

**Commission of Inquiry Montara Well Head Platform Uncontrolled  
Hydrocarbon Release: Outline of Written Submissions by Atlas Drilling (S)  
Pte Ltd (Atlas Drilling)**

**Preliminary**

1. These written submissions are provided in response to an invitation from the Montara Inquiry to Atlas Drilling dated 1 December 2009.
2. The submissions are provided by Atlas Drilling to the Commissioner about matters most closely related to the knowledge, experience and/or expertise of Atlas Drilling. They are for the purpose of assisting the Commissioner's consideration of some issues raised by the Terms of Reference<sup>1</sup>, including the further enquiries that may be necessary to properly investigate the matters raised by the Terms of Reference and the nature and scope of any hearings.
3. Further, these submissions have been drafted with the stated present intention of the Commissioner in mind. That is, to obtain evidence utilising, as appropriate, the full range of mechanisms available to him, including the conduct of any hearings, the utilisation of inspection powers and the production of relevant documents. They focus upon the sequence of events as has been established by investigations to date. Atlas Drilling is undertaking ongoing investigations into the likely causes of the hydrocarbon release and any changes to its systems and practice that should be implemented. It will provide details of the outcomes of those investigations to the Commissioner as soon as they are available.
4. The Jack Up Drilling Rig West Atlas (**West Atlas**) is a bottom supported relocatable drilling unit designed to perform drilling operations in water depths up to 400 feet. The West Atlas was contracted by PTTEP Australasia (Ashmore Cartier) Pty Ltd (**PTTEPA**) to drill a combination of exploration and production wells offshore north western Australia including certain wells in the Montara field. Whilst performing

---

<sup>1</sup> The Terms of Reference for the Commission of Inquiry into the uncontrolled release of hydrocarbons at the Montara Wellhead Platform that commenced on 21 August 2009, and the subsequent events including the fire that commenced on 1 November 2009.

operations under contract to PTTEPA the West Atlas also supports the activities of numerous other specialist contractors engaged by PTTEPA.

5. A glossary of terms is appended to this submission to assist in the reader's understanding of certain industry terms.

#### **Circumstances and likely causes**

6. Between 15 January 2009 and 21 April 2009 the West Atlas drilled 5 wells on the Montara Well Head Jacket. The 5 wells were batched drilled in 2 groups. The initial batch drilling included wells GI, H1 and H4, followed by the second batch drilling of wells H2 and H3 (collectively referred to as the "wells").
7. The wells were designed by PTTEPA.
8. On 18 January 2009, work commenced on well H1 when it was spudded as a horizontal production well. At this time, PTTEPA planned that well H1 would have the following well control barriers in place in order to suspend that well prior to the installation of the jacket topsides:
  - (a) a cemented  $9 \frac{5}{8}$  inch casing shoe; and
  - (b) a shallow set cement plug from 160 metres to 115 metres with inhibited seawater above and below this plug.
9. On 6 March 2009, the  $9 \frac{5}{8}$  inch casing was run to a total measured depth of 3786 metres into and horizontally through the reservoir.
10. The Montara drilling program originally did not provide for the installation of pressure containing corrosion caps (PCCC's) on well H1.
11. On 7 March 2009 a  $9 \frac{5}{8}$  inch PCCC was installed on well H1. On 12 March 2009, PTTEPA formally issued a change control order which replaced the shallow set cement plug with a  $9 \frac{5}{8}$  inch PCCC to be installed on top of the  $9 \frac{5}{8}$  inch casing at the MLS hanger. The change control order also provided for a  $13 \frac{3}{8}$  inch PCCC to be installed on the  $13 \frac{3}{8}$  inch casing.

12. On 7 March 2009 well H1 was temporarily suspended as the required work had been completed. At the time of suspension, well H1 had the following barriers in place:
- (a) cemented 9 <sup>5</sup>/<sub>8</sub> inch casing shoe;
  - (b) cemented 9 <sup>5</sup>/<sub>8</sub> inch casing annulus back to and inside and above the 13 <sup>3</sup>/<sub>8</sub> inch casing shoe (thereby plugging the annulus between the 9 <sup>5</sup>/<sub>8</sub> inch and 13 <sup>3</sup>/<sub>8</sub> inch casings);
  - (c) inhibited seawater column inside the 9 <sup>5</sup>/<sub>8</sub> inch casing; and
  - (d) a 9 <sup>5</sup>/<sub>8</sub> inch PCCC.
13. A further PCCC, being the 13 <sup>3</sup>/<sub>8</sub> inch PCCC, was not installed in well H1 as required in the original change order.
14. PTTEPA's Well Construction Standards requires, when a well is to be suspended long term<sup>2</sup>, two permanent tested barriers are to be installed in the annulus and well bore above any hydrocarbon zone or over pressured zone. The following are described as permanent barriers in PTTEPA's Well Construction Standards :
- (a) pressure tested cement plug (minimum 30 metres in length);
  - (b) permanent packer with no controlled internal flow path and cement on top;
  - (c) cemented casing with proven top of cement;
  - (d) hanger packer;
  - (e) tubing seals; and
  - (f) annular master valve.
15. The H1 casing cement jobs were performed by PTTEPA's cementing contractor under the supervision of PTTEPA. The aim was to mix and pump cement using the cementing contractor's equipment, located on the West Atlas, down the 9 <sup>5</sup>/<sub>8</sub> inch well casing for the purpose of:

---

<sup>2</sup> Long terms suspension is when the drilling rig leaves the well site.

- (a) cementing the 12 ¼ inch x 9 5/8 inch annulus to a point 50 metres above the 13 3/8 inch casing shoe to seal the 9 5/8 inch x 13 3/8 inch annulus; and
  - (b) cementing the 9 5/8 inch casing shoe.
- 16. After the cement was pumped down the 9 5/8 inch casing, the plug landed on the float collar and the casing was tested to a planned 4000 psi in order to determine the integrity of the casing string. The initial casing string pressure test was successful. During the subsequent controlled pressure release an excess volume of fluid was returned suggesting failure of the casing float valves allowing cement from the annulus back into the 9 5/8 inch well casing bore. Subsequently, fluid was re-injected with back pressure and it was held until the cement was considered to be set. A sample of the cement pumped down the 9 5/8 inch casing was held at surface level and checked.
- 17. In light of the events that later occurred, it is possible that the inhibited seawater in the 9 5/8 inch well casing above the cement together with the 9 5/8 inch PCCC held the pressure balance within the 9 5/8 inch casing whilst well H1 was suspended between March 2009 and August 2009.
- 18. On 21 April 2009 the West Atlas completed the suspension of all 5 planned wells.
- 19. On Wednesday, 19 August 2009 the West Atlas returned to the Montara Well Head Platform to carry out the second phase of the drilling programme. The 20 inch, 13 3/8 inch and 9 5/8 inch casing strings in each of the 5 suspended wells were to be tied back to jacket topsides which had been installed following the initial drilling phase by a heavy lift construction barge.
- 20. On Thursday, 20 August 2009 the tieback related operations commenced.
- 21. On 20 August 2009 at approximately 0600 hours the West Atlas skidded over well H1. This involves extending the West Atlas cantilever over the Montara Wellhead Platform to facilitate operations above and on the Well Head Platform. About this time, the 20 inch trash cap on well H1 was removed and visually checked by an Atlas Drilling Toolpusher and then by a PTTEPA drilling supervisor. Upon removal of the 20 inch trash cap, an amount of cement debris lay on top of the 9 5/8 PCCC, and some corrosion was found on the 13 3/8 inch MLS hanger internal thread. It appeared that, in

the absence of the 13 <sup>3</sup>/<sub>8</sub> inch PCCC, the thread had scaled up and developed some corrosion.

22. The condition of this thread led the PTTEPA drilling supervisors to amend the 20 inch tie back programme in order to run a brush on the 13 <sup>3</sup>/<sub>8</sub> inch MLS hanger to clean the threads. To facilitate this brush run the PTTEPA drilling supervisors directed the removal of the 9 <sup>5</sup>/<sub>8</sub> inch PCCC to permit enough clearance to run the brush effectively on MLS hanger thread surface. Prior to the removal of the 9 <sup>5</sup>/<sub>8</sub> inch PCCC, the well was tested for pressure below the PCCC. There was no pressure detected below the 9 <sup>5</sup>/<sub>8</sub> inch PCCC. The 9 <sup>5</sup>/<sub>8</sub> inch PCCC was removed and the brush run. The 20 inch tie back programme on well H1 was then resumed. The 9 <sup>5</sup>/<sub>8</sub> inch PCCC was not re-installed.
23. The removal of the 9 <sup>5</sup>/<sub>8</sub> inch PCCC may have been a sufficient event to alter the balance within the 9 <sup>5</sup>/<sub>8</sub> inch well casing allowing any hydrocarbons to start moving to the surface.
24. Between 1500 hours and 1700 hours on 20 August 2009 a rough cut of the 20 inch casing was performed on well H1. At completion of the cut and subsequent tie back of the 20 inch casing, a spare hatch cover was placed over the 20 inch stump at the mezzanine deck level of the Montara Well Head Platform.
25. Following this, the West Atlas skidded to well GI to continue the 20 inch tie back program. Over the next 12 hours, the 20 inch tie back program was performed on wells GI and H4.
26. At 0536 hours on Friday, 21 August 2009 well H1 kicked, producing what was estimated at 40 bbls of fluid and an unknown quantity of gas. This kick was short lived but resulted in the activation of the gas alarms and subsequent emergency response activity including the muster of personnel on board. At this point the West Atlas cantilever was located over well H4.
27. Following the subsidence of the initial kick on well H1, and after it was considered the immediate danger had passed, the all clear was given and mustered personnel released. A PTTEPA planning meeting was convened and a decision made to run a PTTEPA's cementing contractor RTTS packer into well H1 in order to secure it. This required

first laying down the 20 inch casing cut off from well H4, then skidding the rig back over to well H1.

28. The skidding activity was just about to begin when at 0723 hours, well H1 kicked again ejecting a large quantity of wellbore fluid and gas.
29. Emergency response activities were managed in accordance with the rig emergency response plan, culminating in the abandonment of all personnel (non essential followed by essential) from the West Atlas by lifeboat.
30. At this stage, Atlas Drilling considers the following issues to be the most significant in terms of determining the likely causes of the uncontrolled hydrocarbon release:
  - (a) Were the planned and actual H1 well control barriers adequate, particularly having regard to the well design, and in line with the well construction standards?
  - (b) Why was the requirement for the 13 <sup>3</sup>/<sub>8</sub> inch PCCC added to the well as part of the change control order issued on 12 March 2009?
  - (c) Why did the 9 <sup>5</sup>/<sub>8</sub> inch cement shoe fail?
  - (d) Why was the 13 <sup>3</sup>/<sub>8</sub> inch PCCC not installed on well H1?
  - (e) Did the failure to install the 13 <sup>3</sup>/<sub>8</sub> inch PCCC contribute to the hydrocarbon release?
  - (f) Was it necessary to remove the 9 <sup>5</sup>/<sub>8</sub> inch PCCC on well H1 to enable the 13 <sup>3</sup>/<sub>8</sub> inch casing thread to be cleaned?
  - (g) Why was the 9 <sup>5</sup>/<sub>8</sub> inch PCCC on well H1 not re-installed following its removal to clean the 13 <sup>3</sup>/<sub>8</sub> inch casing thread?
  - (h) Were there departures from accepted industry drilling practice in planning, communicating, supervising and executing drilling operations for well H1 that caused or contributed to the failure of the 9 <sup>5</sup>/<sub>8</sub> inch cement shoe and the consequential hydrocarbon release?
  - (i) Was there adequate communication between PTTEPA and Atlas Drilling in carrying out activities on well H1?

- (j) Did all parties observe their stated policies and procedures related to well control and well barriers documented in their respective management systems, and were those policies and procedures adequate?
- (k) Were appropriately experienced and qualified supervisors present onboard the drilling rig during critical activities?
- (l) Was there sufficient pre-job planning and appropriate awareness of risk during key decision making steps?
- (m) Are there improvements or changes to the practices of any of the parties involved that should be adopted?
- (n) Are there improvements or changes to accepted industry drilling practices that should be adopted with the benefit of hindsight?

**Assess the adequacy of the response to the Uncontrolled Release by the current title-holder of AC/L7, the owner and/or operator of the Montara Wellhead Platform and the owner and/or operator of the West Atlas drilling rig**

*The Evacuation*

- 31. In response to the second alarm on Friday, 21 August 2009, all crew were instructed to assemble at their muster locations. Whilst the crew assembled an order was given to evacuate all non-essential personnel from the rig via the lifeboats. A headcount of all non-essential crew was performed before an orderly evacuation was made at approximately 0735 - 0745 hours on 21 August 2009 using lifeboats numbered 1 and 2.
- 32. At approximately 0810 hours on 21 August 2009 a decision was made to evacuate all remaining essential personnel. The evacuation of all remaining essential personnel was made using life boat 3. After evacuating the West Atlas, all three life boats assembled at sea and made their way to the supply ship, Lady Audrey. All 69 personnel on board were re-accounted for at the Lady Audrey.

*Plugging the well*

- 33. As the West Atlas was inaccessible, PTTEPA contracted a second rig to drill a relief well with a total measured depth of approximately 2.6 kilometres from a surface

location 2.0 kilometres from the Montara Wellhead Platform to intercept and dynamically kill the H1 well. This process required the use of electromagnetic ranging tools to locate the H1 wellbore (approximately 25 centimetres in diameter) at a suitable intercept point.

34. To intercept the H1 well, the Jack-Up Drilling Rig West Triton (**West Triton**) was contracted by PTTEPA within days of the loss of control of the H1 well which is considered, by industry standards, to be extremely short notice.
35. The rig departed Batam Indonesia on 27 August 2009 and arrived at the Montara incident site on 10 September 2009. A short period of time was lost en route due to a parted tow wire and main engine failure on one of the towing vessels.
36. Between 10 September and 13 September 2009 preparations were made on board the West Triton to commence drilling the relief well.
37. On 13 September 2009, drilling operations commenced on the West Triton to drill the relief well. On 5 October 2009, the relief well reached the target depth to commence the intercept operations. The first attempt to locate the leaking well at depth was unsuccessful, missing by approximately 4.5 metres.
38. The nature of locating the leaking well at depth meant that following the unsuccessful initial attempt, a second attempt to locate the well could not be made for several days. The second attempt was further delayed when drilling operations encountered slow drilling progress. On 13 October 2009, the second attempt was made to locate the leaking well. This attempt was also unsuccessful, missing by approximately 70 centimetres.
39. A third attempt to locate the leaking well also failed when the drill string assembly tracked and fell back into the second hole.
40. Further delays associated with down hole equipment issues and hole orientation, meant that the fourth attempt to locate the leaking well was delayed until 23 October 2009. This fourth attempt was also unsuccessful, missing by 30 centimetres.
41. On Saturday 24 October 2009, PTTEPA called a meeting of the other oil companies operating in the region. The purpose of this meeting was to have a peer discussion in

relation to PTTEPA's attempts to plug the well. The peer review concluded at this meeting that PTTEPA's actions were appropriate.

42. On 25 October 2009 a fifth attempt to locate the leaking well was carried out. However, a down hole tool became stuck in the hole and was further delayed because of electrical equipment failure. On 1 November 2009 at 0930 hours, following repairs, the leaking well was intercepted.
43. Upon successfully intersecting the well Atlas Drilling, under the instructions of PTTEPA and their specialist well control contractor ALERT, began pumping heavy mud and brine into the well intersection in order to kill well H1.

#### *The Fire*

44. At a point close to the end of the well kill an ignition source of unknown origin ignited the hydrocarbons still being released causing a fire to break out on the Montara Wellhead Platform under the West Atlas cantilever. This fire continued to be fuelled from the slowing fuel source, until all the kill mud had been pumped. Once the kill mud was exhausted, the flow of hydrocarbons increased again and the fire intensity increased noticeably.
45. While preparations for another attempt to kill well H1 were implemented it was too dangerous to attempt to control the fire due to the severity of the fire and risk to personnel. The West Atlas and the Montara Wellhead Platform both suffered extensive damage in the fire.
46. On 3 November 2009, the second and final attempt to kill well H1 (with higher pump rates) commenced and was successful that evening.
47. The West Triton remained on location for several weeks thereafter monitoring and lubricating the H1 well and acting as an infield logistics facility to facilitate reboarding of the West Atlas and Montara Wellhead Platform until PTTEPA instructed Atlas Drilling to abandon the relief well and demobilise the West Triton to Singapore. The rig departed on 5 December 2009.
48. At this stage, Atlas Drilling considers the most significant issue in terms of assessing the adequacy of the response to the uncontrolled hydrocarbon release to be why the first attempt to kill the well was unsuccessful.

49. Preparations have commenced for the technically challenging process of removing the damaged West Atlas from the Montara field in a safe and timely manner.

Atlas Drilling (S) Pte Ltd

## Glossary of terms

**Annulus:** The void space between the open hole and the string of casing into which a slurry of cement is pumped and allowed to set. The cement develops a seal between the hole and the casing preventing hydrocarbon or pressurised fluids escaping up the annulus and is the primary reason for cementation of production strings.

**Casing shoe:** The bottom of the casing string. Casing is run with special joints of casing on bottom containing non return valves. One NRV is placed at the bottom of the casing and a second higher up. The space between the float valves is known as the cement shoe. After drilling out the cement shoe, the shoe is considered as the exit point of the casing.

**Casing string:** Steel pipe screwed together in 40foot (12.3m) sections (joints) and lowered into the hole one section at a time. Once a casing string has been fully run into the hole it is then cemented in place.

**Cement plug:** A volume of cement placed as a slurry at a specific location within the wellbore. A cement plug has several functions but is generally considered as a method of providing a seal within the bore of the casing preventing pressure and fluid transmission above the plug.

**Float:** A non return valve placed within a cement housing and the whole screwed into a section of casing. A correctly working valve will permit movement of fluids in a single direction. In a casing string each valve will allow fluids to pass down the string and up the annulus but prevent backflow of the heavier fluids from the annulus returning into the casing after pumping has ceased.

**RTTS packer:** A multi-purpose tool. An RTTS Tool is a mechanical reusable packer run into the hole on drillpipe and 'set' at a required depth to perform a specific task. Unlike a cement plug which is deemed permanent (unless drilled out), an RTTS is Retrievable and this single tool can be used to perform Pressure Testing, Chemical Treating and Cement Squeezing.

**Heavy mud:** A complex assembly of dry and liquid chemicals forming a thixotropic fluid providing chemical and mechanical stability to the open hole allowing the drilled hole to be progressed. Barite is the component added as a weighting agent. Weighting agents provide increased density to the fluid which in turn provides an increased hydrostatic head of pressure on the bottom of the hole. Heavy mud is the same as the original mud but with a higher percentage of barite added to bear more hydrostatic pressure on the bottom of the hole.

**Inhibited seawater:** A column of seawater treated with biocides and inhibitors to maintain a minimum hydrostatic pressure at the bottom of the casing, while simultaneously preserving the integrity of the casing during any period of suspension.

**Jack up drilling rig:** An offshore oil rig with a floating hull and retractable legs. The legs can be lowered to the seabed for support then allow the hull to be raised or jacked up the legs to a safe working height.

**Joint:** A single section of steel casing approximately 40 feet (12.3m) long.

**MLS:** Mud line suspension system. A system of internal casing hangers used for suspending subsequent casing string within the previous string at seabed or some deeper point designed to remove weight from the Platform. They are used at surface to facilitate tie back operations.

**MLS hanger thread:** An internal thread on a string of casing inside of which the MLS hanger is located and into which the tieback casing is screwed.

**Packer:** A device that can be run into a wellbore with a smaller initial outside diameter than the bore of the casing string then mechanically expanded to seal the wellbore. Some packers are designed to be removable, while others are permanent.

**Pressure containing corrosion caps (PCCC):** A cap which screws into the casing at the surface and acts as a mechanical internal pressure barrier of the casing bore.

**Skid:** To move the cantilever and/or transverse skidding base (inclusive of the drill floor and derrick) out from its parked position on the rig to bring the centre of the drill floor and derrick over a specific well.

**Spud:** To break the ground at seabed and commence drilling operations.

**Tie back:** The process of connecting a pre-drilled well to an existing or planned Xmas tree and existing or planned Platform production facilities.

**Trash cap:** A cap fitted over a casing string, the purpose of which to prevent debris entering the casings or the annulus. It does not act as a pressure containing barrier.

**Wellbore:** The drilled hole. The casing string is inserted into the wellbore.

**Whipstock:** A manufactured tapered anchor placed into the wellbore or open hole, to facilitate pushing a drilling assembly into the wall of the hole or casing to allow the assembly to 'kick-off' and out from the existing hole.