Engineering Design Practice

Process

Process Fluids

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1. INTRODUCTION

The APA Technical Practice (ATP) aims to achieve sound engineering and design practice through standardisation. We endeavour to make ATP sufficiently flexible to allow engineers to adapt the information in the ATP to project, asset, or customer conditions and requirements. This is of particular importance where the standard may not cover all situations or needs of use.

APA staff and its Contractors shall be solely responsible for applying ATP in the context of legal, statutory and approvals requirements to achieve the required engineering design and quality of work. For those requirements not specifically covered, the designer shall use a recognised engineering practice or standard to accomplish as a minimum the same level of integrity as reflected in the ATP. If in doubt, the Contractor shall, without detracting from their responsibility, consult APA.

See APA's Engineering Glossary [Ref.1] for terms and abbreviations not listed in the Terms and Abbreviations sections.

1.1 Conflicts and Waivers

Conflicts between this standard and other applicable ATP or international, national standards, codes and industry practices shall be resolved in writing by the APA Standards and Assurance team.

Requests for waivers from this standard shall follow the Engineering Standards Waiver procedure in [Ref.2].

1.2 Order of Precedence

See the order of precedence of standards in the Engineering Standards documentation [Ref.3].

2. PURPOSE AND SCOPE

This document provides an overview of the fluids encountered across APA sites and their properties. This information is intended to assist the process and mechanical designs and should be used together with the relevant EDP.

APA uses “Chemwatch” for MSDS for all hazardous materials.

See the Identification of Lines, Valves, Equipment, Electrical, Instruments & Cables Tag Numbers [Ref.6] for the standard listing of Service Identifiers. In all cases where Service Identifiers are used that are not shown in this document, they shall be defined on the drawing where they are used and/or in a master legend for the set of drawings.

APA Climate Transition Plan outlines the company's commitment to achieving net-zero greenhouse gas emissions by 2050. The plan includes a range of strategies to reduce emissions, including increasing the use of renewable energy sources, transitioning to lower-emitting fuels, and improving energy efficiency. APA also aims to reduce its methane emissions, through the implementation of the Methane Guiding Principles. APA has committed to ensuring that all opportunities to reduce emissions are in line with relevant Australian Federal, State, and Territory legislation.

For all greenfield and brownfield projects, the Net Zero requirements shall be considered to eliminate or reduce any risk of harm from Scope 1 and 2 GHG emissions i.e., avoid or minimise Scope 1 and Scope 2 emissions where and so far as is reasonably practicable. The designer(s) shall apply to the commercial decision-making processes in APA’s Internal Carbon Pricing Procedure, [Ref.8], to determine the best options to avoid or abate emissions. See also the Climate Change Standard [Ref.7] and The Methane Guiding Principles [Ref.12].

3. PROCESS FLUIDS

Process emissions are emissions that are released during processing, storage, and transmission of gasses. The designer(s) shall identify all GHG emissions as far as is reasonably practicable during the design process and select appropriate mitigation or reduction methods to effectively address and minimise the impact or other risks they pose if released into the environment as far as is reasonably practicable.

3.1 Air

Table 1 Process Fluid Properties: Air

Property	Details
Source	Atmospheric air, compressed and dried in fixed or portable equipment.
Destination	Instrumentation power source Control valve power source Air power tools Injection into CO_2 regenerators Breathing air for breathing apparatus
Appearance	Colourless, odourless
Composition	79% nitrogen, 21% oxygen, plus traces of other atmospheric gases. Atmospheric air may contain up to 100% relative humidity and requires dehydration to avoid formation of liquid water and corrosion.
Pressure	0-1,000 kPag as found in normal operation. 700 kPag is typical supply pressure instrumentation and control, regulated to a lower pressure where required at the individual instrument panel. Breathing air may be stored in high pressure cylinders (up to ~38,000 kPag) or supplied via fans.
Temperature	Ambient to 70 °C in normal operation.
Notes	1. ASME B16.5 Class 150 [Ref.10] applications only. 2. Plant air is the lowest quality air product and used for power tools and high-volume applications. 3. Instrument air requires higher quality and is dehydrated to at least minus 10 °C dewpoint and filtered. 4. Breathing air intended for human use requires additional processing and for safety reasons shall be segregated from other air applications.
Fluid Codes	CA – Compressed Air IA – Instrument Air PA – Plant Air

3.2 Chemicals - Acid

Table 2 Process Fluid Properties: Chemicals - Acid

Property	Details
Source	Purchased from various vendors.
Destination	Typically used for batch cleaning to remove deposits such as scale on boiler tubes, on reverse osmosis membranes and other scale susceptible processes.
Appearance	Colourless liquid with a spice odour - pungent smell.
Composition	Low pH liquids such as hydrochloric acid, chromic acid and sulphuric acid.
Pressure	Typically stored at atmospheric pressure. Operating pressure varies with application but usually less than 1,700 kPag.
Temperature	Typically stored at ambient temperature. May be heated during application to assist cleaning process.
Notes	1. Acids are aggressive, particularly in concentrated form. 2. Use appropriate personnel protection and precautions during storage and handling.
Fluid Codes	CB – Chemicals Acid

3.3 Chemical - Dosing

Table 3 Process Fluid Properties: Chemical - Dosing

Property	Details
Source	Dosing chemicals are purchased from a range of specialist vendors.
Destination	Dosed into multiple process streams including wellheads, pipelines, processing equipment and water treatment and utility systems.
Appearance	Appearance and properties vary depending upon the chemical.
Composition	Composition varies depending upon the chemical. Dosing chemicals are often complex blends customised to provide specific functionality. Blends may be water or hydrocarbon based to suit the application.
Pressure	Typically stored at atmospheric pressure in drums or IBCs due to the low volumes required. Dosing pumps inject the chemical into the process stream; dosing pump discharge pressure can be high.
Temperature	Normally stored and injected at ambient temperature. Chemical stability at process temperatures should be considered.
Notes	1. Dosing chemicals cover a wide range of chemicals, typically injected in small quantities for specific reasons – examples include corrosion inhibitors, scale inhibitors, pH modifiers, dispersants, flow improvers, pour point depressants, biocides, demulsifiers and water treatment chemicals. 2. Due to the wide range of chemicals in the dosing chemicals category, confirm fluid specifics from the appropriate MSDS. 3. Tubing rather than piping is often used for injection purposes. 4. Properties of oil/water with chemical dosing may be significantly affected. Laboratory tests are often needed to ensure fluid compatibility.
Fluid Codes	CC – Chemical Catalyst CF – Aqueous Film Forming Fluid CG – Glycol CH – Wax Inhibitor CI – Corrosion Inhibitor CJ – Anti-Foam CK – Emulsion Breaker CL – Biocide CM – Scale Inhibitor

3.4 Crude Oil

Table 4 Process Fluid Properties: Crude Oil

Property	Details
Source	Oil wellheads
Destination	Typically transported via a gathering system of flowlines and trunklines to a central collection and processing point. In some areas, crude may be trucked rather than pipelined.
Appearance	Semi-translucent to opaque combustible and/or flammable liquid. Colour from dark yellow brown through dark green to black. Often odourless but may contain natural mercaptans. Many crudes form wax matrices at low temperatures. May contain significant quantities of water and gas condensate.
Composition	Predominantly heavy hydrocarbons including waxes, traces of asphaltene, traces of olefins and fractions of light ends including methane, ethane, propane, butane, etc. Often produced as a full water emulsion - crude oil streams may also contain traces of aromatic components (BTEX), bacteria (acid producing or sulphate reducing), biocides, corrosion inhibitor, corrosion products, forward and reverse emulsion breaker, H_2S, mineral salts, oxygen scavenger, pour-point depressant, proppant or sand. Crude oil ranges from dead (sub atmospheric vapour pressure) through to live (light ends released when pressure reduced).
Pressure	0-15 MPag found in normal operations.
Temperature	Ambient to 100 °C in normal operation. Artificial lift wells produce higher wellhead crude oil temperatures.
Notes	1. Crude oil is also known as raw crude oil and unprocessed oil. 2. Waxes can occur at relatively high temperatures of 30 °C for some fields - design of crude oil transport and storage systems shall address potential for waxing and thickening. 3. Crude oil stored in atmospheric tanks may produce vapour emissions which shall be addressed in the design. 4. Crude oil should not be confused with natural gas condensate (See Section 3.11). Crude oil contains a wider array of hydrocarbon species, particularly unsaturated hydrocarbons and cyclic hydrocarbons which are not seen or have very low concentrations in gas condensate.
Fluid Codes	CO – Crude Oil The CO code is reserved for crude oil with zero to moderate light ends content - high GOR light hydrocarbons use the general HL hydrocarbon code. The CO fluid code applies to crude oil produced from the wellhead and through the gathering system - once crude is blended with other fluids such as gas condensate or processed for vapour pressure control or other reasons; the general HL hydrocarbon code applies.

3.5 Diesel

Table 5 Process Fluid Properties: Diesel

Property	Details
Source	Purchased from various vendors.
Destination	Diesel engines are used for emergency and backup systems where reliable self-contained operation is critical (e.g., emergency diesel power generators, fire pumps). Diesel is not normally preferred for continuously operating process equipment due to the high fuel cost.
Appearance	Light yellow and clear liquid Slight characteristic odour
Composition	Complex mixture of hydrocarbons consisting of paraffins, cycloparaffins, aromatic and olefinic hydrocarbons with carbon numbers predominantly in the C_9 to C_{25} range.
Pressure	Normally stored at atmospheric pressure.
Temperature	Normally stored and used at ambient temperature. Auto-ignition temperature above 220 °C.
Notes	-
Fluid Codes	FO – Diesel Oil

3.6 Ethane

Table 6 Process Fluid Properties: Ethane

Property	Details
Source	The Moomba to Sydney Ethane Pipeline.
Destination	Ethane compression, then ethane sales via pipeline to Sydney.
Appearance	Colourless, odourless, invisible, highly flammable gas. Significant refrigeration effect and heavier than air when depressurised Contact with moist air may produce white cloud of water droplets.
Composition	Predominantly ethane with traces of methane and propane. CO_2 up to 15%mol in ETP feed, removed to <100 ppm in product.
Pressure	0-23 MPa in normal operation at Moomba.
Temperature	Ambient to 115 °C in normal operation. 200 °C downstream of compressors. Approximately minus 100 °C at atmospheric pressure (for the boiling liquid). Liquid formation is typical for large pressure reductions from the dense phase transport pressures unless heating is provided.
Notes	1. Also known as treated ethane and ethane concentrate. 2. Ethane is a dense phase fluid at high pressure – this can affect hydraulics, separation and interface level measurement. 3. Product specifications apply to ethane sales.
Fluid Codes	C2 - Ethane

3.7 Fuel Gas

Table 7 Process Fluid Properties: Fuel Gas

Property	Details
Source	Preferred fuel gas source is a slipstream of sales quality gas. In areas without access to sales quality gas, alternative supplies such as raw gas are used for fuel gas after appropriate gas conditioning.
Destination	Gas recip. engines, Gas turbines, Heaters, Flare purge. Vessel and tank blanket gas (e.g., MEG and condensate storages).
Appearance	Colourless, invisible, flammable gas Lighter than air Often odourless but may contain natural mercaptans if derived from raw gas or may be odourised by third party supplier.
Composition	Predominantly methane and some ethane with varying levels of heavier hydrocarbons and inerts. CO_2 content will reflect source gas - low for CSG but potentially up to 50% for some Cooper Basin raw gas streams. Heavy hydrocarbon content will reflect source gas - minimal for CSG but usually significant for conventional raw gas streams, where hydrocarbon dewpoint conditioning is often required. Unless source gas is dehydrated, fuel gas will typically be water saturated - hydrate control may be required. H_2S content will reflect source gas (i.e., circa 20 ppm in Cooper Basin raw gas streams).
Pressure	0-1,700 kPag as found in normal operations.
Temperature	Ambient to 70 °C in normal operation (due to fuel gas heater). Below 0 °C downstream of pressure reduction.
Notes	1. ASME B16.5 Class 150 [Ref.10] applications only. 2. Gas turbines usually require higher fuel gas pressure - and are less tolerant of impurities - than gas recip. Engines.
Fluid Codes	FG – Fuel Gas

3.8 Glycol

Table 8 Process Fluid Properties: Glycol

Property	Details
Source	Purchased from various vendors. Supplied in drums, IBCs or bulk tanker depending upon usage.
Destination	TEG plants for gas dehydration - see Notes below. MEG injection for hydrate inhibition - see Notes below. PEG injection for antifoam in potassium carbonate systems.
Appearance	Clear, colourless viscous liquid
Composition	MEG - Mono Ethylene Glycol $C_2H_6O_2$ TEG - Tri Ethylene Glycol $C_6H_{14}O_4$ PEG – Poly Ethylene Glycol Glycol that has been in use for some time may contain traces of corrosion products and degradation products - TEG may absorb traces of BTEX from natural gas.
Pressure	Stored at atmospheric pressure. TEG operating pressure cycles from typically 8 MPag in TEG absorber to near atmospheric in TEG regenerator. Dosing pumps boost MEG to the pressure required for injection into the associated process; dosing pump discharge pressure can be high.
Temperature	Stored at ambient temperature. Maximum operating temperature is 204 °C in reboiler of TEG regenerator - excessive temperatures can cause degradation.
Notes	1. TEG is used for gas dehydration in multiple plants. 2. MEG is widely used for hydrate inhibition at wellheads, gathering systems and in low temperature sections of processing plant - MEG is usually supplied in a drum or IBC with a local dosing pump to inject the MEG and is recovered and regenerated onshore for recirculation offshore. 3. TEG and MEG are commonly classified as either rich (loaded with water) or lean (majority of water driven off in the regenerator). 4. Stored glycol may require blanket gas to prevent degradation from contact with air.
Fluid Codes	HG – Hot Glycol CG – Glycol

3.9 Hot Oil

Table 9 Process Fluid Properties: Hot Oil

Property	Details
Source	Purchased from speciality vendors.
Destination	Hot oil heating circuits, e.g., in gas plants
Appearance	Light amber oily liquid, turns black if degraded Mild odour
Composition	Proprietary synthetic or petroleum-based compounds, customised to provide specific heat transfer functionality such as thermal stability, boiling point and vapour pressure. May be toxic, some fluids can form hazardous degradation products.
Pressure	Up to 1,700 kPag in normal operations.
Temperature	Ambient to 320 °C in normal operation. Excessive temperatures can cause degradation.
Notes	1. Hot oil circuits are used as an alternative to a steam system for circulating heat between heaters and process users. 2. Hot Oil is also known as heat transfer fluid.
Fluid Codes	HO – Hot Oil

3.10 Hydrocarbon - General

Table 10 Process Fluid Properties: Hydrocarbon - General

Property	Details
Source	Produced from reservoirs via wellheads.
Destination	Typically transported via a gathering system of flowlines and trunklines to a central collection and processing point.
Appearance	Hydrocarbon liquid generally coloured but may be clear. Hydrocarbon vapour; colourless, invisible, flammable gas. Often odourless but may contain natural mercaptans.
Composition	Organic compounds composed entirely of hydrogen and carbon.
Pressure	Water and acid gas may be produced with the hydrocarbon.
Temperature	Variable
Notes	-
Fluid Codes	FG – Fuel Gas FJ – Jet Fuel FO – Diesel Oil GS – Seal Gas GW – Waste Gas LO – Lubricating Oil IG – Instrument Gas LNG – Liquefied Natural Gas LPG – Liquefied Petroleum Gas MG – Mains Gas NG – Natural Gas (Process)

3.11 Hydrocarbon - Condensate

Table 11 Process Fluid Properties: Hydrocarbon - Condensate

Property	Details
Source	Hydrocarbon liquid condensed from natural gas in well-bores, gathering systems and processing plant, typically recovered in gas separator vessels.
Destination	Typically transported via a gathering system of flowlines and trunklines to a central collection and processing point (e.g., gas plant). Condensate product is then sold by road tanker ship.
Appearance	Colourless to straw coloured, translucent flammable liquid Often odourless, but can contain natural mercaptans and aromatics (BTEX) May contain water and dissolved gas condensate produced at low temperature and/or high pressure can contain significant light ends and will evolve vapour at ambient conditions. Significant refrigeration effect when depressurised.
Composition	Predominantly pentane, hexane, heptane, with fractions of ethane, propane, butane, aromatics (BTEX) and heavier hydrocarbons. May also contain corrosion inhibitor, glycol, methanol, sand, proppant and corrosion products.
Pressure	0-15 MPag found in normal operations.
Temperature	Ambient to 115 °C in normal operation Generally ambient to 70 °C downstream of gas separators Below 0 °C downstream of pressure reduction. Sub zero in cryogenic recovery plants
Notes	1. Also known as Gas Condensate. 2. May also be referred to as Natural Gas Liquids (NGLs), where LPG and ethane content is significant. 3. Hydrocarbon condensate is a by-product of conventional gas or shale gas- CSG wells generally produce negligible condensate.
Fluid Codes	HCC – Hydrocarbon condensate

3.12 Instrument Gas

Table 12 Process Fluid Properties: Instrument Gas

Property	Details
Source	Preferred instrument gas source is a slipstream of sales quality gas In areas without sales quality gas, alternative supplies such as raw gas may be used for instrument gas after appropriate gas conditioning.
Destination	Instrumentation power source Control valve power source
Appearance	Colourless, invisible, flammable gas Lighter than air Often odourless but may contain natural mercaptans if derived from raw gas.
Composition	Predominantly methane and some ethane with varying levels of heavier hydrocarbons and inerts. CO_2 content will reflect source gas - low for CSG but potentially up to 50% for some Cooper Basin raw gas streams. Heavy hydrocarbon content will reflect source gas – minimal for CSG but usually significant for Cooper Basin raw gas streams, where some form of hydrocarbon dewpoint conditioning is typically required. Unless source gas is dehydrated, instrument gas will typically be water saturated - hydrate control may be required. H_2S content will reflect source gas (e.g., circa 20 ppm in Cooper Basin raw gas streams - and may corrode instruments).
Pressure	0-1,000 kPag as found in normal operations.
Temperature	Ambient to 70 °C in normal operation due to IG heating. Below 0 °C downstream of pressure reduction.
Notes	1. ASME B16.5 Class 150 [Ref.10] applications only. 2. Instrument gas has been traditionally used at isolated sites with no dedicated instrument air supply including Main Line Valves. 3. An alternative is provision of instrument air – (e.g., via Solar Powered Air Compressor). 4. Instrument Air Compressor - is preferred over instrument gas due to the higher maintenance costs and venting of unburned hydrocarbons resulting from use of instrument gas.
Fluid Codes	IG – Instrument Gas

3.13 Liquefied Natural Gas (LNG)

Table 13 Process Fluid Properties: LNG

Property	Details
Source	Pipeline gas is treated and then liquefied at low temperatures.
Destination	Revaporised and returned to pipeline at periods of peak demand. Also, possible to export via road or sea tanker.
Appearance	Low viscosity hydrocarbon liquid. Condenses water vapour in air giving a smoky appearance when released.
Composition	Primarily methane with traces of other hydrocarbons and nitrogen.
Pressure	Large bulk storage: Stored at boiling point near atmospheric pressure (107.5 kPaA). Batch tank typically about 700 kPag. Up to 15 MPag when reinjected to pipeline. Up to 1000 kPag when injected into road tanker.
Temperature	-163 °C in storage at 107 kPaA.
Notes	1. LPG and CO_2 are mostly removed during the LNG liquefaction process to prevent freezing and blockages which would occur for these components at -163 °C.
Fluid Codes	LNG – Liquefied Natural Gas

3.14 Liquefied Petroleum Gas (LPG)

Table 14 Process Fluid Properties: LPG

Property	Details
Source	LPG is produced by separation from natural gas streams in gas processing plants, usually by low temperature separation. It is stored at high pressure and ambient temperatures.
Destination	LPG is sold into the domestic market as pressurised (trucked) LPG.
Appearance	Colourless, highly flammable Liquid when under pressure or refrigeration Colourless, invisible, highly flammable gas at atmosphere Odourless, except when odourised at point of sale Heavier than air under all atmospheric conditions Significant refrigeration effect when depressurised Contact with moist air may produce white cloud of water droplets
Composition	Propane and butane, with traces of C_1, C_2 and C_5. Final LPG products may be primarily propane, butane or a mixture of the two, depending on commercial agreements.
Pressure	0-4.6 MPag as found in normal operations. Typically stored at around 2500 kPag and atmospheric temperature.
Temperature	Minus 45 °C to 70 °C in normal operation Below minus 100 °C downstream of pressure reduction
Notes	1. Commonly known as LPG, propane, butane, auto-mix, go-gas. 2. Odorant Ethyl mercaptan is added at point of sale for trucked LPG. 3. Product specifications apply to LPG sales.
Fluid Codes	LPG – Liquefied Petroleum Gas

3.15 Lubricating Oil and Seal Oil

Table 15 Process Fluid Properties: Lubricating and Seal Oil

Property	Details
Source	Purchased from various vendors. Supplied in drums, IBCs or bulk tanker.
Destination	Rotating equipment seal oil and lube oil systems
Appearance	Viscous, translucent, combustible liquid Straw to honey colour when new, generally black after use
Composition	Synthetic, mineral and natural oils to manufacturer's specification
Pressure	Generally atmospheric Some equipment uses high pressure injection pumps.
Temperature	Normally stored at ambient temperatures, however circulating oil will pick up heat from the process.
Notes	1. Used oil requires recycling / recovery. 2. Lube oil and seal oil may or may not be interchangeable. Engine lubrication oil may contain detergents to remove water from the system. Compressor end lubrication oil generally lacks detergents to avoid foaming. 3. Lube oil may enter the process gas if liquid seals are used on compressors.
Fluid Codes	LO – Lubricating Oil

3.16 Methanol

Table 16 Process Fluid Properties: Methanol

Property	Details
Source	Purchased from various vendors. Supplied in drums, IBCs or bulk tanker.
Destination	Used at well-heads, satellites and plants for hydrate control.
Appearance	Colourless, clear, highly flammable liquid Burns with near invisible flame
Composition	Methanol (CH_3OH)
Pressure	Up to 1,700 kPag in normal operations Up to 9 MPag in injection service Most facilities use high pressure methanol injection pumps
Temperature	Ambient to 70 °C in normal operation
Notes	1. Facilities may have a dedicated methanol storage tank and reticulated distribution system; other locations typically utilise a methanol drum at each injection point. 2. Methanol is water soluble - methanol in condensed water may affect downstream water treatment / disposal. Methanol can only be separated from water via distillation which is not typically economical to perform and will be disposed with the wastewater. 3. In MEG/TEG systems, methanol can concentrate in the glycol regenerator and boil over. 4. Common abbreviation MeOH.
Fluid Codes	MeOH - Methanol

3.17 Naphtha

Table 17 Process Fluid Properties: Naphta

Property	Details
Source	Produced by crude oil fractional distillation.
Destination	Transported by road or sea tanker. Used as a solvent or further refined into consumer liquid fuels.
Appearance	Water-white transparent products Slight aromatic odour
Composition	Naphthas are generally produced in three grades: • Light Naphtha – Light to medium hydrocarbons, C_5 to C_8 • Full Naphtha – Light to heavy hydrocarbons, C_5 to C_{15} • Heavy Naphtha – Medium to heavy hydrocarbons, C_{10} to C_{15}
Pressure	0-1700 kPag found in normal operations
Temperature	270 °C immediately downstream of Naphtha heaters Ambient to 100 °C in normal operation
Notes	1. Naphtha is a refined product and conducive to generation and accumulation of static electricity. 2. Light naphtha has a relatively high vapour pressure - RVP shall be controlled for safe storage in tankage. 3. Naphtha vapour may contain aromatic species. 4. Product specifications apply to naphtha sales. 5. Boiling point is 30-90 °C for light naphtha and 90-200 °C for heavy naphtha.
Fluid Codes	NAP - Naphtha

3.18 Nitrogen

Table 18 Process Fluid Properties: Nitrogen

Property	Details
Source	Purchased from vendors. Supplied in portable cylinders or by bulk ISO tanker or generated onsite using a membrane from atmospheric air.
Destination	Plant utility service Purging equipment into or out of service Minor on site laboratory and analyser usage
Appearance	Colourless, invisible, asphyxiating gas at ambient conditions Colourless liquid when under refrigeration (LN) Minor refrigeration effect when depressurised Contact with moist air may produce white cloud of water droplets
Composition	Molecular nitrogen (N_2)
Pressure	0-4.6 MPag as found in normal operations Extra-high pressure (EHP) cylinders are 25 MPag
Temperature	Ambient to 70 °C for pressurised storage, boil off from bulk storage may result in sub zero temperatures. Below minus 100 °C downstream of pressure reduction or if stored as a liquid.
Notes	1. Some facilities have a dedicated nitrogen storage facility and reticulated distribution system involving bulk storage of liquefied nitrogen at temperatures below -100 °C 2. Other locations typically utilise localised nitrogen cylinders, sometimes supplied as packs of manifolded cylinders, stored at ambient temperature and high pressure - up to 16 MPa. 3. Nitrogen is a bulk asphyxiant - confined spaces such as purged equipment shall be nitrogen freed and breathable atmosphere re-established before allowing personnel entry.
Fluid Codes	N2 – Nitrogen LN – Liquid Nitrogen

3.19 Odorant

Table 19 Process Fluid Properties: Odorant

Property	Details
Source	Purchased from vendors. Stored in small or large ISO pressure vessels on site as part of dedicated odorant injection system.
Destination	Added into pipeline gas for leak detection and recognition.
Appearance	Oily liquid Extreme pungent odour Some toxicity when concentrated
Composition	30% Tert-Butylthiol (Tertiary Butyl Mercaptan, TBM), 70% Tetrahydrothiophene (THT) in storage. Injected to gas at 7-14 ppm where it rapidly vaporises.
Pressure	Stored at near atmospheric pressure. Injected up to 15 MPag.
Temperature	Stored and used at ambient temperatures.
Notes	1. Refer to MSDS in Chemwatch, Spotleak 1005 [Ref.11]. 2. Activated carbon may be used for removal of low concentrations of odorant in air, generally packaged in drums. 3. Spill kits to be located near the storage facility at a safe distance.
Fluid Codes	OD - Odorant

3.20 Plant Relief

Table 20 Process Fluid Properties: Plant Relief

Property	Details
Source	Pressure Safety Valves (PSVs) or actuated blowdown valves
Destination	Relief system – See the Flares and Vents [Ref.4].
Appearance	Discharges into relief systems are generally hydrocarbon fluids as described in this Design Practice – See the Flares and Vents [Ref.4].
Composition	See hydrocarbon fluids as described in this Design Practice.
Pressure	Backpressure is determined by relief rate, relief system sizing, relief network interaction and flare tip backpressure. Maximum discharge rates shall be calculated for each relief scenario and suitability of relief system for estimated backpressure confirmed.
Temperature	Relief discharge is often much colder than process streams due to Joule Thomson expansion cooling. Lowest discharge temperature shall be calculated for each specific relief application and suitability of relief system metallurgy confirmed.
Notes	1. Design of relief system is covered in the Flares and Vents [Ref.4] document
Fluid Codes	GW – Waste Gas VC – Vent Closed VE – Vents VG – Vent Gas VL – Vent Line VO – Vent Opened

3.21 Raw Gas - Conventional

Table 21 Process Fluid Properties: Raw Gas - Conventional

Property	Details
Source	Conventional gas wellheads
Destination	Typically transported via a gathering system of flowlines and trunklines to a central collection and processing point.
Appearance	Colourless, invisible, flammable gas Often odourless but may contain natural mercaptans and H_2S. May contain significant quantities of produced water (typically with high salinity equivalent to seawater) and gas condensate as well as condensed water. Significant refrigeration effect when depressurised. Contact with moist air may produce white cloud of water droplets.
Composition	Predominantly methane with fractions of ethane, propane, butane and heavier hydrocarbons, including BTEX, H_2O vapour saturated. Cooper Basin CO_2 30 mol% on average, higher for some specific fields. Cooper Basin H_2S circa 20 ppm on average, higher for some specific fields. Raw gas streams may also contain corrosion inhibitor, glycol methanol, sand, proppant, corrosion products and trace mercury.
Pressure	0-15 MPag or higher at the shut-in tubing head pressure found in normal operations, higher pressures can be experienced in specific fields.
Temperature	Ambient to 115 °C in normal operation Up to 175 °C downstream of reciprocating compressors Up to 200 °C downstream of centrifugal compressors Below 0 °C downstream of pressure reduction
Notes	1. Also known as raw natural gas.
Fluid Codes	RNG – Raw Natural Gas

3.22 Raw Gas - CSG

Table 22 Process Fluid Properties: Raw Gas - CSG

Property	Details
Source	Coal seam gas wellheads
Destination	Typically transported via a gas gathering system of flow lines and to a centralised gas plant for compression and dehydration.
Appearance	Colourless, invisible, flammable gas Usually odourless, unless natural mercaptans are present Lighter than air at ambient, may be heavier than air when cold
Composition	Predominantly methane with traces of ethane, CO_2 and N_2. Usually, minimal C_3+ content and no associated hydrocarbon liquids. Inerts content is usually low enough to satisfy requirements of the Specification for General Purpose Natural Gas, AS 4564, [Ref.9] without further processing. Water vapour saturated - CSG wells may also produce significant quantities of liquid water (typically with low salinity), which is often separated at the wellhead to improve gas gathering system hydraulics. May also contain coal fines, proppant, corrosion products and wellhead chemicals if used.
Pressure	Flowing pressure up to typically 700 kPag found in normal operations, as limited by MAOP of gathering system. Shut In Tubing Head Pressure can be much higher; well-head equipment shall be suitably rated.
Temperature	Ambient to typically 65 °C in normal operation. Maximum flowing well temperature varies with producing formation and may exceed 65 °C in some areas – this shall be addressed in selection of wellhead and gathering system materials.
Notes	1. Usually referred to as Coal Seam Gas (CSG) - also known as Coal Seam Methane (CSM) or Coal Bed Methane (CBM). 2. Coal seam gas withdrawn from storage may be cross-contaminated by contact with other reservoir gas - this may necessitate dewpoint conditioning or other atypical conditioning to remove contaminants not normally found in raw CSG.
Fluid Codes	CSG – Coal Seam Gas

3.23 Steam

Table 23 Process Fluid Properties: Steam

Property	Details
Source	Steam Boilers Thermal Oxidisers Waste Heat Recovery Units
Destination	Process Heating (e.g., Reboilers) Steam Turbines Utility Steam (e.g., steaming out vessels)
Appearance	Hot, invisible, colourless and odourless. Condensation of saturated steam results in white cloud on contact with ambient air. Superheated steam will not produce a white cloud when in contact with ambient air.
Composition	May contain traces of boiler chemicals and corrosion products.
Pressure	High Pressure superheated steam up to 4,600 kPag or as found in normal operations Medium Pressure saturated steam up to 2,930 kPag or as found in normal operations Low Pressure saturated steam up to 1,700 kPag or as found in normal operations
Temperature	High Pressure superheated steam up to 325 °C or as found in normal operations Medium Pressure saturated steam up to 235 °C or as found in normal operations Low Pressure saturated steam up to 200 °C or as found in normal operations
Notes	1. ASME B16.5 Class 150 and Class 300 [Ref.10] applications only. 2. Not all facilities employ all three levels of steam pressure, also demarcation between steam types may vary between sites.
Fluid Codes	ST – Utility Steam

3.24 Steam Condensate

Table 24 Process Fluid Properties: Steam Condensate

Property	Details
Source	Process Plant Reboilers Dump Condensers and Condensing Turbines Process Steam Heaters
Destination	Reused as Boiler Feed Water for steam generation.
Appearance	Hot, colourless and odourless
Composition	May contain traces of boiler chemicals and corrosion products. May partially flash to steam when pressure is reduced.
Pressure	0-1,700 kPag as found in normal operations
Temperature	Ambient to 150 °C in normal operation
Notes	1. ASME B16.5 Class 150 [Ref.10] applications only 2. Steam condensate may require reprocessing (e.g., de-aeration) prior to re-use as Boiler Feed Water. 3. Chemicals are also added such as biocide and anti-scale.
Fluid Codes	SC – Steam Condensate

3.25 Sweet Gas - Conventional

Table 25 Process Fluid Properties: Sweet Gas - Conventional

Property	Details
Source	CO_2 Removal Plant
Destination	Downstream processing – dehydration, liquids removal, compression - then to gas storage or gas sales
Appearance	Colourless, invisible, flammable gas Odourless - odorant mercaptans are usually added by customers. Lighter than air
Composition	Predominantly methane with fractions of ethane, propane, butane and heavier hydrocarbons, including BTEX. H_2O vapour saturated prior to dehydration CO_2 up to 3 mol% Trace H_2S – bulk H_2S will be removed in CO_2 Removal Unit.
Pressure	0-17 MPag in normal operations
Temperature	Minus 95-115 °C in normal operation 320 °C during DPCU regeneration cycle Up to 175 °C downstream of reciprocating compressors Up to 200 °C downstream of centrifugal compressors Below minus 100 °C downstream of pressure reduction
Notes	1. Significant refrigeration effect when depressurised. 2. The SG (sweet gas) fluid code applies to methane or ethane-based gases with low (<3% mol) CO_2 content. 3. Where gas exceeds 3% mol CO_2 at the wellhead - it is classed as RG until CO_2 content is reduced, after which the SG code applies. 4. Conventional gas after CO_2 removal still requires dehydration and heavy ends removal to meet the sales gas requirements specified in AS 4564 [Ref.9]. 5. Stored sweet gas may be cross-contaminated by contact with other reservoir gas – withdrawal gas may require reprocessing to remove specific contaminants. 6. Eastern Queensland CSG is classified as SG after dehydration. 7. Ethane produced at Moomba also falls into the SG classification.
Fluid Codes	NG – Natural Gas (Process) MG – Mains Gas

3.26 Sweet Gas - CSG

Table 26 Process Fluid Properties: Sweet Gas - CSG

Property	Details
Source	Coal seam gas dehydration plants
Destination	Domestic gas sales, gas storage or LNG export plant feed
Appearance	Colourless, invisible, flammable gas Usually odourless - odorant may be added by customers. Significant refrigeration effect when depressured. Lighter than air at ambient, may be heavier than air when cold. Contact with moist air may produce white cloud of water droplets.
Composition	Predominantly methane with traces of ethane, CO_2 and N_2. Dehydrated to less than 0 °C water dewpoint. Inerts and C_3+ content is usually low enough to satisfy requirements in AS 4564 [Ref.9] without further processing. May contain traces of glycol, methanol, compressor oil or corrosion products - filter coalescers may be used to remove impurities.
Pressure	0-15 MPag as found in normal operations Low pressure at wells of around 0-300 kPag, compressed to higher pressures for pipeline transport.
Temperature	Ambient to 115 °C in normal operation Up to 175 °C downstream of reciprocating compressors Up to 200 °C downstream of centrifugal compressors Down to minus 100 °C downstream of pressure reduction
Notes	1. Usually referred to as Coal Seam Gas (CSG) - also known as Coal Seam Methane (CSM) or Coal Bed Methane (CBM). 2. Stored sweet gas may be cross-contaminated by contact with other reservoir gas – this may require further treatment to remove specific contaminants. 3. CSG sold into the Australian domestic gas market shall meet the requirements in AS 4564 [Ref.9]. 4. Product specifications for CSG sold to an LNG plant or third-party customer are application specific and may be more stringent than the requirements in AS 4564 [Ref.9].
Fluid Codes	NG – Natural Gas (Process) MG – Mains Gas

3.27 Water, Associated

Table 27 Process Fluid Properties: Water, Associated

Property	Details
Source	Water co-produced with coal seam gas from CSG wells.
Destination	Typically transported via an associated water gathering system to a central hub for treatment, including interceptor ponds, holding ponds, reverse osmosis plants and associated water amendment facilities. See Appendix A.
Appearance	Clear, usually odourless
Composition	Associated water may contain dissolved CSG and traces of coal fines and wellhead chemicals but typically low salinity.
Pressure	0-1,700 kPag as found in normal operations Pressure at wellhead around 300 kPag
Temperature	Ambient to typically 65 °C in normal operation. Maximum flowing well temperature varies with producing formation – temperature of associated water may exceed 65 °C for some wells.
Notes	1. Coal seam gas contains minimal heavy hydrocarbons, hence water produced from CSG wells does not suffer from hydrocarbon liquid contamination and is classified as associated water rather than oily water. 2. Water co-produced from conventional gas or oil wells is contaminated by contact with liquid hydrocarbons and is classified as oily water - refer to separate fluid entry. 3. Water produced from wells drilled to access artesian water is classified as raw water – refer to separate fluid entry.
Fluid Codes	AW – Associated Water

3.28 Water, Boiler Feed

Table 28 Process Fluid Properties: Water, Boiler Feed

Property	Details
Source	Treated water plants Steam condensers and condensing turbines Steam condensate return Boiler feedwater pumps
Destination	Boilers for steam generation Steam desuperheaters and steam quench systems
Appearance	Hot, colourless, and odourless treated water
Composition	May contain traces of dosing chemicals (e.g., biocide, anti-scale, anti-corrosion, etc.). May partially flash to steam when pressure is reduced.
Pressure	0-4,600 kPag as found in normal operations
Temperature	Ambient to 120 °C in normal operation
Notes	1. ASME B16.5 Class 150 and Class 300 [Ref.10] applications only
Fluid Codes	BFW – Boiler Feed Water SC – Steam Condensate

3.29 Water, Oily

Table 29 Process Fluid Properties: Water, Oily

Property	Details
Source	Water contaminated with traces of oil due to prior contact with hydrocarbon liquids such as crude oil or gas condensate. Common source is water co-produced from oil or gas wells and then separated in tanks or separators.
Destination	Treatment, including skimmers, coalescers, CPIs, settling tanks, interceptor ponds, holding ponds, and ultimately disposal.
Appearance	Clear with settling oil film or emulsion Often odourless, but may contain natural mercaptans
Composition	Oily water will contain dissolved and free liquid hydrocarbon. Oily water may also contain dissolved natural gas and traces of biocides, corrosion inhibitor, corrosion products, emulsion breaker, H_2S, trace amounts of mercury, vanadium and other heavy metals, mineral salts, oxygen scavenger, proppant, or sand. In certain areas, oily water may contain acid producing bacteria (APBs) and sulphate reducing bacteria (SRBs).
Pressure	0-1,700 kPag as found in normal operations
Temperature	Ambient to 90 °C in normal operation Artificial lift wells will produce higher wellhead temperatures and hence hotter oily water.
Notes	1. Also known as produced water or produced formation water, when co-produced with crude oil or gas condensate. 2. Oily water can also be generated from run-off of water from paved plant areas containing residual hydrocarbon. 3. Levels of oil in oily water shall be reduced to acceptable levels prior to disposal - required oil levels and allowable disposal mechanisms vary with jurisdiction. 4. Oily water contaminated by hydrocarbon liquids may form emulsions - these may be more pronounced for crude oil-water systems than for gas condensate-water systems due to crude oil's higher viscosity and higher density. 5. Coal seam gas contains minimal heavy hydrocarbons, hence water produced from CSG wells does not normally suffer from hydrocarbon liquid contamination. This water is classified as associated water (see Appendix A) rather than oily water - see separate entry.
Fluid Codes	OW – Oily Water

3.30 Water, Raw

Table 30 Process Fluid Properties: Water, Raw

Property	Details
Source	Raw water is a water stream deliberately sourced from the surrounding environment (lake, river, bore etc.) for treatment and further use.
Destination	Treated water plants
Appearance	Ideally colourless, liquid and odourless
Composition	Raw water quality is variable depending upon the source. Raw water streams from artesian bores may contain dissolved natural gas with traces of hydrocarbons, sand, mineral elements, H_2S and mercaptans, corrosion inhibitors and corrosion products.
Pressure	0-1,700 kPag as found in normal operations
Temperature	Ambient to 90 °C in normal operation
Notes	ASME B16.5 Class 150 [Ref.10] applications only 1. Raw water should not be considered safe for drinking or washing without further treatment.
Fluid Codes	RW – Raw water

3.31 Water, Treated Products

Table 31 Process Fluid Properties: Water, Treated Products

Property	Details
Source	Water Treatment Plants
Destination	Process Use Boiler Feed Water for steam generation Human Consumption
Appearance	Light yellow and clear liquid Slight characteristic odour
Composition	Clean, filtered water - TDS, pH and other aspects of the water chemistry are typically controlled to suit specific applications.
Pressure	0-1,700 kPag as found in normal operations Normally stored at atmospheric pressure.
Temperature	Ambient to 90 °C in normal operation
Notes	1. ASME B16.5 Class 150 [Ref.10] applications only 2. Defining feature of treated water products is that they are all purified, conditioned water streams produced by water treatment plants – end uses (and required quality) are varied. 3. Desalinated water is a low TDS (typically <500 ppm) form of treated water required for processes or end-uses sensitive to hardness and solids deposition, typically produced by reverse osmosis plants and containing some residual salts. 4. Demineralised / deionised / distilled water is an even higher purity form of desalinated water where salts have been effectively totally removed for specific applications such as turbine inlet evaporative cooling. 5. Potable water is a specific sub-class of treated water suitable for human consumption e.g., drinking water. 6. Treated water is the general descriptor for water whose quality has been improved but where a more specific fluid code is not available - quality of generic treated water is generally lower than that of the named subclasses such as desalinated and potable water.
Fluid Codes	PW – Potable Water

3.32 Water, Utility Products

Table 32 Process Fluid Properties: Water, Utility Products

Property	Details
Source	Raw or treated water
Destination	Various utility services – see Notes below
Appearance	Colourless transparent liquid
Composition	If raw water is used, utility water may contain traces of H_2S, corrosion inhibitors, sand, corrosion products, salts and corrosion causing bacteria.
Pressure	0-1,700 kPag as found in normal operations
Temperature	Ambient to 90 °C in normal operation
Notes	1. Usually, ASME B16.5 Class 150 [Ref.10] applications only 2. These fluids may have less stringent water chemistry requirements than for treated water, although treated water is often used as a convenient source for utility water. Raw water may also be used. 3. Cooling water is used within a cooling tower or reticulated cooling system – water chemistry needs to be controlled and treated water is normally used. Chemicals normally added include biocides, anti-scale, and anti-corrosion. 4. Firewater is used for firefighting via monitors, hydrants, deluge, spray, shower, or foam generation - fresh or treated water is normally used to minimise corrosion risk in stagnant firewater mains. Storing sufficient firewater to manage a major fire can be challenging. Raw water and sea water sources may be sourced in emergencies. 5. Utility Water is the general descriptor for water used for miscellaneous activities such as wash-down and housekeeping. 6. If raw water is used for wash-down, care shall be taken with subjecting equipment to routine or prolonged exposure due to chlorides content and general corrosion concerns.
Fluid Codes	CW – Cooling Water FFW – Fire Water HW – Hot Water

3.33 Water, Waste Products

Table 33 Process Fluid Properties: Water, Waste Products

Property	Details
Source	Processing equipment
Destination	Treatment and/or disposal
Appearance	Water based – may contain solids or visible traces of oil, may smell.
Composition	Wastewater streams may contain traces of dissolved and suspended impurities, solids, hydrocarbons, heavy metals and chemicals.
Pressure	0-1,700 kPag as found in normal operations
Temperature	Ambient to 90 °C in normal operation
Notes	1. Usually, ASME B16.5 Class 150 [Ref.10] applications only 2. Defining feature for this set of fluids is that they are all water-based waste by-products - sources (and quality) vary. 3. Brine is the high-salt water residue produced by reverse osmosis water plants. 4. Sour water is water contaminated with acid or acid gases (typically H_2S, CO_2) generated by acid gas removal processes. 5. Oily water is water contaminated with traces of oil due to prior contact with hydrocarbon liquids such as crude oil or gas condensate – refer to separate fluid description. 6. Wastewater is the general descriptor for water-based wastes where a more specific fluid code is not available e.g., filter backwashes.
Fluid Codes	DW – Stormwater OW – Oily Water

3.34 Vents and Drain Streams

Table 34 Process Fluid Properties: Vents and Drain Streams

Property	Details
Source	Process Equipment
Destination	Relief and Drain Systems
Appearance	Hydrocarbon and other fluids as described in this document
Composition	Hydrocarbon and other fluids as described in this document
Pressure	Variable – See the Gas Breakthrough and RO Sizing Liquid Lines [Ref.5].
Temperature	Variable – See the Gas Breakthrough and RO Sizing Liquid Lines [Ref.5].
Notes	1. Design of drain systems is discussed in the Gas Breakthrough and RO Sizing Liquid Lines [Ref.5] 2. A closed drain is a system for collecting liquids which is sealed and where operating pressure may be above atmospheric – e.g., due to backpressure from flow. 3. An open drain is a system for collecting liquids involving a tundish, open culvert etc. where the system is always at atmospheric pressure. 4. A closed vent is a manually operated vent valve which discharges into a sealed relief system which transports the vapour to a remote discharge point. 5. An open vent is a manually operated vent valve which relieves locally to atmosphere, either directly or through a short tail pipe.
Fluid Codes	DC – Drain, Closed DH – Drain, Open Hazardous DL – Drain, Lube Oil DM – Drain, Mud DO – Drain, Open Non-Hazardous DS – Drain, Sewer DW – Stormwater VC – Vent Closed VE – Vent VG – Vent Gas VL – Vent Line VO – Vent Opened

4. REVISION CHANGE RECORD

Table 35 Revision Change Record

Rev	Description	Date	Author
1	Document content based on 530-EDP-Q-0017 Rev 2 and updated as appropriate. Net Zero and environmental considerations added.	10.07.2023	C. Nicholson

5. TERMS

ITEM	[1]DEFINITION
Fluid Codes	Short alphanumeric designations for classes of fluid commonly encountered in industry. These codes are used as abbreviation in process descriptions and as identifiers in process line numbering systems shown on P&IDs.
Greenhouse Gas	A Greenhouse Gas (GHG) is a gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. The primary Greenhouse gases in Earth's atmosphere are water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3).
HL hydrocarbon	A hydrocarbon substance with added active ingredients to increase the corrosion protection and resistance to aging.
Joule-Thomson	The real gas phenomenon where the temperature changes (typically cools) when the gas pressure is reduced at constant enthalpy.
Net Zero	A target of completely negating the amount of greenhouse gases produced by human activity, to be achieved by reducing emissions and implementing methods of absorbing carbon dioxide from the atmosphere.

[1] Definitions should be accompanied by a reference using the "Citations & Bibliography" APA style. Terms listed in the APA Engineering Glossary need not be repeated in this list.

6. [2]ABBREVIATIONS

ITEM	DEFINITION
APB	Acid producing bacteria
ASME	American Society of Mechanical Engineers
AW	Associated Water
AWAF	Associated Water Amendment Facility
BFW	Boiler Feed Water
BFW	Boiler Feed Water
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
C2	Ethane
C2	Ethane
CA	Compressed Air
CB	Chemicals Acid
CBM	Coal Bed Methane (Also CSG)
CC	Chemical Catalyst
CF	Aqueous Film Forming Fluid
CG	Glycol
CH	Wax Inhibitor
CI	Corrosion Inhibitor
CJ	Anti-Foam
CK	Emulsion Breaker
CL	Biocide
CM	Scale Inhibitor
CO	Crude Oil

[2] Any abbreviation (acronym) used more than once in the body of the document shall be listed in this table. An abbreviation/acronym used once only, must be written out in full in parentheses after the abbreviation/acronym, for example WIP (Work in Progress).

ITEM	DEFINITION
CPI	Corrugated Plate Interceptor
CSG	Coal Seam Gas (Also CSM and CBM)
CSG	Coal Seam Gas
CSM	Coal Seam Methane (Also CSG)
CW	Cooling Water
DC	Drain, Closed
DH	Drain, Open Hazardous
DL	Drain, Lube Oil
DM	Drain, Mud
DO	Drain, Open Non-Hazardous
DPCU	Dew Point Control Unit
DS	Drain, Sewer
DW	Stormwater
EHP	Extra High Pressure
ETP	Ethane Treatment Plant
FFW	Fire Water
FG	Fuel Gas
FJ	Jet Fuel
FO	Diesel Oil
GHG	Greenhouse Gas
GOR	Gas-Oil Ratio
GS	Seal Gas
GW	Waste Gas
HCC	Hydrocarbon Condensate
HCC	Hydrocarbon condensate
HG	Hot Glycol
HO	Hot Oil

ITEM	DEFINITION
HW	Hot Water
IA	Instrument Air
IBC	Intermediate Bulk Container
IG	Instrument Gas
LN	Liquid Nitrogen
LNG	Liquefied Natural Gas
LNG	Liquefied Natural Gas
LO	Lubricating Oil
LPG	Liquefied Petroleum Gas
LPG	Liquefied Petroleum Gas
MAOP	Maximum Allowable Operating Pressure
MEG	Mono-Ethylene Glycol
MeOH	Methanol
MeOH	Methanol
MG	Mains Gas
MSDS	Material Safety Datasheet
N2	Nitrogen
NAP	Naphta
NAP	Naphtha
NG	Natural Gas (Process)
NGL	Natural Gas Liquid
OD	Odorant
OD	Odorant
OW	Oily Water
P&ID	Piping and Instrumentation Diagram
PA	Plant Air
PEG	Polyethylene Glycol

ITEM	DEFINITION
PSVs	Pressure Safety Valve
PW	Potable Water
RNG	Raw Natural Gas
RNG	Raw Natural Gas
RO	Reverse Osmosis
RVP	Reid Vapour Pressure
RW	Raw Water
RW	Raw water
SC	Steam Condensate
SRB	Sulphate reducing bacteria
ST	Utility Steam
TBM	Tert-Butylthiol (Tertiary Butyl Mercaptan)
TDS	Total Dissolved Solids
TEG	Triethylene Glycol
THT	Tetrahydrothiophene
VC	Vent Closed
VE	Vent
VG	Vent Gas
VL	Vent Line
VO	Vent Opened

7. REFERENCES

All work performed in accordance with this document shall be in conformance with the current issue, including amendments, of those national and international standards, codes of practice, guidelines and APA document/s listed below.

APA STANDARDS AND OTHER DOCUMENTS

Ref. No.	DOC NO.	DESCRIPTION
1.	530-LI-QM-0001	APA Engineering Glossary
2.	530-PR-EM-0002	Engineering Standards Waivers
3.	530-PR-EM-0003	APA Engineering Standards
4.	ATP-EDP-Q-0003	Flares and Vents
5.	ATP-EDP-Q-0019	Gas Breakthrough and RO Sizing Liquid Lines
6.	530-SP-Q-0003	Identification of Lines, Valves, Equipment, Electrical, Instruments & Cables Tag Numbers
7.	APA Group Standard	Climate Change Standard
8.	APA Group Procedure	Internal Carbon Pricing

SUPERSEDED DOCUMENTS

Ref. No.	DOC NO.	DESCRIPTION
	530-EDP-Q-0017	Process Fluids, Rev 3

AUSTRALIAN STANDARDS AND OTHER DOCUMENTS

Ref. No.	DOC NO.	DESCRIPTION
9.	AS 4564	Specification for General Purpose Natural Gas

INTERNATIONAL STANDARDS AND OTHER DOCUMENTS

Ref. No.	DOC NO.	DESCRIPTION
10.	ASME B16.5	American Standard: Pipe Flanges and Flanged Fittings
11.	Spotleak 1005	ICE Safety Data Sheet – Spotleak 1005
12.	Methane Guiding Principles	The Methane Guiding Principles

APPENDIX A ASSOCIATED WATER TREATMENT

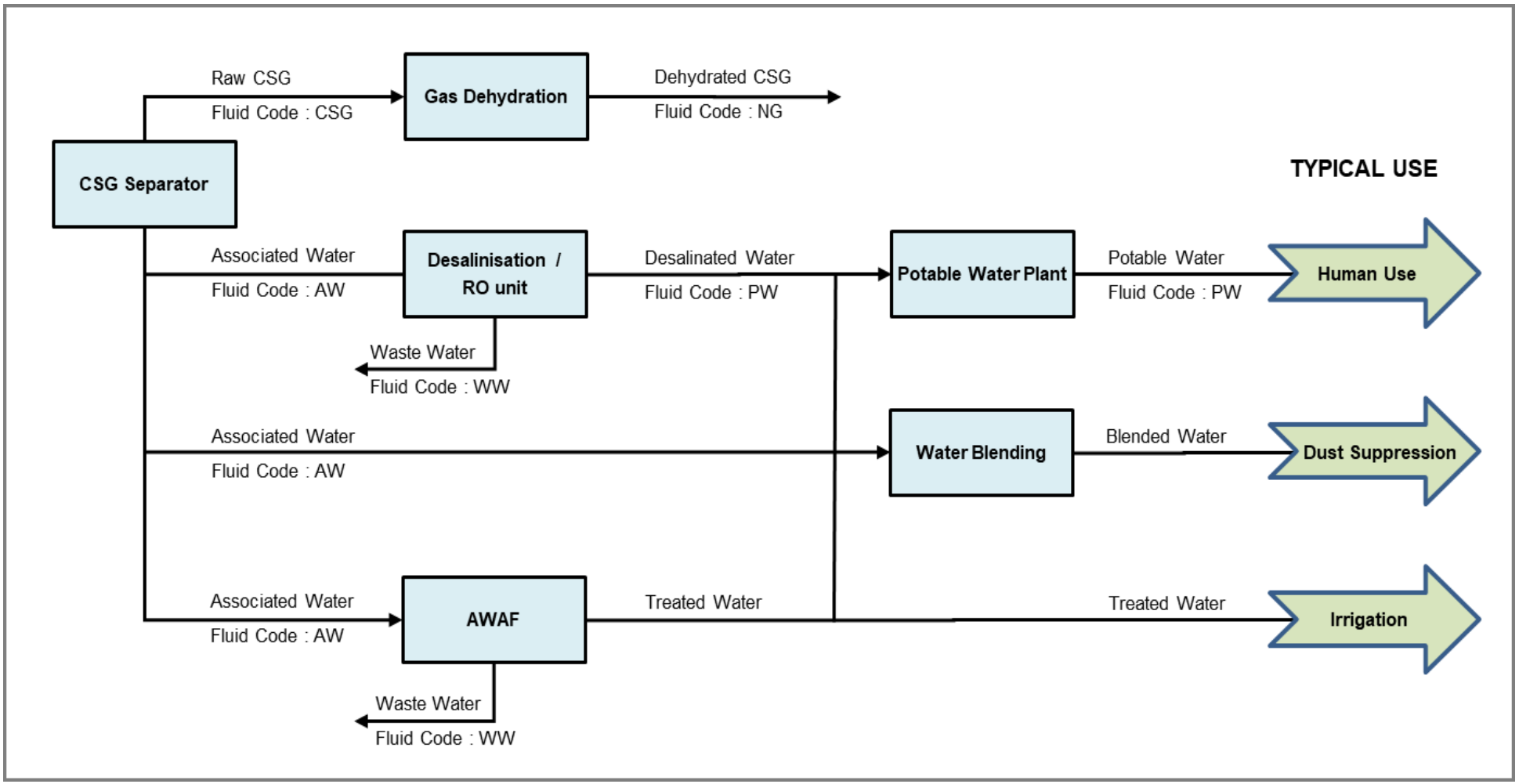

Figure 1 Associated Water Treatment Flowchart