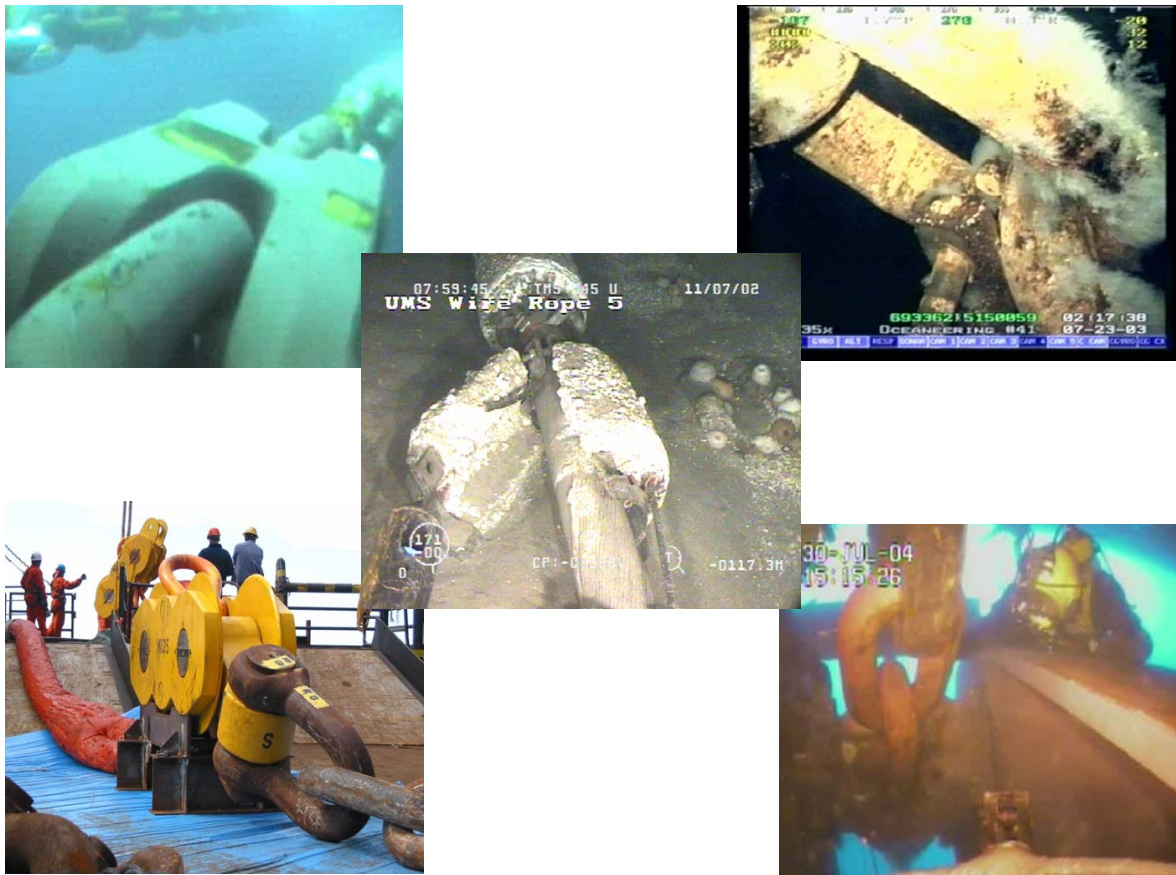


JIP PROPOSAL - EXECUTIVE SUMMARY

PHASE 2 FPS MOORING INTEGRITY

“IMPROVING MOORING DURABILITY”



Report No: A5124/00/NDC/MGB/Mb – dated 8th December 2006

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“IMPROVING MOORING DURABILITY” - EXECUTIVE SUMMARY

General

Phase 1 of the Mooring Integrity JIP was a wide ranging review, which revealed a number of mooring issues with potential long term integrity implications. Phase 2 is focused on testing, data gathering and correlation with in field behaviour. Rather than trying to obtain data on a large number of FPSs, as proved difficult in phase 1, phase 2 will be targeted on key representative units, which are known to have good data available. The objective is to provide improved design methodology, such that true long-term durability of new mooring systems can be achieved. Phase 1 showed that existing systems are not lasting as well as expected with some unanticipated degradation methods and that system rectification costs are high. For existing mooring systems, phase 2 will provide advice on when and where problems may be expected, so that appropriate checks can be undertaken at the right time in a cost effective manner. Phase 2 will also report on developments in line failure detection systems, since this is still an area of integrity weakness and there is a lack of in field operational experience.

The proposed topics, or CTRs, to achieve the above objectives are outlined below along with the approximate cost estimates. Exactly how much can be achieved within the proposed budget will depend on the quality and format of data, which the JIP participants are prepared to make available to the project. However, over the course of the project Noble Denton will work with participating Operators to recommend data recording, inspection and testing work scopes, which can be adopted at times to suit the operational requirements of the particular FPS.

More details on the principal findings from phase 1 and the phase 2 proposal can be found in the previously supplied presentation Noble_Denton_Phase_2_Mooring_Integrity_JIP_Proposal_Nov_2006.pdf. The proposed JIP contract for phase 2 is included in Appendix A.

Outline of the Proposed Topics/CTRs

1.0 In Field Wear + Corrosion Rates (budget £11k)

Phase 1 showed that in field corrosion and wear can be significantly higher than is presently specified in the established mooring codes. *If this is a general result it has significant implications for the long-term durability of FPS moorings.* Therefore, it is important to obtain more data on different units, different designs of vessel interface (e.g. bending shoe, semi-sub gypsy wheel, turret gypsy wheel, internal and external trumpet turrets, spread moored submerged fairleads, spread moored deck fairlead, spar fairleads, etc) and varied geographical areas, so that a better design methodology can be developed. This data will also aid in the selection of the best type of vessel interface arrangement for future FPS designs.

From phase 1 it is known which units are most likely to be able to supply this type of information and hence will be targeted. The data from this CTR will be an important input to CTR 3 (Validated Wear/Corrosion Model).

2.0 Determination of Actual Break Strength of Used Mooring Lines (budget £14k)

Mooring lines, which have been exposed to many years of fatigue loading (axial, bending and torsion), wear, corrosion and perhaps local damage, will tend to be less strong than when new. It is important to understand how the strength of mooring lines and associated components will deteriorate over time. If this data is available *it may be possible to design mooring lines so that they will last through out the life of the FPS*. As a minimum it should be possible to evaluate when to replace lines before they reach the stage at which they could fail in an unpredictable manner.

As FPSs are redeployed at the end of field lives, or when repairs are undertaken, mooring line components become available for testing. This testing will be carried out at a suitable certified test house. To minimise mooring component transportation costs the testing will be carried at local facilities where ever possible. The proposal is to work with the Operators, with the JIP providing guidance on how to test components and in return gaining access to the test results. The proposed break strength testing will be financed out of Operators’ normal operations and maintenance budgets. The results from this CTR will be another input to CTR 3.

3.0 Validated Wear/Corrosion Model (budget £17k)

The wear and corrosion behaviour of FPS mooring systems will vary depending on system configuration and where in the world they are deployed. During the mooring design stage it is important to be able to make an accurate assessment of the “safe design life” (SDL) of a mooring system, including all individual components. At present this is difficult to achieve, since there are no accepted and validated methods to assess how long it will take for wear or corrosion to reduce component strength to a critical level. *This CTR will attempt to rectify this deficiency.*

Based on data from CTRs 1 and 5 it should be possible, via adjusting the wear co-efficient (F) in Archard’s equation (see below), to make the wear prediction match what has been experienced in the field. Reliable validated wear co-efficients will enable much more accurate estimates to be made of the mooring system safe design life.

$$TMV = \sum_{i=1}^{N-1} \left(\frac{F_{i+1} + F_i}{2} \right) (\phi_{i+1} - \phi_i) \left(\frac{\pi}{180} \right) (r)(K_i).$$

where:

F	=	chain tension
Ø	=	roll angle (degrees), e.g. Orcaflex simulation
r	=	radius of the chain barstock
K	=	wear coefficient
N	=	number of records
TWV	=	total wear volume for the duration of the test

Indicative base rate corrosion (where no wear is present) may be provided by chain links which have been wet stored on the sea-bed, with their diameters checked every few years. Alternatively, if good as manufactured data is available on chain links, measurements can be taken on parts of links which are not normally subject to wear.

4.0 New Line Failure Detection Techniques (budget £8.5k)

For some systems, such as internal turrets with submerged stoppered off lines, it is vital but not straight forward to be able to quickly and reliably detect whether or not a line has failed. To date this subject has been much discussed, but few systems have been implemented in the field. This CTR will report on the as installed field operational performance of such systems. In addition, the proposed Response Learning System (RLS) reported in phase 1 will be developed to an equipment specification level.

5.0 Correlation of Analysis Techniques with In Field Data (Tension & Fatigue) (budget £78k)

Considerable resources are devoted to the design stage of FPS mooring systems. However, *once the units are installed in the field very rarely is much correlation undertaken between the actual performance of the system and its design predictions.* Some of the phase 1 findings indicate that the in field performance of mooring lines can be significantly different to design predictions. For example, low tension snatch loading occurring, perhaps when turret bearing friction is overcome and a FPSO rotates. Another factor, in certain instances, appears to be regular rotation of mooring lines with resulting torsional loading in the lines. Unexpected effects, particularly over time, can reduce the design safety margin associated with a system. It is also possible that careful comparison with in field data may show that certain design assumptions are unnecessarily conservative and that this can result in expensive, over designed, systems. In the past field correlation was difficult, since there is a need to measure the environment, tensions, motions, offsets, etc. However, with Differential Global Positioning Systems (DGPS), improvements in sensor technology and data logging/storage, this is now much more achievable. Fortunately, a number of FPSs are already instrumented and the JIP intention is to make use of existing data, rather than instrument from scratch, which would be expensive.

Preliminary discussions have been held with a number of FPS operators who have access to good quality data. The general consensus seems to be that as long as a number of operators are prepared to make data available to phase 2, there will be good co-operation. As well as in field data it will be necessary to review the original design data. If it is clear that there is a major discrepancy between design and in field data, this will be investigated using the latest mooring analysis techniques. This will hopefully reveal the cause of the discrepancy which will be reported and the consequences of which discussed. Consultation will be undertaken with the Classification Societies if it appears that changes may be desirable to the existing design codes.

On certain units mooring line fatigue cracking has occurred much earlier in the field life than expected. It will be informative to compare the predicted fatigue lives with actual cracks detected in the field based on the actual line tensions experienced over time. It is likely that a degree of Forensic Engineering, and adopting some reasonable assumptions may be required, since it is likely that there will be some gaps in the available data.

This topic represents a substantial piece of work which will have a significant input to a number of the other CTRs. Considerable data manipulation will be required to convert data into an appropriate format. A likely beneficial outcome from this exercise may be a recommendation as to a standard reporting format for in field recorded data.

6.0) Proof Testing Implications for Improved Fatigue Life (budget £20k)

Proof loading during manufacture leaves a small permanent set, which induces locked in residual stresses that are compressive at the inner shoulders. Hence, in field mooring line tensions have to reverse the residual compressive stresses before tension is induced in these fatigue prone areas. BOMEL's JIP ("Design Guidelines for Anchor Chains", 1992) has demonstrated that *proof loading is surprisingly beneficial to fatigue endurance*, at least in terms of tension fatigue, but bending fatigue may be different. Regular dialogue on the effect of out of plane loading will be maintained with SBM's JIP on this subject.

To further investigate proof loading effects an open workshop will be held with chain manufacturers and classification societies, etc., to review the existing evidence and implications of possible changes to proof loading. Following on from this workshop a testing programme will developed if this is judged to be worthwhile. It is envisaged that the chain manufacturers themselves will finance the testing programme, with the results being reported to the JIP.

7.0) Advanced Inspection plus Corrosion Control (e.g. Use of Cathodic Protection) (budget £14k)

Any inspection operations using ROVs or divers from dedicated support vessels is inevitably expensive, due to the high and increasing day rates associated with these vessels. This cost tends to discourage the amount of inspection which is carried out. However, if the cost of inspection can be reduced significantly it becomes a much more cost effective and thus attractive option, which by minimizing failures can save money in the long-run.

Recent trials in the North Sea have shown that the FPS itself can act as the supporting platform for mini and micro ROV operations, utilizing a light weight fibre optic umbilical. The JIP will review the performance of such systems, including the efficiency of cleaning operations using low power ROVs. It is also hoped to consider the impact during inspection of cleaning chain close to bare metal conditions and how this influences future corrosion.

Inspection of fibre ropes is a subject which continues to develop. At present test inserts have been proposed on some Gulf of Mexico systems. The JIP hopes to report on the performance of the tests inserts and associated terminations. Hopefully it will be possible to make recommendations for in situ testing of these components, due to the inevitable danger of damage during test insert recovery and reinstatement operations.

Phase 1 showed that there is considerable variation in the cathodic protection operating practices adopted by different operators. It is unclear how these different practices will influence the corrosion and possible embrittlement behaviour of mooring components. However, it is hoped that sufficient data is now becoming available on this subject, so that it will be possible to identify the likely best cathodic potential operating approach for long-term integrity.

Recent in field experience has shown that Sulphate Reducing Bacteria (SRBs) can cause pitting corrosion, with the pits sometimes acting as initiation points for fatigue cracking. By collecting samples from the vicinity of mooring lines, it is possible to undertake tests to assess the concentration of SRBs. It is hoped during phase 2 to undertake tests on SRB concentration so as to get a better understanding of this issue.

There has been some evidence to date that enhanced corrosion can occur if a mooring system is made up of components with somewhat different chemical compositions. Phase 2 will document further evidence of this trend, if relevant data becomes available.

8.0 Compilation of In Field Pay-In and Pay-Out Tests (budget £11k)

Phase 1 showed that tension unbalanced mooring systems can occur and that this significantly increases the danger of individual, and potential multiple line, failure occurring. Phase 2 will attempt to undertake tests on FPSs to address how wide spreads this problem could be and how best to address it. It will be interesting to find out whether partially seized wheeled fairleads are more likely to occur for wire or chain systems. *This is a priority topic* since unbalanced mooring systems could be a factor in the number of semi-submersible mooring line failures which occur each year. The cost of carrying out the tests will be borne by Operators/Contractors rather than the JIP.

9.0) Reporting/Distribution of Key Findings and Expenses (budget £30k)

Phase 1 resulted in a substantial report summarizing the project. Although the phase 1 report is useful as a reference work, the size of the document is such that it is difficult for non specialists to easily absorb the key information contained within. In addition, it is not clear how well the key results have been distributed through out the industry as a whole. Hence, in phase 2 it is intended to summarize the results more succinctly via conferences and articles, as agreed by the Steering Committee. An overall summary report will also be produced at the end of the project.

As with phase 1 it is proposed that the six monthly Steering Committee meetings should be held along with the FPSO Forum/JIP week, as long as this suits the majority of participants.

It should be noted that the Steering Committee meetings in their own right are extremely beneficial in encouraging people to share experiences and learn what has happened in the industry over the last six months.

JIP Participation Contract, Fees and Voting Rights

As with phase 1, all participants to phase 2 will need to sign the JIP contract enclosed in appendix A. The phase 2 contract is very similar to that utilised during phase 1.

The participation fees for the JIP are outlined in the following table along with the associated voting rights on the Steering Committee:

Category	Fee	Votes on Committee
Principal Sponsors	£30,000	5
Oil Company	£16,500	3
Design Contractor	£11,000	2
Class society/ Government authority	£6,600	2
Equipment Supplier	£3,300	1

Principal Sponsors are organizations that wish to take a leading role in the project development and direction. This leading role is reflected in their additional voting rights on the Steering Committee.

The participation fee can be paid in equal instalments at the beginning of 2007 and 2008.

Outline Schedule, Duration and Date of First Meeting

The proposed schedule for phase 2 is that sufficient signed contracts should be in place by the end of 2006, such that the initial phase of the project can commence in the first quarter of 2007. The nominal duration of phase 2 is approximately two years, although this will depend on how quickly data comes through.

A significant networking exercise will be required to obtain data on the selected units, including obtaining permission to release data to the JIP. Status on the data collection exercise will be reported at the first Steering Committee meeting. This is planned to be held during the next FPSO Forum/JIP week in Galveston from the 23rd to the 27th of April 2007. This is the week before Offshore Technology Conference (OTC) in Houston.

Management

The project will be run from Noble Denton's Aberdeen office at No.1 The Exchange, 62 Market Street under the direction of Martin Brown. Specialist consultancy support will be drawn from other Noble Denton offices through out the world, including London, Houston, Singapore, etc. The expertise of BOMEL, which is now a Noble Denton company, may also be utilised.

Budget

The estimated budget for phase 2 has been estimated to be approximately £205,000. This equates to approximately 1.6 man years of effort for an experienced engineer.

The project will formally commence once signed contracts have been received back which in total amount to £120,000. Based on past experience, it has been found that once the project is formally running additional participants will join. If the final JIP subscription is less than £205,000, it will be necessary to make some adjustments to the scope of work. Any adjustments to the scope of work will be agreed with the Steering Committee.

Concluding Remarks

It is appreciated that the proposed scope for phase 2 of this JIP is fairly wide ranging. However, it is felt that it is important, from the perspective of improving mooring integrity in the short-term, to make progress on the proposed topics/CTRs as soon as possible. The degree of progress made will inevitably be related to the amount of support provided by industry. However, it was found during phase 1 that by adopting a flexible pro-active approach it is possible to move forward the state of the art and in doing so improve offshore safety.

APPENDIX A – PHASE 2 JIP CONTRACT

<ul style="list-style-type: none">• Enter Company or Organisation Name on Pages 1 and 3 of both copies.
<ul style="list-style-type: none">• Enter Address details on Page 14 of both copies.
<ul style="list-style-type: none">• Complete and Sign on Page 16 of both copies.
<ul style="list-style-type: none">• Return both copies to Noble Denton for Execution. A completed copy will be returned to you for your files.

A G R E E M E N T

between

and

NOBLE DENTON CONSULTANTS LIMITED

of

39 Tabernacle Street, London EC2A 4AA

**For a Joint Industry Sponsored Project
on**

F.P.S. Mooring Integrity – Phase 2

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General Conditions

This AGREEMENT is made by and between

----- (later referred to as PARTICIPANT) and Noble Denton Consultants Limited, whose registered office is at 39 Tabernacle Street, London, England (later referred to as the PRINCIPAL).

WHEREAS ----- has decided to become a PARTICIPANT in the Joint Industry Sponsored Project (the PROJECT):

F.P.S. MOORING INTEGRITY – PHASE 2

The project objective is to tackle the key areas of concern identified in phase 1 of Noble Denton’s FPS Mooring Integrity JIP.

IT IS HEREBY AGREED AS FOLLOWS:

1. DEFINITIONS

1.1 The following definitions are used in the contract agreement document:

AGREEMENT: When executed by the PARTICIPANT and the PRINCIPAL, the AGREEMENT shall consist of these General Conditions and the PROPOSAL which describes the PROJECT Tasks, Personnel, Tests and Schedule. These General Conditions shall take precedence over the PROPOSAL in the event of any discrepancy between the two documents.

AFFILIATE: With respect to any PARTY, any parent company of the PARTY which now or hereafter owns or controls, directly or indirectly, fifty percent (50%) or more of the stock of such PARTY having the right to vote for directors of the PARTY, and any company other than the PARTY of which the PARTY or such parent company now or hereafter owns or controls, directly or indirectly, fifty percent (50%) or more of the stock having the right to vote for directors thereof, or in the case of Secretary of State for Energy, any Government Department

APPROVAL: Consent of the STEERING COMMITTEE by two-thirds (2/3) majority or by written agreement of two-thirds of the PARTICIPANTS, unless specifically provided otherwise in the AGREEMENT.

EFFECTIVE DATE: The EFFECTIVE DATE of this AGREEMENT shall be the date when a minimum of £120,000 (one hundred and twenty thousand pounds sterling) in cash or cash equivalent has been committed to this PROJECT as evidenced by the signature of AGREEMENTS by a sufficient number of PARTICIPANTS to confirm such commitment..

LATE PARTICIPANT: Any company or individual which, by signing, enters into this AGREEMENT or equivalent Agreement after 31st April 2007.

<u>ORIGINAL PARTICIPANT:</u>	Any company or individual which, by signing, enters into this AGREEMENT or an equivalent Agreement on or before 31 st April 2007.
<u>PARTICIPANT:</u>	Any company or individual which by signing this AGREEMENT or an equivalent AGREEMENT has agreed to participate in the PROJECT.
<u>PARTIES:</u>	All PARTICIPANTS and the PRINCIPAL.
<u>PARTY:</u>	Any PARTICIPANT or the PRINCIPAL.
<u>PRINCIPAL:</u>	Noble Denton Consultants Limited, whose registered office is at 39 Tabernacle Street, London EC2A 4AA, United Kingdom.
<u>PROJECT:</u>	Work to be carried out in the PROPOSAL as necessary to satisfy the defined objectives.
<u>PROJECT BASE</u>	The normal working location for the PROJECT, which shall be the PRINCIPAL's Aberdeen office at No.1 The Exchange, 62 Market Street, Aberdeen AB10 1XA, U.K.
<u>PROJECT COMMENCEMENT:</u>	1 st December 2006
<u>PROJECT RESULTS:</u>	All data, designs, reports, information and other results of the PROJECT and any design code or regulatory recommendations.
<u>PROJECT TERMINATION:</u>	The date when all activities have been performed by the PRINCIPAL under this AGREEMENT and all reports and the financial accounts for the PROJECT have been approved by the STEERING COMMITTEE or earlier termination by mutual agreement among the PARTIES.
<u>PROPOSAL:</u>	The proposal is described in the PowerPoint file Noble_Denton_Phase_2_Mooring_Integrity_JIP_Proposal_Nov_2006.ppt.
<u>STEERING COMMITTEE:</u>	The body appointed by the PARTICIPANTS in accordance with Article 3 hereof.

SUBCONTRACTORS: Any institutions or organisations subcontracted by the PRINCIPAL to carry out work as part of the PROJECT.

1.2 Words importing the singular also include the plural and vice versa where the context requires.

2. VALIDITY

2.1 This AGREEMENT shall become effective upon the EFFECTIVE DATE. In the event that the AGREEMENT has not become effective by 30th September 2007, unless the date is extended by APPROVAL, the AGREEMENT shall lapse and the PARTIES shall be under no further obligation to each other. The PRINCIPAL undertakes to promptly notify the PARTICIPANT as soon as the AGREEMENT becomes effective.

2.2 The duration of this AGREEMENT shall be from the EFFECTIVE DATE to PROJECT TERMINATION.

3. STEERING COMMITTEE

3.1 The PARTICIPANTS shall form a STEERING COMMITTEE to be effective from the date of PROJECT COMMENCEMENT. The PARTICIPANT shall have the right to nominate a representative, who will carry votes in the STEERING COMMITTEE as shown in table below. Representation from SUBCONTRACTORS may also attend the meeting of the STEERING COMMITTEE but will have no voting rights. Section 5 provides additional information on the categories summarised in the table below.

Category	Fee	Votes on Committee
Principal Sponsors	£30,000	5
Oil Company/Operator	£16,500	3
Design Contractor	£11,000	2
Class society/ Government authority	£6,600	2
Equipment Supplier	£3,300	1

3.2 Any PARTICIPANT may elect not to be represented on the STEERING COMMITTEE, but will have to abide by the decisions of the STEERING COMMITTEE.

3.3 The chairman of the STEERING COMMITTEE shall be elected by APPROVAL of PARTICIPANTS of the first STEERING COMMITTEE meeting.

3.4 A representative from the PRINCIPAL shall act as Secretary to the STEERING COMMITTEE and shall be responsible for preparing written minutes of the meetings which shall contain a record of all decisions of that STEERING COMMITTEE meeting. These minutes shall be submitted to the PARTICIPANTS for approval and SUBCONTRACTORS for information or action as necessary.

3.5 The terms of reference of the STEERING COMMITTEE shall be to:-

- review the progress of the PROJECT;

- provide collective guidance to the PROJECT.
 - to give consideration to any matters arising from the PROJECT which require a decision.
- 3.6 The STEERING COMMITTEE shall meet as required during the execution of the PROJECT at approximately six monthly intervals. The meetings shall be held at the business address of the PRINCIPAL in Aberdeen or London, unless decided otherwise by the STEERING COMMITTEE. Assuming the venue and location of the FPSO Forum/JIP Week suits the majority of participants the Steering Committee meetings may be part of JIP Week.
- 3.7 The PRINCIPAL shall give the representative of the PARTICIPANT written notice of date, time, place and purpose of a meeting of the STEERING COMMITTEE, accompanied by an agenda together with sufficient information to allow PARTICIPANTS to consider beforehand the general nature of matters to be discussed at the meeting at least ten (10) working days in advance of the date thereof. The PARTICIPANT shall have the right to require the PRINCIPAL to place an item on the agenda of the meeting of the STEERING COMMITTEE provided it shall be furnished to the PRINCIPAL at least two (2) working days prior to the date thereof.
- 3.8 No decision shall be taken at a meeting of the STEERING COMMITTEE on any matter not listed on the agenda for the STEERING COMMITTEE meeting unless there is unanimous agreement between the PARTICIPANTS.
- 3.9 If the PARTICIPANT is not represented at a STEERING COMMITTEE meeting the PARTICIPANT may nevertheless vote on any matter on the agenda by sending the PRINCIPAL a written notice advising of its vote on such matter to arrive prior to commencement of the meeting.
- 3.10 The PARTICIPANTS' costs, such as travel, hotel expenses, etc., arising in connection with the meetings of the STEERING COMMITTEE shall be borne by the respective PARTICIPANTS.

4. PROJECT EXECUTION

- 4.1 The PRINCIPAL is responsible for the performance and completion of the PROJECT, for coordinating and scheduling the various tasks of the PROJECT, for providing regular reports of all activities, and to manage the day-to-day budgeting.
- 4.2 The PRINCIPAL is also responsible, where practically possible, for notifying the STEERING COMMITTEE of any circumstances which may be likely to cause a delay to the PROJECT tasks, and where possible for proposing corrective action.
- 4.3 The PRINCIPAL shall exercise all reasonable skill, care, practice and diligence in the performance of the PROJECT.
- 4.4 The nominated personnel for the PROJECT are given in the PROPOSAL where Dr Nigel Robinson has been nominated as the Project Director and Mr. Martin Brown as the Project Manager.

- 4.5 The PRINCIPAL is also responsible for ensuring that one (1) copy of all technical reports is delivered to the PARTICIPANTS. The PRINCIPAL will deliver one (1) copy of the draft final report to each PARTICIPANT, not later than two (2) months after completion of the PROJECT Tasks. On PROJECT TERMINATION, the PRINCIPAL will deliver one (1) copy of the final report to the PARTICIPANTS.
- 4.6 In the expenditure of PROJECT funds, the PRINCIPAL shall be compensated each month from the PROJECT COMMENCEMENT to PROJECT TERMINATION for the time spent by its staff and direct expenses incurred in connection with the PROJECT.

5. PAYMENTS

- 5.1 The total fixed price cost of the full programme of work as given in the PROPOSAL is £205,000 (two hundred and five thousand pounds sterling).
- 5.2 Each PARTICIPANT shall pay a participation fee of £30,000 (thirty thousand pounds sterling) to the PROJECT.
- 5.3 Each PARTICIPANT, which pays the £30,000 (thirty thousand pounds sterling) participation fee, will be categorised as a Principal Sponsor. Principal Sponsors are organizations that wish to take a leading role in the project development and direction. This leading role is reflected in their additional voting rights on the Steering Committee – see section 3.1.
- 5.4 Oil Companies/Operators who become PARTICIPANTS and contribute to the PROJECT by the provision of constructive information will qualify for a reduced participation fee of £16,500 (sixteen thousand five hundred pounds sterling) to the PROJECT.
- 5.5 Engineering Design and Installation Contractors who become PARTICIPANTS and contribute to the PROJECT by the provision of constructive information will qualify for a reduced participation fee of £11,000 (eleven thousand pounds sterling) to the PROJECT.
- 5.6 Classification Societies who become a PARTICIPANT and contribute to the PROJECT by review, appraisal and constructive comment on the work, will qualify for a reduced participation fee of £6,600 (six thousand six hundred pounds sterling) to the PROJECT.
- 5.7 Equipment manufacturers and in-water survey companies who become a PARTICIPANT and contribute to the project by the provision of constructive information will qualify for a reduced participation fee of £3,300 (three thousand three hundred pounds sterling) to the PROJECT.
- 5.8 If any participant chooses to leave the JIP before the expiry of the project they will only be liable for the participation fee appropriate to their particular category.
- 5.9 In addition to the standard participation fee, any LATE PARTICIPANT will also pay a late joining fee of £3,300 (three thousand three hundred pounds sterling), unless a decision is taken by APPROVAL to waive the fee.
- 5.10 Payments will be in two (2) equal instalments adding up to the applicable participation fee. The first payment shall be due on execution of the AGREEMENT and before 30 days have elapsed from the EFFECTIVE DATE. The second payment shall be due on the 31st of November 2007.
- 5.11 LATE PARTICIPANTS joining after the 31st April 2007 will make one payment of the appropriate participation fee together with the late joining fee.

- 5.12 Invoices in respect of the participation fee referred to in this Article 5 shall be prepared by the PRINCIPAL and submitted in good time to each PARTICIPANT, and will bear the appropriate Contract Reference to that PARTICIPANT.
- 5.13 The PARTICIPANT undertakes to make payment against the PRINCIPAL'S invoices within thirty days of receipt of such invoices. Payments shall be to the NDC account at Barclays Bank, Lombard Street, Account No. 60116106, Sort Code 20-00-00.
- 5.14 To the extent that payments to be made hereunder attract Value Added Tax (VAT) the proper amount of such tax shall be shown as a separate and additional item on the PRINCIPAL'S invoices.
- 5.15 A financial statement will be forwarded to each PARTICIPANT prior to each STEERING COMMITTEE meeting and warning will be given if it is thought that the PROJECT costs are likely to be exceeded. If the PROJECT costs are not spent in full upon PROJECT TERMINATION, the excess will be returned to the PARTICIPANTS (including LATE PARTICIPANTS) in proportion to the PARTICIPANT'S contribution excluding any late joining fee. Alternatively, by APPROVAL, excess funds may be used to increase the scope of work in a manner to be agreed by the STEERING COMMITTEE.

6. OWNERSHIP

- 6.1 The PROJECT RESULTS shall be owned jointly by the PRINCIPAL and PARTICIPANTS (including LATE PARTICIPANTS).

7. CONFIDENTIALITY

- 7.1 ALL PROJECT RESULTS shall be treated as confidential by all PARTIES and not disclosed to any third party, person or company except as set out herein. The period for which the PROJECT RESULTS shall be maintained in confidence shall terminate on distribution of the final report. The PARTICIPANTS shall have the power to amend the term of restrictions of the obligation of confidentiality on the PROJECT RESULTS or any portion thereof by APPROVAL.
- 7.2 The obligation of confidentiality shall not apply to any PARTY with regard to any of the PROJECT RESULTS:
- which are part of the public domain at the time of disclosure hereunder;
 - that the PARTY can show were in its possession at the time of disclosure hereunder, and were not acquired by the PARTY, directly or indirectly, as a result of this PROJECT under an obligation of confidentiality;
 - after disclosure of such report become part of the public domain through no fault of the PARTY, but only after they become part of the public domain;
 - which are independently developed by the PARTY.
- 7.3 GOVERNMENT AGENCIES have the right to publish any information or results arising from the PROJECT which could impinge upon their statutory obligations where such publication is sufficiently important to justify the issue of or statement relating to official guidance notes. Each GOVERNMENT AGENCY will inform the PARTICIPANTS of their intention to publish any information arising from the PROJECT.

- 7.4 Following termination of the obligation of confidentiality, each PARTY may freely use and disclose the PROJECT RESULTS without restriction.
- 7.5 Each PARTY shall have the right to disclose any PROJECT RESULTS to its AFFILIATES. Any AFFILIATES receiving the PROJECT RESULTS shall agree in writing to the obligation of confidentiality in terms corresponding to these set forth in this Article 7.
- 7.6 During the confidentiality period each PARTY and its AFFILIATES may divulge PROJECT RESULTS to clients, consultants, contractors, public authorities, and certifying agencies only following APPROVAL from the STEERING COMMITTEE. Any PARTY making use of such right shall ensure that the recipient signs a confidentiality agreement which shall limit the use and divulgence of PROJECT RESULTS to such specific and named project only.

8. LIABILITY AND INDEMNIFICATION

- 8.1 The PRINCIPAL and PARTICIPANT shall each include for the purpose of this indemnity any AFFILIATE and their contractors and subcontractors of any tier and their respective agents, officers, directors and employees. The PRINCIPAL'S indemnity to the PARTICIPANT shall also include other PARTICIPANTS, their AFFILIATES and their contractors and subcontractors of any tier and their respective agents, officers, directors and employees.
- 8.2 The PRINCIPAL and PARTICIPANT shall indemnify, defend and hold harmless each other from any and all claims, demands, causes of action, damages, costs or losses howsoever arising from sickness, injury or disease to or death of their respective employees or loss or damage to property of such employees engaged on the performance of the PROJECT from any cause whatsoever, irrespective of the negligence or breach of duty (statutory or otherwise) of the indemnified party.
- 8.3 Subject only to the obligation of confidentiality set forth in Article 7, the PROJECT RESULTS may be used by any PARTICIPANT desiring to do so. Every reasonable effort shall be made by the PRINCIPAL to ensure the accuracy and reliability of the PROJECT RESULTS. However, the PRINCIPAL makes no representation, warranty, express or implied or guarantee in connection with the PROJECT or PROJECT RESULTS.
- 8.4 Subject to the provisions of Clauses 11.7 and 11.8 the PRINCIPAL and PARTICIPANT shall indemnify, defend and hold harmless each other from any and all claims, demands, causes of action, damages, costs or losses howsoever arising from their respective use of the PROJECT RESULTS generated from the PROJECT including but not limited to loss of earnings or profits, loss of interest, loss of business opportunity and business interruption and loss of production whether or not foreseeable at PROJECT COMMENCEMENT or at later date, irrespective of the negligence or breach of duty (statutory or otherwise) of the indemnified party.
- 8.5 Notwithstanding the above Clauses, neither party to this AGREEMENT shall be liable to the other party, or to any other PARTICIPANT, for loss of earnings or profit or other consequential damages suffered by such other party or such other PARTICIPANT, nor shall either party be entitled to claim any compensation from the other party or from any other PARTICIPANT for such loss or damage suffered by itself as a result of participation in the PROJECT, irrespective of the negligence or breach of duty (statutory or otherwise) of the indemnified party.

9. RIGHTS OF THIRD PARTIES ACT

- 9.1 No terms of this contract shall be enforceable under the Contracts (Rights of Third Parties) Act 1999 by a person who is not a party to this contract.

10. LATE PARTICIPANTS

- 10.1 Applications to join the PROJECT after the 31st April 2007 but prior to the termination of the PROJECT shall be submitted by the PRINCIPAL for APPROVAL.
- 10.2 By signing an Agreement in equivalent terms to this AGREEMENT, LATE PARTICIPANTS attain the same rights and obligations as the other PARTICIPANTS. The proceeds from LATE PARTICIPANTS shall be used in connection with the PROJECT as decided by the STEERING COMMITTEE.

11. FORCE MAJEURE

- 11.1 Delay in or failure of performance of any PARTY hereto shall not constitute a default hereunder or give rise to any claim for damage if and to the extent such delay of failure is caused by an occurrence beyond the control of the PARTY, (herein referred to as "FORCE MAJEURE") except as to the payment of participation fees as set out in Article 6 which must occur in any event except where the PRINCIPAL has made no or substantially no progress with the PROJECT.
- 11.2 In case of such occurrence, the PRINCIPAL shall be compensated by the Project funds for reasonable costs due to any delay resulting therefrom subject to the approval of all the PARTICIPANTS.

12. PATENT RIGHTS

- 12.1 Any inventions made by the PRINCIPAL'S personnel or by personnel of SUBCONTRACTORS developed under the PROJECT and any and all patents or patent applications or other industrial property rights relating thereto, shall, subject to the rights of any third party, be the property of the PARTICIPANTS. The cost of application grant and maintenance of any patents or other industrial property rights shall subject to APPROVAL be funded by the PARTICIPANTS (including LATE PARTICIPANTS).
- 12.2 In the event that APPROVAL is not given the PRINCIPAL may at its own discretion, apply for and obtain grant of any patent or industrial property right at cost for its own account and subject to the continuing rights of the PARTICIPANT pursuant to Clause 11.5 hereof.
- 12.3 In relation to any invention as referred to in Clause 11.1 hereof the PRINCIPAL hereby grants to each PARTICIPANT and its AFFILIATES a royalty free, irrevocable, world-wide non-exclusive use of such invention including a licence of any patent or other form of industrial property protection obtained covering such invention.
- 12.4 Any royalties received by the PRINCIPAL from the licence to any third party of patents or other form of industrial property rights the cost of application, grant and maintenance of which was funded by the PARTICIPANTS shall be shared between each of the contributing PARTICIPANTS in equal shares.
- 12.5 If in accordance with Clause 11.2 the PRINCIPAL, at its own expense, applies for and obtains grant of any patent or industrial property rights then such use by the PARTICIPANTS and their AFFILIATES of any invention described in Clause 11.1 hereof shall be on a royalty free basis as defined in Clause 11.3 above but any royalties received by the PRINCIPAL from the license to any third party of such patent or other form of industrial property right shall be for the PRINCIPAL'S sole account.
- 12.6 The PRINCIPAL shall maintain complete and accurate books and records in sufficient detail to enable any royalties to be paid hereunder to be determined, and further agrees to permit access, at all reasonable times, to such books and records to the extent necessary to enable the amount of such royalties payable to PARTICIPANTS to be ascertained. Such examination and audit is to be made by an auditor appointed by the PARTICIPANTS and at the PARTICIPANTS expense.

- 12.7 The PRINCIPAL shall indemnify and hold harmless the PARTICIPANT from all claims, losses, damages, costs (including legal costs), expenses and liabilities of every kind and nature for, or arising out of, any alleged infringement of any patent or proprietary right, arising out of or in connection with the performance of the obligations of the PRINCIPAL in accordance with the AGREEMENT.
- 12.8 The PARTICIPANT shall indemnify and hold harmless the PRINCIPAL from all claims, losses, damages, costs (including legal costs), expenses and liabilities of every kind and nature for, or arising out of, any alleged infringement of any patent, or proprietary, or protected right, arising out of or in connection with the performance of the obligations of the PARTICIPANT concerned in accordance with the AGREEMENT or the use by the PRINCIPAL of specifications, data or documentation supplied by the PARTICIPANT concerned.

13. LAW

- 13.1 This AGREEMENT shall be construed in accordance with English Law. Any disputes arising under this AGREEMENT or in relation to its implementation will be resolved by arbitration in London according to the English Arbitration Acts of 1950 and 1979 and any subsequent amendments thereto.

14. AUDIT

- 14.1 The PRINCIPAL agrees to keep adequate books, records and all other documentation to support all financial matters relating to the PROJECT. The PRINCIPAL will preserve such documentation for a period of two years following completion of its services under this AGREEMENT. Any PARTICIPANT or its authorised representative has the right to audit once in each calendar year the PRINCIPAL'S PROJECT accounts at all reasonable times upon notice during term of this AGREEMENT and for a period of two years after PROJECT TERMINATION. Such audit shall be executed on the PRINCIPAL'S premises. All costs in connection with the audit shall be borne by the PARTICIPANT requesting the audit.

15. RELATIONSHIPS

- 15.1 Nothing herein shall be construed as establishing any partnership relationship or as creating any joint obligation between the PARTIES except as may be specifically set forth herein. Each PARTY maintains the right to conduct its own business as it sees fit and maintains the right to carry out its own research directed towards the subject matter covered by the PROJECT.

16. EARLY TERMINATION

- 16.1 A PARTICIPANT may at any time terminate its participation in the PROJECT without cause by giving the PRINCIPAL written notice. Such termination will be effective upon receipt by the PRINCIPAL of such written notice. Such termination shall not affect the PARTICIPANT'S obligation to pay the full participation fee to the PROJECT as set forth in Article 5. If at any time from Project Commencement the PRINCIPAL is in default in compliance with their obligations hereunder, the PARTICIPANT may terminate its participation in the PROJECT by giving 7 days notice of termination to the PRINCIPAL hereunder. The PRINCIPAL will refund to the PARTICIPANT its share of unspent funds.
- 16.2 Such termination shall also not affect PARTICIPANT'S rights, until the date of termination, to receive the documentation and all other PROJECT RESULTS and information delivered to other PARTICIPANTS who have paid the participation fee. After termination no additional information and material which may be delivered to other PARTICIPANTS will be provided to any such terminating PARTICIPANT. The license granted in Article 11 shall survive any TERMINATION of this AGREEMENT.
- 16.3 If at any time from PROJECT COMMENCEMENT, any PARTY is of the opinion that the major objectives of the PROJECT cannot be achieved for any reason, then by APPROVAL the PROJECT may be terminated. Such early termination will be implemented in a manner to be determined by the STEERING COMMITTEE, and will involve negotiation of termination costs with SUBCONTRACTORS and refund of unspent funds to PARTICIPANTS.

17. SUBCONTRACTORS

- 17.1 The PRINCIPAL shall ensure that the terms and conditions of any subcontractors into which it may enter for the purpose of this AGREEMENT shall safeguard the rights, including rights in intellectual property and the interests of the PARTIES hereto.
- 17.2 The PRINCIPAL shall ensure that the terms and conditions of any contract it enters into with sub-contractors (as defined in Section 560 Income and Corporation Taxes Act 1988) shall defend and indemnify PARTICIPANT and hold PARTICIPANT safe and harmless from any and all taxes assessed or levied by the contrary of operations or any sub-division therein or by the Government of any other country against the sub-contractor.

18. ASSIGNMENT

- 18.1 This AGREEMENT shall be assignable by the PARTICIPANT to an AFFILIATE or to the successor in title of its entire business and shall be subject to the acceptance by such AFFILIATE or successor of all of the PARTICIPANT obligations hereunder. Notwithstanding any such assignment as aforesaid the PARTICIPANT shall continue to be bound by the obligations of confidence under Article 7 hereof.

19. NOTICES AND CORRESPONDENCE

19.1 Where, in accordance with the AGREEMENT, a notice in writing is required, it shall be sent by first class mail or telefax to the address of the party as described in 19.2 and 19.3 below to receive it or to such other address as may from time to time be notified by the PARTIES to each other in writing and shall be deemed effected, and hence effective, not earlier than the moment of receipt by the receiving party.

19.2 To the PARTICIPANT (please complete):

<u>For the Attention Of:</u>	
<u>Company / Organisation</u>	
<u>Address</u>	
<u>Postcode /Country</u>	
<u>Telephone</u>	
<u>Fax</u>	

For invoicing purposes the following address, if different from above.

<u>For the Attention Of:</u>	
<u>Company / Organisation</u>	
<u>Address</u>	
<u>Postcode /Country</u>	
<u>Telephone</u>	
<u>Fax</u>	

19.3 To the PRINCIPAL.

<u>For the Attention Of:</u>	Nigel J Robinson (F.P.S. Mooring Integrity JIP – Phase 2)
<u>Company / Organisation</u>	Noble Denton Consultants Limited.,
<u>Address</u>	No. 1 The Exchange, 62 Market Street, Aberdeen, U.K.
<u>Postcode /Country</u>	AB11 5PJ
<u>Telephone</u>	(+44)-1224-564455
<u>Fax</u>	(+44)-1224-564456

For communications regarding invoices and payments the following address will apply.

<u>For the Attention Of:</u>	Kevin Fenn (F.P.S. Mooring Integrity JIP)
<u>Company / Organisation</u>	Noble Denton Consultants Limited,
<u>Address</u>	Noble House, 39 Tabernacle Street, London, U.K.
<u>Postcode /Country</u>	EC2A 4AA
<u>Telephone</u>	(+44)-20-7812 8700
<u>Fax</u>	(+44)-20-7812 8701

The address of the bankers and the account number for payments of invoices will be shown on the invoices as set out in Article 5.

20. ENTIRE AGREEMENT

20.1 This AGREEMENT constitute the entire understanding between the parties hereto with respect to the subject matter hereof and cancel and supersede all prior negotiations, representations and agreements, either written or oral. No changes, alterations, or modifications to this AGREEMENT will be effective unless agreed in writing and signed by the parties hereto.

IN WITNESS WHEREOF the parties hereto have executed the AGREEMENT on this

_____ day of _____, 200_.

Participant	
for	_____
	(please type name of Company or Organisation)
Authorised Representative	_____
(signature)	_____
	(please type name and title of Authorised Representative)

Principal	for	Noble Denton Consultants Limited
Authorised Representative		Nigel J Robinson
(signature)	_____	Operations Director, Aberdeen.