Glossary of terms

Item	Definition
Adsorption	Attraction and adhesion of ions from an aqueous solution to the surface of solids.
AHD	Australian Height Datum.
Alluvial	Of, or pertaining to, material transported by water.
Alluvium	Sediments deposited by, or in conjunction with, running water in rivers, streams or sheet wash and in alluvial fans.
ANZECC Guidelines	Australian and New Zealand Environment and Conservation Council's Guidelines for Fresh and Marine Water Quality 2000.
Analytical Model	Provides exact or approximate mathematical solution to a differential equation (and associated initial and boundary conditions) for subsurface water movement/transport.
Anisotropy	Conditions where one or more hydraulic properties of an aquifer vary with direction (see Isotropy).
Anticline	Fold convex upward or had such an attitude at some stage of development. In simple anticlines, beds are oppositely inclined while in more complex types limbs may dip in the same direction. Some anticlines are so complicated as to have no simple definition. Others may be defined as folds with older rocks toward the centre of curvature, providing the structural history is not unusually complex.
Appraisal Well	CSG well drilled for long-term production testing. Stand-alone or part of a pilot program and may become a development well.
Aquiclude	Geologic formation which may contain water (sometimes in appreciable quantities) but is incapable of transmitting fluids under ordinary field conditions.
Aquifer	(a) Consolidated or unconsolidated geologic unit (material, stratum, or formation) or set of connected units yielding significant quantities of suitable quality water to wells or springs in economically usable amounts. Types of aquifers include: • Confined (or artesian) – Aquifer overlain by confining layer or aquitard (layer of low permeability) that restricts water's upward movement. Confined aquifers have no water table as aquitards prevent water rising (the piezometric head is above the aquifer). • Leaky/semi-confined – (i) Aquifer receiving recharge via cross-formational flow through confining layers. (ii) Aquifer overlain by a layer partly restricting water's upward movement. Perched – Local unconfined aquifer at a higher elevation than the regional unconfined aquifer. An unsaturated zone between the two unconfined aquifers. Or subsurface material with perched groundwater separated from a deeper aquifer by unsaturated materials • Unconfined (or water table) – (i) Aquifer's upper surface is the water table. Water table aquifers are directly overlain by an unsaturated zone of a surface water body. (ii) Aquifer containing water not under pressure, with the upper boundary the saturation zone. In an unconfined aquifer, a well's water level equals the water table outside the well. (See also Aquitard, and Aquiclude.) (b)(i) Layer of geologic material containing water. (ii) Zone, stratum or group of strata that can store and transmit sufficient quantities of water for a specific use. (c) Geological formation comprising layers of rock, unconsolidated deposits or regolith, that is capable of receiving, storing and transmitting significant quantities of water. Term usually applies to saturated materials currently containing water.
Aquifer system	Intercalated permeable and poorly permeable materials of two or more units separated by aquitards impeding vertical groundwater movement but not affecting regional hydraulic continuity.
Aquitard	Semi-pervious geologic formation able to store water but transmits it at a low rate than the aquifer.

Item	Definition
Artesian aquifer	Confined aquifer with the piezometric head above the surface. The pressure causes water to flow freely at bores.
AS	Australian Standard.
Associated Water	Water produced as a by-product of CSG extraction (referred to as CSG water).
ATP	Authority to Prospect – CSG exploration and appraisal.
Average annual recharge	Water volume naturally added to groundwater sources, usually by rainfall and river flow infiltration, using long-term average assessments. Recognises recharge amounts are subject to annual natural variations.
Barrel (bbl)	Volume measurement unit for petroleum products: (1 bbl = about 42 US gallons or 158.9873 litres (159L).
Base flow	Part of the discharge entering a stream channel mainly from groundwater (but also from lakes and glaciers) during long periods without precipitation (or snowmelt).
Baseline Bore Assessment	Required under the Queensland Government's Water Act 2000 (Section 397) using DEHP Bore Baseline Assessment Guidelines. Establishes an assessment program for all groundwater bores within, and in close proximity to, QGC coal seam gas tenures. Incorporates data collection on water bore condition, construction, water level and basic water quality to assist in determining regional groundwater quality and levels. Also important in managing underground water impacts and covers: (a) Baseline assessment statement undertaken for identified bores in the area before the plan is provided to the chief executive; (b) Identification of each petroleum tenure area in which water bores other than those mentioned in paragraph (a) are or may be located (each is a priority area); (c) Baseline assessments of water bores timetable in each priority area where an assessment has not been completed, including dates for doing all baseline assessments in compliance with section 398 (a baseline assessment timetable); and, (d) Rationale for the baseline assessment timetable.
Basement	Solid rock lying beneath soil and other unconsolidated material.
Basin	Large size depression in which sediments have accumulated.
BCF	Billion cubic feet (1 BCF = about 1.08 petajoules (PJ)).
Bedrock	Solid rock lying beneath soil and other unconsolidated material. 'Rock outcrop' if surface exposure.
bgl	Below ground level.
Bore	Drilled hole (borehole) constructed by a drilling rig. Covers any well or excavation used to access groundwater. Similar to 'water well' (See Well). Here, 'bore' is used, as per Australian and Queensland Government usage.
Boundary condition	Specified conditions at the edges or surfaces of a groundwater system.
BUA	Beneficial Use Approval via Queensland's administering authority, the Department of Environment and Natural Resources, for approval of a resource (treated CSG water sourced from the QGC Kenya Water Treatment Plant).
Carboniferous	Geological time period: 359 million to 299 years ago.
Catchment	(a) Land area collecting rainfall and contributing to surface water (streams, rivers, wetlands) or groundwater. (b) Total land area potentially contributing to water flowing through a particular point.
CDA	Central Gas Fields.
CG	Coordinator General (Queensland).
Cleat	Vertical cleavage or fracture plane in coal seams. Usually two perpendicular cleat systems develop as the main set of joints along which mined coal breaks. Provides the predominant pore space within a coal mass as either void space or conduit plane for groundwater movement and storage.

Item	Definition
Coal	Combustible black or brownish-black sedimentary rock normally in rock strata in layers or veins called coal beds, seams. Harder forms (like anthracite coal) are called metamorphic rock due later exposure to elevated temperature and pressure. Composed primarily of carbon with variable other elements like sulphur, hydrogen, oxygen and nitrogen. Plant matter layers accumulated below a water body protected (usually) by mud or acidic water from biodegradation and oxidization. Shallow lakes of the Jurassic Period trapped atmospheric carbon in immense peat bogs then deeply buried by sediments and metamorphosed into coal. Chemical and physical properties of the plant remains (mainly fern-like species antedating modern plant species) changed over time by geological action.
Coal seam	Layer, vein or deposit of coal.
Coal seam gas	(CSG) Natural gas (mostly methane) contained within coal.
Company	BG Group or a wholly owned subsidiary company or other client organisation.
Completed	Defines which aquifer the well screened is positioned opposite.
Contour	Imaginary line connecting points of equal elevation (i.e. the same height above sea level).
CS Water	Coal seam water (formerly Associated water).
CWMP	CSG Water Management Plan (formerly an Associated Water Management Plan).
Dam	Barrier, embankment or excavated earth structure constructed to impound water for storage. Often built in or near drainage lines with dam walls ranging from Chinchilla Weir-style concrete structures to small earthen farm dams.
Darcy's Law	Mathematical relationship generalisations for groundwater (or other fluid) flow rates through porous media: a) For three dimensions: Water's viscous flow rate in isotropic porous media is proportional to, and in the direction of, the hydraulic gradient. b) For other fluids: Viscous flow rate of homogeneous fluids via isotropic porous media is proportional to, and in the direction of, the driving force. Under saturated flow conditions, adjusted Darcy's Law also accounts for unsaturated, multiphase flow.
Darcy	Measure of permeability. See Permeability.
Default Draw down Limit (or Groundwater Draw down Threshold)	Designated water level or pressure value for an aquifer, triggering specific response actions. Determined values are based on numerical groundwater flow modelling and 'make good' response actions for a water supply ('farmer's') bore or water supply supplementation for springs. QGC monitors specified thresholds 20 km from production points (radially outwards towards the relevant springs) or derives equivalent draw down thresholds using appropriate analytical methods (Theis Equation), monitoring at appropriate distances within 20 km of production points.
DEEDI	Queensland's Department of Natural Resources and Mines.
DEHP	Queensland Department of Environment and Heritage Protection (DEHP) formerly the Department of Environment and Resource Management (DERM)
Development Well	Well designed and used for long-term CSG production.
DEWHA	Australia's Department of Environment, Water, Heritage and Arts (now SEWPaC).
Discharge	Groundwater body water moving to the surface (or into a surface water body, such as a lake or ocean). Leaves aquifers directly via seepage (active discharge) or indirectly via capillary rise (passive discharge). (See Spring).
Discharge area	Where significant volumes of groundwater surface, either as liquid water or as vapour.
DNRM	Queensland's Department of Natural Resources and Mines
Draw down	Water table lowering due to aquifer water removal or reduction in hydraulic pressure. As target aquifers are confined, 'draw down' equates with 'hydraulic head' reduction. Terms are treated as interchangeable as a reduction in an aquifer's hydraulic head pressure.

Item	Definition
Drill stem test (DST)	Controlled (short time) fluid flows from a reservoir allowing estimation of local rock permeability, flow rate and fluid type. Run in open hole or through cased hole perforations.
EA	Environmental Authority (Queensland).
EC	Electrical conductivity (measure of a medium's ability to conduct electricity) is often used as a surrogate measure of salinity levels in water or soil because solution conductivity of a generally increases in proportion with salt content.
EIS	Environmental Impact Statement.
Effective porosity	Porosity contributing to the water flow or interconnected porosity (Ø). Is the fraction of total volume in which fluid flow is effectively taking place (excluding dead-end pores or non-connected cavities).
Effects	Direct effects are caused by an action and occur at the same time and place. Indirect effects are later in time or farther removed in distance but still reasonably foreseeable. Indirect effects include growth-inducing and other effects related to induced changes in patterns of land use, population density or growth rate and related effects on air and water and other natural system, including ecosystems. Includes ecological effects such as that on natural resources and on components, structures and functioning of affected ecosystems, aesthetic, historic, cultural, economic (social or heath), whether direct, indirect, or cumulative. May also include outcomes from actions having both beneficial and detrimental effects. In this report, the terms 'effects' and 'impacts' are synonymous.
Elevation	Topographic feature of any size rising above adjacent land or surrounding ocean bottom; an elevated place or station. Vertical distance from a datum (usually mean sea level) to a point or object on surface level; especially heights of ground points above sea level. Term is synonymous with 'altitude' for distance above sea level but, in surveying practice, 'elevation' indicates height and altitude indicates heights of points in space above the Earth.
EMP	Environmental Management Plan.
EPBC	Environmental Protection and Biodiversity Act 1999 (Commonwealth).
EPBC Act Approval	Referral EPBC 2008/4398 Approval (subject to conditions) granted on 22 October 2010 for QGC (the BG Group) to develop, construct, operate and decommission the Curtis Island LNG Project's coal seam gas field component, and expansion of QGC-operated Surat Basin coal seam gas fields.
ERM (or DEHP)	Queensland's Department of the Environment and Resource Management (ERM, previously NRW and EPA). (See DEHP)
Equipotential	(In hydrogeology) a line connecting points of equal hydraulic potential or hydraulic head. Equipotential ('isopotential' in mathematics, chemistry and physics) refers to a spatial region where every point is of equal potential.
ESTWA	Exposure Standard Time Weighted Average.
Evaporation	Conversion of liquid into vapour. In the hydrological cycle, evaporation involves heat from the sun transforming water (held in surface storages in soil) from a liquid into water vapour.
Evaporation Basin	Shallow excavated earth tank or natural pond for water storage (usually saline) allowing evaporation. Disposal method for groundwater extracted from subsurface aquifers or deep drains.
Evapotranspiration	Soil water transfer from vegetated land to the atmosphere, via soil evaporation and plant transpiration processes.
Expert Panel	Provides expert hydrological and hydrogeological advice to the Minister and Australian Government's Department of Sustainability, Environment, Water, Population and Communities on major coal seam gas proposals seeking approval under the Environmental Protection and Biodiversity Conservation Act 1999 (the EPBC Act).
Exploration Well	Well drilled to determine a hydrocarbons presence in an area or structure.

Item	Definition
Extraction Limit	Average yearly volume to be extracted from a water source by all access licences.
Fault	(a) Fracture in the Earth's crust along which rocks on one side are displaced relative to those on the other. (b) Fracture after translation or movement of fracture walls parallel to the fracture plane.
Fault Line	Fracture or fracture zone of the Earth's crust with displacement along one side.
Fault Trap	Hydrocarbon trap relying on reservoir termination against a seal due to fault displacement.
Field	Geographical area beneath which an oil or gas reservoir lies.
Flow Model	Digital computer model calculating a hydraulic head field for the modelling domain using numerical methods to yield an approximate solution for the differential equation of groundwater flow.
Flow Rate	Surface water or groundwater at a point or line per given time period; (as volume, depth or area per time unit.
Flow System	Flow system transports local groundwater where discharge and recharge occur within kilometres. May be permanent or temporary and on a downhill-slope via an unconfined aquifer that is relatively thin (<20 m) and close to the surface.
Flow Velocity	Surface water/groundwater flows, measured as a distance per unit of time (e.g. mm/hr, or m/day).
Fluvial, Fluviatile	Originated by deposition within riverine environments (See Alluvial). Referring to river processes.
Formation	(a)Stratigraphy unit defining rock succession. (b) Rock strata body with same lithology or combination of lithologies.
Fracture	Sub-planar discontinuity in a rock or soil formed by mechanical stresses.
Fracture Skin	Fracture surface coating, and/or altered zone beneath the fracture surface, with hydrogeological properties differing from the unaltered rock or sediment.
Fractured Rock Aquifers	Rocks capable of receiving, storing and transmitting significant quantities of water due to numerous cracks, fissures or fractures in otherwise impermeable material.
Fresh Water	Water with a salinity < 1000 mg/l; drinkable or potable water is implied.
GDE	Groundwater Dependent Ecosystem.
Geological Time Scale	Time subdivisions into eras, periods and epochs, for interpretation of stratigraphic relationships between rocks.
Geology	Science relating to the history and development of the Earth's crust.
Geomorphology	Scientific interpretation of landform patterns and landscape formation processes.
Gigajoule (GJ)	1,000,000,000 joules.
Gravel	Sedimentary grains with a particle size of 2mm to 4 mm (i.e. grains larger than coarse sand but finer than pebbles).
Gravel Pack, Filter Pack	Graded sand or gravel placed in the annular space of a groundwater installation to protect the screens or slotted casing adjacent to selected aquifer horizons.
Groundwater (Ground Water)	Permanent underground water bodies that saturate (in available openings) soil or rock, at greater than atmospheric pressure so it flows freely into a bore or well.
Groundwater Draw down Limit or Threshold	Designated water level or pressure value for specific aquifers triggering response actions, determined via numerical groundwater modelling. Response action for water supply bores (farmer's bore) may be a 'make good' measure, or for a Spring, water supply supplementation.

Item	Definition
Groundwater Flow	Water movement through openings in sediment and rock in the saturation zone. Lateral groundwater flow is non-vertical movement, usually (not always) parallel to the ground surface.
Groundwater Model	Simplified conceptual or mathematical image of a groundwater system with features essential to the model's purpose (including pertinent system assumptions). Mathematical groundwater models include numerical and analytical models (See Flow Model, MODFLOW, FEFLOW).
Guideline Value	Water quality characteristic concentration (or measure) either not a significant risk to consumer health (health-related guideline value) or related to good quality water (aesthetic guideline value).
Ha	Hectare (100 m by 100 m area or 10,000 m^2).
HDPE	High density polyethylene.
Head (Hydraulic Head, Static Head)	Energy contained within a water column resulting from elevation or pressure. The static head is the height at which the surface of a water column could be supported against the action of atmospheric pressure. Actual effect manifests as a reduction of hydraulic head pressure in the aquifer concerned. Note that, since the target aquifers are confined, 'draw down' is synonymous with reduction of hydraulic head and, in this report, the terms are used interchangeably.
Hydraulic Conductivity κ	(a) Measure of potential fluid flow rate through soil or rock, allowing for the fluid's nature, degree of saturation and the permeability of material through which it passes. Hydraulic conductivity is measured in either saturated or unsaturated states. Unsaturated hydraulic conductivity changes as a material becomes wetter but saturated hydraulic conductivity remains constant. Expressed in units of length per unit of time, or as millimetres per hour (mm/hour) or metres per day (m/day). (b) Coefficient of proportionality describing fluid moves rates through interconnected pore spaces in a porous medium. In determining conductivity, fluid density and viscosity must be considered. (c) Volume of fluid flowing through porous medium for a unit hydraulic gradient normal to that area; (d) Rate of horizontal groundwater flow through a unit area of an aquifer under a unit hydraulic gradient. Hydraulic conductivities are reported as m/day [L/T]. Values commonly range between 0.02 m and 40 m/day for unconsolidated sand aquifers, less than 0.5 m/day for sandstone, and below 0.0001 m/day for clays or shale (See Hydraulic Gradient, and Permeability (darcy, millidarcy). Conversion factor: 1 m/day = 1.157 D (or 8.64 x 10^{-1} m/day per darcy (D)) or 1 m/Day = 1157 mD (or 8.64 x 10^{-4} m/day per millidarcy (mD)).
Hydraulic Fracturing (Fraccing, Fracking, Frac)	Hydraulic fracturing, fraccing or fracking, creating rock fractures. Done from a well bore drilled into reservoir rock formations (a coal seam in the case of CSG) to increase the rate and efficiency recovery of a petroleum production (i.e. CSG, conventional gas or oil).
Hydraulic Gradient	(a) Slope of the water table or potentiometric surface. The hydraulic gradient is determined from the decline in groundwater level at two measuring points divided by the distance between them. (b) Change in hydraulic head with direction.
Hydraulic head (h)	Elevation in a well relating to a specific datum; the mechanical energy per unit weight of water [L].
Hydrocarbons	Naturally-occurring organic compounds containing only the elements hydrogen and carbon that may exist as solids liquids or gases.
Hydrogeology	Study of groundwater movement through soil, sediment or rock under natural/induced conditions.
Hydrological Cycle	Continuous water circulation between land, sea (or other water surface) and the atmosphere.
Hydrology	Study of water and water movement in relation to land. Deals with the properties, laws, geographical distribution and movement of water on land or under the Earth's surface.
Impermeable	Nature of solid material that will not allow fluids to pass freely.
In Situ	Material that occurs where it was originally formed or deposited, literally 'at the site' (Latin).

Item	Definition
Infiltration	Process of water entering soil through its surface. Water's downward movement into a soil profile.
Isotropy	Condition where the properties of a system or a parameter do not vary with direction.
Joints	Fractures with little or no displacement parallel to the fracture surface.
Jurassic	Geological time period: 199 million to 145 years ago.
Juvenile Water	Water that has never before been part of the hydrologic cycle.
LC50	Median lethal concentration (LC50) of a toxic substance is the dose required to kill half the members of a tested population after a specified test duration.
LCLo	Lethal concentration low is the minimum amount of a chemical tests show will be lethal to a specified type of animal. This is normally quoted in mg/kg body weight.
LD50	Median lethal dose of a toxic substance needed to kill half a tested population in a given test duration.
LDLo	Lethal Dose Low is the minimum amount of a chemical that tests show to be lethal for a specified type of animal. Normally quoted in mg/kg body weight.
IDLH	Immediately dangerous to life or health is defined by the US National Institute for Occupational Safety and Health (NIOSH) as exposure to airborne contaminants "...likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment..."
Leakage	Flux of fluid from or into an aquifer or reservoir, referring to cross-formational flow.
Leakance	Vertical permeability of a hydrostratigraphic unit divided by its thickness.
Licence	Authority to explore for or produce minerals, oil or gas in a specific area issued by the authorising State Government.
Lithology	Physical/mineralogical characteristics of a rock, including grain-size of strata or subsurface media.
LNG	Liquefied Natural Gas.
Matrix Flow	Water passing through interconnected pores in the soil matrix as opposed through macropores as preferential flow.
Mesozoic	Geologic era between about 230 million and 65 million years ago, including Triassic, Jurassic and Cretaceous Periods (See Era).
Metamorphic rock	Rock of any origin altered in mineralogical composition, chemical composition or structure by heat, pressure or movement at depth in the Earth's crust (i.e. schist, gneiss and quartzite). Parallel bands of minerals may be evident.
Meteoric water	Water that is or has recently been part of the hydrologic cycle's atmospheric portion.
mg/L	Milligrams per litre.
Migration	Movement of a fluid (water, gas or oil) from regions of higher to lower pressure.
Mining	(In hydrogeology) Implies extraction from a groundwater system not currently receiving recharge.
ML	Megalitres.
ML/day	Megalitres per day.
MNES	Matters of National Environmental Significance.
MOL	Maximum operating level.
MRL	Maximum Recordable Level.
MSDS	Material safety data sheet.

Item	Definition
Mudstone	Result of grains of clay deposited layer upon layer, compacted by overlying material and cemented together over millions of years to form hard rock. Like shales but without a layered structure.
Nested Monitoring Wells	Groundwater installation comprising a single large-diameter hole with multiple piezometer casings screened at varying depths to intersect different aquifers or aquifer levels (i.e. 'multiple completion wells'). Needs accurate placement of individual filter packs and bentonite seals to isolate each aquifer intersected. (See VWP).
NRW	Queensland Department of the Natural Resources and the Environment (NRW now part on DEHP). (See DEHP)
NDA	Northern Gas Fields.
OGIA	Office of Groundwater Impact Assessment (Queensland).
OSHA PEL	Occupational Safety and Health Administration Permissible Exposure Level.
Outcrop	(a) Part of rock formation appearing at surface level. (b) Vein or lode as part of apex definition. May not imply visible surface presentation but includes deposits found by easy digging. (c) Part of geologic formations or structures appearing at the surface. Also, bedrock under only surficial deposits such as alluvium. (d) Appearing exposed and visible at surface level; to crop out.
Overburden	Material of any nature, consolidated or unconsolidated, overlying a deposit of useful materials, ores or coal. Especially deposits mined from the surface by open cuts.
P&W	Pressure and water quality.
Palaeochannel	River channel, drainage line incised into an ancient land surface and then infilled by of younger sediment deposition.
Palaeozoic	Era of geological time extending between around 600 million and 230 million years, includes the Cambrian, Ordovician, Silurian, Devonian, Carboniferous and Permian Periods (See Era).
Perched Aquifer (Perched Water Table)	Aquifer where infiltrating water is separated by an unsaturated zone from an underlying main groundwater body. Perching is often due to intermediate impermeable or low permeability layers. An unconfirmed perched aquifer, means a perched water table exists. (See Aquifer).
Period	Geological timeframe smaller than eras and subdivided into epochs.
Permeability	Measure of the capacity of rock or stratum to allow water or other fluids such as oil to pass through it (i.e. the relative ease with which a porous medium can transmit a fluid). The SI unit for permeability is m^2. A traditional unit for permeability is the darcy (D), or more commonly the millidarcy (mD) (1 darcy ≈ 10 to 12 m2). The unit of cm^2 is also sometimes used (1 m^2 = 10^4 cm^2). The darcy is defined using Darcy's law, which can be written as: $v = k\,\Delta P / \mu \Delta x$ Where: v is the superficial (or bulk) fluid flow rate through the medium; k is the permeability of a medium; μ is the dynamic viscosity of the fluid; ΔP is the applied pressure difference; Δx is the thickness of the medium. The darcy is referenced to a mixture of unit systems. A medium with a permeability of 1 darcy permits a flow of 1 cm^3/s of a fluid with viscosity 1 cP (1 mPa·s) under a pressure gradient of 1 atm/cm acting across an area of 1 cm^2. A millidarcy (mD) is equal to 0.001 darcy and a microdarcy (µD) equals 0.000001 darcy. The conversion factor in calculating the D and mD values is: Conversions: 1 m/day = 1.157 D (or 8.64 x 10-1 m/day per darcy (D)) or 1 m/Day = 1157 mD (or 8.64 x 10-4 m/day per millidarcy (mD)). (See darcy and Hydraulic Conductivity.) Relationship between Permeability and Hydraulic Conductivity: The proportionality constant specifically for water flows through a porous media is called hydraulic conductivity; a portion is permeability as a property of porous media only, not the fluid. Given the value of hydraulic conductivity for a subsurface system, κ, the permeability can be calculated as: $K = \kappa \times (\mu / \rho g)$ Where: K is the permeability, m^2; κ is the hydraulic conductivity, m/s; μ is the dynamic viscosity, kg/(m-s); ρ is the density of the fluid, kg/m^3; g is the acceleration due to gravity, m/s^2.

Item	Definition
Permian	Geological time period about 298 million to 251 million years ago.
Permotriassic	Geological time period: 298 million to 199 years ago.
Petroleum	Generic name for hydrocarbons, like crude oil, natural gas liquids, natural gas and their products.
pH	Measure of the acidity or alkalinity of water and is related to the free hydrogen ion concentration in solution (i.e. pH = 7 is neutral; pH < 7 acidic; pH > 7 alkaline).
Phase	Sequenced operational areas within mining activity progression, including coal seam gas 'mining'.
Phreatic	Phreatic surface or zone of saturation, is the area in an aquifer below the water table, where relatively all pores and fractures are saturated with water. Phreatic zone may fluctuate with seasonal changes or during wet and dry periods.
Piezometer	(a) Pressure measuring device (tube, pipe or other device) open to the atmosphere above, water below, and sealed along its length. Measures a geologic unit's hydraulic head. Typically measures a well's given-point fluid pressure rather than integrating pressures. (b) Borehole cased with pipe and completed with a seal(s) adjacent to the slotted section to observe groundwater pressure over the slotted interval rather than water table elevation.
Piezometric Head	Elevation to which water rises in a piezometer connected to a point in an aquifer. Differences in piezometric head determine the hydraulic gradient and hence the groundwater flow direction.
Piezometric Surface	Surface of equal hydraulic heads or potentials, usually depicted by an equipotentials map (e.g. a water-table elevations map). (See Potentiometric Surface).
Piper Diagram	Displays the ratios of principal ionic constituents in water (modified from Davis and DeWiest, 1966, and Freeze and Cherry, 1979). SMOW is standard mean ocean water.
PJ	Petajoule (one million gigajoules).
PL	Petroleum lease.
Pleistocene	Epoch of geologic time between about two million and 10,000 years ago (See Epoch).
Plys (Spilts)	Above and below a rock parting coal sections within a coal seam are often referred to as plys.
ppm	Parts per million.
Pore Water Pressure	Pressure exerted by fluid in voids or 'pore' spaces of soil or rock. Usually expressed with respect to atmospheric pressure. Positive pressures indicate the porous medium is saturated (negative pressures indicate it is unsaturated).
Porosity (Ø, s or n)	Void volumes divided by the total volume of porous medium (percentage of rock or soil represented by open voids or spaces): Effective – Interconnected porosity contributing to groundwater flow. Often mistakenly used synonymously with 'specific yield'. Fracture – Porosity of the fractures. Intergranular – the porosity between the grains of a sediment or sedimentary rock. Primary – Intergranular porosity formed during deposition of sediment or from vesicles in igneous rocks. Secondary – Porosity formed after rock is lithified by either dissolution or fracturing.
Porous	Having porosity.
Potable	Drinkable. Potable waters can be consumed safely.
Potentiometric Surface	Surface of equal hydraulic heads or potentials, shown by equipotentials maps (e.g. water-table elevations map).
Precipitation	(a) Water condensing from the atmosphere and falling under gravity in drops or particles (e.g., snow, hail, sleet) to the land surface. (b) Formation of a solid from dissolved or suspended matter. (c) Water transfer from the atmosphere to the land surface, mostly as rainfall but also as dews, frosts, mists, snow, sleet, hail and fog.

Item	Definition
Preferential Flow (Sediment or Rock)	Rapid groundwater flow through any structure significantly more permeable than the bulk sediment or rock.
Preferential Flow (Soil)	Rapid soil water flow that occurs through macropores or any other structure significantly more permeable than the bulk soil.
Preferred Pathway	Channel or pore in soil layers having low permeability for water to flow preferentially. Old tree root channels are preferred pathways in many clayey sub soils in the South-West Agricultural Region.
Pressure (p)	Force per unit area [MLt -2L-2 or ML-1t-2 or Pa]: Abnormal – Departure from hydrostatic pressure, including over/under -pressures. Excess or Overpressure (u) – Fluid pressures above hydrostatic pressure (ps). Also called geo-pressures, abnormal pressures, or excess pore-fluid pressures. Hydrostatic (ps) – Pressure equal to that (or would be) induced by the weight of the overlying water column, where 'h' is height of the water above a given point. Lithostatic pressure (s) – Pressure equal to that which is (or would be) induced by the weight of the overlying column of materials of bulk density, where H is the height of the materials (rock and water) above a given point.
Proponent	QGC – A BG Group Company.
Production Bore	Allows abstraction of groundwater, either through pumping or artesian flow.
Project Area	The term 'Project Area' refers to those areas of land contained with QGC tenements.
Pump-out Test (Pumping Test, Test Pumping)	Test conducted in a production bore or other installation using a pump to abstract groundwater. Allows estimation of hydraulic characteristics of an aquifer or bore, usually using a production bore in association with observation bores.
QCLNG	Queensland Curtis LNG.
QWC	QGC is an independent, statutory authority responsible for achieving safe, secure and sustainable water supplies in South-East Queensland and other designated regions. The QWC was established in June 2006 under the Water Act and operates under a legislative framework defined in the Water Act 2000.
Radius of Influence	Radial distance to points where hydraulic head is noticeably affected by a pumping well.
Recharge	(a) Water moving into a groundwater body and replenishing or increasing sub-surface storage. Recharge typically enters an aquifer by rainfall infiltrating the soil surface and then percolating through the zone of aeration (unsaturated soil). Recharge can also come via irrigation, the leakage of surface water storage or leakage from other aquifers. (b) Expressed in units of depth per unit of time (e.g. mm/year). (c) Process of water entering a groundwater system or, more precisely, entering the phreatic zone. (d) Area of land from which a significant amount of groundwater recharge occurs. In agricultural areas, most of cleared land that is not discharging groundwater contributes some recharge.
Recovery	Rate the water level in a pumped bore rises once abstraction has ceased.
Relative Permeability	Ability of porous medium to allow fluid flow with other fluid phases present, relative to fluid flow if other fluid phases are not present.
Relief	Elevation difference between highest mountaintop, ridge or hill and lowest valley of a permit area.
Representative Sample	Material or water portion nearly identical in content and consistency to the larger material or water body sampled.
Residual Draw down	Difference between the original standing water level measured prior to pumping, and the depth to groundwater at a given instant during the recovery period following cessation of pumping.
Retention Basin	Basin (either natural or constructed) holding run-off or stream flow and thus reducing peak flows and flood risk. Basin may store water permanently while some is released at a controlled rate.

Item	Definition
Reverse Osmosis (RO)	Flow of fluid through a membrane from the high salinity to the low salinity side of the membrane, typically caused by exerting very high fluid pressures on the high salinity side.
Risk Assessment	Process of using available information to predict how often hazards or specified events may occur (likelihood) and the magnitude of consequences (adapted from AS/NZS 43601999).
Risk Management	Systematic evaluation of a water supply system, identification of hazards and hazardous events, risk assessments and development and implementation of preventive strategies to manage them.
RO	Reverse Osmosis (water treatment method using filtration to remove large molecules and ions (e.g. salts) by applying pressure to a solution when it is on one side of a selective membrane.
RoW	Right of way
Runoff	(a) Portion of rainfall not absorbed by the deep strata used by vegetation, lost by evaporation or as surface flow into streams. (b) Water flowing downslope over the ground surface, also known as 'overland flow'. Precipitation not infiltrating the soil and not stored in depressions becomes run-off.
Safe Yield	Volume of water to be annually withdrawn from an aquifer (groundwater basin or system) without: 1) Exceeding average annual recharge; 2) Violating water rights; 3) Creating uneconomic conditions for water use; or, 4) Creating undesirable side effects, such as subsidence or saline water intrusion.
Saline (Water)	Water with high salinity levels (in excess of 5,000 mg/L), limiting suitability for many uses.
Salinity	Accumulation of soluble salts in soil root zone at levels where plant growth or land use is adversely affected. Also indicates amounts of various salts in soil or water. (See Total Dissolved Solids).
Sand	Sedimentary mineral grains deposited by wind or water action having a particle size of between 1/16" and 2 mm diameter. The grains comprise predominantly quartz and can include other minerals such as feldspars, mica, glauconite and iron oxides.
Sandstone	Sedimentary rock, mostly consolidated sand-sized grains (often between 1/16" and 2 mm and quartz), with cement.
SAR	Sodium adsorption ratio.
Saturated Zone	Part of a body of soil or rock where voids and spaces are filled with water.
Screen, Slotted Section	Casing section (often steel, fibre glass resin, PVC or HDPE) with apertures or slots cut into tubing to allow groundwater to flow through. 'Screen' is a machined section with appropriately sized openings for the aquifer matrix and filter pack grading.
Seal	Largely impermeable rock (usually claystone or shale) retarding passage of water, gas or oil.
SDA	Southern Gas Fields.
Sediment	a) Solid material (both mineral and organic) in suspension, being transported or moved from its original site by air, water, gravity or ice and coming to rest on the surface (above/below sea level). b) Solid material (mineral or organic) moved from its original position and redeposited.
Sedimentary Rock	Rock formed from the consolidation of sediment.
Seep	Point at where seepage occurs. (See Spring).
Seepage	Water table/ground surface intersection water flows. Hydraulic gradient drives active discharge.
Seismic survey	Technique for determining the detailed structure of rocks underlying a particular area by passing acoustic shock waves into the strata and detecting and measuring reflected signals.
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth) – see DEWHA.
Shale	Fine-grained sedimentary rock comprised of clays and other finely sized mineral particles.

Item	Definition
Share Component	Share component of a water access licence is the volume share of water made available in a water source, similar to the entitlement volume on previous water licences under the Water Act 1912. Amount of water a licence holder is allocated per year after an available water determination, based on their share component.
Silt	Sedimentary grains with a particle size of between 0.002 mm and 0.05 mm diameter. Almost always deposited by water action and usually comprising finely divided particles of quartz, carbonate dust, carbon and iron pyrite minerals. Silt transmits and absorbs water but does not become sticky and so is considered to be non-plastic.
Siltstone	Sedimentary rock comprising silt-size particles cemented together. Result of grains of silt particles deposited layer upon layer, compacted by overlying material and cemented together over millions of years to form hard rock.
Sorption	General process by which solutes, ions, and colloids become attached (sorbed) to solid matter in a porous medium. Sorption includes absorption and adsorption.
SP Act	Sustainability Planning Act 2009 (Queensland).
Specific storage (S^s)	Amount of water absorbed released or expelled from storage in a unit volume (i.e. 1 x 1 x 1) of aquifer under a unit change in hydraulic head (i.e. $\delta h = \pm 1$).
Specific Yield (Sy)	Quantity of groundwater draining under gravity from a unit volume (i.e. 1 x 1 x 1) of an unconfined aquifer. Unit decline in hydraulic head under unconfined conditions results in both pressure reduction and the saturated thickness of the aquifer. Hence, the storativity of an unconfined aquifer is related to the specific yield (S^y), saturated zone thickness (h) and specific storage (S^s) according to the equation $S = S^y + h\ S^s$. Product of specific storage and saturated thickness (i.e. $h\ S^s$) is often considerably less than the value of the specific yield. Hence, for almost all unconfined aquifers, storativity is considered equivalent to specific yield. (See Storage Coefficient, Specific Storage)
Standing Water Level (Static Water Level, SWL)	Depth to groundwater measured at any given time when pumping or recovery is not occurring.
Stochastic	Process involving a randomly determined sequence of observations each of which is considered as a sample of one element from a probability distribution.
Storage Coefficient (Storativity; S)	Groundwater volume expelled from or absorbed into storage under a unit change (i.e. $\delta h = \pm 1$) in hydraulic head over a unit area (i.e. 1 x 1) of the aquifer. Confined aquifer storativity is related to the specific storage (S^s) and saturated thickness (b), by equation $S = b\ S^s$ (See Specific Storage).
Stratigraphy	Study of stratified rocks, especially their age, correlation and character.
Structure	Deformed sedimentary rocks, where the bed configuration forms a trap for migrating water gas and/or hydrocarbons.
Study Area	Area of land from which the entire dataset considered by the assessment was gathered in describing the existing environment, environmental values and potential impacts.
Stygofauna	Very small animals and microbes living in groundwater and caves, comprising many types of crustaceans and other groups such as fish, worms, snails, arachnids, mites and insects.
Subsidence	(a) Vertical surface movement, although small-scale horizontal movements may be present. Land sinking or settlement can be caused by a number of processes, including production of fluids, solution, and compaction or cooling of magmatic bodies. (b) Ground surface lowering by hydrostatic pore space pressure removal (through buoyancy) or underground mine voids collapse.
Surface Drainage	Systems to intercept and remove excess surface water, including spoon drains and W-drains.
Surface Flow	Movement of water across the ground surface as run-off or stream flow.

Item	Definition
Sustainable Yield	General: Volume able to be extracted from a groundwater source by all water users without causing unacceptable impacts (i.e. without detrimentally affecting existing supplies or flows to dependent environments). Simplistically, average annual recharge less the portion reserved for the environment gives the sustainable yield. SEWPaC definition: "...The groundwater extraction regime, measured over a specified planning timeframe that allows acceptable levels of stress and protects dependent economic, social, and environmental values..."
TC_{Lo}	Toxic concentration low – Concentration of a substance in air to which humans (or animals) are exposed for any given time period that has produced any toxic effect or a tumorigenic or reproductive effect in the subject group(s).
TD_{Lo}	Toxic dose low – Lowest published toxic dose (Toxic Dose Low, TD_{Lo}) unit of bodyweight (typically stated mill per kg) of a substance known to produce toxicity signs in a particular animal species. Usually stated as a TD_{Lo} with the particular species and method of administration (e.g. ingested, inhaled, intragenous).
TDS	Total dissolved solids/Total disolved salts
Targeted Aquifer	Aquifer layers targeted for CSG extraction or by groundwater users (in this case: Mooga, Gubberamunda, Springbok, Hutton and Precipice, as well as the WCM).
Tertiary	Geologic time period between about 65 million and two million years ago (See Period).
Texture (soil)	Levels of gravel, sand, silt and clay in a soil. Heavy texture implies a higher proportion of smaller particles such as clay. Lighter texture implies larger particles such as sand.
Theis Equation	Equation for radial transient flow to a well in an idealized confined aquifer.
Thiem Equation	Equation for radial steady flow to a well in an idealized confined aquifer.
Threshold Value	Value designated for a particular parameter (e.g. water quality or level values) beyond which specific response actions would be triggered. (See also Groundwater Draw down Threshold.)
Throw (fault throw)	Distance of movement along a fault plane.
TLM96	Median tolerance limit 96 hours
TLV-TWA	Threshold Limit Value — Time-Weighted Average
Tortuosity (T or t)	Length of a groundwater flow path (La) divided by the straight line distance between the ends of the flow path (L). Several variations in the formula are used to calculate this ratio. They are: $t = (La\ L)^2$, $t = La\ L$, or their reciprocals.
Total Dissolved Solids (TDS)	Total soluble mineral content of water determined by either measuring residue on evaporation or the sum of analysed chemical constituents. Quoted in milligrams per litre (mg/L) or equivalent parts per million (ppm), TDS may also be approximated from electrical conductivity (EC) measurements using the conversion EC (µS/cm) x 0.68 = TDS (mg/L) (see Electrical Conductivity).
Transmissivity (T)	Rate of horizontal groundwater flow through the fully saturated thickness (b) across an aquifer's unit width (i.e. an area of b x 1) (i.e. through a 1 m-wide slice across an aquifer's entire depth) under a unit hydraulic gradient ($\delta h / \delta l = 1$). May be quoted as m^3/day/m [$L^3/T/L$], but usually as m^2/day [L^2/T]. Better comparison of an aquifer's possible yield than saturated hydraulic conductivity as it takes into account an aquifer's saturated thickness. Transmissivity is related to an aquifer's hydraulic conductivity by the equation T=Kb.
Triassic	Geologic time period extending from 230 million to 180 million years ago (See Period).
TSS	Total suspended solids.
Unconfined Aquifer (Water Table Aquifer)	Aquifer where the saturated zone surface is at atmospheric pressure. (See Aquifer.)
Unconformity	Surface between successive strata representing a missing geologic time interval from either an interruption in deposition or the erosion of depositionally continuous strata followed by renewed deposition; A type of discontinuity.

Item	Definition
Unsaturated Zone	The part of a body of soil or rock separating the land surface and the water table.
Water balance	Relationship between input, storage and output within a hydrological system. System is in equilibrium when the water entering the system equals the amount leaving (with storage remaining constant). Where input exceeds output, the water balance is altered and stored water increases. The water balance can also be altered as storage decreases in response to output exceeding input.
Water Table	(a) Upper surface of a body of groundwater occurring in an unconfined aquifer. At the water table, pore water pressure equals the atmospheric pressure. (b) Surface of a body of groundwater within an unconfined aquifer where the pressure is atmospheric.
WCM or WSG	Walloon Coal Measures or Walloon Subgroup.
WDRC	Western Downs Regional Council.
Well	Excavations or structures created by digging, driving, boring or drilling to access groundwater in underground aquifers and can vary greatly in depth, water volume and water quality. Water is drawn by electric submersible, trash, vertical turbine, a hand or a mechanical pump (e.g. from a water-pumping windmill) or by containers such as buckets (raised mechanically or by hand). Here 'Bore' is used in line with preferred Australian and Qld Govt usage.
Well Screen	Perforated or slotted portion of well casing, allowing water to flow through. Screen and associated filter packing (sand) act as a filter permitting the liquid or air flows but preventing the passage of sediments or backfill particles.
Well Yield	Discharge of well at (nearly) steady flow [L^3/T].
Wetland	Areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or land covered by shallow water. Wetlands must have one or more of these attributes: (1). At least periodically, the land supports predominantly hydrophytes; (2). Substrate is predominantly undrained hydric soils; and (3). Substrate is non-soil and saturated with water or covered by shallow water at some time during the growing season of each year.
WQO	Water quality objectives.
WTP	Water treatment plant.