$$\left[\mathbf{I}-\frac{\nu\otimes\mathbf{N}}{\mathbf{N}\cdot\nu}\right]\left[[(\mathbf{I}-d\mathbf{H})(x)]^{-1}\right]^T[(\mathbf{I}-d\mathbf{H})(x)]^{-1}\left[\mathbf{I}-\frac{\mathbf{N}\otimes\nu}{\mathbf{N}\cdot\nu}\right]$$
$$=\left[\mathbf{I}-\frac{\nu\otimes\mathbf{N}}{\mathbf{N}\cdot\nu}\right][\mathbf{I}+2\sum_{i=1}^{n}d(x)\kappa_i(\psi(x))\mathbf{e}_i\otimes\mathbf{e}_i]\left[\mathbf{I}-\frac{\mathbf{N}\otimes\nu}{\mathbf{N}\cdot\nu}\right]+O(h^{2k})$$
$$=\mathbf{I}-\frac{\nu\otimes\mathbf{N}}{\mathbf{N}\cdot\nu}-\frac{\mathbf{N}\otimes\nu}{\mathbf{N}\cdot\nu}+\frac{\nu\otimes\nu}{(\mathbf{N}\cdot\nu)^2}$$
$$+2\sum_{i=1}^{n}d(x)\kappa_i(\psi(x))\left[\mathbf{e}_i\otimes\mathbf{e}_i-\frac{\mathbf{N}\cdot\mathbf{e}_i}{\mathbf{N}\cdot\nu}(\nu\otimes\mathbf{e}_i+\mathbf{e}_i\otimes\nu)+\left(\frac{\mathbf{N}\cdot\mathbf{e}_i}{\mathbf{N}\cdot\nu}\right)^2\nu\otimes\nu\right]$$
$$+O(h^{2k}).$$