North Pailin Gas Development Project
PMI Project of the Year Application - 2003

UNOCAL 76

NORTH PAILIN GAS DEVELOPMENT PROJECT
PMI Project of the Year Award 2003

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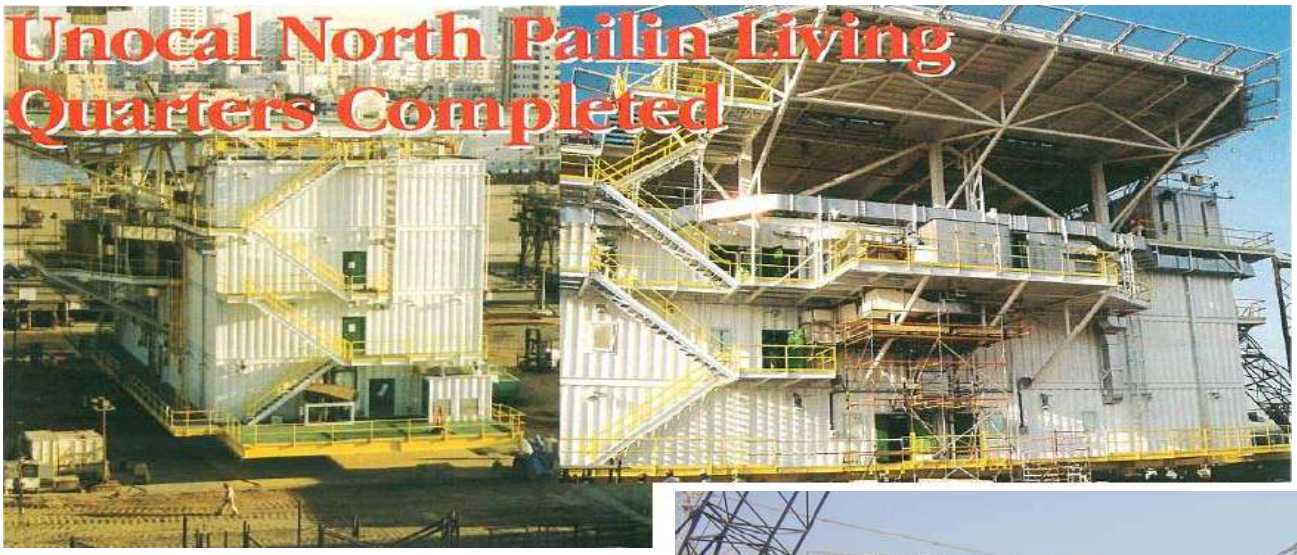


Above: Load out of the Jacket
Below: Setting the West Module
Right: North Pailin CPP

NORTH PAILIN GAS DEVELOPMENT PROJECT

1. GENERAL INFORMATION AND PROJECT TEAM

1.1. Project Name & Location

North Pailin Gas Development Project (Gulf of Thailand)
Unocal Thailand Ltd.
SCB Park Plaza, 19 Ratchadapisek Road
Chatuchak, Bangkok 10900, Thailand

1.2. Clients

Sponsor	Tara Tiradnakorn	VP Operations, Unocal Thailand
Owners:	Raymond Walker	Director, Pailin Asset Team, Unocal Thailand
	Dave Byford	Manager, Global Engineering & Construction, Sugarland, Texas

1.3. Project Team

Project Manager	Al Diaz	LQ Project Manager	Bill Park
Construction Manager	John Eckert	Project IE/Process Engineer	Perapon S
Procurement Manager	Steve Belgard	Project Mechanical Engineer	Somchai W
Project Engineer	Rich Walloch	Project Process Engineer	Artit K
Thai Logistics Manager	Ian Lippiat	Project I&E Engineer	Thanapol S
Contract Administration	Tom Fischer	Project Management Coach	Mike Sypsomos
CPP Fabricator – J Ray McDermott South East Asia Pte Ltd.	LQ Fabricator – Lamprell	Design Engineers – Worley Ltd.	

2. PROJECT PERFORMANCE

2.1. Summary of the Project

On May 23 2002 the North Pailin Gas Development Project produced its first gas 37 days ahead of contract delivery schedule and 12% under the baseline budget. Although constrained by customer demand, the project achieved 18% above the required production rate of 165MMCFD one week ahead of schedule, on June 24th 2002. Not only does the North Pailin facility represent 15% of the Unocal Thailand gas production, but it also represents 6% of the total gas energy needs for the Kingdom of Thailand.

The North Pailin Central Processing Platform (NPCPP) is an offshore platform located 301 miles south of Rayong, 124 miles south east of Khanom and 100 miles east of Nakhon Si Thammarat, in the Gulf of Thailand. It looks different to other Unocal Central Processing Platforms (CPPs) in the Gulf of Thailand, as it is more compact, having integrated Production and Living Quarters onto one platform unlike the traditional two separate platforms. It is operated by Unocal Thailand Ltd, which holds a 35% working interest in the Pailin gas field which is part of Block 12/27. Other investors include The Petroleum Authority of Thailand Exploration & Production PLC (PTTEP) (45%), Amerada Hess Exploration (Thailand) Co (15%) and MOECO Thai Oil Development Co (5%). On completion, it was estimated that the NPCPP weighed 14,200 short tons (ST) made up of 10,000ST topsides, supported by a 2,200ST jacket (legs) with 2,000ST of piles, standing in 370 feet from the seabed to the top of the cranes in 189 feet of water. There is approximately 15 kilometers of piping running through the platform and 82.5 kilometers of cabling. Pictures are contained at the start of this document.

Unocal Thailand's infrastructure and thorough understanding of the geologically complex Pattani Basin are key factors in being able to profitably produce gas from reservoirs that many would consider sub-commercial or unattractive at best. Unocal was positioning itself to take the lead in the queue for the next

Gas Sales Agreement (GSA) with PTT in 1996. At the start of the Block 12/27 GSA negotiations the proven reserves in the southern section of the Pailin Field allowed Unocal to commit a take-or-pay Daily Contract Quantity (DCQ) of 165 MMCFD. The delineation drilling success in the northern part of the Pailin Field had shown some potential for additional reserves of a similar magnitude to those in the southern area. On the strength of this drilling success the Unocal GSA team was able to negotiate a doubling of the GSA volume if the reserves could be proven.

North Pailin, also known as Pailin Phase 2, follows on from the success posted when first production was achieved from Pailin Phase 1 (South Pailin) in the fall of 1999 after the installation and commissioning of the South Pailin Central Processing Platform (SPCPP). North Pailin is an offshore gas and condensate processing facility consisting of a CPP with an initial five wellhead platforms and sixty-three wells for startup. Throughput capacity of the plant is a nominal 200 million cubic feet (of gas) per day (MMCFD), although it has also proved a capacity of over 230 MMCFD. It also produces 11,000 Barrels of Condensate per day and 25,000 Barrels of Water per day. The North Pailin development was originally staged to gain some operating experience with the CO_2 removal plant at South Pailin CPP. Although there was confidence that the volume of the reserves were sufficient in North Pailin, there was uncertainty about the heating quality of the gas. It was only after drilling a number of delineation wells that it became apparent that a second CO_2 removal plant would not be required.

2.2. Complexity of the Project

The customer requirements changed many times throughout the project. In particular a major challenge for the project team was managing the effects of the 1997 Asian economic crisis. When this occurred, there was grave concern that market demand would not allow projects such as North Pailin to sell gas as originally scheduled in the GSA. The North Pailin project team had initially rushed through preliminary design in response to a request to bring forward the original delivery date. Following the economic crisis and completion of the preliminary design, the project had to be put on hold while Pailin Partners and PTT discussed options to delay start-up and associated increased gas deliveries from North Pailin. When detailed design was re-started there was still uncertainty. At the very latest date possible, the decision was made to proceed with a target delivery date of 1 July 2002. The project team was under a great amount of pressure to re-gain momentum and get the project back on track. The experienced and talented project team, many of whom worked on the first Pailin CPP, were able to put the project back on schedule while not compromising quality or allowing costs to creep upward. Indeed, innovations in contract awards and management of long lead items saved a lot of money in getting items at more favorable prices and mitigated the risks associated with gas market demand.
The project was actually kicked off on 18 October 1998. Participants were scattered from companies around the globe. The project was designed in Perth, Australia; the NPCPP was fabricated in Batam, Indonesia; the LQ was fabricated in Sharjah, UAE; and materials procured worldwide – USA, Switzerland, UK, Italy, Australia, Germany and Singapore. This represented a major challenge in procurement, expediting and shipping coordination, which was all undertaken from Batam, Indonesia. The logistics, communication, risks and challenges of operating from this location proved to be some of the greatest hurdles for the project team.

Carefully considering the benefits, the project took risks awarding the CPP fabrication contract to be undertaken in Batam, Indonesia. Up until the Unocal contract, the McDermott fabrication yard had been closed for approximately 2 years. This allowed Unocal to negotiate a favorable contract, but it also meant setting up with new staff and processes and re-starting a ‘cold’ yard. Unocal supported this start-up resulting in jobs for over 1000 people and more money flowing into an extremely poor local economy. The team also had to overcome the challenges of actually living in Batam. The project team arrived in Batam within 2 weeks of bombings. There were 4 bombs exploded on the island on Christmas day which resulted in significant religious tensions. For security reasons, the team had to be moved around the island, which resulted in a higher level of emergency and evacuation planning. Malaria and Dengue Fever affected some team members who had to return to the USA for treatment. As a result, disease movements were tracked quarterly and there were regular medical checks and hygiene audits implemented. Although away from their families for extended periods of time, often having to deal with political unrest and other problems, the team focussed on the project goals and used team building and other motivational activities to manage and ultimately overcome the many difficulties they faced.

This project was a highly challenging endeavor as it achieved its goal to design and build a CPP with enhanced operational capacity, combined with a decreased facility size. The result being a platform which uses almost half of the operations manpower of a typical platform. The team met the challenge by using innovative design to build the first integrated CPP and Living Quarters facility for Unocal Thailand.

Prior to the North Pailin project, Unocal Thailand used no formal Project Management system in planning and implementing projects. The Project Management initiative, which started only a year earlier (1998), was still under way and was put to a true test. The ambitious challenge placed in front of the Project Manager at the start of the project was "let's do this project in such a way that we win the PMI POY award" and was accepted. The services of a dedicated Project Management Coach (who was also part of the Project Management initiative team) were used to ensure that PM best practices were followed. The project met all its objectives through the application of the PMBOK elements by a highly competent team.

2.3. Special Management Methods

Many project management and product innovations were introduced through the life of this project. The following lists the major innovations first for the product and secondly for project management techniques. Many of these innovations were identified through the use of lessons learned from the South Pailin project.

2.3.1. Product Innovation

- For this size of project the design would normally use 2 **production trains**. The North Pailin team went to one by utilizing advanced technology in many areas. By using one compressor package and 1 inlet separator they accomplished cost savings of $5.3 million for equipment and were able to use less deck space.

- The **condensate stabilization system** was an innovative design eliminating reflux accumulators and pumps. A special study was undertaken to determine whether costs, weight and space saving could be achieved for the NPCPP Condensate Stabilisation system by utilizing an alternative configuration. This comprised a simple stripper column rather than the refluxed column proposed in the Conceptual Design. The stripper column scheme eliminates the rectification section of the column and the associated reflux condenser drum and pumps and is therefore simpler to control, operate and maintain. The study also reviewed the benefits of using a kettle reboiler rather than the pump-around type proposed in the Conceptual Design package and the use of cold feed to cool/condense the column overheads rather than an air-cooled exchanger. Cost savings were determined to be US$ 150,000.

- Through innovative operational design the team was able to considerably reduce the operational **staffing** requirements for the facility. This equated to a manpower capacity reduction from the "normal" 130 to a new staffing of 60 people with a maximum living capacity of 80. This represented a radical change from the typical manpower requirements for Unocal asset operations in SE Asia. The throughput per employee (sales per employee on platform) ultimately proved to be three times better than the next best Unocal facility in the Gulf of Thailand and five times better than the average.

- **Integrated Living Quarters (LQ)**. Normally the LQ is located on a separate structure and linked to the CPP by a bridge. North Pailin integrated the LQ onto the CPP. This was the first time for the Thailand Business Unit.

- To support a compact and lightweight CPP design many other innovations were used, such as lightweight **Glass Reinforced Pipe** for the first time in the Gulf of Thailand and free fall **lifeboats** for the first time in Unocal SE Asia operations.

2.3.2. Project Management Innovation

- As stated above, the team understood that one of the critical success factors for project innovation was to start by using **lessons learned** collected from the South Pailin project, completed in 1999. This would enable the avoidance of past mistakes and repetition of things that worked well. A systematic and thorough process was developed. One of the key Scope Planning activities was to

assign a dedicated person to review past Lessons Learned and ensure that every one of them was considered when applicable. Once opportunities were identified and approved by the Project Manager and the project team, new activities were developed and added to the plan.

- A new process for procuring equipment was undertaken. Considering the time constraints and uncertainty before and during detailed design, Unocal chose a **Company Furnished Mechanical Equipment (CFME)** approach to procurement instead of an EPC contract. This meant that Unocal would be in full control of all major mechanical components and enabled greater flexibility for ordering the long lead items and innovative contract approaches which lead to substantial savings in procurement costs.

- The project used a **Front End Loading Index** (FELI) tool at the start of each project phase to identify the amount of project planning and design required for that phase. This innovative software tool was developed as part of the newly implemented Unocal Thailand Project Management initiative, specifically for use on Unocal Thailand projects. It is intended to characterize a project and in a scalable manner suggest organizational, planning and control tools that will add value to that type of project. (See Appendix1).

- One large project expense item that was improved was that of the **installation lift** (i.e. lifting the CPP platform components from the transport barge and positioning them on the jacket offshore). In South Pailin with one of the major offshore lifts exceeding 5,600 (ST), Unocal had to engage one of the largest barges in the world to do the installation and there was little choice in contractor selection, which made the price very expensive. Consistent with the strategy to develop a compact and lightweight CPP, during the design phase the team decided to fabricate the decks not to exceed 2,500 tonnes in weight, therefore one lift would not exceed 2,500 tonnes. This enabled more competitive bids from a number of offshore installers, saving money and removing time constraints that could be imposed by a single contractor.

- The team implemented a very **rigid change control system** resulting in minimizing unnecessary changes. Change control was supported by the **Design Freeze** of the AFD package imposed by the Project Manager. This design freeze allowed the detailed design to proceed without costly changes and forced accountability and clarity of scope.

- A carefully designed **Prioritized systems turnover** approach was adopted so that non-revenue systems and the utilities were commissioned first (ie prior to bringing well fluids to platforms). This allowed easy transition from hook up, to commissioning, to production. This approach was contrary to the past practice where focus was on the hydrocarbon systems first then other systems, then back to hydrocarbons. This practice was inefficient, as operations were too busy in the end, trying to commission everything at once and as a result secondary systems got neglected.

- **Incentives** were used very effectively to get cost saving and innovative ideas from the team. An amount of US$20,000 was included in the budget that paid for itself many times over with the first innovation - to eliminate a sump tank, which resulted in a saving of approximately US$ 250,000.

- To minimize offshore electrical and instrumentation commissioning work, **instrument & electrical buildings** were fabricated along with the structure modules onshore. This left only fiber optics cable to be installed to the Central Control Room offshore. This approach contributed significantly to cost savings, reduced risk and shortened the offshore commissioning time.

- The use of a **LQ (Living Quarters) refurbishment company** to fabricate a new LQ was a successful strategic move. After carefully reviewing the capabilities of the chosen fabricator, Unocal was confident that they (the fabicator) could build new LQ's. As a result, by turning a potential risk (quality product) into an opportunity a very good contract was negotiated which saved Unocal money.

- **A PM Coaching** approach was adopted. This was the first major project to use the services of a dedicated Project Management Coach throughout the project to ensure that PM best practices were followed. Coaching a significant project such as North Pailin proved its value and application benefits and created a model for coaching other projects within Unocal Thailand.

2.4. Owner Satisfaction

See letter as follows:

Unocal Thailand, Ltd.
5th floor, Tower III, SCB Park Plaza
19 Ratchadapisek Road, Chatuchak
Bangkok 10900, Thailand
Tel (662) 545-5555
Fax (662) 545-5554

December 11, 2002

Attn: Mr. Albert Diaz & Project Team

I would like to take this opportunity to congratulate the North Pailin Gas Development Project Team on their outstanding achievements in delivering this project ahead of schedule and well under budget despite many external, uncontrollable challenges encountered by the project. The professional and committed manner in which the team overcame these obstacles resulted in the highest-quality result to date for this type of project in our region. It has far exceeded expectations and has become the model project against which all others are being compared.

When the economic crisis hit in 1997 there was grave concern that market demand would not allow projects such as North Pailin to sell gas as originally scheduled. North Pailin had already completed preliminary and initial stages of detailed design and then had to be put on hold while Pailin partners discussed options to delay start-up and associated increased gas deliveries with our customer. The project team's innovative approach to detailed engineering design allowed the project to move forward during these negotiations, while not risking significant exposure to stranding major investments that would have resulted from an agreement with the customer to delay the project. Additionally, the team's outstanding project management controls and understanding of the impacts of both the proceed and delay decisions, allowed us to negotiate in good faith with our customer to the very latest date that was possible in order to re-start detailed engineering and fulfill our contractual start-up obligations.

Fortunately, the decision was made to proceed and the project team was under pressure to re-gain momentum and get the project back on track. The experienced and talented project team, many of whom worked on the previous South Pailin Gas Development Project, were able to put the project back on schedule while not compromising quality or allowing costs to creep upward as might be expected. The application of project management tools and techniques together with exceptional teamwork and a clear vision was fundamental to this success.

Risk evaluation and management was an important part of this process, as Indonesia was working through a change in leadership and as a result represented more political risk than other alternatives at the time of awarding the fabrication and installation contract. Additionally, the construction yard had been shut down for over a year and thus required mitigating the risks associated with start-up of a cold facility and workforce. The project management team worked with the contractor's management to ensure that all associated risks were properly mitigated through procedures and controls, and thus turned both of these risks into opportunities for both parties.

Not only is it a great project for Unocal and contractors, but the people of Thailand benefit from this venture as it represents low-cost, clean, native fuel to help power an ever-expanding economy. In addition to these benefits for the people of Thailand, the people of Batam, Indonesia and Sharjah, UAE have profited from the facilities being fabricated in these countries through significant employment opportunity during the market downturn.

The end result of this well-managed effort was a project that excelled in every category:
Flawless start-up ahead of schedule despite the challenges noted above, coupled with the shortest commissioning period ever for a Unocal project of this type, actual costs that were 28% less than originally budgeted, and a quality facility that is capable of delivering 25% more than design and has broken all records by a significant margin for our measures of online reliability.

Well done on this milestone achievement!

Regards,

Raymond K. Walker
Director, Pailin Asset Team
Project Owner, North Pailin Gas Development Project

3. PROJECT INTEGRATION MANAGEMENT

Excellence in Integration Management was one of the keys to the success of this project. Unocal Thailand initiated the development of its Project management methodology and toolkit in 1998. North Pailin was the first major project to fully utilize the newly developed tools & techniques. These were promoted and mentored to the project team through use of a Project Management Coach – a skilled professional who had been part of the Unocal Thailand Project Management methodology development team and had over 20 years of Project Management experience in the Oil & Gas industry.

The team adopted a typical five-phase approach:

- Engineering Design (preliminary, detailed)
- Procurement
- Fabrication
- Installation & Hook up
- Commissioning & start Up

A Phase gate approach and review was adopted to make certain that the Gate Deliverables underwent scrutiny for completeness prior to moving into the next Phase. A detailed project plan was prepared for each one of the above phases including project management planning requirements for each of the PMBOK areas and a project implementation plan describing the monitoring and control activities to be undertaken to meet performance expectations. The FELI tool (Appendix 1) was instrumental in defining the extent of the planning requirements. The project owners and senior executives at Unocal Thailand approved these plans prior to each phase. The preparation and approval of a detailed project plan for each phase was critical and represented a valuable management tool for the project manager and project team.

Of particular importance for project implementation was the use of a very **rigid change control system** Unocal needed to make sure unnecessary changes were minimized. A design freeze, Design Change Notice (DCN) and review system were therefore introduced and all contractors were required to strictly follow this system. (see Appendix 2 for the DCN form)

The DCN system was used in three intervals.

- The first interval applied from the issue of the Approved for Design (AFD) Package on 28 January, 2001 through to the Issue for Bid (IFB). The base design in all disciplines was frozen during this period to allow the detailed design to proceed unimpeded and without expensive design change variations. It forced accountability and clarity and as a result nothing fell through the cracks.

- The second interval applied from the IFB up to the issue of the Approved for Construction (AFC) drawings. During this time the DCN was used to track changes as a result of vendor queries and new data prior to the contract award. It also included the 28-day period after fabrication and installation contract award when McDermott had to perform a review of the AFC design package and highlight any errors, omissions or discrepancies and immediately bring these to Unocal attention. After this 28-day period any contractual errors were deemed to be at the vendors' cost.

- The third interval applied the DCN system in the fabrication yard and at the vendors' site. This process was extremely important, as it was the prime documentation for defining change orders when appropriate.

The Project Manager ensured that only significant changes were allowed to be made, initially based on problems unique to the Pailin Field such as Mercury adsorber addition and design changes to meet higher than normal Hydrogen Sulphide removal requirements. To serve as a continuous reminder, the team adopted a simple, easy to remember principle/ motto that was posted in many conspicuous places:

> If it doesn't work -fix it
> If it's unsafe -fix it
> If it's illegal -fix it

The DCN was a great project control/management tool. It provided structure to keep track of changes and provided a mechanism to ensure each discipline reviewed all changes prior to approval for implementation. This was extremely powerful and meant Unocal knew exactly which changes were being made on the project and their impact. This tool is being used on the next major Unocal project development in Indonesia.

The team and contractors initially found it hard to accept this rigorous decision making and change control process but by end of project they recognised and embraced this PM approach and saw the value for all parties.

4. PROJECT SCOPE MANAGEMENT

The vision for the North Pailin project was established in 1996 when exploration drilling indicated the probability of sufficient gas resource to justify a second development phase for the Pailin gas field. Prior to the economic crash in 1997 PTT had wanted Unocal to accelerate the project as much as 12 months. When the impact of the economic crash was realized the project was actually deferred 9 months from the original delivery date of October 2001 to a new date of July 2002. This significant change in customer requirements resulted in a hiatus in project progress between preliminary and detailed engineering design. Detailed engineering was re-started in October 1999 to meet contractual obligations when PTT had a better understanding of the longer-term impacts of the recession on the gas market. Nevertheless, PTT requested additional start up delay to help manage its uncertainty with the economic recovery. The innovative approach to detailed engineering in conjunction with a clever long lead item procurement strategy allowed the project to progress on schedule, while negotiating a delay acceptable to all parties, without committing to significant capital investment.

The period on hold during engineering design was creatively used by the team as an opportunity for discussion and feedback; to get stakeholders' agreement, complete the work, agree on direction and scope and publish the preliminary engineering work.

The approved project plan for each phase contained the business case, a charter including the mission, objectives, deliverables, scope (including a WBS), and other PMBOK areas specifically for that particular phase. Developing the project plan for each phase at the end of the previous phase meant that the project scope and documentation were current, relevant to each phase and achievable. Also, the management tools were "fit for purpose" and could be effectively used by the project manager to define, verify and manage the project scope with contractors and the project team. A sample of the Project Plan from the Fabrication phase is contained in Appendix 3

The Work Breakdown Structure for each phase was developed as a team exercise. The WBS that was developed for the South Pailin project was used as a template and modified to fit the scope of the North Pailin project. Integration and project support elements were included as part of the detailed Work Breakdown Structures. A high level example of the Procurement WBS is included in the Appendix 4.

The Project Design Engineers were Worley Ltd based in Perth Australia. The Project engineering concept design provided initial scope of work and approach. This was refined through subsequent engineering reviews, preliminary engineering and detailed design. Worley received 15,000 items of vendor data from 102 packages. They created 2000 documents and drawings and over 4,000 piping iso's making up the basis of the Approve for Construction (AFC) package. Two Worley systems were used in a fabrication yard for the first time. "Incontrol" being used for document and vendor data management and "DAD" which is a databased client server system being used for Instrument design and technical information management.

Design refinements were conducted at the Worley offices in Perth between the Unocal and the Design Team. It was considered critical that Unocal and the Design Team worked closely to ensure the full scope of work was included without 'gold plating' the project. Indeed an innovation incentive program was introduced to encourage cost saving ideas. The first idea (to eliminate a sump tank) saved the company enough money to cover the cost of the program 12.5 times over and AUS$1000 was awarded to the person who came up with the idea.

One of the most significant outcomes from this close working relationship was the decision to go to a specialist for the fabrication of the Living Quarters (LQ) rather than including this activity within the scope of the main contract for the CPP fabrication. A separate project plan was developed and project management team was assembled for this work package which was awarded to Lamprell and fabricated in Sharjah, UAE. This team functionally reported to the Project Manager, who at the time was located in Batam leading the CPP fabrication effort.

Overall cost savings of 26% over the original project estimate is attributed to project controls, soft market conditions, contracting strategy and the incorporation of lessons learned. As described previously the project design team also made extensive use of the lessons learned from the South Pailin project. In fact, they incorporated 218 suggestions from the first project, which contributed to capital cost savings of some $17m (12%) against the definitive cost estimate and CPP capacity increase of 25% above design.

The engineering design formed the basis for the scope in the main contracts (CPP & LQ) and the procurement strategy (Company Furnished Mechanical Equipment – CFME) The contract and procurement documentation specified the quality, time and cost performance requirements, verification procedures and reporting for the contractors and vendors. Project scope change was administered through the change control system and design change notice system previously described.

5. PROJECT TIME/SCHEDULE MANAGEMENT

Work on conceptual and preliminary Engineering Design originally started in 1997 with a gas delivery date of October 2001. Initially Unocal was put under pressure to fast track the project for a gas delivery date of October 2000. However as the effects of the economic crash were realised the project went through a series of stop/start decisions before the project was suspended in March 1999. By this stage 12 volumes of documents had already been prepared. Despite ongoing uncertainty a revised gas delivery date was agreed for 1 July 2002. Detailed Design was re-started in October 1999. At that time the schedule was baselined with a planned design completion of September 2000. Despite the gas market uncertainties, Unocal was able to sign the fabrication contract with McDermott on December 12th 2000. Completion of Fabrication and preparation for the Load-Out was scheduled for December 2001. Some minor fabrication was completed offshore after the installation of the facilities during the 1st quarter of 2002. An outline Project schedule and milestone plan is contained in Appendix 5.

The objective of schedule management for the project team was to deliver the gas to PTT in contract quantities on 1st July 2002. Only a 30 day window was allowed by the Gas Sales Agreement for gas to be delivered prior to 1st July. There was no point in being months early, as the gas could not have been sold. The point of the schedule management for this project was to deliver within a month of the required date – no earlier and certainly no later.

A Contract Master Schedule was specified in the CPP fabrication contract. This was a key contractual document used in conjunction with the milestone plan and manpower forecast for schedule monitoring on a weekly basis by McDermott, who provided Unocal with a schedule performance report throughout the duration of the fabrication. This report contained detailed information on cumulative early, late and actual performance for each of the fabrication work packages as well as an overall view. Unocal was able to closely monitor the performance and McDermott was able to benefit from bonus payments in meeting critical milestones early.

A Critical Path analysis showed that the CPP and LQ fabrication schedule had less than one month of float and this month included less than two weeks of float for offshore work. Management of the schedule was therefore critical and this was administered through well planned and proactive progress tracking, analysis and control of the schedule activities. Unocal clearly communicated to McDermott and Lamprell the need for tight control and described detailed requirements for schedule control and reporting. These included content detail, format, frequency and clear responsibilities between client and contractor.

The hookup and commissioning schedule was broken down to all tasks requiring completion on a subsystem basis. Ten hookup areas were defined and each task to be performed was broken down on a discipline basis of all the subsystems within these areas. The hookup included hydrotesting of each tie-in-piping spool and reinstatement of the instrumentation systems following the hydrotest. Additionally all details required for completing the mechanical equipment, electrical works, instrumentation works were

clearly identified and tracked using the Project Information Management System (PIMS). PIMS was an excellent tracking tool and provided real time information regarding the real progress of the offshore work. Dossier packages were tracked as well as the punch list.

During Commissioning and start up, the schedule was of critical importance as float was almost non-existent. A dedicated Project Controller was employed to assist the Start Up Manager by tracking and managing the schedule on a daily basis in order to reduce the risk of not meeting the conditions of the GSA, i.e. delivering gas on the 1st July. This could have resulted in a significant penalty. The detailed schedule was developed after a "Work Package Interface" workshop was conducted during which the Work Package Managers outlined their deliverables, support to other Work Packages and needs from other Work Package Managers in order to accomplish their deliverables. The product from that exercise was then translated into a detailed WBS and schedule. Extensive coordination through weekly progress meetings between the Project Manager, Start Up Manager, Project Coach, Project Controller, Project Owner and Work Package Managers ensured continuous communication of progress, risk updates, remaining work and problem areas. As a result, any problems were identified early and resolved. First gas was produced on 23rd of May 2002 one month ahead of schedule and first sales made on 20th of June 2002.

One significant item was the use of a "range" approach to planning and tracking the schedule progress in which both the "early" and the "late" schedule were plotted and progress was tracked. This allowed the team to know the safe limits within which the actual progress could vary. When the actual schedule progress got dangerously close to the late dates, additional analysis was conducted to identify the reason(s) and take swift corrective action. An example of that chart is shown in Appendix 6.

Two major risks were identified that could have affected the schedule:

- Carry over of onshore fabrication work into the offshore scope. This was managed through design innovations that allowed maximum amount of fabrication, pre-commissioning and testing to be completed in the yard prior to sail out.

- Offshore weather downtime. This could not be avoided, but the effect of this risk was mitigated. This was achieved by planning the sail-out well in advance to avoid the typhoon season. Any slippage would have resulted in delays to the hookup and initial startup. Contingencies were also included for other weather risks such as temporary accommodation on the platform if the barge had to leave due to bad weather.

Neither of these risks came to fruition. McDermott completed fabrication of the CPP ready for sail out and installation according to schedule.

6. PROJECT COST/RESOURCE MANAGEMENT

In mid 1997 an Order of Magnitude estimate was prepared that indicated a total project cost for North Pailin of $170 million. This provided the basis for the approval of the Master Approval for Expenditure (AFE). Each project phase had to gain approval for individual Phase AFE's against this Master. The Order of Magnitude estimate was based on historical information, project data from other projects of this type as well as expert advice. A significant amount of historical information on procurement packages was also used.

In the 3rd quarter of 1999 a Definitive Estimate of $142 million was developed. The project team was able to refine the 1997 estimate and cut this by some $28 million based on

- information of actual costs from the recently completed South Pailin project
- industry technical innovations that were available to the North Pailin project
- the design incentive program
- preliminary vendor information indicating 'soft' market conditions

The Definitive estimate provided the cost baseline and forecast against which to track project costs as detailed below in comparison with the actuals. The project completed with an actual cost of $125million, or a 12% saving against the definitive estimate.

NORTH PAILIN PROJECT FORECAST ($millions)					
	98/99	2000	2001	2002	Total
Prelim & Soils	*Commercially Sensitive*				
Detailed Engineering					
CPP Procurement					
CPP Fabrication/installation					
LQ Module					
Total Planned	**2.6**	**38.8**	**73.8**	**25.4**	**141.6**
Actual	**2.6**	**26.8**	**75.8**	**19.8**	**125**

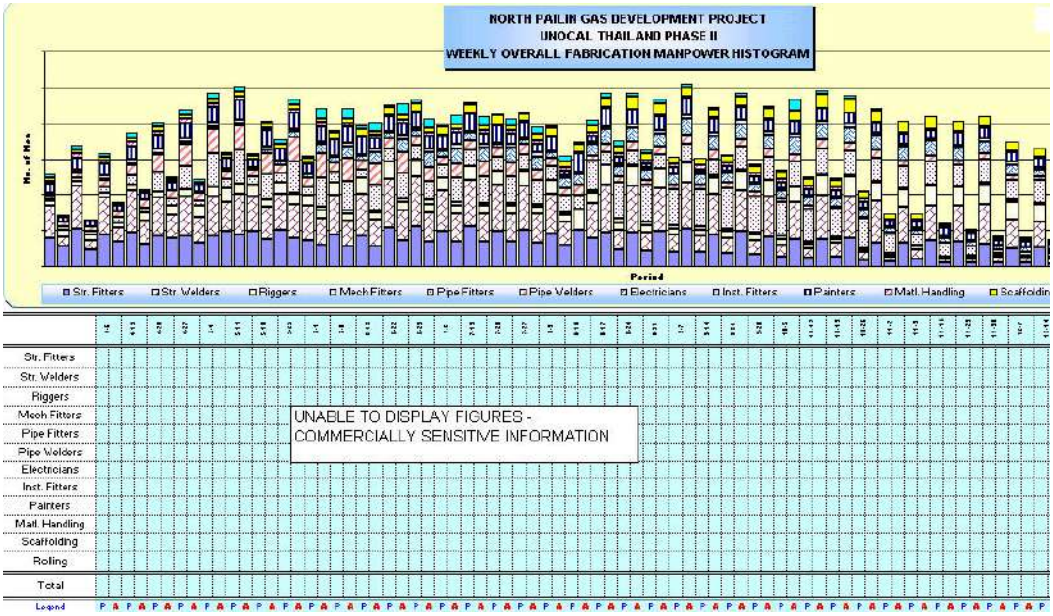
Cost savings against plan were achieved due to:

- Ongoing incentive program during design, fabrication and installation phases
- Procurement items purchased when market was slow and deals were good
- Rigid change control to prevent cost escalation

The definitive estimate included a contingency amount to cover the cost of risk response measures. The amount was calculated after critical project risks had been identified and the cost of their response strategies estimated. Risk monitoring was closely linked to cost tracking. When the potential for the occurrence of a risk event passed, the costs held in the project contingency against that particular risk could be returned to the Company. These "contingency drawdowns" were implemented throughout the life of the project and as a result, the Company made timely use of the money for other projects, instead of waiting until the end of the project.

A Cost Tracking system was developed and specified to the contractors so that costs were collected, tracked, reported and forecasted in a similar manner. The project team collected the reports, analyzed and forecasted the cost at completion. The contingency drawdown was done when the forecasted costs resulted in a significant reduction to the Estimate at Completion. An example of the cost-tracking curve is attached in Appendix 7.

McDermott provided a resource histogram for manpower forecasting and follow-up weekly updates of each craft or trade at the fabrication yard. The total number of personnel at the peak was 1,018, which equaled to a total of 2.7million man-hours for fabrication. The resource histogram was reviewed jointly and was used to compare actual versus planned resources and identify trends that could pose problems. For example early in the project, Unocal and McDermott identified a trend that was showing a decline in progress. After resource histogram analysis the problem was identified as a decrease in the number of welders. McDermott took immediate action and the problem was rectified. A copy of the weekly histogram is shown below:



7. PROJECT QUALITY MANAGEMENT

Quality Planning

Project Quality management expectations were expressed through:

Project guiding principles
These were the same in the project plan for every phase. A sample is shown in Appendix 3.

Scope statements
The project plan for each phase also contained a quality statement. The following is from the Procurement Phase:

> "The Engineers are responsible for defining what is required and the acceptance criteria. They shall design equipment that is reliable, easy to maintain and has low life cycle costs. The inspection team is responsible for ensuring that the item that was ordered, is what is received. The Engineering contract with Worley places Worley with the responsibility for the overall design and holds them liable for any physical rework caused by a design error. Worley has specified in the RFQ's that the equipment Vendors must issue a performance guarantee for its piece of equipment that is a pass through to Worley/Unocal. A statement relating to quality. The following is from the Procurement phase:

Project Objectives and deliverables
These varied according to the project phase (see Appendix 3 for an example of a charter).

Business Trade-offs
Quality & reliability were stated in all project phases as the most important trade off as follows:

> "Quality and reliability in project execution are the first priority because the CPP must be able to achieve better than 96% online time from start up throughout the duration of the Concession per the Gas Sales Agreement. It will also be manned by a smaller number of operations and maintenance personnel. The platform must be efficient and cost effective to operate and maintain. Equipment will be procured with reliability and ease of maintenance in mind. This will mean paying more for the equipment and deliveries could be longer to meet the quality demand."

Specifications
Four sets of Unocal Thailand general specifications –

- General
- Technical
- Installation
- Equipment

These were very clear and were specifically written for oil and gas construction projects to provide very specific guidance. They removed uncertainty, provided risk control, made needs and expectations explicit. These have been developed over a long period of time to uphold quality expectations. During preliminary engineering they were reviewed and updated to incorporate lessons learned and cost savings identified through design workshops. McDermott and other team members commended the quality and clarity of these documents, which enabled them to better perform and communicate with the Unocal project team.

Quality Assurance & Control

Quality Assurance and Control were seen as critical to meet the quality objectives. A QA/QC Manager was therefore appointed to oversee the quality aspects of both the CFME and the Fabrication, installation and commissioning. The tools used were:

Contract Specifications
CFME contracts required:

- Plant survey report forms to technical & production capabilities
- Vendor Quality policy
- Vendor Inspection & Test Plans (ITP)
- Vendor documentation on staff qualifications, material test reports and repair procedures

Inspections
A large team of skilled inspectors was deployed on a worldwide basis to inspect and test the CFME equipment during manufacturing.

The Quality Surveillance Specification defined the minimum requirements for the provision of the Third Party Inspection Services and Expediting. A master Inspection and Test Plan (ITP) was developed and identified the level of inspection required for each CFME package. This included initial inspection meeting, material inspections, random visits, hold points, factory acceptance test (FAT), review of vendor quality plan and Manufacturing Data Reports (MDRs).

Inspectors were also employed in the fabrication yard for the CPP and in Sharjah for the LQ fabrication inspections. Detailed roles and responsibilities for each inspection position were prepared to assure knowledge and quality performance. (See Appendix 8).

Overage, Shortage, and Damage (OS&D) Report
Every CFME package went through a thorough OS&D Report on arrival at the fabrication yard. There were no significant items outstanding on the received equipment but minor punch list items were identified. A small team of 5 workers prepared punch lists. Minor punch list items were resolved onshore resulting in huge savings if these had been left till offshore.

Continuous improvement
Throughout the entire project it became very clear that good document control was necessary to maintain all the drawings, reports, correspondences, etc. Literally thousands of documents are created on a project of this size. Worley's "Incontrol" document software proved to be an excellent tool to track the project documents. During the course of the project a tracking mechanism was establish to show the progress of all the Installation and Operating Manuals (IOMs) and Manufacturing Data reports (MDRs) on the CFME. Each package was reviewed for completeness by the site project team and required a formal sign off by the discipline engineers and the document controller. Organizing and shipping of the final project documents can be a daunting task. Significant emphasis was placed on organizing the documents for shipping from the work site and improvements made in this area when compared to previous projects.

A Document Control Handling and Hand-Over Procedure for the project was prepared. The objective of this procedure was to define and document the Engineering, Design, Fabrication, Vendor documentation, drawings handling and handover process to Unocal Thailand for the NPCPP project. The procedure defined responsible parties or focal points for the handling, sorting, filing, packing and labeling of final documents/drawings to be shipped to various Unocal locations, upon completion of the NPCPP project in Batam Indonesia.

Audits were performed in the field to ensure the contractor built the project in accordance to the design. Piping and Instrument Diagrams (P&IDs) along with other pertinent documents formed the basis of the audits. This process ensured that all piping and instrumentation works were completed.

All drawings were closely monitored to ensure the accuracy of the as-built status. Final drawings were updated electronically, Issued As-built, and handed over the operations within 6 months of startup.

Project Information Management System (PIMS) was utilized throughout the fabrication and hookup and commissioning phases. The project works were broken down in systems and subsystems and subsequently broken down by disciple tasks and testing such as mechanical, electrical, instrumentation, hydro and nitrogen leak testing and reinstatement.

Lessons Learned were carried out during each project phase (Detailed Engineering, Fabrication and Offshore Installation, Hookup and Commissioning, Procurement including QA/QC, and LQ Fabrication). These have been included in Unocal Thailand's database as well as the Corporate Global E&C Web Site for use on future projects.

Innovation incentive program.
During design engineering an incentive program was introduced to encourage innovation in the design whilst meeting 'fit for purpose' objectives without "gold plating". The first idea saved the company enough money to cover the cost of the program many times over and AUS$1000 was awarded to the person who came up with the idea.

Client Expectations

The end product delivered to the client was recognized as a state of the art CPP and LQ far exceeding expectations and the operational capability of previous platforms in the Gulf of Thailand.

- Reliability – exceeded the 96% online objective. In fact, delivered 99% for the first five months and has been delivering 98% since. No other Unocal facility in SE Asia has been able to post this level of online efficiency
- Capacity – Delivered 10% more capacity than design over a 24-hour period. Customer demand restricts the need to increase this capacity, however testing has shown that the facility can achieve 25% greater capacity than the design criteria.
- Throughput per employee (an indicator showing gas sales per employee on the platform) on the North Pailin Platform proved to be three times better than the next best Unocal facility in the Gulf of Thailand and five times better than the average.
- No major punch list items outstanding after handover to operations
- The Quality of the LQ accommodation is generally accepted to be superior to all the other LQ's in Unocal operations in SE Asia

8. PROJECT HUMAN RESOURCE MANAGEMENT

Organizational Planning & Acquisition

Expertise, availability and commitment of the project team members represented the fundamental requirements presented by the project owners and project manager in the selection of team members. In order to meet these requirements very detailed position descriptions and a responsibility matrix were completed for each phase of the project. An example is contained in Appendix 8. They were referenced continuously and represent one of key reasons why the project ran smoothly – everyone knew what they were meant to be doing.

Two project owners were assigned (See Appendix 9). This provided leadership from both operations (Raymond Walker - Pailin Asset Director) and Engineering & Construction (Dave Byford). The result was a life cycle focus for the project rather than the typical approach of the leadership coming from one or the other stakeholder.

The project owners selected a Project Manager, Al Diaz, from Unocal Thailand; based in Bangkok, and subsequently transferred to the Global Construction Group of Corporate E&C. Al Diaz had over 21 years of oil and gas industry experience and three years of experience in similar types of projects. He was therefore well placed to manage the North Pailin project. He also had experience in the operational side of the business so was able to understand a customer view of the project. He was re-located from Bangkok Thailand to Perth, Australia and Batam, Indonesia to manage different phases of the project.

Multiple stakeholders participated in the team as team members, which was instrumental in ensuring that the needs of the project were met. The project organization was that of a 'dedicated project team' as Unocal realized that to deliver the project within such tight time frames required a focus that could not be achieved through a matrix operation. Core team members were selected from within Unocal Thailand, the Engineering Team from Worley and the successful main contractors, McDermott and Lamprell for the construction of the Living Quarters. The Unocal Thailand organization Chart is contained in Appendix 9. The Unocal project team was populated with a mix of E&C and operations members. The operations members form the Thailand business unit were involved in the design, fabrication and hook up phases. They were able to represent the client perspective to solve potential problems early, rather than leaving an issue which might require re-work or result in a long punch list. This was essential in terms of life cycle planning and management for the asset. The transition period from hook up to commissioning was flawless and represented the fastest hookup ever undertaken by Unocal Thailand.

One of the critical success factors was the value of having the Worley Engineering design team located with the rest of the Project team at the fabrication yard. This was actually a lesson learned from the South Pailin project where the Engineering team was in a different location. The benefits of collocation proved invaluable in terms of design queries being addressed within one or two days rather than having to wait for long distance responses which typically take 7 to 14 days to resolve. It also reduced misunderstandings in query response, clarified uncertainties and supported team development activities and growth.

North Pailin was a 33-month project from start of Engineering, through Fabrication, Installation and Commissioning. Unocal and Contractor work hours totaled 3.6 million hours during this period. The resource usage was reported by the contractors through weekly progress reports, which included a resource histogram broken down to show number of men employed by trade and week. See sample report in section 6.

Team Development

The McDermott, Worley and Unocal teams worked together to build collective teamwork for the project. The core team members were located together in temporary offices in the Batam fabrication yard. All the organizations recognized this as an excellent exercise in building trust and partnership and working towards common goals. The excellent relationship between the parties was one of the successes of the project. Worley, McDermott and Lamprell (LQ) are all highly supportive of the submission for the Project of the Year award and believe North Pailin represents an excellent model worthy of nomination.

Locating the team in Batam Indonesia posed many challenges for team members and a special management approach as described in Section 2. Despite these challenges, during their presence in Batam, the team never felt threatened and were very well received by the community.

The international team mix, was promoted through national theme dinners, lunches and other functions. In particular, team dinners were organized when milestones were completed and team members were also presented with team polo shirts, baseball caps, insulating can holders, and a special project momento – a multi-tool symbolizing the tools required to complete a mechanical task. There was also a logo competition to design the North Pailin team logo that was unveiled at a team party.

Golf tournaments, go karting, bowling events, lunches and parties were organized for both the local and expat community. There were 3000 workers in the fabrication yard at Batam, 1000 of these jobs were created as a result of the North Pailin project. The remainder were working on other projects that McDermott was able to secure after winning the Unocal contract and re-opening the yard. This represented a tremendous boost to the local economy.

The innovation award program initiated during the design phase encouraged teamwork as well as saved money. The scheme was proposed by Unocal and was fully supported by Worley.

Health and safety management were extremely important to the project team.

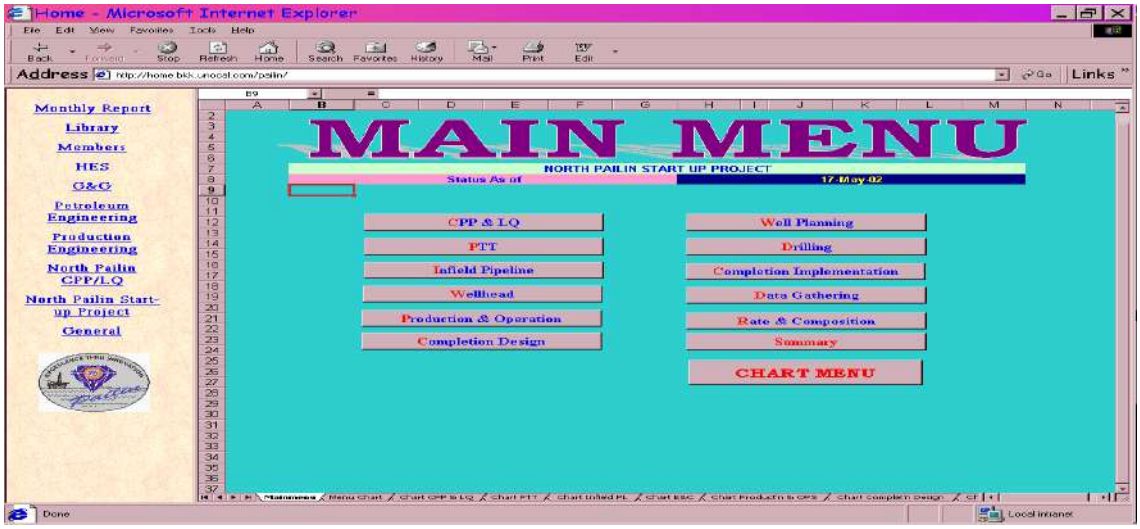
- There were weekly safety walkabouts by Unocal & McDermott.
- The OSHA recordable rate was 0.6 measured against 1996 NSC industry average of 4.2 with only 1 LTA over 3.6 million manhours throughout the life of the project.
- A safety award and incentive program was introduced to both encourage safety and develop teamwork. Special recognition awards from this program included prizes such as motorbikes, motorcycle helmets, bicycles, VCR, TV's, T-shirts, caps, soccer balls, CD's & gift vouchers.
- An emergency and evacuation plan was prepared
- Disease monitoring, medical checks and hygiene audits were undertaken with medical administrative support from Singapore
- Embassy security notices were posted to keep track of advisory notices.
- Unocal's Corporate E&C Operations Management System was also used for the first time. It defined the standards and activities required to be performed to be in compliance with Company guidelines.

The Project offices in Batam were also visited by other stakeholders external to the immediate project team

- Corporate E&C off site staff made frequent visits to Batam and offered assistance as required.
- Unocal Thailand support groups also made frequent visits to Batam and provided necessary interface; such as, the Communication Department, Metering and Measurement Department and Unocal Thailand Engineering and Construction Department.
- The project owners also closely monitored the project and made several visits to the fabrication yard.

9. PROJECT COMMUNICATIONS MANAGEMENT

Project communications was viewed within the context of a spirit of "win-win", cooperation and openness. This was communicated up front and reinforced throughout the project by everyone on the team.



The Project Plan for each phase of the project contained a communications plan. This identified the project audiences and described the communications requirements, methods and timing for all team members during that phase. The primary method of information dissemination was email. This enabled communications with team members and vendors who were dispersed globally. Conference calls and faxes were also used when appropriate. The Pailin Asset team Intranet site also contained a section that carried current information on the North Pailin Development Project. It was used extensively, particularly during the start up phase, for schedule monitoring and reporting progress to stakeholders and team members. The Project Controller designed the site with a control panel menu for ease of navigation enabling one click information access. (see above) The Project Information Management System (PIMS) was used throughout the project for information and document management, in conjunction with information systems used by Worley and McDermott.

Formal communications were in the form of team meetings, weekly reports and monthly reports.

Meetings
Interfaces between the project team and the functional groups at the Business Unit office were established and strengthened, by designating single points of contact for the various stakeholder groups, i.e. Pipelines, Metering and Measurement, Corporate Communication, etc.

At the start of each phase a formal kick off meeting was held with all parties. This enabled participants to gain a collective view of the objectives and deliverables for that phase. This was particularly important in developing the communications and relationships with the project contractors for the CPP and LQ.

The Project Manager made quarterly presentations to key stakeholders both internal and external. Informal presentations were often undertaken for visitors to Batam about the project and for site safety orientation.

Reports
Guidelines specifying consistent reporting requirements for the fabrication contractors were developed early in the project by the Unocal team and communicated to both McDermott and Lamprell. These requirements ensured that data collection and reporting was done in a consistent manner, and included format, level of detail, frequency and responsibilities.

McDermott and Lamprell developed a **weekly progress report** during the fabrication phase. The project manager used this to prepare a high-level executive progress summary for the project owners on a weekly basis

The Project manager developed **monthly Reports** for distribution to stakeholders within the organization. These summed up the cost and schedule progress for four weeks and included an earned value analysis. This covered the CPP, LQ and CFME items. A summary of this report was also contained in the Pailin Asset team monthly report, which was distributed to Thailand Business Unit VP's and senior management.

Project owner Raymond Walker, also communicated monthly reports to the external block 12/27 Partners and managed any other external communications. This enabled the team to focus on the internal project team communications.

Document Control System
A document control system was developed, which mirrored the Work Breakdown Structure of the project and was kept up to date on a continuous basis. At the end of the project, it facilitated a seamless transfer of records to the various record keeping locations.

Community Relationships
Unocal's corporate responsibility program seeks to "improve the lives of people wherever we work." Unocal has always developed a significant stake in the social and economic viability of the communities, in which it works and invests. Developing an excellent relationship and supporting the local community in Batam was therefore very important. The people in Batam had a very low standard of living; there was extreme poverty, malnutrition and high crime rates in certain areas. Unocal embarked on a program of community support. This included

- Food donations
- School scholarships
- School equipment
- Sporting goods donations
- Dental chair donation (photo attached on page 22)
- The McDermott Women Employees Club assisted it in some activities. A letter to the chair is contained in Appendix 10.

Project Close out & Lessons Learned
The project plan for each phase contained the requirements for project close out documentation, turnover activities and lessons learned.

The use of previous lessons leaned and capture of new ones was extensive on this project. 218 lessons were captured and used from the South Pailin project, which had been completed in 1999. The use of these lessons lead to some of the innovations that contributed to the capital cost savings increase in capacity of the platform. Some of the lessons learned have already been listed in section 2.2

A two-day lessons learned workshop was conducted at the end of each phase of the project. Approximately 500 lessons had been collected, through this process, by the end of the project. The format for capture of the lessons was developed especially for the North Pailin project and considered various critical factors such as cultural dynamics, time availability and location of participants, etc. This format has since been used extensively throughout Unocal Thailand and other worldwide business units.

10. PROJECT RISK MANAGEMENT

Risk management planning was undertaken at the start of every project phase during a risk identification and analysis workshop. This used a checklist of potential internal and external risk sources to trigger participation. The risk analysis was qualitative and the Project Management Coach and Project Manager facilitated the sessions. The following template was used:

Risk Description	Prob. Of Occur (H/M/L)	Potential Effect (H/M/L)	Risk Response	Action By Whom	Action By When
1. If the CFME items are delivered late, then the fabrication of the CPP will be delayed	M	L	• 56 days float built into schedule of most pieces of CFME • etc	Procurement Manager	Ongoing
2. etc					

A detailed response and action plan was prepared for those risks with a combination of medium/high or high/high probability and potential effect. (See Appendix 11) Actions were subsequently included in the project schedule if necessary. These risks and responses were re-visited throughout the project and managed as appropriate. The following five items were identified as the most critical risks to the project, requiring detailed response plans and action. Most related to the potential for project delays, all were managed without coming to fruition.

Gas market fluctuations resulting in uncertainty
This has been described previously in sections 2.1 and 4 and was the biggest challenge facing the management team. The uncertainty meant that Unocal had to develop an innovative response strategy to keep the project on track whilst not committing resources that might be wasted. This was a delicate balancing act that ultimately turned the risk into an opportunity. The procurement strategy described in Section 11, in particular, saved the company millions of dollars.

Schedule delays resulting in late delivery
There were many and varied causes of potential schedule delays in every phase. During procurement, there were risks around the late delivery of CFME in the fabrication yard. Adequate time for the delivery of the CFME which contained 56 days of delivery float was built into each item and contingency was planned to enable extra labor for installation in the yard prior to ship out. The contract was designed with heavy liquidated damages for late completion. Payments were made relating to milestone achievement and percentage progress to encourage completion. Incentives were also in place for early mechanical acceptance, which was achieved 27days early.

During commissioning & start up a project controller was employed to closely monitor and update the project schedule to enable the team to have early warning of potential delays and take corrective action. Progress information was gathered weekly from all work package managers and weekly team meetings were held with the project owner and selected work package managers whose tasks were on the critical path. An issues log was also used to closely track actions required from the team meetings. The project owner knew the status of the schedule and the project management tools and techniques applied reinforced his confidence in the ability of the team to meet the GSA target.

The Installation Lift had the potential to be costly and cause delay
In South Pailin Unocal had to engage one of the largest barges in the world to undertake the CPP installation. This proved costly. For North Pailin the team wanted to reduce the costs and the potential risk should a large barge installer be unavailable in the region when required. The team therefore designed the CPP decks not to exceed 2500 tonnes. This increased the number of bidders for the installation lift and reduced the costs in comparison to South Pailin. Furthermore engaging a third party to inspect and certify the cranes mitigated the risk of dropping the CPP into the sea during the lift.

Fabrication in Batam Indonesia
Fabrication of the CPP in Batam was risky for a number of reasons.

- The yard had been mothballed and required a cold start.
- There was political unrest.
- There were health issues

Unocal's contract with McDermott and team approach got the yard running swiftly. Unocal identified community development initiatives in order to support the local community and it developed a medical plan and support strategy to mitigate any health issues.

The selection of the LQ Fabricator
It was the strategy to tender the LQ separately from the CPP construction. This allowed highly specialized LQ vendors to participate in the bidding besides the fabrication yard contractors such as McDermott. There were a number of potential vendors for the LQ. Unocal took a risk in selecting Lamprell as it was predominately a LQ refurbishment company rather than new build. However Unocal recognized the capabilities of this company and turned the risk into an opportunity through their selection, which also resulted in significant cost savings. Lamprell was so experienced in refurbishment Unocal had confidence in getting a quality new build product of the highest standards.

11. PROJECT CONTRACT/PROCUREMENT MANAGEMENT

Every major E&C project is unique, however, there were several key market forces in effect at the time the North Pailin project was sanctioned which affected procurement strategy. These market forces were

- there was a possibility that the project would be suspended due to the downturn in the economy
- there were punitive economic consequences for non-delivery of gas by the contractual delivery date
- the market for oil and gas equipment was extremely soft as few orders were booked with suppliers.

The conditions above created both opportunity and downside for Unocal contracting and procurement. The opportunities included

- to leverage the soft market conditions and book orders with qualified suppliers at very low prices
- to obtain equipment deliveries that would ensure the contractual gas delivery date was met
- to lock in pricing of parts and service through warranty (3 years)
- to negotiate favorable terms and conditions such as extended warranties, liquidated damages and banker's guarantees.

The downside was

- there was a moderate probability that the project would be suspended until the Asian economy recovered,
- if the project did not proceed on schedule Unocal would be penalized for non-delivery of the gas unless the Thai government actually agreed to a renegotiated delivery date
- without the renegotiated delivery date, Unocal had to proceed as if the project was a full go,
- a procurement strategy had to be developed that would maximize the market opportunity, stay on schedule and minimize the financial commitment to suppliers should the project be suspended.

The procurement strategy adopted was to first continue engineering work through the Approved for Construction (AFC) phase. At this point it would take minimal effort to restart the process at a later date should the project be suspended. To reach the AFC stage would require the suppliers to submit all documentation and drawings for Unocal approval. Equipment suppliers are in the business of selling equipment and not performing engineering work. Once the order was placed, their system was set up to ensure there was continuous progress through delivery of the goods. As Unocal wished to lock in the benefits of the soft market and yet minimize financial commitment it was decided that the best strategy was to split the order into an engineering portion and a fabrication portion. The entire order was placed with the supplier which ensured that the supplier would actively engineer the package including drawings and data packages but could not proceed with fabrication without Unocal's approval (or they did so at their sole risk). A suspension schedule was negotiated with the supplier should they reach the fabrication stage and not be able to proceed while awaiting Unocal's approval. Basically, the fabrication could be held up for 6 months without any financial impact to Unocal. After this point the price would be increased

by the amount agreed in the schedule. The negotiations to split the orders were difficult but successful and eventually the fabrication hold was released and the required schedule was maintained.

Unocal and McDermott both had procurement responsibility for the project. Unocal was to purchase and deliver major process equipment, controls and primary steel to the contractor for incorporation into the platform/modules. The contractor was to purchase all remaining steel, hook-up material (piping, valves, electrical, etc.), and to provide testing and commissioning services through mechanical acceptance of the facility.

Customer Furnished Material and Equipment (CFME)

Unocal Engineering and Construction projects in the past have been based on the fabrication contractor procuring the major process equipment, controls and steel. Due to the extremely short time Unocal had to meet the contractual gas delivery date it was decided that Unocal was in the best position to procure, inspect and ship the required equipment to meet the delivery schedule. This process began months before the fabrication contractor was chosen. The scheduled start-up date could not have been met if procurement of this equipment remained in the Contractor's scope of work.

Procurement's roles and responsibilities are summarized below:

The Request for Quotation (RFQ) process:

1. Approximately 100 equipment packages were to be purchased
2. No pre-qualification due to order placement priority
3. Specifications were prepared at detailed engineering including vendor data requirements
4. Commercial bid package was prepared by procurement including bid instructions, contractual terms & conditions, requirements for spares and service rates to be frozen throughout the term of the contract. This was combined with all engineering specifications/drawings and the RFQ packages were sent to the approved bidders.
5. Bid review was split into a technical review (unpriced copy of the bid) which was conducted by the engineering group and a commercial review (priced) conducted independently by procurement. This process ensured that selection was based on the vendor with the lowest technically acceptable bid

Order Processing, Expediting, QA/QC, Delivery & Warranty

Upon Order placement the following activities were managed by procurement:

1. Split order into engineering and fabrication sections
2. Obtain bank guarantees from all suppliers whose order value exceeds $1mm to cover warranty, liens, or failure to perform. These guarantees ensure maximum leverage with the supplier as the banks will pay immediately on Unocal's notice that the supplier has failed to perform. This is an effective tool and may be utilized for orders above $250,000 in the future.
3. Expediting delivery of equipment and vendor data
4. Change order negotiation and processing
5. QA/QC including third party inspection of all major packages
6. Export boxing, documentation and shipping of material to fabrication site
7. Payments to suppliers based on actual progress made and contractual terms
8. Report effectively to ensure that all pertinent parties know the status of equipment, cost, quality concerns, etc.
9. Resolve overage, short-shipped and damaged shipments (OS&D)
10. Resolve warranty failures
11. Call out supplier's service personnel after mechanical acceptance
12. Close out purchase orders
13. Conduct lessons learned workshops for procurement and QA/QC and distribute to all concerned parties

Procurement staffing was kept to a minimum as the Project Management Team effectively utilized internal Unocal procurement resources already in place such as the Business Unit (Bangkok), Regional (Singapore) and Global (Sugar Land). These organizations were involved in purchases, shipping, documentation and expediting.

Utilization of the procurement strategies above was extremely effective cost wise as evidenced by the actual dollars spent which were almost 50% less than the order of magnitude procurement estimate for the project. In addition, the project was on time and the contractual gas delivery date was met. Actual gas sales revenue was booked prior to the official start-up date.

Contractor Procured Material

The contractor provided the remaining procured materials for the project and Unocal decided that it was prudent to place trust in the contractor's procurement system after ensuring that:

1. The contractor's scope of work was well defined
2. Very tight specifications were provided to and understood by the contractor
3. There was a written formalized process in place for variance to the specification in terms of notification to and approval by Unocal
4. The Approved for Design (AFD) preliminary drawing milestone was frozen prior to detail design and ordering of any major equipment. The intent was that this freeze would allow detailed design to proceed unimpeded and without major variations or scope changes.
5. There was a written formalized process in place for changes in the contractual work scope, which ensured the change was valid and priced per the negotiated unit rates or contract terms. The change was not valid until Unocal approved it.

Other Contracting Measures

Additional contract measures were employed that reduced the need for change order requests and helped ensure that the fabrication schedule remained on track:

1. All pipe support details were completed and handed over to fabricator, which saved them time and reduced Unocal's expense. This was an unusual but effective strategy.
2. A tertiary steel allowance (access platforms, pipe supports, etc.) was bid as part of the fabrication contract. This shifted the responsibility of tracking the smaller fabricated steel items to the Contractor and greatly reduced management's need to monitor this process. Unocal was only to become involved if the total allowance was exceeded and it was not on this project.
3. The Contractor was given a month to review the Approved for Construction (AFC) drawings for completeness. It then became the Contractor's responsibility to provide any missing or incomplete material that was discovered after the AFC design review period.
4. In the fabrication bid package Unocal provided the Contractor with supplier service rates obtained when the CFME equipment was ordered. This enabled Contractor to estimate the hours/cost to submit in their bid to Unocal. The Contractor was solely responsible for calling out suppliers for commissioning & pre-commissioning work. As the Contractor was paying for the service the total number of days and cost of calling out supplier representatives was greatly reduced. In the past this function was Unocal's responsibility and the Contractor would keep the supplier's service personnel on site as long as possible which was extremely expensive for Unocal.

The extremely positive results of employing the strategies above can be demonstrated by comparing the industry average for change orders (3-5%) for projects of this type with the actual for North Pailin which was only 1% after discounting the cost for Builder's Risk Insurance (BRI).

Donation of Dental Chair

APPENDIX 1 – FELI SAMPLE

Front End Loading Index Calculation
Planning Component

Project Planning Front End Loading Index Component
Project Name: NPCPP Fab & Inst

Project Organization	Requirement	Relative Wt	50%	100%	Score
Project Unified Command					
Decision Making Executive	Required	2		x	0.72727
Project Owner	Required	4		x	1.45455
Programme Manager/Director with line authority	Consider			x	
Director of Project Management as functional head					
Full Time Project Manager(s) with demonstrable track record	Required	4		x	1.45455
Assigned Project Manager					
Project Coordinator					
Organizational Breakdown Structure (OBS) and written job respons	Consider			x	
Work Package Manager(s)	Consider			x	
Specific Quality Assurance responsibilities assigned	Required	4		x	1.45455
Project Estimator with experience in subject	Consider			x	
Project Scheduler	Consider			x	
Project Cost Controller	Required	4		x	1.45455
Project Contract Administrator	Required	4		x	1.45455
Planning Tools					
Written business case with comparison of alternatives	Required	4		x	1.27273
Written Objectives and Deliverables agreed with Owner	Required	6		x	1.90909
Specified Phases, Phase Gates, and Phase deliverables	Required	4		x	1.27273
Project Charter	Consider			x	
Requirements Document agreed with owner	Consider			x	
Functional Specifications Document	Consider			x	
Request for Resources to Plan Project Form (RRPP)	Consider			x	
Work Package Agreement Form (WPAF)	Required	2		x	0.63636
Work Breakdown Structure (WBS)	Required	6		x	1.90909
Logic Diagrams	Consider			x	
Resource Histograms	Consider			x	
Contracting Strategy and Plan	Required	4		x	1.27273
Cost Commitment Schedule	Required	2		x	0.63636
Cost Spend Schedule	Required	2		x	0.63636
Bill of Materials	Required	2		x	0.63636
Risk Management Plan	Required	2		x	0.63636
Quality Management Plan	Required	2		x	0.63636
Design Walkthrough	Required	2		x	0.63636
Value Engineering Session(s)	Required	2	x		0.31818
Constructability Review	Required	2		x	0.63636
Communications Plan	Required	2		x	0.63636
Project Skills Assessment and Staff Training Plan	Consider			x	
Project Interface listing	Consider				
Control Tools					
Project Baseline Plan Document (PBP)	Required	4		x	1.27273
Project Baseline cost and schedule	Required	4		x	2.66667
Open issue log	Consider			x	
Project Change Management Procedure	Required	4		x	2.66667
Project Quality Milestones	Required	2		x	1.33333
Project Risk Milestones	Consider			x	
Earned Value Reporting	Required	4		x	2.66667

Planning Component (34%) 32
Design Component (66%) 62
Total FELI (100%) 95

Project Manager: _____ Date: 14/11/00
Al Diaz/Ian Lippiatt

Project Owner: _____ Date: 21 Nov 2000
Raymond Walker Pailin Asset Director

Cost $67MM

Attach one copy to AFE, send another copy to Director, Project Management

Project: NPCPP Fab & Inst

Engineering, Construction and/or Facilites Front End Loading Index Component

			NA	RelWt	AbsWt	50%	100%	Score
1	Design Objective / Philosophy	10		10	7.1		x	7.1
2	Offsite Scope Documentation	10		10	7.1		x	7.1
3	Feasibility Study Results	5		7	5.0		x	5.0
4	External Department Input	5		7	5.0		x	5.0
5	Peer Review	2	x					0.0
6	Permitting	2		2	1.4		x	1.4
7	Corporate E&C Concurrence	2		5	3.5		x	3.5
8	Environmental Impact Assessment (EIA)	4		5	3.5		x	3.5
9	Hazard Assessment for Design	7		5	3.5		x	3.5
10	Hazard Assessment for Fabrication / Installation	4		5	3.5		x	3.5
11	[illegible]	5		5	3.5		x	3.5
12	[illegible]	5		5	3.5		x	0.0
13	[illegible]	1		4	2.8		x	2.8
14	[illegible]	1		4	2.8		x	2.8
15	[illegible]	1		2	1.4		x	1.4
16	[illegible]	2		3	2.1		x	2.1
17	Equipment Specifications	5		2	1.4		x	1.4
18	General Specifications	5		2	1.4		x	1.4
19	Standard Long Lead Equipment Identification	3		2	1.4		x	1.4
20	[illegible]	7		2	1.4		x	1.4
21	[illegible]	7		2	1.4		x	1.4
22	[illegible]	2		1	0.7		x	0.7
23	[illegible]	2		1	0.7		x	0.7
24	[illegible]	2		1	0.7		x	0.7
25	Engineering Drawing Data	1		1	0.7		x	0.7
		100		93	66.0			62.45161

Approval: _____ Date: 14 Nov 2000
Technical Approval

Approval: _____ Date: 14/11/00
Project Manager

Approval: _____ Date: 21 Nov 2000
Project Owner

APPENDIX 2 – DESIGN CHANGE NOTICE

DESIGN CHANGE NOTE FORM

TITLE: Change Crane Power Supply from 208V to 120V AC	DCN No: CN212

DESCRIPTION OF CHANGE:

Change out 2 x 3 Pole circuit breakers in distribution panel DPPL-20 for 2 x 2 Pole circuit breakers to supply a 120V single phase switched neutral power supply to the cranes instead of the existing 3 phase 208 V supply. Short out 3 phase bus in crane juntion box to create single phase bus.

REASON FOR CHANGE:

Crane vendor required 120V but requested a 3 phase supply (208V). We designed the breaker and cable for a 3 phase 3 wire 208V supply but found the vendor required a 4 wire 3 phase and neutral 120V supply. To rectify this, we have taken the simpler option and not changed the original cable selected for circuit (3/C AWG#10) but only changed out the circuit breaker to 2 pole single phase with a switched neutral. The 3 phase bus in the vendor junction box can be shorted to make it all one phase as the load is not too large for single phase. The other option would have been to source a 4 pole circuit breaker (3Ph+N) as well as change the cable to a 4/C AWG#10

SUMMARY IMPACT: (Schedule/Weight/Safety/Procurement/Certification)

Design drawings

ORIGINATOR:	R. Kildea		
HAZOP REQUIRED:		YES ☐	NO ×

INTER DISCIPLINE CHECK RECORD/DISTRIBUTION LIST

DCN Issued for	Inter discipline Review ×				Approved for Implementation ☒	
DISCIPLINE	Yes/ No	IMPACT TO DISCIPLINE DOCUMENTS	INITIALS	DATE	SIGN	DATE
ELECTRICAL	Y		AJG	06/09/2001	AJG	06/09/2001
INSTRUMENT						
MECHANICAL						
PIPING						
PROCESS						
STRUCTURAL						
UNOCAL PROJECT ENGR	Y				5/28/01	
UNOCAL PROJECT MGR						
PROCUREMENT						
ARCHITECTURAL						

DCN Close –out

ORIGINATOR		LEAD ENGINEER		PROJECT ENGINEER	
SIGN	DATE	SIGN	DATE	SIGN	DATE
RFK	28/8/01	AJ Gleeson	06/09/2001	R.D. WALLOCH - 6 SEP 2001	

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1 CHARTER

1.1 PROJECT MISSION

The North Pailin Facilities Project Team will Fabricate and Install the North Pailin Central Process Platform in such a manner that the North Pailin Field will be ready to produce Hydrocarbon in accordance with the Gas Sales Agreement for Block 12/27. This will be achieved in order to fulfil our contractual obligations with PTT and generate revenues for the Company and Partners and thereby increase shareholder value.

1.2 PROJECT GUIDING PRINCIPLES

The guiding principles for this project are :

1.2.1 Zero Lost Time Accidents. Construction is a potentially risky business and extreme care must be taken to prevent losses to people, property and process

1.2.2 The Process Platform must be:

- Available for the introduction of well fluids on or before June 1, 2002
- Ready to produce DCQ quality and quantity of gas at July 1, 2002
- Reliable (online greater than 96% of the time throughout the Concession period)
- Be able to be maintained without a large number of people offshore and without a large contingent of Vendor Reps during equipment turn-arounds.
- Capable of producing life cycle costs that are equal to or lower than the industry standard for that piece of equipment.
- Designed using proven technology and will be developed by building on current 'good industry practices' and standards.

1.2.3 Using shared-participation approach. The project will be designed in a way that Project Team members will be required to be responsible for various Work Packages and to participate in the overall project scheduling and cost control.

1.2.4 The Platform will be user friendly and integrated.

1.3 PROJECT OBJECTIVES

The NPCPP facilities project has three phases. The first two phases, Engineering and Procurement are covered under separate AFE's and Project Plans. The Engineering produced the Equipment package designs and the Fabrication/Installation bid documents. The Procurement component bought the equipment specified during Engineering and will deliver it to the Fabricator. The final phase of the NPCPP facilities project is the Fabrication and Installation. The Fabrication and Installation is divided into the Fabrication and Installation of NPCPP and the Fabrication and Transportation of NPLQM. This Project Plan is for the Fabrication and Installation of the North Pailin Central Process Platform.

1.3.1 Successfully negotiate with the short listed bidders and select the most technically and commercially attractive bid that maintains the intent of the bid.

1.3.2 To sign the NPCPP Fabrication/Installation Contract that minimises the risks to Unocal and the partner group, and provides sufficient wording to focus the Contractor to maintain schedule and costs.

1.3.3 To manage the contract for engineering, procurement, fabrication, load-out, seafastening, transportation, installation, hook-up, precommissioning and commissioning the North Pailin Central Process Platform (NPCPP).

1.3.4 Ensure that NPCPP is mechanically complete and ready to safely accept well fluids by the Second Phase Delivery Date in the Pailin Gas Sales Agreement.

1.3.5 Ensure that the materials to be procured by the Contractor shall be compatible with the That Business Units warehouse stock for like materials and the types of materials are detailed in the Preferred Vendors List.

1.3.6 Ensure that the bids are kept confidential.

1.3.7 Ensure that the materials incorporated into NPCPP and fabrication processes meet or exceed the Contract Specifications and Industry Standards. Each piece of material, equipment and/or fabricated item must be inspected, tested and documented according with said Specifications and Standards, prior to sail-out from the fabrication yard

1.3.8 Ensure that all of the final Vendor Data is collected, verified that it is complete and incorporated into the Vendor Data Dossiers.

1.3.9 Ensure that Company Furnished Materials and Equipment (CFME) is packed in accordance with the General Specification, including all referenced documentation, and transported to the Fabrication Contractor's yard in a timely manner. The equipment delivery shall not have impact on the Contract Master Schedule.

1.3.10 The Fabrication/Installation phase of the project must not clash with the overall schedule. It must merge with the Engineering deliverables, CFME delivery schedules and the Fabricator's schedule to procure, fabricate, load-out, transport, install, hook-up, pre-commission and commission the facilitates to allow well fluids to be introduced onto the platform no later than June 1, 2002. The schedule must also provide access for other parties to complete their work to allow NPCPP to commence production on time.

1.3.11 To promote safe operations and environmental awareness that complies with the Safety and Environmental Policy of the Business Unit and Corporate HES.

1.3.12 To have zero design errors that surface during fabrication, that result in physical rework.

1.3.13 To have a zero fabrication Change Orders related to design errors in the AEC Design Package.

1.3.14 To use a unified Project Team comprising of Corporate E&C, Thailand Business Unit, Seconded PTTEP Engineers, Unocal's Global Procurement and other Unocal entities.

1.4 PROJECT DELIVERABLES

1.4.1 NPCPP shall achieve Mechanically Acceptance and be ready for the safe introduction of well fluids on or before June 1, 2002.

1.4.2 NPCPP shall achieve DCQ quantity and quality gas on or before July 1, 2002.

1.4.3 Spend no more than $70MM for the Fabrication and Installation of NPCPP.

1.4.4 The Installation Operation Manual shall be complete and ready for use on or before March 1, 2002

1.4.5 Vendor Data dossiers shall be collated and distributed within 6 months of mechanical completion.

1.4.6 The as-built drawings shall be finalised and distributed within 90 days of Mechanical Acceptance

1.4.7 The PTT Space Agreement shall be completed within 120 days of Operational Acceptance.

1.4.8 Career development for the Business Unit and PTTEP secondees.

1.5 BUSINESS TRADE OFFS

The following project priorities are identified, in order of importance.

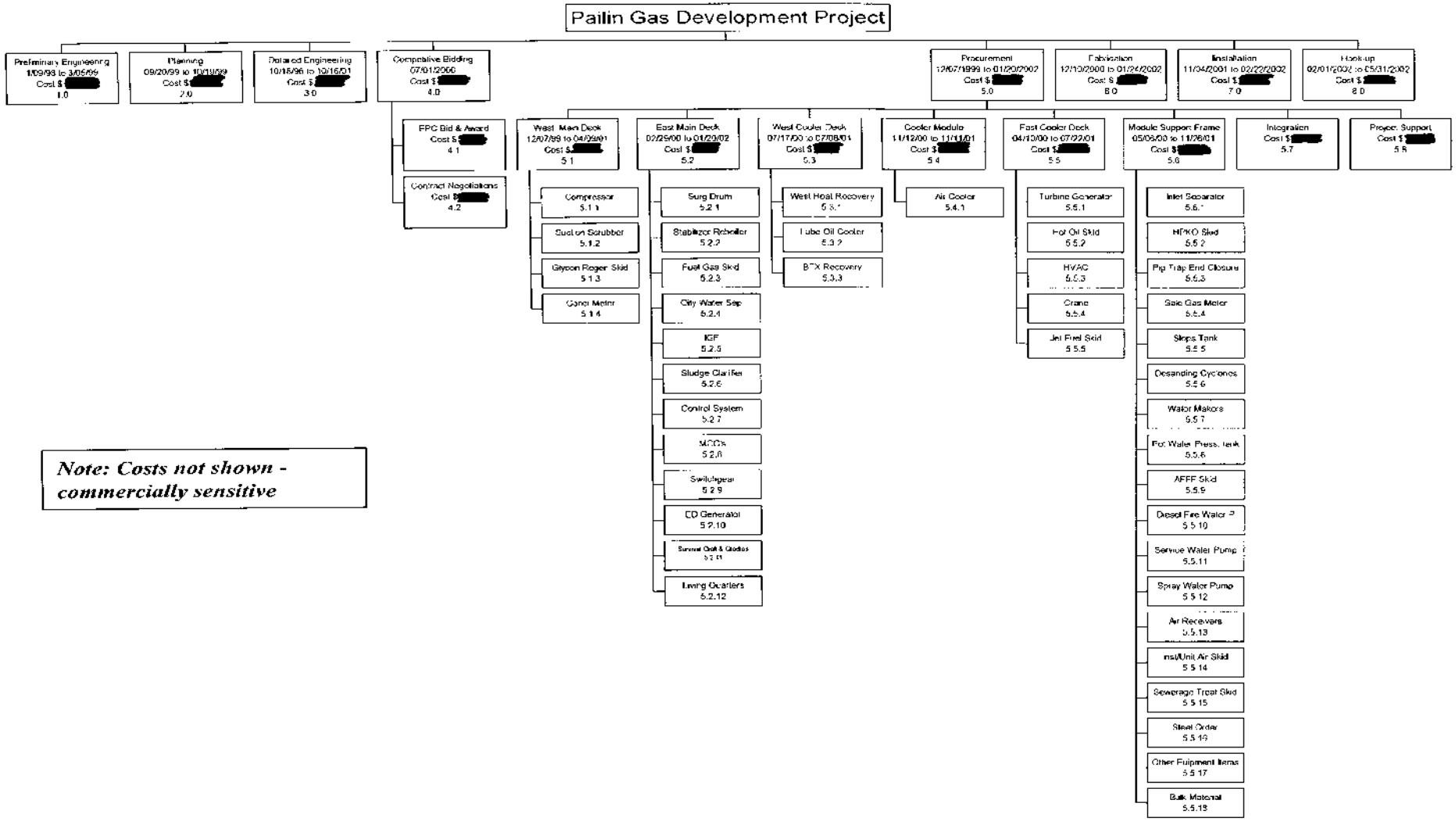
- Quality and Reliability
- Time
- Minimum Cost

Quality and Reliability : Quality and reliability in project execution are the first priority because the Central Process Platform must be able to achieve better than 96% online time from start-up throughout the duration of the Concession, per the Gas Sales Agreement. It will also be manned by a smaller number of Operation and Maintenance personnel. The platform must be efficient and cost effective to operate and maintain. NPCPP has been designed and will be constructed with reliability and ease of maintenance in mind. The fabrication contract is very descriptive and it includes a very detailed Approved For Construction set of documents. The quality aspects for the NPCPP fabrication and installation have been defined in these documents.

Time : While meeting the quality and the reliability requirements as the first priority, minimum cost and time are ranked equally as second priorities. The schedule does not have excess float and any delays may not be able to be recovered if not acted upon and rectified quickly. It is a requirement of the Pailin Gas Sales Agreement that NPCPP shall be ready for commencement of the "30-day commissioning period" on June 1, 2002. The Second Phase Delivery Date is July 1, 2002 and NPCPP must produce DCQ quality and quantity gas from that date forward. Certain CFME deliveries packages are being expedited as any delay in the Required On Site dates of the major pieces of equipment may effect the fabrication schedule and this could delay the overall project. Changes or improvements in cost and time will be made only if they are determined to improve safety, quality and reliability.

Cost Efficiency : The fabrication and installation project has been bid in a very cost competitive business environment, caused largely by the delay in some other major projects. The project team will strive to maintain minimum cost by strictly controlling any requests for changes of scope. These changes in scope normally result in Changes Orders for the Contractor. Any change in scope must add value to the project.

APPENDIX 4 – PROCUREMENT PHASE WBS



Note: Costs not shown - commercially sensitive

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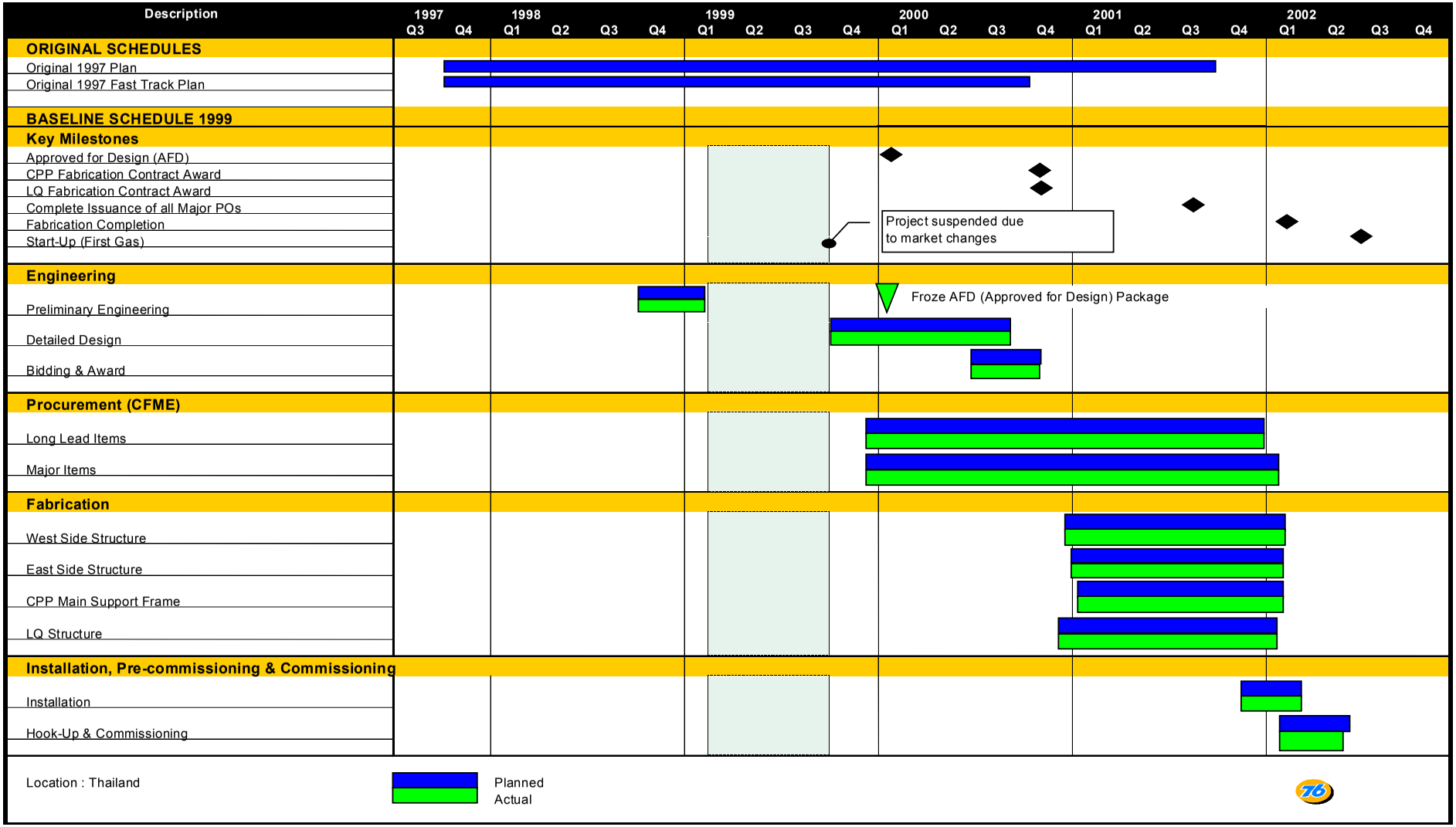
APPENDIX 5 OUTLINE SCHEDULE AND MILESTONE PLAN



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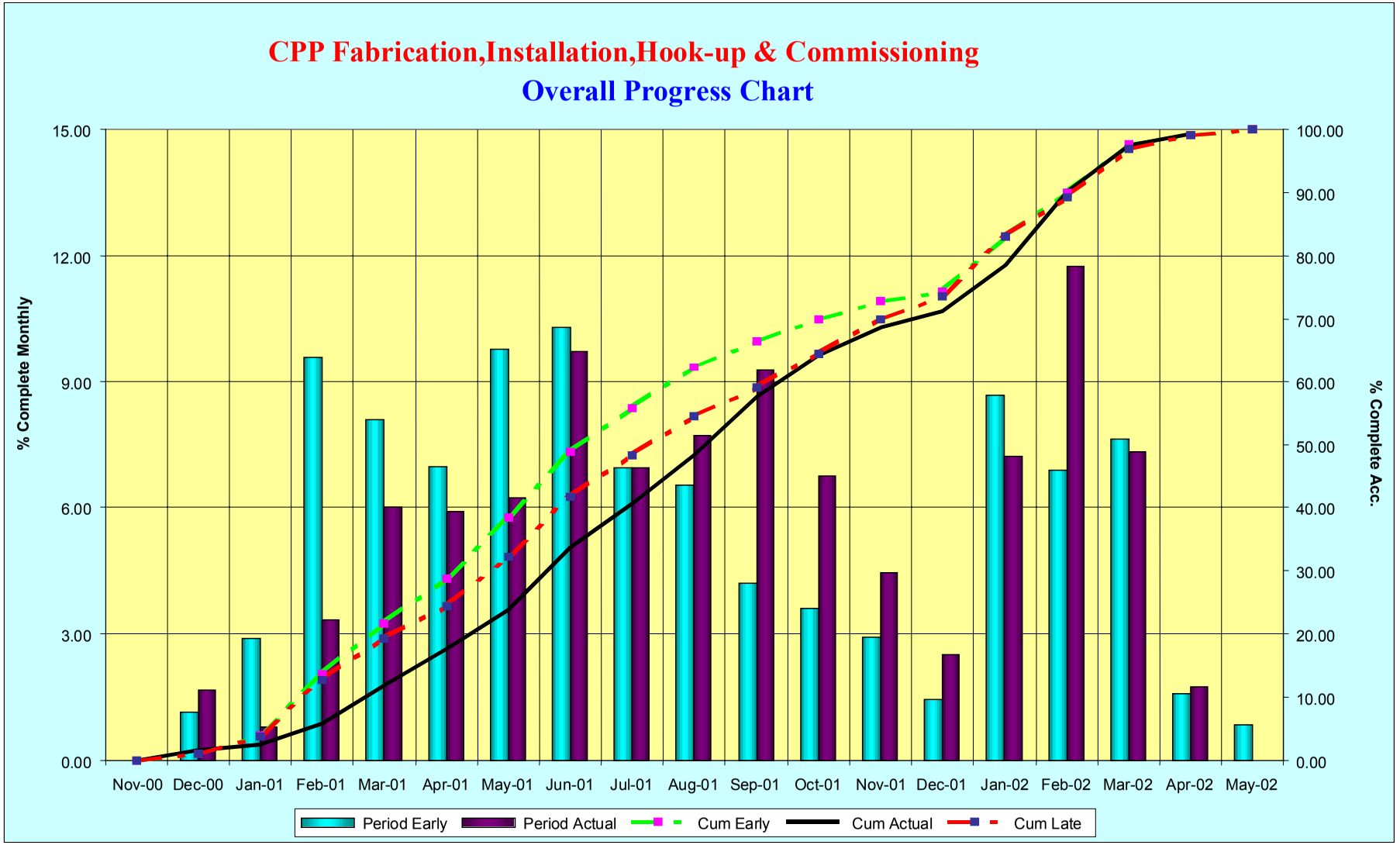
APPENDIX 6 – SCHEDULE PROGRESS CHART



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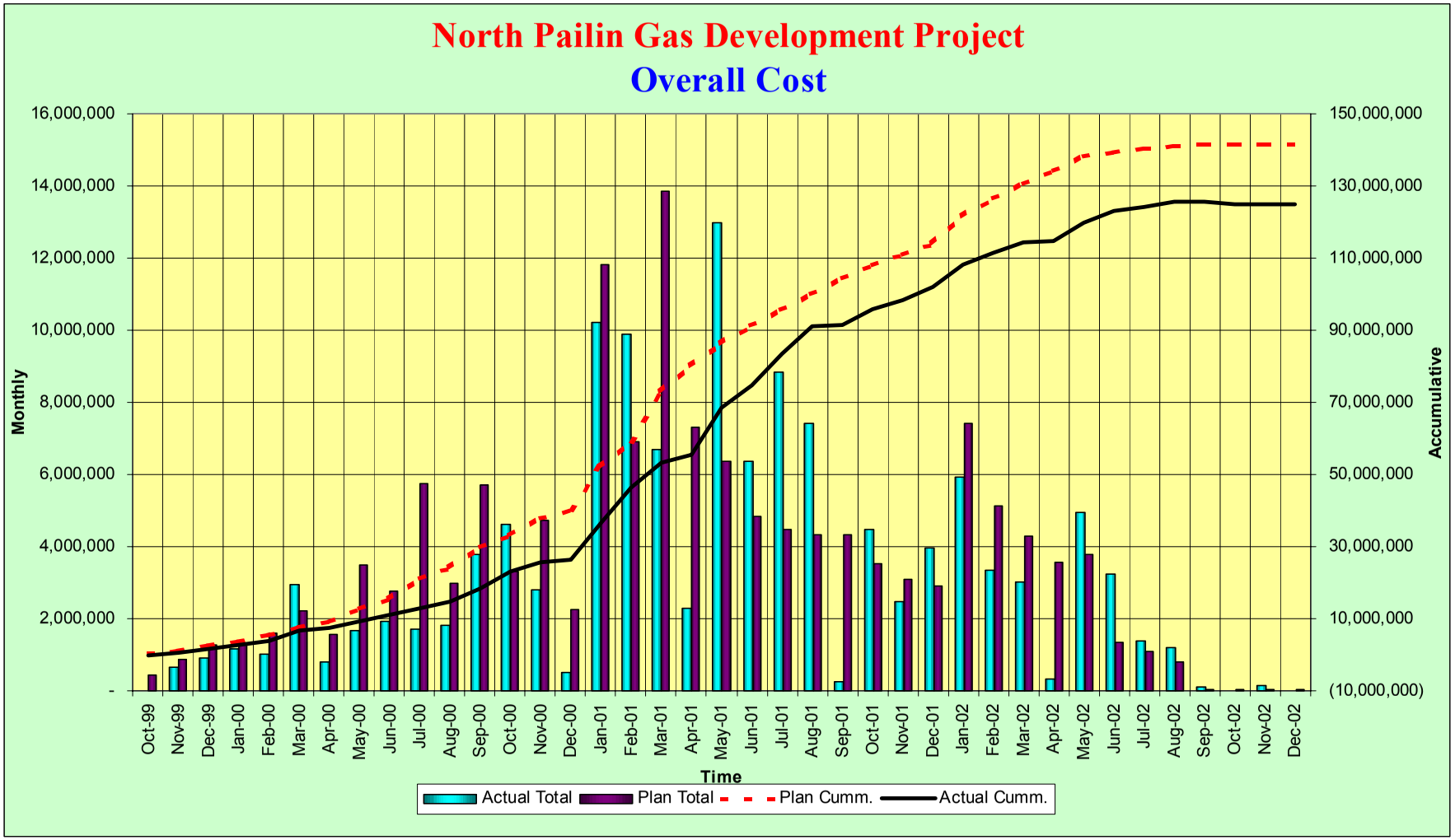
APPENDIX 7 – COST TRACKING CURVE

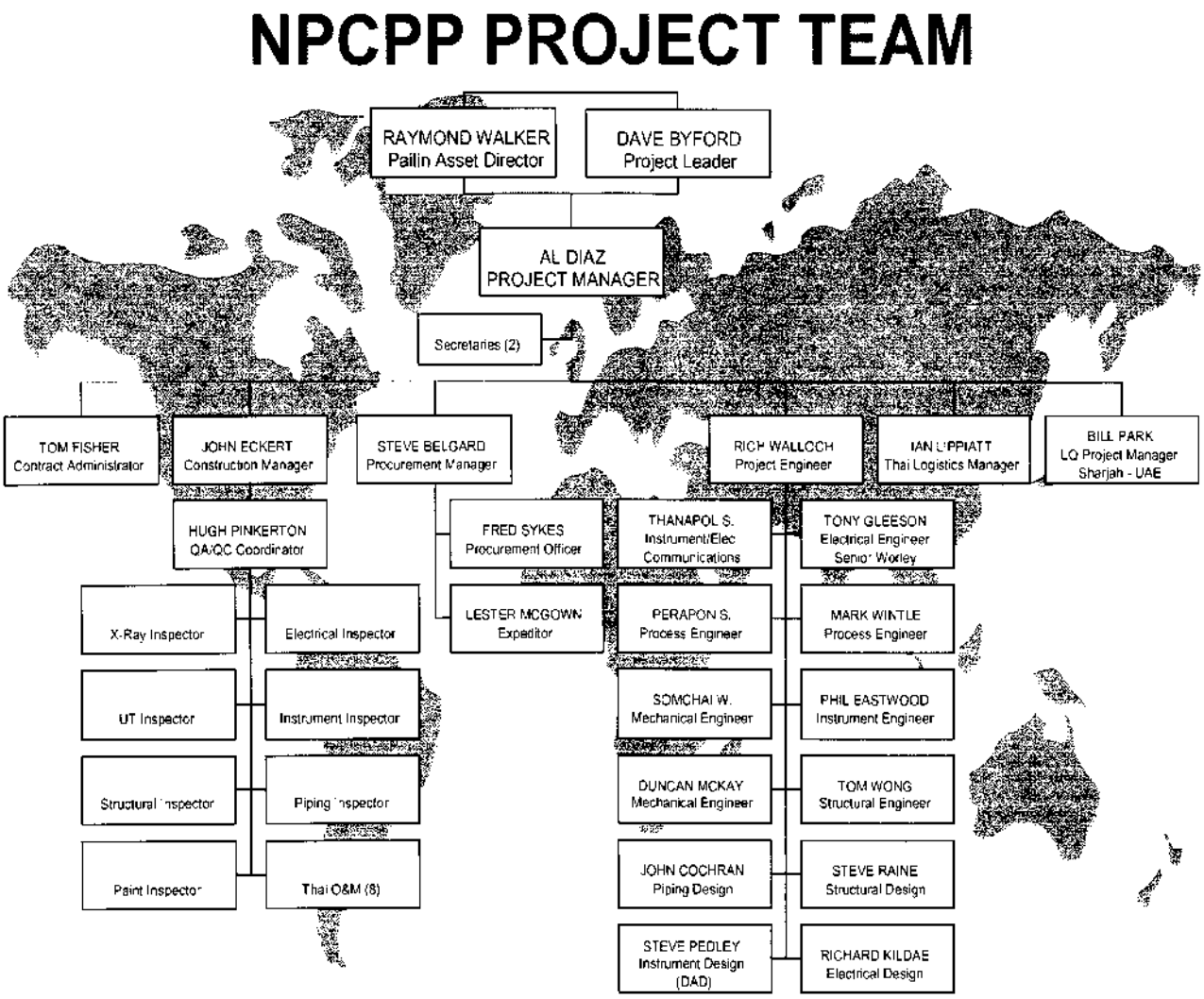


APPENDIX 8 – SAMPLE OF INSPECTION TEAM ROLES & RESPONSIBILITIES

QA/QC CO-ORDINATOR	❑ Purchase Orders ❑ Assisting in developing an inspection and test plan (ITP) appropriate to the CFME being purchased. ❑ Establishing and publishing clear policies and directives for the Third Party Inspection Company. ❑ Ensuring that appropriate quality assurance requirements are included in the RFQ and PO documents. ❑ Assessing Vendors' quality systems. ❑ Assisting requisitioners with identifying quality assurance, quality control and inspection requirements. ❑ Ensuring that equipment and materials are progressively (or final) inspected during manufacture and witness tested (where applicable), to make certain that goods are supplied in accordance with the requirements of the Purchase Order. ❑ Co-ordinating and administering Unocal's third party inspection/expediting services contract. ❑ Reviewing and distributing inspection/expediting reports. ❑ Reviewing MDRs. ❑ Liasing with certifying body, as applicable. ❑ Liasing with responsible Package Engineer ❑ Fabrication/Installation Contract ❑ Review and comment on all Quality Procedures and Plans ❑ Review and comment on all Welding and Welding Repair Procedures ❑ Review and comment on all Welding Procedure Qualification Tests ❑ Review and comment on all Welder Qualifications (and Testing if applicable) ❑ Review and comment on the dimensional control procedures ❑ Review and comment on the collation of QA/QC, weld records and weld maps ❑ Review and comment on plans and procedures for Material Identification, Material Trace-ability and Mill Certification ❑ Adjudicate on any interpretational dispute that may arise during the inspection activities ❑ Attend the daily yard operation meeting along with the Construction Manager ❑ Develop work daily work activity plans for the Inspection Team ❑ Co-ordinate the inspection of CFME equipment as it arrives the fabrication yard. Maintain a log of OS&D (Over, Short and Damage) recorded against each PO and ensure the items of deficiency are cleared in a timely manner
FABRICATION INSPECTION	❑ **RADIOGRAPHIC INSPECTOR** ❑ Must possess a valid CSWIP/PCN Level 3 Radiographic Interpreter certificate ❑ Shall read and interpret all radiographs to the applicable specifications, codes and standards ❑ Shall have experience in evaluation of "Repair Methods". ❑ Shall review and comment on welding procedures, welder qualification tests and radiographic welding inspection procedures ❑ Must witness calibration of test equipment ❑ Must use and is thoroughly familiar with the Oil Industry radiographic acceptance criteria for Structural, Process Piping and Pipelines.

	❑ Must be conversant with Unocal Specifications, Industry Codes and Standards such as AWS D1.1, NACE, ASME Section V, ASME B31.3, ASME B31.8, API RP2A and ASME IX. ❑ Shall possess a valid CSWIP 3.6 and 3.9 Ultrasonic Testing Interpreter qualifications ❑ **ULTRASONIC INSPECTOR** ❑ Must possess a valid CSWIP 3.6 and 3.9 Ultrasonic Testing Interpreter qualifications ❑ Shall read and interpret all ultrasonic tests to the applicable specifications, codes and standards ❑ Shall have experience in evaluation of "Repair Methods". ❑ Shall review and comment on welding procedures, welder qualification tests and UT welding inspection procedures ❑ Must witness calibration of test equipment ❑ Must UT interpret welds on TKY joints ❑ Must use and is thoroughly familiar with the Oil Industry UT acceptance criteria for Structural, Process Piping and Pipelines. ❑ Must be conversant with Unocal Specifications, Industry Codes and Standards such as AWS D1.1, NACE, ASME Section V, ASME B31.3, ASME B31.8, API RP2A and ASME IX. ❑ Shall possess a valid CSWIP/PCN Level 3 Radiographic Interpreter certificate ❑ **STRUCTURAL INSPECTOR** ❑ Structural Welding Inspector shall possess valid CSWIP/AWS qualifications ❑ Shall have experience using/working with Unocal Specifications and Industry Codes and Standards including AWS D1.1, API RP 2A, ASIC, ASTM, API 5L, AWS, ASME ❑ Must monitor material identification, material and weld traceability ❑ Must review scaffolding to ensure compliance with SCAFFTAG ❑ Must review and witness Tubular manufacture in the yard ❑ Must review and approve structural fit-ups and dimensional control ❑ Review and comment on welding processes (SMAW, FCAW, SAW, GTAW & GMAW), Pre-heat, PWHT & NDT activities, monitoring consumable control and Welding & Welder operator control. ❑ Must witness and monitor the running of Weld procedures and general welding inspection. ❑ Must witness calibration of test equipment ❑ Must witness fireproofing activities ❑ Must witness blasting and painting of the structural field welds ❑ **PAINT INSPECTOR** ❑ Paint inspector shall possess a valid PCN Coating inspection certificate ❑ Shall be able to determine the SA3.0 anchor profile ❑ Must witness calibration of test equipment ❑ Shall witness and monitor painting activities using shop primer, three coat systems, two coat systems, high temperature coating systems (that cure in ambient temperatures), two coat high build non-skid coating systems, quick drying repair systems, fire rated coatings, galvanising, vulcanising and paint inventory control. ❑ Shall test the paint materials to determine defective paint materials ❑ Shall train the fabricators paint team if they are not performing up to

APPENDIX 9 - PROJECT ORGANISATION CHART



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APPENDIX 10 – LETTER TO MCDERMOTT WOMEN EMPLOYEES

Unocal Thailand, Ltd.
5th floor, Tower III, SCB Park Plaza
19 Ratchadapisek Road, Chatuchak
Bangkok 10900, Thailand
Tel (662) 545-5555
Fax (662) 545-5554

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November 17 2001

Engineering & Construction

J. Ray McDermott Middle East (Indian Ocean) Ltd.
C/o P. T. McDermott Indonesia
Jalan Bawal, Batu Ampar
Batam 29432
Indonesia
Phone: (62-778) 411-001

Attention: McDermott Women Employees Club
Ms. Poni
MWEC Chairwomen

Subject: Batam Community Charity Event November 2001
Sponsored by Unocal

Unocal very much appreciates working with the ladies of the McDermott Woman's Employees Club (MWEC). Our charity event for the Batam community during November 2001 was a resounding success. I owe the success of this program to you and the ladies of the MWEC.

Your organization did a great job identifying the needs of the local schools and families within the villages on Batam. We appreciate your coordination efforts with the local village chiefs and school headmasters. Without this important legwork and knowledge of the area we would have never achieved our goal of assisting the community and to reach the effective level of distributions to needy individuals and schools.

During a special luncheon ceremony on November 2nd, it was a great honor as a company representative to make a special donation in the amount of 29,124,000 Rupiahs to the McDermott Women Employees Club (MWEC). The ladies did a fantastic job purchasing and preparing the food parcels and schools supplies. The club was very effective in managing the distributions of food parcels to the villages by using coupons. The use of the certificates for school supplies and scholarships were an excellent method for providing special recognition and documentation. Through your efforts over 3.8 tons of food was distributed to 250 families, 22 school scholarships awarded and 10 schools received teaching kits. All expenditures were very well documented in the close out report.

The Unocal team enjoyed participating with the ladies from the MWEC in the distributions. Our team was very impressed by how well each community respected each of their own during the distribution. We made several new acquaintances within your club and enjoyed each other's company during the distribution events.

Unocal appreciates the MWEC shared vision of improving the lives of others wherever we work. I know other McDermott clients will want to support the local community and will tremendously enjoy working with the MWEC. We look forward to working with your organization again.

Yours very truly,

Albert M. Diaz
North Pailin Project Manager

cc: Derek Parsons
Dave Byford
Raymond Walker

APPENDIX 11 – RISK RESPONSE PLAN SAMPLE

RISK RESPONSE & MANAGEMENT	
Project Name: NP Start Up	
Project Manager: Al Diaz	**Risk Owner: K Teekaporn**
Risk Item No: 10	**Date:29/01/02**

Describe Risk Event -- What if 'x' happens and what is/are the cause(s):
What if well completions take longer to perforate because:

- Fish
- Equipment breakdown
- Crane on WHP not serviceable

Describe the impact(s) of risk event 'x' happening on the project:
We may not have enough rate for start up

Risk Triggers – Describe the risk triggers or signposts that will give warning that the risk may occur

- No trigger – just happens
- No trigger – just happens or If the well takes longer than 3 days to perforate
- If crane is unstable – ie boom cannot maintain angle

Describe how will these triggers be monitored?

1. PE constantly monitoring and will be able to identify signs of potential fish & will manage accordingly
2. Monitor operations
3. Monitor operations

Describe the response(s) to the risk event and impact(s), person responsible and timeframe: (Identify a strategy that will either **prevent** 'x' from happening, or **lessen** the impact if 'x' happens or plan a strategy to **manage** 'x' if it happens. Provide attachments if required)

1. K Teekaporn will talk to well services on their processes and past causes. Will then identify actions to avoid the event. By 8/2/02
   The schedule has allowed enough float for 4 fish (1 per platform) before impact on critical path. If we have more than 4 fish we will need to think about adding more perforations to the work programme. If the event happens – it will be accepted and the perforation programme will continue.
2. Undertake a quality check on the equipment prior to acceptance. Well Services is responsible for this. Teekaporn to follow up with them by 8/2/02
3. Some of the tests for the crane have already been completed. The remaining tests cannot be completed until the drilling programme is finished. – Amnaj coordinating.

Describe additional Costs required:

1. Cost of $3-8000?? per day (not from project budget)
2. No Cost - part of preventative maintenance activities & budget in Well Services
3. Operational activity – no anticipated impact on project budget

Identify additional time requirements or tasks to be recognised in schedule and any impact on other work packages, in order to implement the risk response as stated above

1. Schedule will only be impacted if more than 4 fish.
2. Par of Well Services work programme – they are simply doing this earlier than originally planned
3. Tests have not and will not impact the schedule – can be done in parallel with other work

Other related risks, quality issues or long term effects of risk event and/or response:

1. If the event occurs and is accepted – Well services will need to come back to retrieve it
2. Supports quality approach
3. ditto

Project Owner:		**Project Manager:**	
	Signature & Date		*Signature and Date*