

$$\begin{aligned}
H = V + K_1 + K_2 = & \Delta^{-2} \begin{pmatrix} 1 + \Delta^2 V_0 & 0 & 0 & & 0 \\ 0 & 1 + \Delta^2 V_1 & 0 & & 0 \\ 0 & 0 & 1 + \Delta^2 V_2 & & 0 \\ & & & \ddots & \\ & & & & 1 + \Delta^2 V_{L-2} & 0 \\ 0 & & 0 & & 0 & 1 + \Delta^2 V_{L-1} \end{pmatrix} \\
& + \Delta^{-2} \begin{pmatrix} \boxed{\begin{matrix} 0 & -1/2 \\ -1/2 & 0 \end{matrix}} & 0 & 0 \\ 0 & \boxed{\begin{matrix} \ddots & -1/2 \\ -1/2 & 0 \end{matrix}} & 0 \\ 0 & 0 & \boxed{\begin{matrix} 0 & -1/2 \\ -1/2 & 0 \end{matrix}} \end{pmatrix} + \Delta^{-2} \begin{pmatrix} 0 & 0 & 0 & 0 \\ 0 & \boxed{\begin{matrix} 0 & -1/2 \\ -1/2 & 0 \end{matrix}} & 0 \\ 0 & 0 & \ddots & 0 \\ 0 & 0 & 0 & \boxed{\begin{matrix} 0 & -1/2 \\ -1/2 & 0 \end{matrix}} \end{pmatrix}
\end{aligned}$$