Let $s(\theta)$ be the lens hood suppression as a function of angle θ from the camera boresight to a given point-source on the sky. By definition,

$$s(\theta) \equiv \frac{F_{\rm obs}}{F_{\rm ns}}, \tag{1}$$

for $F_{\rm obs}$ the observed flux of the source (that which reaches the CCD), and $F_{\rm ns}$ the flux that would be observed with no suppression. The observed flux of the source can then be written as a function of θ

$$\begin{aligned} F_{\rm obs}(\theta) &= s(\theta)F_{\rm ns} \qquad (2)\\ &= s(\theta)F_0 10^{-0.4(m_{\rm ns}-m_0)}, \qquad (3) \end{aligned}$$

for F_0 the (non-suppressed) flux corresponding to a source with zero-point apparent magnitude m_0, and $m_{\rm ns}$ the apparent magnitude of the source with no suppression. Winn 2013 tabulates $F_0 = 1.6 \times 10^6$ ph/s/cm^2 for an $I = 0$, G2V star. Thus

$$F_{\rm obs}(\theta) = (1.6 \times 10^6) s(\theta) 10^{-0.4 m_{\rm ns}} \quad [\text{ph/s/cm}^2]. \tag{4}$$

We can then write the following expression for $\mu \equiv F_{\rm obs}A\eta/N$, the mean incident flux on the camera of interest:

$$\mu = (1.6 \times 10^6) s(\theta) 10^{-0.4 m_{\rm ns}} \frac{A\eta}{N} \quad [\text{ct/px/s}], \tag{5}$$

for A the effective observing area in cm^2, N the number of pixels per camera, and η the quantum efficiency. For TESS, $A = 69.1\,\text{cm}^2$, $N = 4096^2$, and $\eta \approx 1$. Plugging in these numbers gives

$$\mu = 6.59 s(\theta) 10^{-0.4 m_{\rm ns}} \quad [\text{ct/px/s}]. \tag{6}$$

Note that the above expression assumes that the scattered flux from the source is uniformly spread across the CCD. The reality may be quite different. In addition, the zero-point we used relied on an I magnitude calibration – for accuracy, separate zero-points based on different bandpasses should be computed. Assuming a Poisson arrival rate, the standard deviation in the number of counts per pixel per 2 second readout is then

$$\sigma \approx \mu^{1/2} = \left[13.2 s(\theta) 10^{-0.4 m_{\rm ns}}\right]^{1/2} \quad [\text{ct/px RMS per 2 sec image}]. \tag{7}$$

To compute the net effect on TESS's noise budget, add σ from Eq. 7 in quadrature with Eq. BLAH.