Pollution Control in the City of Windsor Wastewater & CSO Management 2013 Status & Update

The 7th Biennial Meeting of the Lake Erie Millennium Network
Status of Lake Erie – Management Needs & Research Questions
University of Windsor, Windsor Ontario
Oct. 29-31, 2013

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Stantec

Pollution Control in the City of Windsor
Wastewater & CSO Management

1. Windsor Riverfront Pollution Control Planning Study
2. Lou Romano Water Reclamation Plant Upgrade & Expansion
3. Combined Sewer Overflow (CSO) Retention Treatment Basin (RTB)

Since 2007, the City of Windsor has invested over $183 million in pollution control infrastructure

- **LRWRP Upgrade & Expansion - $115,000,000**
- **CSO RTB - $68,000,000**
- **+ Scheduled sewer replacement, rehabilitation and maintenance**

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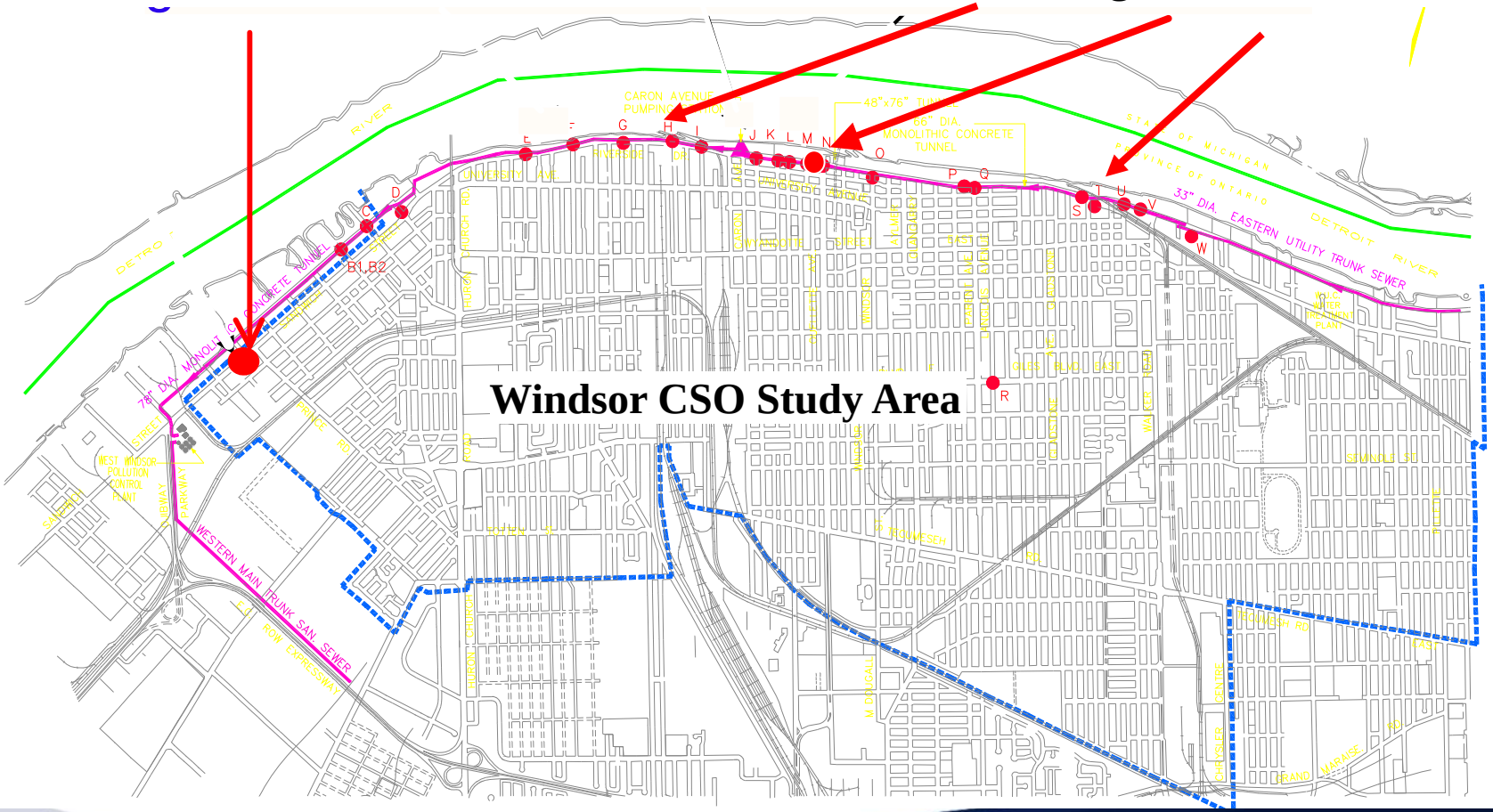
Windsor Riverfront Pollution Control Planning Study – Study Area

Lou Romano Water Reclamation Plant

26 Interceptor Chambers with CSOs along Riverfront



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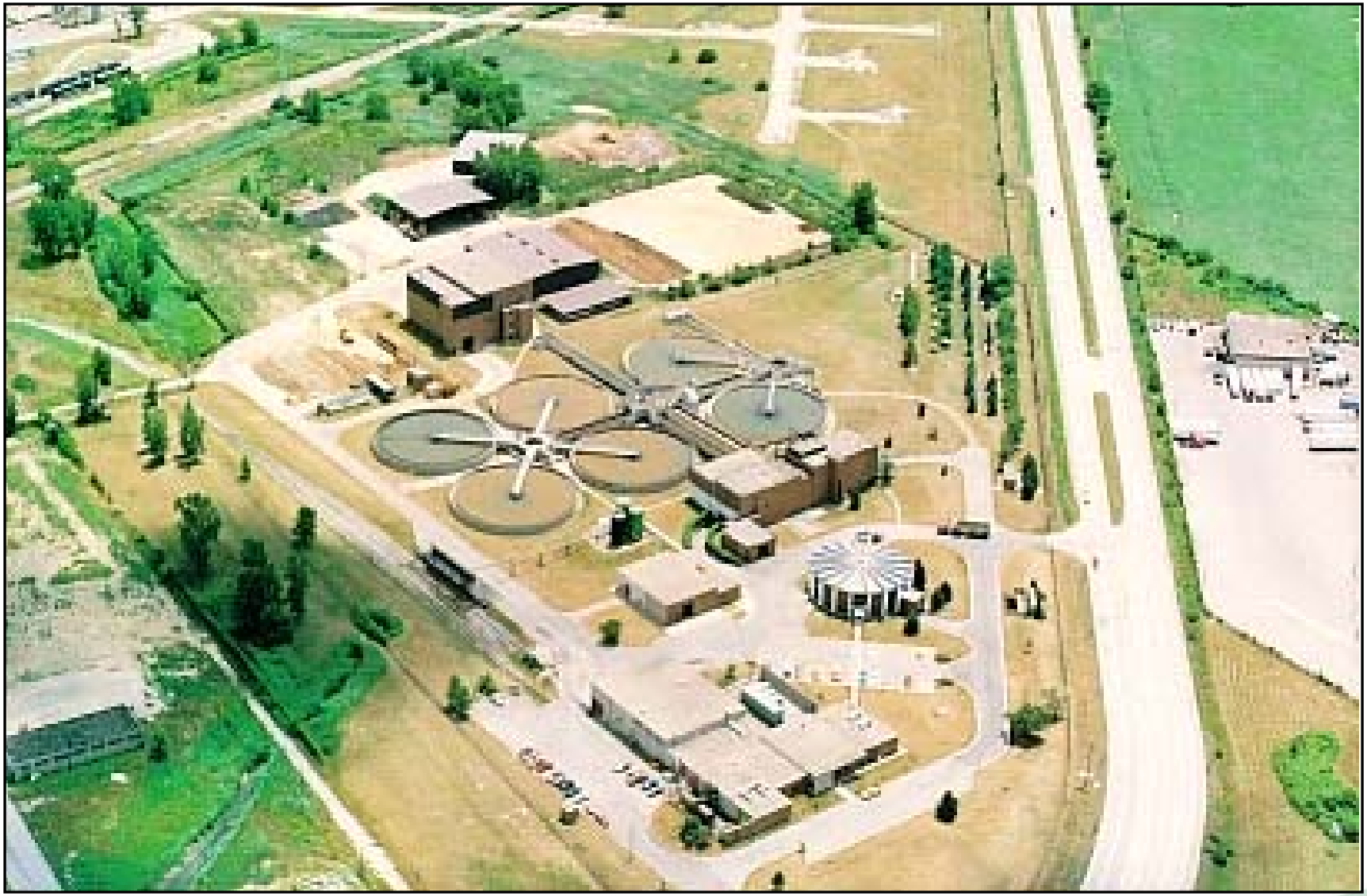
Windsor Riverfront Pollution Control Planning Study - Recommendations

Main Recommendations

- Expand and upgrade CMH Woods P.S.
- Extend Riverfront Interceptor Sewer
- Upgrade the LRWRP to secondary treatment & increase dry weather treatment capacity
- Increase LRWRP wet weather treatment capacity
- Recommended 3 RTBs (at Caron Avenue, west of Hiram Walker's & McDougall / Aylmer St. area)
- Possible tunnel storage or RTB west of CMH Woods P.S.

Lou Romano Water Reclamation Plant

Prior to 2007, the City of Windsor's Lou Romano Water Reclamation Plant, formerly called the West Windsor Pollution Control Plant, was the largest and one of the last remaining primary chemical physical wastewater treatment plants in the Great Lakes basin. The plant effluent is directly discharged to the Detroit River, one of 43 areas of concern identified by the International Joint Commission (IJC) requiring remedial action with respect to beneficial use impairments.



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Lou Romano Water Reclamation Plant

Realizing the need to upgrade the LRWRP to secondary treatment, the City performed pilot plant studies in 1989-91 and 1994-96 to investigate innovative alternatives to conventional secondary treatment in an effort to determine the preferred process for their needs and to minimize wastewater treatment plant expansion costs

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The LRWRP - Background

- Construction of the plant began in 1967 and it commenced operation as a 110,000 m^3/d primary treatment plant in 1970
- In 1974 it was converted to a physical-chemical treatment plant incorporating phosphorus removal
- Numerous upgrades and expansions of the plant occurred throughout the 1980s

The LRWRP - Upgrade & Expansion

- In 2005, the City commenced with an upgrade and expansion of the LRWRP that included the expansion of primary treatment rated capacity from 163,700 m^3/d to 272,800 m^3/d and the construction of a BAF for secondary treatment with a rated capacity of 218,000 m^3/d.
- The plant is designed to handle a peak flow of two times the rated capacity.

The LRWRP - Upgrade & Expansion

Other Work included:

- New coarse bar screens and conveyors
- New primary sludge pumphouses
- Primary effluent pumping station
- Ultraviolet (UV) disinfection (secondary effluent)
- Sodium hypochlorite (bypass flows) disinfection facility
- New centrifuge sludge dewatering equipment

The $115,000,000 upgrade and expansion of the LRWRP is the largest single project ever undertaken by the City of Windsor

The LRWRP BAF Construction

Construction of Secondary Treatment
Biological Aerated Filters

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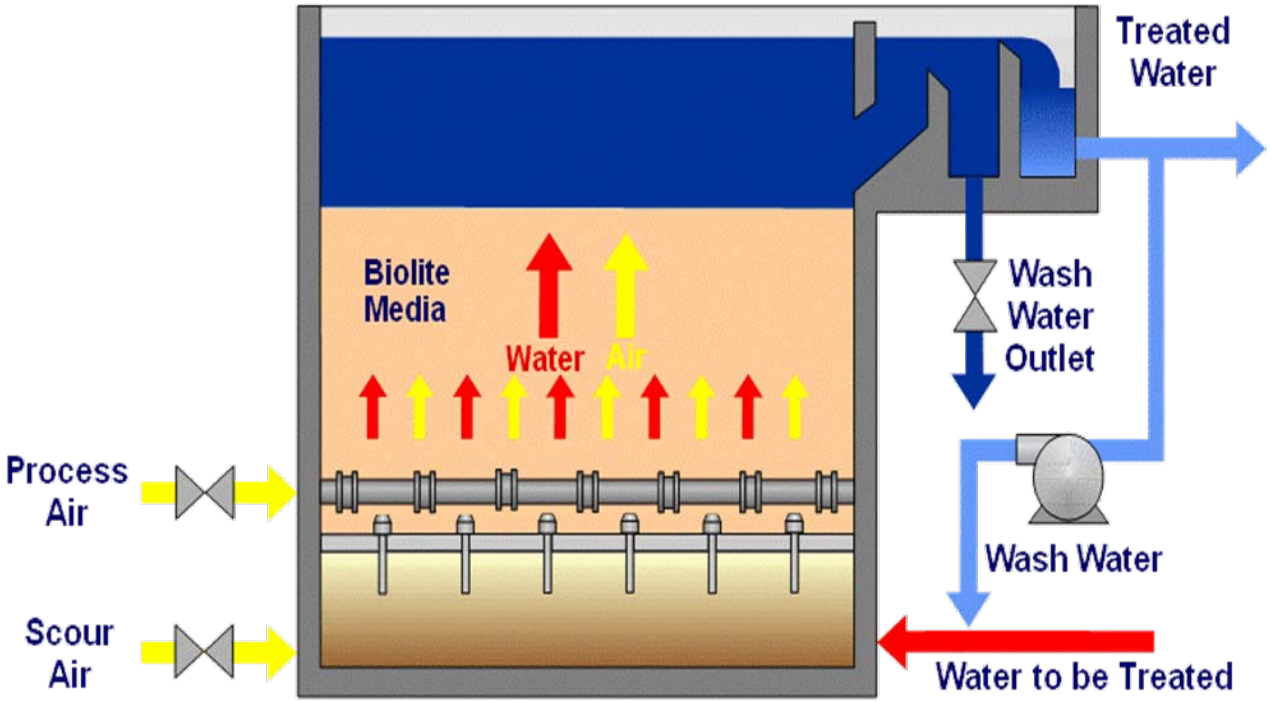
Biological Aerated Filter Process



LRWRP Improvements in Effluent Quality

LRWRP Effluent 2006 vs 2012 Concentration (mg/l)		
Parameter	**2006**	**2012**
TSS	25.7	7.0
TP	0.58	0.27
BOD**	46.8	3.7
TKN	16.2	5.5
NH_3	10.6	2.9
****2006 BOD is TBOD, 2012 BOD is CBOD**		

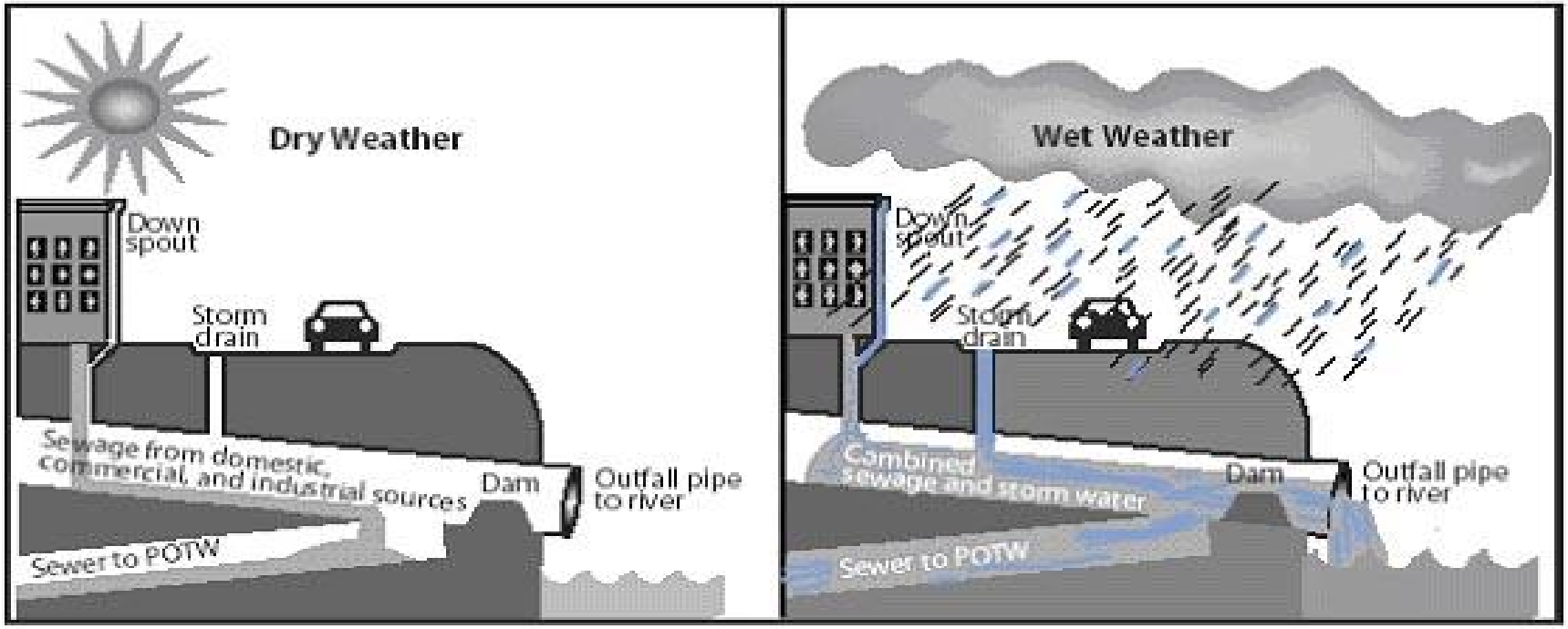
LRWRP Improvements in Effluent Quality

LRWRP Effluent 2006 vs 2012 % Removal Efficiency		
Parameter	**2006**	**2012**
TSS	81.7	96.8
TP	84.5	93.4
BOD**	63.1	97.5
TKN	19.4	77.9
NH_3	6.5	79.6
****2006 BOD is TBOD, 2012 BOD is CBOD**		

LRWRP Improvements in Effluent Quality

LRWRP Effluent 2006 vs 2012 Annual Loading (tonnes)			
Parameter	**2006**	**2012**	**Difference**
TSS	1479	365	-1114
TP	33	14	-19
BOD**	2691	192	-2499
TKN	930	286	-644
NH_3	609	148	-461
****2006 BOD is TBOD, 2012 BOD is CBOD**			

CSO - storm water and combined sewage overflow is diverted to Detroit River when …



Volume of water in collector sewer during wet weather becomes 2.5 times more than volume of water in dry weather

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CSO RTB Studies

Bench-Scale

Jar testing & settling column testing

Pilot-scale

Performance evaluation of RTB at high hydraulic loading rates

Characterization of scum and sludge

Hydrodynamic modeling to confirm RTB size and geometry

Objectives of the Study

- Select site-specific and efficient satellite treatment facilities to meet MOE Procedure F-5-5 Guidelines:

F-5-5 Guidelines

90% of wet weather flow volume to be captured and receive equivalent to primary treatment

50% TSS & 30% BOD removal

TSS < 90 mg/l 50% of the time

applies during 7 month period from April to November

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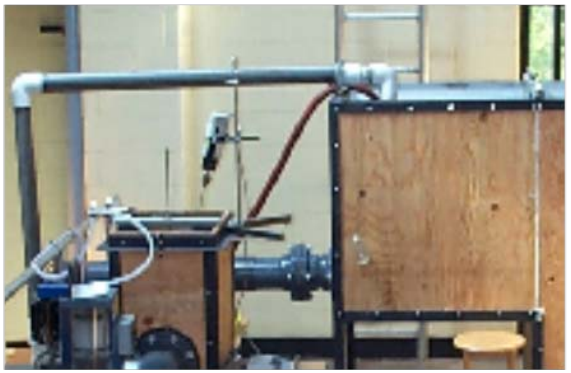
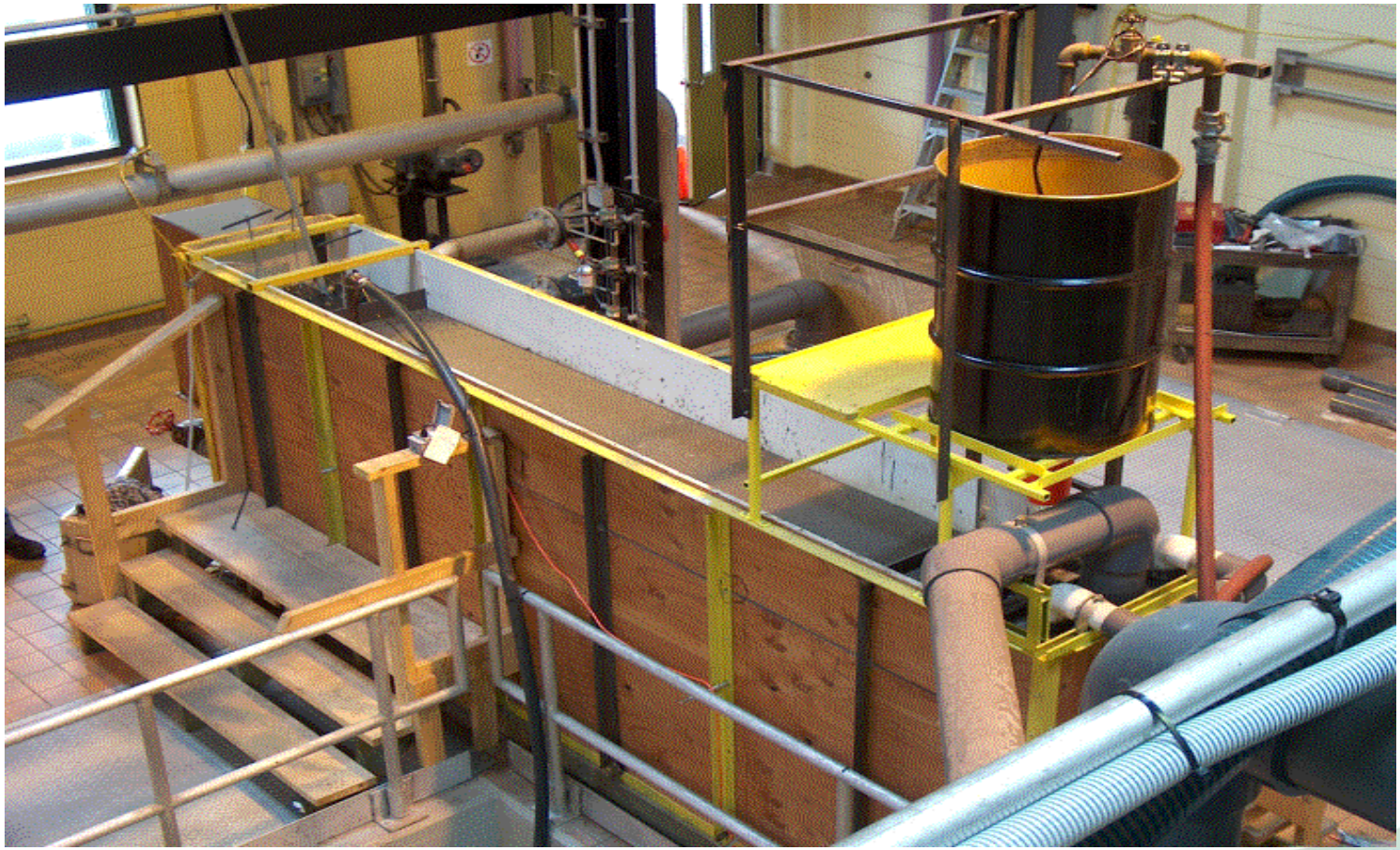
CSO RTB Pilot Scale Testing

- Constant-head Tank
- Two mixing systems – static & dynamic
- Polymer Feeding System



CSO RTB Pilot Scale Testing



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CSO RTB Pilot Scale Testing Results

- The model of the preliminary prototype tank showed that good TSS removal (>70%) could be achieved for SOR < 30 m/h.
- Above 30 m/h, the model showed that the removal started to decrease due to washout of retained solids
- The hydrodynamic model of the pilot basin is in agreement with the results of pilot testing which shows a decline in the removal efficiency for very high SORs.

CSO RTB Pilot Scale Testing Results

Results of RTB pilot scale testing indicated that the recommended three (3) riverfront RTBs (at Caron Avenue, west of Hiram Walker's Distillery & McDougall / Aylmer St. area) could be combined into one (1) centrally located RTB along with the construction of an RTB interceptor collector sewer parallel to the Riverfront Trunk Sewer

Thus the preferred solution for CSO control east of Caron Ave. consists of a Collection Sewer Interceptor (6400 m^3) & RTB Basin (8000 m^3) with total volume of 14,400 m^3

Full Scale RTB

- Full scale RTB construction started in March 2010
- RTB located on the Riverfront between Glengary and Aylmer Avenues
- RTB maximum flowrate: 7.85 m^3/s, surface overflow rate: 20 m/hr
- Includes a building to house chemical feed (cationic polyelectrolyte) and feed equipment
- 2.4 km, 2250 mm new CSO Interceptor Trunk Sewer constructed parallel to the existing Riverfront Interceptor Sewer delivers CSO to the RTB
- 5 new interceptor chambers installed

CSO RTB Construction

CSO RTB - Completed

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CSO RTB Optimization Study

Scope of Study

- Is the RTB operating as designed?
- Identify locations for a coordinated flow and water level monitoring to collect flow data in the combined sewers
- Build models based upon information obtained from Windsor Pollution Control Planning Study and current flow monitoring data
- Collect RTB influent and effluent samples for analysis of legacy and emerging contaminants.
- Study is scheduled for completion in March 2014

CSO RTB Performance

- Study is ongoing – preliminary review of RTB operational data shows:

65% TSS removal
61% BOD_5 removal
No effluent TSS > 90 mgl^{-1}

- MOE Procedure F-5-5 Guidelines are being met

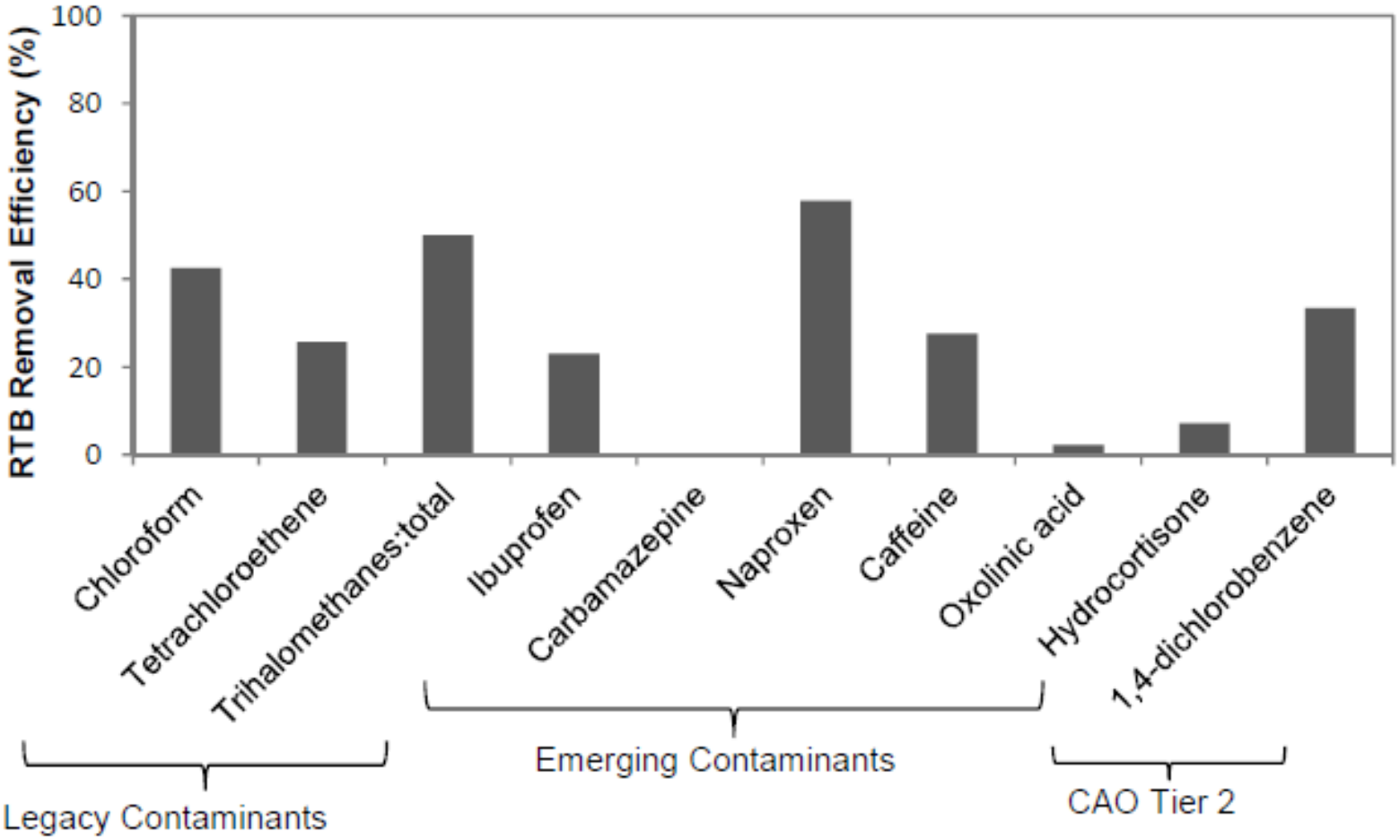
CSO RTB Performance
Emerging Contaminant and Legacy Pollutant Removal

- Collect RTB influent (CSO) and effluent samples under Annex 2 of Canada-Ontario Agreement (COA) to understand the fate of legacy and emerging contaminants

- Testing for 157 parameters including conventional pollutants, metals, pharmaceuticals and personal care products

- As of June 2013, 9 samples from 5 storm events have been collected

CSO RTB Performance
Emerging Contaminant and Legacy Pollutant Removal



Questions

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