QGP Operations Manual

GTS-199-OM-PL-001

Emergency No: Phone: **1800 620 492**

Melbourne Control Centre: Phone: **1300 137 978**
Fax: **1300 658 920**
Email: GTcontrol@Jemena.com.au

Revision History

Rev	Date	Amended By	Description of Changes
0	18/08/2008	-	Initial Revision
1	1/03/2013	Mark Kowalczyk	General Revision

Review Frequency

2 years

Authorisation

Approvals	Title	Name	Signature	Date
Originator:	Graduate Engineer	Mark Kowalczyk	Mark Kowalczyk	04/02/13
Endorsed by:	Assessment Engineering Manager	Michael Peoples		4/2/13
Approved by:	Assessment Engineering Manager	Michael Peoples	-	-

Table of Contents

List of Tables

List of Figures

Abbreviations

Term	Definition
QGP	Queensland Gas Pipeline
RBL	Rockhampton Branch Pipeline
SCADA	Supervisory Control and Data Acquisition
APLNG	Australian Pacific LNG
MLV	Mainline Valve
CPU	Cathodic Protection Units
QAL	Queensland Alumina Limited
MAOP	Maximum Allowable Operating Pressure

1. OPERATION

1.1 General Overview

Owned and operated by Jemena, Queensland Gas Pipeline (QGP) is a natural gas pipeline, spanning from Wallumbilla through to Gladstone. It consists of three pipeline segments:

Wallumbilla - Gladstone City Gate

514.4 km of 323.9 mm O.D. Class 600 transmission pipeline from Wallumbilla to Gladstone City Gate Station. This line has an inlet pressure operating range of 5000 - 10200 kPa. Normal operating pressure range is 8200 - 9500 kPa as measured at Rolleston Meter Station. During pipeline works such as pigging and welding, this line may be operated with a Rolleston pressure as low as 5000 kPa.

Fairview lateral

25.64 km of 200 mm O.D. Class 900 pipeline from Fairview station to Ridgeland connecting station (KP 134.5). MAOP is 10200 kPa (g) and the operating pressure can range from 5000 to 10200 kPa.

Expansion loop from Oombabeer scraper station to Callide station

This expansion comprises two looping sections:

- Loop1 is a 68.3 km x DN400 pipeline between Oombabeer Scraper Station KP318.1 and Banana Scraper Station KP386.4.
- Loop 2 is a 44.7 km x DN400 pipeline between Banana Scraper Station KP386.4 and Callide KP431.1.
- The MAOP of the looping is 10,200 kPa (g) and the operating pressure can range from 5000 -10200 kPa.

Gladstone City Main

16.1 km of 323.9 mm O.D. Class 300 pipeline and associated laterals from Gladstone City Gate Station to QAL Meter Station. The normal operating pressure of this pipeline segment is approximately 2700 kPa. Pipeline works such as welding or pigging may reduce the delivery pressure to a minimum of 1700 kPa. In the future, as this segment approaches full capacity, the Transporter will increase the operating pressure toward the 5100 kPa, Maximum Allowable Operating Pressure (MAOP). Water bath heaters operate as required at Gladstone City Gate Station to ensure that hydrate formation does not occur in the pipeline and in control piping downstream of the regulation. The water bath heaters are automatically controlled to sense outlet gas temperature and operate as required to keep the outlet gas temperature above the hydrocarbon dew point of the gas.

Larcom Creek - Rockhampton

96.7 km of 219.0 mm O.D. Class 600 pipeline from Larcom Creek Meter Station (the tee off of the main line) to Rockhampton City Gate Station. Pressure regulation at Larcom Creek Meter Station reduces pressure from the Mainline as gas enters the Rockhampton Branch Pipeline (RBL). Normal operating pressure for the Rockhampton Branch Pipeline is approximately 4500 kPa. Pressure regulation at Rockhampton City Gate Station further decreases pressure to downstream customer's delivery pressure of approximately 2000 kPa.

1.2 GENERAL OPERATING CONDITIONS

1.2.1 SITE DESCRIPTIONS AND PRESSURES: RECEIPT POINTS

Jemena's QGP has six gas receipt points. A brief description of each is set out below

Wallumbilla

Wallumbilla Station (K.P. 0.00). This receipt point services the Surat, Cooper & Eromanga Basins and provides inter-connection with the Roma to Brisbane and Ballera to Wallumbilla pipelines. Facilities include:

- Pig Launcher
- Station/Pipeline Isolation Facilities
- Filter Separator
- Single Metering Skid
- SCADA Control & Monitoring System (satellite link)
- Radio and Telephone Communications
- Pipework to facilitate forward or reverse flow

Gooimbah Scraper Station

Gooimbah Scraper Station (K.P. 93.917). Jemena owns the scraper station but not the meter station, which is owned by APLNG. The receipt point is connected to the Gooimbscraper station via a short (150m) interconnecting pipeline.

- Pig receiver
- Pig Launcher
- SCADA Control & Monitoring System (satellite link)
- Radio and Telephone Communications

Fairview

The Fairview lateral ties into the main line at KP 134.5 (Ridgelands Scraper Station). There is 25.64km of 200mm NB Class 900 pipeline between the Fairview meter station and the main line. Ridgelands Scraper Station facilities include:

- Receiver
- Manual MLV
- Provisions for future regulation

Fairview Meter Station (Lateral K.P. 25.64) facilities include:

- Station/Pipeline Isolation Facilities
- Filter Separator
- Single Metering Skid
- Pig Launcher
- Radio SCADA Data Link to Westgrove
- Radio Voice Communications

Westgrove

Westgrove Station (K.P. 154.04) is a single producer receipt point servicing the South Denison Trough. Facilities on site include:

- Pig Launcher/Receiver
- Station/Pipeline Isolation Facilities
- Filter Separator
- Single Metering Skid
- SCADA Control & Monitoring System (satellite link)
- Radio Communications

Rolleston

Rolleston Station (K.P. 243.45) is a single producer Receipt Point servicing the North Denison Trough.

Facilities on site include:

- Pig Launcher/Receiver
- Station/Pipeline Isolation Facilities
- Filter Separator
- Single Metering Skid
- SCADA Control & Monitoring System (satellite link)
- Radio Communications

Moura

Moura Station (K.P. 360.71) is a dual producer Receipt Point, servicing the Bowen Basin coal seam reserves.

- Dual Filter Separators
- Station/Pipeline Isolation Facilities
- Dual Metering Skids
- SCADA Control & Monitoring System (landline link)
- Radio Communications

1.2.2 SITE DESCRIPTIONS AND PRESSURES: COMPRESSOR STATION

QGP has two compressor stations

Rolleston Compressor Station

The Rolleston Compressor Station (KP243.449) is a single unit midline compressor station located outside the town of Rolleston, Queensland. The primary role of Rolleston Compressor Station is to re-pressurise gas to facilitate gas transportation to the QGP delivery points.

Facilities include:

- Inlet Filter Separator
- Gas measurement equipment
- One Taurus turbine and compressor unit
- Gas Engine Alternator
- Coolers
- Pig Receiver and Launcher
- Station/Pipeline Isolation Facilities
- SCADA Control & Monitoring System
- Radio and Telephone Communications
- Compressor control room
- Maintenance facility

Banana Compressor Station

The Banana Compressor Station (KP386.398) is a single unit midline compressor station located outside the town of Banana, Queensland. The primary role of the Banana Compressor Station is to re-pressurise gas to facilitate gas transportation to the QGP delivery points.

Facilities include:

- Inlet Filter Separator
- Gas quality measurement equipment
- Gas metering equipment
- 1 set of Solar Taurus turbine and compressor unit
- Coolers
- Pig Receiver and Launcher
- Station/Pipeline Isolation Facilities
- SCADA Control & Monitoring System
- Radio and Telephone Communications
- Compressor control room
- Maintenance facility

1.2.3 SITE DESCRIPTIONS AND PRESSURES: DELIVERY POINTS

The Transporter currently owns and operates thirteen delivery points (13) dedicated delivery stations on the Pipeline. An additional three Delivery Points are owned and operated by Origin Energy Ltd. Origin Energy Ltd has three Delivery Points, two located in Rockhampton and one in Gladstone. Detailed below is a brief description of the Transporter owned and operated delivery points.

Wallumbilla

Can deliver and receive gas

- Pig Launcher
- Station/Pipeline Isolation Facilities
- Filter Separator
- Single Metering Skid
- SCADA Control & Monitoring System (satellite link)
- Radio and Telephone Communications
- Pipework to facilitate forward or reverse flow

Moura

Can deliver and receive gas

- Dry filter
- Meter skid.
- Orifice plate
- SCADA Monitoring (radio)

QERL

- Dry Filter
- Single Metering run (orifice)
- SCADA Monitoring (radio)

Wide Bay

- Single Metering run (orifice)
- SCADA Monitoring (radio)

Yarwun

- Dual Dry Filter
- Water bath heater
- Odorant tank
- Station/Pipeline Isolation Facilities
- Dual Metering Skid (Yarwun)
- SCADA Monitoring (landline)

ORICA Australia Operations Pty Ltd

The ORICA Delivery Point is located downstream of the Gladstone City Gate at K.P. 516.26.

Facilities include:

- Dry Filter
- Station/Pipeline Isolation Facilities
- Metering Skid
- SCADA monitoring system (Radio)

Queensland Alumina Limited [QAL]

The QAL delivery station is located at the end of the Gladstone City Main at K.P. 530.41. It acts as a dual delivery station servicing both the QAL and Boyne smelters.

QAL Metering Skid Facilities include:

- Dual Dry Filter
- Station/Pipeline Isolation Facilities
- Dual Metering Skid (QAL)
- Single Metering Skid (Boyne)
- SCADA Monitoring (landline)

Boyne Smelter Metering Skid

Facilities include:

- Dual Dry Filter
- Station/Pipeline Isolation Facilities
- Single Metering Run (turbine)
- SCADA Monitoring (landline)

AMC (de-commissioned but maintained)

Facilities include:

- Dry Filter
- Station/Pipeline Isolation Facilities
- Single Metering run (orifice)
- SCADA Monitoring (radio)

TICOR (de-commissioned but maintained)

Facilities include:

- Dry Filter
- Station/Pipeline Isolation Facilities
- Single Metering run (orifice)
- SCADA Monitoring (radio)

SUNCOR

Facilities include:

- Dry Filter
- Station/Pipeline Isolation Facilities
- Single Metering run (orifice)
- SCADA Monitoring (radio)

Queensland Magnesia (Operations) Pty Ltd [QMag]

The QMag delivery site is located within the Rockhampton City Gate Station at the end of the RBL (96.7 km from Larcom Creek).

Facilities include:

- Station/Pipeline Isolation Facilities
- Metering Skid (Turbine)
- Dry Filter
- SCADA monitoring system (Landline)

1.2.4 SITE DESCRIPTIONS AND PRESSURES: SCRAPER STATIONS

In addition to launcher/receiver facilities located at the receipt and check stations, The Transporter owns and operates six dedicated Scraper Stations.

I. Mainline Locations

1. Wallumbilla KP 0
2. Gooimbah KP 93.92
3. Oombabeer KP 318.07
4. Banana KP 386.40
5. Bell Creek KP 449.97
6. Gladstone City Gate KP 514.31
7. QAL KP 530.41

II. Fairview Lateral

8. Ridgelands KP 134.50

III. Rockhampton Branch

9. Larcom Creek KP 497.77
10. Bajool 50.65 km downstream from Larcom Creek K.P 50.365
11. Rockhampton City Gate KP 96.704

Facilities include:

- Pig Launcher/Receiver Facilities
- Pipeline Isolation & Blowdown Facilities
- SCADA Control & Monitoring (at Banana only)

1.2.5 SITE DESCRIPTIONS AND PRESSURES: MAIN LINE VALVES (MLVS)

The Transporter owns and operates 12 main line valves along its Pipeline. Detailed below is a brief description of each.

Mt Saltbush

The Mt Saltbush MLV (K.P. 45.51) is located between Wallumbilla Meter Station and Gooimbah Scraper Station. This facility contains an MLV and a blowdown facility.

Ridgelands Fairview Tee off

The Ridgelands Fairview tee off (K.P 134.5) is located. This facility contains an MLV and a blowdown facility.

Arcadia Valley

The Arcadia Valley MLV (K.P. 208.04) is located between the Westgrove Meter Station and the Rolleston Meter Station. This facility contains an MLV and a blowdown facility.

Calliope

The Calliope MLV (KP 481.671) is located Bell Creek Scraper Station and Gladstone City Gate. This facility contains an MLV and a blowdown facility.

RED ROVER ROAD

The Red Rover Road MLV (KP 522.71) is located between the Gladstone City Gate and QAL Meter Station. This facility contains an MLV and a blowdown facility.

Larcom Creek

The Larcom Creek check metering station (K.P. 497.77) is the take off point for the RBL. It has the multi function of metering, regulating and odorising the gas into the RBL.
Facilities include:

- Pig Launcher
- Filter/Separator
- Station/Pipeline Isolation Facilities
- Regulator Skid
- Metering Skid
- Odorant Injection Plant
- SCADA Control & Monitoring (landline)

Rockhampton City Gate

The Rockhampton City Gate is located at the end of the Rockhampton Branch Line, 96.7 km from Larcom Creek. It has the dual function of metering and regulating the gas.
Facilities include:

12. Pig Receiver
13. Station/Pipeline Isolation Facilities
14. Dual Filter/Separators
15. Dual Regulator Skids
16. Dual Metering Skids
17. SCADA Control & Monitoring (landline)
18. Radio & Telephone Communications

Gladstone City Gate

Gladstone City Gate Station (K.P. 514.31) is located at the end of the Transporter mainline prior to the Gladstone City Main. It has the multi function of metering, regulating and odorising the gas into the City Main.
Facilities include:

- Pig Receiver
- Station/Pipeline Isolation Facilities
- Pipeline Blowdown Facilities
- Dual Filters/Separators
- Dual Regulator Skids
- Dual Meter Skids
- Dual Heaters
- Odoriser Injection Plant
- SCADA Control & Monitoring (satellite link)
- Telephone Communications

MLV1 (Gavial Road)

This MLV (K.P 75.870) is located between Bajool Scraper Station and Rockhampton City Gate. This facility contains an MLV and a blowdown facility.

MLV 2 (Airport)

This MLV (K.P 86.362) is between the Bajool Scraper Station and Rockhampton City Gate, but downstream of MLV1 at Gavial Road. This facility contains an MLV and a blowdown facility.

Fitzroy River Sth

The Fitzroy River Sth MLV (K.P 93.31) is near the Fitzroy River. This facility contains an MLV and a blowdown facility.

Fitzroy River Nth

The Fitzroy River Sth MLV (K.P 93.69) is near the Fitzroy River. This facility contains an MLV and a blowdown facility.

1.2.6 LINE PACK

The Transporter owns and maintains sufficient linepack for safe and efficient operation of the pipeline.

Real time data is acquired from RTU's at each compressor, meter, scraper or MLV station and stored in the line pack system database along with the physical properties of each section. The changes in pipeline volume due to the effect of temperature and pressure variations are considered with each calculation cycle. The line pack program performs a calculation cycle every five minutes, applying the weighted moving average for section end point pressures, temperatures and weighted gas composition.

Linepack calculations are performed by a Honeywell application software using data from the SCADA system.
The line is divided many different sections of the pipeline:

Pipeline from Wallumbilla to Gladstone:
Wallumbilla – Mount Saltbush
Mount Saltbush – Gooimbah
Gooimbah – Ridgelands
Ridgelands – Fairview
Ridgelands – Westgrove
Westgrove – Arcadia
Arcadia – Rolleston
Rolleston – Oombabeer
Oombaber – Banana LOOP
Oombabeer – Moura
Moura – Banana
Banana – Callide LOOP
Banana – Bell Creek
Bell Creek – Calliope
Calliope – Larcom Creek Inlet
Larcom Crk – Gladstone City Gate
Gladstone City Gate D/S – QAL
Gladstone to Laterals

Lateral from Larcom Crk to Rockhampton:
Larcom Crk – Rockhampton City Gate
Gladstone City Gate D/S – Ticor
Ticor Meter Station - Suncor
AMC Lateral

Calculations are performed based on the Universal Gas Law to determine the quantity of gas contained within each section, expressed at Standard Conditions. Further corrections are made in accordance with the AGA 8 equations to account for gas compressibility. The Gladstone City Gate average monthly GHV is applied to the calculated volumetric linepack to calculate the energy value of the mainline linepack. The RBL linepack, Gladstone City Main Linepack plus City Main laterals, and Fairview Lateral Linepack are calculated using snapshot pressures and gas composition due to the relatively high turnover of these lines. Energy value for RBL and Gladstone City Main is calculated by applying the previous 24 hour average Gladstone City Gate GHV. The Fairview energy value is calculated from the Fairview GHV. Linepack in these lines shows little variation due to the constant pressure control method used.

Total linepack is calculated each morning at 0800 hrs by summing the Wallumbilla - Gladstone City Gate, Larcom Creek – Rockhampton, Gladstone City Main plus laterals, and Fairview Lateral Linepacks.

1.2.7 NORMAL FLOW

Normal, or forward flow on the pipeline exists when the scheduled quantities to Gladstone and Rockhampton exceed those scheduled quantities to Wallumbilla.

Producers supply gas to pipeline receipt points at a flow rate (GJ/day) specified on a daily basis as agreed by the Transporter. Gas received into the pipeline is regulated by the producers to the maximum allowable supply pressure of 10,200 kPa. The Transporter does not regulate flow or pressure at Receipt Points. The Transporter does maintain over pressure protection at Receipt Points.

Pipeline integrity is ensured through continuous flow monitoring (via SCADA) and the capacity to limit and isolate flow. Automated and/or manual shut in valves are operated at each Receipt and Delivery Point, and at a further 17 locations along the pipeline.

1.2.8 Reverse Flow

Reverse flow in any section of the Pipeline occurs when the scheduled quantities to Wallumbilla exceed the scheduled quantities to Gladstone and Rockhampton. This scenario typically occurs between Wallumbilla and Westgrove.

Flow through the Wallumbilla Meter Station can be reversed by manually operating the reverse flow pipework on site so that the meter run will measure the quantity of gas leaving the Pipeline.

Connecting Pipelines at Wallumbilla include connections to the South West Queensland Pipeline and the Roma to Brisbane Pipeline.

Connecting Pipelines and Pipeline facilities are advised of the quantity of gas scheduled to back flow from the Pipeline and the Transporter allocates the gas to the respective Shipper's account.

A back flow imbalance is calculated by the Transporter and provided to connecting Pipelines/Pipeline facility owners. The back flow imbalance details the quantitative difference between gas which was scheduled to flow and the actual quantity of gas delivered.

Back flow schedules are adjusted to eliminate back flow imbalances as quickly as possible.

1.2.9 Delivery Pressures

Wallumbilla delivery pressure is the same as the operating pressure of the Main line ie. between 5000 kPa and 10200 kPa. The normal operating pressure range is between 8500kPa and 9500 kPa.

Gladstone City Main delivery pressures currently range from a minimum of 1700 kPa to 3400 kPa. As the Gladstone City Main nears capacity the Transporter will provide notice to shippers with delivery points on this segment and increase the delivery pressure toward the pipeline MAOP of 5100 kPa. Rockhampton Branch Line delivery pressures upstream of Rockhampton City Gate Station are approximately 4500 kPa. The pressure is set to ensure that the gas temperature downstream of Rockhampton City Gate regulation remains above 10°C and to provide reasonable linepack to service Rockhampton in the event of a failure on the main line. The pressure in the RBL can be increased to the MAOP of 10,200 kPa to meet customer requirements. Downstream of the Rockhampton City Gate Station delivery pressure is regulated to approximately 2000 kPa.

1.3 ROUTINE MAINTENANCE

1.3.1 Measurement, Gas Receipt and Delivery Stations

All measurement stations are inspected on a regular basis. The status of critical equipment, in particular the metering and cathodic protection equipment, is noted and compared with SCADA records. Detailed checks, recording of measurement equipment outputs and non-intrusive routine maintenance are carried out at intervals as defined in Jemena QGP Measurement Manual.

1.4 CORROSION PROTECTION SYSTEM

The pipeline is protected from external corrosion by a polyethylene or fusion bonded epoxy coating systems as the primary form of protection. The following additional measures have been designed and installed to support the coating system in providing a high level of external corrosion protection for the pipeline;

1.4.1 CORROSION PROTECTION SYSTEM

- The cathodic protection system can be summarised as follows;
- The cathodic protection has been designed and installed in accordance with AS 2885.1:1997 and AS/NZS 2832.1:1998.
- Cathodic protection monitoring procedures have been developed using AS/NZS 2832.1:1998 as a minimum requirement.
- Cathodic protection criteria acceptance limits are in accordance with AS/NZS 2832.1:1998.
- Approximately 290 cathodic protection test points have been installed at 2km nominal intervals for the monitoring of pipeline cathodic protection potential measurements.
- Eleven impressed current cathodic protection units (CPUs) have been installed along the pipeline. All CPUs are fitted with interrupters, which can be synchronised via the SCADA system, so that true cathodic protection potential measurements can be carried out over the length of the pipeline if needed.
- Cathodic protection pipeline potential and output current is continuously monitored by SCADA at each cathodic protection unit so that a rapid response may be provided to unit problems.

1.5 EMERGENCY RESPONSE

QGP has developed an Emergency Response Management Plan, which provides for a Jemena organisational structure and methods to control an emergency situation on the pipeline.

An Emergency is considered to be anything unexpected or seriously wrong with the operation of the pipeline and its facilities, which creates:
- an immediate or potential hazard to persons or to property
- a threat to the security of gas supply
- a requirement for third party assistance
- a situation that may give Jemena significant media coverage.

QGP's first priority during an emergency is to the safety of any persons in the immediate vicinity.

Emergency Response manuals are issued to all parties related to pipeline activities. The document is subject to document control therefore any reviews or updates will be issued to parties for update as soon as they are approved by Jemena management.

If an emergency situation occurs Jemena will inform Shippers and Suppliers of the following information as soon as it becomes available:

- that an emergency situation exists and that Jemena is running under the Emergency Response organisational structure
- site of the emergency
- any delivery or receipt restrictions
- regular updates on availability of supply
- regular updates on the progress of the emergency situation
- estimated time to remedy the emergency and
- when the emergency situation has ceased.

If, during an emergency, supply to Shippers needs to be curtailed, Jemena will use its best endeavours to keep any such curtailment to a minimum.

2. GAS QUALITY

2.1 Requirements for Natural Gas

The Natural Gas received at each Receipt Point, and the Natural Gas that the Transporter transports for the Shipper, must:

(a) [***no impurities***] be commercially free from objectionable substances that may damage Pipelines, Regulators, meters or other appliances, or that can adversely affect or interfere with:

(i) the transmission of the Natural Gas through Pipelines; or

(ii) the commercial use of the Natural Gas by the Shipper

(Without limiting this provision, dust, gums, gum-forming constituents, crude oil, hydrocarbons liquefiable at temperatures in excess of 0 degrees and at pressures not exceeding 1.5 times the maximum pressure employed in the Pipeline and other impurities are objectionable substances); and

(b) [***mercaptan***] not have more than 15 mg of mercaptan/standard m3 of Natural Gas; and

(c) [***hydrocarbon dew-point***] not have a hydrocarbon dew-point of more than 10°C at pressures between 1,000 kPag and 10,000 kPag; and

(d) [***hydrogen sulphide***] not have more than 7 mg of hydrogen sulphide/standard m3 of Natural Gas; and

(e) [***sulphur***] not have more than 50 mg of total sulphur/standard m3 of Natural Gas; and

(f) [***carbon dioxide***] not have more than 3% by volume of carbon dioxide; and

(g) [***water vapour***] not have more than 65 mg of water vapour/standard m3 of Natural Gas; and

(h) [***temperature***] be at a temperature between 10°C and 50°C at a Receipt Point; and

(i) [***oxygen***] be as free of oxygen as it can be kept but, in any event, have no more than 0.2% by volume of oxygen; and

(j) [***inert Natural Gases (1)***] have 6% or less by volume of inert Natural Gases; and

(k) [***inert Natural Gases (2)***] if it has more than 4% by volume of inert Natural Gases — have a Gross Heating Value of at least 37.9 MJ/standard m3 of Natural Gas and not more than 42.3 MJ/standard m3 of Natural Gas; and

(l) [***inert Natural Gases (3)***] if it has 4.0% or less by volume of inert Natural Gases – have a Gross Heating Value of not less than 35 MJ/standard m3 of Natural Gas and not more than 43 MJ/standard m3 of Natural Gas; and

(m) [***Wobbe index***] have a Wobbe Index not less than 47 and not more than 52.

Carbon dioxide is considered an inert gas.

These gas quality requirements are an addition to the requirements imposed by the *Petroleum and Gas*

(Production and Safety) Act 2004 and other Laws that regulates the quality of Natural Gas in Queensland during the term of the Agreement.

3. NOMINATIONS & SCHEDULING

3.1 GENERAL

"Nominations" are forecasts from Shippers of the daily quantities of gas, in gigajoules per day, requested to be received at each receipt point and delivered to the Shipper's delivery point. The primary method of submitting nominations to Jemena is through Jemena's gas accounting system (pypIT). Nominations received from Shippers can cover a period of one month, one week, one day or, in the case of an intra day nominations, part of one day. These Nominations are used by Shippers to forecast to Jemena delivery rates and Jemena uses these nominated quantities for calculating available pipeline and meter capacity and transportation agreement compliance. Jemena also uses the Nominations to schedule daily receipt quantities to control pipeline pressure and Shipper imbalances. Nominations also provide Jemena and Suppliers prior knowledge of excessive or low delivery rates which enable maintenance and/or production planning.

"Schedules" are rates, in gigajoules per day, which Jemena requires to be flowed from a Shipper's Receipt Point/s to meet Shipper Nominations plus any system use gas and imbalance corrections as applicable.

Shippers may submit a request for changes (submitted to the website) to weekly nominations at any time. Jemena shall exercise best endeavours to satisfy a late request initiated by a Shipper but will not be obliged to comply with the request. A change takes effect once Jemena sends confirmation via Jemena web site to the Shipper. In deciding whether to implement a requested change, Jemena will take into account operational matters and whether the proposed change will detrimentally affect other users.

Jemena may, from time to time, request additional Nominations from Shippers. These may be for, but not limited to, annual quantities of gas to be transported and peak demands.

The Shippers have designated an Authorised Person in each Haulage Service Contract as responsible for the issuing of notices, including nominations, to Jemena. The Authorised Person may delegate the responsibility for nomination to another person, Jemena Control Centre requests formal notification when there is a change to the Authorised person. If Operational Balancing Agreements are in place, the terms of those agreements may require that the operator of facilities downstream of Delivery Points nominates on behalf of the Shipper, or that Jemena provides advice of scheduled flow rates directly to an operator of facilities upstream of a Receipt Point.

3.2 NOMINATIONS

3.2.1 MONTHLY NOMINATIONS

(1) No later than 10 Days before the start of each Month during the Period of Supply the Shipper must provide to the Transporter a notice setting out, for each Day in the following Month, the quantity of Natural Gas that the Shipper requires the Transporter:

(a) to deliver to the Shipper at the Delivery Points; and

(b) to receive at each Receipt Points, (**'Monthly Nomination'**).

(2) Where the Shipper is not the supplier of the Natural Gas, the Shipper must supply similar information to its Supplier.

(3) The Transporter will provide to the Shipper a notice, confirming receipt of the Shipper's Monthly Nomination (**'Notice of Receipt of Monthly Nomination'**) before the end of the relevant Month. The Notice of Receipt of Monthly Nomination must set out whether, in the Transporter's opinion:

(a) in respect of a Firm Gas Transportation Service in which the Shipper has nominated a quantity of gas in excess of its MDQ – there will not be enough Capacity available to meet a quantity of Overrun Gas the Shipper nominated or if the Service is likely to be Curtailed;

(b) in respect of a Backhaul Service or an As Available Gas Transportation Service – there will not be enough Capacity available to meet a quantity the Shipper nominated.

(4) Where the Shipper fails to provide the Transporter with a Monthly Nomination:

(a) in the case of gas transportation agreements for Firm Gas Transportation Services, the Transporter will (subject to this Agreement) be obliged to provide to the Shipper and the Shipper will be obliged to pay for the Shipper's MDQ for each Receipt Point and Delivery Point during the relevant Month; and

(b) in the case of gas transportation agreements for Backhaul Services or As Available Gas Transportation Services, the Transporter is not obliged to provide any Services to the Shipper for the relevant Month.

3.2.2 MONTHLY NOMINATIONS

(5) No later than 10 Days before the start of each Month during the Period of Supply the Shipper must provide to the Transporter a notice setting out, for each Day in the following Month, the quantity of Natural Gas that the Shipper requires the Transporter:

(c) to deliver to the Shipper at the Delivery Points; and

(d) to receive at each Receipt Points, (**'Monthly Nomination'**).

(6) Where the Shipper is not the supplier of the Natural Gas, the Shipper must supply similar information to its Supplier.

(7) The Transporter will provide to the Shipper a notice, confirming receipt of the Shipper's Monthly Nomination (**'Notice of Receipt of Monthly Nomination'**) before the end of the relevant Month. The Notice of Receipt of Monthly Nomination must set out whether, in the Transporter's opinion:

(c) in respect of a Firm Gas Transportation Service in which the Shipper has nominated a quantity of gas in excess of its MDQ – there will not be enough Capacity available to meet a quantity of Overrun Gas the Shipper nominated or if the Service is likely to be Curtailed;

(d) in respect of a Backhaul Service or an As Available Gas Transportation Service – there will not be enough Capacity available to meet a quantity the Shipper nominated.

(8) Where the Shipper fails to provide the Transporter with a Monthly Nomination:

(c) in the case of gas transportation agreements for Firm Gas Transportation Services, the Transporter will (subject to this Agreement) be obliged to provide to the Shipper and the Shipper will be obliged to pay for the Shipper's MDQ for each Receipt Point and Delivery Point during the relevant Month; and

(d) in the case of gas transportation agreements for Backhaul Services or As Available Gas Transportation Services, the Transporter is not obliged to provide any Services to the Shipper for the relevant Month.

3.2.3 WEEKLY NOMINATIONS

(1) No later than 1200 hours on each Friday during the Period of Supply, the Shipper must provide to the Transporter, a notice setting out, for each Day in the following Week the quantity of Natural Gas that the Shipper requires the Transporter:

(a) to deliver to the Shipper at the Delivery Points; and

(b) to receive at each Receipt Points,
(**'Weekly Nomination'**).

(2) Where the Shipper is not the supplier of the Natural Gas, the Shipper must supply similar information to its Supplier.

(3) The Transporter will provide to the Shipper, a notice confirming receipt of the Shipper's Weekly Nomination (**'Notice of Receipt of Weekly Nomination'**). The Notice of Receipt of Weekly Nomination must set out whether, in the Transporter's opinion:

(a) in respect of a Firm Gas Transportation Service in which the Shipper has nominated a quantity of gas in excess of its MDQ – there will not be enough Capacity available to meet a quantity of Overrun Gas the Shipper nominated or if the Service is likely be Curtailed;

(b) in respect of a Backhaul Service or an As Available Gas Transportation Service – there will not be enough Capacity available to meet a quantity the Shipper nominated;

(4) The Transporter must allocate Available Capacity to any Service in accordance with the priority of service as outline above.

(5) In the event that the Shipper fails to provide a Weekly Nomination while nominating a quantity of gas in excess of its MDQ, then the Shipper's Monthly Nomination will be deemed to apply.

3.2.4 DAILY NOMINATIONS

(1) No later than 1300 hours on the Day before the Transporter is to provide the relevant Service to the Shipper, the Shipper may by notice to the Transporter request a change to the Shipper's Weekly Nomination (**'Daily Nomination'**).

(2) In the event that the Daily Nomination is received between 1300 hours and 1500 hours on the Day before the Transporter is to provide the relevant Service to the Shipper, the Transporter has no obligation to accept the change, but must use its reasonable endeavours to accommodate the request.

(3) The Transporter must by 1500 hours or as soon as possible thereafter on the Day before the Transporter is required to provide the relevant Service to the Shipper (whether or not the Shipper provides a Daily Nomination), provide a notice to the Shipper containing the Shipper's:

(a) Confirmed Receipt Nomination; and

(b) Confirmed Delivery Nomination (together a **'Confirmed Nomination'**).

(4) The Transporter is not under any obligation to accept any change requested in a Daily Nomination submitted to the Web Site after 1500 hours on the Day before the Transporter is required to provide the relevant Service to the Shipper.

(5) In making a decision regarding whether to accept Daily Nominations, the Transporter, will consider, in its reasonable opinion:

(a) operational matters; and

(b) whether the proposed change will detrimentally affect Other Shippers,

For the avoidance of doubt, the Transporter's decision regarding a Daily Nomination is final and is not subject to intellectual property right clauses.

(6) At any time before the Shipper receives the Confirmed Nomination, the Shipper may by notice to the Transporter, withdraw the Daily Nomination.

(7) Unless otherwise set out in the notice, the Confirmed Nomination is final and has immediate effect upon receipt of service.

3.2.5 INTRA-DAY NOMINATIONS

The Transporter may choose, in its sole discretion, whether to accept a Daily Nomination submitted by the Shipper on the day the Transporter is required to provide the Services.

3.2.6 NOMINATION CHANGES ARE NOT RETROSPECTIVE

Changes to Nominations cannot be made after the Transporter has commenced providing a Service to the Shipper. Nominations and changes to Nominations may only be made for a Service that the Transporter has not commenced providing to the Shipper.

3.2.7 COMPATIBLE NOMINATIONS

The Shipper must ensure that all Nominations the Shipper provides to the Transporter are compatible with similar forecasts provided under service agreements with operators of facilities upstream of Receipt Points or downstream of Delivery Points.

3.2.8 CHANGES TO NOMINATIONS PROCEDURE

(1) The Transporter may by notice in writing to the Shipper change the procedures set out in sections above and below.

(2) The Transporter may provide a Notice of Change to Procedure to the Shipper if the changes proposed in that notice in the Transporter's reasonable opinion, do not have a materially detrimental effect on the Shipper.

(3) The changes detailed in any Notice of Change to Procedure will take effect on the date specified in the Notice of Change of Procedure, such date not to be less than seven (7) Days from the date the Notice of Change of Procedure is given.

3.2.9 OBLIGATION TO SUPPLY SERVICES

For the avoidance of doubt, the parties agree that Transporter's obligations to supply Services and the Shipper's obligation to receive the Services is:

(a) in the case of Firm Gas Transportation Services, the lower of:

(i) the Shipper's MDQ for each Receipt Point and Delivery Point; and

(ii) the Confirmed Nomination; and

(b) in the case of Backhaul Services or As Available Gas Transportation Services and the Confirmed Nomination.

3.3 SCHEDULING

3.3.1 SCHEDULES

Schedules are rates of Natural Gas, measured in GJ/Day, which the Transporter requires to flow from each of the Receipt Points to meet the Confirmed Nominations plus Imbalance corrections (inclusive of System Use Gas) for the Shipper.

3.3.2 NOTICES

A notice, consent or other communication must be submitted to the Web Site, and will be deemed to be received by the Transporter. If a party is unable to submit any such notice, consent or other communication to the Web Site because of a fault with the Web Site, notification may be given by email to pipelines@jemena.com.au and will be deemed effective to be received by the Transporter.

3.3.3 TRANSPORTER'S OBLIGATIONS

(1) The Transporter will, at the time the Confirmed Nomination is issued to the Shipper, determine the flow rates (measured in GJ/Day) required to flow from each Receipt Point to each Delivery Point to meet the Confirmed Nomination plus any gas for correcting Imbalances (**'Daily Shipper Schedule'**).

(2) Unless otherwise stated in the Daily Nominations and it is agreed to by the Transporter, Natural Gas must be flowed through the Receipt Points at an even rate throughout the Day.

(3) The Transporter may, in its sole discretion, vary hourly flow rate if, in its sole opinion, the variance from an even hourly rate:

(a) will not be detrimental to the operation of the Pipeline; and

(b) will not detrimentally affect the Shipper or Other Shippers.

3.3.4 THE TRANSPORTER CAN CHANGE SCHEDULES

If the parties agree, the Transporter can change a daily schedule by giving Notice via an Electronic Advice to the Shipper and the Shipper's Supplier (if authorised to do so) specifying the change. The Notice must be provided by the Transporter no later than 1 hour before the change is to take effect.

3.3.5 PARTIES MUST GIVE NOTICE OF CHANGES IN OPERATING CONDITIONS

If a party to this Agreement reasonably expects:

(a) a change in the nominated or scheduled quantity of Natural Gas; or

(b) a change in the pressures or other operating conditions,

it must promptly send the other party an Electronic Advice describing the change, and why it is expected.

3.3.6 THE TRANSPORTER CAN CHANGE THESE PROCEDURES

The Transporter may change these scheduling procedures at any time. A change takes effect when the Transporter gives the Shipper written Notice of the changes, following which, the provisions of this clause 3.3 will be amended accordingly.

3.3.7 RESPONSIBILITY FOR SCHEDULING AT RECEIPT POINTS

(1) The Shipper must ensure that it's Supplier schedules to the Transporter appropriate amounts of Natural Gas at the Receipt Points to meet the Confirmed Nominations and any Imbalances.

(2) The Transporter must ensure that appropriate information is supplied to the Shipper and the Shipper's Supplier, if authorised to do so, to facilitate scheduling.

(3) The Shipper must ensure that the Transporter is provided with its Supplier's schedule by 1200 hours on the day before the one to which the schedule relates.

(4) The Transporter is entitled to rely on the Shipper's Supplier's schedule.

(5) The Transporter may consider other scheduling options proposed by the Shipper but is under no obligation to adopt them.

3.4 MAXIMUM DAILY QUANTITY

3.4.1 RECEIPTS AND DELIVERIES TO BE WITHIN MDQ

In respect of a Firm Gas Transportation Service, subject to any right of the Transporter to reduce (or not provide) the Service under this Agreement, the Transporter is not obliged on any Day to:

(a) receive at a Receipt Point a quantity of Natural Gas; or

(b) deliver at a Delivery Point a quantity of Natural Gas, greater than the MDQ for that Receipt Point or Delivery Point.

3.4.2 MDQ

In respect of a Firm Gas Transportation Service, subject to any right of the Transporter to reduce (or not provide) the Service under this Agreement, the Transporter may agree to increase, but not decrease, the MDQ, during the Period of Supply, subject to availability of Capacity on the Pipeline.

3.5 Backhaul Services and As Available Gas Transportation Service

In respect of a Backhaul Service or As Available Gas Transportation Service, and subject to any right of the Transporter to reduce (or not provide) the Services under this Agreement, the Transporter is not obliged on any Day to:

a) receive at a Receipt Point a quantity of Natural Gas; or

b) deliver at a Delivery Point a quantity of Natural Gas, greater than the Confirmed Nomination.

3.6 OVERRUNS

3.6.1 OVERRUN GAS

(1) An overrun occurs when:

(a) in the case of Firm Gas Transportation Services, the Actual Delivered Quantity or Actual Received Quantity is in excess of the MDQ for that Path or the quantity specified in an Operational Flow Order for that Path; or

(b) in the case of Backhaul Services or As Available Gas Transportation Services, the Actual Delivered Quantity or Actual Received Quantity for a Path is in excess of the Confirmed Delivery Nomination or Confirmed Receipt Nomination respectively for that Path or the quantity specified in an Operational Flow Order for a Path under this Agreement,

(**'Overrun Gas'**).

(2) If the quantity of Natural Gas for a Path is less than either:

(a) the MDQ, in the case of Firm Gas Transportation Services; or

(b) less than the Confirmed Delivery Nomination or Confirmed Receipt Nomination (as the case may be), in the case of Backhaul Services or As Available Gas Transportation Services, the Overrun Gas for that Path will be 0 GJ and will not reduce the Overrun Gas for other Paths.

Example Calculation:

A Shipper has a gas transportation agreement for Firm Gas Transportation Services with an MDQ of 1000 GJ/d on Path 1 and an MDQ of 2000 GJ/d on Path 2. If the Shipper flows 1200 GJ on Path 1 and 1800 GJ on Path 2 on a certain Day, the Transporter will calculate the extent of the Shipper's Overrun Gas as follows:

- 200 GJ Overrun for Path 1; plus
- 0 GJ Overrun for Path 2.

Therefore the total Overrun Gas, invoiced in accordance for the Shipper for that Day will be 200 GJ.

3.6.2 TRANSPORTER MAY AUTHORISE OVERRUNS

As far as reasonably practicable, the Shipper must limit the actual quantity of Natural Gas taken at its Delivery Points and injected at its Receipt Points on any Day to the following:

(a) in the case of Firm Gas Transportation Services, the MDQ for each Path. However, the Transporter may authorise the Shipper to overrun its MDQ where in the sole opinion of the Transporter it is technically and commercially acceptable to do so and shall show the overrun quantity it has authorised in a Confirmed Delivery Nomination or Confirmed Receipt Nomination for that Shipper for that Day (**'Authorised Overrun Gas'**).

(b) in the case of Backhaul Services and As Available Gas Transportation Services, the quantity of gas that the Transporter has agreed to in its Confirmed Delivery Nomination or Confirmed Receipt Nomination for each Path for that Shipper for that Day.

3.6.3 DELIVERY OF OVERRUN

(1) The Shipper may nominate Overrun Gas, for any Path on any Day under this Agreement, the Transporter must use its reasonable endeavours to deliver Overrun Gas nominated by the Shipper and authorised by the Transporter on any Day.

(2) The Transporter is under no obligation to accept a Nomination from the Shipper for Overrun Gas. If there is sufficient Capacity in the Pipeline to deliver the Overrun Gas, for any Path on any Day under this Agreement, the Transporter will advise the Shipper when it confirms the Shipper's Daily Nomination.

3.6.4 OVERRUN IS INTERRUPTIBLE

(1) The delivery of Overrun Gas on a Day is interruptible in the sole discretion of the Transporter.

(2) The Shipper acknowledges and agrees that the Transporter will have no liability to the Shipper for any and all Losses suffered or incurred by the Shipper as a result of any interruption arising directly or indirectly out of the Shipper taking Overrun Gas.

3.6.5 UNAUTHORISED OVERRUN GAS

Any quantity of gas delivered at a Delivery Point or injected at a Receipt Point for a Path for the Shipper in excess of the limits, will be treated by the Transporter as **'Unauthorised Overrun Gas'** and charged accordingly.

3.6.6 CHARGES FOR OVERRUN GAS

Charges for Overrun Gas will be calculated by the Transporter.

3.7 IMBALANCES

3.7.1 CALCULATION OF IMBALANCE

(1) An imbalance is:

(a) the aggregate quantity of Natural Gas determined by the Transporter as received on the Shipper's account under this Agreement at its Receipt Points; less

(b) the aggregate quantity of Natural Gas determined by the Transporter as delivered on the Shipper's account under this Agreement at its Delivery Points; plus

(c) the Shipper's System Use Gas allocation for quantities of Natural Gas transported on the Shipper's account under this Agreement for Firm Gas Transportation Services and As Available Gas Transportation Services, and may be a positive or a negative amount (**'Imbalance'**).

(2) The Transporter will calculate Imbalances daily.

3.7.2 CUMULATIVE IMBALANCE

(1) The Transporter will monitor and record a running total of the Shipper's daily Imbalances, at the end of each Day (**'Cumulative Imbalance'**).

(2) A positive Cumulative Imbalance will occur if, during the relevant period, the aggregate quantity of Natural Gas delivered under this Agreement at Delivery Points is less than the quantity of Natural Gas received at the Receipt Points (net of System Use Gas) for Firm Gas Transportation Services, Backhaul Services or As Available Gas Transportation Service (i.e. the Shipper is owed gas from the Pipeline).

(3) A negative Cumulative Imbalance occurs if, during the relevant period, the aggregate quantity of Natural Gas delivered under this Agreement at Delivery Points is more than the quantity of Natural Gas received at the Receipt Point (net of System Use Gas) for Firm Gas Transportation Services, Backhaul Services or As Available Gas Transportation Services (i.e. the Shipper owes gas to the Pipeline).

3.7.3 SHIPPER'S OBLIGATION TO BALANCE

(1) The Shipper must control and, if necessary adjust receipts and deliveries of Natural Gas to ensure that its Cumulative Imbalance under this Agreement is minimised.

(2) The Shipper must correct a Cumulative Imbalance within three (3) Days unless the Transporter agrees in writing to allow the Shipper a longer period for correction of that Cumulative Imbalance.

(3) The Transporter may offer (at a nominated fee) an ancillary service to adjust scheduled flows in order to manage Imbalances on the Shipper's behalf.

3.7.4 TRANSPORTER'S RIGHTS TO CORRECT SHIPPER'S IMBALANCE

The Transporter may correct the Shipper's Cumulative Imbalance at a Receipt Point by adjusting the Shipper's nominations if, in the Transporter's sole discretion:

(a) the Shipper's Cumulative Imbalance is affecting the Transporter's ability to perform its obligations to Other Shippers;

(b) the Shipper's Cumulative Imbalance is affecting the Transporter' ability to offer Services to Prospective Shippers; or

(c) the Shipper is not taking reasonable steps to control its Cumulative Imbalance including by not correcting the Cumulative Imbalance within the timeframe set out above.

3.7.5 FORECAST AMENDMENT

To correct its Cumulative Imbalance and satisfy the Transporter's operational requirements, the Shipper must amend the forecasts it provides under third party service agreements with operators of upstream facilities or submit change requests to its delivery nominations to the Transporter.

3.7.6 Elimination of Cumulative Imbalances at the End of Period of Supply

(1) Within seven (7) Days of the end of the Period of Supply any Cumulative Imbalance the Shipper may have must be eliminated.

(2) If the Shipper's Cumulative Imbalance is positive, the Transporter may, at its option either:

(a) deliver to the Shipper a quantity of Natural Gas equal to the Shipper's Cumulative Imbalance, subject to the terms and conditions of a Backhaul Service or an As Available Gas Transportation Service; or

(b) pay the Shipper the market price of that quantity of Natural Gas as at the Expiration Time and Date.

(3) If the Shipper's Cumulative Imbalance is negative, the Transporter may, by written Notice to the Shipper, require the Shipper to either:

(a) deliver to the Transporter at the Receipt Point under this Agreement a quantity of Natural Gas equal to the Shipper Cumulative Imbalance; or

(b) pay to the Transporter the cost of Line Pack/GJ at the market price as at the Expiration Time and Date.

3.7.7 Charges for Imbalances

(1) The charges for Imbalances on any Day applicable for Firm Gas Transportation Services, Backhaul Services and As Available Gas Transportation Services are calculated in accordance with how (**'Imbalance Charge'**) is calculated above.

(2) In respect of a Firm Gas Transportation Service, the Imbalance Charge will be the greater of:

(a) if on any Day the Shipper's Cumulative Imbalance (whether a positive or a negative, but expressed as an absolute value) at its Receipt Points has for the immediately preceding three (3) consecutive Days exceeded 10% of the sum of the MDQs supplied from its Receipt Points under this Agreement, the Shipper is required to pay to the Transporter an Imbalance Charge of 30% of the then current Capacity Reservation Rate for the Firm Gas Transportation Service applied for each GJ in excess of 10% of the sum of those MDQs for each Day until the Cumulative Imbalance is reduced to within 10% of the sum of the MDQs; and

(b) on any Day the Shipper's Cumulative Imbalance (whether a positive or a negative, but expressed as an absolute value) at its Receipt Points exceeds 15% of the sum of the MDQs supplied from its Receipt Points under this Agreement, the Shipper will pay to the Transporter an Imbalance Charge of 30% of the then current Capacity Reservation Rate for the Firm Gas Transportation Service, applied for each Day for each GJ in excess of 15% of the sum of those MDQs.

(3) In respect of a Backhaul Service and an As Available Gas Transportation Services, if on any Day the Shipper's Cumulative Imbalance (whether a positive or negative, but expressed as an absolute value) at its Receipt Points exceeds 15% of the sum of the

Confirmed Delivery Nominations supplied from its Receipt Points under this Agreement, the Shipper is required to pay to the Transporter an Imbalance Charge of 30% of the then current Backhaul Rate for Backhaul Services or As Available Rate for the As Available Gas Transportation Service (as the case may be), applied for each Day for each GJ in excess of 15% of the sum of the Confirmed Delivery Nominations.

3.7.8 Allocation and Sharing Arrangements

(1) Where the Shipper shares a Receipt Point or a Delivery Point with Other Shippers, the Shipper must enter into formal arrangements, on terms acceptable to the Transporter, with the Transporter, the Other Shippers and the operators of interconnecting facilities in relation to:

(a) Daily Nominations and allocation of quantities of Natural Gas delivered or received; and

(b) the communication of those allocations, for each Shipper at that shared Receipt Point or Delivery Point.

(2) The quantities so allocated as being received or delivered on the Shipper's behalf will be applied for the purposes of determining where applicable:

(a) Tariffs;

(b) Overrun Gas;

(c) Imbalance quantities;

(d) Overrun Charges;

(e) Imbalance Charges;

(f) Imbalance Settlement Charges;

(g) Odourisation Charges; and

(h) any other charges, determined with reference to quantities of Natural Gas transported or measured, if any, to the Shipper's account.

3.7.9 Settlement

(1) The Transporter may issue an Operational Flow Order that requires the Shipper to:

(a) cease or reduce deliveries or receipts of Natural Gas under this Agreement; or

(b) receive or deliver quantities of Natural Gas, to adjust the Shipper's Cumulative Imbalance.

(2) The Shipper will incur an Overrun Charge for any quantities of Natural Gas received into the Pipeline from the Shipper contrary to the reasonable requirements of an Operational Flow Order, and not delivered on the Shipper's account.

(3) Any quantities of Natural Gas not received by the Transporter to the Shipper's account in accordance with the reasonable requirements of an Operational Flow Order will be invoiced to the Shipper by way of an Imbalance Settlement Charge calculated as Line Pack/GJ at the then current market price (**'Imbalance Settlement Charge'**).

(4) A reasonable requirement of an Operational Flow Order includes a requirement that the Shipper delivers or receives quantities of Natural Gas to correct its Cumulative Imbalance within 24 hours of the issue of the Order.

3.8 OPERATIONAL FLOW ORDERS

3.8.1 TRANSPORTER CAN ISSUE AN OPERATIONAL FLOW ORDER

The Transporter has the right to issue an order to the Shipper to alter Natural Gas receipts and deliveries (**'Operational Flow Order'**) when in the Transporters' reasonable opinion, expected receipts and deliveries:

(a) will cause adverse operating conditions in the Pipeline;

(b) will not accommodate Capacity limitations resulting from events or circumstances which endanger the safety or integrity of the Pipeline including the need to perform unscheduled maintenance and/or repairs;

(c) will not maintain the Transporters' ability to meet Service commitments; or

(d) will adversely affect imbalances under shippers' gas transportation agreements.

3.8.2 PRIORITY OF OPERATIONAL FLOW ORDERS

The Transporter must use its reasonable endeavours to first apply Operational Flow Orders to those Shippers, if any, whose actions or omissions have resulted in the need for Operational Flow Orders.

3.8.3 TIMING FOR AN OPERATIONAL FLOW ORDER

At least two hours prior to the effective commencement of an Operational Flow Order, the Transporter shall provide a written copy of the order to the Shipper whereupon the Shipper must use its reasonable endeavours to take the actions requested by the Transporter.

3.8.4 CONTENTS OF AN OPERATIONAL FLOW ORDER

Each Operational Flow Order must contain the following information:

(a) time and date of issue;

(b) adjustments to Confirmed Nominations;

(c) the time that the Operational Flow Order is to become effective;

(d) the duration of the Operational Flow Order (if none is specified, the Operational Flow Order will remain in effect until further Notice);

(e) a description of the area of the Pipeline for which the Operational Flow Order is in effect;

(f) the specific actions required of the Shipper at the Receipt Points and Delivery Points

in order to comply with the Operational Flow Order;

(g) the reasons for issuing the Operational Flow Order; and

(h) any other information relevant to the Operational Flow Order.

3.8.5 CONSEQUENCES OF NOT COMPLYING WITH AN OPERATIONAL FLOW ORDER

Without limiting the Transporters' remedies under this Agreement or at law, if the Shipper fails to use its reasonable endeavours to comply with an Operational Flow Order, then the Transporter may charge the Shipper an Unauthorised Overrun OFO Charge for that quantity of Natural Gas by which the Shipper deviates from the requirements of the Operational Flow Order.

3.9 FLEXIBLE RECEIPT AND DELIVERY POINTS

3.9.1 SHIPPER CAN PROPOSE A CHANGE IN RECEIPT POINTS AND DELIVERY POINTS

(a) The Shipper can propose to extend or shorten the Shipper's Path by sending an Electronic Advice to the Transporter with the proposal for the Shipper's variation of Receipt Points and Delivery Points.

(b) The Shipper must provide the Transporter at least 30 Days written Notice of the change. Where the Shipper provides less than 30 Days Notice of the change to the Transporter, the Transporter may choose whether to implement the change or not in its sole discretion.

(c) The Transporter does not have to consider a variation, more frequently than once every 3 Months.

(d) The Transporter will assess the proposed variation and may, in its sole discretion, refuse the Shipper's request to vary its Receipt Points or Delivery Points.

3.9.2 CHANGE IN RECEIPT POINTS OR DELIVERY POINTS REQUIRING THE TRANSPORTER TO MAKE CAPITAL IMPROVEMENTS

The Transporter will be entitled to pass on any capital costs or other costs incurred by the Transporter in allowing the Shipper to change a Delivery Point or Receipt Point, or in providing the Service to the different Delivery Point or Receipt Point.

3.10 SYSTEM USE GAS

System Use Gas means the quantity of natural gas used in the provision of services on the pipeline, including:

a) fuel gas used for compressors and other equipment;

b) natural gas lost or not accounted for in connection with the operation of the pipeline; and

c) natural gas recorded as lost or gained due to metering error;

but does not include

d) line pack; and

e) natural gas lost through Jemena QGP's negligence or wilful misconduct.

Each Day the Shipper (other than in respect of a Backhaul Service) is required to supply, on a pro rata basis based on its Confirmed Receipt Nominations, System Use Gas at its cost unless the parties otherwise agree.

3.11 PRIORITY OF SERVICE

(1) The priority number for each Standard Service is:

(a) Firm Gas Transportation Service, 1.0;

(b) Backhaul Service, 2.0; and

(c) As Available Gas Transportation Service, 3.0.

(2) An Authorised Overrun Service has a priority number of 4.0.

(3) Services of different types are to be given priority according to their priority numbers.

(4) The lower the priority number the higher the priority.

(5) Priority number 1.0 has the highest priority.

4. MEASUREMENT & RECONCILIATION .

4.1 OVERVIEW OF MEASUREMENT

Jemena is the Measurement Authority for the QGP, with responsibility for measurement and reconciliation of all gas received and delivered on the QGP. Jemena owns, operates and maintains gas quality measuring equipment at selected Receipt Point(s) and at selected Delivery Points on the pipeline. Flow measurement facilities are maintained by Jemena at each Delivery Point and Receipt Point, except Gooimbah, Gladstone Breslin St Offtake, Rockhampton South and Rockhampton north.

Measured flow is corrected for temperature and pressure to produce instantaneous volumetric and energy based flow rates at standard conditions, from the application of gas quality data imported via the QGP SCADA system. An on-site RTU based flow computer performs the calculations, integrates the results, and accumulates volume and energy totals in non-volatile registers within the flow computer memory. All calculations done by the flow computer are in accordance with recognised industry standards. In conjunction with line pack calculations, the accumulated quantities are used for the daily reconciliation and balancing of the pipeline.

Monitoring of flow is achieved using the SCADA system that has land communications links to on site measurement equipment at the receipt and key delivery points.

4.2 MEASUREMENT EQUIPMENT

The equipment specification varies between measurement facilities, however the schematic Figure 4.2.1 identifies and links the key repeated components.

4.2.1 DESCRIPTION

Meter Assembly

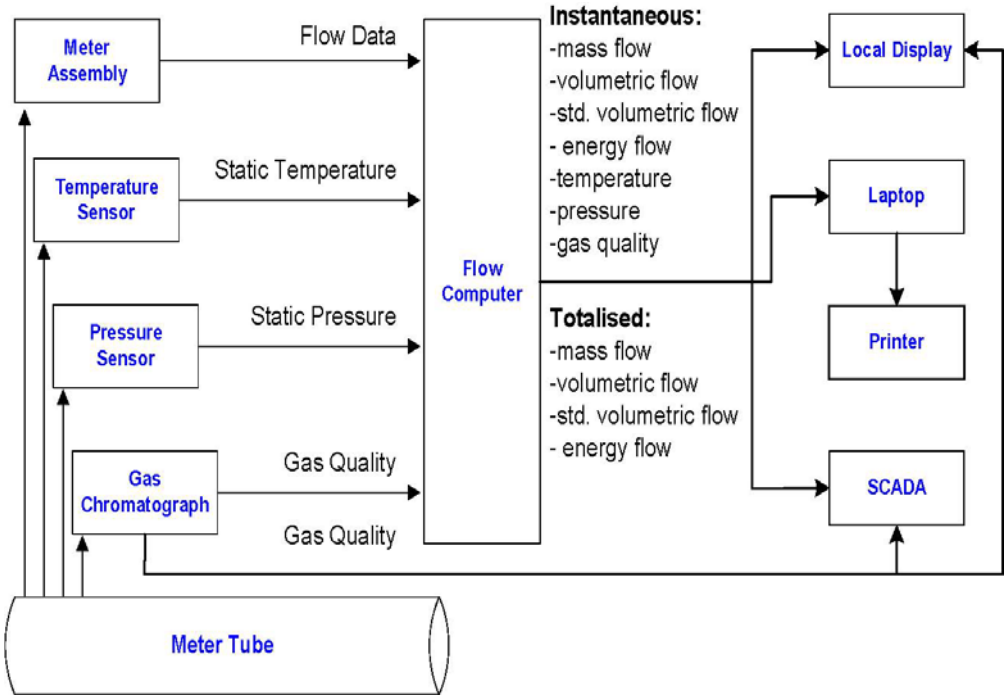

Figure 4.2.1: Measurement Facility Schematic

The meter assembly measures dynamic flow properties for use in the calculation of volumetric flow. Three styles of meter assembly are in service on the QGP. QGP receipt stations use ultrasonic and coriolis meters. At the Delivery Points, a mixture of ultrasonic, coriolis and turbine meters are employed. Turbine meters measure the compressor fuel gas.

Gas Chromatograph

Chromatographs are located at the Wallumbilla, Gooimbah, Fairview, Westgrove, Rolleston, Moura, Gladstone and Yarwun receipt and delivery points. There units provide gas quality data for local volumetric and energy flow calculation and for retransmission to other delivery points.

Static Pressure Sensor

The static pressure sensors are mounted on each meter assembly, in accordance with the requirements of the meter type. Generally, the static pressure and temperature are required to formulate the correction factor applied in the conversion of the observed flow rate at metering conditions to a volume at standard conditions.

The pressure transmitter mounted on the coriolis metering skids also serves to compensate for variations in the coriolis meter tube at high pressures to enable enhanced accuracy in the measurement of mass flow.

Resistance Temperature Detectors

The operating principle of the resistance thermal detector is relatively simple. A platinum wire is fixed within a probe positioned mid stream in the pipe. The resistivity of a conductor is proportional to its temperature. Hence, variation in gas temperature can be inferred from the variation in the measured resistance across the platinum wire.

The resistivity across the platinum wire is monitored and converted to a 4 to 20 mA signal by a transmitter either directly or remotely mounted.

Flow Computer

Each meter assembly is connected to a local Bristol Babcock RTU programmed as the Flow Computer to apply the appropriate AGA and Pipeline industry standard calculation techniques to local and external data, in order to determine corrected volumetric and energy flow rates.

Fixed inputs are manually programmed using a local interface on the flow computer into flow computers RTU's or are hard-coded. These are updated as required using Jemena's change management process.

Based on the data received the flow computer calculates and outputs:

- instantaneous volumetric flow rates at metering conditions;
- instantaneous volumetric flow rate at standard conditions;
- instantaneous mass flow rate;
- instantaneous energy rate;
- higher heating value;
- totalised volume at standard conditions; AND
- totalised energy.

Output is provided on-site via a visual interface and/or laptop computer. The flow computers are also scanned by the SCADA system.

4.3 VERIFICATION

Validation of gas quality, volume and energy accounting equipment is performed at each of the pipeline metering stations to ensure the continued accuracy of metering. The period between validations as define the QGP Measurement Manual. This interval may be varied subject to prior notice by Jemena, as accuracy of a measurement facility is proven. General quality assurance principles shall be applied by Jemena in the determination of an appropriate interval, with gradual increases being permitted subject to sustained satisfactory performance by the site equipment. Any variances to intervals shall only be enacted upon issue of written notification by Jemena of its implementation of a proposed variation, or reinstatement of a shortened period.

Representatives of each of the parties having an interest in the quality and quantity of gas passing through the measurement facility - Jemena, Producers and Consumers who are party to contracts with QGP - are to be given at least 48 hours notice of the proposed date and time of scheduled tests so that they may witness the tests. The Field Operators must notify the Jemena Control Centre in Melbourne immediately prior to commencing any measurement facility validation. The Jemena Control Centre, if required, will notify the affected producers or shippers that the validation is to commence. This will alert the producer/shipper should they have to make provision for the loss of flow signals from the Jemena equipment. The Jemena Control Centre must be kept informed as to the status of the measurement facility validation processes and advised immediately of any abnormal test results.

The validation tests will be conducted as scheduled. In the event that any or all of the invited witnesses do not attend, the test results will be deemed to be an accurate statement of current performance and shall be accepted by all parties. Notice will be forwarded to each of the relevant parties within 14 days of the test being completed. Witnesses are given the opportunity to sign report forms at the site to signify their attendance at the validation process.

In the event of rapid onset of equipment failure, damage or accuracy drift, Jemena may conduct interim validations without witnesses and effect appropriate remedial action but shall, where possible, give prior notice to the relevant parties that an interim validation is to be undertaken. Where possible, any maintenance such as changing ultrasonic sensors, replacing consumables or spare parts items, etc. will be performed during a scheduled validation to be witnessed by all parties.

In any case, all affected parties will receive comprehensive written details of the validation results, one copy of each of the completed test reports and advice of any adjustments made to equipment and processes subsequent to the tests.

The following is a general description of the procedures conducted at verification.

Shippers can request unscheduled verifications of equipment, but if the equipment is found to be correct, costs of such verifications will be charged to the shipper. For a detailed description of verification procedures, the Jemena QGP Measurement Manual should be consulted.

4.3.1 METER ASSEMBLIES

Ultrasonic Meter Assembly

Ultrasonic meters are installed and operated and maintained as per the current requirements of the American Gas Association (AGA) Report No. 9.

Procedures for the validation of the ultrasonic metering systems are provided in the QGP Measurement Manual.

Each meter reading is corrected for temperature and pressure via sensors attached to the meter.

Turbine Meter Assembly

Turbine meters are installed and operated and maintained as per the current requirements of the AGA Report No. 7, second edition 1996.

Procedures for the validation of the turbine metering system are provided in the QGP Measurement Manual.

Full verification involves changing the flow on the meter run skid so the test meter is in series with the in service meter and recording the output from each. Results are then compared with those taken at time of installation to establish any deterioration of the in-service meter performance. The preamplifier unit on the meter is tested using a NATA Certified frequency generator.

Coriolis Meter Assembly

Coriolis meters are installed, operated and maintained as per the manufacturer's instructions and Industry Standards.

Procedures for the validation of the coriolis metering system are provided in the QGP Measurement Manual.

4.3.2 GAS CHROMATOGRAPH

In addition to the regular self-calibrations, the chromatographs are included in the verification to ensure their continued accuracy in analysis and computation. See Section 4.4.1.

4.3.3 STATIC PRESSURE/TEMPERATURE SENSOR

Static Pressure Transmitter

The static pressure sensing lines are leak tested. The transmitter is then calibrated across its range using a Dead Weight tester. A known equivalent pressure is applied to the transmitter. The transmitter output (mA), and the pressure reading (kPa) from the flow computer display are compared to expected values.

4.3.4 FLOW COMPUTERS

Flow calculations are carried out as per the AGA; or ANSI standard appropriate to the metering apparatus. Calculation of the compressibility factor for the purpose of flow and volume correction to standard conditions is per current requirements of the AGA Report No. 8, second edition 1992.

All programmed constants are checked and confirmed for accuracy and/or appropriateness for operating conditions.

All functions of the flow computer are checked using electronic test instrumentation. Performing a flow calculation using measured properties substituted into custom software, and comparing the result with that from the flow computer assesses calculation accuracy.

4.3.5 ANCILLARIES

Sulphur Gas Chromatograph
Using a calibration gas with known sulphur component compositions, the sulphur GC can be verified and calibrated.

Pressure Transmitters - Scraper Stations
Pressure transmitters located at scraper stations and MLVs are used in the calculation of line pack and are calibrated at least every twelve months.

Temperature Transmitters - Scraper Stations
Temperature transmitters located at scraper stations and MLVs are used in the calculation of line pack and are verified at least once every twelve months. The transmitter is tested as per Section 3.3.3 but as the probe is buried and attached to the pipeline it can only be checked against a second (reference) probe which is connected to the pipe along side of the in service probe.

Alarms and Trips
A review of all alarms and trips is conducted annually to ensure that the settings remain valid for current pipeline operating conditions.

4.4 CALIBRATION

Detailed procedures for the testing and calibration of the gas quality and flow measurement equipment are not included in this operations manual. More appropriately, they are specified in the QGP Measurement Manual. As part of Jemena's obligation under the Standard Terms and Conditions, the QGP Measurement Procedures Manual is available to any shipper upon request and can be found on Jemena's webpage on the QGP site. Measurement equipment is tested for conformity to manufacturer specified tolerances and is detailed in the QGP Measurement Manual.

4.4.1 TOLERANCES

Over and above the individual tolerances of the measurement equipment, the limit for equivalent total error in measured volumetric flow is 1%. Equivalent total error in volumetric flow is established by substituting expected and "as found" measured quantities into the flow calculator and equating the % difference.

4.4.2 STANDARD CONDITIONS

Standard conditions referenced in the specification of gas quality or used in the calculation of volumetric and energy flow rates are determined as:

- Standard Condition Pressure 101.325 kPa
- Standard Condition Temperature: 15^0C (288.15K)
- Standard Gravitational Force: 9.807 m/s^2 at sea level and 45^0 latitude

4.4.3 LOCAL GRAVITY AND ATMOSPHERIC PRESSURE CALCULATIONS

Local Gravitational Acceleration

Local gravitational acceleration at each site is calculated in accordance with equation 3-A-10 of AGA3-1992. The local gravity is dependent on the latitude and elevation of the site.

Local Atmospheric Pressure

Local atmospheric pressure is also calculated for each site. It is calculated using the following equation and is dependent on the elevation only.

$$P_{local} = 101.325 - \frac{(h \times \rho_{air} \times g_{st'd})}{1000} kPa$$

where

h	= site elevation (m)
ρ_{air}	= 1.225 kg/m^3
$g_{st'd}$	= 9.807 m/s^2

4.5 COMPUTATION OF FLOW

Equations applied in the calculation of volumetric flow are specific to the metering system being employed. In general, however, the meter assembly is measuring a time based characteristic of the flow.

Ultrasonic meters measures the velocity of the flow through the meter run by a series of transducers mounted at an angle to the pipe, sending signals through the gas stream. They derive a gas volumetric flowrate from time-of flight measurements of ultrasonic energy pulses transmitted through the flow stream. The transducers both transmit and receive pulses and the transit time is measured. When gas is flowing in the pipe, the pulse travelling against the flow takes longer to reach the opposite transducer than the pulse travelling with the flow. This time difference is used to calculate the velocity of the flowing medium. The difference in transit time between upstream and downstream pulses increases with increasing velocity of the gas stream. Generally, ultrasonic meters are installed by Jemena where flow rates require a metering run of 150mm or greater diameter.

Turbine meters measure the velocity of the flow through displacement of rotary vanes in the gas stream. The observed flow rate (m^3/hr) at measurement conditions is corrected to standard conditions (sm^3/hr) using a correction factor based on the gas composition and the static temperature and pressure.

Curved tube coriolis meters are used to directly measure the mass flow of fluid and are generally applied by Jemena for metering runs up to 100mm in diameter. The mass flow is determined by passing the fluid through a pair of parallel tubes, which are bent, into a U shape. Vibration is induced into the tubes by a coil and magnet, and fluid moving through the meter's tubes produces Coriolis forces that then cause the flow tubes to twist in opposition to each other. During a no flow condition, there is no Coriolis effect and the sine waves generated by pickup coils and magnets installed at the inlet and outlet of the tubes are in phase with each other. As a result of any flow-induced twist in the flow tubes, the sine waves generated by the pickups are now out of phase, with the inlet side lagging behind the outlet side. The phase shift is directly proportional to the mass flow rate - the greater the phase shift, the greater the mass flow rate.

The energy based flow rate (GJ/day) used in the daily operation of the pipeline is established by multiplying the calculated standard flow rate (sm^3/hr) by the calculated Gross Heating Value (MJ/sm^3) of the gas, and adjusting the time scale.

4.6 RECONCILIATION

Reconciliation is the process by which Jemena checks the relative difference between receipt and delivery meters whilst taking into account change in line pack. This is done by using the equation:

$$\frac{\text{Delivered Quantity + QGP Gas Used + Change In Linepack}}{\text{Receipt Quantity}}$$

The reconciliation process is structured to:

- ensure metering on the pipeline is within acceptable limits;
- identify any metering discrepancy; AND
- calculate the quantity of unaccounted for gas.

The pipeline is reconciled over each gas day and also over the cumulative monthly figures, with summary results being issued to Shippers on a monthly basis as part of the billing documentation.

4.7 METERING EQUIPMENT FAILURE

If measuring equipment is found to be in error in excess of stated tolerances such that the total measurement error for the receipt or delivery point exceeds 1% of the total quantity of gas measured, special action is required. Unless an alternate agreement between Jemena and the shipper is reached, or Jemena can identify the time and date of the failure, Jemena will adjust the total quality of gas measured at the receipt or delivery point for a period equal to half the time period since the last verification. A correction to the shipper's invoice, reflecting the adjustment, will then be issued.

4.8 ON SITE ANALYSIS

At each Receipt Point:

- an on-line gas chromatographs (C6 and C9 units) analyse the gas for its major components;
- the hydrocarbon dewpoint, higher heating value and relative density are calculated using data from the two gas chromatographs;
- a sulphur GC analyses the sulphur components in the gas;
- an RTD probe measures the gas temperature; AND
- a pressure transmitter measures the static pressure of the gas stream.

MEASURED ON-LINE	CALCULATED ONLINE	INFERRED
Hydrocarbon breakdown to C6+ Hydrocarbon breakdown C6 to C9+ Nitrogen Moisture Dew Point Gas Temperature Gas Pressure	Higher Heating Value Relative Density Wobbe Index Hydrocarbon Dew Point (Gooimbah) Compressibility Factor	Total Inerts

Table 4.8.1: Output from On-Site Analysis

Output from the on-site measurement equipment is linked to the Melbourne Control Centre via a landline communication network. The SCADA system then uses prioritised alarms to trigger a visual and audible interface to assist controllers in tracking the measured or calculated gas properties should they approach the limits specified in Table 2.1.1: **GAS QUALITY SPECIFICATIONS**.

4.9 LABORATORY ANALYSIS

The on-site analysis is limited to monitoring the constituents or properties that have a critical short-term impact on the pipeline operation, or that are necessary for the energy accounting process. The on-site analysis is therefore supplemented with periodic laboratory testing to ensure all conditions of the gas specification are being met.

Should a third party analysis of the gas be required, or tests conducted for gas properties outside the capabilities of the installed equipment on the pipeline, then the following table lists the required measured and calculated outputs of the laboratory analyses.

LABORATORY MEASURED	LABORATORY CALCULATED
Methane (CH_4)	Higher Heating Value
Ethane (C_2H_6)	Lower Heating Value
Propane (C_3H_8)	Absolute Density
I-Butane (iC_4H_{10})	Relative Density
N-Butane (nC_4H_{10})	Wobbe Index
Neo-Pentane ($neoC_5H_{12}$)	Hydrocarbon Dew Point
I-Pentane (iC_5H_{12})	Water Content
N-Pentane (nC_5H_{12})	Water Dew Point
N-Hexane (nC_6H_{14})	Compressibility Factor
N-Heptane (nC_7H_{16})	
N-Octane (nC_8H_{18})	
N-Nonane+ (nC_9+)	
Nitrogen (N_2)	
Carbon Dioxide (CO_2)	
Oxygen (O_2)	
Tetrahydrothiophene $CH_2(CH_2)_3S$	
Tertiary Butyl Mercaptans $(CH_3)_3C–SH$	
Hydrogen Sulphide (H_2S)	
Total Sulphur	

Table 4.9.1: Laboratory Analysis Output

4.10 SAMPLING AND ANALYSIS EQUIPMENT

4.10.1 GAS CHROMATOGRAPH SYSTEM

A small gas sample is retrieved from the pipeline at nominal intervals of 3 – 6 minutes and is analysed by the C6 gas chromatograph for the following components:

- Methane (CH_4)
- Ethane (C_2H_6)
- Propane (C_3H_8)
- I-Butane (iC_4H_{10})
- N-Butane (nC_4H_{10})
- Neo-Pentane ($neoC_5H_{12}$)
- I-Pentane (iC_5H_{12})
- N-Pentane (nC_5H_{12})
- N-Hexane$^+$ (nC6+)
- Nitrogen (N_2)
- Carbon Dioxide (CO_2)

A small gas sample is retrieved from the pipeline at nominal intervals of 3 – 6 minutes and is analysed by the C9 gas chromatograph for the following components:

- Methane (CH_4)
- Ethane (C_2H_6)
- Propane (C_3H_8)
- I-Butane (iC_4H_{10})
- N-Butane (nC_4H_{10})
- Neo-Pentane ($neoC_5H_{12}$)
- I-Pentane (iC_5H_{12})
- N-Pentane (nC_5H_{12})
- N-Hexane (nC_6H_{14})
- N-Heptane (nC_7H_{16})
- N-Octane (nC_8H_{18})
- N-Nonane+ (nC_9+)
- Nitrogen (N_2)
- Carbon Dioxide (CO_2)

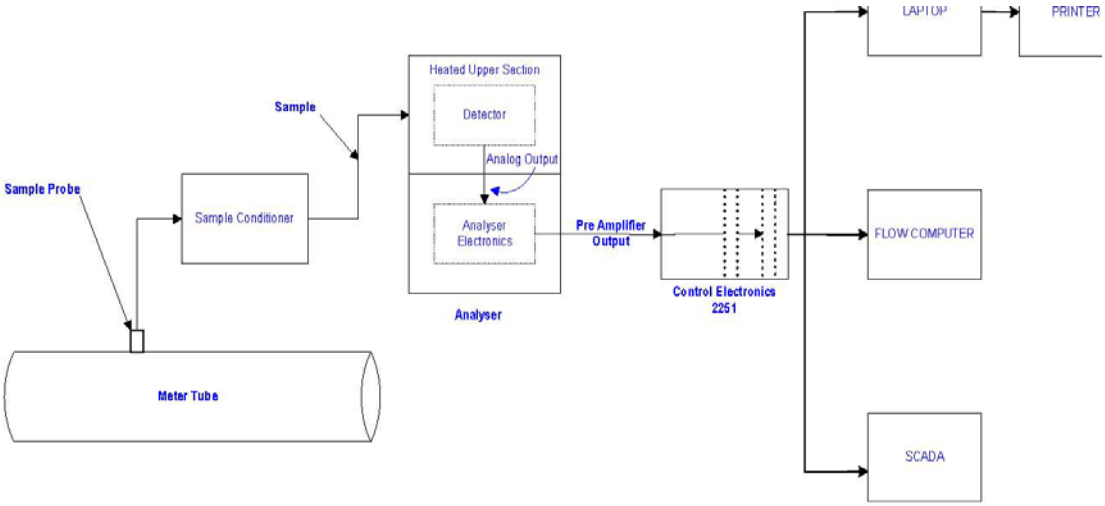

Figure 4.10.1: Chromatograph System

Component analysis, in general terms, is achieved by passing the sample gas through a separation system. A detector located at the outlet of the separator senses the elusion of each component from the column and outputs an electrical signal, proportional to the volume.

An internal microprocessor calculates from the above data the relative densities, compressibility factor, Higher Heating Values, and the Wobbe index. The basis of these calculations is ISO-6976. These figures are telemetered to the control room via a SCADA system and are also fed into the flow computer for correcting gas volume and calculating gas quantity.

The chromatograph automatically calibrates itself every 24 hours using a reference gas custom-blended to be very similar to the gas being transported. This reference gas is supplied with a certification of analysis, which is entered into the chromatograph for self-adjustment on calibration.

The chromatograph is checked during the routine verifications of gas analysis and energy accounting equipment.

4.10.2 MOISTURE ANALYSERS

There is a moisture analyser at Gooimbah but this is not owned by Jemena, however Jemena can monitor this water content reading.

4.11 TEST AND CALCULATION PROCEDURES

Standard test and calculation procedures for property analysis are listed in the table below.

PROPERTY	CODE
Hydrocarbons	ISO 6974 AND ISO 6975; ASTM1945; OR GPA 2261
Carbon Dioxide	ISO 6974 AND ISO 6975; ASTM D1945; OR GPA 2261
Nitrogen	ISO 6974 AND ISO 6975; ASTM D1945; OR GPA 2261
Oxygen	ISO 6974 AND ISO 6975; ASTM D1945; OR GPA 2261
Higher Heating Value	ISO 6976; GPA 2172; OR ASTM D3588
Lower Heating Value	ISO 6976; GPA 2172; OR ASTM D3588
Relative Density	ISO 6976; GPA 2172; OR ASTM D3588
Wobbe Index	ISO 6976; GPA 2172; OR ASTM D3588
Compressibility Factor	ISO 12213; GPA 2172; OR ASTM D3588
Tetrahydrothiophene	ISO 6326; ASTM D6228 (0.02 to 20 mg/m3)); OR ASTM D5504 (0.01 - 1,000 mg/m3)
Total Sulphur	ISO 6326; ASTM D4468 (0.001 - 20 ppm/v); ASTM D6228 (0.02 to 20 mg/m3); ASTM D5504 (0.01 - 1,000 mg/m3); OR ASTM D1072 (25 - 700 mg/m3)
Trace Elements	ASTM D3919
Solids	ASTM D3926

Figure 4.11.1: Standard Test and Calculation Procedures

4.12 OFF SPECIFICATION GAS

Jemena is contractually obligated to flow on behalf of its Shippers only gas that meets specification as outlined above and in more detail in the Jemena QGP Standard Terms and

Conditions as defined in schedule 1. It is the Shipper's responsibility to ensure that gas to be transported meets this specification at its Receipt Point.

Jemena will immediately notify the Shipper and Supplier when gas is not meeting specifications as identified by Jemena gas quality measuring devices at the Receipt Point. Knowledge of the presence of off-specification gas by Jemena personnel, does not relieve the Shipper from its contractual obligation for providing gas meeting the specifications, or liability for any direct or indirect damages incurred by Shippers due to the receipt of off-specification gas on behalf of a Shipper.

Off specification gas is gas, which does not meet the required standards as set out in schedule 1 of the QGP Standard Terms and Conditions.

If Shippers receipt gas does not meet specifications Jemena may exercise its right to terminate receipt of gas from the Shipper.

Jemena may consider (for short term emergencies) co-mingling or blending of the off specification gas with gas which is in the pipeline, however, if in the opinion of QGP, the co-mingling or blending of the off specification gas may have an adverse or deleterious effect on any other Shipper on the pipeline, Jemena will terminate the receipt of such gas and immediately notify the Shipper and the Shipper's Supplier of such action.

The supplier can recommence supply when the supplier can prove to Jemena's satisfaction that gas intended for receipt on to the pipeline has been returned to within specification limits. In resuming receipt of gas after an off specification termination, Jemena will not accept any off specification gas which has accumulated in the connecting pipeline to the Jemena pipeline.