Maggie Brooks
County Executive

Mike Garland, P.E.
Director

Wastewater Treatment in Monroe County:
Research Opportunities and Upcoming Issues

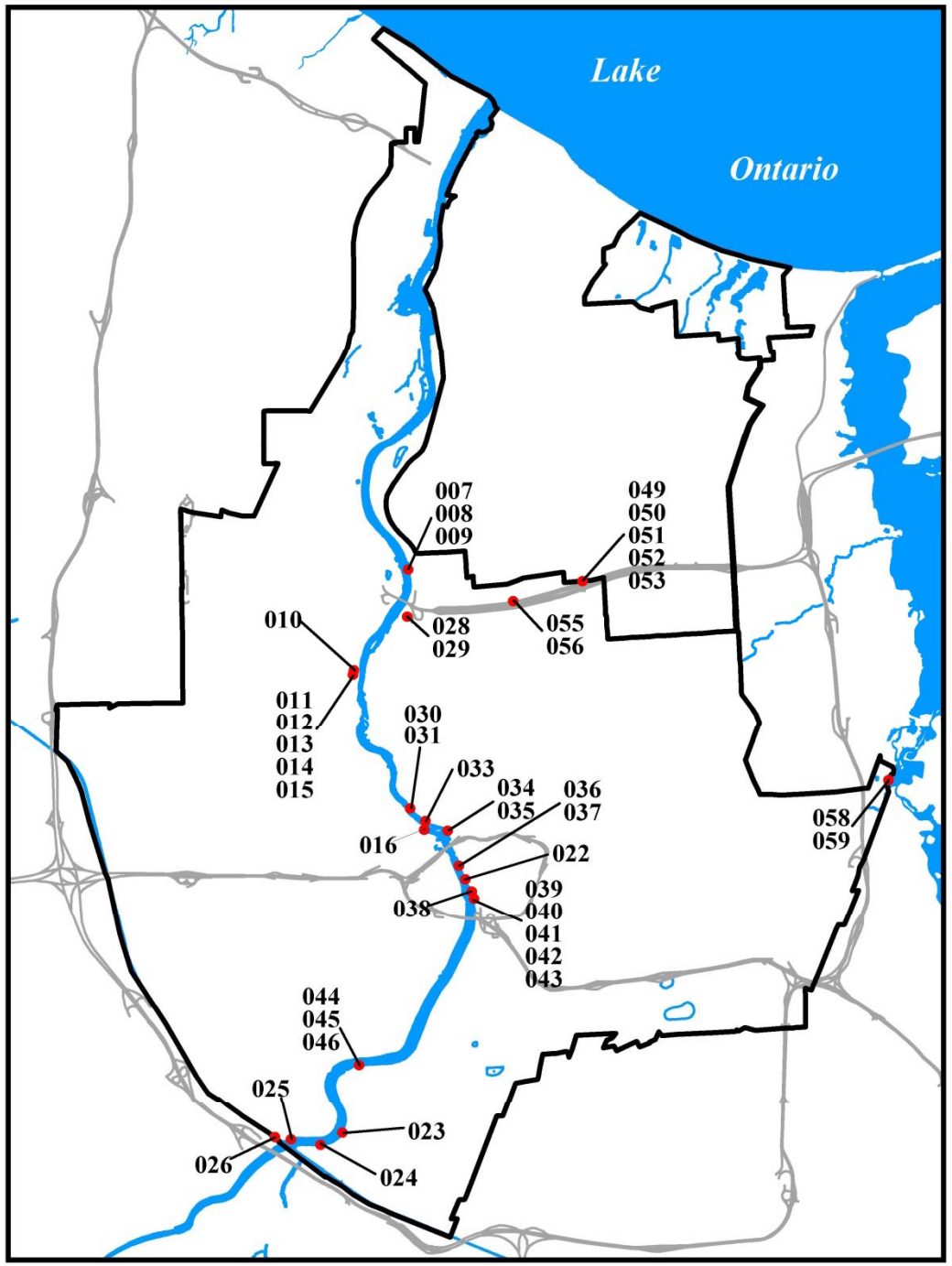
Presented by: Drew Smith
Environmental & Regulatory Compliance Manager
dsmith@monroecounty.gov
585/753-7555

Department of Environmental Services

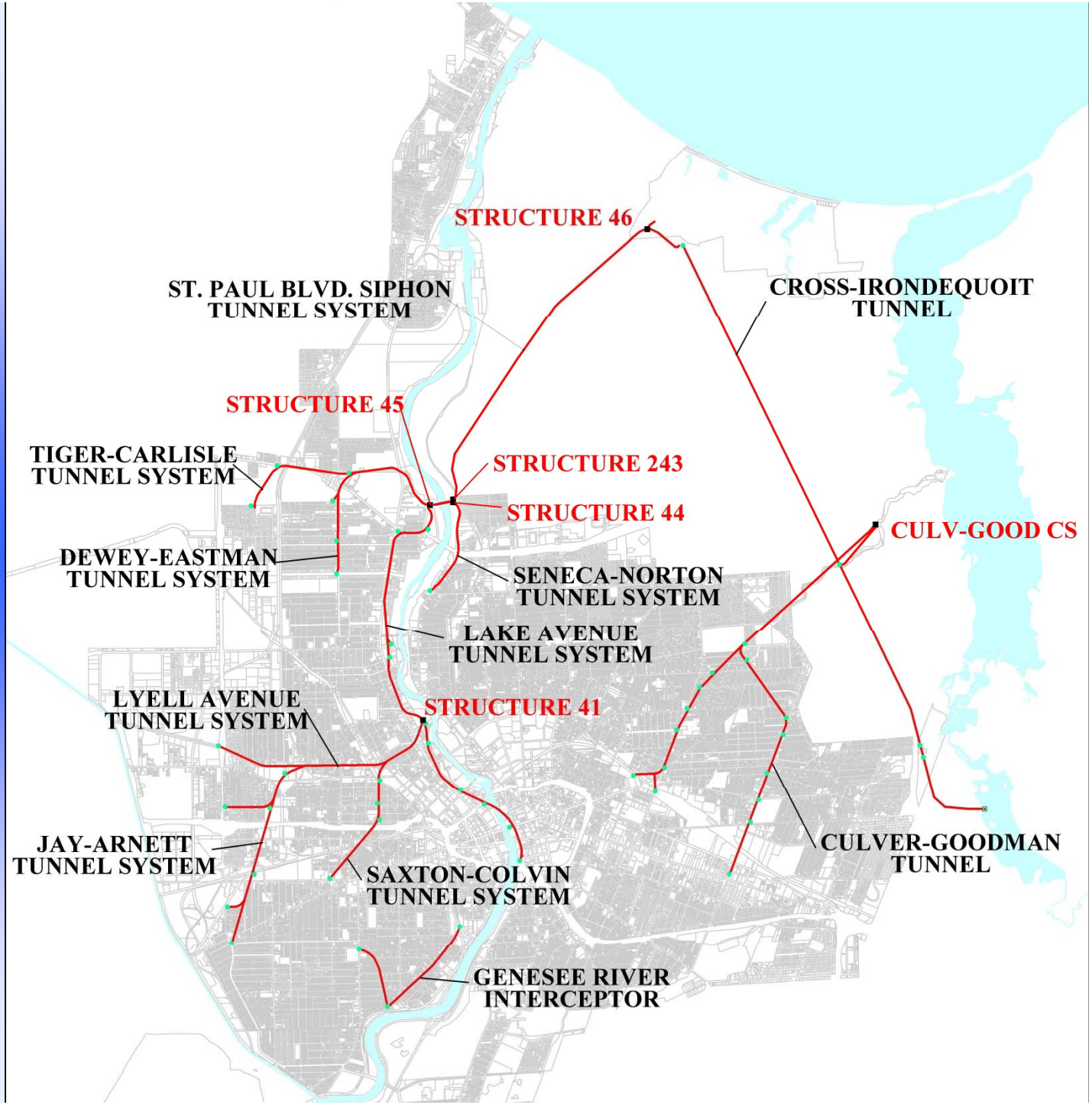
The Way We Were

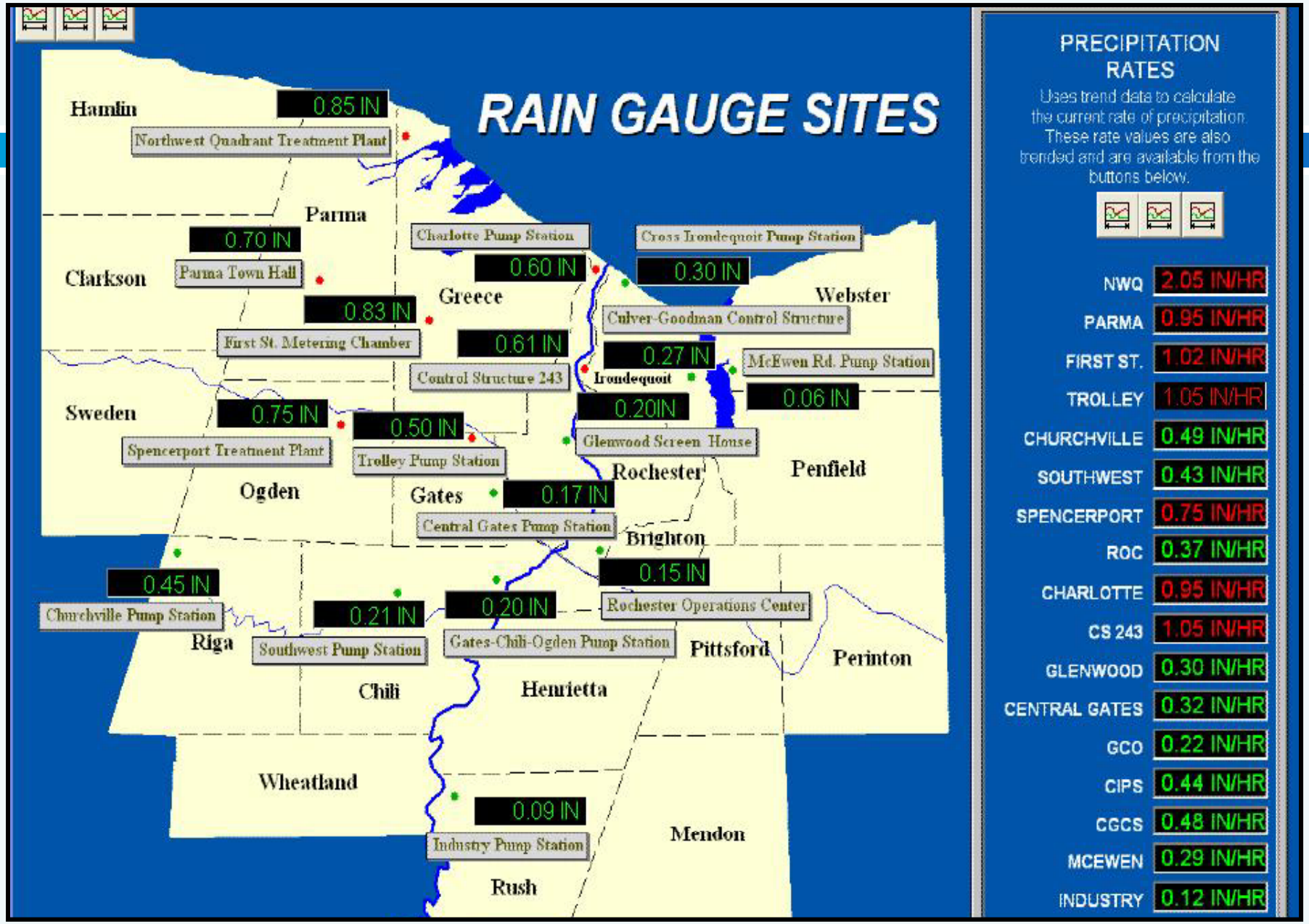
The Way We Were...

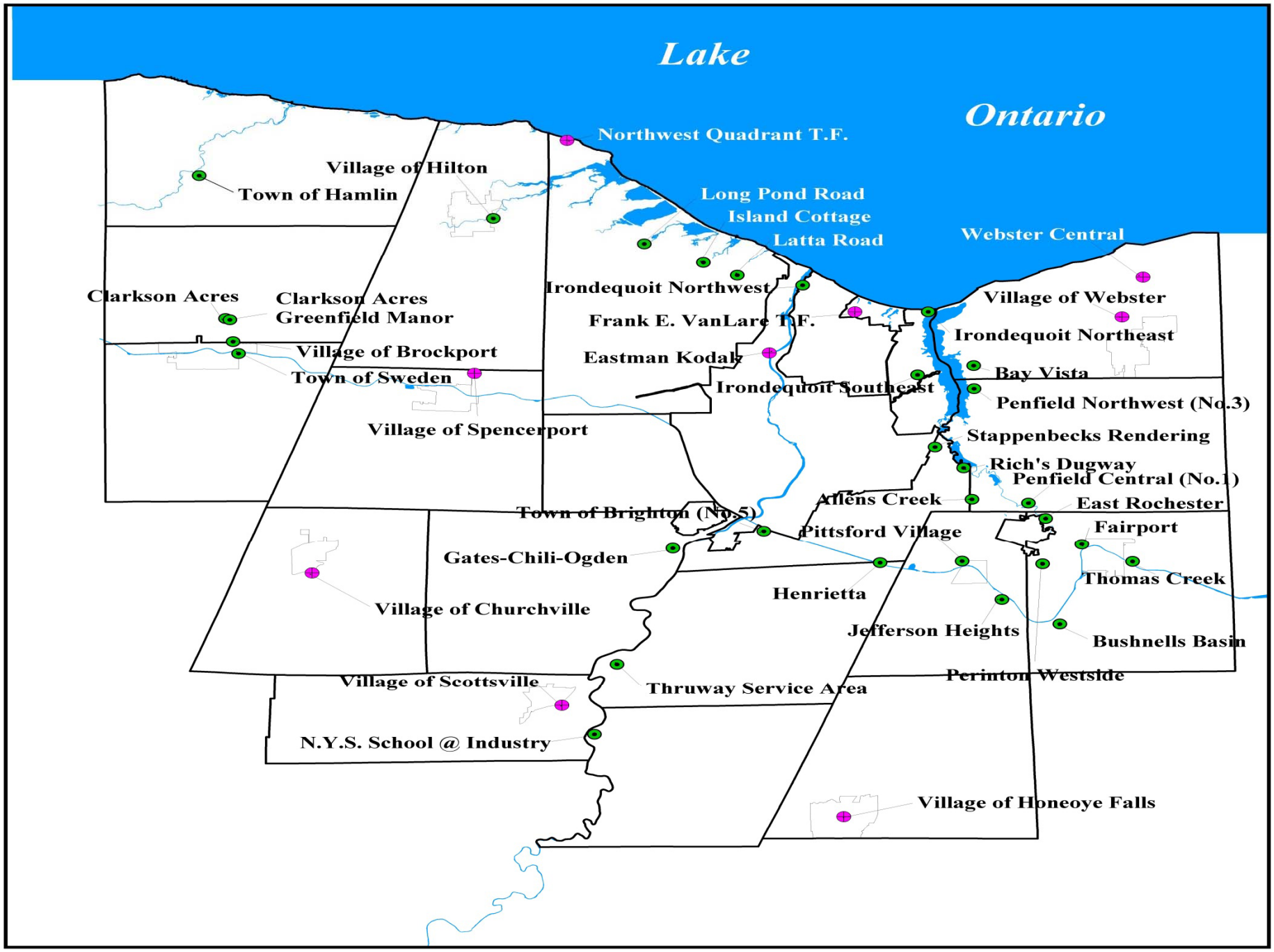
- **Waterway CSO Protection Priorities**
  - **Highest: Irondequoit Bay**
  - **Second: Genesee River**
  - **Third: Lake Ontario**

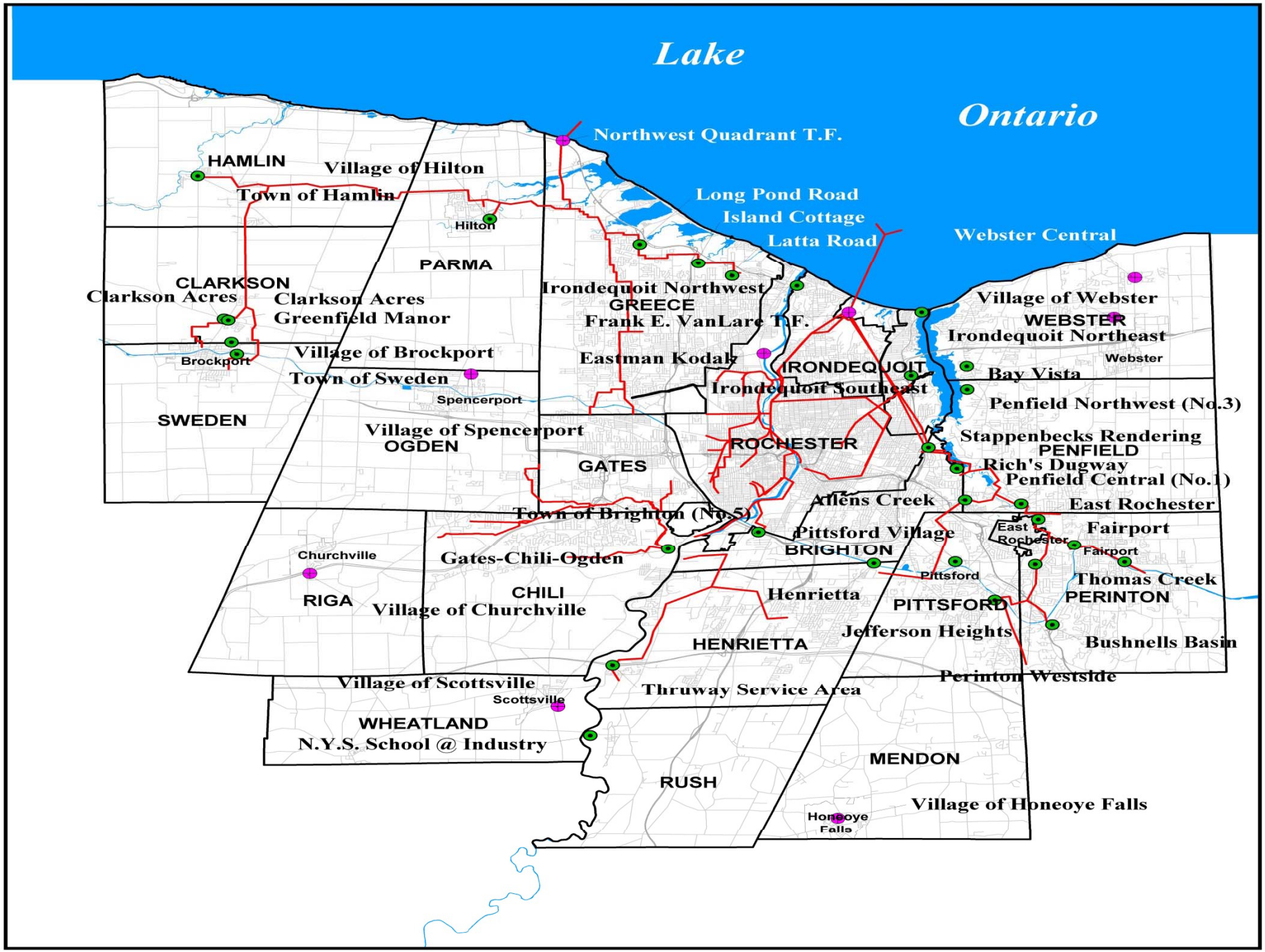


CSOAP Tunnel System




RAIN GAUGE SITES
Hamlin
0.85 IN
Northwest Quadrant Treatment Plant
Parma
0.70 IN
Clarkson
Parma Town Hall
Charlotte Pump Station
0.60 IN
Greece
Cross Irondequoit Pump Station
0.30 IN
Webster
0.83 IN
First St. Metering Chamber
Culver-Goodman Control Structure
0.61 IN
Control Structure 243
0.27 IN
Irondequoit
McEwen Rd. Pump Station
0.06 IN
Sweden
0.75 IN
Spencerport Treatment Plant
0.50 IN
Trolley Pump Station
0.20IN
Glenwood Screen House
Rochester
Penfield
Ogden
Gates
0.17 IN
Central Gates Pump Station
Brighton
0.15 IN
0.45 IN
Churchville Pump Station
0.21 IN
0.20 IN
Rochester Operations Center
Riga
Southwest Pump Station
Gates-Chili-Ogden Pump Station
Pittsford
Perinton
Chili
Henrietta
Wheatland
0.09 IN
Industry Pump Station
Mendon
Rush
PRECIPITATION RATES
Uses trend data to calculate the current rate of precipitation. These rate values are also trended and are available from the buttons below.
NWQ 2.05 IN/HR
PARMA 0.95 IN/HR
FIRST ST. 1.02 IN/HR
TROLLEY 1.05 IN/HR
CHURCHVILLE 0.49 IN/HR
SOUTHWEST 0.43 IN/HR
SPENCERPORT 0.75 IN/HR
ROC 0.37 IN/HR
CHARLOTTE 0.95 IN/HR
CS 243 1.05 IN/HR
GLENWOOD 0.30 IN/HR
CENTRAL GATES 0.32 IN/HR
GCO 0.22 IN/HR
CIPS 0.44 IN/HR
CGCS 0.48 IN/HR
MCEWEN 0.29 IN/HR
INDUSTRY 0.12 IN/HR


Lake
Ontario
Northwest Quadrant T.F.
Village of Hilton
Town of Hamlin
Long Pond Road
Island Cottage
Latta Road
Webster Central
Clarkson Acres
Clarkson Acres
Greenfield Manor
Irondequoit Northwest
Village of Webster
Frank E. VanLare T.F.
Irondequoit Northeast
Village of Brockport
Eastman Kodak
Bay Vista
Town of Sweden
Irondequoit Southeast
Penfield Northwest (No.3)
Village of Spencerport
Stappenbecks Rendering
Rich's Dugway
Penfield Central (No.1)
Allens Creek
East Rochester
Town of Brighton (No.5)
Pittsford Village
Fairport
Gates-Chili-Ogden
Thomas Creek
Henrietta
Village of Churchville
Jefferson Heights
Bushnells Basin
Perinton Westside
Village of Scottsville
Thruway Service Area
N.Y.S. School @ Industry
Village of Honeoye Falls


Lake
Ontario
Northwest Quadrant T.F.
HAMLIN
Village of Hilton
Town of Hamlin
Hilton
Long Pond Road
Island Cottage
Latta Road
Webster Central
PARMA
CLARKSON
Clarkson Acres
Clarkson Acres
Greenfield Manor
Irondequoit Northwest
GREECE
Frank E. VanLare T.F.
Village of Webster
WEBSTER
Irondequoit Northeast
Webster
Brockport
Village of Brockport
Eastman Kodak
IRONDEQUOIT
Bay Vista
Town of Sweden
Irondequoit Southeast
Spencerport
Penfield Northwest (No.3)
SWEDEN
Village of Spencerport
OGDEN
ROCHESTER
Stappenbecks Rendering
PENFIELD
GATES
Rich's Dugway
Penfield Central (No.1)
Allens Creek
East Rochester
Town of Brighton (No.5)
Pittsford Village
East Rochester
Fairport
BRIGHTON
Churchville
Gates-Chili-Ogden
Fairport
Pittsford
Thomas Creek
PERINTON
RIGA
CHILI
Village of Churchville
Henrietta
PITTSFORD
Jefferson Heights
HENRIETTA
Bushnells Basin
Perinton Westside
Village of Scottsville
Thruway Service Area
Scottsville
WHEATLAND
N.Y.S. School @ Industry
MENDON
RUSH
Village of Honeoye Falls
Honeoye Falls

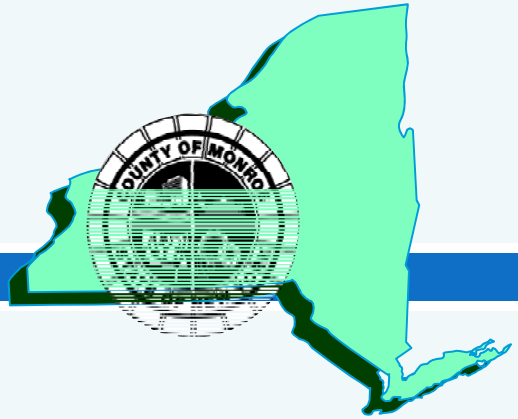
Sludge/Bio-Solids

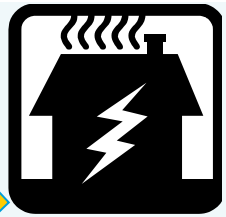
The settled sludge is pumped to gravity thickener tanks.

Sludge with the addition of polymer enters into the centrifuges, further separating water from the solids.

The bio-solids are hauled to the landfill where they are added to other municipal solid waste and helps to produce methane gas for the production of energy.

Waste to Watts Cycle





Waste-to-Watts

Waste

Leachate Forcemain

Biosolids

Biosolids + garbage = methane

Department of Environmental Services also collects household hazardous waste

…in efforts to keep them out of the wastewater.

Lawn Care Products

Paint Related and Car Care Products

What the Future Brings?

CEC's-Chemicals of Emerging Concern

Fracking-High-Volume Hydraulic Fracturing

CEC's-Chemicals of Emerging Concern

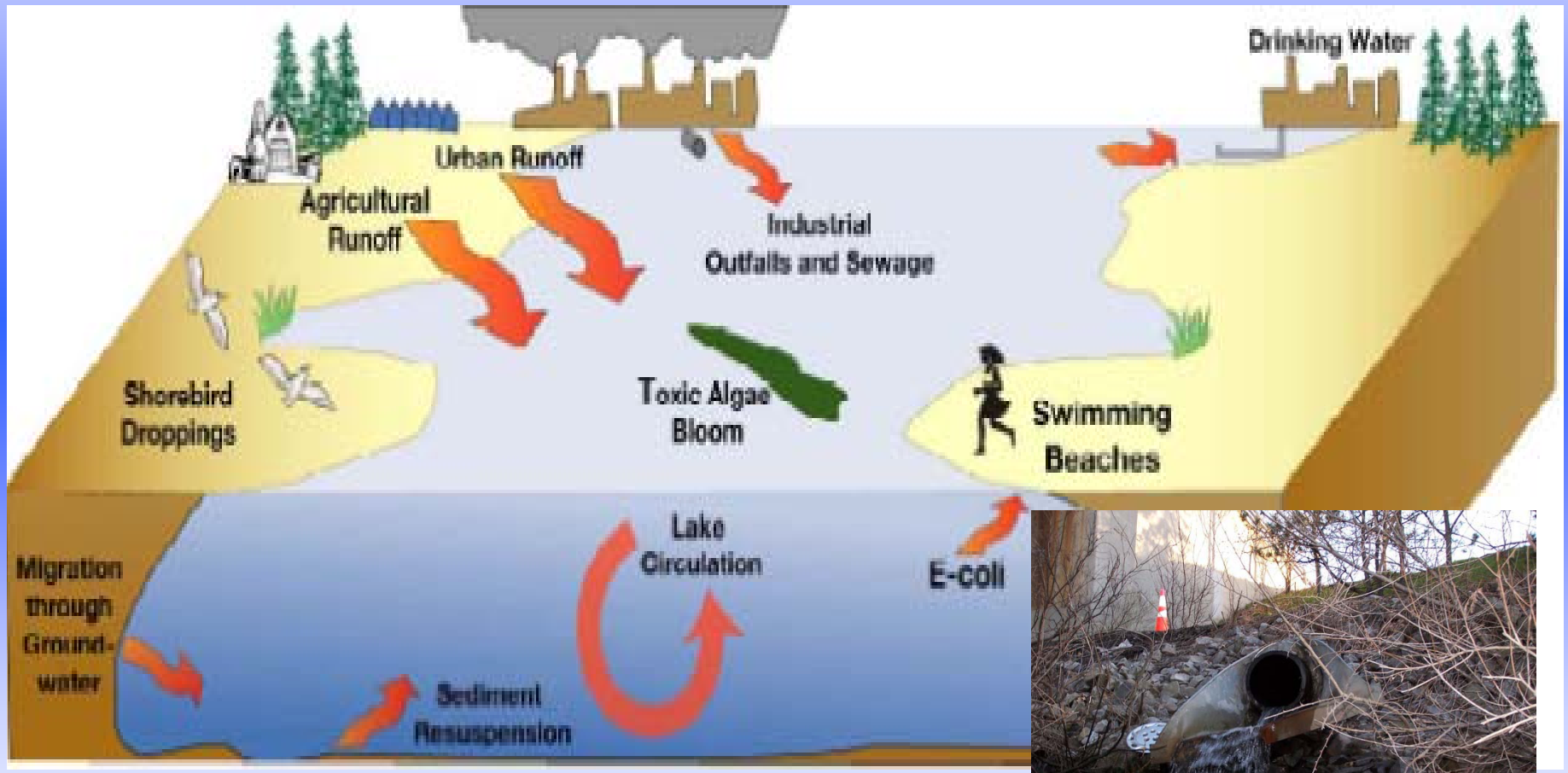
- Pharmaceuticals
- PCP-Personal Care Products
- Nanoparticles
- Pesticides/Herbicides
- Cosmetics/Fragrances
- Paints
- Cleaners/Disinfectants

CEC has come to characterize the increasing awareness of the presence in the environment of many chemicals used by society, and the risk that these chemicals many pose to humans and ecosystems.*

. . . . Few, if any, have regulations governing their release into the environment and discharges from wastewater treatment plants are a significant source of contaminants to surface water in the Great Lakes basin.*

* from IJC 2011 Biennial Meeting, Detroit Mi

Pollution Pathways



Effectiveness of Wastewater Treatment Plants on CEC's

Confidence le;el (n •# of records)	Low removal efficiency (<25°• probability of 7S o+ removal)	Medium removal efficiency (25-75°'o probability of 75°o+ removal)	High removal efficiency {>75°o probabslityof 75°o+ removal}_
Low (n<9)	AIJ3Zine Pyrene	Benzophenone Indomethacin Sulfamerazine	Musk ketone Di{2-etbylhexyl) adspate (DEHA) N.N-dietbyl-toluamide (DEET) Testosterone
Med1um (9:Snsl5)	Gemlibrozil Perfluorooctanoic acid (PFOA) PerOuorooctyl sulfonate (PFOS)	Di (2-ethylbexyl) phthalate (DERP) Norfloxncin Ranitid.ine Roxithromycin Tetracvdine	
High (tf15)	CATbamazepine C'iprotloxacin Clofibric acid DidofeMc Erythromycin Trimethoprim	Bezafibrate B -phenol A Estrone (El) 17a-Ethynyl estradiol (EE2) 17P-Estradiol (E2) Gnla.xolide Ibuprofen Ketoprofen N11proxen Nonylphenol Nonylphenol monoethoxylnte (NP I EO) Nonylphenol dtethoxy!&te (NP2EO) Ocrylphenol Sulfamethoxazole Tonalide Triclosan	AcelAminophen Caffeine Estriol (E3)

Table 3 Summary of confidence level vs removal efficiency for 42 CEC's by activated sludge*

Frequency of occurrence in samples	Poor removal (<25%)	Moderate removal (25-75%)	Good removal (>75%)
Infrequent (<25%)	Trichloroethyl phosphate (TCEP) Triphenyl phosphate	Octylphenol	Methyl-3-pheuylproptionate
Intennediate (25-75%)	Butylated hydroxyanisole (BHA) N.N-diethyl-toluamide (DEET) Musk ketone	Ethyl-3-phenylproprionate	
Frequent (>75%)	Galaxolide	Benzopheuone Triclosan	Benzyl salicylate Butylbenzyl phthalate Caffeine Chloroxylenol Methylpa raben Ibuprofen Octylmethoxycillllamate Oxybeuzone 3-Phenylproprionate

Table 4. Sumnal)l of Rerroval Efficienciesof PhcnrtcK:euticals and Personal Care Prodxts by /ldivaed Sllx:!ge *Sysems(Slefhensm andQJpenheirrer, 2007)**

* from IJC 2011 Biennial Meeting, Detroit Mi

Comparison of the results presented in Tables 3 and 4 indicates that removal efficiencies for many of the chemicals common to both studies were similar while others were diametrically opposed. The reason for this discrepancy is unclear but may reflect different operating conditions among facilities.*

* from IJC 2011 Biennial Meeting, Detroit Mi

Take a look at the variables:

~300 CEC's

~50 with removal efficiency work done (17%)

WWTP's with varying operational types

WWTP's with varying operational control & removal %

WWTP's with varying waste stream characteristics

Varying discharges to the receiving streams

- Agriculture
- CSO
- Overflow
- Industrial Discharges
- Private septic systems
- Biosolids land applied

What we do know:

WWTP's with ammonia removal also remove higher percentages of CEC's.

These are plants with high solids retention times (MCRT) over 5 days.

These plants not only remove BOD, but also oxidize ammonia to NO_2 & NO_3. (nitrification)

With continued holding time the plant off gases N_2 (denitrification).

$$NH_3 >>>> NO_2 >>>> NO_3 >>>> N_2$$

Aerated digestion leads to facultative anaerobic digestion when O_2 is removed.

Ideas for research:

Confirm digestion variations on % removal

Investigate CSO/bypass effects on receiving stream

Would the benefits of changing treatment out way the costs?

Investigate surrogate compounds like NH_3 (WERF)

What role does biosolids removal have in % removal?

Determine priority of investigation (estrogen vs caffeine)

- Do we go after the low concentration, high impact CEC?
- Do we pursue high frequency found?

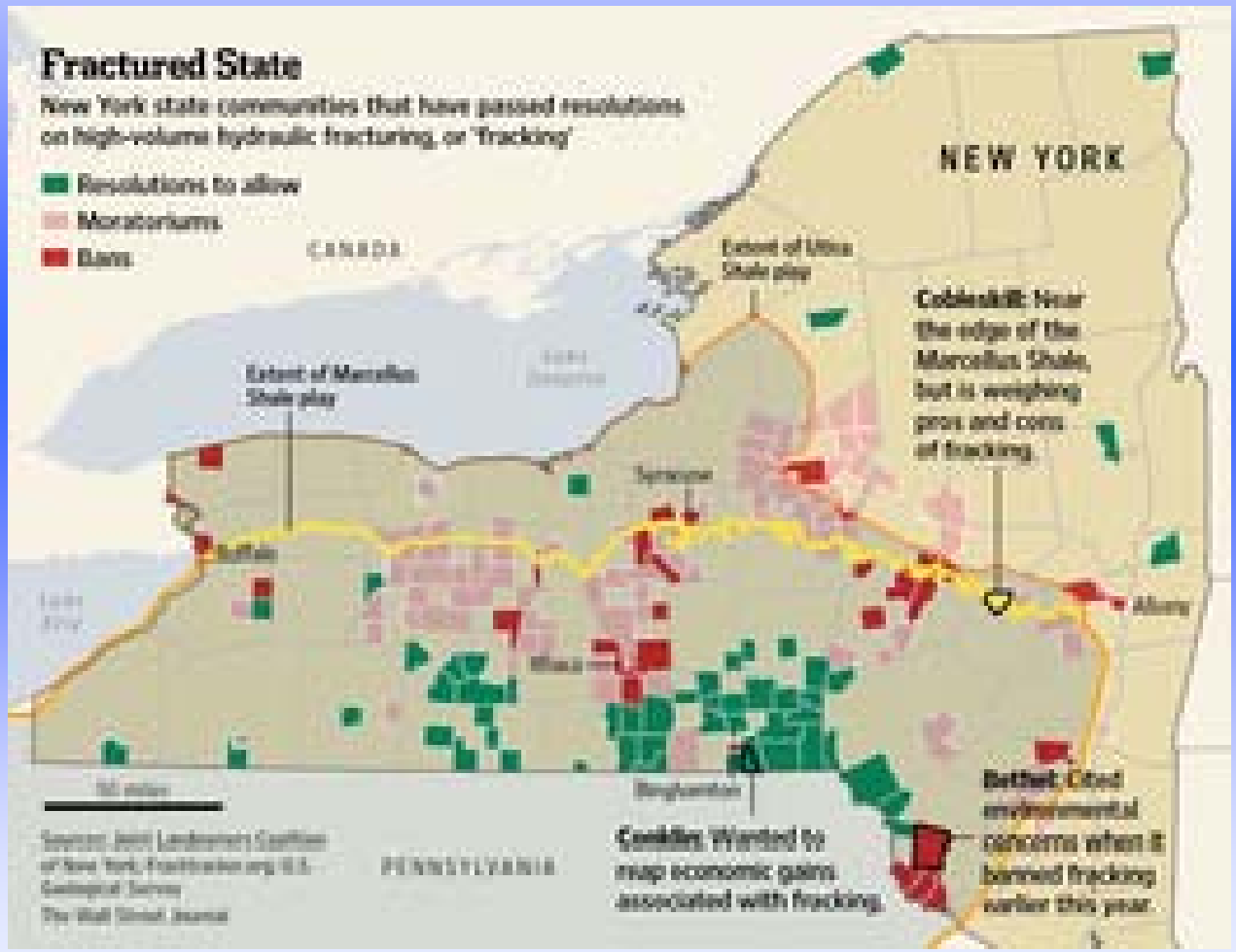
Pollution prevention technique education to the public (grant)

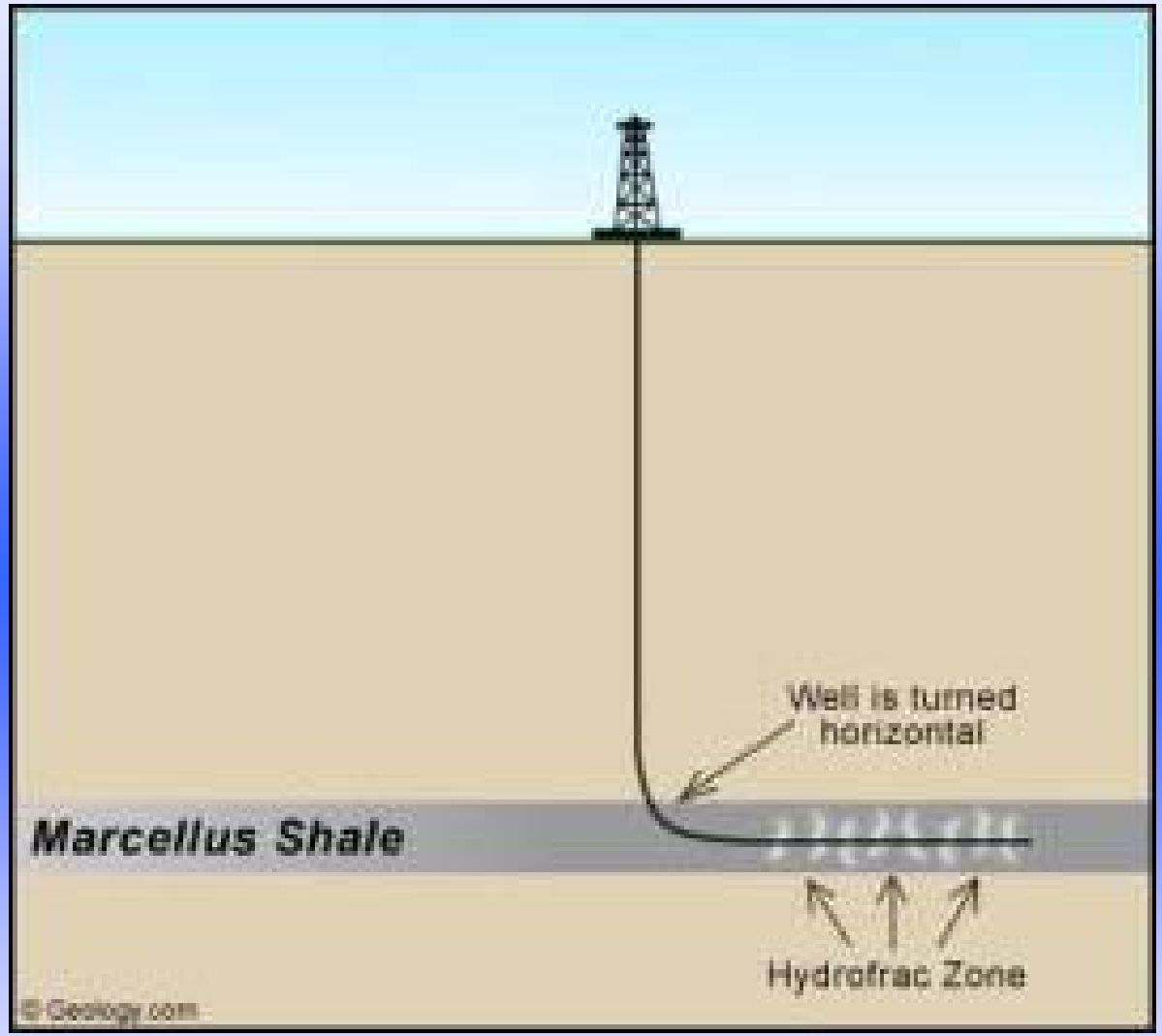
- Pharmaceutical collection
- Source volume reduction
- Consider effect before using/buying (Rochester Midland)

Take tox research to the organelle level instead of the whole species.

Impact of leachate on WWTP effluent

What the frack are we doing?




Well is turned horizontal
Marcellus Shale
Hydrofrac Zone
© Geology.com

The Concern:

Chemical make up

fracking fluid

backflow water

Volumes

Chemical Make Up Fracking Fluid:

99% Water and Sand

1% Varies with manufacturer (Denver Database)

- Acid
- Anti-bacterial Agent
- Breaker
- Corrosion Inhibitor
- Friction Reducer
- Gelling Agent
- Iron Control
- Scale Inhibitor
- Surfactant

How Monroe County handles Industrial waste?

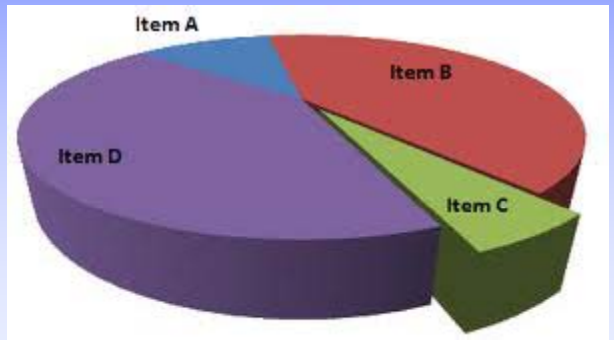
Industrial users apply for discharge to Pure Waters

We have to answer two basic questions

- What are the chemicals and volumes?
- Can we convey and treat it?

Maximum Allowable Headworks Loading (MAHL)

- Divide up the pie



Revised Draft Supplemental Generic Environmental Impact Statement {(DSGEIS Appendix 22 (07/11)}

HVHF MAHL is different from current status
- TDS
- NORM
- Metals

Monroe County's team done with analyses

DEC/EPA needs to approve taking material

SPDES Permit Modification

Additional Monitoring of Plants

Monitoring of Trucked Material

Sewer Use Law gives Pure Waters Final Say

Industrial User-Each Well Needs a Permit and Secondary Disposal Procedure

Research ideas:

Define the 1%

Is the 1% treatable and effect on the ecology?

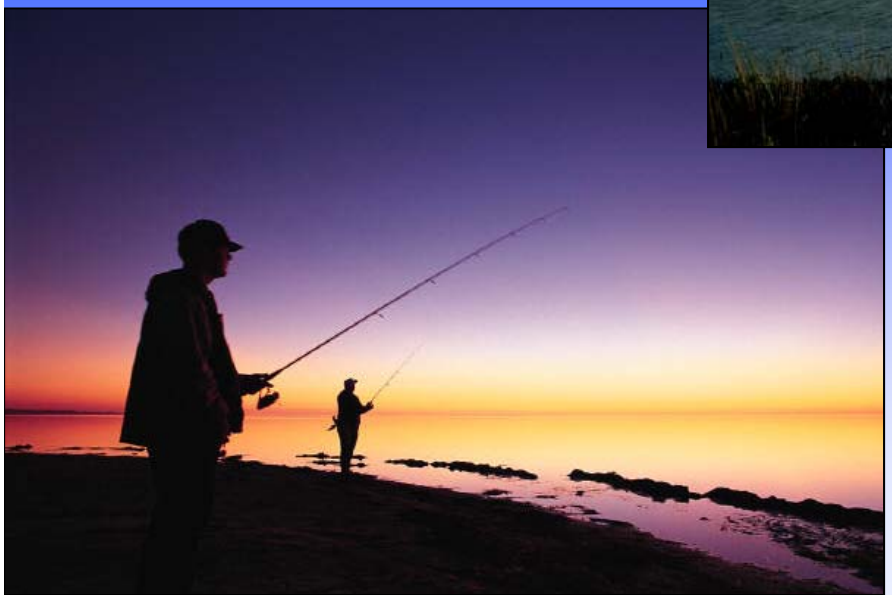
Human/ecological impacts to discharging Cl to lake

Is there a more sustainable option to HF water?

Reuse of water-treatment on site

Does current requirements provide safe wells?

Pure Waters




CLEAN WATER
EQUALS
CLEAN WORLD