Petroleum Production Licence No. 62 & 168
(Katnook & Ladbroke Grove Complex)

Development Plan

and

2000 Operational Review

PPL62 & 168

Otway Basin
South Australia

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1 Abstract

Origin Energy Resource Limited ("Origin Energy") as Operator of PPL 62 & 168 (Figure 1) presents this Development Plan and 2000 Operational Review (Revision 3), on behalf of the PPL 62 & 168 Joint Ventures, to PIRSA.

The following reports were provided to PIRSA during the year.

Reports	Remarks
Monthly Report	Monthly production summaries and plant activities were submitted
Quarterly Report	Quarterly reports were not provided in 2000 (will be provided from 2001)
Annual Report	Annual report was submitted to PIRSA
Well Completion Report	Ladbroke Grove 3 – In preparation (submitted in March 2001)
Special Report	Incident investigation report in relation to the failure of the Ladbroke Grove 2 wellhead spool.

1A Compliance With Petroleum ACT and Regulations 2000

From September 2000, the Katnook and Ladbroke Grove operations were operated in accordance with the Petroleum Act and Regulations 2000. Origin Energy Resources Limited has taken considerable efforts to enure that activities conducted under the licence during the year comply with the Petroleum Act and Regulations 2000.

Also, Origin has kept PIRSA informed of it's activities via regulatory reporting in accordance with the new Regulations and also participated in frequent meetings with PIRSA.

An interim Statement of Environmental Objectives (SEO) has been submitted as required by this new regulatory regime. The Katnook and Ladbroke Grove operations have interim classification as Low Supervision under this new regime. At the time of writing a Fitness-for-Purpose Assessment is being completed that will in turn be used to provide input to an Environmental Impact Report. Preparation of this document has been an interactive and co-operative exercise between officers of PIRSA and Origin and is currently in draft version 3.

All operations during the year have been completed in accordance with Petroleum Act 2000 with exception of one item (delayed submission of a well completion report). This involved the submission of the Ladbroke Grove 3 Well Completion Report. Ladbroke Grove 3 was drilled in July 1999, however the well completion report was not submitted until March 2001 due to late preparation of the report by a sub-contractor (preparation of the report was subcontracted to Oil Company of Australia). Even though the well was drilled prior to the new Act, the submission is still expected to comply with the new regulations and is therefore non-compliant.

In order to ensure that this failing does not recur a dedicated Onshore Otway team is established at OERL in Adelaide and is able to sustain reporting responsibilities, and consequently future reports will be completed and submitted in accordance with the Regulations and the Petroleum Act 2000.

New procedures are also in place with regards to submission of all regulatory reports. A Permit Compliance Database system has been developed in order to manage the regulatory reporting requirements as prescribed by the Regulations under the Petroleum Act 2000. The database comprises a monthly updated permit status report highlighting significant operations, subsequent reporting requirements and deadlines. Shortly it is hoped to adopt a corporate Regulatory Compliance Management System (RCMS) which will further improve the scheduling of compliance events.

1B Introduction

This document describes the operational activities associated with the Katnook Gas Plant, Ladbroke Grove Gas Plant and related gas fields located 10 km South of Penola in the South East of South Australia.

Calendar year 2000 was the tenth year of production operations at Katnook, and heralded the commencement of high CO2 gas production from Ladbroke Grove Field.

The commissioning of the Ladbroke Grove facilities was completed in December 1999 and gas production commenced in January 2000. Ladbroke Grove gas is processed for removal of liquids through the Ladbroke Grove Gas Plant before being delivered to the Power Station.

The Ladbroke Grove Power Station has two LM 6000 gas turbines for electricity generation. Construction of the first turbine was completed in 1999, and construction of the second was completed in April 2000. Sweet gas from the Katnook plant is used to start the turbines.

Origin Energy Resources Limited undertook a comprehensive reservoir simulation study of the Katnook, Haselgrove/Haselgrove South and Redman fields in the first half of 2000 to identify the timing requirements for adding deliverability by drilling and/or compression. A copy of the report was submitted to the Department.

2 Safety

2.1 Safety Issues

No lost time or medical treatment injuries occurred during the year.

During July 2000, an uncontrolled gas release to atmosphere occurred, due to failure of a spool immediately downstream of the Ladbroke Grove #2 wellhead. The incident was quickly brought under control without further escalation.

The incident was investigated and actions undertaken to avoid recurrence, and to ensure that corrosion effects were understood throughout the Ladbroke Grove operation. The actions taken include:

a) Replacement of carbon steel alloy upstream of the wellyard chokes with duplex stainless steel.

b) Relocation of corrosion inhibitor injection point further upstream (ie directly into the wellhead).

c) Visual inspection of wellhead internals, wellyard piping, inlet and exit points to flow-lines (ie above ground sections) and vessel and piping inspections within the Ladbroke Grove Gas Plant.

d) Caliper surveys of the Ladbroke Grove #2 and #3 tubing strings.

e) A review of corrosion monitoring activities.

A report has been sent to PIRSA summarising this incident and ensuring actions.

A number of incidents of lesser magnitude occurred during 2000. These include:

(i) a minor collision of a vehicle with one of the sheds on-site
(ii) a gas release when incorrect isolations were used in conjunction with an unanticipated gas plant blowdown
(iii) a tank overflow (contained within the bunded area)

These have all been investigated using Origin's internal Incident Reporting and Investigation System.

A fitness-for-purpose assessment will be completed in 2001 in accordance with new Petroleum Act. This will involved a systematic approach in accordance with the principles of Qualitative Risk Assessment in order to ensure that all of the risks

associated with the Katnook/Ladbroke Grove are appropriately identified, managed and mitigated.

At the time of writing, no new foreseeable threats have arisen that have not been previously reported, or that are not normally associated with producing operations.

2.2 Safety Management System

Two audits of the Katnook/Ladbroke Grove operations were undertaken in 2000.

In mid 2000, Hazcon audited against compliance with Workcover Regulations on behalf of MIP (for whom OERL provide specific services). Satisfactory compliance was determined.

An internal environmental audit was undertaken in December 2000. This is discussed further in section 3.

Activities were also undertaken in order to ensure compliance with the new Petroleum Act (SEO,EIR, Fitness-for-Purpose Assessment) and revised EPA Licence (Site Environmental Management Plan).

3 The Environment

3.1 Environmental Issues

No significant environmental incidents occurred in 2000.

An Origin Energy internal environmental audit of the Katnook and Ladbroke Grove Gas Plants was completed in 2000. This identified eight action items, of which three have been completed, and a further five are underway.

A separate Origin Energy audit was completed of well sites and well yards. Two audit actions were identified in relation to the well yards of producing wells. One item has been completed, and one is underway.

Origin Energy Resources Limited developed an interim Statement of Environmental Objectives, for the Production Operations, as required under the Petroleum Act and Regulations 2000, which was accepted by PIRSA.

Whilst the Statement of Environmental Objectives only came into effect from October 2000, Origin Energy effectively worked to these objectives throughout 2000.

A separate Site Environmental Management Plan is being developed in accordance with the EPA Licence requirements for the Katnook and Ladbroke Grove Gas Plants.

3.2 Compliance with SEO

The operation of Katnook and Ladbroke Grove Gas Plant complied with the assessment criteria described in the Production and Producing SEO.

Appendix 1 contains a detailed summary of the performance against objectives.

4 Reserves

The following table summarises the field's initial and remaining reserves.

Field gas production to 31 December 2000 totals 24.61 PJ. The field total initial estimated 2P gas reserve is 76.9 PJ (refer to the following summary and the attached tables) with approximately 52.29 PJ remaining as at 31 December 2000 of which Ladbroke Grove gas reserves (high CO2 gas) accounts for 27.33 PJ.

Fields	Total Initial Gas Reserves (PJ)	Total Gas Production @ 31 Dec 00 (PJ)	Total Remaining Gas Reserves @ 31 Dec 00 (PJ)	Reserves Classification
Katnook (PPL62)	23.80	12.78	11.02	2P
HG & HGS (PPL62)	14.00	4.77	9.23	2P
Redman (PPL68)	7.10	2.39	4.71	2P
Ladbroke Grove	32.00	4.67	27.33	
TOTAL	**76.90**	**24.61**	**52.29**	**2P**

A simulation study of Katnook, Haselgrove/Haselgrove South and Redman fields was undertaken to assess deliverability of the existing wells for the purpose of depletion planning, production optimisation and compression requirement. Five static gradient surveys have been conducted in Ladbroke Grove 1, Ladbroke Grove 2 and Haselgrove South1 during 2000.

Figures 2 to 5 show the well production performance.

4.1 Katnook Field (Initial=23.8 PJ, Rem=11.0 PJ)

Katnook gas Field has been re-evaluated using reservoir simulation. The Eclipse 100 reservoir simulator was used to create a model that included each field. . Forgas nodal analysis software was used to model the flow system and was run with the reservoir simulator to control well production rates and pressures. Based on the study field estimated OGIP is 793.0 MMSCM from which 23.8 PJ is recoverable using a minimum compressor suction pressure of 1400.0 kpa.

4.2 Haselgrove/Haselgrove South Fields (Initial=14.0 PJ, Rem=9.2 PJ)

Haselgrove and Haselgrove South fields were re-evaluated as a part of the simulation study. The Haselgrove and Haselgrove South Field model was built and matched for production history in conjunction with the fields. The Forgas model was used to simulate the flow system and to optimise well production. Based on this study the field estimated OGIP is 475.8 MMSCM from which 14.0 PJ is recoverable using a minimum compressor suction pressure of 1400.0 kpa.

4.3 Redman Field (Initial=7.1 PJ, Rem=4.7 PJ) – PPL 168

Redman Field was also part of the Otway fields simulation study. The Redman Field model was also matched for production history in conjunction with the other fields. The Forgas model was also run simultaneously with the reservoir model for simulation of the flow system and production optimisation. Based on this study the field estimated OGIP is 260.5 MMSCM from which 7.1 PJ is recoverable using a minimum compressor suction pressure of 1400.0 kpa.

4.4 Ladbroke Grove Field (Initial=32.0 PJ, Rem=27.3)

Volumetric mapping indicates a resource of 32 PJ is present within the Ladbroke Grove Structure. The volumetric calculations are consistent with the range of 25 to 37 PJ "seen" by Ladbroke Grove 2 during its production test. A static pressure survey conducted at Ladbroke Grove 3 in April 2000 indicates a pressure depletion equivalent to 31.0 PJ of gas reserves assuming a recovery factor of 80% (see the attached P/Z plot- Figure). A second pressure survey conducted at Ladbroke Grove 2 and 3 in December 2000 is currently being analysed (initial interpretation suggests higher gas reserves).

5 Development Activities

5.1 Development activities in 2000

No development activities occurred in the PPLs during the year.

5.2 Development activities for 2001

No development activities are planned for 2001.

6 Production

Production data sheets for the Katnook, Haselgrove/Haselgrove South, Redman and Ladbroke Grove reservoirs were forwarded to PIRSA on a monthly basis.

Production was maintained throughout 2000 without interruption to customer supply.

Redman 1, Katnook 2 and Haselgrove South 1 were the primary producers throughout most of 2000.

6.1 Katnook

A total of 23,041 MSCM of raw gas, 801 kl of condensate and 421 kl of water was produced from Katnook 2 and Katnook 3 in 2000.

Cumulative production from Katnook 2 and Katnook 3 at the end of 2000 was 330,685 MSCM of raw gas, 12021 kl of condensate and 4261 kl of water.

6.2 Haselgrove and Haselgrove South

A total of 13,838 MSCM of raw gas, 1223 kl of condensate and 154kl of water were produced from the Haselgrove and Haselgrove South fields in 2000.

Cumulative production from Haselgrove and Haselgrove South at the end of 2000 was 125,060 MSCM of raw gas, 11,210 kl of condensate, and 1,807 kl of water.

6.3 Redman (PPL-168)

A total of 30,879 MSCM of raw gas, 3,859 kl of condensate and 431 kl of water were produced from Redman field in 2000.

Cumulative production from Redman Field at the end of 2000 was 61,544 MSCM of raw gas, 7,980 kL of condensate, and 823 kl of water.

6.4 Ladbroke Grove

Ladbroke Grove Field commenced production in January 2000. A total of 197,131 MSCM of raw gas, 1,465 kl of condensate and 1732 kl of water were produced from Ladbroke Grove field in 2000.

6.5 Production Forecasts

The production forecasts for 2000 and 2001 presented in the attached table are provided as the "most likely" scenario. The forecasts reflect the continued growth demand in natural gas supply to the local south-east market. Kimberly-Clark continues to be the major gas consumer in the south east. Carter Holt Harvey at Nangwarry was connected into the Epic transmission system in the late 2000, representing further growth in industrial demand for gas.

One of the two Ladbroke Grove gas turbines has been unable to run since late December. This is not expected back in service until mid April 2001.

Further, both the Ladbroke Grove gas turbines are expected to run as intermediate generators in 2001, reducing Ladbroke Grove gas sales relative to 2000 levels.

PRODUCTION FORECAST FOR 2001

Month (2001)	Katnook Gas (TJ)	Ladbroke Grove (TJ)	Condensate (bbl)
January	229	287	3.5
February	204	269	2.9
March	229	287	3.5
April	217	279	3.0
May	241	287	3.5
June	226	279	3.0
July	252	279	3.6
August	262	279	3.6
September	231	270	3.6
October	253	279	3.6
November	248	270	3.6
December	208	279	3.6
Total	**2800**	**3344**	**41.0**

7 Surface Facilities

7.1 2000 Surface Activities

Construction of the Ladbroke Grove 3 wellyard facilities was completed in early 2000.

No other significant construction activities took place in 2000 either at the Katnook or Ladbroke Grove Gas Plants.

During 2000, efforts were focussed on commissioning the Ladbroke Grove facilities. This resulted in a number of minor modifications to the filter-coalescer level control, water bath heater firing controls and air compressor discharge piping among others.

The Haselgrove South 1 gas conditioning skid and associated instrumentation was upgraded in late 2000 ahead of returning to production which occurred during November.

7.2 2000 Expenditure

The following table shows a summary of expenditure for PPL62/PPL168 for 2000.

EXPENDITURE	AMOUNT $

Not available for public inspection as per Regulation 33(5)

7.3 2001 Surface Activities

Activities under consideration for 2001 include:

- installation of a second evaporation pond
- replacing the mass flow computer component of the Katnook sales meter
- a wellhead upgrade project to ensure all wells are available at any time.

8 Reservoir And Downhole

8.1 Reservoir Management

A simulation study of Katnook, Haselgrove/Haselgrove South and Redman was undertaken in 2000 to assess the deliverability of existing wells to assist depletion planning, production optimisation and compression requirements. An excellent pressure match was obtained using the original gas in-place of 793 MMSCM , 476 MMSCM and 261 MMSCM for Katnook, Haselgrove and Haselgrove South and Redman fields respectively. A number of development scenarios were investigated and it was concluded a case with compressors at minimum suction pressure of 1400 kpa is an optimum case (Figure 7).

A copy of the simulation study report was submitted to PIRSA. The study is used as the basis for estimating field deliverability and for reservoir management planning.

Management of each fields gas production has been planned based on the following considerations.

- Safety and environmental considerations.
- Maximise gas recovery from the field.
- Reservoir considerations.
- Wellbore considerations.
- Contractual obligations and market requirements
- Plant constraints and operational considerations.
- Turbine operation and constraints (for high CO2 gas)
- Field deliverability and production optimisation
- Data acquisition and field monitoring.
- Maximise condensate revenue.
- Availability of efficient back-up options.

The Pretty Hill reservoirs are highly compartmentalised and in order to maximise gas recovery and delay compression, it is necessary to program a depletion plan consistent with the behaviour of the compartmentalised reservoirs. High permeability compartments usually deplete first and one option to be considered is to shut in affected wells to allow them to be recharged from low permeability sands prior to resuming production. The compartmentalised characteristic of these fields is one of the main reservoir considerations in production management. A major factor with respect to compartmentalised reservoirs is the extent of the compartment and the degree of communication between them. This governs the accessibility of the wells to the field gas reserves. Another important reservoir consideration is the vertical variation of CO_2 found in the Ladbroke Grove Field.

Acquiring production information, monitoring the well head shut-in and flowing pressure and measuring the CO_2 level (for Ladbroke Grove) on a routine basis are essential for updating the field gas deliverability forecast and on going reservoir evaluation.

8.2 Well Schedule

The following well schedules have been programmed to meet all the reservoir and operating considerations.

8.2.1 Sweet Gas Production

There are 6 sweet gas producers in PPL 62 & 168 with flow capacity ranging from 200 to 7000 md.ft. In accordance with the planned reservoir management, the required gas demand is currently supplied with only one or two wells. The wells have been periodically switched to maintain field deliverability. As the fields deplete and reservoir pressure declines, more wells will be put on production to achieve required production rates.

8.2.1.1 Katnook 2 & 3

The Katnook Field came on production from February 1991 to supply gas to the southeast market. Katnook was the only producing field in this area until end of May 1997 when the Haselgrove Field commenced production. Katnook 2 and 3 have been used as back up wells since May 1997. Figure 2 shows Katnook 2 and 3 production histories. The total gas production from Katnook 2 and 3 to the end of December 2000 is 69,571 MSCM and 261,114 MSCM respectively.

These wells are planned to be used as back ups in 2001 and to support gas supply during high demand periods.

8.2.1.2 Haselgrove 1

As shown in Figure 3, Haselgrove 1 had been shut–in during the year. The total gas production from Haselgrove 1 is39,063 MSCM.

The well is planned to come on production during the 1st quarter of 2001 to support gas supply from Haselgrove South-1.

8.2.1.3 Haselgrove 2

Due to poor well deliverability Haselgrove 2 was put on production for a short period in 2000 (Figure 3). The gas production from Haselgrove 2 totals 7,119 MSCM.

The plan is to bring Haselgrove 2 on line in second half of 2001 to support Haselgrove South-1 and Haselgrove 1.

8.2.1.4 Haselgrove South 1

Haselgrove South 2 was put on production in Q4 2000 (Figure 3) and is planned to be online for most of the 2001 period. The total gas production from Haselgrove South 1 stands at 78,878 MSCM to the end of December 2000.

8.2.1.5 Haselgrove South 2 (PEL32 – outside PPL62 boundary)

This well has very low deliverability and is planned to be used as an observation well (not connected). As shown in the Figure 3 the Haselgrove South 2 wellhead shut-in pressure has declined due to production from Haselgrove South 1.

8.2.1.6 Redman 1 (PPL 168)

This well was on production for a good part of the year (Figure 4). The total gas production from Redman 1 stands at 61,544 MSCM to the end of December 2000. The well is planned to come on production during the 4th quarter of 2001.

8.2.2 High CO_2 Gas Production

8.2.2.1 Ladbroke Grove 2 &3

The Ladbroke Grove Field came on production from January 2000 to supply gas to the LadbrokeGrove power generation station. Ladbroke Grove 2 and 3 are high CO2 gas producers. These wells have flow capacity of 10,000.0 and 4160.0 md.ft respectively. Figure 5 shows Ladbroke Grove 2 and 3production performance during 2000. The total gas production from Ladbroke Grove 2 and 3 to the end of December 2000 is 150,586 MSCM and 46545 MSCM respectively.

8.3 Wellbore Activities

8.3.1 Static Gradient Surveys

During 2000 the following static gradient surveys were conducted in the wells.

?? Ladbroke Grove 2 on 8 April 2000.
?? Ladbroke Grove 3 on 7 April 2000.
?? Haselgrove South 1 on 2 November 2000.
?? Ladbroke Grove 2 17 December 2000.
?? Ladbroke Grove 3 16 December 2000.

The results of these surveys will be incorporated in the 2001 reserves updates.

8.3.2 Kinley Caliper Surveys

The following caliper surveys were undertaken at the following wells.

?? Ladbroke Grove 2 31 October 2000.
?? Ladbroke Grove 3 01 November 2000.

8.4 2001 Wellbore Activities

Activities under consideration for 2001 include:

?? caliper survey of tubing at Ladbroke Grove 2 and 3.
?? static pressure surveys in Ladbroke Grove and other fields

9 Operations

The Katnook Gas Plant maintained its high level of reliability during 2000 with no unplanned outages being experienced. Further, no incidents that had the potential to escalate to an unplanned outage occurred.

Efforts were made to maximise condensate production by preferential production from the most liquids-rich fields (Redman and Haselgrove).

The Katnook Gas Plant was shutdown on two occasions:

- a 3 hour shutdown to facilitate the installation of a mercaptan injection skid within the Epic compound
- a shutdown on December 24 and 25 to undertake minor maintenance, PSV changeouts and emergency shutdown system checks.

The Ladbroke Grove Gas Plant also achieved a high level of reliability during 2000. Whilst the plant is designed with effectively no redundancy, the unplanned downtime achieved was less than 1%, whilst planned downtime was also less than 1%.

The Ladbroke Grove Gas Plant was shutdown on two occasions:

- for 24 hours as a result of the Ladbroke rove #2 wellhead spool failure, which was the subject of a separate report to PIRSA,
- for 31 hours for mandatory vessel inspection after the first year of operation. (No corrosion was found in any of the Ladbroke Grove vessels or piping inspected at that time).

10 Corrosion Program

10.1 Katnook Facilities

Corrosion coupon analysis and dissolved iron count analysis suggested continued low internal corrosion levels.

10.2 All Facilities - External Corrosion

Monitoring of the Impressed Current cathodic protection system and sacrificial anode systems was again undertaken by Incospec and Associates during 2000. All systems were found to be operating effectively.

10.3 Ladbroke Grove Facilities – Internal Corrosion

A corrosion induced failure occurred at the Ladbroke Grove 2 well. This has been separately covered by an Incident Investigation report provided to PIRSA during the year.

A detailed Corrosion Monitoring and Management Plan for the Ladbroke Grove facilities has been in operation all year. Key elements of the plan include:

- daily checks of corrosion inhibitor injection rates
- ultrasonic thickness surveys
- corrosion coupon monitoring
- dissolved iron count analysis
- vessel inspection (more frequent than mandatory requirements)

APENDIX 1

ENVIRONMENTAL OBJECTIVES AND ASSESMENT CRITERIA

PERFORMANCE AGAINST OBJECTIVES

ENVIRONMENTAL OBJECTIVES

The objects of the *Petroleum Act 2000* under which Origin Energy Resources Limited operates the Katnook gas plant include the minimization of environmental damage from the activities involved in exploration for, or the recovery or commercial utilisation of, petroleum and other resources and protection of the public and employees from risks inherent in regulated activities.

The broad objectives of the OERL *Statement of Environmental Objectives for Production and Processing of Petroleum and Associated Activities in the Otway Basin* which are in keeping with the above objects of the Act, are:

?? To manage and facilitate rehabilitation of the impacts of regulated activities that have, or are likely to have, only short to moderate term adverse consequences on the biological diversity or cultural features of a region or on other land users.

?? To avoid undertaking all regulated activities that have, or are likely to have, long term significant adverse consequences on the biological diversity or cultural features of a region or on other land users in accordance with the environmental objectives.

The land area occupied by the gas plant has not changed during the period of operation of the SEO and regulated activities performed under the SEO have not had adverse impact on the region or other land users. An uncontrolled release of gas occurred in July 2000 but no impact to the environment was recorded. Minor incidents occurred within the perimeter of the plant but such localized events did not result in damage to the regional environment

Assessment of OERL's degree of compliance with the SEO has been is presented in Table 1. The objectives for the SEO were fully met in relation to all areas with the possible exception of the release of gas from the Ladbroke Grove 2 wellhead. The inlet wellhead design was to accommodate injection of corrosion inhibitor according to accepted practice. However a design oversight resulted in failure to achieve the desired goal of protecting the steel in an high CO2 environment. OERL has acted to improve the protection afforded by the corrosion inhibitor and achieved the objective of minimizing the possible risk to the environment and third parties by rapid response and appropriate remedial action. This incident was reported to PIRSA separately (refer to section 2).

APPENDIX 1: ENVIRONMENTAL OBJECTIVES AND ASSESSMENT CRITERIA

OBJECTIVE	ASSESSMENT CRITERIA	PERFORMANCE AGAINST OBJECTIVES
1. Avoid disturbance to known sites of Aboriginal and European heritage significance.	?? The plant site and access tracks have already been scouted by appropriately trained and experienced personnel for sites of Aboriginal and European heritage significance before commencement of construction. ?? Records of scouting have been kept wherever possible from previous operators and those records which are available may be audited. ?? Any sites identified have been flagged and subsequently avoided. Trained personnel will be used to identify and respond appropriately to any sites discovered during operational activities.	?? No construction activities likely to cause impact to the environment and items of heritage significance were performed during the reporting year. ?? This objective was achieved.
2. Avoid disturbances which have long term impact on biological, cultural or agricultural values of a particular area.	No programme to expand the plant or construct new well sites will be carried out without the specific approval of the Minister and notifying the respective land owner.	?? No construction activities likely to cause impact to the environment and requiring approval from the Minister were performed during the reporting year. ?? This objective was achieved.
3. Prevent the introduction and establishment of exotic weed species.	?? All vehicles and equipment appropriately cleaned prior to entering the Otway Basin/ Penola district. ?? Cleaning carried out in accordance with specified company procedures and accepted practices. ?? Records of vehicle and equipment cleaning are kept and available for auditing. ?? Exotic weed species as a consequence of industry activities are eliminated.	?? No vehicles recognised as potentially introducing exotic weed species were admitted to the gas plant ?? Vehicles in operation at the plant were from the local area or were confined to bitumen roads consequently no cleaning was required. ?? No new exotic weed species were observed at the plant and regular maintenance of the plant controlled any existing species ?? This objective was fully achieved.
4. Minimise impacts to soil and grazing capacity of farm land.	?? Hazardous material stored, used and disposed of in accordance with relevant legislation on dangerous substances. ?? The landowner to be informed of procedures and to confirm satisfaction about rehabilitation of the soil. Pipeline construction and operation to be in accordance with AS2885 Any significant spill site will be rehabilitated and	?? No impact occurred to peripheral grazing land. ?? A tank overflow was confined within the bunded area and did not come in contact with the surrounding grazing land. ?? The evaporation pond was maintained in good condition and no overflow occurred. ?? Hazardous materials were stored safely without incident.

APPENDIX 1: ENVIRONMENTAL OBJECTIVES AND ASSESSMENT CRITERIA

OBJECTIVE	ASSESSMENT CRITERIA	PERFORMANCE AGAINST OBJECTIVES
	monitored to ensure no long term contamination of soil or ground water	?? No pipelines were constructed during the reporting year. ?? This objective was fully achieved.
5. Minimise unavoidable loss of reservoir and aquifer pressures and contamination of freshwater aquifers.	<u>Producing Wells</u> ?? Casing design (including setting depths) have, at the time of drilling, been carried out in accordance with company defined procedures which satisfy worst case expected loads and environmental conditions determined for the particular well. ?? Monitoring programs, carried out in accord with company approved procedure(s), demonstrate no crossflow or fluid migration occurring behind casing. ?? Casing integrity and corrosion monitoring programs, carried out in accordance with company approved procedure(s), show adequate casing condition to satisfy the objective. ?? Reduction in reservoir pressure as a natural consequence of production will be monitored in accordance with good industry practice. <u>Plant Operation</u> ?? Formation water disposal pit lined with impervious layer to protect the underlying limestone aquifer. ?? Monitoring for possible leakage carried out on a regular basis according to Company approved procedures <u>Inactive Wells</u> In the case where a well is suspended for a prolonged period of time: ?? Monitoring methods for detecting fluid migration, carried out in accord with company approved procedures for this purpose, are in place and show no fluid migration.	?? Casing design meets the objectives. ?? Caliper survey was carried out in Ladbroke Grove #2 and Ladbroke Grove 3 to monitor tubing integrity of these wells with respect to corrosion. ?? The tubing and casing pressure of all active wells are monitored on a weekly basis. ?? A wellhead monitoring program is now in placed to monitor the tubing and casing pressure of all non active wells on a quarterly basis (to be carried out from 2001). ?? A yearly monitoring and inspection program is now in placed to check the wellhead condition of all active and non-active wells (to be carried out from 2001).

APPENDIX 1: ENVIRONMENTAL OBJECTIVES AND ASSESSMENT CRITERIA

OBJECTIVE	ASSESSMENT CRITERIA	PERFORMANCE AGAINST OBJECTIVES
6. Minimise Impact on Surface Water by contaminants.	?? Water production monitored closely during periods of heavy rainfall and consequent threat of pond overflow. ?? Evaporation ponds monitored regularly, especially over winter and consequent periods of low evaporation. ?? Contingency plans for "100 year rainfall event" ?? Construction of perimeter bunding to confine possible fluids released by accidental wall breaching or overflow ?? Regular monitoring of evaporation pond fluid composition so that effects of a possible spill may be anticipated and ameliorated. ?? In situ treatment of pond water should pH vary from neutral.	?? The evaporation pond bund was maintained so that no overflow could contaminate surface water and water levels were monitored. ?? Excess water in the evaporation pond was trucked to an EPA approved waste facility for disposal. ?? Water composition from below the evaporation pond liner was monitored to detect leakage ?? This objective was fully achieved
7. Minimise visual and audible impact on the surrounding landscape.	?? Establish consultation with land owners regarding visual impact of the two plants. New metallic fittings are likely to be conspicuous but will dull with exposure to the atmosphere. ?? Noise emissions from the two gas plants are acceptable to the land owner. ?? Plant operations regulated so that no procedures likely to cause noise are conducted at night.	?? Operations within control of the plant operators were conducted so as to minimize noise and inconvenience to the land owner. ?? This objective was achieved.
8. Minimise risks to the safety of the public and other third parties.	<u>Producing Wells</u> ?? Pipelines to be constructed and operated in accordance with AS 2885 to control corrosion of pipe and fittings. ?? Adequate fencing, signage and precautions taken for warning third parties of the potential danger and to keep away from producing or suspended wells. ?? Casing integrity and corrosion monitoring programs, carried out in accord with the company approved procedure(s), show adequate casing condition to satisfy the objective. ?? Origin management systems are in place to maintain the integrity of the gas plant and	?? Risks to third parties were minimized by the use of appropriate fencing and signs ?? A reportable incident in the form of an uncontrolled gas release to atmosphere occurred during the reporting year. The incident was caused by corrosion in an high CO2 environment and resulted from a fault in the original design of the wellhead. The release was brought under control without further escalation. The incident has resulted in revised procedures relating to addition of corrosion inhibitor to the wellhead. ?? Casing corrosion is monitored by caliper surveys. ?? No adverse impact occurred to third parties and

APPENDIX 1: ENVIRONMENTAL OBJECTIVES AND ASSESSMENT CRITERIA

OBJECTIVE	ASSESSMENT CRITERIA	PERFORMANCE AGAINST OBJECTIVES
	minimise the likelihood of any serious incident. ?? Effective Emergency Response Plan and procedures are in place in the event of a serious incident in the gas or generating plant. ?? Hazardous material stored, used and disposed of in accordance with relevant legislation on dangerous substances for occupational health and safety. ?? MSDS information readily accessible on site. <u>Vehicular Movements</u> ?? Drivers to be made aware of risks of intersections by a programme of induction. ?? Periods of increased activity within the rural community to be flagged and supply companies requested to schedule deliveries at alternative times	this objective was achieved. ?? A minor collision with an on-site shed occurred during the reporting year. No injuries were reported and plant personnel have been further instructed to take care when operating vehicles at the plant. ?? No incidents occurred on roads away from the gas plant and this objective was achieved
9. Minimise impact on the environment of gaseous emissions and wastewater handling and disposal.	?? All emissions meet standards imposed by EPA licence conditions. ?? All wastes generated on site (except sewage) to be disposed at an EPA licensed facility.	?? Two incidents involving release of gas to atmosphere occurred during the reporting year. o a leak initiated by corrosion occurred at the Ladbroke Grove 2 wellhead o an unanticipated gas plant blowdown resulted in gas release to the plant vent ?? The emissions did not impact on the environment due to the small volumes released and the location of the emissions. ?? A gas release associated with a blowdown is a normal process and does not represent a failure to meet this objective.
10. Avoid adverse impacts on livestock.	?? Defined policy relating to use of motor vehicles on country roads and access tracks. Policy specifies acceptable speeds when near stock and emphasise that stock may become complacent when familiar with vehicle movements.	?? No incidents relating to livestock were observed and this objective was fully achieved.

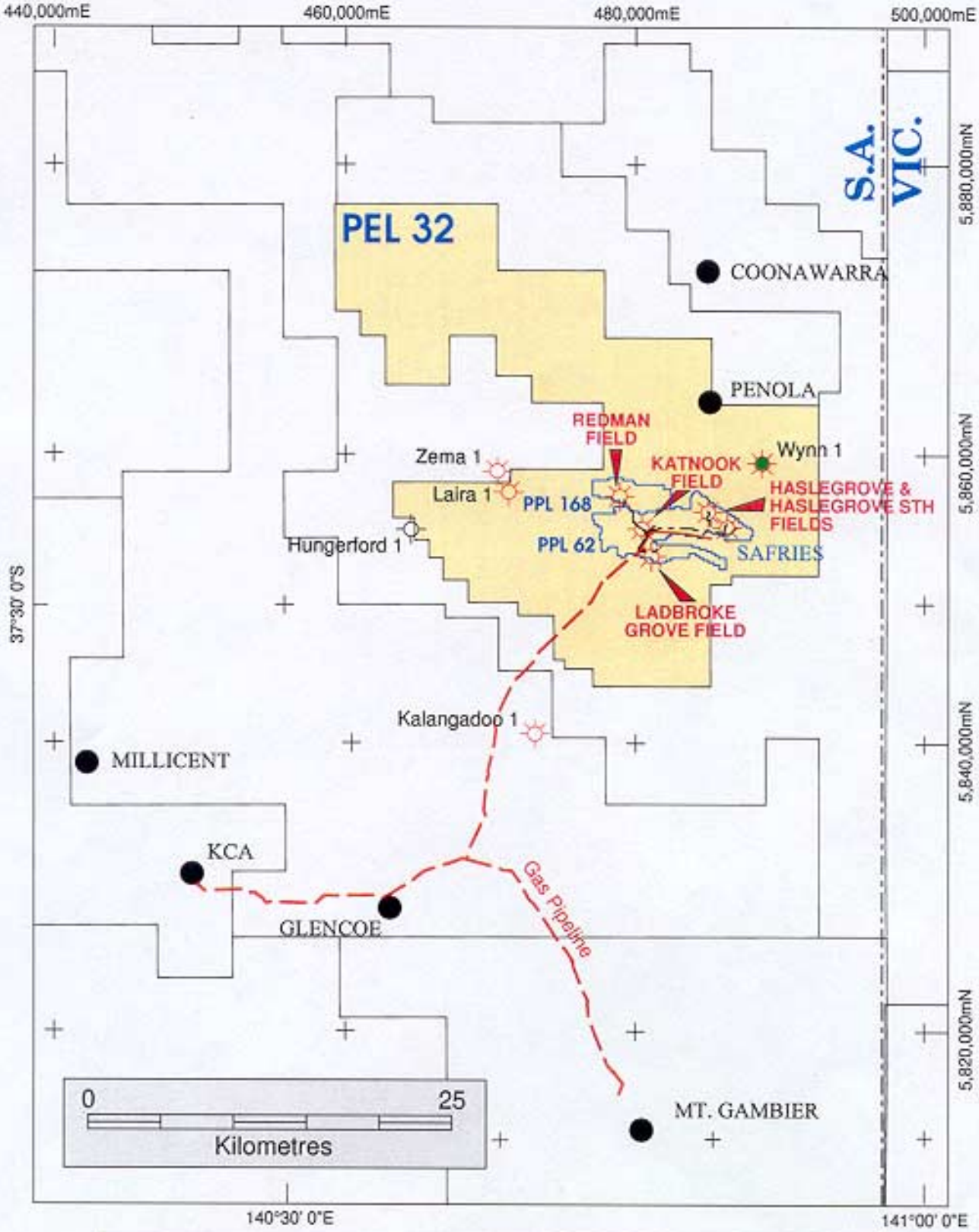
APPENDIX 1: ENVIRONMENTAL OBJECTIVES AND ASSESSMENT CRITERIA

OBJECTIVE	ASSESSMENT CRITERIA	PERFORMANCE AGAINST OBJECTIVES
	?? In the likely presence of livestock all moving equipment is to be fenced off. Perimeter fencing around the plant and evaporation ponds to be fenced off. ?? In the case of a producing well, the well cellar, rat hole and mouse hole are made safe for livestock either through appropriate covering or fencing. ?? pipelines to be constructed and operated in accordance with AS 2885.	
11. Avoid spills of produced water, oil or hazardous material outside of impermeable sumps or other areas designed to contain such spills.	?? MSDS information to be readily accessible at plants. ?? Conduct and record analyses of evaporation pond fluids. ?? Cumulative number and volume of spills at any point in time during the year is less than the cumulative spills for the same period from the previous year and a general declining trend in number and volume of spills over the long term. ?? Thorough review of the cause of the spill to prevent such an incident re-occurring.	?? The integrity of the evaporation pond bund wall was maintained and the fluid level was not permitted to exceed the height of the bund. No spillage from the pond occurred during the reporting year. Excess pond fluids were trucked to an EPA approved waste site for disposal. ?? This objective was achievd.
12. In the event of an oil spill or overflow from bunded evaporation ponds , minimise the impacts on fauna, flora, soil, livestock and surface and ground water.	?? In the event of an oil spill, contingency plan implemented after the spill event. ?? Results of emergency response procedures carried out in accord with Regulation 31 show that oil spill contingency plan in place in the event of a spill is adequate and any necessary remedial action needed to the plan is undertaken promptly by the licensee. ?? Bio-remediation is undertaken on the affected soil, either on site or offsite. ?? All oil spill bio-remediation meets end point assessment criteria developed specifically for the relevant environment. End point criteria based on the Victorian EPA are 0.1% total petroleum	?? No spills outside bunded areas designed to contain such spills occurred and this objective was achieved.

APPENDIX 1: ENVIRONMENTAL OBJECTIVES AND ASSESSMENT CRITERIA

OBJECTIVE	ASSESSMENT CRITERIA	PERFORMANCE AGAINST OBJECTIVES
	hydrocarbons within 12 months after the spill. The Victorian EPA limit will be used until a specific bioremediation end point is prepared for this region.	
13. Minimise the risk of initiation and/or propagation of fire	?? The Plant Emergency Response Plan includes a section for the safety of plant personnel should a fire approach, or be initiated within, the plant. ?? Adopt aggressive procedures to minimise risk of initiating and propagating fire at all times. Welding and grinding are regarded as high risk activities that should be avoided wherever possible and deferred or curtailed until weather conditions are suitable. ?? Fuel stores are monitored and equipped with extinguishers. ?? Clearly define the risks of fire to staff and transport drivers and plan to minimise or eliminate heavy vehicle movements on defined high risk days. ?? Maintain contact with the local Country Fire Service in order to keep roads clear during episodes of fire and predict their likely movements. ?? Maintain pumps and a water supply in readiness during periods of high fire danger. Inform the CFS that a volume of water in the evaporation pond is suitable for high extraction rates should it be required in an emergency. Up to date chemical analyses are available to confirm negligible toxicity and harm to the environment.	?? No incidents relating to fire occurred and this objective was fully achieved.

PPL 62 LOCATION MAP



PEL 32-PPL62/168 JOINT VENTURE PARTICIPANTS

Origin Energy Resources Ltd. (OP)	75.7%
Australian Worldwide Exploration (AWE)	24.3%

CPK

10846.022001 Fig.1

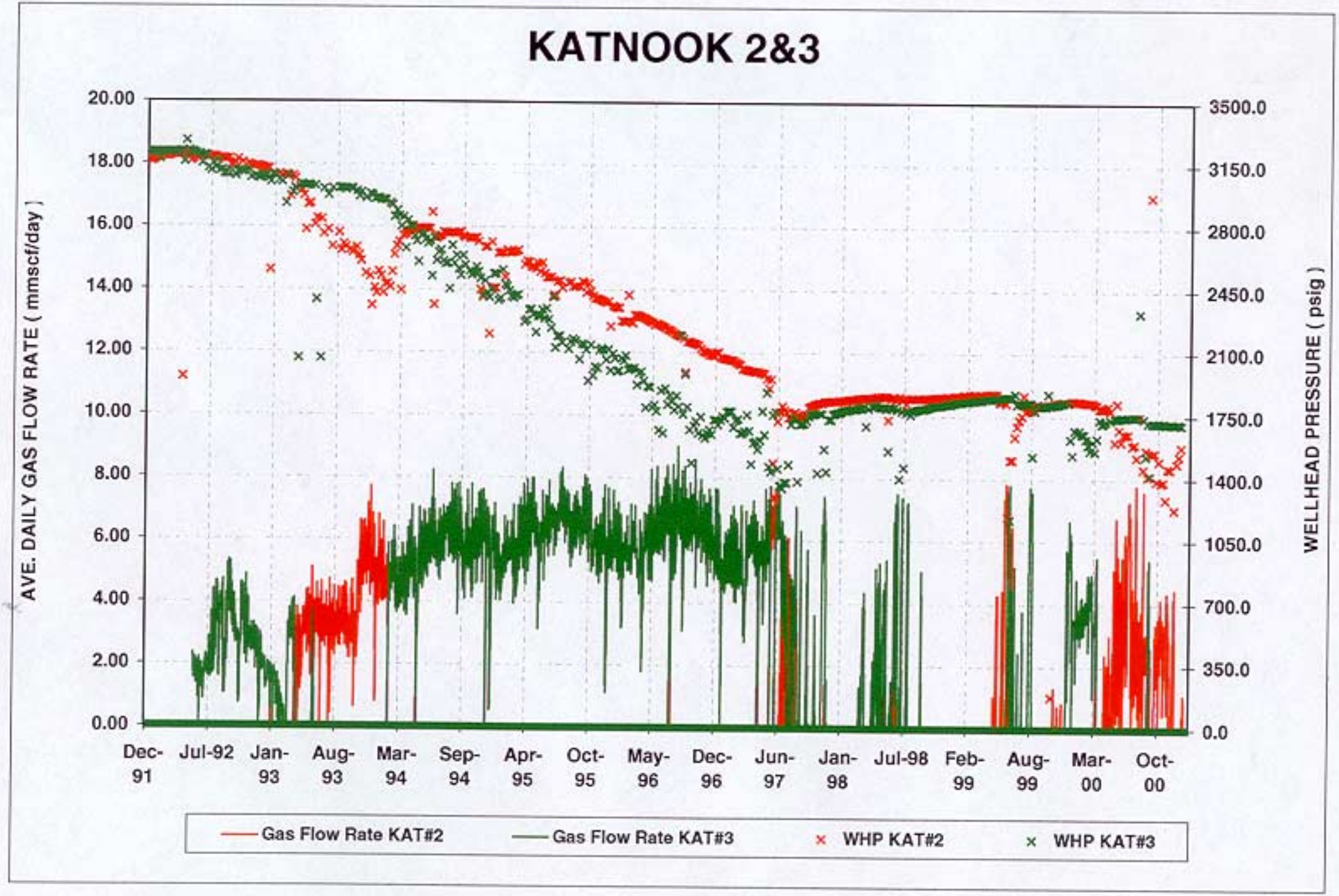

KATNOOK 2&3
AVE. DAILY GAS FLOW RATE (mmscf/day)
WELLHEAD PRESSURE (psig)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
3500.0
3150.0
2800.0
2450.0
2100.0
1750.0
1400.0
1050.0
700.0
350.0
0.0
Dec-91
Jul-92
Jan-93
Aug-93
Mar-94
Sep-94
Apr-95
Oct-95
May-96
Dec-96
Jun-97
Jan-98
Jul-98
Feb-99
Aug-99
Mar-00
Oct-00
Gas Flow Rate KAT#2
Gas Flow Rate KAT#3
WHP KAT#2
WHP KAT#3

FIGURE 2

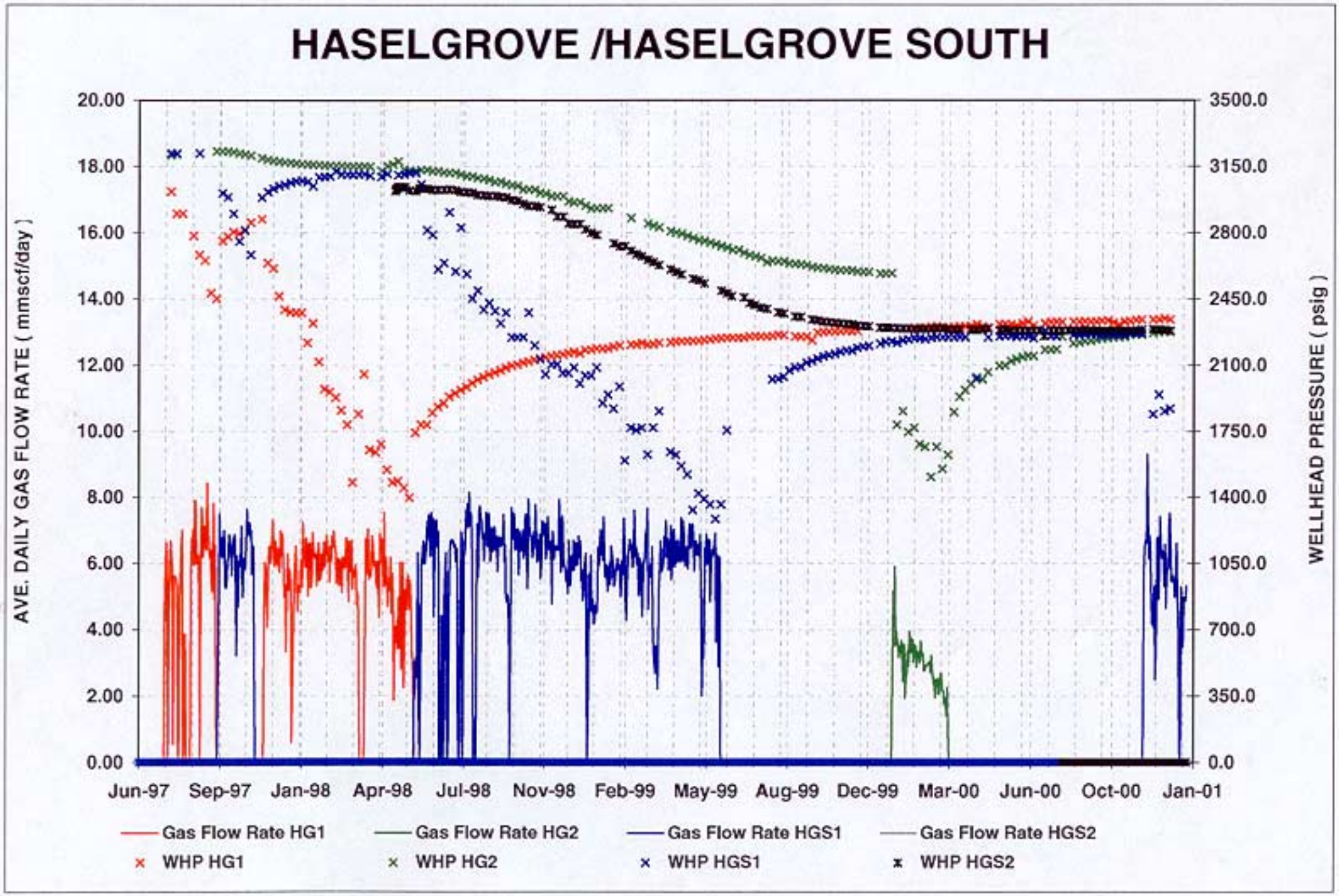

HASELGROVE /HASELGROVE SOUTH
AVE. DAILY GAS FLOW RATE (mmscf/day)
WELLHEAD PRESSURE (psig)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
3500.0
3150.0
2800.0
2450.0
2100.0
1750.0
1400.0
1050.0
700.0
350.0
0.0
Jun-97
Sep-97
Jan-98
Apr-98
Jul-98
Nov-98
Feb-99
May-99
Aug-99
Dec-99
Mar-00
Jun-00
Oct-00
Jan-01
Gas Flow Rate HG1
Gas Flow Rate HG2
Gas Flow Rate HGS1
Gas Flow Rate HGS2
WHP HG1
WHP HG2
WHP HGS1
WHP HGS2

FIGURE 3

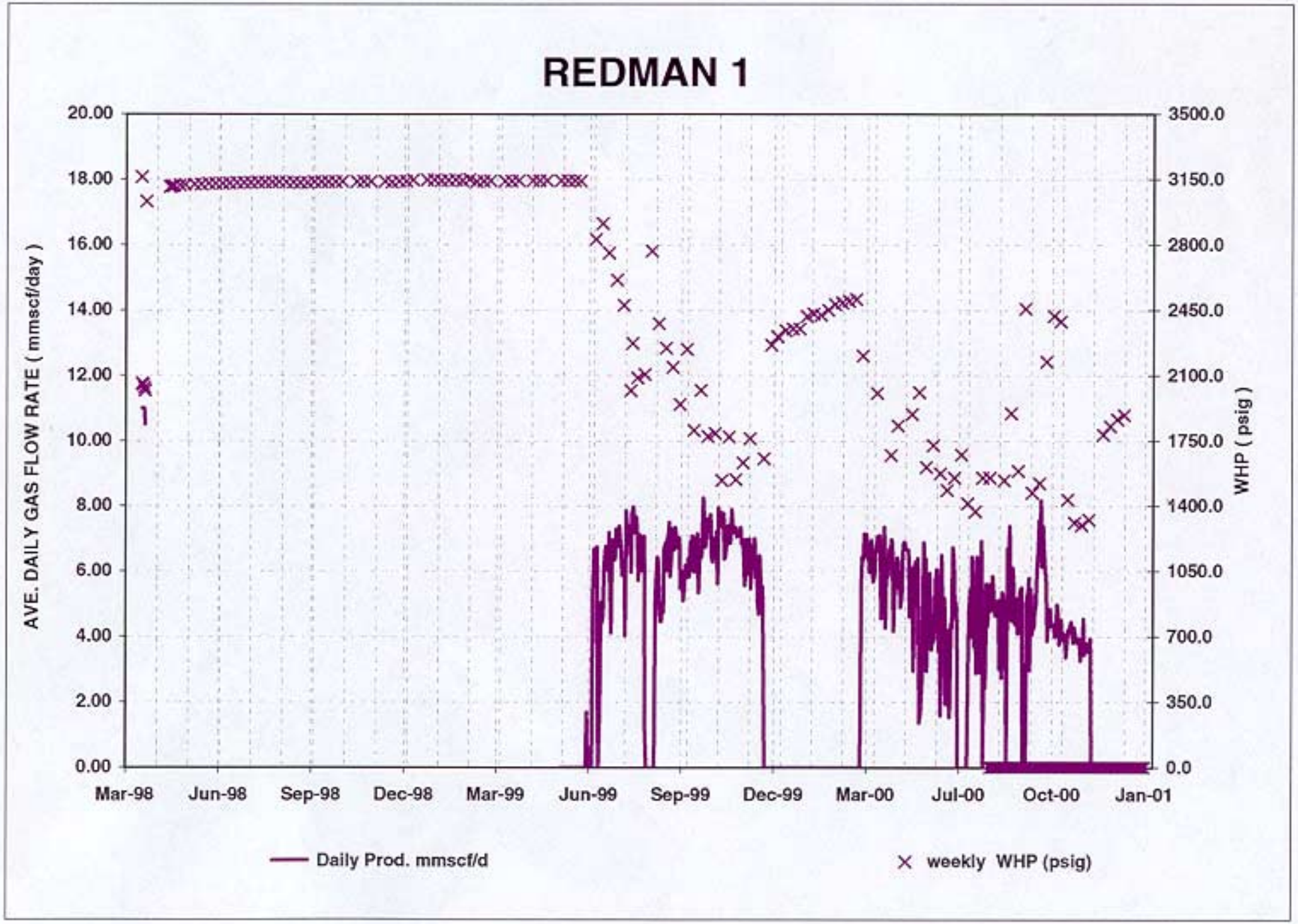

REDMAN 1
AVE. DAILY GAS FLOW RATE (mmscf/day)
WHP (psig)
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
3500.0
3150.0
2800.0
2450.0
2100.0
1750.0
1400.0
1050.0
700.0
350.0
0.0
Mar-98
Jun-98
Sep-98
Dec-98
Mar-99
Jun-99
Sep-99
Dec-99
Mar-00
Jul-00
Oct-00
Jan-01
Daily Prod. mmscf/d
weekly WHP (psig)

FIGURE 4

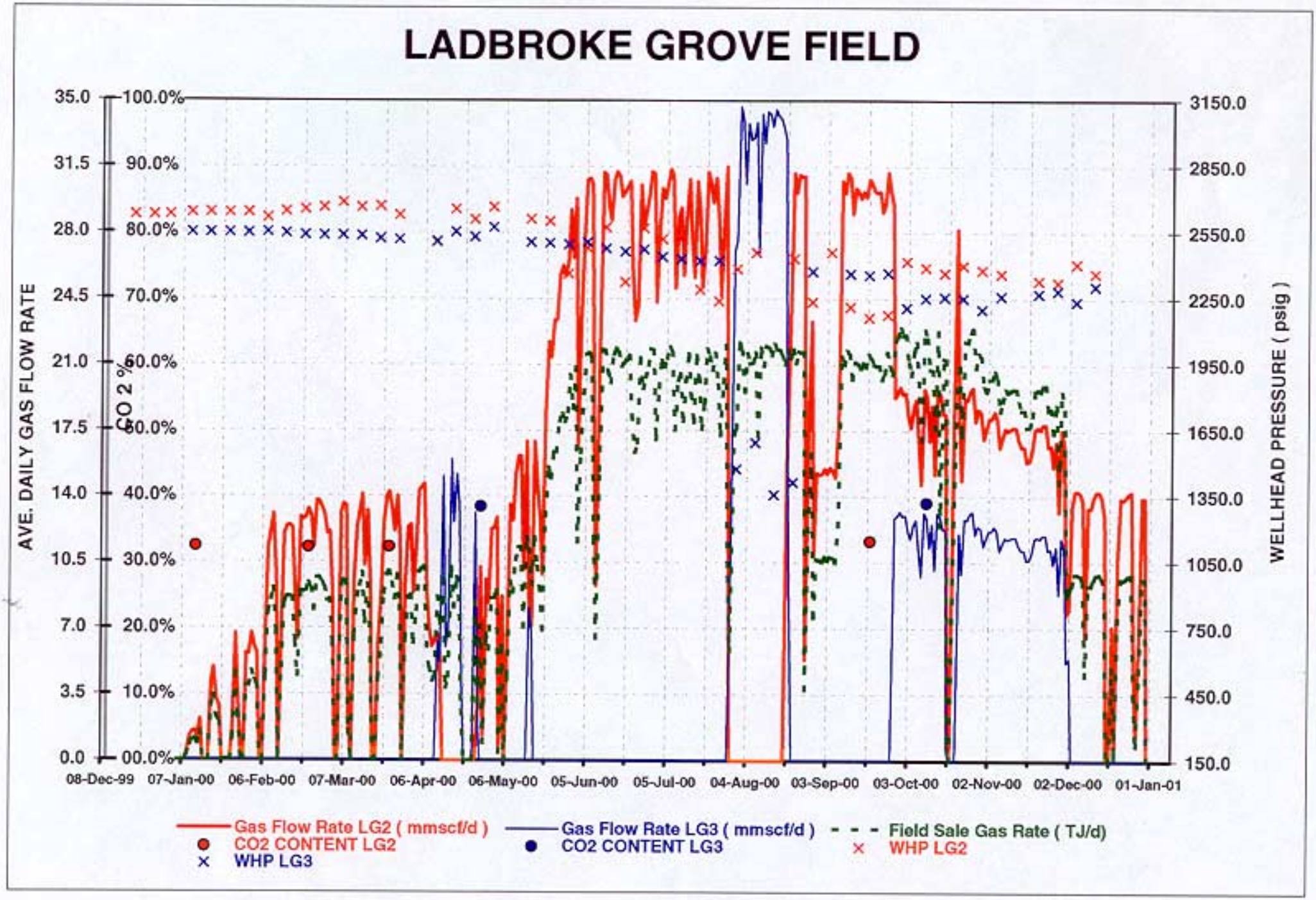

LADBROKE GROVE FIELD
AVE. DAILY GAS FLOW RATE
CO 2 %
WELLHEAD PRESSURE (psig)
35.0
31.5
28.0
24.5
21.0
17.5
14.0
10.5
7.0
3.5
0.0
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
00.0%
3150.0
2850.0
2550.0
2250.0
1950.0
1650.0
1350.0
1050.0
750.0
450.0
150.0
08-Dec-99
07-Jan-00
06-Feb-00
07-Mar-00
06-Apr-00
06-May-00
05-Jun-00
05-Jul-00
04-Aug-00
03-Sep-00
03-Oct-00
02-Nov-00
02-Dec-00
01-Jan-01
Gas Flow Rate LG2 (mmscf/d)
Gas Flow Rate LG3 (mmscf/d)
Field Sale Gas Rate (TJ/d)
CO2 CONTENT LG2
CO2 CONTENT LG3
WHP LG2
WHP LG3

Figure 5

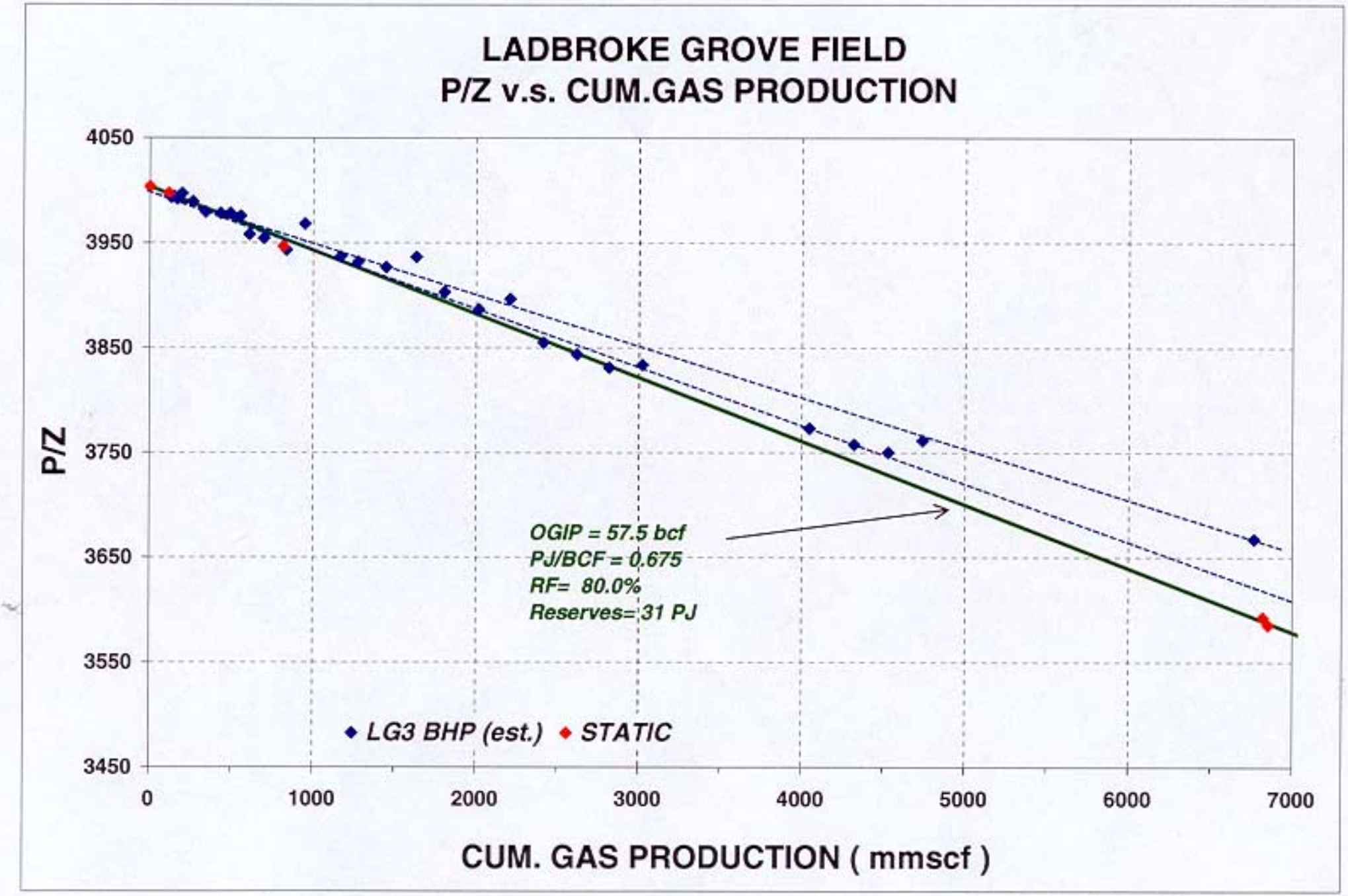

LADBROKE GROVE FIELD
P/Z v.s. CUM.GAS PRODUCTION
P/Z
4050
3950
3850
3750
3650
3550
3450
0
1000
2000
3000
4000
5000
6000
7000
CUM. GAS PRODUCTION (mmscf)
OGIP = 57.5 bcf
PJ/BCF = 0.675
RF= 80.0%
Reserves= 31 PJ
LG3 BHP (est.)
STATIC

Figure 6

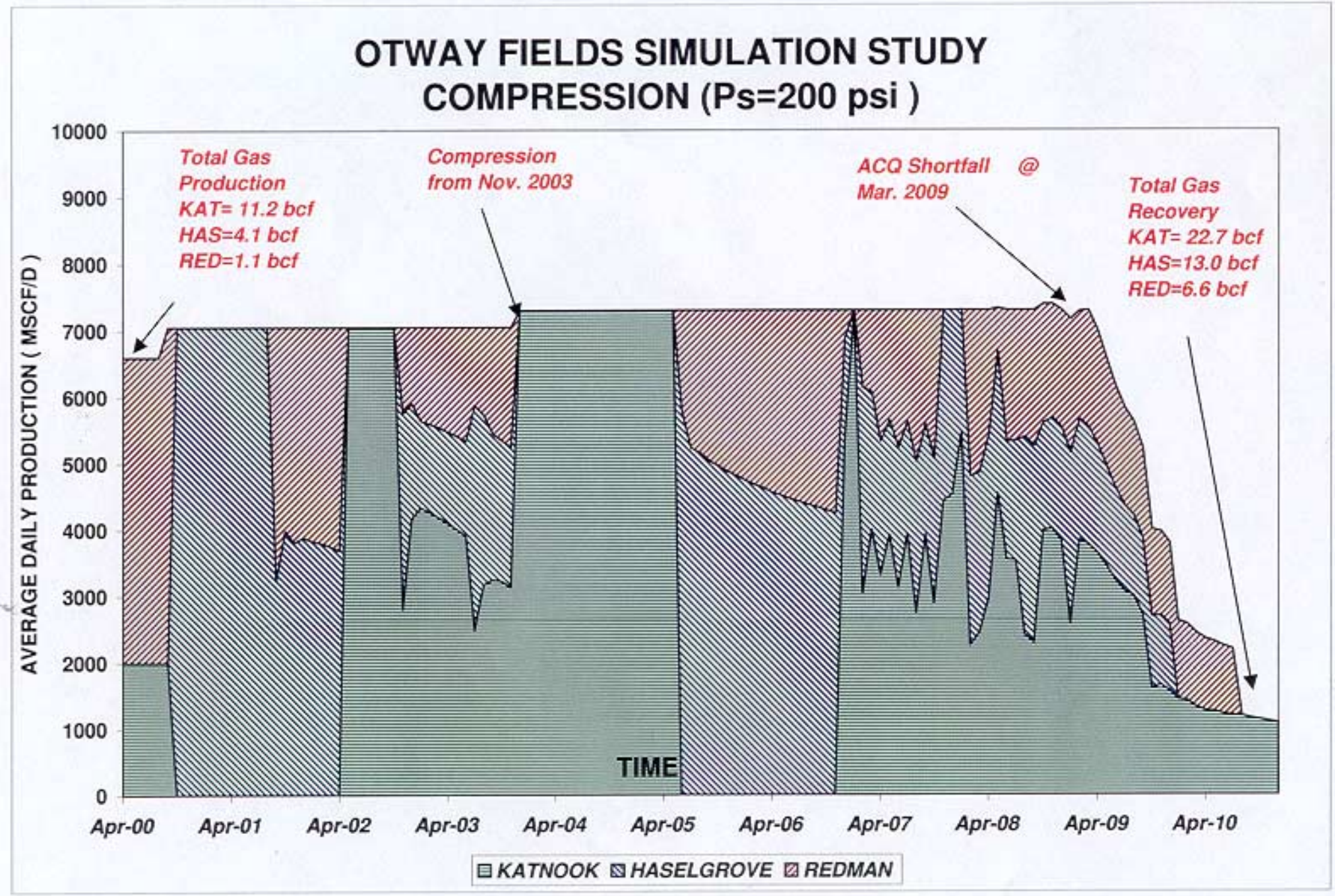

OTWAY FIELDS SIMULATION STUDY
COMPRESSION (Ps=200 psi)
AVERAGE DAILY PRODUCTION (MSCF/D)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Total Gas Production KAT= 11.2 bcf HAS=4.1 bcf RED=1.1 bcf
Compression from Nov. 2003
ACQ Shortfall @ Mar. 2009
Total Gas Recovery KAT= 22.7 bcf HAS=13.0 bcf RED=6.6 bcf
TIME
Apr-00
Apr-01
Apr-02
Apr-03
Apr-04
Apr-05
Apr-06
Apr-07
Apr-08
Apr-09
Apr-10
KATNOOK
HASELGROVE
REDMAN

Figure 7