



South Portland VOC Air Quality Monitoring Project Update

August 20, 2019

Andrew Johnson, Director
Division of Air Quality Assessment

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION

Protecting Maine's Air, Land and Water

April 16 City Council Workshop

- Citizen concerns over air emissions and/or odors from the petroleum product storage facilities
- Repeated requests for air quality monitoring done within City boundaries
- DEP promised it would work with the City on accomplishing that goal



Timeline of Significant Planning Events

- April 16: City Council public workshop
- May 23: Initial VOC monitoring planning meeting
- June 6: 1st follow-up meeting with stakeholders
- June 20: 2nd follow-up meeting with stakeholders
- July 25: Data presentation considerations
- August 14: Draft early data presentation review
- August 20: City Council public workshop



May 23 Initial Monitoring Planning Meeting

- City's stated monitoring objective:

“Is the air safe to breathe?”

- Initial monitoring focus to be on measuring VOCs
- “Not targeting an industry, we’re protecting a community”
 - There are a variety of VOC sources in the City
- Monitoring effort to consist of two phases:
 - An immediate “grab” sampling phase done by citizens
 - Fixed 24-hour sampling sites phase, operated by DEP staff
- One fixed 24-hour sampling site in each district
(i.e. five sites, plus one “floater” sampling system)



VOC Ambient Air Monitoring Project Goals

- To measure VOC air quality across the City generally to gain an in-depth understanding of them in South Portland, recognizing there are a variety of VOC sources present in the City.
- To report findings to the public and to work with the State Toxicologist to interpret those findings.
- To identify potential sources of VOC emissions that may require further controls or scrutiny.
- To correlate odor incidents as observed by the public with VOC data



Volatile Organic Compounds (VOCs) - 1

- What are they?

Carbon-containing chemicals used in and emitted by vehicle engines and a wide variety of solvents, industrial processes, household chemicals, consumer items, as well as biogenics (vegetation and soils); any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate) which participates in atmospheric photochemical reactions.

- What are some common examples?

- Acetone (nail polish remover)
- Benzene (cigarettes, gasoline)
- Ethylene glycol (antifreeze, detergents)
- Methylene chloride (wood floor cleaners, spray shoe polish)
- Perchloroethylene (spot removers)
- Toluene (paints, paint thinners, nail polish)
- Xylene (synthetic fiber production, papermaking)
- 1,3-butadiene (internal combustion engines exhaust, tobacco smoke)



Volatile Organic Compounds (VOCs) - 2

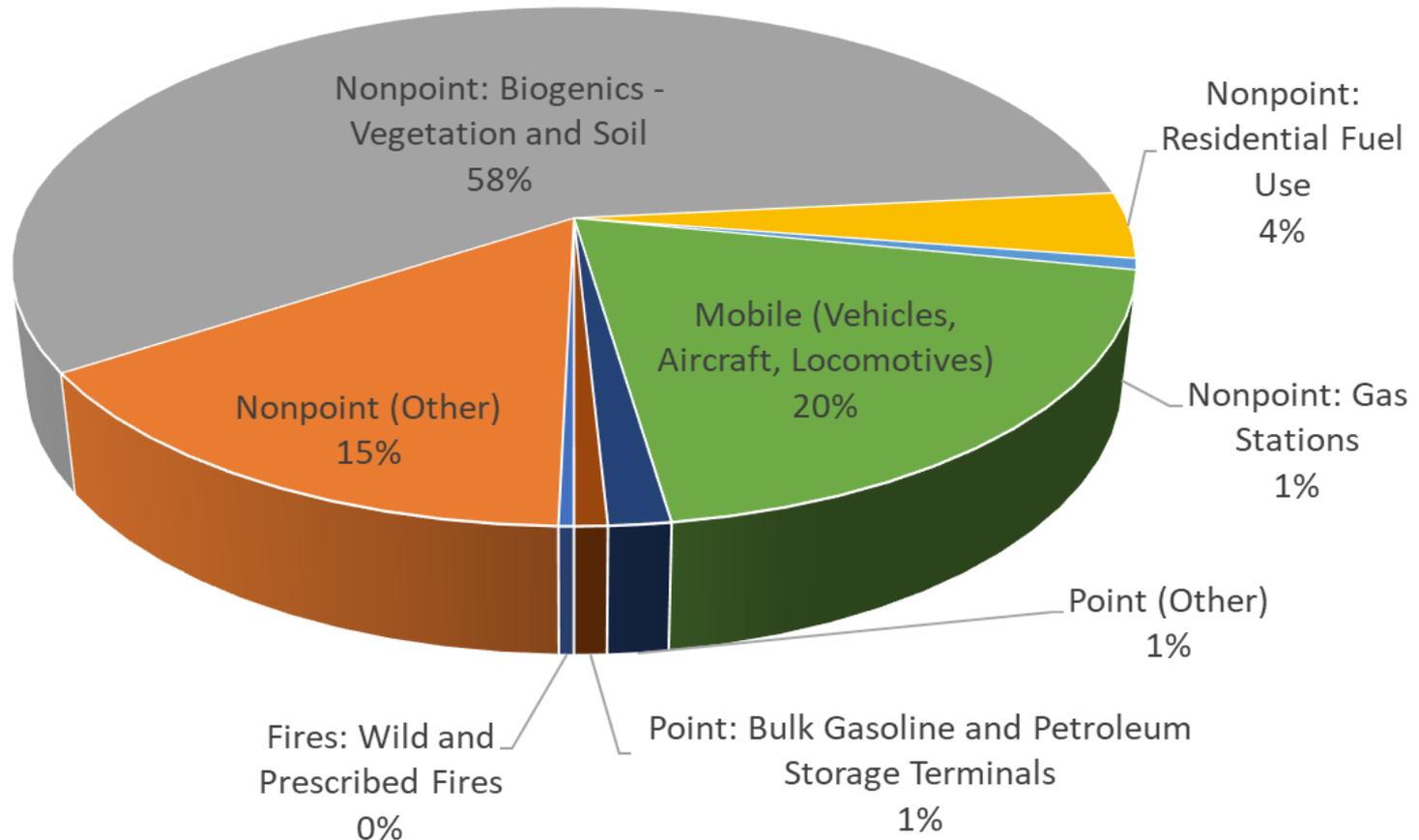
- What are some common VOC sources?
 - Nonpoint sources:
 - Biogenics (vegetation and soils)
 - Residential fuel use
 - Gas stations
 - Point sources:
 - Mobile (vehicles, aircraft, locomotives)
 - Bulk gasoline and petroleum storage terminals
- What are the understood health impacts of VOCs?

According to the EPA, VOCs may cause eye, nose and throat irritation, frequent headaches, nausea, and can also damage the liver, kidney and central nervous system.



VOCs in Cumberland County

Data from EPA's most current National Emissions Inventory (NEI, 2014)



VOCs in Cumberland County

Data from EPA's most current National Emissions Inventory (NEI, 2014)

VOC Emissions in Cumberland County (2014 NEI)

Category	Emissions (Tons/Year)
Nonpoint: Biogenics - Vegetation and Soil	10,841
Mobile (Vehicles, Aircraft, Locomotives)	3,662
Nonpoint (Other)	2,865
Nonpoint: Residential Fuel Use	775
Point (Other)	282
Point: Bulk Gasoline & Petroleum Storage Terminals	150
Nonpoint: Gas Stations	131
Fires: Wild and Prescribed Fires	69

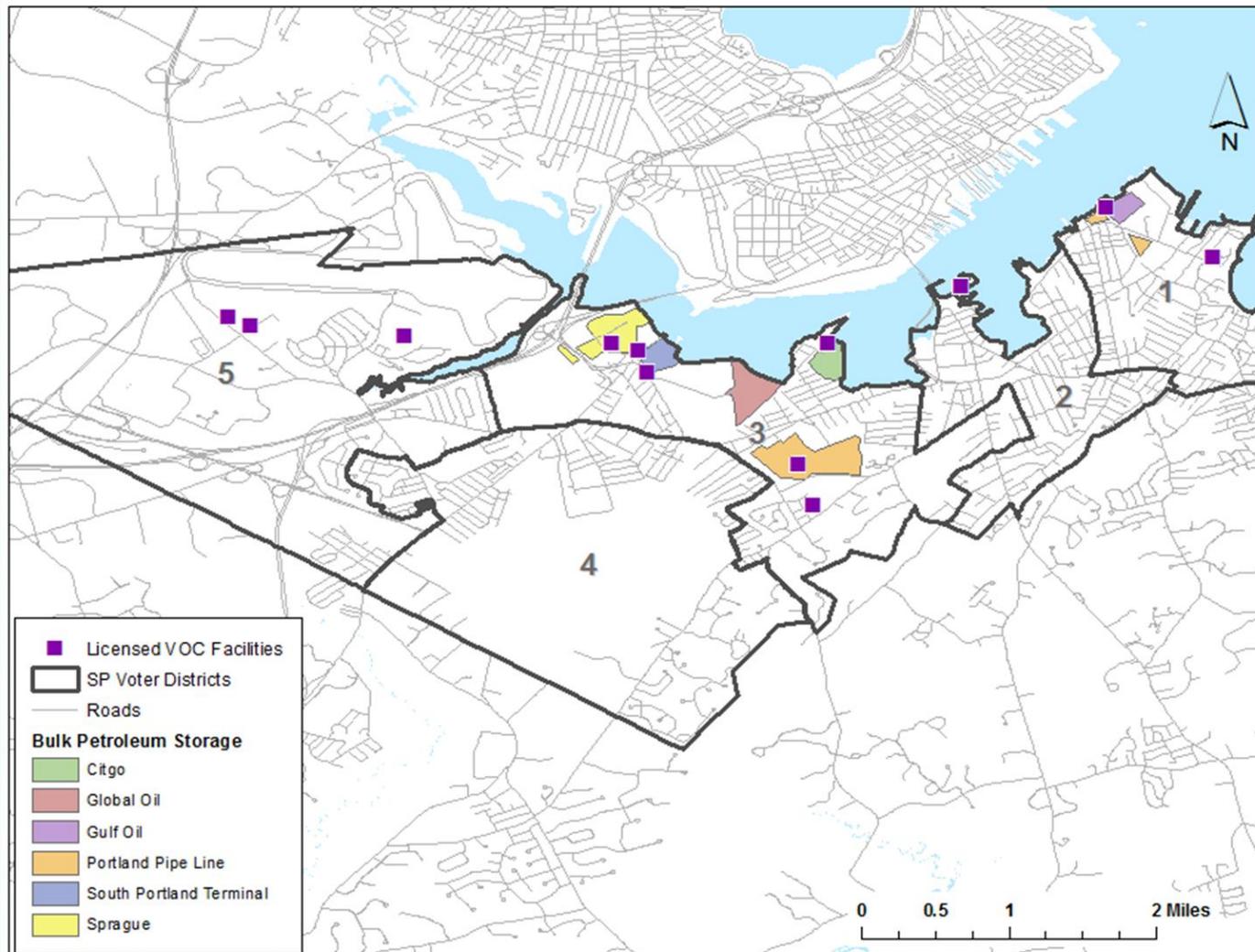
Category descriptions:

- **Fires:** emissions from fires including agricultural fires, prescribed fires, and wild fires.
- **Nonpoint:** emissions estimates from sources which individually are too small to report as point sources.
- **Mobile:** includes emissions from on-road vehicles, off-road vehicles, locomotives, aircraft, and commercial marine vessels.
- **Point:** emissions from larger sources that are located at a fixed, stationary location (e.g., a business or power plant)

Subcategories within each category have been highlighted. "Other" indicates the remaining emissions from that category.

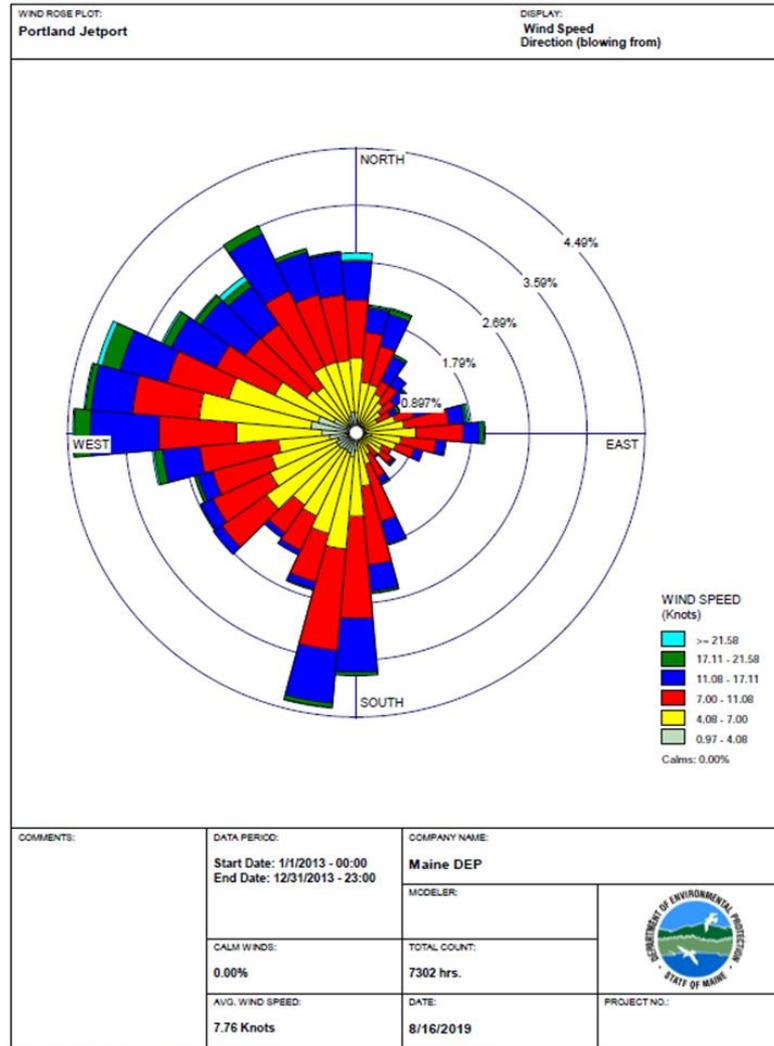


Map of Licensed VOC Facilities



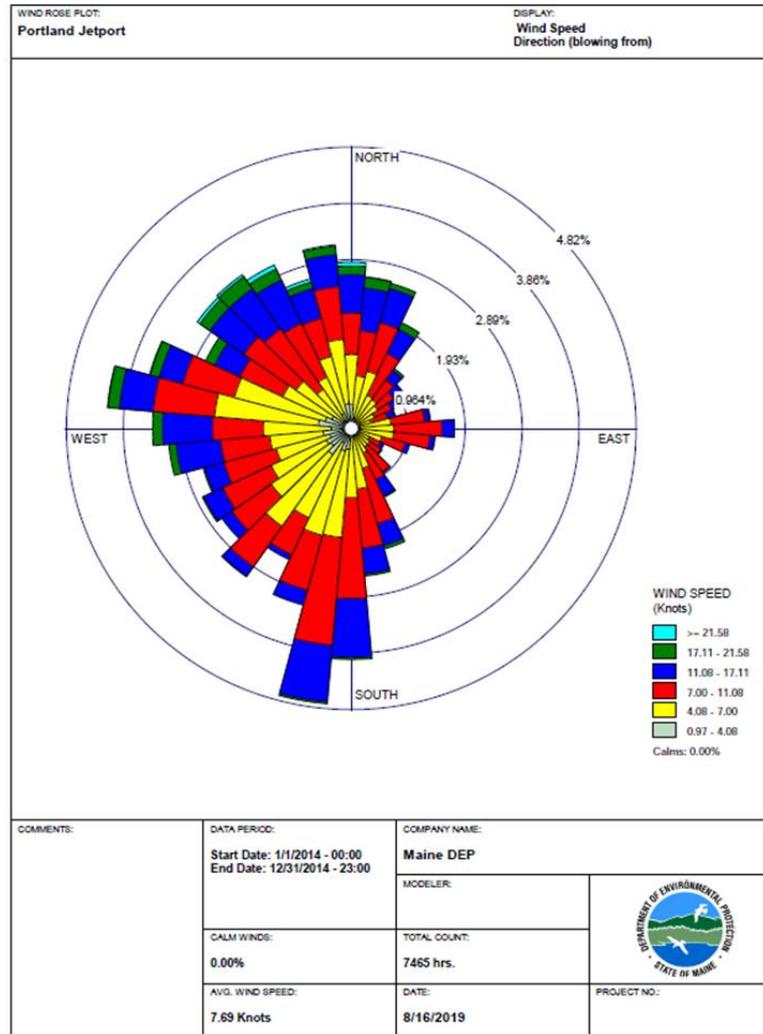
Annual Wind Rose

Portland Jetport Data - 2013



Annual Wind Rose

Portland Jetport Data - 2014

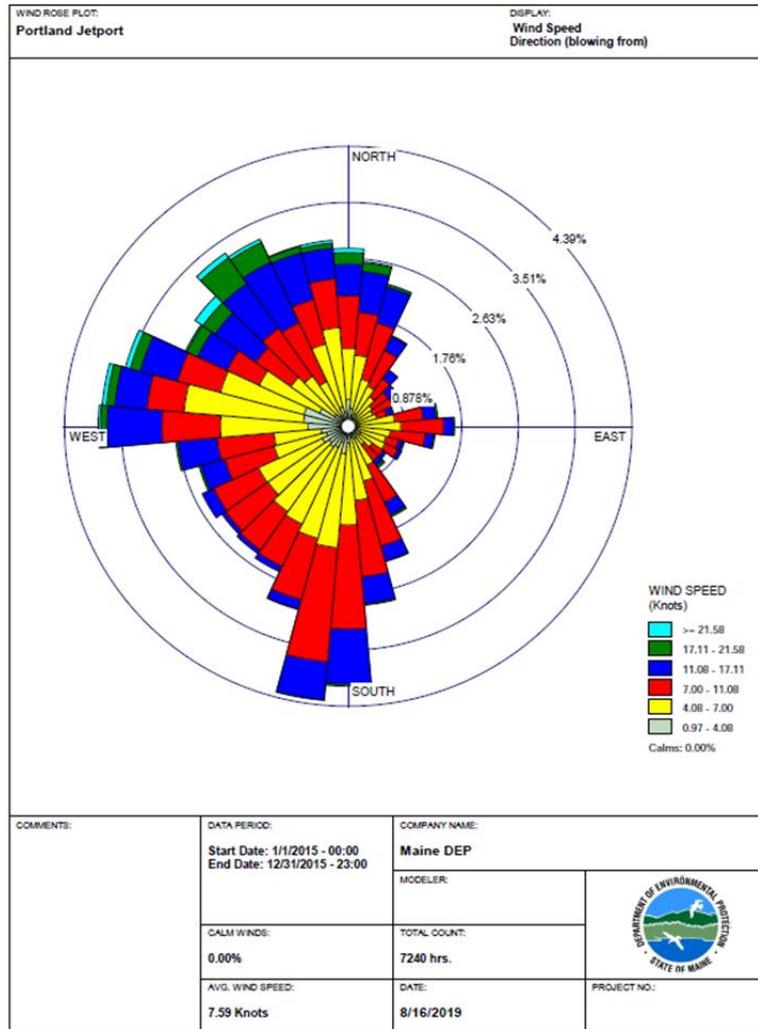


WRPLOT View - Lakes Environmental Software



Annual Wind Rose

Portland Jetport Data - 2015

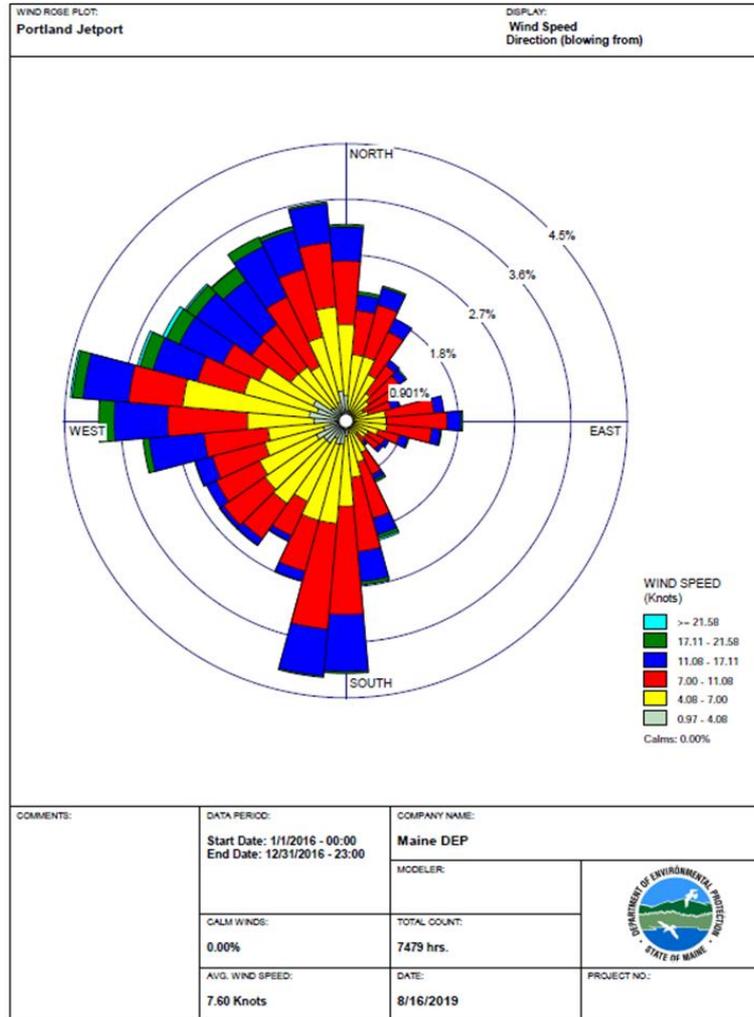


WRPLOT View - Lakes Environmental Software



Annual Wind Rose

Portland Jetport Data - 2016

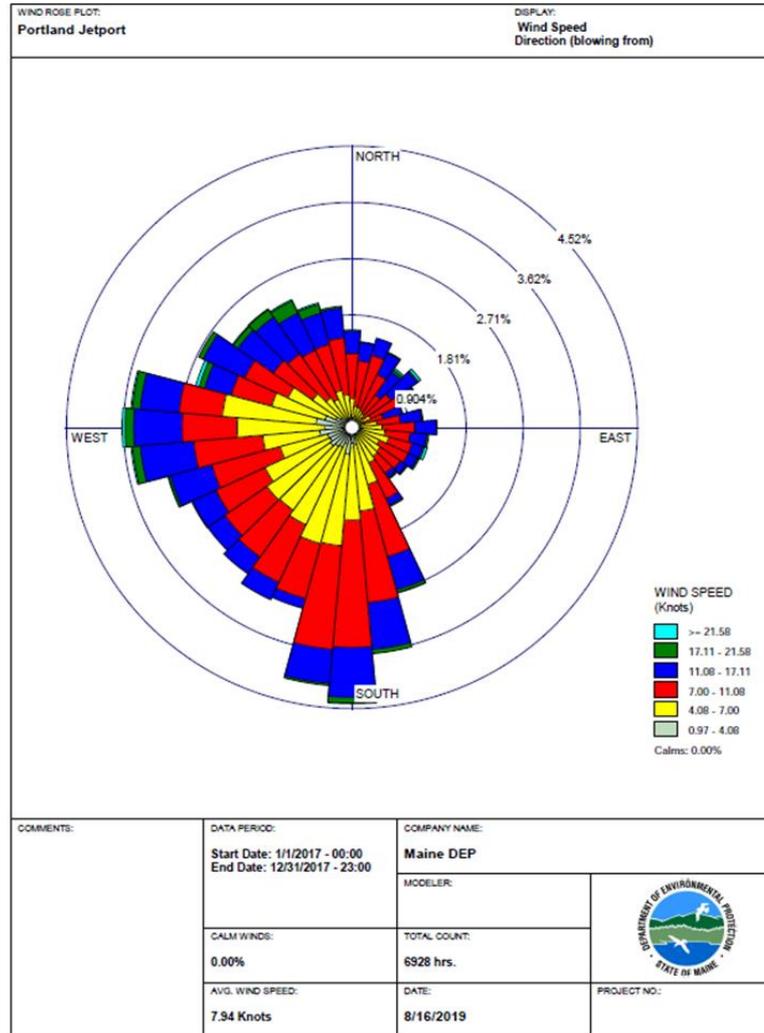


WRPLOT View - Lakes Environmental Software



Annual Wind Rose

Portland Jetport Data - 2017

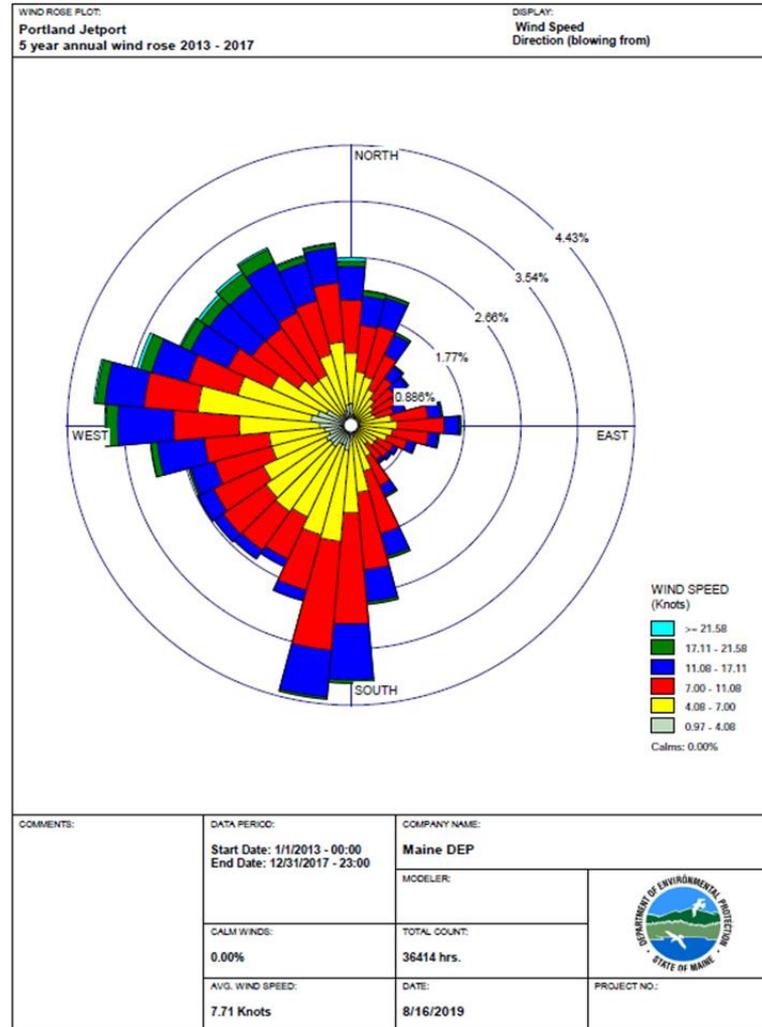


WRPLOT View - Lakes Environmental Software



5-Year Wind Rose

Portland Jetport Data: 2013 - 2017

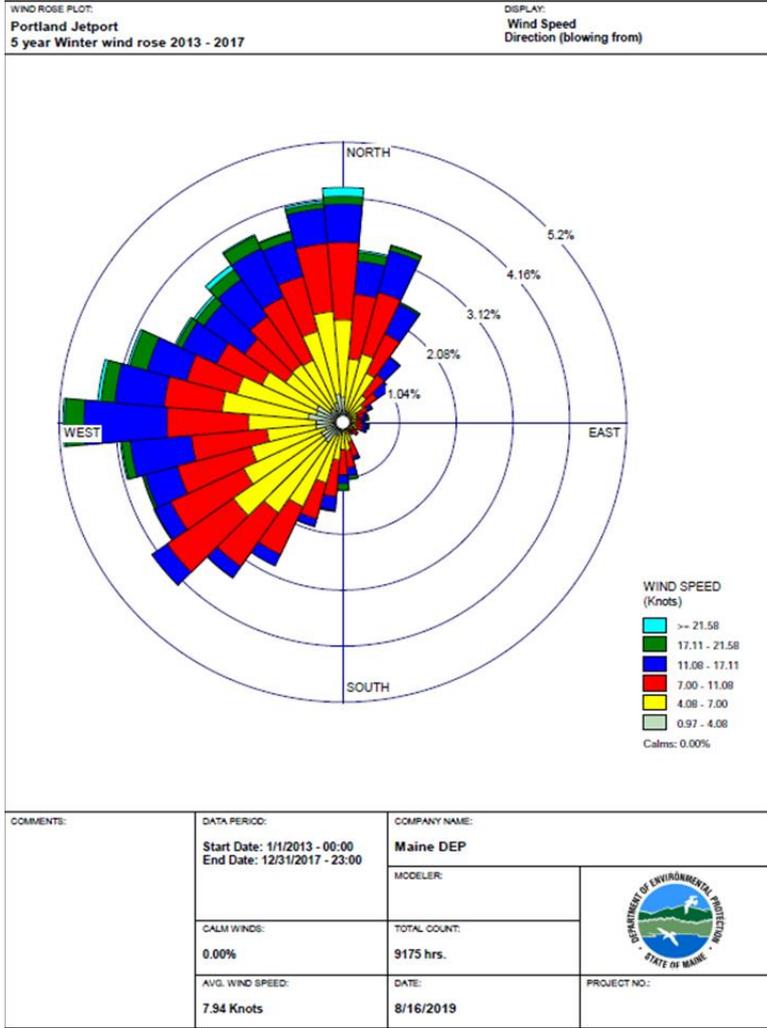


WRPLOT View - Lakes Environmental Software



5-Year Winter Season Wind Rose

Portland Jetport Data: 2013 - 2017

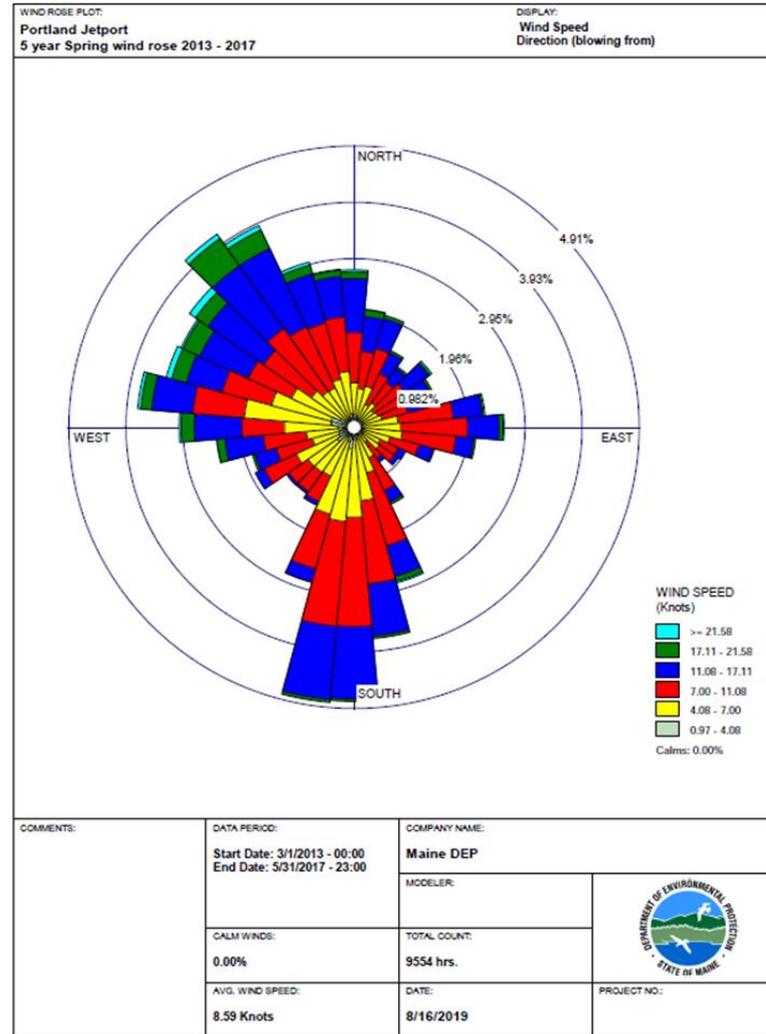


WRPLOT View - Lakes Environmental Software



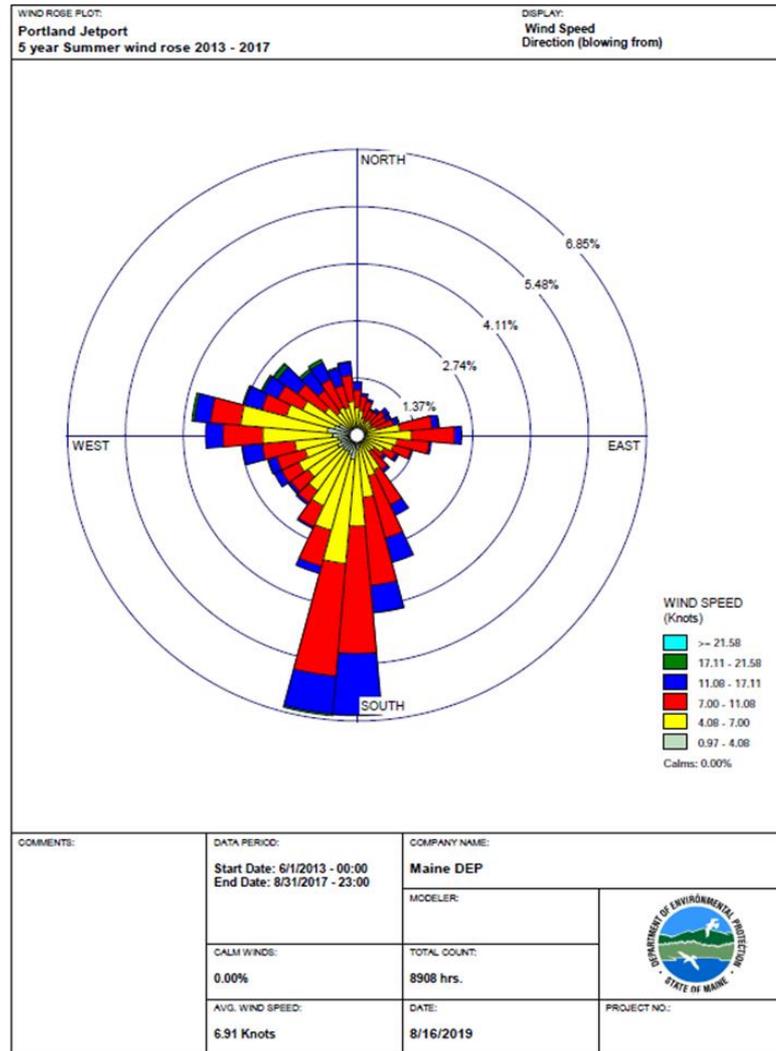
5-Year Spring Season Wind Rose

Portland Jetport Data: 2013 - 2017



5-Year Summer Season Wind Rose

Portland Jetport Data: 2013 - 2017

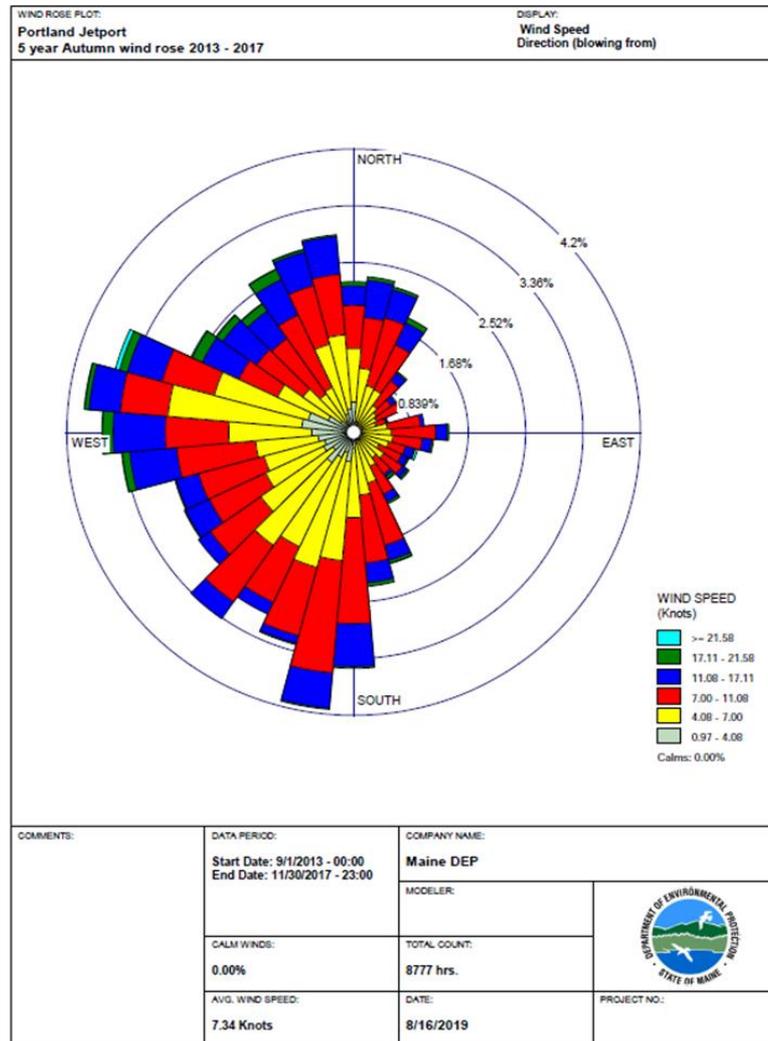


WRPLOT View - Lakes Environmental Software



5-Year Fall Season Wind Rose

Portland Jetport Data: 2013 - 2017



WRPLOT view - Lakes Environments Software



Grab Sampling Phase Update

(as of August 1, 2019)

- Citizen training session on June 10
- 6 canisters made available weekly
 - 5 assigned to citizen volunteers
 - 1 assigned to S. P. Fire Department
- Citizen interest & participation resulted in canisters being “booked” through the end of September
- Samples analyzed by DEP Air Lab



ME09381
ME09381 Sample Date: _____
Sample Start Time: _____ AM / PM
Sample End Time: _____ AM / PM
Comments:

Relinquished By: _____ Date: _____
Received By: _____ Date: _____



Grab Sampling Phase Purposes

(as of August 1, 2019)

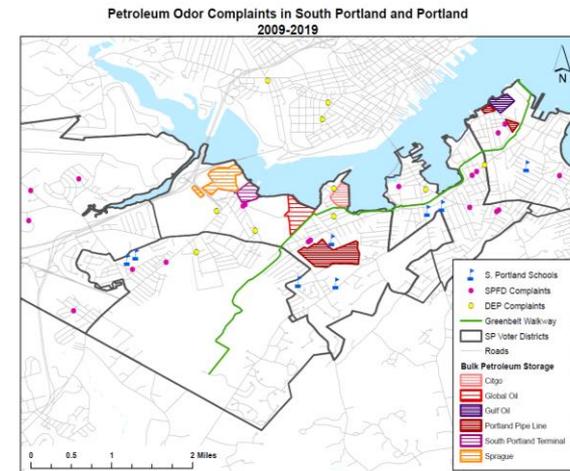
- Opportunity for citizens to become involved
- A means of correlating odor incidents as observed by the public with VOC data
- Can help to inform the adequacy of the initial 24-hour site locations and potential “hot spots”
- Grab sample data is not appropriate to use for any comparison to longer term average levels, guidelines or standards for health assessments



Fixed 24-Hour Sampling Phase Update

(as of August 1, 2019)

- Reviewed potential site locations that met sampling and siting criteria
- Identified “1st choice” locations in each district to pursue further for set-up
- Sites will collect samples every 6 days (SIP calendar schedule)
- DEP will operate a 5-site network for one full year
- “Floater” canister sampling system
- Samples analyzed by DEP Air Lab



Criteria for Locating the 24-Hour Fixed Sampling Sites

Contact information for site location	Spacing from obstruction(s) [distance from the obstacle to the inlet is at least twice the height difference the obstacle protrudes above the inlet]
Unrestricted air flow?	Inlet height above ground-level? [2 - 15 meters]
Ease of access? [Good - Fair - Poor]	Vertical and/or horizontal spacing from any supporting structure [1 meter]
AC power available?	Spacing from trees [minimally 10 meters from the dripline (end of the nearest branch)]
Sampler placement at location? [Rooftop - Inside - Stand-alone Enclosure]	Spacing from Roadways [see Table 2.4-2 below]

Table 2.4-2. Sampling Unit Inlet Required Minimum Distances from Roadways

Day Average Daily Traffic (ADT), Vehicles per Day	Minimum Distance to Inlet (m) ^a
≤ 15,000	15
20,000	20
40,000	40
60,000	60
80,000	80
≥100,000	100

^a Distance from the edge of the nearest traffic lane. The distance for intermediate traffic counts should be interpolated from the table values based on measured traffic counts. Values in this table taken from 40 CFR Part 58 Appendix E, Figure E-1 for neighborhood scale sites.



Fixed 24-Hour Sampling Site Locations & Status

- District 1: Bug Light Park (1st sample 8/13/19)
- District 2: City Assessors Office (1st sample 6/26/19)
- District 3: South Portland High School (1st sample 7/2/19)
- District 4: School Administration Building (pending)
- District 5: Redbank Community Center (pending)
- “Floater” canister sampling system



Latest Status of Fixed 24-Hour Sites

District 1: Bug Light Park



Latest Status of Fixed 24-Hour Sites

District 2: City Assessors Building



Latest Status of Fixed 24-Hour Sites

District 3: High School Concession Stand



Latest Status of Fixed 24-Hour Sites

District 4: School Administration Building



Latest Status of Fixed 24-Hour Sites

District 5: Redbank Community Center



Why are there no Global “fence line” 24-hour fixed monitoring sites?

- Shared recognition among Project planners that there are various sources of VOCs located throughout the City
- City officials were clear from the outset they wanted air quality data representative of all VOCs present in neighborhoods across the entire City
- The grab sampling phase provides for citizens to take their canister samples at the fence line
- The “floater” 24-hour sampling system can be easily moved to collect data at any location as changing situations and circumstances warrant



Quality of DEP's Air Lab Operations

- 20+ years of experience doing TO-15 canister analyses
- Consistently in the top 5 of EPA NATTS* analytical laboratories based on semi-annual proficiency testing
 - *National Air Toxics Trends Stations
- Analytical detection limits down to the parts per trillion level
- Rigorous quality assurance / quality control system described in its EPA-approved "Air Toxics Quality Assurance Project Plan for VOCs"
- Participant in various special research projects such as LISTOS and collaborations with NASA, NYSERDA, U of MD



Summary of Grab Sampling Results – 1

(as of August 1, 2019)

- 48 canisters provided to citizens since June 10
- 36 grab samples taken / returned to DEP (12 cans not yet returned)
- 22 grab samples analyzed
 - 6 samples not yet analyzed
 - 8 samples voided
 - 2 citizen canisters had no vacuum upon use
 - 6 canisters left the lab pressurized, instead of under a vacuum
- 13 grab samples have fully reviewed and validated data
- Not always a correlation between reported intensity of odors and analytical results



Summary of Grab Sampling Results – 2

(as of August 1, 2019)

File Name	06211908.D	07111925.D	06211911.D	06211913.D	06211912.D	06211910.D	07151914.D	07111917.D	07151911.D	07151912.D	07151913.D	07151916.D	07181910.D	07151915.D	07181915.D	
Date	6/21/2019	7/2/2019	6/12/2019	6/12/2019	6/16/2019	6/17/2019	6/30/2019	6/30/2019	7/1/2019	7/2/2019	7/3/2019	7/5/2019	7/7/2019	7/8/2019	7/12/2019	
Time	15:02	24 hr.	5:15	1:50	17:08	7:10	7:22		12:35	4:00	23:45	5:25	14:19	11:02	8:31	
Comments	na	na	strong odor	low odor	no odor	sewer odor	no odor	no odor	asphalt odor	low odor	no comment	no comment	odor	no comment	no comment	
Location	Lab Blank	Deering Oaks	C St.	Elm St.	Evan St.	Fisherman Ln.	Oakdale Ave	Latham St.	Cash St.	Chapel St.	Olive Rd.	Sunset Ave.	Broadway	Osborne Ave	Skillins St.	
(ppb)																
Total Coolants	1	<	1.20	1.25	1.37	1.46	1.36	1.65	1.69	1.61	1.49	1.57	1.67	1.80	1.64	2.30
Total Solvents	2	<	1.18	0.81	0.26	0.56	0.26	0.59	0.51	0.67	0.76	0.81	0.80	0.63	1.18	1.47
Total Chlorinated Solvents	3	0.05	0.22	0.39	0.14	0.28	0.26	0.31	0.29	0.32	0.91	0.39	0.33	0.30	0.50	0.75
Total Combustion By-Products	4	<	0.17	0.14	0.10	0.19	0.20	0.33	0.33	0.39	0.53	0.32	0.34	0.26	0.81	2.57
Total Aromatics	5	<	0.69	1.33	0.76	0.42	0.12	0.25	0.45	2.88	12.51	0.89	1.98	0.21	1.56	31.89
(Benzene)*		<	0.13	0.26	0.10	0.10	0.05	0.07	0.09	0.17	2.33	0.15	0.30	0.05	0.23	3.24
Total Aliphatics	6	<	37	52	25	107	15	28	Pending	65	328	37	Pending	Pending	Pending	Pending
Alkanes/Alkenes																



VOC Categories

Coolants

Dichlorodifluoromethane
Trichlorofluoromethane
Freon 113
Freon 114
Methyl Chloride
Ethyl Chloride

Solvents

Methyl Ethyl Ketone
Methyl Isobutyl Ketone

Chlorinated Solvents

Methylene chloride
Tetrachloroethylene
Trichloroethene
c-1,2-Dichloroethene
t-1,2-Dichloroethene
Vinyl Chloride
Chloroform
Carbon Tetrachloride
Ethylidene Dichloride
Ethylene Dichloride
Chlorobenzene
1,1-Dichloroethene
1,1,1-Trichloroethane
t-1,3-Dichloropropene
c-1,3-Dichloropropene
1,1,2-Trichloroethane
1,1,2,2-Tetrachloroethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene

Combustion by-products

(1,3-Butadiene)
Acrolein

Aromatics

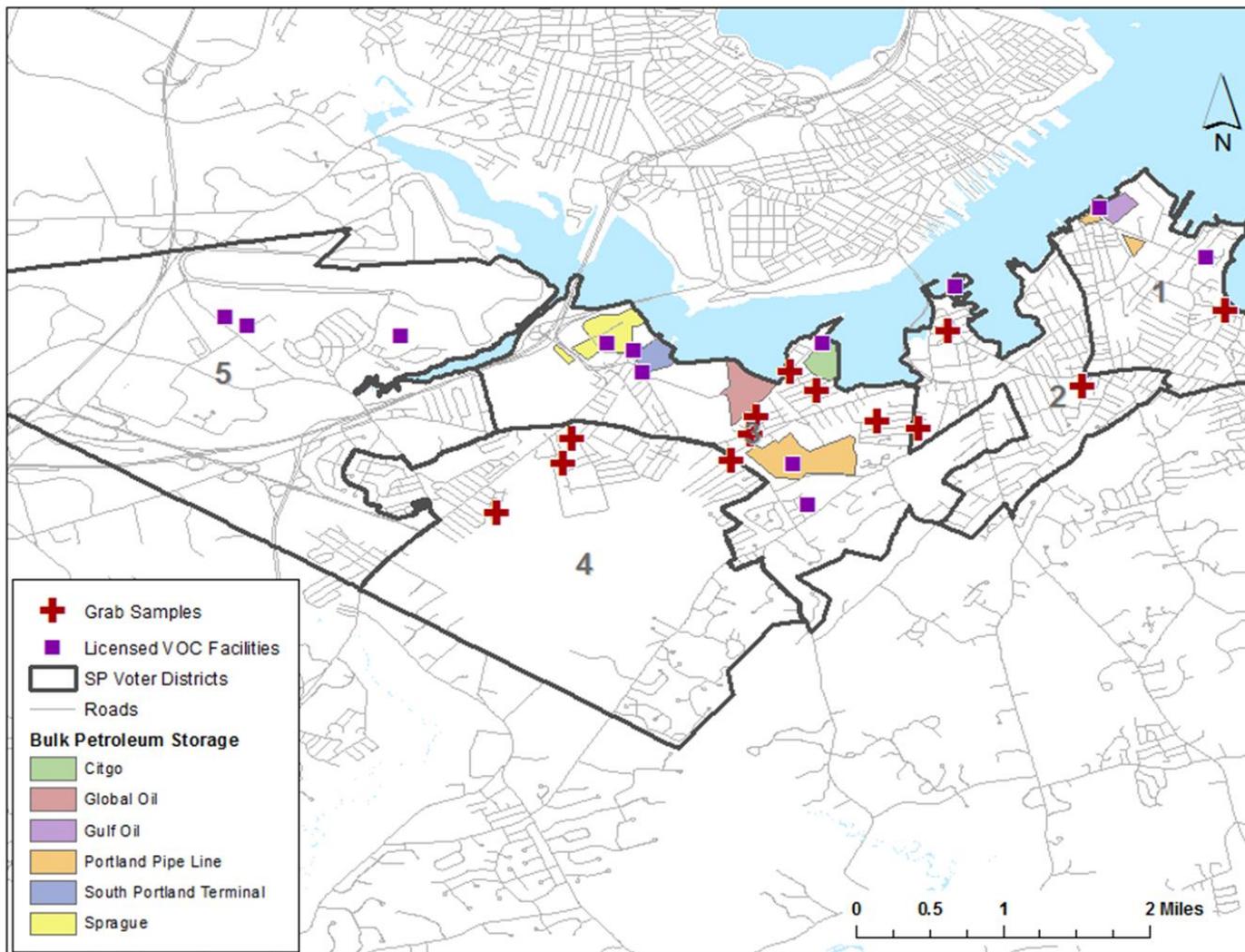
(Benzene)*
Toluene
Ethylbenzene
m/p-Xylene
o-Xylene
1,3,5-Trimethylbenzene
1,2,4-Trimethylbenzene
(Naphthalene)

Total Allipatics

Alkanes/Alkenes



Map of Grab Sampling Locations



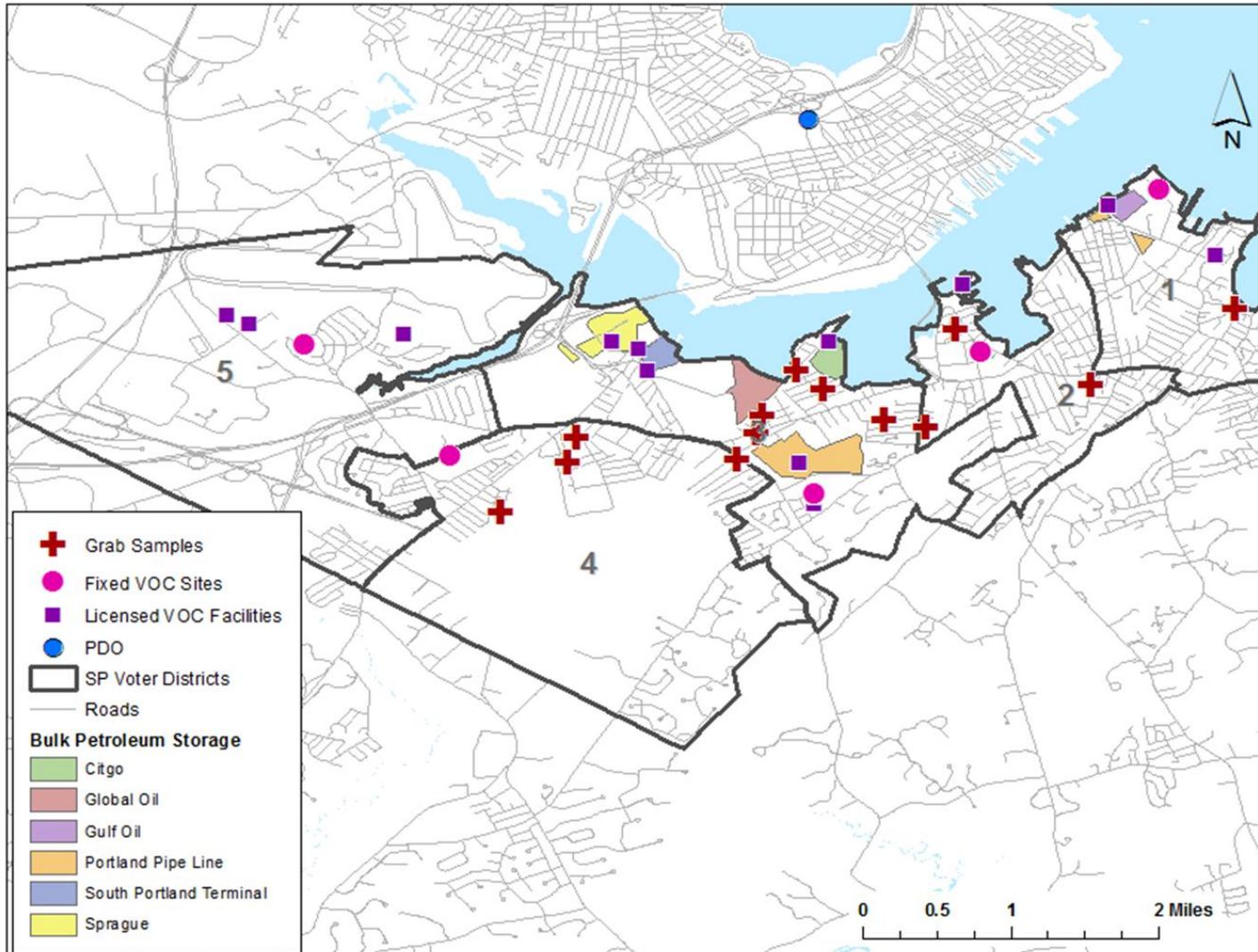
Summary of 24-Hour Sampling Results

(as of August 1, 2019)

- 5 samples collected at Assessors Office site
- 4 samples collected at High School site
 - These samples are suspect, due to likely contamination by some as yet unconfirmed cause
- 6 concurrent samples collected at Portland Deering Oaks site for all South Portland sample dates
- 15 samples analyzed
- 11 samples with fully reviewed and validated data



Map of 24-hour Sampling Site Locations



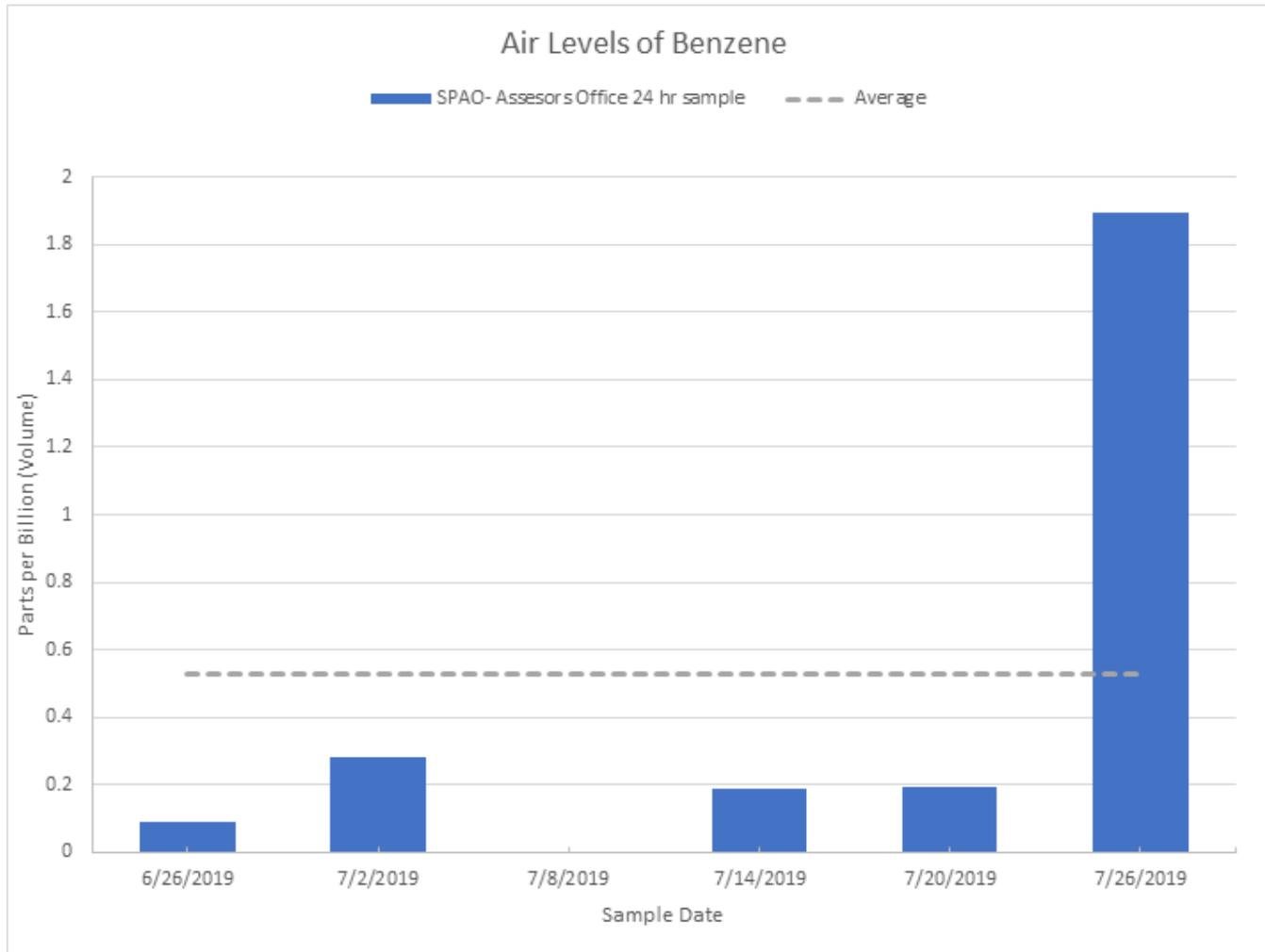
24-hour Sampling Data

(through 7/31/19)

File Name	06211908.D	07111925.D	07081920.D	07111923.D	07241926.D	07311920.D	08051918.D	
Date	6/21/2019	7/2/2019	6/26/2019	7/2/2019	7/14/2019	7/20/2019	7/26/2019	
Time	15:02	24 hr.	24 hr					
Comments	na	na	na	na	na	na	na	
Location	Lab Blank	Deering Oaks	SPAO	SPAO	SPAO	SPAO	SPAO	
(ppb)								
Total Coolants	1	<	1.20	1.75	1.59	1.34	1.42	1.20
Total Solvents	2	<	1.18	0.45	0.75	0.55	0.93	0.71
Total Chlorinated Solvents	3	0.05	0.22	0.40	0.38	0.24	0.28	0.33
Total Combustion By-Products	4	<	0.17	0.20	0.15	0.16	0.22	0.13
Total Aromatics	5	<	0.69	0.45	1.66	0.73	0.77	3.34
(Benzene)*		<	0.13	0.09	0.28	0.19	0.19	1.90
Total Alliphaties Alkanes/Alkenes	6	<	37	Pending	Pending	Pending	Pending	153

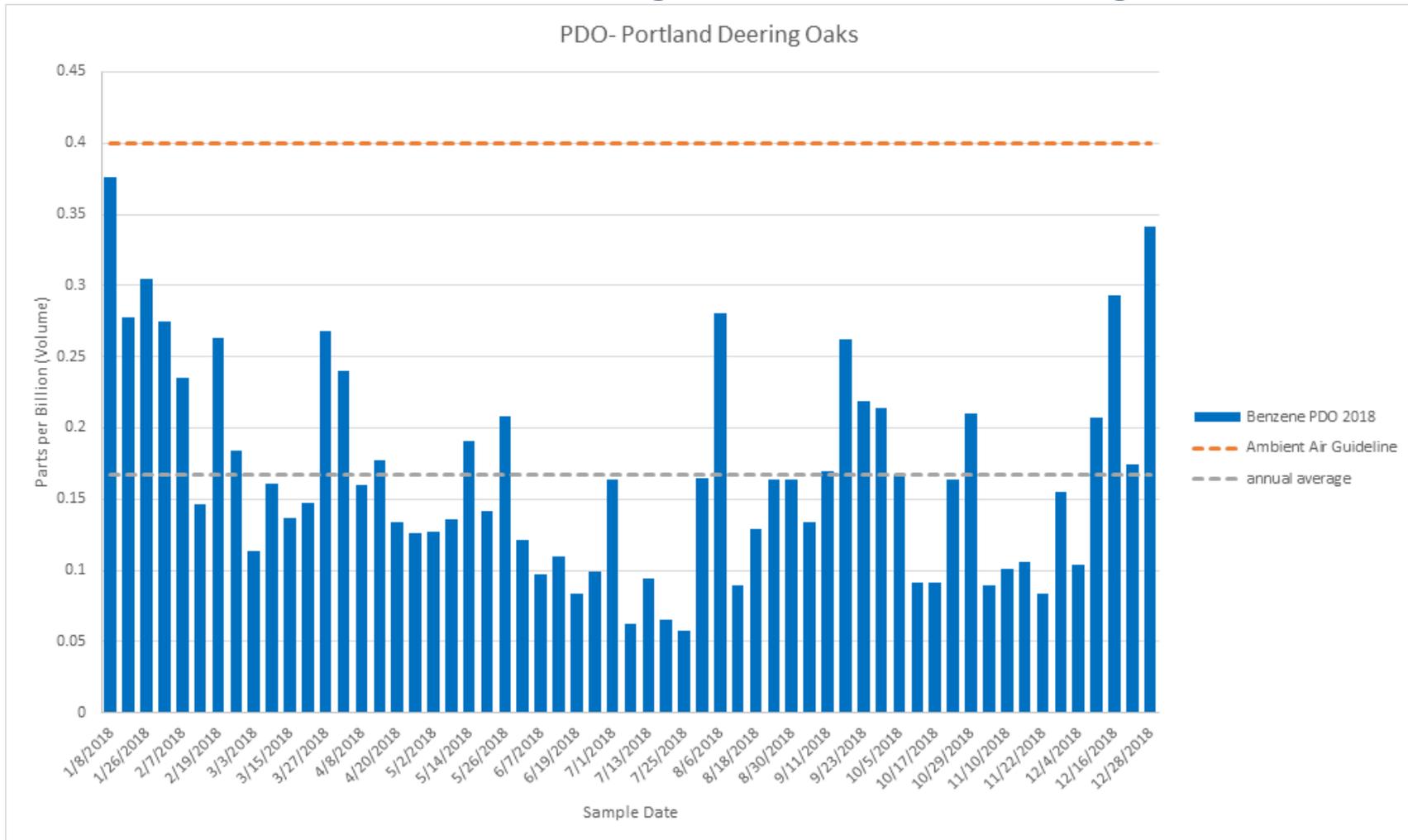


Assessors Office Benzene Results



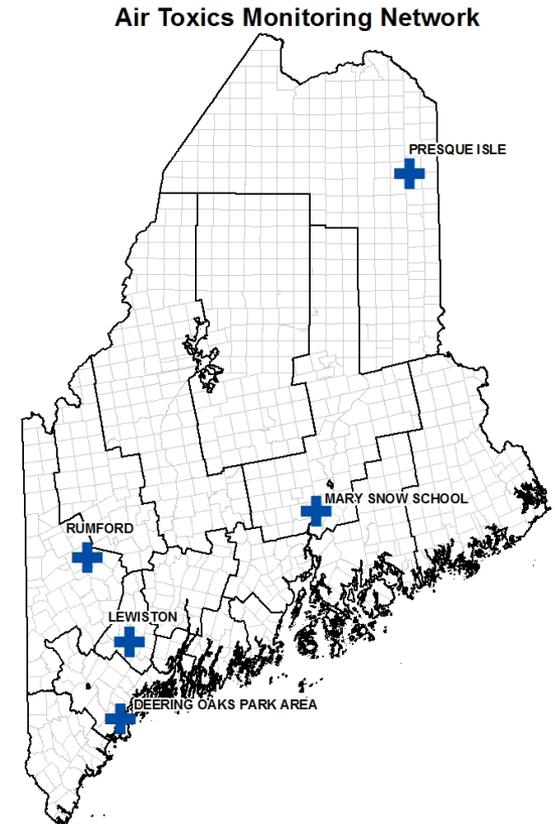
Portland Deering Oaks Site

Benzene 24-hour Averages and Annual Average



Quantifying the Effort to Date

- The 5 VOC air monitoring sites in South Portland equal the same number (5) of VOC sites operating in the entire State
- 6 canister sampling systems = ~\$12,000
- 36 canisters = ~\$23,400
- Analytical costs = ~\$29,000
- Total to date: ~\$64,400
- Significant amounts of staff time spent on planning efforts, assembling & deploying equipment, establishing & operating sites, implementing grab sampling phase, and managing the data



Going Forward from Here

- Grab and 24-hour sampling data will be made available on the DEP website beginning August 27
- Complete 24-hour sampling site set-ups in Districts 4 and 5
- Install and operate two meteorological sensors units at two appropriate locations
- Deploy “floater” sampling system to confirm “interesting” results and/or locations (i.e. “hot spots”), and explore other project objectives as needed (e.g. Greenbelt Walkway)
- Continue to do further assessments of all sample data and work with the State Toxicologist on interpreting findings
- Continue to share findings and provide periodic updates and reports to the City, and upon request.





Contact:

Andrew Johnson
Andy.Johnson@maine.gov
(207) 480-0906

www.maine.gov/dep

