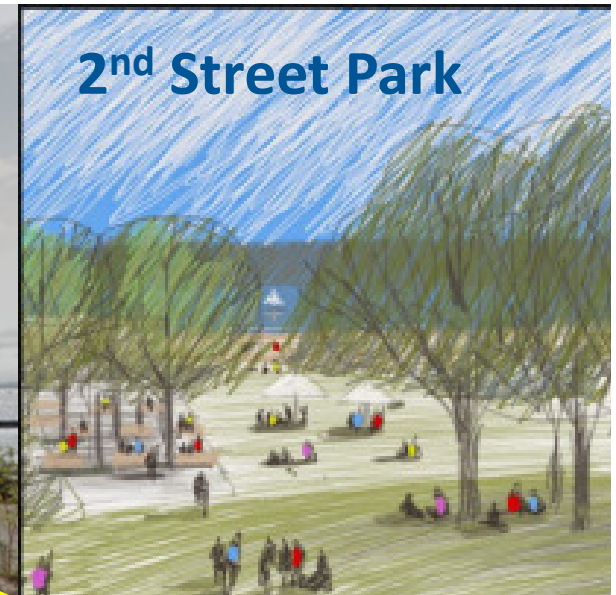
**7 CSO Outfalls consolidated into one EHRT
Satellite treatment facility – 61 MGD**



**Transport \$17.0 million
Treatment \$30.3 million
Total \$47.3 million**



2nd Street Park





Satellite EHRT for CSO Control

- **90% TSS Removal**
- **Meets secondary criteria**
- **Amenable to UV Disinfection**
- **Unmanned Operation**
- **Auto Cleaning**
- **No residuals**
- **No odors**
- **Low O&M**

Other Benefits

- **Public health protection**
- **Beach re-opening**
- **Exist Outfall Removal**
- **Shellfish bed water quality improvements**
- **Linear park opportunities along consolidation sewer**
- **Foundation for greenspace and/or other dual uses on top of EHRT structure at grade**



Summary

Wet Weather pollution issues including CSOs, SSOs and Stormwater runoff can be solved with Satellite facilities that satisfy water quality criteria and provides the foundation for public amenities promoting sustainable infrastructure.

