Orthovoltage x-ray beams exhibit the characteristic of depth dose buildup which is not well described in the literature. The principal reason for this phenomenon is the increase in dose deposited due to electrons set in motion by secondary (Compton) scattered photons within the phantom, as depth is increased until longitudinal equilibrium is reached. This happens within a few millimetres of the surface and has been demonstrated both experimentally and by Monte Carlo methods. The Monte Carlo technique also enabled the description of a second order primary dose buildup effect (due to longitudinal photoelectron buildup) that would be impossible to detect with conventional detectors due to the extremely short range of the photoelectrons. The magnitude of buildup was observed to alter with various combinations of the orthovoltage beam parameters. The experimentally measured depth dose curve from an 135 kVp x-ray beam gave a maximum dose that was 7.5% greater than the surface dose and the dose at depth dropping below the surface dose at about 5 mm. It is recommended that radiation oncology departments assess this effect in the context of their clinical data in current use to ensure that there are not doses higher than those prescribed being applied a few millimetres below the skin surface. This should be considered especially if the depth dose data was not collected with a thin windowed, parallel plate ionisation chamber or that coarse steps were used along the beam central axis.