Nitrogen dioxide (NO$_2$) is a principle component of photochemical smog that is present in polluted atmospheres at the parts per billion (ppb) level. In this work, cavity ring-down spectroscopy (CRDS) is utilized for the detection of ambient NO$_2$. Sub ppb limit of detection is routinely achieved. Experimental approaches to remove the particulates and to improve the detection limit and accuracy are investigated. Ambient measurements of NO$_2$ by CRDS are evaluated, and are compared side by side with the NO$_2$ measurements by chemiluminescence analysis.