The equation for $\rho$ is obtained in a sequence of steps. First, the density $\rho_w$ of pure water $(S = 0)$ is given by

$$\rho_w = 999.842594 + 6.793952 \times 10^{-2}t - 9.095290 \times 10^{-3}t^2 + 1.001685$$
$$\times 10^{-4}t^3 - 1.120083 \times 10^{-6}t^4 + 6.536332 \times 10^{-9}t^5. \tag{A3.1}$$

Second, the density at one standard atmosphere (effectively $p = 0$) is given by

$$\rho(S, t, 0) = \rho_w + S(0.824493 - 4.0899 \times 10^{-3}t + 7.6438 \times 10^{-5}t^2$$
$$- 8.2467 \times 10^{-7}t^3 + 5.3875 \times 10^{-9}t^4)$$
$$+ S^{3/2}(-5.72466 \times 10^{-3} + 1.0227 \times 10^{-4}t$$
$$- 1.6546 \times 10^{-6}t^2) + 4.8314 \times 10^{-4}S^2. \tag{A3.2}$$

Finally, the density at pressure $p$ is given by

$$\rho(S, t, p) = \rho(S, t, 0)/(1 - p/K(S, t, p)), \tag{A3.3}$$

where $K$ is the secant bulk modulus. The pure water value $K_w$ is given by

$$K_w = 19652.21 + 148.4206t - 2.327105t^2 + 1.360477 \times 10^{-2}t^3$$
$$- 5.155288 \times 10^{-5}t^4. \tag{A3.4}$$

The value at one standard atmosphere $(p = 0)$ is given by

$$K(S, t, 0) = K_w + S(54.6746 - 0.603459t + 1.09987 \times 10^{-2}t^2$$
$$- 6.1670 \times 10^{-5}t^3) + S^{3/2}(7.944 \times 10^{-2} + 1.6483 \times 10^{-2}t$$
$$- 5.3009 \times 10^{-4}t^2) \tag{A3.5}$$

and the value at pressure $p$ by

$$K(S, t, p) = K(S, t, 0) + p(3.239908 + 1.43713 \times 10^{-3}t$$
$$+ 1.16092 \times 10^{-4}t^2 - 5.77905 \times 10^{-7}t^3) + pS(2.2838 \times 10^{-3}$$
$$- 1.0981 \times 10^{-5}t - 1.6078 \times 10^{-6}t^2) + 1.91075 \times 10^{-4}pS^{3/2}$$
$$+ p^2(8.50935 \times 10^{-5} - 6.12293 \times 10^{-6}t + 5.2787 \times 10^{-8}t^2)$$
$$+ p^2S(-9.9348 \times 10^{-7} + 2.0816 \times 10^{-8}t + 9.1697 \times 10^{-10}t^2). \tag{A3.6}$$

Values for checking the formula are $\rho(0, 5, 0) = 999.96675$, $\rho(35, 5, 0) = 1027.67547$, and $\rho(35, 25, 1000) = 1062.53817$.