



Port of Oakland, California

Radiello® sampler

Summary

Media:	Outdoor air
Study Type:	Side-by-side study
Technology:	Accumulation
Peer Reviewed:	Yes
Publication Date:	November 18, 2013

Study Description

- The Port of Oakland and neighboring communities of West Oakland and Alameda are all in California’s Bay Area. Samples were collected in industrial areas, as well as mixed-use commercial and residential areas. Sampling conditions included both summer and winter weather.
- Compound: Nitrogen dioxide (NO₂), oxides of nitrogen (NO_x), sulfur dioxide (SO₂), benzene/toluene ethylbenzene/xylenes (collectively known as BTEX), carbonyl compounds (formaldehyde, acetaldehyde, and acrolein), PM_{2.5}, organic carbon (OC), elemental carbon (EC), and metals.
- This study was conducted over two approximately month-long periods in the summer of 2009 and the winter of 2009/2010. During each sampling event, the passive samplers were deployed for four one-week periods. Additional spatial surveys were conducted during select days within these monitoring events using a “mobile monitoring van.” The vans would collect real-time measurements from the sampling locations twice a day.
- Samples were collected and/or analyzed using the following technologies:
 - BTEX and carbonyl compounds: Radiello passive samplers
 - NO₂, NO_x, and SO₂: Ogawa passive samplers
 - PM_{2.5}: Collected using 7-day Teflon and quartz filter samples with portable Airmetrics MiniVol samplers and analyzed by gravimetry
 - OC and EC: Thermal-optical reflectance with the IMPROVE protocol
 - Metals: X-ray fluorescence (XRF)

Remedial Phase

In 2004, the Bay Area Air Quality Management District (BAAQMD) initiated the Community Air Risk Evaluation (CARE) program to evaluate health risks associated with exposure to toxic air contaminants (TACs). Its objectives were to identify at-risk communities within the nine San Francisco Bay Area (Bay Area) counties and subsequently establish policies to address these concerns. Under the CARE program, initial modeling identified West Oakland, a mixed residential/industrial area that borders the Port of Oakland, as one of these “at-risk communities.” This study, known as the West Oakland Monitoring Study (WOMS), was conducted to collect supplemental air quality data for the evaluation of local-scale dispersion modeling of diesel emissions and other toxic air contaminants. WOMS objectives were to evaluate whether gradients in pollutant concentrations exist within West Oakland, the adequacy of existing air quality

monitoring in the area, mean pollutant concentrations compared to other Bay Area urban areas, and whether the results are consistent with the modeled results from the CARE and BAAQMD's 2005 health risk assessment (HRA).

Outcome

The analytical data were compared to the three other air monitoring networks in the Bay Area (San Francisco, Fremont, and San Jose). BTEX concentrations in all four networks were similar. Aldehyde levels were lower in West Oakland than in Fremont and San Jose, "reflecting greater contribution of atmospheric formation of aldehydes from photo-oxidation of hydrocarbons in downwind area of the Bay Area." Compared to San Jose, West Oakland had a similar estimated mass concentrations of diesel particulate matter (DPM), but higher fractions of DPM to TAC and PM_{2.5}. The results of the study also indicated that estimated concentrations of DPM in the WOMS were consistent with those of the 2005 HRA "after adjustments were made for recent mitigation measures and corrections were made to truck traffic volumes." The WOMS indicated the effectiveness of the diesel reduction projects, updated regulatory requirements, and focused enforcement near the Port of Oakland; however, WOMS recommended continued monitoring to further assess the higher pollutant concentrations along major roadways in West Oakland that had been identified.

Table 7. Comparisons of DPM ($\mu\text{g}/\text{m}^3$) estimated from the WOMS saturation monitoring data with modeled results from the CARB/BAAQMD health risk assessment

Site	WOMS Summer	WOMS Winter	WOMS Average Summer and Winter	Annual Average HRA Estimates	Adjusted HRA Estimates	HRA/WOMS	Adjusted HRA/WOMS
POU	0.44 ± 0.22	1.77 ± 0.46	1.1	< 1.6	0.6–0.9	1.4	0.7
POC & POC2	0.64 ± 0.24	2.66 ± 0.66	1.7	4.7	1.8–2.8	2.9	1.4
NR1	0.92 ± 0.29	2.03 ± 0.52	1.5	3.1	1.2–1.9	2.1	1.0
WO1	0.81 ± 0.27	2.05 ± 0.54	1.4	3.1	1.2–1.9	2.2	1.1
WO3	0.89 ± 0.28	2.06 ± 0.53	1.5	3.1	1.2–1.9	2.1	1.0
WO2	0.84 ± 0.28	1.85 ± 0.48	1.3	3.1	1.2–1.9	2.3	1.1
EMUD		1.93 ± 0.51	1.3	3.1	1.2–1.9	2.3	1.1
CFDW	0.66 ± 0.25	1.98 ± 0.51	1.3	3.1	1.2–1.9	2.4	1.2
Community mean	0.81 ± 0.11	1.98 ± 0.21	1.4	3.1	1.2–1.9	2.2	1.1
STN San Jose	0.93	2.54	1.7				

Case Study Source

Fujita, Eric M., David E. Campbell, W. Patrick Arnott, Virginia Lau, and Philip T. Martien. 2013. "Spatial Variations of Particulate Matter and Air Toxics in Communities Adjacent to the Port of Oakland." *Journal of the Air & Waste Management Association* 63(12) (December 1): 1399–1411. <https://doi.org/10.1080/10962247.2013.824393>.

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