The prediction of extreme air pollution concentrations for environmental assessments is routinely performed by modelling one year using an air quality dispersion model. In most cases, modelling one year rather than a number of years is the only practical approach to use, as often meteorological data needed to drive air quality models are not available for more than one year in industrial regions. However, questions remain with this approach as to whether reliable extreme statistics can be obtained from a one year modelling study, and how these are then interpreted and used when applying regulatory standards and exceedance goals or emission licensing requirements. This paper investigates the sensitivity and inherent uncertainty in modelling annual statistics of ground level concentration for a single year by using a prognostic meteorological and air pollution model to simulate a generic elevated point source over a twelve year period. The year-to-year variability in modelling annual statistics is explored for the regional maximum of the annual average, 9th highest and maximum ground level concentration. Both a tracer species and a chemically reacting species are examined.