Case Study: Odor Control Evaluation and Corrective Action at the Stamford WPCF

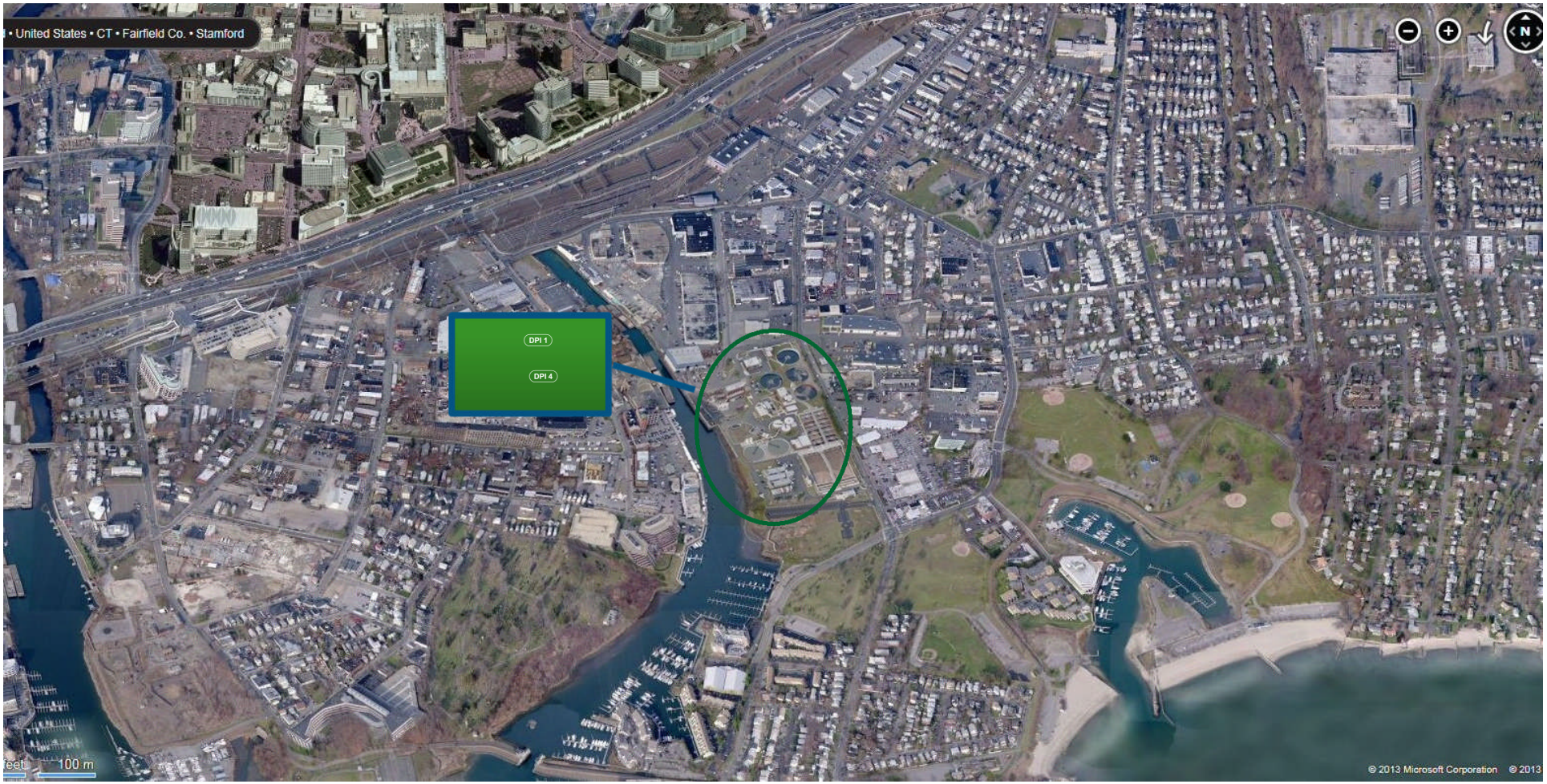
How Successful Partnering Resulted in Benefits for SWPCA Ratepayers

- Daniel E. Capano
  - Vice-Chairman SWPCA Board of Directors
- Jeffrey R. Pinnette
  - Wright-Pierce

The Problem: Pervasive Odors make WPCF a Bad Neighbor

- The WPCF was plagued by nearly constant and pervasive odors
- WPCF surrounded by development with residential neighborhoods close by
- Odor complaints from residents and businesses created much bad press focused on the SWPCA
- Complaints from public and City-elected representatives were mounting

SWCPA Plant and Environs



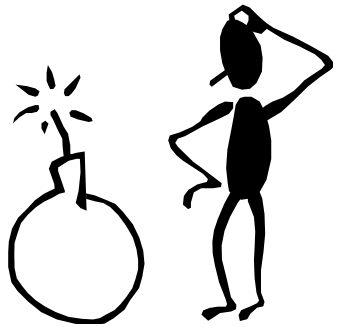
Bad Press

Local News

WPCA working to clear the air

The Internal Investigation

- Mayor Michael Pavia appointed two new board members with wastewater treatment and odor control experience
- An internal investigative committee was formed to determine the source of the problem
- Board of directors and plant management made reduction of odors a priority



SWPCA's Odor Control Systems

- Four wet scrubber systems:
  - Headworks
  - Primaries / Gravity Thickeners
  - Solids Processing Building (SPB)
    - BFP dewatering of primary and secondary sludge
  - SPB - Drying
- Sludge Drying/Pelletizing Facility:
  - RTO: Regenerative Thermal Oxidizer
    - RTO Bypass

Results of the Internal Investigation: Sludge Pelletizing OCS

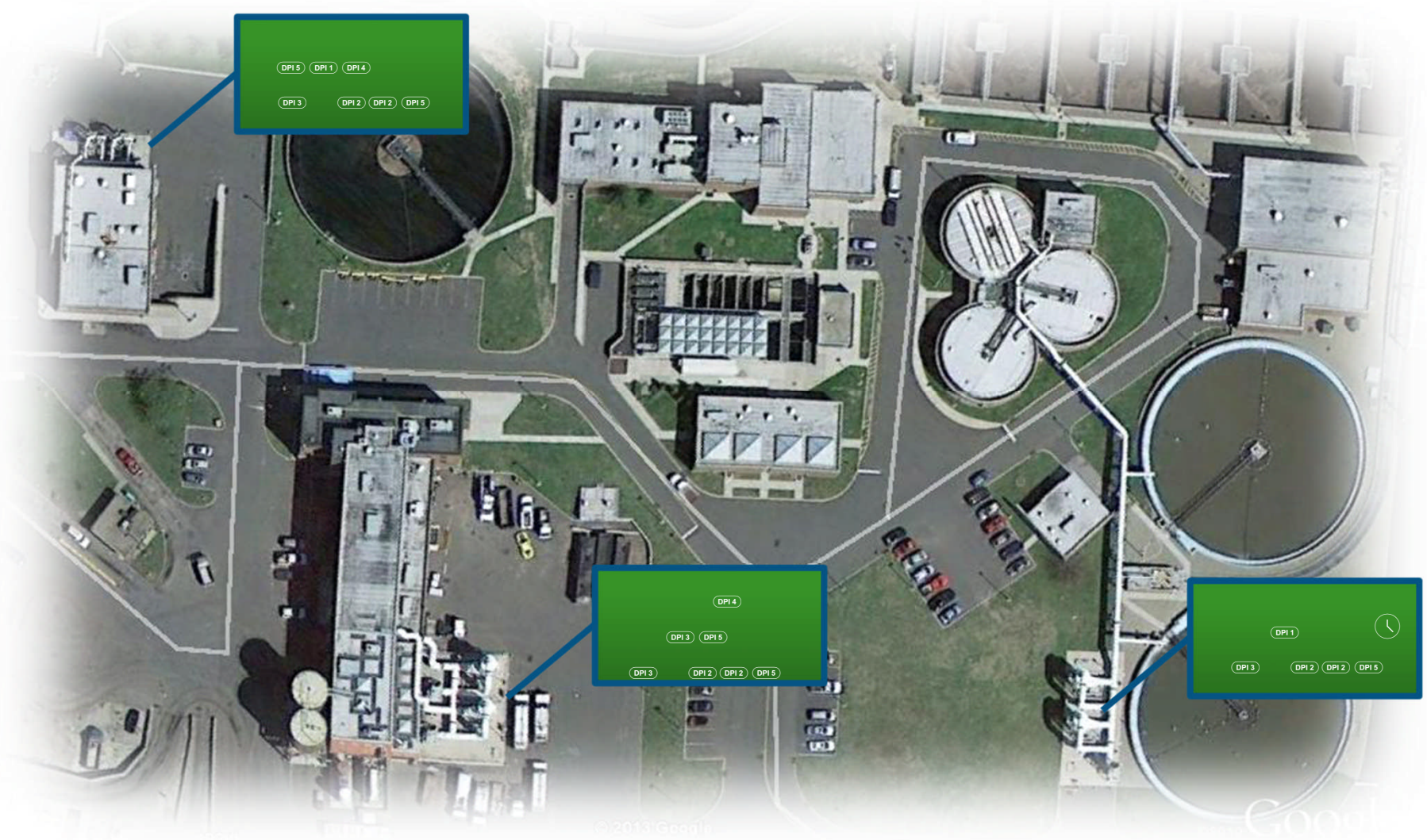
- During normal operation, the sludge dryer was ventilated directly to atmosphere twice a day – RTO Bypass
- This blanketed the plant and surrounding area with a "burnt hair" odor
- Source most directly linked to odor complaints

RTO Bypass
Discharges at Ground Level

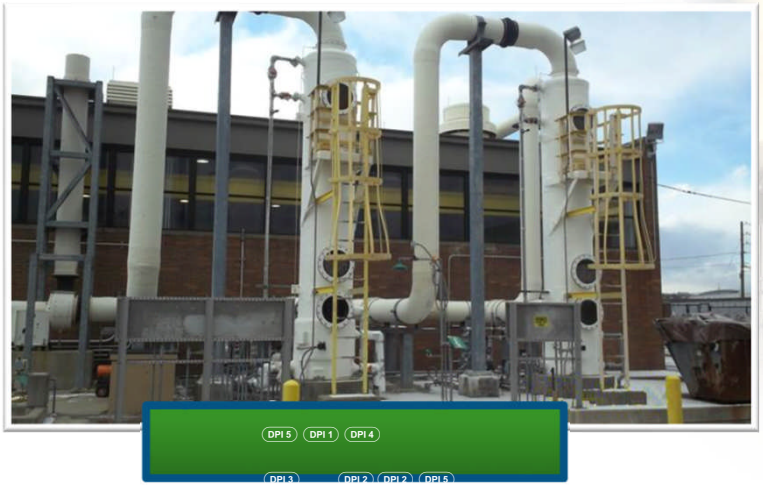
Results of the Internal Investigation: Wet Scrubbers

- None of the wet scrubbing features were operational – units operated dry for ventilation only
- Wet scrubbing features had been run only for acceptance testing
- Pipes were leaking / broken and heat-trace/insulation damaged
- Chemical pump and control system problems
- Chemical lines clogged
- Particulate in packing – pelletizing facility

Wet Scrubbers



Packed-Bed Scrubbers



Staff Immediately Began Remediation

- SWPCA staff began repairs immediately after the committee report was issued
- The primary / GT OCS was placed into service quickly
- Sludge dryer OCS was cleaned and placed into operation
- Excessive misting and frothing was noted
- Further, in-depth evaluation was deemed appropriate

Plant Odors Were Significantly Reduced in a Short Time

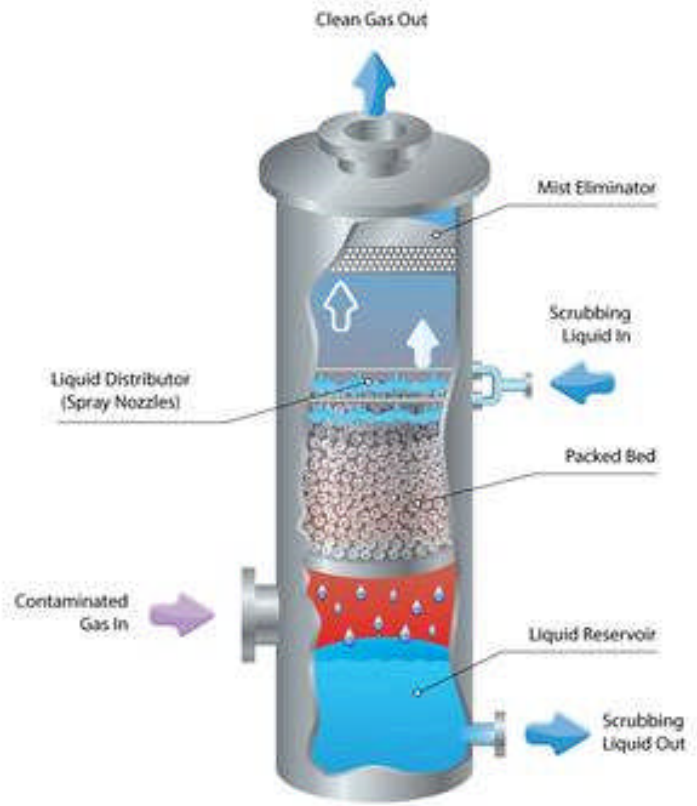
- By simply remediating the existing odor control systems and making some small adjustments, odors were markedly reduced
- There were still odors being occasionally emitted from the plant
- Odor complaints from the public were significantly reduced
- SWPCA's press coverage was also reduced considerably

Professional Evaluation Was Required to Complete the Task

- The board of directors and plant management elected to retain a consultant to perform in-depth evaluations of all systems
- Wright-Pierce was selected as SWPCA's consultant for this task.
- Wright Pierce proposed a comprehensive program of inspection and evaluation
- This effort resulted in additional system improvements and further reductions in odor emissions

Part 2: Wright Pierce Evaluation

- Packed-bed scrubber issues
  - high mist carry over
  - pH/ORP control issues
  - chemical pump failures
  - cleaning of packing
  - piping system leaks
- RTO bypass
- Additional odor sources
- Dispersion modeling



2005 WWTF Upgrade

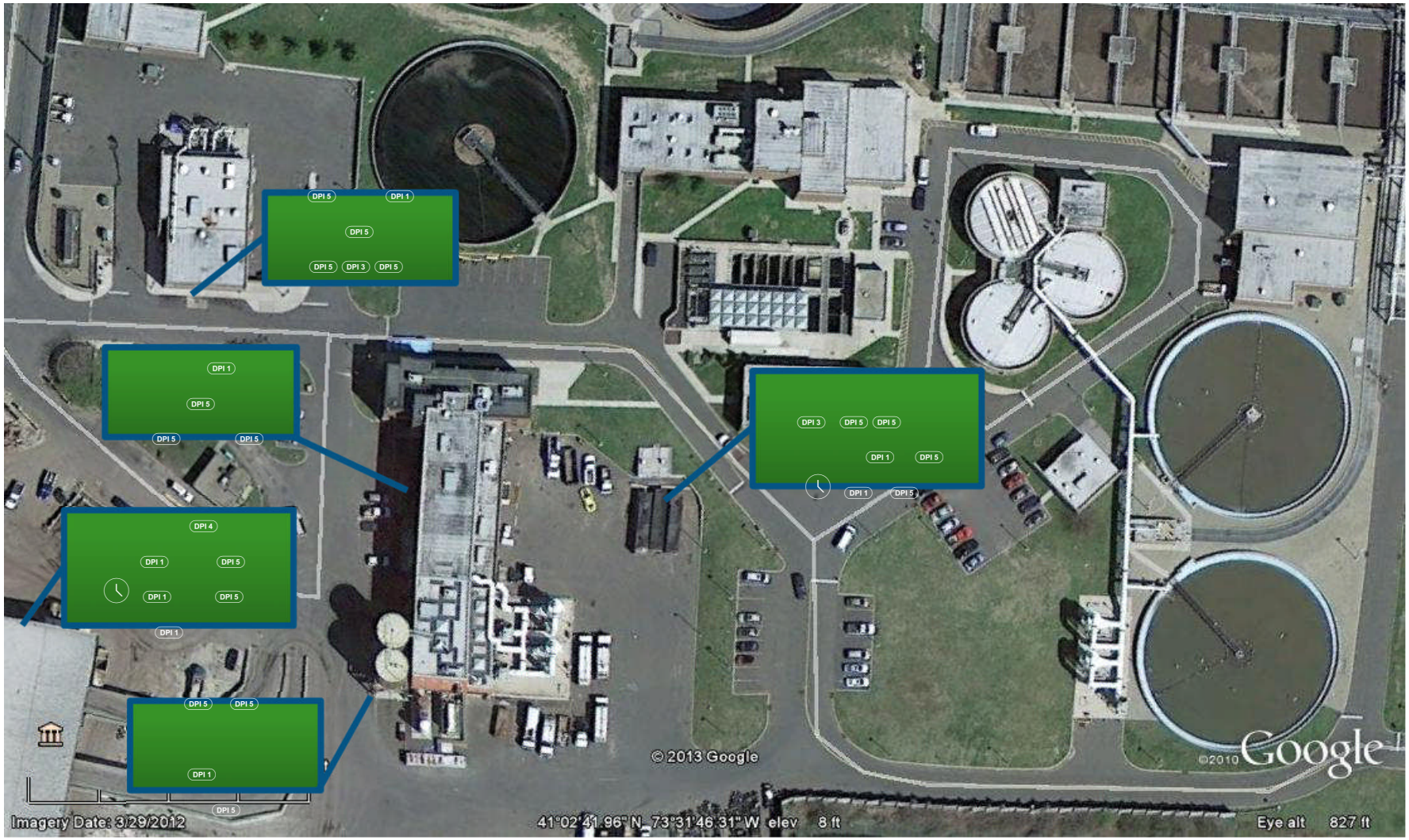
Scrubbers	Flowrate, cfm	Design H2S, ppm
Headworks	2,750	200
Primary / GT	14,000 / 25,000	200
SPB – Dewatering	25,000	100

- Three, 2-stage systems w/ 10’ deep packing in each stage
- Primary / GT – initially launder covers on primaries with future capacity for full covers on primaries

2007 Drying/Pelletizing Facility

- SPB - Dewatering modified by converting second stage to separate system for drying area exhaust
- SPB – Drying – 25,000 cfm
  - drying area – 10,500 cfm
  - add'l dewatering area in warm weather – 14,500 cfm
- RTO for dryer exhaust
  - Bypass during start-up / shutdown cycle

Additional Odor Sources



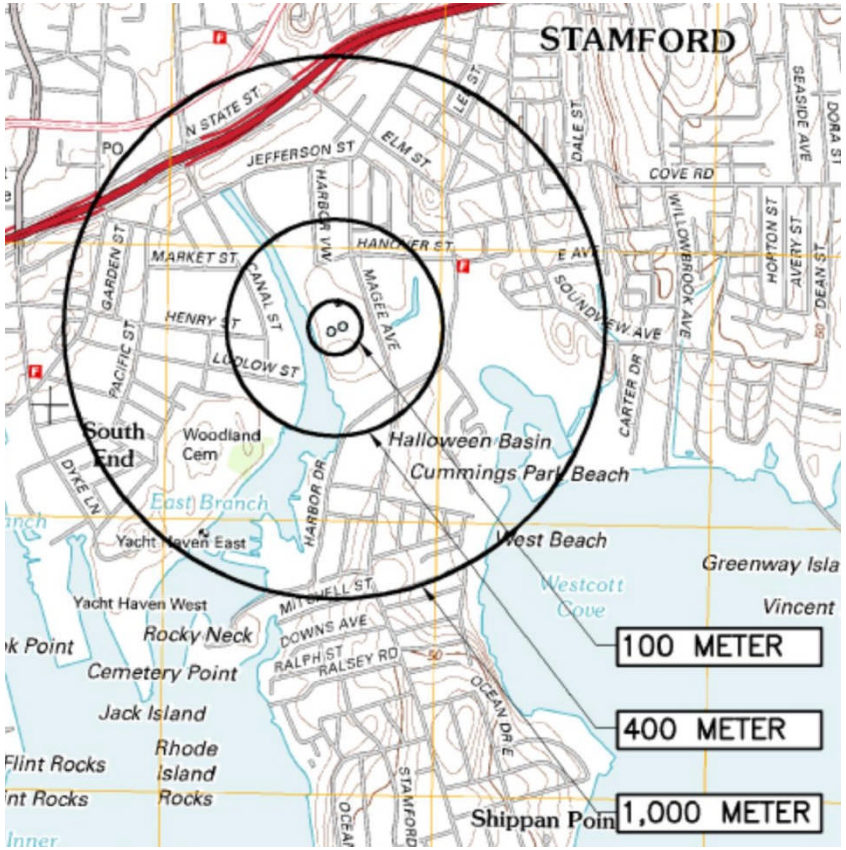
Odor Sources – Screening Level Modeling

Source	Flowrate, cfm	Discharge Elevation, ft[b]	Uncontrolled Odor Concentration, Dilutions to Threshold	Treated Odor Concentration, Dilutions to Threshold
Primary / GT Scrubber	14,000	55.5	>12,300[a]	100-200
SPB – Dewatering Scrubber	25,000	48.5	>4,700[a]	100-200
SPB – Drying Scrubber	10,500 / 25,000	48.5	>100[a]	100-200
Headworks Scrubber	2,750	35.5	>3,000[a]	100-200
Dryer – RTO Discharge	3,200	74.4	11,400[b]	500-700[b]
Dryer - RTO Bypass	3,200	~20	11,400[b]	100
Pellet Silo Baghouse	1,600	~37	300	300

a. Scrubber concentrations based on late Oct. 2010 H2S data
b. RTO data based on OS&E testing in Feb. 2011

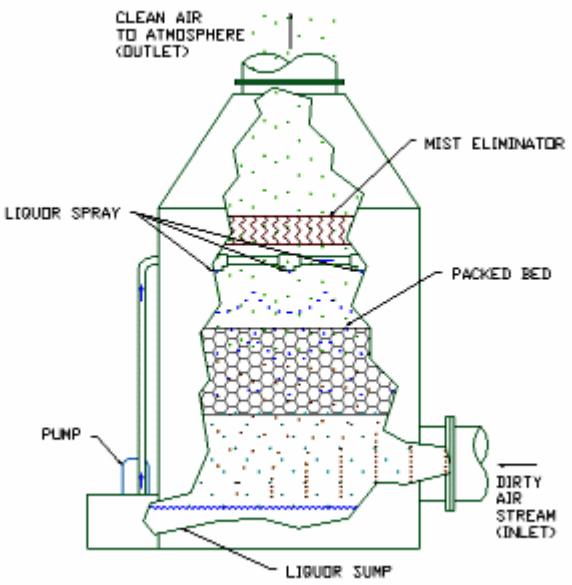
Dispersion Modeling

- Uncontrolled scrubber and RTO sources all have the potential for off-site odor impacts.
- Treated scrubber emissions levels should not cause off-site odor impacts
- RTO discharge and pellet silo baghouse should not cause off-site odor impacts



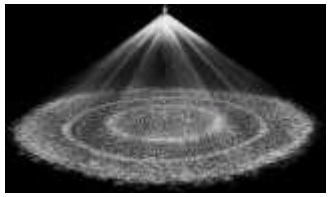
Wet Scrubbers – High Mist Carry Over

- Mist carry over - key issue for staff
  - safety and impact on parked automobiles
  - 2010 – Manufacturer evaluation of issues to get scrubbers operating
    - Revise make-up water
    - Modify blowdown piping
    - Replace isolation dampers
  - 2011 - City moved forward with first 2 recommendations at cost of $156,000
  - **Misting problem was not fixed**



Wet Scrubbers – High Mist Carry Over

- Potential causes of high mist carry over:
  - Nozzle type distribution system
  - Excessive recirculation flow rate / pressure
    - High pressure = smaller droplet size easier to convey in air flow
    - Pump system head analysis indicated high pressure
    - Recommended installing pressure gauges and throttling recirculation pumps as necessary
  - Excessive air flow rate:
    - Higher face velocity = convey larger particles in flow
    - Air flow pressure drop analysis indicated high flow
    - Recommended air flow rate testing and adjustment as necessary

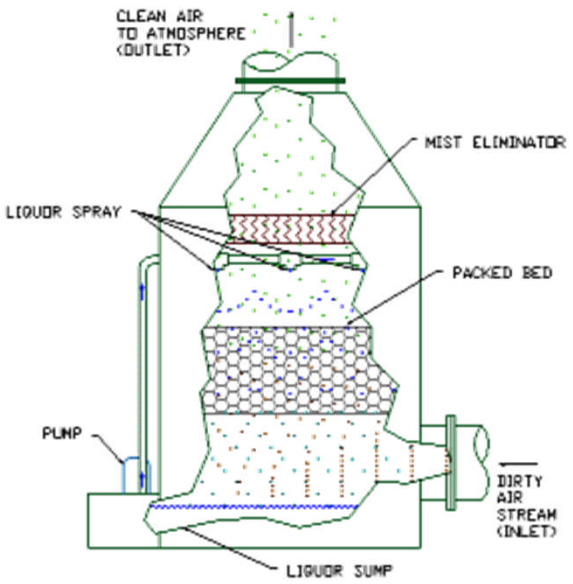


Packed Bed Scrubber - Testing

Location	Design Flow (cfm)	Actual Flow (cfm)	Actual Pressure (In. of H2O)
SPB - Dewatering Scrubber	25,000	37,000	5.40
SPB - Drying Scrubber - Low Speed	10,500	29,600	4.50
Primary / GT Scrubber (Loc. 1)	14,000	21,800	5.40
Primary / GT Scrubber (Loc. 2)	14,000	28,000	5.04
Headworks Scrubber	2,750	4,500	12.80

Packed Bed Scrubber

- Reduced air flow rates to design criteria
  - New fan sheaves or adjust VFD
- Throttled pumps to achieve intended pressure / flow rate at nozzle
  - Increased average water droplet size
- ***Mist carry over was eliminated***



Packed Bed Scrubber

- Throttling of recirculation pumps:
  - also addressed key issue with pH and ORP sensor performance
  - has been “finicky” – City moved forward with pump replacement
    - reduced pump size – power savings
    - magnetically-driven to eliminate pump seal issues

- Other Staff projects:
  - New hypochlorite feed pumps
    - Restored hypochlorite feed

RTO Bypass

- Intermittent operation
- 3,200 cfm
- Carbon canister was installed on the bypass discharge
- Norit carbons – a VOC carbon followed by Darco H2S that can handle high humidity

Additional Odor Sources

Filtrate Wetwell	fixed ductwork in solids processing building
Septage Receiving	carbon canister
Grit / Screening Container	carbon canister
Pellet Silo Baghouse	no apparent contribution to off-site odor issues
Solid Waste Transfer Facility	does not appear to contribute to off-site odor issues

Planned improvements

- Headworks / Raw Influent P.S. upgrade
  - enclose septage receiving
  - potentially convert to activated carbon to simplify operation
- New garage for grit / screenings trailer w/ activated carbon
- New pumps for caustic addition to scrubbers
- Move pH and ORP sensors to scrubber sumps

A Successful Partnership

- Through the partnership between SWPCA and Wright-Pierce, a significant improvement in overall odor control and mitigation was achieved
- There have been no pervasive odors in the surrounding neighborhoods
- Odor complaints are rare
- Instead of complaints, SWPCA is complimented for the improvement in odor control

Questions?

Thank you

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