

APPENDIX E: WATER QUALITY ANALYSIS PARAMETERS

Appendix E Table 1. List of hydrochemical analysis by bore type

| Analyte | Units | ALS LOR | Taroom Coal GW Monitoring Bores Proposed | QGC SW/GW Interaction Bores Proposed | Farm Bores monitored by QGC (RN 58133) | DNRM Bores (not monitored by QGC) | QGC Monitoring Bores - OGIA requirement |
|---|---------|---------|--|--------------------------------------|--|-----------------------------------|---|
| Physical Parameters (field) | | | | | | | |
| pH | pH Unit | NA | ✓ | ✓ | ✓ | ✓ | ✓ |
| Electrical Conductivity | µS/cm | NA | ✓ | ✓ | ✓ | ✓ | ✓ |
| Temperature | °C | NA | ✓ | ✓ | ✓ | ✓ | ✓ |
| Redox | mV | NA | ✓ | ✓ | ✓ | ✗ | ✓ |
| Dissolved Oxygen | % | NA | ✓ | ✓ | ✓ | ✗ | ✓ |
| Turbidity | NTU | NA | ✓ | ✓ | ✓ | ✗ | ✓ |
| Physical Parameters (laboratory) | | | | | | | |
| pH Value | pH Unit | 0.01 | ✗ | ✗ | ✗ | ✓ | ✗ |
| Electrical Conductivity @ 25°C | µS/cm | 1 | ✗ | ✗ | ✗ | ✓ | ✗ |
| Total Dissolved Solids @180°C | mg/L | 5 | ✓ | ✓ | ✗ | ✓ | ✗ |
| Total Hardness as CaCO ₃ | mg/L | 1 | ✓ | ✓ | ✗ | ✓ | ✗ |
| Suspended Solids | mg/L | 5 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Turbidity | NTU | 0.1 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Alkalinity | | | | | | | |
| Hydroxide Alkalinity as CaCO ₃ | mg/L | 1 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Carbonate Alkalinity as CaCO ₃ | mg/L | 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Bicarbonate Alkalinity as CaCO ₃ | mg/L | 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Total Alkalinity as CaCO ₃ | mg/L | 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Major Ions | | | | | | | |
| Sulfate as SO ₄ 2- | mg/L | 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Chloride | mg/L | 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Calcium | mg/L | 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Magnesium | mg/L | 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Sodium | mg/L | 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Potassium | mg/L | 1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fluoride | mg/L | 0.1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Bromide | mg/L | 0.1 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Dissolved Metals by ICP-MS | | | | | | | |
| Aluminium | mg/L | 0.01 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Antimony | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Arsenic | mg/L | 0.001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Beryllium | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Barium | mg/L | 0.001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Cadmium | mg/L | 0.0001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Chromium | mg/L | 0.001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Cobalt | mg/L | 0.001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Copper | mg/L | 0.001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Nickel | mg/L | 0.001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Lead | mg/L | 0.001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Zinc | mg/L | 0.005 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Lithium | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Manganese | mg/L | 0.001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Mercury | mg/L | 0.0001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Molybdenum | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Selenium | mg/L | 0.01 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Silver | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Uranium | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Vanadium | mg/L | 0.01 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Boron | mg/L | 0.05 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Iron | mg/L | 0.05 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Strontium | mg/L | 0.001 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Total Metals by ICP-MS | | | | | | | |
| Aluminium | mg/L | 0.01 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Antimony | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Arsenic | mg/L | 0.001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Beryllium | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Barium | mg/L | 0.001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Cadmium | mg/L | 0.0001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Chromium | mg/L | 0.001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Cobalt | mg/L | 0.001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Copper | mg/L | 0.001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Nickel | mg/L | 0.001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Lead | mg/L | 0.001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Zinc | mg/L | 0.005 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Lithium | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Manganese | mg/L | 0.001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Mercury | mg/L | 0.0001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Molybdenum | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Selenium | mg/L | 0.01 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Silver | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Uranium | mg/L | 0.001 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Vanadium | mg/L | 0.01 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Boron | mg/L | 0.05 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Iron | mg/L | 0.05 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Strontium | mg/L | 0.001 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Nutrients | | | | | | | |
| Ammonia as N | mg/L | 0.01 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Nitrite as N | mg/L | 0.01 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Nitrate as N | mg/L | 0.01 | ✓ | ✓ | ✗ | ✓ | ✗ |
| Nitrite + Nitrate as N (Oxidised N) | mg/L | 0.01 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Total Kjeldahl Nitrogen as N | mg/L | 0.1 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Total Nitrogen as N | mg/L | 0.1 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Total Phosphorus as P | mg/L | 0.01 | ✓ | ✓ | ✗ | ✗ | ✗ |

| Analyte | Units | ALS LOR | Taroomb Coal GW Monitoring Bores Proposed | QGC SW/GW Interaction Bores Proposed | Farm Bores monitored by QGC (RN 58133) | DNRM Bores (not monitored by QGC) | QGC Monitoring Bores - OGIA requirement |
|---|-------|---------|---|--------------------------------------|--|-----------------------------------|---|
| Reactive Phosphorus as P | mg/L | 0.01 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Organic Nitrogen as N | mg/L | 0.1 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Ionic Balance | | | | | | | |
| Total Anions | meq/L | 0.01 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Total Cations | meq/L | 0.01 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Ionic Balance | % | 0.01 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Total Petroleum Hydrocarbons | | | | | | | |
| C6 - C9 Fraction | µg/L | 20 | ✓ | ✗ | ✗ | ✗ | ✗ |
| C10 - C14 Fraction | µg/L | 50 | ✓ | ✗ | ✗ | ✗ | ✗ |
| C15 - C28 Fraction | µg/L | 100 | ✓ | ✗ | ✗ | ✗ | ✗ |
| C29 - C36 Fraction | µg/L | 50 | ✓ | ✗ | ✗ | ✗ | ✗ |
| C10 - C36 Fraction (sum) | µg/L | 50 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Total Recoverable Hydrocarbons - NEPM 2013 | | | | | | | |
| C6 - C10 Fraction | µg/L | 20 | ✓ | ✗ | ✗ | ✗ | ✗ |
| C6 - C10 Fraction minus BTEX (F1) | µg/L | 20 | ✓ | ✗ | ✗ | ✗ | ✗ |
| >C10 - C16 Fraction | µg/L | 100 | ✓ | ✗ | ✗ | ✗ | ✗ |
| >C16 - C34 Fraction | µg/L | 100 | ✓ | ✗ | ✗ | ✗ | ✗ |
| >C34 - C40 Fraction | µg/L | 100 | ✓ | ✗ | ✗ | ✗ | ✗ |
| >C10 - C40 Fraction (sum) | µg/L | 100 | ✓ | ✗ | ✗ | ✗ | ✗ |
| >C10 - C16 Fraction minus Naphthalene (F2) | µg/L | 100 | ✓ | ✗ | ✗ | ✗ | ✗ |
| BTEXN | | | | | | | |
| Benzene | µg/L | 1 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Toluene | µg/L | 2 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Ethylbenzene | µg/L | 2 | ✓ | ✗ | ✗ | ✗ | ✗ |
| meta- & para-Xylene | µg/L | 2 | ✓ | ✗ | ✗ | ✗ | ✗ |
| ortho-Xylene | µg/L | 2 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Total Xylenes | µg/L | 2 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Sum of BTEX | µg/L | 1 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Naphthalene | µg/L | 5 | ✓ | ✗ | ✗ | ✗ | ✗ |
| Other | | | | | | | |
| Methane (dissolved) | mg/L | 0.01 | ✓ | ✓ | ✓ | ✗ | ✓ |
| Chlorophyll a | µg/L | 5 | ✓ | ✓ | ✗ | ✗ | ✗ |
| Isotopes $\delta^2\text{H}$ and $\delta^{18}\text{O}$ | ‰ | | ✓ | ✗ | ✗ | ✗ | ✗ |
| Isotope $\delta^{13}\text{C}$ | ‰ | | ✓ | ✗ | ✗ | ✗ | ✗ |

Appendix E Table 2. Surat North WMMP surface water quality analysis parameters

| | | ALS | Surat North |
|---|---------|--------|---------------|
| Analyte | Units | LOR | Surface Water |
| Physical Parameters (field) | | | |
| pH | pH Unit | NA | ✓ |
| Electrical Conductivity | µS/cm | NA | ✓ |
| Temperature | °C | NA | ✓ |
| Redox | mV | NA | ✓ |
| Dissolved Oxygen | % | NA | ✓ |
| Turbidity | NTU | NA | ✓ |
| Physical Parameters (laboratory) | | | |
| pH Value | pH Unit | 0.01 | ✗ |
| Electrical Conductivity @ 25°C | µS/cm | 1 | ✗ |
| Total Dissolved Solids @180°C | mg/L | 5 | ✓ |
| Total Hardness as CaCO ₃ | mg/L | 1 | ✓ |
| Suspended Solids | mg/L | 5 | ✓ |
| Turbidity | NTU | 0.1 | ✓ |
| Alkalinity | | | |
| Hydroxide Alkalinity as CaCO ₃ | mg/L | 1 | ✓ |
| Carbonate Alkalinity as CaCO ₃ | mg/L | 1 | ✓ |
| Bicarbonate Alkalinity as CaCO ₃ | mg/L | 1 | ✓ |
| Total Alkalinity as CaCO ₃ | mg/L | 1 | ✓ |
| Major Ions | | | |
| Sulfate as SO ₄ ²⁻ | mg/L | 1 | ✓ |
| Chloride | mg/L | 1 | ✓ |
| Calcium | mg/L | 1 | ✓ |
| Magnesium | mg/L | 1 | ✓ |
| Sodium | mg/L | 1 | ✓ |
| Potassium | mg/L | 1 | ✓ |
| Fluoride | mg/L | 0.1 | ✓ |
| Bromide | mg/L | 0.1 | ✓ |
| Dissolved Metals by ICP-MS | | | |
| Aluminium | mg/L | 0.01 | ✓ |
| Antimony | mg/L | 0.001 | ✓ |
| Arsenic | mg/L | 0.001 | ✓ |
| Beryllium | mg/L | 0.001 | ✓ |
| Barium | mg/L | 0.001 | ✓ |
| Cadmium | mg/L | 0.0001 | ✓ |
| Chromium | mg/L | 0.001 | ✓ |
| Cobalt | mg/L | 0.001 | ✓ |
| Copper | mg/L | 0.001 | ✓ |
| Nickel | mg/L | 0.001 | ✓ |
| Lead | mg/L | 0.001 | ✓ |
| Zinc | mg/L | 0.005 | ✓ |
| Lithium | mg/L | 0.001 | ✓ |
| Manganese | mg/L | 0.001 | ✓ |
| Mercury | mg/L | 0.0001 | ✓ |
| Molybdenum | mg/L | 0.001 | ✓ |
| Selenium | mg/L | 0.01 | ✓ |
| Silver | mg/L | 0.001 | ✓ |

| | | ALS | Surat North |
|-------------------------------------|-------|--------|---------------|
| Analyte | Units | LOR | Surface Water |
| Uranium | mg/L | 0.001 | ✓ |
| Vanadium | mg/L | 0.01 | ✓ |
| Boron | mg/L | 0.05 | ✓ |
| Iron | mg/L | 0.05 | ✓ |
| Strontium | mg/L | 0.001 | ✓ |
| Total Metals by ICP-MS | | | |
| Aluminium | mg/L | 0.01 | ✓ |
| Antimony | mg/L | 0.001 | ✓ |
| Arsenic | mg/L | 0.001 | ✓ |
| Beryllium | mg/L | 0.001 | ✓ |
| Barium | mg/L | 0.001 | ✓ |
| Cadmium | mg/L | 0.0001 | ✓ |
| Chromium | mg/L | 0.001 | ✓ |
| Cobalt | mg/L | 0.001 | ✓ |
| Copper | mg/L | 0.001 | ✓ |
| Nickel | mg/L | 0.001 | ✓ |
| Lead | mg/L | 0.001 | ✓ |
| Zinc | mg/L | 0.005 | ✓ |
| Lithium | mg/L | 0.001 | ✓ |
| Manganese | mg/L | 0.001 | ✓ |
| Mercury | mg/L | 0.0001 | ✓ |
| Molybdenum | mg/L | 0.001 | ✓ |
| Selenium | mg/L | 0.01 | ✓ |
| Silver | mg/L | 0.001 | ✓ |
| Uranium | mg/L | 0.001 | ✓ |
| Vanadium | mg/L | 0.01 | ✓ |
| Boron | mg/L | 0.05 | ✓ |
| Iron | mg/L | 0.05 | ✓ |
| Strontium | mg/L | 0.001 | ✓ |
| Nutrients | | | |
| Ammonia as N | mg/L | 0.01 | ✓ |
| Nitrite as N | mg/L | 0.01 | ✓ |
| Nitrate as N | mg/L | 0.01 | ✓ |
| Nitrite + Nitrate as N (Oxidised N) | mg/L | 0.01 | ✓ |
| Total Kjeldahl Nitrogen as N | mg/L | 0.1 | ✓ |
| Total Nitrogen as N | mg/L | 0.1 | ✓ |
| Total Phosphorus as P | mg/L | 0.01 | ✓ |
| Reactive Phosphorus as P | mg/L | 0.01 | ✓ |
| Organic Nitrogen as N | mg/L | 0.1 | ✓ |
| Ionic Balance | | | |
| Total Anions | meq/L | 0.01 | ✓ |
| Total Cations | meq/L | 0.01 | ✓ |
| Ionic Balance | % | 0.01 | ✓ |
| Other | | | |
| Methane (dissolved) | mg/L | 0.01 | ✓ |
| Chlorophyll a | µg/L | 5 | ✓ |