

Wood Buffalo Environmental Association **Program Description**

Passive Program

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Program Overview

The Passives sampling program is a part of a collection of integrated monitoring programs operated by the WBEA Deposition (DEP) monitoring group (formerly the Terrestrial Environmental Effects Monitoring [TEEM] group). The Passives program provides measurements of key atmospheric pollutants in remote areas around the Regional Municipality of Wood Buffalo. The monitoring network aims to accurately determine the spatial and temporal distribution of atmospheric pollutants for air quality and deposition modeling and evaluation of ecosystem responses.

The Passives program was established to address specific monitoring questions:

- Monitor NO₂, SO₂ and O₃ in remote areas
- Co-locate with Denuders to monitor air quality parameters denuders currently cannot

Sampling Environment

Passives are placed either on a 30-m tower or on a tripod (near ground).

At tower sites, the passives are installed so that the samples are positioned approximately 5 meters above the canopy and offset 1 meter from the tower. A pulley system allows the sampler to be lowered to the ground for monthly sample changeouts.

Passives are placed on tripods (near ground) for two main reasons: (1) instalment of a tower at that location is not possible, or (2) it is co-location at an ambient Air Monitoring Station (AMS). At AMS locations, Passives are mounted on the AMS roof so that the samplers are positioned approximately 3-4 meters above the ground surface. At other tripod (near ground) locations not at AMS sites, the Passives are placed on a tripod in an open area. The tripod is placed on a wood deck at ground level.

History

Below is a timeline of major network developments.

- 2010 – First samplers deployed as part of Passives program. Network consisted of Disk/Tang-BV and Ogawa samplers under a PVC capped shelter. Some passives were mounted on T-posts at ground level, and some were located on towers. Species of interest included NO₂, SO₂, O₃, NH₃ and NO₃.
- 2019 – December was the last month of the old passives network. Questions arose about the calculation of the blank samples. Network was paused.
- 2023 – New passive program was proposed to be restarted. This included changes such as: Ogawa clip samplers, and co-location with denuder (on tower or tripod). Species of interest included NO₂, O₃ and SO₂.



Equipment Details

Field blanks are deployed at 10% of the sites within the Passives program. These are used to measure potential contamination during transport and field operations. The blank sampler must remain unexposed to ambient air. The blanks remain in the sealed plastic bag and are stored underneath a separate shelter only for blanks. Field blanks are attached to the aluminum bar using a binder clip.

Sampler Description

Passive air samplers use collection media that accumulate chemical compounds from ambient air by physical or chemical absorbance and, as a result, do not have any moving parts or power requirements. Passive samplers rely on gas diffusion through a barrier or permeation through a membrane and the physics of this process control the sampling rate. Samplers are exposed to ambient air for 30 ± 4 days (AMD requirement). Atmospheric concentrations of the target gas are determined by extracting and analyzing the target analyte and then converting the mass loading to a concentration in air using an empirically derived equation.

The Ogawa passives are a two-ended sampler on a clip that is clipped up under a weather shelter (Figure 1 and 2). Three passive samplers are deployed at each site. Duplicates of each analyte are deployed at each site in case of loss of field samples due to dropping or damage (Table 1). Samplers are labelled for analytes on each sample.

Table 1: Compounds currently measured by Ogawa passives and combinations for deployment.

| Sampler ID | Compound 1 | Compound 2 |
|------------|-----------------|------------------|
| A | Ozone | Nitrogen dioxide |
| B | Sulphur dioxide | Ozone |
| C | Sulphur dioxide | Nitrogen dioxide |



Figure 1. Ogawa passive sampler





Figure 2. Ogawa passive samplers under the weather shelter

Timeline of Activities

- Monthly changeouts
 - Inspect the sampler at time of arrival
 - Lower shelter and retrieve sampling media from previous month
 - Deploy sampling media for the current month (and any field blanks) and verify that all connections are tight
 - Confirm proper placement within the shelter before raising sampler to the top of the MET tower

