North Portland Air Quality Monitoring Project Summary

Key Findings

This brief report summarizes the 2015 data from the air toxics monitoring locations (one full site, one metals only site) in the Swan Island area of North Portland.

- Eight organic compounds and one metal detected over at a range of three to 13 times their respective Oregon Ambient Benchmark Concentrations (ABCs)
- All nine compounds also detected at the National Air Toxics Trend Site, Roselawn, during the same time period at similar levels over their corresponding benchmarks
- Major emission source for most compounds – cars and trucks
- Seven of the nine compounds included in Portland Air Toxics Solutions modeling project; expected to be present in Portland metro area above benchmarks
- Two compounds detected over their odor thresholds in five percent or less of the samples

Introduction

In 2014, the Oregon Legislature provided funding to DEQ to conduct monitoring of air toxics in the Swan Island area in North Portland. In late 2014, DEQ established monitoring stations in this area. These stations included nine meteorological stations measuring temperature, wind direction and speed, one full spectrum air toxics monitoring station monitoring a wide range of potential toxic air pollutants and one metals only station (Figure 1). These stations collected data from late 2014 through early 2016. This summary provides a brief discussion of the data collected from the air toxics monitoring station during 2015.

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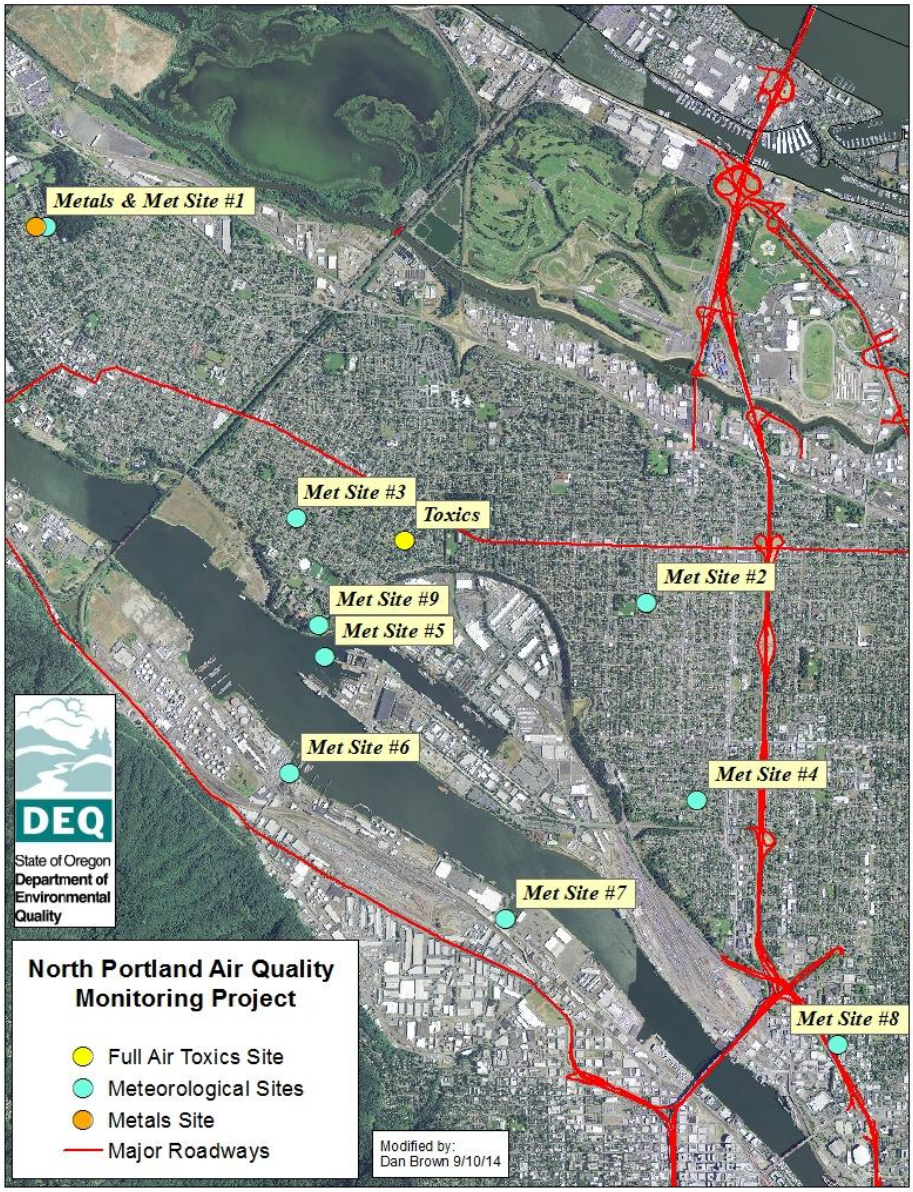
Figure 1 – Map of monitoring locations in study



Data Summary

Oregon Ambient Benchmark Concentrations

Overall, detections occurred for 20 volatile organic compounds (VOCs), 10 metals, three aldehydes or ketones and 11 polycyclic aromatic hydrocarbons (PAHs). Of these detections, the annual mean concentrations of nine compounds exceeded the associated Oregon Ambient Benchmark Concentration (ABC, Table 1).

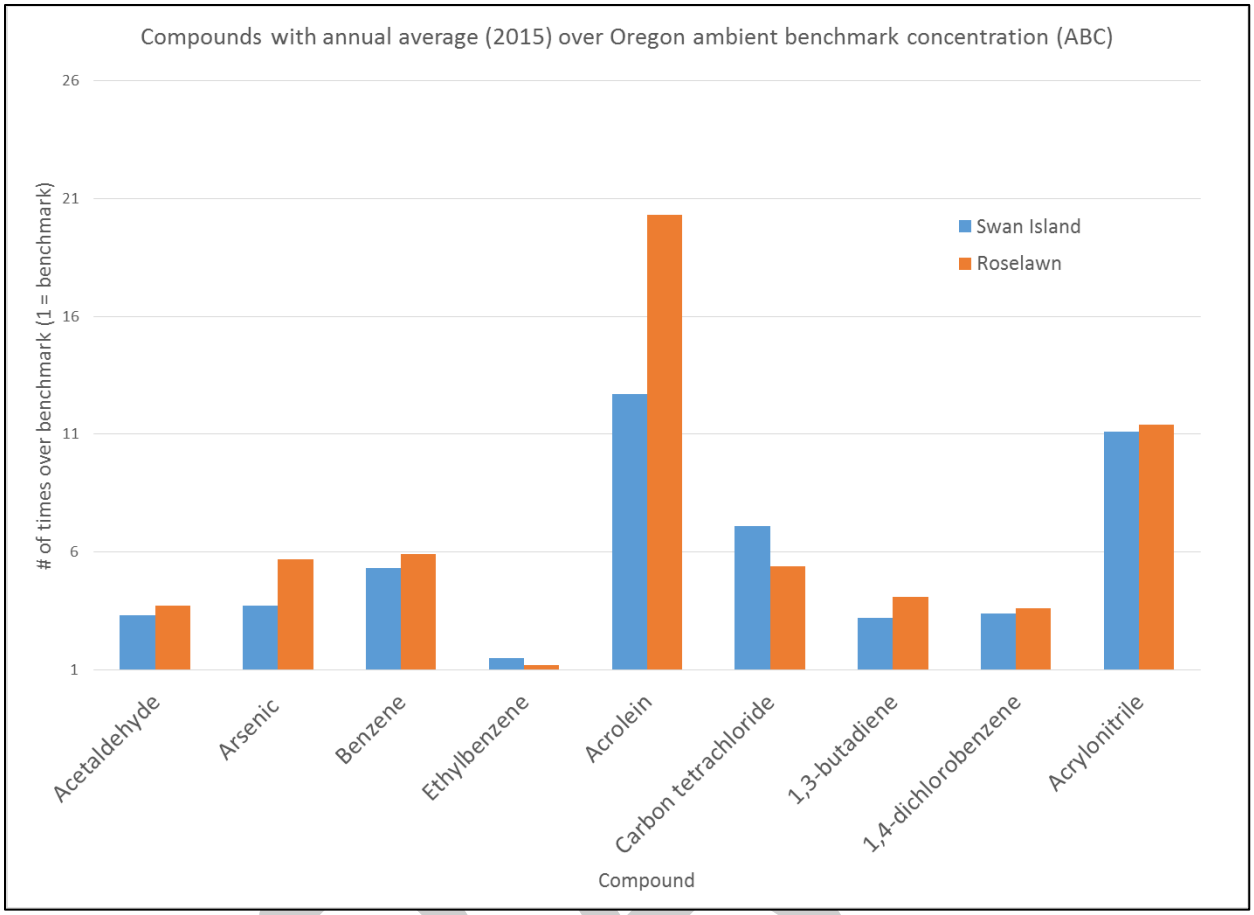


Figure 1 - Compounds with annual average over Oregon ABC

Figure 1 and Table 1 compare the detections and annual average concentrations of these compounds with the data from the urban National Air Toxics Trends Station (NATTS) at North Portland Roselawn. All compounds detected over the benchmark at the Swan Island site were also present over the benchmark at the Roselawn site. In addition at the Sitton site (metals only) the mean concentration of arsenic was 4 times the benchmark. Calculated average concentrations and percent detections were similar between the Swan Island monitoring location and the NATTS Roselawn monitoring location.

All but two (acrolein and 1,4-dichlorobenzene) of these compounds are on EPA's Master List of Compounds Emitted by Mobile Sources. In addition, the Portland Air Toxics Solutions project included all but two (carbon tetrachloride and acrylonitrile) of these compounds.

At least one detection of six compounds exceeded the associated annual average benchmark (Table 2). These data cannot be directly compared to the benchmarks (based on annual averages), but on-going spikes in concentrations may warrant additional investigation. Similar results occurred at Roselawn for all except cis-1,3-dichloropropene which was not detected at Roselawn. This compound is a fumigant used as a pesticide on a variety of crops.

Table 1 - Compounds with annual averages (2015) over Oregon Ambient Benchmark Concentration (ABC) compared to Urban NATTS [a] site, Roselawn

Compound	% Detection Swan Island	# of samples evaluated Swan Island	% Detection Roselawn	# of samples evaluated Roselawn	EPA Mobile Source Air Toxic [c]	Modeled as part of Portland Air Toxics Solutions [d]	Emission Source
Acetaldehyde	100%	58	100%	25	X	X	Wood burning [d] Cars & trucks [d]
Arsenic	100%	59	100%	22	X	X	Cars & trucks [d]
Benzene	100%	42	100%	28	X	X	Cars & trucks [d]
Ethylbenzene	100%	58	90%	21	X	X	Cars & trucks [d]
Acrolein	97%	58	96%	24		X	Wood burning [d]
Carbon tetrachloride	88%	58	70%	23	X		Industry [e] Jet Exhaust [c]
1,3-butadiene	16%	58	39%	23	X	X	Cars & trucks [d]
1,4-dichlorobenzene	10%	58	28%	32		X	Fumigant [d]
Acrylonitrile	7%	58	19%	27	X		Industry [f]

[a] National Air Toxics Trends Stations, Urban, North Portland Roselawn
[b] Oregon DEQ, Air Toxics Program, Ambient Benchmark Concentrations (ABC), October 2010
[c] EPA, The Master List of Compounds Emitted by Mobile Sources - 2006, EPA420-B-06-002
[d] Portland Air Toxics Solutions, http://www.deq.state.or.us/aq/toxics/pats.htm
[e] EPA Technology Transfer Network, Air Toxics, https://www3.epa.gov/airtoxics/hlthef/carbonte.html
[f] EPA Technology Transfer Network, Air Toxics, https://www3.epa.gov/airtoxics/hlthef/acryloni.html

Although detections of 11 PAHs occurred at the Swan Island site, the calculated exposure risk associated with these compounds was one third of the established benchmark.

Odor Thresholds

Two compounds, acetone and acetaldehyde, exceeded the respective odor threshold at the Swan Island site in 1% and 5% of samples, respectively. Both of these compounds may be emitted by mobile sources, i.e. vehicle emissions including gasoline and diesel. Additional review of the acetone data and the maximum result at the Swan Island is warranted. This compound may have industrial sources in the area, however, the high value was uncommon and only occurred in one sample. In addition, the maximum concentration of acetaldehyde also exceeded the odor threshold at the Roselawn site in 5% of samples.

Other Detections

Detections occurred for five compounds that do not have associated Oregon benchmarks, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, acetone, styrene and 2-butanone (MEK). All of these compounds are on EPA's Master List of Compounds Emitted by Mobile Sources and also occurred in samples collected at Roselawn.

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Table 2 – Compounds with at least one sample over the Oregon annual average benchmark concentration (ABC)

Compound	% of samples over benchmark Swan Island Toxics site	% of samples over benchmark Sitton	EPA Mobile Source Air Toxic	Modeled as part of Portland Air Toxics Solutions	Top Source
Manganese	10%	5%	X	X	Industry [a]
Hexavalent chromium	10%	NM	X (total)	X	Cars & trucks [a]
Formaldehyde	10%	NM	X	X	Wood burning [a] Cars & trucks [a]
Cadmium	5%	1%	X	X	Industry [a]
Nickel	1%	1%	X	X	Industry [a]
1,3-dichloropropene	1%	NM			Fumigant, pesticide [b]

[a] Portland Air Toxics Solutions, http://www.deq.state.or.us/aq/toxics/pats.htm
[b] EPA Technology Transfer Network, Air Toxics, https://www3.epa.gov/airtoxics/hlthef/dichl-pe.html

Summary

Analysis of the meteorological data may provide insight into data and potential sources of some pollutants. More information is needed to evaluate the potential concerns that may be associated with the detected compounds that do not have associated benchmarks.

All compounds detected above their associated benchmarks (Oregon ABCs) at the Swan Island site also occurred at the Roselawn NATTS site over their benchmarks on an annual average basis during 2015. Most of these compounds are included on EPA's Master List of Compounds Emitted by Mobile Sources and were part of the Portland Air Toxics Solutions (PATS) project. The modeling conducted during the PATS project indicated the potential for these to exceed benchmarks around the Portland metro area. These data confirm the presence of these compounds at levels of concern. These data in conjunction with the Portland Air Toxics modeling data may be used to focus future monitoring and source reduction efforts.

Additional Information and Resources

Portland Air Toxics Solutions, http://www.deq.state.or.us/aq/toxics/pats.htm

Oregon DEQ, Air Toxics Ambient Benchmarks Concentrations, October 2010, http://www.deq.state.or.us/aq/toxics/docs/abcRuleFinal.pdf

Oregon DEQ, Air Toxics benchmarks for industrial facilities' nickel use, April 2016, http://www.deq.state.or.us/aq/toxics/docs/BenchmarksforNickel.pdf

EPA, The Master List of Compounds Emitted by Mobile Sources - 2006, EPA420-B-06-002, http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1004KHZ.txt

EPA, National Air Toxics Trends Stations, https://www3.epa.gov/ttnamti1/natts.html

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