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

$$+\Delta^{-2}\begin{pmatrix} 0 & -1/2 & 0 & & & 0 \\ -1/2 & 0 & 0 & & & \\ 0 & 0 & 0 & & & \\ & & & \ddots & -1/2 & 0 \\ & & & -1/2 & 0 & 0 \\ 0 & & & 0 & 0 & 0 \end{pmatrix} + \Delta^{-2}\begin{pmatrix} 0 & 0 & 0 & & & 0 \\ 0 & 0 & -1/2 & & & \\ 0 & -1/2 & 0 & & & \\ & & & \ddots & & 0 \\ & & & & 0 & -1/2 \\ 0 & & & 0 & -1/2 & 0 \end{pmatrix}$$