



GORGON PROJECT – Overview of Gorgon Subsea Well Design and Construction

The Gorgon subsea well design features a 10-3/4" x 7-5/8" monobore completion. This design represents the highest deliverability installation that is currently considered field proven. Other key factors that have influenced the well design includes the pressure and temperature conditions of 6588 psi and 161 deg C at a reservoir datum depth of 4000m TVDss, the wellbore environment comprising 16 mol% CO₂, 6 mol% N₂ and 25 ppmv H₂S, and the perforating strategy.

The reservoir intervals planned for completion during the initial campaign (Zones 10, 30 and 50) are relatively high strength sands and have a low likelihood for free water production. Accordingly, no specific provision has been made for downhole components to isolate individual problem zones or sands. In the unlikely event that the zones do not perform as predicted and excessive water production is experienced, the monobore completion design will readily facilitate the installation of plugs and/or straddles to provide water shut-off as required. Water production due to water of condensation is expected, and provision for this is incorporated in the well design basis.

A cased, cemented and perforated completion strategy will be adopted for the initial completions. Sand control is not incorporated in the initial completions. Sand production has not been observed during any of the well tests on the Gorgon appraisal wells. Sanding studies also support this outcome, and indicate that due to higher average rock strength and greater overburden stress, sanding expectations are generally lower in Gorgon than they are at other offset NW Shelf gas fields, where sanding is known not to pose a problem.

The reservoir section will be drilled with a 8.3/4" open hole section, and then lined and cemented with 7" liner. In addition to the liner hanger, the liner will feature a liner top packer and 6m PBR.

The subsea well system will comprise a flow support base, a 7" x 2" horizontal xmas tree (HXT) including the subsea control module (SCM), concentric tubing hanger system and choke module assembly. The HXT will be installed prior to installing the well completion.

The upper completion string will comprise 7.5/8" production tubing, a 10.3/4" x 7" production packer providing a mechanical barrier between the reservoir interval and the production annulus, a permanent downhole gauge to facilitate the downhole measurement of pressure and temperature, and a 7" surface controlled subsea safety valve to provide a mechanical barrier for the tubing string as required.

The upper completion string will be tied back from the liner top PBR using a non-sealing stinger. Once the completion is installed and pressure tested to satisfy well integrity requirements, the reservoir will be perforated using perforating guns deployed on wireline. Several wireline trips will be required to perforate the reservoir interval/s of each well.

A well cleanup will then be conducted from the MODU to ensure each well is cleaned as best as practical of well construction fluid, perforating debris and other well construction contaminants prior to well commissioning operations.

Due to the wellbore environment, the material specification for all flow wetted surfaces is primarily 25Cr or Nickel Alloy 718. All wells are designed to satisfy a minimal intervention requirement based on an expected well life of 40 years.

The drilling programme is summarised:

1. Move MODU on location.
2. Drill 36" hole.
3. Run and cement 30" structural casing.
4. Drill 26" hole with seawater.
5. Run and cement 20" surface casing.
6. Run BOP and riser.
7. Drill 17.1/2" hole with water based mud. Run and cement 14" intermediate casing.
8. Drill 12.1/4" x 13.1/2" (under-reamed) hole with Non Aqueous Fluid (NAF).
9. Run and cement 10.3/4" production casing.
10. Drill 8.3/4" hole with NAF to TD.
11. Conduct wireline logging programme.
12. Run and cement 7" production liner.
13. Conduct cased hole cleanup and displace well to brine.
14. Install suspension packer.
15. Pull riser and BOP
16. Move MODU to next well.

The completion programme is summarised:

1. Move MODU over well.
2. Install 7" horizontal subsea tree.
3. Run BOP and riser.
4. Retrieve suspension packer.
5. Run the 7.5/8" completion string with subsea test tree, 8.5/8" completion riser, surface flow tree and coiled tubing lift frame.
6. Displace well to packer fluid and underbalance fluid, and tie-back the completion string from liner top PBR (non-sealing). Set production packer.
7. Perforate well on electricline.
8. Conduct MODU well cleanup.
9. Conduct PLT survey on electricline.
10. Install tubing hanger plugs on slickline.
11. Pull coiled tubing lift frame, surface flow tree, completion riser and subsea test tree
12. Pull riser and BOP, or move MODU to next well
13. Install tree cap using ROV
14. Move MODU to next well

Note: The drilling and completion programmes will be conducted in 'batch' mode.

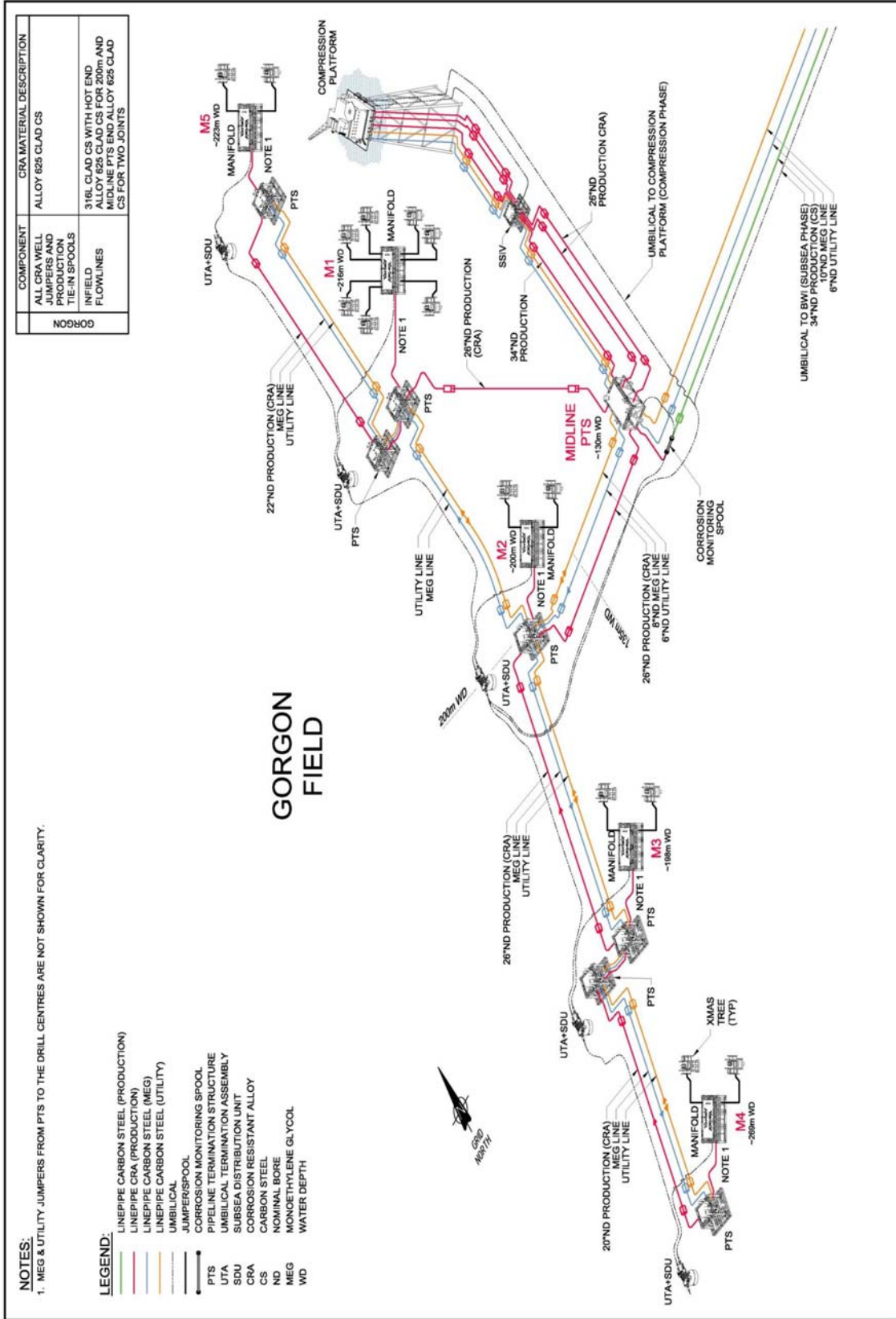


Figure 1 Subsea Well Development Schematic



Chevron Australia
Gorgon Subsea Gas Producer (GB5-A)
7-5/8" 25Cr-125 Monobore Completion

Schematic	Description	Depth m MDBRT	Depth m TVDBRT	Deviation Deg	OD Inches	ID Inches
	7" Tubing Hanger	240	240	0	18.750	6.059
	30" 457 ppf 1.5" wt / 309.7 ppf 1" wt X-52 Conductor	310	310	0		27.000
	7-5/8" 35.8 ppf 25Cr-125 Vam Top HC Tubing				8.362	6.644
	7" Tubing Retrievable Safety Valve (Non-Equalising)	540	540	0	9.070	5.812
	20" 132 ppf 0.625" wt X-65 Surface Casing	640	640	0		18.750
	TOC (500m below 20" Casing Shoe)	1140	1121			
	7-5/8" 35.8 ppf 25Cr-125 Vam Top HC Tubing				8.362	6.644
	14" 82.5 ppf P110 Intermediate Casing (10m above Gearle)	2296	2008	40.6		12.876
	TOC (500m below 14" Casing Shoe)	2796	2389			
	7-5/8" Permanent Downhole Gauge Mandrel (Dual)	3968	3279	40.6	9.105	6.745
	Tubing X/over, 7-5/8" x 7"	3983	3291	40.6	8.140	6.094
	7" 32 ppf 25Cr-125 Vam Top HC Tubing (2 joints)				7.717	6.094
	10-3/4" x 7" Production Packer	4008	3310	40.6	9.340	5.875
	7" x 5.75" Landing Nipple, Top No-Go	4023	3321	40.6	7.732	5.750
	Tie-back Assembly (Non-Sealing)	4038	3333	40.6	<Hold>	6.074
	10-3/4" x 7" Liner Hanger / Liner Top Packer c/w 6m PBR	4041	3335	40.6	<Hold>	6.100
	10-3/4" 60.7 ppf T95 Vam Top Production Casing (600m) x 10-3/4" 65.7 ppf T95 / C110 / P110 Vam Top Production Casing (30m above Intra-Jurassic Unconformity)	4191	3449	40.6	11.652 11.734	9.660 9.560
	Top Perforation Interval (Zones 30 & 50)	4518	3697	40.6		
	Base Perforation Interval	5001	4064	40.6		
	Base Sump	5061	4110	40.6		
7" 32 ppf 25Cr-125 Vam Top HC Liner	5101	4140	40.6	7.717	6.059	
Notes:						
Air Gap = 25m, Water Depth = 215m Hole Sizes = 36", 26", 17-1/2", 12-1/4" x 13-1/2" (Under-reamed), 8-3/4" KOP = 695m MDBRT, EOB = 1309m MDBRT (1259m TVDBRT) Horizontal Stepout = 2675m 10-3/4" T95 / C110 X/over Depth = 1900m TVDBRT (65 deg C) 10-3/4" C110 / P110 X/over Depth = 2600m TVDBRT (80 deg C) Special Drift = 9.600" for 60.7 ppf & 9.500" for 65.7 ppf 10-3/4" casing Wireline TCP Gun Configuration to be confirmed Subsea Tree Type = 7" Horizontal (with 7" flow bore)			Completion Equipment Material Spec = Alloy 718 7" Tubing Hanger has a 7" 32 ppf Vam Top connection (box down) 7" Safety Valve has 7-5/8" 35.8 ppf Vam Top HC connections Safety Valve Hold Open Sleeve ID (during well construction) = ±5.0" Control Line / PDHG Cable OD = 0.433" (11mm) 7-5/8" Cable Protector OD = ±9.35" Reservoir Pressure = 6588 psi at 4000m TVDss Reservoir Temperature = 321 deg F (161 deg C) at 4000m TVDss			
Rev	Date	Description			Drawn	Approved
0	8-Jul-08	Issued for Packer Tech Spec Rev 2			SRM	MW
1	30-Mar-09	Revised for BOD Rev 2			SRM	MW

Figure 2 Well Design Schematic