$g^{\mu\nu}\delta W^{(1)}_{\mu\nu}$ v3

1 Generalized RW Geometry

We use the following geometry which facilitates easy computation by either taking $k = 0$ or $\Omega(x) = \Omega(\tau)$ depending, on the desired coordinates (conformal flat or conformal comoving respectively).

$$\begin{aligned} ds^2 &= (g_{\mu\nu} + h_{\mu\nu})dx^\mu dx^\nu = \Omega^2(x)(\tilde{g}_{\mu\nu} + f_{\mu\nu})dx^\mu dx^\nu && (1.1)\\ \tilde{g}_{\mu\nu} &= \text{diag}\left(-1, \frac{1}{1-kr^2}, r^2, r^2\sin^2\theta\right) \qquad \tilde{\Gamma}^\lambda_{\alpha\beta} = \delta^\lambda_i\delta^j_\alpha\delta^k_\beta\tilde{\Gamma}^i_{jk} && (1.2)\end{aligned}$$

1.1 W_1

As evaluated in the background geometry of (1.1):

$$\begin{aligned} g^{\mu\nu}W^{(1)}_{\mu\nu} &= 6\nabla_\alpha\nabla^\alpha R\\ &= 6\Omega^{-4}\tilde{\nabla}_\alpha\tilde{\nabla}^\alpha\tilde{R} - 12\tilde{R}\Omega^{-5}\tilde{\nabla}_\alpha\tilde{\nabla}^\alpha\Omega - 12\Omega^{-5}\tilde{\nabla}_\alpha\tilde{R}\tilde{\nabla}^\alpha\Omega + 12\tilde{R}\Omega^{-6}\tilde{\nabla}_\alpha\Omega\tilde{\nabla}^\alpha\Omega - 144\Omega^{-6}\tilde{\nabla}_\alpha\tilde{\nabla}_\beta\tilde{\nabla}^\beta\Omega\tilde{\nabla}^\alpha\Omega\\ &\quad -108\Omega^{-6}\tilde{\nabla}_\alpha\tilde{\nabla}^\alpha\Omega\tilde{\nabla}_\beta\tilde{\nabla}^\beta\Omega + 216\Omega^{-7}\tilde{\nabla}_\alpha\Omega\tilde{\nabla}^\alpha\Omega\tilde{\nabla}_\beta\tilde{\nabla}^\beta\Omega + 36\Omega^{-5}\tilde{\nabla}_\beta\tilde{\nabla}^\beta\tilde{\nabla}_\alpha\tilde{\nabla}^\alpha\Omega\\ &= 36\Omega^{-5}\Big[\dddot{\Omega} - 2k\ddot{\Omega} + 6\ddot{\Omega}\dot{\Omega}^2\Omega^{-2} - 3\ddot{\Omega}^2\Omega^{-1} - 4\dddot{\Omega}\dot{\Omega}\Omega^{-1} + 2k\dot{\Omega}^2\Omega^{-1} - 2\tilde{\nabla}_a\tilde{\nabla}^a\ddot{\Omega} + 4\dot{\Omega}\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\dot{\Omega}\\ &\quad -6\dot{\Omega}^2\Omega^{-2}\tilde{\nabla}_a\tilde{\nabla}^a\Omega + 6\ddot{\Omega}\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\Omega + 4\Omega^{-1}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\ddot{\Omega} - 6\ddot{\Omega}\Omega^{-2}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega + 6k\Omega^{-1}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega\\ &\quad +\tilde{\nabla}_b\tilde{\nabla}_a\tilde{\nabla}^b\tilde{\nabla}^a\Omega - 3\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega + 6\Omega^{-2}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega - 4\Omega^{-1}\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\Omega\Big] && (1.3)\end{aligned}$$

1.2 $g^{\mu\nu}\delta W^{(1)}_{\mu\nu}$

We set $k = 0$ and substitute the gauge invariants and null trace condition ($g^{\mu\nu}W^{(1)}_{\mu\nu} = 0$),

$$\begin{aligned} \alpha &= \phi + \psi + \dot{B} - \ddot{E}, \qquad \gamma = \psi - \Omega^{-1}[(B - \dot{E})\dot{\Omega} - (\tilde{\nabla}_a E + E_a)\tilde{\nabla}^a\Omega],\\ Q_i &= B_i - \dot{E}_i, \qquad E_{ij}. && (1.4)\end{aligned}$$

$$\begin{aligned} \tilde{\nabla}_a\tilde{\nabla}^a\tilde{\nabla}_b\tilde{\nabla}^b\Omega &= -\dddot{\Omega} - 6\ddot{\Omega}\dot{\Omega}^2\Omega^{-2} + 3\ddot{\Omega}^2\Omega^{-1} + 4\dddot{\Omega}\dot{\Omega}\Omega^{-1} + 2\tilde{\nabla}_a\tilde{\nabla}^a\ddot{\Omega} - 4\dot{\Omega}\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\dot{\Omega} - 2k\tilde{\nabla}_a\tilde{\nabla}^a\Omega\\ &\quad +6\dot{\Omega}^2\Omega^{-2}\tilde{\nabla}_a\tilde{\nabla}^a\Omega - 6\ddot{\Omega}\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\Omega - 4\Omega^{-1}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\ddot{\Omega} + 6\ddot{\Omega}\Omega^{-2}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega\\ &\quad +3\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega - 6\Omega^{-2}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega + 4\Omega^{-1}\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\Omega && (1.5)\end{aligned}$$

$$\begin{aligned} \tilde{\nabla}_a\tilde{\nabla}^a\tilde{\nabla}_b\tilde{\nabla}^b\dot{\Omega} &= -\ddddot{\Omega} + 12\ddot{\Omega}\dot{\Omega}^3\Omega^{-3} - 15\ddot{\Omega}^2\dot{\Omega}\Omega^{-2} - 10\dddot{\Omega}\dot{\Omega}^2\Omega^{-2} + 10\dddot{\Omega}\ddot{\Omega}\Omega^{-1} + 4\ddddot{\Omega}\dot{\Omega}\Omega^{-1} + 2\tilde{\nabla}_a\tilde{\nabla}^a\dddot{\Omega}\\ &\quad -4\dot{\Omega}\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\ddot{\Omega} + 10\dot{\Omega}^2\Omega^{-2}\tilde{\nabla}_a\tilde{\nabla}^a\dot{\Omega} - 10\ddot{\Omega}\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\dot{\Omega} - 12\dot{\Omega}^3\Omega^{-3}\tilde{\nabla}_a\tilde{\nabla}^a\Omega\\ &\quad +18\ddot{\Omega}\dot{\Omega}\Omega^{-2}\tilde{\nabla}_a\tilde{\nabla}^a\Omega - 6\ddot{\Omega}\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\Omega - 4\Omega^{-1}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\dddot{\Omega} - 4\Omega^{-1}\tilde{\nabla}_a\dot{\Omega}\tilde{\nabla}^a\ddot{\Omega} + 4\dot{\Omega}\Omega^{-2}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\ddot{\Omega}\\ &\quad +12\ddot{\Omega}\Omega^{-2}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\dot{\Omega} - 12\ddot{\Omega}\dot{\Omega}\Omega^{-3}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega + 6\ddot{\Omega}\Omega^{-2}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega - 6\Omega^{-2}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\dot{\Omega}\\ &\quad +6\Omega^{-1}\tilde{\nabla}_a\tilde{\nabla}^a\dot{\Omega}\tilde{\nabla}_b\tilde{\nabla}^b\Omega - 3\dot{\Omega}\Omega^{-2}\tilde{\nabla}_a\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega - 12\Omega^{-2}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\dot{\Omega}\tilde{\nabla}_b\tilde{\nabla}^b\Omega\end{aligned}$$

$$
\begin{aligned}
&+12\dot{\Omega}\Omega^{-3}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega + 4\Omega^{-1}\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\dot{\Omega} + 4\Omega^{-1}\tilde{\nabla}^a\dot{\Omega}\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\Omega \\
&-4\dot{\Omega}\Omega^{-2}\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\Omega. \qquad (1.6)
\end{aligned}
$$

The perturbed trace $g^{\mu\nu}\delta W^{(1)}_{\mu\nu}$ can then be expressed entirely in terms of the gauge invariants as

$$
\begin{aligned}
g^{\mu\nu}\delta W^{(1)}_{\mu\nu} \;=\;& \ddot{\alpha}(144\dot{\Omega}^2\Omega^{-6} - 144\ddot{\Omega}\Omega^{-5}) - 36\ddot{\alpha}\dot{\Omega}\Omega^{-5} - 36\dddot{\gamma}\Omega^{-4} - 12\Omega^{-4}\tilde{\nabla}_a\tilde{\nabla}^a\ddot{\alpha} + 72\Omega^{-4}\tilde{\nabla}_a\tilde{\nabla}^a\ddot{\gamma} \\
&+60\dot{\Omega}\Omega^{-5}\tilde{\nabla}_a\tilde{\nabla}^a\dot{\alpha} - 36\Omega^{-5}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\ddot{\alpha} + (288\Omega^{-5}\tilde{\nabla}_a\dot{\Omega} - 576\dot{\Omega}\Omega^{-6}\tilde{\nabla}_a\Omega)\tilde{\nabla}^a\dot{\gamma} \\
&-288\dot{\Omega}\Omega^{-6}\tilde{\nabla}_a\gamma\tilde{\nabla}^a\dot{\Omega} + \tilde{\nabla}_a\alpha(72\Omega^{-5}\tilde{\nabla}^a\ddot{\Omega} + 144\dot{\Omega}\Omega^{-6}\tilde{\nabla}^a\dot{\Omega}) \\
&+\alpha(-864\ddot{\Omega}\dot{\Omega}^2\Omega^{-7} + 432\ddot{\Omega}^2\Omega^{-6} + 576\dddot{\Omega}\dot{\Omega}\Omega^{-6} - 144\ddddot{\Omega}\Omega^{-5} + 144\Omega^{-5}\tilde{\nabla}_a\tilde{\nabla}^a\ddot{\Omega} - 288\dot{\Omega}\Omega^{-6}\tilde{\nabla}_a\tilde{\nabla}^a\dot{\Omega} \\
&+432\dot{\Omega}^2\Omega^{-7}\tilde{\nabla}_a\tilde{\nabla}^a\Omega - 432\ddot{\Omega}\Omega^{-6}\tilde{\nabla}_a\tilde{\nabla}^a\Omega - 288\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\ddot{\Omega} + 432\ddot{\Omega}\Omega^{-7}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega) \\
&+\dot{\alpha}(-216\dot{\Omega}^3\Omega^{-7} + 648\ddot{\Omega}\dot{\Omega}\Omega^{-6} - 216\dddot{\Omega}\Omega^{-5} + 72\Omega^{-5}\tilde{\nabla}_a\tilde{\nabla}^a\dot{\Omega} - 216\dot{\Omega}\Omega^{-6}\tilde{\nabla}_a\tilde{\nabla}^a\Omega - 144\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\dot{\Omega} \\
&+216\dot{\Omega}\Omega^{-7}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega) \\
&+\dot{\gamma}(-432\dot{\Omega}^3\Omega^{-7} + 432\ddot{\Omega}\dot{\Omega}\Omega^{-6} - 144\dot{\Omega}\Omega^{-6}\tilde{\nabla}_a\tilde{\nabla}^a\Omega - 288\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\dot{\Omega} + 432\dot{\Omega}\Omega^{-7}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega) \\
&+\ddot{\gamma}(216\dot{\Omega}^2\Omega^{-6} - 144\Omega^{-5}\tilde{\nabla}_a\tilde{\nabla}^a\Omega + 72\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega) + 24\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\alpha \\
&-72\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\gamma + \tilde{\nabla}_a\tilde{\nabla}^a\alpha(-24\dot{\Omega}^2\Omega^{-6} + 96\ddot{\Omega}\Omega^{-5} - 24\Omega^{-5}\tilde{\nabla}_b\tilde{\nabla}^b\Omega) \\
&+\tilde{\nabla}_a\tilde{\nabla}^a\gamma(72\dot{\Omega}^2\Omega^{-6} - 144\ddot{\Omega}\Omega^{-5} + 144\Omega^{-5}\tilde{\nabla}_b\tilde{\nabla}^b\Omega) + 12\Omega^{-5}\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\alpha \\
&+12\Omega^{-4}\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\tilde{\nabla}^a\alpha - 36\Omega^{-4}\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\tilde{\nabla}^a\gamma - 144\Omega^{-6}\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}_a\alpha\tilde{\nabla}^b\Omega \\
&+288\Omega^{-6}\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}_a\gamma\tilde{\nabla}^b\Omega \\
&+\tilde{\nabla}^a\alpha(-216\dot{\Omega}^2\Omega^{-7}\tilde{\nabla}_a\Omega - 72\ddot{\Omega}\Omega^{-6}\tilde{\nabla}_a\Omega - 216\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega + 72\Omega^{-5}\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\Omega \\
&+216\Omega^{-7}\tilde{\nabla}_a\Omega\tilde{\nabla}_b\Omega\tilde{\nabla}^b\Omega - 144\Omega^{-6}\tilde{\nabla}_b\tilde{\nabla}_a\Omega\tilde{\nabla}^b\Omega) \\
&+\tilde{\nabla}^a\gamma(432\dot{\Omega}^2\Omega^{-7}\tilde{\nabla}_a\Omega - 144\ddot{\Omega}\Omega^{-6}\tilde{\nabla}_a\Omega + 144\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega - 432\Omega^{-7}\tilde{\nabla}_a\Omega\tilde{\nabla}_b\Omega\tilde{\nabla}^b\Omega + 288\Omega^{-6}\tilde{\nabla}_b\tilde{\nabla}_a\Omega\tilde{\nabla}^b\Omega) \\
&+72\Omega^{-5}\tilde{\nabla}_b\tilde{\nabla}_a\Omega\tilde{\nabla}^b\tilde{\nabla}^a\alpha - 144\Omega^{-5}\tilde{\nabla}_b\tilde{\nabla}_a\Omega\tilde{\nabla}^b\tilde{\nabla}^a\gamma - 36\dddot{Q}^a\Omega^{-5}\tilde{\nabla}_a\Omega \\
&+\ddot{Q}^a(-144\Omega^{-5}\tilde{\nabla}_a\dot{\Omega} + 144\dot{\Omega}\Omega^{-6}\tilde{\nabla}_a\Omega) + 36\Omega^{-5}\tilde{\nabla}^a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\dot{Q}_a + 72\Omega^{-5}\tilde{\nabla}^a\dot{\Omega}\tilde{\nabla}_b\tilde{\nabla}^bQ_a \\
&+(-144\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}_b\Omega + 72\Omega^{-5}\tilde{\nabla}_b\tilde{\nabla}_a\Omega)\tilde{\nabla}^b\dot{Q}^a - 288\Omega^{-6}\tilde{\nabla}^a\dot{\Omega}\tilde{\nabla}_b\Omega\tilde{\nabla}^bQ_a \\
&+144\Omega^{-5}\tilde{\nabla}_b\tilde{\nabla}_a\dot{\Omega}\tilde{\nabla}^bQ^a \\
&+Q^a(-144\Omega^{-5}\tilde{\nabla}_a\dddot{\Omega} + 432\dot{\Omega}\Omega^{-6}\tilde{\nabla}_a\ddot{\Omega} - 432\dot{\Omega}^2\Omega^{-7}\tilde{\nabla}_a\dot{\Omega} + 432\ddot{\Omega}\Omega^{-6}\tilde{\nabla}_a\dot{\Omega} - 432\ddot{\Omega}\dot{\Omega}\Omega^{-7}\tilde{\nabla}_a\Omega + 144\ddot{\Omega}\Omega^{-6}\tilde{\nabla}_a\Omega \\
&-144\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\dot{\Omega} - 432\Omega^{-6}\tilde{\nabla}_a\dot{\Omega}\tilde{\nabla}_b\tilde{\nabla}^b\Omega + 432\dot{\Omega}\Omega^{-7}\tilde{\nabla}_a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega + 144\Omega^{-5}\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\dot{\Omega} - 144\dot{\Omega}\Omega^{-6}\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\Omega \\
&+432\Omega^{-7}\tilde{\nabla}_a\dot{\Omega}\tilde{\nabla}_b\Omega\tilde{\nabla}^b\Omega - 288\Omega^{-6}\tilde{\nabla}_b\tilde{\nabla}_a\dot{\Omega}\tilde{\nabla}^b\Omega) \\
&+\dot{Q}^a(-216\Omega^{-5}\tilde{\nabla}_a\ddot{\Omega} + 432\dot{\Omega}\Omega^{-6}\tilde{\nabla}_a\dot{\Omega} - 216\dot{\Omega}^2\Omega^{-7}\tilde{\nabla}_a\Omega + 216\ddot{\Omega}\Omega^{-6}\tilde{\nabla}_a\Omega - 216\Omega^{-6}\tilde{\nabla}_a\Omega\tilde{\nabla}_b\tilde{\nabla}^b\Omega \\
&+72\Omega^{-5}\tilde{\nabla}_b\tilde{\nabla}^b\tilde{\nabla}_a\Omega + 216\Omega^{-7}\tilde{\nabla}_a\Omega\tilde{\nabla}_b\Omega\tilde{\nabla}^b\Omega - 144\Omega^{-6}\tilde{\nabla}_b\tilde{\nabla}_a\Omega\tilde{\nabla}^b\Omega) + 72\ddot{E}_{ab}\Omega^{-5}\tilde{\nabla}^b\tilde{\nabla}^a\Omega \\
&+\dot{E}_{ab}(144\Omega^{-5}\tilde{\nabla}^b\tilde{\nabla}^a\dot{\Omega} - 288\dot{\Omega}\Omega^{-6}\tilde{\nabla}^b\tilde{\nabla}^a\Omega) - 72\Omega^{-5}\tilde{\nabla}^b\tilde{\nabla}^a\Omega\tilde{\nabla}_c\tilde{\nabla}^cE_{ab} \\
&+E_{ab}(-288\Omega^{-6}\tilde{\nabla}^a\ddot{\Omega}\tilde{\nabla}^b\Omega + 432\ddot{\Omega}\Omega^{-7}\tilde{\nabla}^a\Omega\tilde{\nabla}^b\Omega + 144\Omega^{-5}\tilde{\nabla}^b\tilde{\nabla}^a\ddot{\Omega} - 288\dot{\Omega}\Omega^{-6}\tilde{\nabla}^b\tilde{\nabla}^a\dot{\Omega} + 432\dot{\Omega}^2\Omega^{-7}\tilde{\nabla}^b\tilde{\nabla}^a\Omega \\
&-432\ddot{\Omega}\Omega^{-6}\tilde{\nabla}^b\tilde{\nabla}^a\Omega - 432\Omega^{-7}\tilde{\nabla}^a\Omega\tilde{\nabla}^b\Omega\tilde{\nabla}_c\tilde{\nabla}^c\Omega) \\
&+288E_{ac}\Omega^{-6}\tilde{\nabla}^a\Omega\tilde{\nabla}^c\tilde{\nabla}_b\tilde{\nabla}^b\Omega + 288\Omega^{-6}\tilde{\nabla}_aE_{bc}\tilde{\nabla}^a\Omega\tilde{\nabla}^c\tilde{\nabla}^b\Omega \\
&+E_{bc}(432\Omega^{-6}\tilde{\nabla}_a\tilde{\nabla}^a\Omega\tilde{\nabla}^c\tilde{\nabla}^b\Omega - 432\Omega^{-7}\tilde{\nabla}_a\Omega\tilde{\nabla}^a\Omega\tilde{\nabla}^c\tilde{\nabla}^b\Omega + 288\Omega^{-6}\tilde{\nabla}^a\Omega\tilde{\nabla}^c\tilde{\nabla}^b\tilde{\nabla}_a\Omega - 144\Omega^{-5}\tilde{\nabla}^c\tilde{\nabla}^b\tilde{\nabla}_a\tilde{\nabla}^a\Omega) \\
&-144\Omega^{-5}\tilde{\nabla}_cE_{ab}\tilde{\nabla}^c\tilde{\nabla}^b\tilde{\nabla}^a\Omega. \qquad (1.7)
\end{aligned}
$$