33.14. **Model:** Assume the inductance is that of a solenoid.
Visualize: The inductance of a solenoid depends on the number of turns, the length, and the cross-sectional area.
Solve: The length in terms of the number of turns in a layer and the wire diameter is $l = N_l d_{\text{wire}}$. The total number of turns is $N = 4N_l$. For a solenoid we have

$$L_{\text{sol}} = \frac{\mu_0 N^2 A}{l} \Rightarrow N = \sqrt{\frac{lL_{\text{sol}}}{\mu_0 A}} = \sqrt{\frac{(0.050\ \text{m})(100\times10^{-6}\ \text{H})}{(4\pi\times10^{-7}\ \text{H/m})\pi(0.0050\ \text{m})^2}} = 225$$

$$\Rightarrow N_l = \tfrac{1}{4}N = 56 \Rightarrow d_{\text{wire}} = \frac{l}{N_l} = \frac{0.050\ \text{m}}{56} = 8.9\times10^{-4}\ \text{m} = 0.89\ \text{mm}$$