Draft Hayden Island Area-Wide Air Sampling Results

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State of Oregon
Department of Environmental Quality

Summary of findings

This report summarizes the 2016 data from hydrogen sulfide (H_2S) and volatile organic compound (VOC) monitoring locations in the Hayden Island area of North Portland. Initial findings are:

- No H_2S was detected at the 20 separate locations around Hayden Island.
- DEQ was not able to positively identify a compound causing odors. No VOC compound had concentrations above their odor thresholds (where odor threshold concentrations exist).
- Background samples (non-odor event) yielded the lowest concentration for several compounds that may be associated with emissions from petroleum recycling, including benzene, ethylbenzene, n-hexane, and toluene. For other VOCs, the background sample concentrations were not consistently above or below grab and 24-hour VOC concentrations.

Background

In September 2015, the U.S. Environmental Protection Agency collaborated with Oregon DEQ to investigate odor complaints and air quality concerns near Hayden Island in North Portland. EPA concluded (report) that the air testing results indicated no immediate serious or life threatening risks to the health of residents and an emergency response for air toxics was not needed. However, EPA recommended that DEQ collect additional data to further identify the chemicals causing intermittent odors and evaluate long-term health effects. Through the issuance of two information request letters, DEQ and EPA are requiring American Petroleum Environmental Services (APES) and Oil Re-refining Company (ORRCO) to perform odor monitoring twice daily and conduct sorbent tube sampling for benzene, chlorine, chloroform, dioxane, naphthalene, hydrogen sulfide and sulfur dioxide. Sorbent tube sampling is useful at identifying specific compounds at a single point in time and location and is not used to establish emission factors or make long term determinations regarding the pollutant detected. It is an inexpensive method to detect if a compound is present in stack emissions. APES and ORRCO are required to report sampling results to both DEQ and EPA twice monthly.

In addition, DEQ and EPA performed investigations into air quality concerns near Hayden Island. DEQ collected air samples near APES and ORRCO to determine the H_2S and VOC concentrations near Hayden Island. Also, short duration grab samples were collected during odor events to identify odor-causing compounds. These sampling results are from those investigations.

Sampling

DEQ used adsorbent cartridge samplers to collect 108 H_2S samples on and around Hayden Island. DEQ collected samples of H_2S at 20 separate locations over an eight-day period. Each location had one sorbent tube sample for the entire eight-day period, while the other samples were replaced every 48 hours.

DEQ also collected seven VOC samples (including one background sample) on Hayden Island using two different air canister sampling methods, a grab sample and a 24-hr sample. A Hayden Island resident collected the grab samples to evaluate VOC concentrations during specific odor events. DEQ performed 24-hour sampling to determine an average ambient concentration. Grab samples and 24-hour samples were collected simultaneously to correlate short-term events with a 24-hour period.

Seven grab samples were collected by the resident on Hayden Island. One 24-hr sample was collected on May 28, coinciding with an odor event. Grab samples were collected during odor events on June16 (two samples), and July 3. During the same period, DEQ collected two 12-hour samples near APES and ORRCO. Finally, DEQ determined background pollutant concentrations on Hayden Island by conducting sampling when no odors were present.

Hayden Island data

The DEQ laboratory did not detect H_2S above the reporting limit in any of the samples tested. Hydrogen sulfide was detected in all analyzed laboratory quality control samples, ensuring the chemistry of the method is valid.

Table 1 below shows data from the ten VOC samples collected on Hayden Island. The odor threshold for each compound is included. DEQ analyzed the samples for sixty-three VOCs at the DEQ laboratory in Hillsboro. Where odor thresholds exist, the concentrations of the corresponding compounds were in all cases much less than the odor threshold, and in most cases, less by orders of magnitude.

The background sample shown in the table was collected during a no-odor event. The background sample yielded the minimum (lowest) concentration for several compounds, including benzene, ethylbenzene, n-hexane, and toluene, that may be associated with emissions from petroleum recycling. The background sample was the only sample to have a chloroform detection above the method detection limit (MDL). For other VOCs, the background sample concentrations were not consistently below grab and 24-hour VOC concentrations.

Table 1. GS is a grab sample. Non-detect (ND) values indicate that the concentration of the compound was below the detection limit of the measuring device. All values in the table below have units of µg/m³.

Compound	Odor Threshold	GS Background 6/25	24 hr 4/30	12 hr ORRCO 5/1	12 hr APES 5/1	GS 5/28	24 hr 5/28	GS 6/9	GS1 6/16	GS2 6/16	GS 7/3
1,2,4-Trimethylbenzene	30	0.536	1.042	1.696	2.222	2.379	4.066	2.463	1.465	1.077	1.834
1,2-Dimethylbenzene	N/A	0.336*	0.569	0.964	1.507	0.942	1.103	1.485	0.591	0.612	0.890
1,3,5-Trimethylbenzene	30	0.288*	0.271*	0.506*	0.629	0.551	1.008	0.551	0.391*	0.391*	0.467*
1,3-Butadiene	220	ND	ND	0.117*	ND	0.109*	ND	0.095*	ND	ND	ND
1,4-Dichlorobenzene	730	ND	ND	ND	ND	0.326*	0.340*	ND	ND	ND	ND
1,4-Dimethylbenzene + 1,3-Dimethylbenzene	N/A	0.729*	1.381	2.683	4.068	2.605	2.761	4.602	1.415	1.402	2.748
2-Butanone (MEK)	N/A	0.422*	0.991	0.902	1.079	0.935	1.103	2.763	0.448*	0.495*	0.908
4-Ethyltoluene	N/A	ND	ND	ND	0.605*	0.536*	0.959*	0.590*	ND	ND	ND
Acetone	940	4.252	5.440	4.870	4.323	6.628	5.440	11.188	2.874	4.323	3.611
Acetonitrile	N/A	0.274*	0.181*	0.104*	0.149*	0.248*	0.218*	0.343	0.238*	0.571	0.287*
Acrolein	8.3	0.152*	0.214*	0.271	0.218*	0.243	0.200*	0.232	0.179*	0.211*	0.196*
Acrylonitrile	3400	ND	ND	ND	ND	0.143*	ND	0.121*	ND	ND	0.121*
Benzene	1500	0.160*	0.345	0.530	0.594	1.154	0.495	1.032	0.336	0.336	0.451
Benzyl chloride	N/A	ND	ND	ND	ND	ND	0.275*	ND	ND	ND	ND
Carbon tetrachloride	10580	0.619	0.628	0.487	0.527	0.500	0.512	0.493	0.561	0.581	0.539
Chloroform	500	0.275*	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	<21000	1.183	1.295	1.074	0.743	1.086	1.233	1.101	1.640	1.448	1.024
Cyclohexane	N/A	ND	0.244*	0.998	0.644	1.404	0.406	1.194	0.485	0.465	0.657
Dichlorodifluoromethane (Freon 12)	N/A	2.576	2.824	2.393	1.647	2.250	2.517	2.458	3.051	2.908	2.428
Ethylbenzene	26	0.272*	0.364*	0.686	0.977	0.695	0.643	1.151	0.460	0.447	0.686
Isopropanol	N/A	0.479*	0.273*	ND	0.420*	1.482	0.917	1.050	0.361*	0.681	0.322*
Methylene chloride	4100	0.545	0.493	0.531	0.597	0.396	0.386	0.750	0.660	0.743	0.382
n-Heptane	N/A	ND	0.334*	0.656	0.533	1.254	0.504	1.689	0.402*	0.422	1.238
n-Hexane	5300	0.215*	0.402	0.927	0.754	2.196	0.656	1.921	0.779	0.761	1.600
Styrene	12	0.228*	ND	0.332*	0.354*	0.329*	0.230*	0.302*	0.219*	0.235*	0.313*
Tetrachloroethylene	5200	ND	ND	0.157*	ND	0.165*	ND	0.621*	ND	ND	ND
Tetrahydrofuran	N/A	ND	ND	ND	ND	1.251	3.018	8.214	ND	ND	2.574
Toluene	98	1.023	1.702	6.854	5.843	6.911	3.483	9.214	2.332	2.416	5.545
Trichlorofluoromethane (Freon 11)	N/A	2.054	2.314	2.092	1.410	1.954	2.061	1.962	2.061	2.069	1.801
Trichlotrifluoroethane (Freon 113)	N/A	0.211*	0.210*	0.187*	0.217*	0.181*	0.189*	0.204*	0.215*	0.217*	0.189*

*Values are below the Method Reporting Limit (MRL) and the lowest calibration standard for the analytical method being used. Therefore values are reported as estimates.

Compound information

ORRCO and APES recycle used petroleum products through the combination of vacuum distillation and wiped-film evaporation. Emissions of air toxics such as benzene, ethylbenzene, n-hexane and toluene, as well as hydrogen sulfide are known byproducts of used oil re-recycling.

The following table provides information regarding the most significant sources of VOCs. The table shows 17 compounds of the 30 compounds with detectable concentrations at Hayden Island are listed on EPA's list of 187 hazardous air pollutants (HAPs).

Compound	Most Significant Sources
1,3-butadiene	1,3-butadiene comes from incomplete combustion of fuels from cars and trucks, and off-road engines like lawn mowers and boats. Additional sources include petroleum refining, production of rubber and plastics, forest fires and cigarette smoke.
1,4-Dichlorobenzene	1,4-Dichlorobenzene is used as a fumigant to control moths, molds, and mildew. It also is used as a disinfectant in waste containers and restrooms and is the characteristic smell associated with urinal cakes.
2-Butanone (MEK)	2-Butanone is a manufactured chemical but it is also present in the environment from natural sources. 2-Butanone is produced in large quantities. Nearly half of its use is in paints and other coatings because it will quickly evaporate into the air and it dissolves many substances. It is also used in glues and as a cleaning agent.
Acetonitrile	Acetonitrile is predominantly used as a solvent in the manufacture of pharmaceuticals, for spinning fibers and for casting and molding of plastic materials, in lithium batteries, for the extraction of fatty acids from animal and vegetable oils, and in chemical laboratories for the detection of materials such as pesticide residues. Acetonitrile is also used in dyeing textiles and in coating compositions as a stabilizer for chlorinated solvents and in perfume production as a chemical intermediate.
Acrolein	Acrolein enters the air mainly from wood burning, structural (house and building) fires and construction. Tobacco smoke is another source of acrolein.
Acrylonitrile	Acrylonitrile is used to make other chemicals such as plastics, synthetic rubber, and acrylic fibers. A mixture of acrylonitrile and carbon tetrachloride was used as a pesticide in the past. However, all pesticide uses of this chemical have stopped.
Benzene	Benzene is formed from both natural processes and human activities. Benzene is found in emissions from cars and trucks, wood smoke, evaporation from service stations and industrial solvents. Tobacco smoke contains benzene.
Benzyl chloride	Benzyl chloride is used as a chemical intermediate in the manufacture of certain dyes and pharmaceutical, perfume and flavor products. It also is used as a photographic developer. Benzyl chloride can be used in the manufacture of synthetic tannins and as a gum inhibitor in petrol. Benzyl chloride has been used as an irritant gas in chemical warfare.

Compound	Most Significant Sources
Carbon tetrachloride	Carbon tetrachloride is a manufactured chemical that does not occur naturally. It was used in the production of refrigeration fluid and propellants for aerosol cans, as a pesticide, as a cleaning fluid and degreasing agent, in fire extinguishers and in spot removers. Because of its harmful effects, these uses are now banned and it is only used in some industrial applications.
Chloroform	In the past, chloroform was used as an inhaled anesthetic during surgery, but it isn't used that way today. Today, chloroform is used to make other chemicals and can also be formed in small amounts when chlorine is added to water.
Chloromethane (methyl chloride)	Methyl chloride is used mainly in the production of silicones where it is used to make methylate silicon. It also is used in the production of agricultural chemicals, methyl cellulose, quaternary amines, and butyl rubber and for miscellaneous uses including tetramethyl lead. Methyl chloride was used widely in refrigerators in the past, but generally this use has been taken over by newer chemicals such as Freon.
Ethylbenzene	The main sources of ethylbenzene in the Portland area are gasoline engines, gasoline evaporation and painting operations. Ethylbenzene also is used in the production of styrene (used to make polystyrene plastic).
Methylene chloride	Methylene chloride does not occur naturally in the environment. Methylene chloride is used as an industrial solvent and as a paint stripper. It also may be found in some aerosol and pesticide products and is used in the manufacture of photographic film.
n-Hexane	*n*-Hexane is a chemical made from crude oil. Pure *n*-Hexane is used in laboratories. Most of the *n*-Hexane used in industry is mixed with similar chemicals called solvents. The major use for solvents containing n-Hexane is to extract vegetable oils from crops such as soybeans. These solvents are also used as cleaning agents in the printing, textile, furniture, and shoemaking industries. Certain kinds of special glues used in the roofing and shoe and leather industries also contain n-Hexane. Several consumer products contain *n*-Hexane, such as gasoline, quick-drying glues used in various hobbies, and rubber cement.
Styrene	Styrene is primarily a synthetic chemical. It often contains other chemicals that give it a sharp, unpleasant smell. Billions of pounds are produced each year to make products such as rubber, plastic, insulation, fiberglass, pipes, automobile parts, food containers, and carpet backing. Most of these products contain styrene linked together in a long chain (polystyrene) as well as unlinked styrene. Low levels of styrene also occur naturally in a variety of foods such as fruits, vegetables, nuts, beverages and meats.
Tetrachloroethylene (PERC)	Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It also is used to make other chemicals and is used in some consumer products.
Toluene	Toluene occurs naturally in crude oil and in the tolu tree. It also isproduced in the process of making gasoline and other fuels from crude oil and making coke from coal. Toluene is used in making paints, paint thinners, fingernail

Compound	Most Significant Sources
	polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

* Significant source information from ATSDR, USEPA, and DEQ's PATS

Next steps

As part of the joint 114 letter sent to APES on April 5, 2016, by DEQ and EPA, APES was required to sample effluent streams at the facility using sorbent tubes approved by DEQ and EPA. DEQ and EPA have received sorbent tube data from ORRCO and APES and are in the process of evaluating those results. DEQ will compare the sorbent tube results to days with recorded citizen complaints, wind direction, wind speed, and the results of grab samples collected during odor events. This comparison will help inform whether there is a correlation between emissions and odors.