

The Air Quality Impact of Super Storm Sandy and the Mitigation Strategies That Could Have Helped

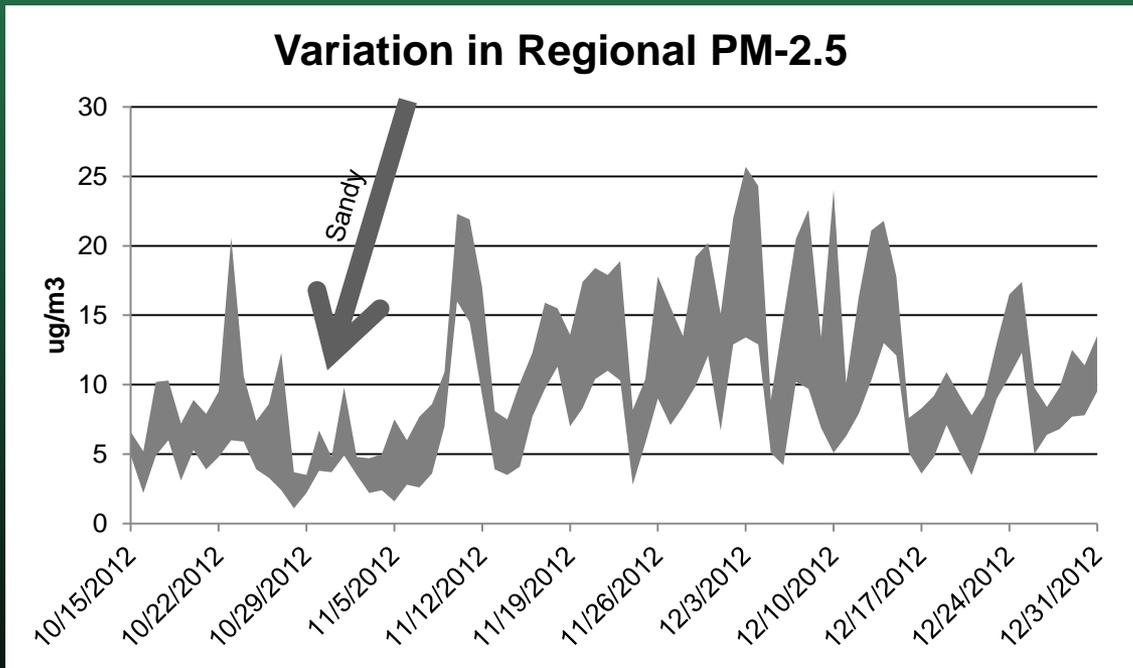
Session A: Air Quality & Health Effects

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NYSERDA EMEP Conference
Albany, NY November 6-7, 2013



Existing Network Monitoring Data

- The Regional PM-2.5 network saw a slight increase in site to site variability after Sandy
 - Normal between site range 2 - 6 $\mu\text{g}/\text{m}^3$
 - Post Sandy between site range 3 - 10 $\mu\text{g}/\text{m}^3$



The 24-Hr PM-2.5 averages did not exceed the Moderate AQI Category or the Daily NAAQS

Air Quality Concerns

- Concentrations of Air Pollutants are low during hurricanes
- Cleanup and Demolition Activities create enormous quantities of fugitive dust
 - Increase in road dust: on and off road mobile sources (Loaders, dump trucks)
- Woody Debris Incineration: Floyd Bennett Field
- Emissions from Emergency Generators and other building support equipment
 - Necessary for business operation and rehabilitation of flooded areas in lower Manhattan



Sandy Related Air Monitoring Objectives

- Why: Data needed to evaluate air quality in hardest hit neighborhoods
 - Data needed to address public concerns
 - Data needed to determine if existing network is adequate
 - Data must be accurate and not add to confusion
- When: To be useful, data must be available to the public within hours or at least daily via the NYSDEC, NYSDOH and NYCDOH Website
 - Data must be reviewed before release
- Where: Data must be representative of neighborhood scale air quality

Network Design: Non-Routine Monitoring

- Which pollutant?
- What method?
- Where do we put monitors?
- What is the representativeness of the data?
- What is the background?
- What do we compare the data to?
- Where and how do we display data?
- What is the appropriate message for the public?
- When do we stop monitoring?



Website Map from Sandy Response



Website Map from Sandy Response



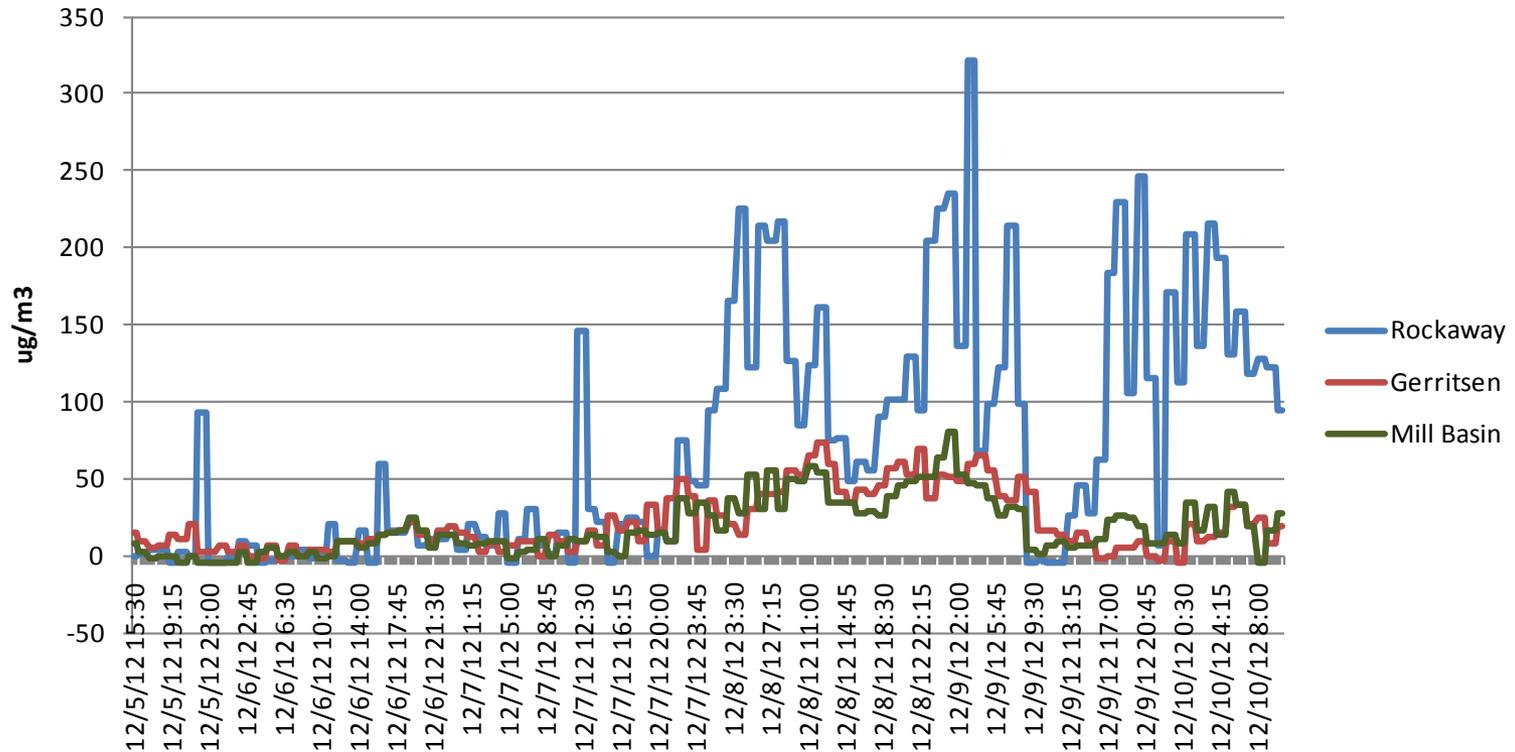
Fugitive Dust: This Rockaway site was installed at the last operational light pole heading east in Belle Harbor



- The EPA ERT provided samplers used for the Gulf Oil spill and for forest fires
- These samplers are not suited to high and variable humidity

Fugitive Dust: High and Erratic Data

December 5 - 10, 2012 PM-2.5 (1-Hr EBAM)



- Staff at the site said:
“you could feel the sand and dust falling”



Fugitive Dust: Sand collection and Sifting



Fugitive Dust: Neighborhood Scale Sites



We moved the site 9 blocks to the east in a Rockaway Neighborhood

We replaced the EPA ERT samplers with TEOMs that can handle high humidity



Fugitive Dust: Mitigation Strategy

- Target dust control measures
 - Assign street sweepers to impacted areas
 - Wet roads that are in use for debris handling
 - Wet or cover loose material piles
- Locate material handling and storage areas away from residential areas
- Provide relief if possible to residents that are unavoidably impacted by emergency response



Woody Debris Incineration: Air Curtain Incinerators at Floyd Bennett Field



The public was concerned that the incineration of woody debris would negatively impact air quality

Clean Woody Debris: 200,000 cu/yds



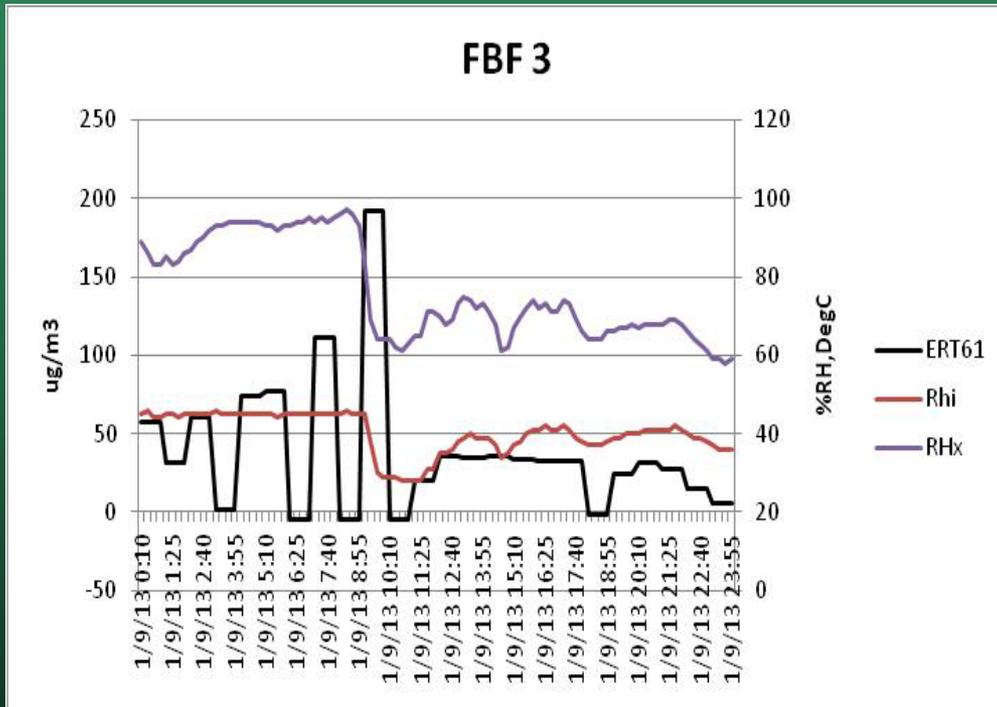
EPA ERT: Floyd Bennett Field, 8 Monitors were set up to monitor a point source (Micro scale: 10-100m)



- The results from these monitors should be used to regulate the operation of the incinerators
- The data from these monitors should only be used to describe the conditions between the monitors and not to predict impact in populated areas



The EPA ERT Monitors did not Perform Adequately in this Deployment



Black Line is 1-Hr PM-2.5
Purple Line is Ambient RH
Red Line is Filter RH

The EPA website presented 24-Hr average results from the FBF monitors.

The 1-Hr data (not public) indicated a RH filter artifact and most of the data should have been invalidated



Hurricane Sandy - Air Curtain Incinerator – Air Monitoring at Floyd Bennett Field, Brooklyn, NY

DAILY PM _{2.5} CONCENTRATIONS										
	Monitoring Date	FBF-01	FBF-02	FBF-03	FBF-04	FBF-05	FBF-06	FBF-07	FBF-08	Prevailing Wind
Pre-Burn Baseline Data	11/19/2012	14.01	7.00	13.99	13.52	7.01	6.26	5.37	5.03	N/A
	11/20/2012	14.73	5.91	16.88*	18.04	15.77	16.85	12.71	12.26	N/A
	11/21/2012	16.93	19.11	N/A	13.78	17.01	19.74	18.60	13.72*	N/A
	11/25/2012	6.09	7.57	7.61	5.94	6.75	5.98	6.60	5.74	N/A
	11/26/2012	15.43	17.72	17.17	15.15	15.49	24.24	14.34	14.66	N/A
	11/27/2012	6.03	3.56	4.64	4.64	3.61	23.06	2.41	12.60	N/A
Test-Burn	11/28/2012	14.69	16.44	17.08	9.32	15.40	15.46	15.61	15.18	NNW
	11/29/2012	20.37	21.92*	19.66*	10.87	20.82	19.60	20.44	20.29	W
Burn Day	12/28/2012	4.37	1.46*	7.18	6.12	21.72*	N/A	4.06	N/A	NW
	12/29/2012	14.88	N/A	11.17	17.13	24.94	N/A	10.1	N/A	NNE
	12/30/2012	4.43	9.19	6.32	0.83	1.17	N/A	N/A	N/A	NNW
	12/31/2012	N/A	11.08	11.60	7.16	10.44	N/A	4.26*	3.16*	W
	1/1/2013	N/A	11.65	13.52	15.47	14.73	N/A	11.39	9.83	WNW
	1/2/2013	N/A	5.31	15.17*	9.93	13.76	N/A	N/A	5.54*	NW
	1/3/2013	8.69*	15.37	15.55	12.56	13.41	8.76*	16.98*	14.71	WNW
	1/4/2013	N/A	22.54*	15.8*	17.28	16.87	17.30	20.94*	17.64	W
	1/5/2013	8.40*	14.03	13.45	5.99	12.59	12.90	11.16	20.29*	W
	1/6/2013	23.30*	26.00*	26.59*	30.35*	21.00*	28.87*	12.49*	22.74	SW
	1/7/2013	41.85	39.4	39.4	34.9	33.7	37.2	36.5	41.6	WNW
	1/8/2013	24.38	27.17*	29.46	24.55	24.07	25.73*	9.76*	22.72	SW
	1/9/2013	41.23*	39.36	39.39	34.89	33.74	37.17	36.47*	41.58	N
	1/10/2013	3.55*	7.73	9.24	0.03	8.29	11.46	19.12*	7.39	NW
	1/11/2013	5.87	6.91	8.19	9.95	7.01	6.86	4.99	6.22	E
	1/12/2013	14.94	22.05	26.05*	24.92*	21.78	29.56	15.62	19.95*	N
	1/13/2013	13.37	15.92							S
	1/14/2013	8.44	8.42*							N
	1/15/2013	12.69	14.72							N
	1/16/2013	8.44*	15.50*							NNE
	1/17/2013	14.16*	13.86							NW
	1/18/2013	10.35*	8.41							N
	1/19/2013	17.96	29.58							SW
	1/20/2013	12.28	11.80							SW
	1/21/2013	9.54	12.18							SW
	1/22/2013	6.93	8.35							WNW
	1/23/2013	6.70*	9.85							WNW
	1/24/2013	8.80*	10.10*							N
	1/25/2013	6.90*	N/A							WSW
	1/26/2013	6.35*	4.00*							NW
	1/27/2013	10.11	10.65*	12.57	11.86	10.80	13.08	10.59	14.06	WNW
	1/28/2013	28.51	23.70*	43.73	44.50	30.48	35.29	20.32	27.69	SW
	1/29/2013	30.66	N/A	51.01	47.43	56.09	56.21	22.08	63.87	ESE
1/30/2013	11.06	12.64*	18.31	27.49	16.89	24.93	9.34	13.21	S	
1/31/2013	5.33	8.36	8.30	9.34	6.94	6.95	4.24	5.31	W	
2/1/2013	4.97	4.36	5.61	5.67	5.50	7.13	4.31	6.32	W	
2/2/2013	11.26	8.21*	10.98	15.27	11.62	11.84	8.13	15.07	WSW	
2/3/2013	17.95	N/A	22.62	22.11	21.64	25.21	13.01	23.60	NNE	
2/4/2013	17.81*	7.73*	12.15	14.10	12.14	12.82	9.44	13.06	W	
2/5/2013	N/A	N/A	27.63*	30.89	31.11	33.61	17.27	43.58	NE	

January 9th

The Regional PM-2.5 ranged from 22 – 38 ug/m3

Suspect data included in report

Regional Background not considered

Consequences of Poor Data and poor interpretation of Data

- The EPA indicated that the air curtain incinerators caused exceedances of the 24-Hr PM-2.5 NAAQS on 5 occasions
<http://www.epa.gov/sandy/data/fbf-results.pdf>
- Much of the data should have been invalidated and the 5 high days corresponded with high regional background PM-2.5
- The press and the public were led to believe that the incineration was harmful though this cannot be verified with this dataset



New Sales Literature for Incinerator Manufacturer: Air Burners Inc.

WHAT YOU NEED TO KNOW ABOUT OUR FIREBOX AT FLOYD BENNETT FIELD

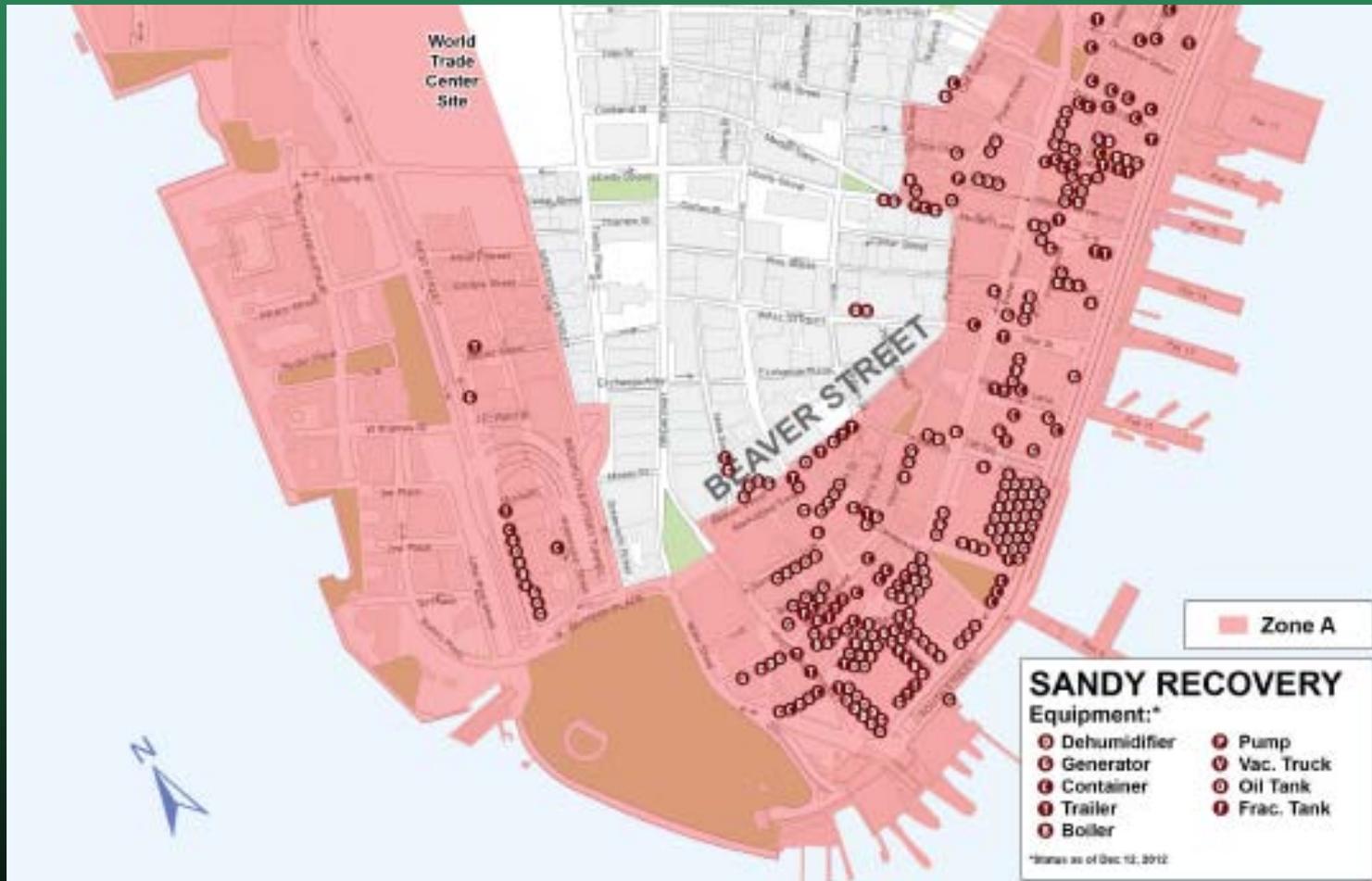
1. Our FireBox S-327 did not increase any area pollutants already present. It had ZERO EFFECT on the environment.
2. Grinders and trucks release more dust and pollutants, soot and bad CO2 Greenhouse Gas than our FireBox ever.
3. The mulch piles are decomposing causing ground water pollution and terrible odor and Methane releases.
4. The collected wood waste and the mulch at Floyd Bennett Field contain live Asian Longhorned Beetles and larvae.
5. Disposing the unprocessed wood waste in our FireBox will assure that all beetles are killed.
6. These beetles kill our live hardwood trees, such as maple and elm. The mulch is dangerous and useless.
7. The mulch piles can combust spontaneously and then smolder, smoke and stink for many weeks. A real nuisance.
8. Mulch cannot be eliminated in the air curtain FireBox; only wood waste that is un-chipped in chunks can be burned.
9. Not all air curtain burners are the same; only our proven Air Burners FireBoxes were tested by the EPA and FEMA.
10. Our air curtain burners are used all around the world; they are clean and efficient and do not pollute.
11. Our FireBox has a "Zero Carbon Footprint" as it releases only so-called *biogenic* CO2 and virtually no smoke or soot.

Incineration: ~~Mitigation~~ Lessons Learned

- The monitoring data was not adequate to determine actual impact of air curtain incinerators
- The modeling results indicated that there was a near field impact but a negligible impact on off-site populated areas
- Lessons learned
 - Data must be Quality Assured
 - Data interpretation must account for background
 - Source characterization is complex, it requires controlled conditions and a valid experimental design



Lower Manhattan: Most of the Dots Represent Temporary Diesel Powered Equipment: Generators, Boilers, Pumps and Dehumidifiers



Courtesy of LMCCC

NYS Department of Environmental Conservation





Large Emergency Generators

- Trailer mounted, primarily diesel powered
- Emissions Regulated by EPA non-road Tier Rules based on Year of manufacture
- Output from <1 MW up to 2.5 MW
Engines from 1400 Hp and larger
Fuel consumption 70 gph and up
Emission points 3 - 4m from the ground
- Provide power during emergencies, during grid maintenance, for fairs and other planned activities



Sandy Air Monitor in Manhattan

Site established to address impact of emissions from temporary generators and building support equipment

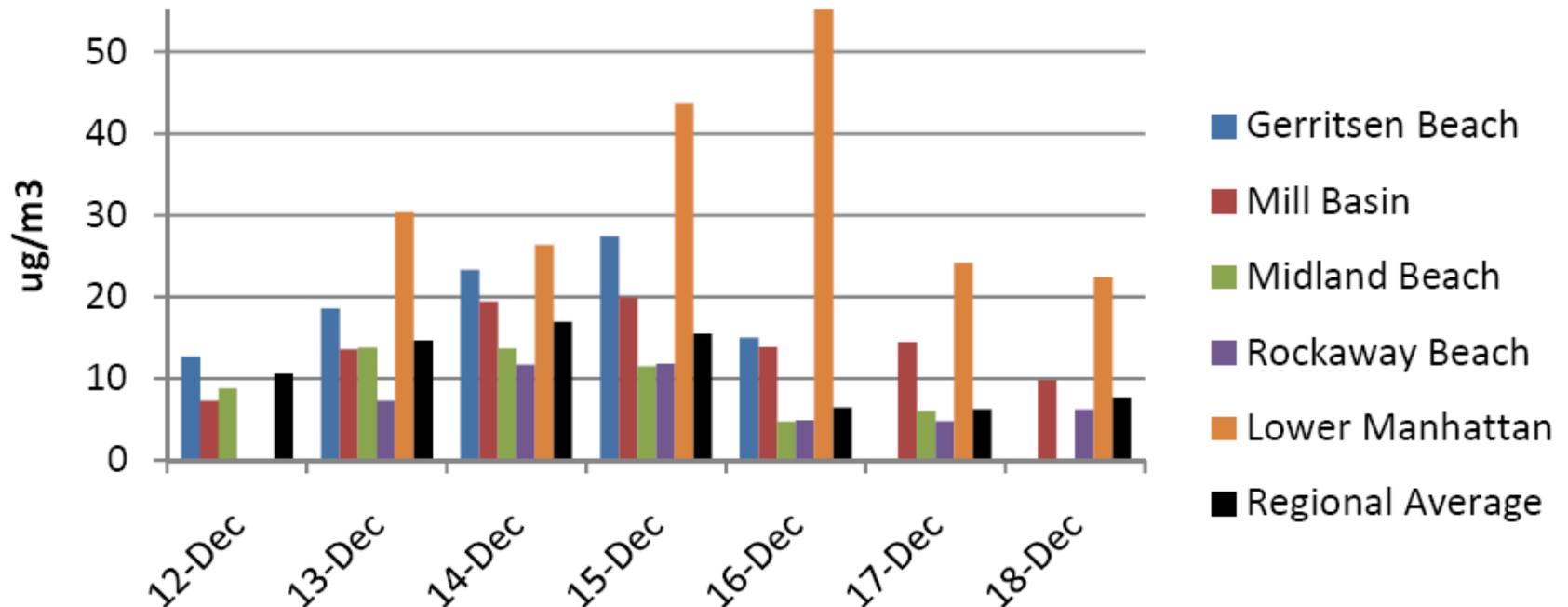


- Water St between John St and Fletcher
- Public complained of soot and diesel odors
- This site would have recorded an exceedance if the generators remained

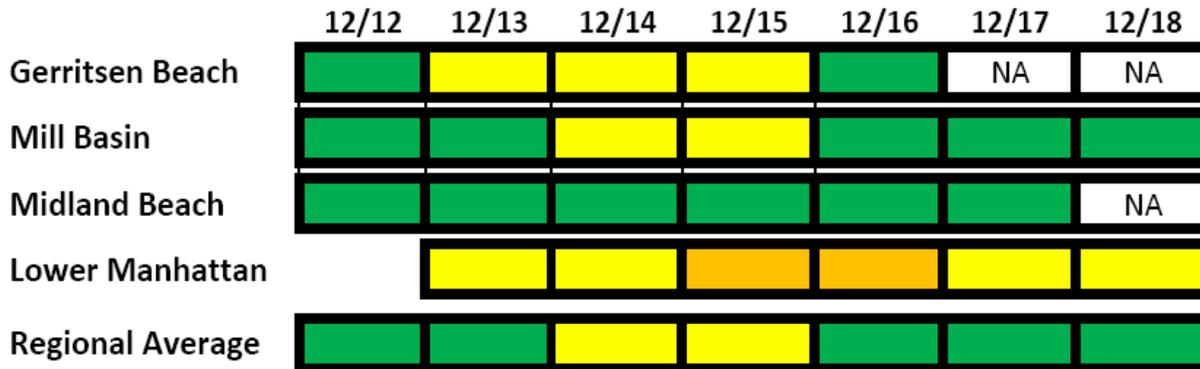


Sandy NYSDEC Public Data Presentation

Daily PM-2.5 Levels Measured at Monitors Near Clean-Up Activities and Daily Average of Regional Monitors



Local Air Quality Index (AQI) in Clean-up Area



AQI Category	Health Advisory
Good	None.
Moderate	Unusually sensitive people should consider reducing prolonged or heavy exertion.
Unhealthy for Sensitive Groups	People with heart or lung disease, older adults, and children should reduce prolonged or heavy exertion.
Unhealthy	People with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Everyone else should reduce prolonged or heavy exertion.
Very Unhealthy	People with heart or lung disease, older adults, and children should avoid all physical activity outdoors. Everyone else should avoid prolonged or heavy exertion.

Health Messaging for NYSDEC Sandy Data

Sandy Data was directly compared to Regional Average (Background)



Emergency Generator: Mitigation

- Mobile source if not stationary for 1-Yr
 - EPA no time limit for emergency use
 - DEC <500 hrs considered emergency use
 - DEC <30 days considered temporary
 - Mobile rules do not consider NAAQS
 - Rules developed prior to 1-Hr NO₂ NAAQS
- Potential mitigation strategies: minimum in-use emission tier, setback, stack height, installation density, fuel switching



Public Messaging During an Emergency

- Notify public if air quality is poor
 - Clearly delineate area where poor air quality exists or is expected to exist
 - Predict how long poor air quality will persist
 - Suggest protective measures for severely impacted areas (masks, stay indoors, avoid area)
- Explain that air quality during an emergency may be impacted and unhealthy in affected areas
 - Control measures are being used but they cannot completely mitigate temporary sources
 - Sources that contribute to poor air quality will diminish once the emergency is over





<http://hazecam.net> January 25, 2013 7:00 am

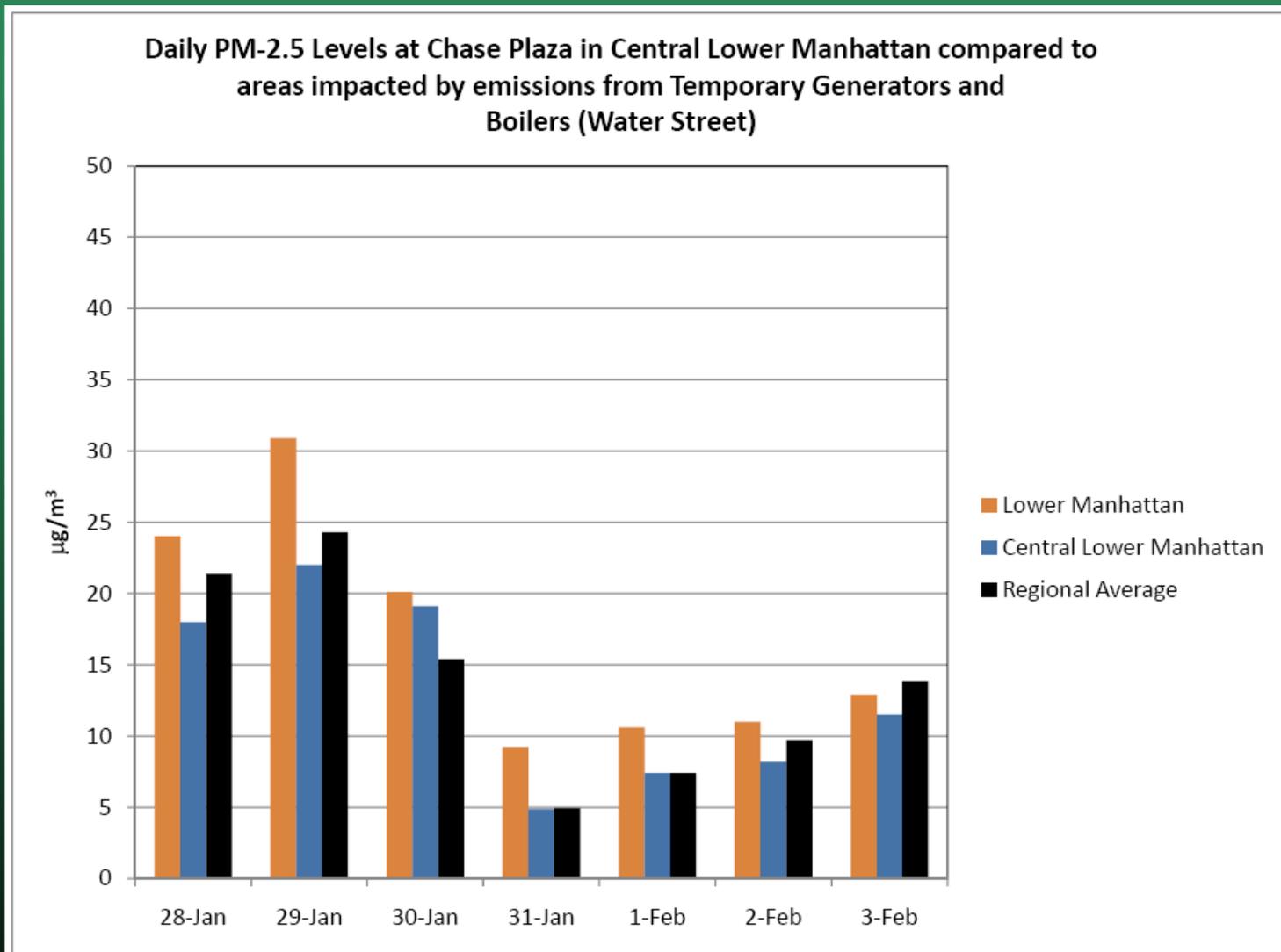
Portable Generators and Building Support Equipment

Status Date	12-Nov-12 Assessment #1	12-Dec-12 Assessment #2	25-Jan-13 Assessment #3	25-Feb-13 Assessment #4
Dehumidifiers	59	75	2	0
Generators	136	109	52	29
Containers	51	51	17	3
Trailers	15	29	12	8
Boilers	10	18	9	9
Pumps	13	8	0	0
Vac. Trucks	7	1	0	0
Oil Tanks	3	7	5	2
Frac. Tanks	8	3	0	0
Chillers	0	0	4	3
Total	302	301	101	54

Courtesy of LMCCC

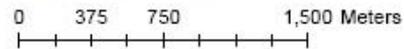


Representativeness of Water St Monitor





Estimated PM Impacts
Assuming Operation
of 3 Air Curtain Burners ($\mu\text{g}/\text{m}^3$)



24 hour impacts of PM modeled with AERMOD.
Run by MV using 2006-2010 JFK met data.
Assuming emissions of 3 air curtain burners.
Run dated 121212

Modeled impact of 3 Air Curtain Incinerators

Offsite impact was
estimated to be
minimal

Operation was to
be curtailed if
stagnant
conditions were
forecast

January 9th EPA ERT FBF Data

