Table 4.3
Most prominent redox reactions in landfill leachate plumes. Dissolved organic matter is represented by the model compound CH_2O. Gibbs free-energy changes at pH 7 are taken from Champ et al. (1979). OMO is short for the reaction Organic Matter Oxidation

Reaction	Process	ΔG_0(W) kcal/mol
Methanogenic/fermentative organic matter mineralization	$2CH_2O \rightarrow CH_3COOH \rightarrow CH_4 + CO_2$	−22
Sulfate reduction/OMO	$2CH_2O + SO_4^{2-} + H^+ \rightarrow 2CO_2 + HS^- + 2H_2O$	−25
Iron reduction/OMO	$CH_2O + 4Fe(OH)_3 + 8H^+ \rightarrow CO_2 + 4Fe^{2+} + 11H_2O$	−28
Manganese reduction/OMO	$CH_2O + 2MnO_2 + 4H^+ \rightarrow CO_2 + 2Mn^{2+} + 3H_2O$	−81
Denitrification/OMO	$5CH_2O + 4NO_3^- + 4H^+ \rightarrow CO_2 + 2N_2 + 7H_2O$	−114
Aerobic respiration/OMO	$CH_2O + O_2 \rightarrow CO_2 + H_2O$	−120
CO_2 reduction	$HCO_3^- + H^+ + 4H_2 \rightarrow CH_4 + 3H_2O$	−55[a]
Ammonium oxidation	$NH_4^+ + 2O_2 \rightarrow NO_3^- + 2H^+ + H_2O$	−72[a]
Methane oxidation	$CH_4 + 2O_2 \rightarrow HCO_3^- + H^+ + H_2O$	−196[a]

[a] Calculated from standard Gibbs free energy of formation of the compounds in the reaction (values from Stumm and Morgan, 1996).