PIPELINE SHORE APPROACH
PRE-QUALIFICATION DOCUMENT

Offshore Construction Specialists (OCS)
36 Kian Teck Road,
Singapore 628781
Tel: +65 6898-0210
Fax: +65 6898-0209
Web: http://www.offshore-ocs.com

Contact Information

<table>
<thead>
<tr>
<th>Contact</th>
<th>Company Position</th>
<th>Email Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keith Jackson</td>
<td>Managing and Technical Director</td>
<td><a href="mailto:keith.jackson@offshore-ocs.com">keith.jackson@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Seto Jian</td>
<td>Operations Manager</td>
<td><a href="mailto:seto@offshore-ocs.com">seto@offshore-ocs.com</a></td>
</tr>
<tr>
<td>William Wijaya</td>
<td>Project Manager</td>
<td><a href="mailto:william.wijaya@offshore-ocs.com">william.wijaya@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Loke Kah Poh</td>
<td>Project Manager</td>
<td><a href="mailto:kplode@offshore-ocs.com">kplode@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Rakul Remanan</td>
<td>Engineering Manager</td>
<td><a href="mailto:rakulr@offshore-ocs.com">rakulr@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Alastair Wong</td>
<td>Construction &amp; Equipment Manager</td>
<td><a href="mailto:alastair.wong@offshore-ocs.com">alastair.wong@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Fery Wijaya</td>
<td>Construction Manager</td>
<td><a href="mailto:fery@offshore-ocs.com">fery@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Henry Chuy</td>
<td>Subcontracts &amp; Procurement Manager</td>
<td><a href="mailto:chuy.chunfei@offshore-ocs.com">chuy.chunfei@offshore-ocs.com</a></td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

1.0 INTRODUCTION .......................................................................................................................... 3
1.1 SHORE APPROACH EXPERIENCE ............................................................................................... 4
2.0 ORGANISATION CHART ............................................................................................................... 6
3.0 TYPICAL PIPELINE SHORE APPROACH ORGANISATION CHART ........................................ 8
4.0 PLANNING AND EXECUTION ...................................................................................................... 10
5.0 OCS CLIENT BASE ....................................................................................................................... 17
6.0 PIPELINE PRE-TRENCH AND SHORE APPROACH - TRACK RECORD ................................... 18
7.0 UTILITY BARGE (OCS UB1) GENERAL DESCRIPTION ............................................................... 19
8.0 EQUIPMENT SPECIFIC DESCRIPTION ....................................................................................... 21
9.0 PRINCIPAL EQUIPMENT DATA SHEETS .................................................................................... 22
9.1 Utility Barge ................................................................................................................................. 22
9.2 Excavators (CAT375) ................................................................................................................. 23
9.3 Crawler Crane ............................................................................................................................ 24
9.4 Linear Pull Winch (Typical) ....................................................................................................... 25
10.0 ISO CERTIFICATION ................................................................................................................. 26
1.0 INTRODUCTION

Offshore Construction Specialists (OCS) was formed in 2007 from a core group of experienced marine construction engineers with an extensive track record working with major contractors.

OCS provides construction management, engineering and strategic support equipment services primarily to the offshore oil and gas sector focusing on the installation of pipelines, platforms, tanker moorings and related facilities. In addition to engineering, OCS also provides turnkey services for pre-trench and shore approach, post lay pipeline burial, pipeline pre-commissioning & drying, flexible flow line installation and umbilical installation on a subcontract basis to marine contractors.

The company has grown steadily since incorporation and now employs 60 personnel of whom over 36 are civil/structural and mechanical engineers along with an equipment group comprising of mechanics and technicians to operate in-house developed equipment. The engineers and technician work hand in hand to ensure all projects are properly engineered and operationally practical.

OCS operates a new utility barge, a customised 160’x40’x10’ (48768mmm x 12192mm x 3048mm) flat top barge with 8 nos 10T air operated winches below deck and 2 nos spud wells, which can be utilised and complements all activities covering pre-trenching, shore approaches preparation, beach pull (as a pull barge) which facilitates the Company’s pipeline near shore and shore approaches configuration including post trenching. This is drawn from the experience from 2 major projects that our personnel has executed under OCS as well as other shore approach projects while working for major contractor.

OCS utility barge can be configured for different conditions within the overall shore approach scope of work. For each different work scope/packages, OCS utility barge (OCS UB1) can be configured specifically to requirement, e.g.

i. As a Shallow water Pre-trenching spread, equipped with two (02) Caterpillar 375 excavators with modified long arms and 2m³ buckets, an 80T crane for handling spuds and two (02) spuds for positioning.
ii. As a Pull barge with project specific Linear pull winch capacity (300T/400T/450T) loaded onto her and used as a support/floating platform where site location/configuration prevent a proper LPW foundation to be set up.
iii. Near shore supporting role – deployment of beach pull wire and trench maintenance prior and during beach pull – excavator/spuds and crane use.
iv. For Back filling (if the need arises) – with the excavators configuration.
v. Post trenching configuration where OCS’s post trenching equipment can be mobilised and swap out with the excavators. The barge has 8-10T mooring winches built in below deck to allow for a mooring system.
vi. For Above Water Tie-in configuration (if necessary with portable A-Frames installed).

All the above can be made possible when the utility barge is mobilised once for a shore approach project, avoiding the need to separately mobilised additional expensive spreads for the different work scope within a project where one (same) spreads can be used.
Our equipment is managed and operated by personnel who come from the same background as the main marine contractor. We help the major marine contractor plan the work such that the shore approach activities have the least impact on critical path operations. We are proactive in highlighting potential issues and ensuring both parties win. OCS understands the importance of getting the job done safely and efficiently to minimise operational costs for all concerned.

This document is prepared to outline the general planning and execution methodology, equipment and required preparation work and the equipment specification going into any shore approach project.

1.1 SHORE APPROACH EXPERIENCE

OCS has undertaken three (3) major shore approach projects for different customers;

a) HCML (Husky CNOOC Madura Ltd) BD Project Pre Trench/Shore Approach Beach Pull/Post Trench (June/Aug 2016) – 16” CWC pipeline, 52km long with 5.8km burial with 4.8km pre-trench and 1km post trench with 2m cover from T.O.P. Near shore location at Pasuruan City, Surabaya, Indonesia:
- Pre-Trenching of an open trench for a 4.8km beach pull. The trench depth was 2m T.O.P.
- The end of pipeline is at the onshore (landfall point) and soil condition do not allow for a pulling winch foundation and calls for a customised pull barge.
- Sheet pile Hold Back foundation behind pull barge (in clay environment)
- 4.8 km beach pull using purpose built buoyancy foam as flotation for cable and pipe
- Deployment of pull cable with floatations
- Supporting operation during beach pull (trench maintenance)
- Back filling of near shore trench.
- Post Trenching at section after the pre-trench area

b) Bukit Tua, Ketapang (Petronas, 2014) near shore at offshore Gresik in Surabaya, a 110km long of 12" CWC pipeline from shore LFP to offshore WHP, pre-trenching of first 4km pipeline for beach pull and post trenching of 27km of 12" CWC pipeline to 2m TOP:
- Sheet pile Cofferdam at the beach front due to sandy material from KP110.31 to KP110.2100.
- Pre-Trenching of an open trench for a 4km beach pull. The trench depth is 2m T.O.P.
- Land Fall Point at KP110.310
- Sheet pile Hold Back foundation
- Linear Pull Winch set up on beach front
- 4km beach pull using purpose built buoyancy foam for cable and pipeline as flotation
- Deployment of pull cable with cable bouys
- Supporting operation during beach pull (trench maintenance)
- Back filling of near shore trench.
c) APD/Salamander (Serica Kambuna Development project) 2009/10, 14” CWC pipeline x 13,000 km total burial distance (8km post trench), 2.0m TOP cover. Nearshore north of Medan, Sumatra, Indonesia; The scope involved the following:-
- Pre-Trenching of an open trench for a 5km beach pull. The trench depth was 2m T.O.P.
- No sheet pile cofferdam was required.
- The end of pipeline is at the onshore (landfall point) and soil condition do not allow for a pulling winch foundation and calls for a customised pull barge.
- Sheet pile Hold Back foundation behind pull barge (in clay environment)
- 5km beach pull using purpose built buoyancy foam as flotation for cable and pipe
- Deployment of pull cable
- Supporting operation during beach pull
- Back filling of near shore trench.

d) Other projects that OCS personnel were intimately involved in (while employed by major contractor, with experience maintained within OCS) are

- John Brooks Project for Apache Energy Limited (Australia – 2005) – laying of DN450 55km Gas export line with a 7km beach pull in Varanus Island, with rock bolting as the major stabilization method. Hold back for the Linear pull Winch was a drilled and grouted steel tendons.
- Camau Gas Pipeline Project (PetroVietnam - 2006) for the installation of a 297km 18’ gas pipeline from offshore (BRB platform to Land Fall Point) covering near shore excavation and pre trenching, beach pull preparatory work (LPW on pull barge), hold back sheet pile wall.

Our in-house equipment spread is described in detail in this document. OCS is equipped to handle the full range of shore approach and pre-trenching activities with depth of cover ranges from one (1) to two (2) metres in shallow water.

OCS is equipped to handle large projects or discrete project elements depending on the specific needs of the customer. During the preparation for shore approach or any offshore work the safety of personnel, equipment and environment plays a vital role in the success of a project and as such, HAZID’s shall be conducted prior to any operations. These meetings are attended by key engineers and supervisors and all potential risks are identified and mitigation measures put in place to ensure they are as low as reasonably practicable.
2.0 ORGANISATION CHART

2.1 KEY PERSONNEL CONTACTS

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keith Jackson</td>
<td>Managing and Technical Director</td>
<td><a href="mailto:keith.jackson@offshore-ocs.com">keith.jackson@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Seto Jian</td>
<td>Operations Manager</td>
<td><a href="mailto:setoj@offshore-ocs.com">setoj@offshore-ocs.com</a></td>
</tr>
<tr>
<td>William Wijaya</td>
<td>Project Manager</td>
<td><a href="mailto:william.wijaya@offshore-ocs.com">william.wijaya@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Loke Kah Poh</td>
<td>Project Manager</td>
<td><a href="mailto:kploke@offshore-ocs.com">kploke@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Rakul Remanan</td>
<td>Engineering Manager</td>
<td><a href="mailto:rakulr@offshore-ocs.com">rakulr@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Alastair Wong</td>
<td>Construction &amp; Equipment Manager</td>
<td><a href="mailto:alastair.wong@offshore-ocs.com">alastair.wong@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Fery Wijaya</td>
<td>Construction Manager</td>
<td><a href="mailto:fery@offshore-ocs.com">fery@offshore-ocs.com</a></td>
</tr>
<tr>
<td>Henry Chuy</td>
<td>Subcontracts &amp; Procurement Manager</td>
<td><a href="mailto:chuy.chunfei@offshore-ocs.com">chuy.chunfei@offshore-ocs.com</a></td>
</tr>
</tbody>
</table>

Refer to the next page for OCS Organisation Chart
3.0 TYPICAL PIPELINE SHORE APPROACH ORGANISATION CHART
(to be further refined)

Typical Organization Chart for pre-trenching operations

**Typical onshore Land Fall Site set up during beach pulling operations:**
Typical Post Trenching team

Personnel requirements for 24 hour operations specifically for operating the pipe burial equipment spread are as follows:

- 1 x Jetting Supervisor/Superintendent
- 1 X Jetting Engineer.
- 4 x Technicians/Mechanic (2 per shift)
- 4 x Winch Operator / General Helpers(2 per shift)

OCS normally provides personnel specifically associated with the operation of the jet sled and associated water distribution systems only.

Craneage, rigging and welding support along with key subcontract support including diving and survey services are usually provided by the vessel operator or main contractor. OCS can provide additional personnel as required.

Where specifically required, OCS can provide an option for provision of the entire support vessel. Customer requirements for this option can be discussed on a case by case basis.
4.0 PLANNING AND EXECUTION

For any shore approach projects, OCS will cover the following areas during planning and execution.

4.1 Planning Stage

The first activity on award, OCS will review the requirements, drawings, specification and environmental information – water depth, tides, currents, soil type and local site infrastructure to establish a shore approach execution plan which will be the basis for procedure and engineering to proceed.

i. Buoyancy requirement based on beach pull length, pipe size, on bottom stability. These covers cable buoys and pipeline buoys.
ii. Hold back beam and foundation design (typically sheet pile wall in trenchable areas or drilled and grouted tendon hold back in hard rocky locations.
iii. Linear Pull Winch foundation capacity design check
iv. Pull head design
v. Linear Pull winch capacity specification
vi. Trench depth and wide design to suit equipment and soil type
vii. Requirement of a cofferdam vs open tranch
viii. Mobilization plan for equipment and ancillaries
ix. Major procurement plan/strategy
x. Support equipment/vessels that are required

4.2 Pre-Trench

Pre-trenching works requires the excavation of bulk spoil and deposited to nearby area. Depending on the proximity of the shoreline, it can be defined either as a floatation trench or a pipe trench. A floatation trench is one that requires a trench to be excavated to enable the pre-trench barge to access toward shore line. Once the floatation trench is established the pipe trench can proceed. Depth of flotation trench depends on the tide and pipe trench will depend on the required cover.

Prior to excavation works, a pre-engineering survey will need to be performed, which will map the bathymetry of the natural seabed, and to mark out the excavation limits. This survey will also mark out the winch location to ensure alignment with the offshore and onshore pipeline.

Pre-trenching works will be planned with due considerations to the tides. Tides will be monitored during the works and compare to existing data available.
4.3 Cofferdams

Cofferdams are support structure erected at the beach head where pipeline is to be buried, to provide structural support to keep the open excavation from collapse due to unsuitable soil condition. A decision to erect a cofferdam is crucial as it is expensive and time consuming which requires a considerable amount of resources and cost as well as schedule sensitive and should only be decided if no alternative is available.

Figure 4.3.1 Typical cofferdams (previous project)

4.4 Linear Pull Winch, Spooler and Cables

The line pipes are pulled off from the Pipe Lay Barge from offshore location using a suitably sized Linear Pull Winch (Lucker Winch) positioned and secure at onshore. Lucker winch is design with either a 300mT or 450mT capacity and is available in this region. Lucker winch is hydraulically powered and will required dedicated power pack which comes standard. To complement the use of luckyer winch, a suitably sized pull cable is required and dependant on the length of the beach pull, one or several reels of pull cables are required. When more than one reel of cable are required then factors like cranage at site, wire socket handling management, reel storage management must be carefully assessed. These reels are hydraulically operated to deploy the pull cable as well as during beach pull operations where the pull cable will be recovered and stored back into its storage reels. A powered spooler is also part of the standard equipment for every beach pull operation.

OCS has the expertise and can provide management support to hire this lucker winch package including power packs and spooler, as well as sourcing of the required and suitable pull wires.
4.5  Lucker Winch Hold Back

During beach pull operation with the Linear Pull Winch (lucker winch), the winch will exert a significant amount of force onto an “anchor” to react with the pulling load of the pipe weight from the barge. A hold back foundation will need to be design and installed behind the lucker winch as a hold back “anchor”. Depending on the soil/ground condition, a sheet pile hold back wall is normally selected. For harder ground or rock formations, it is generally required a drilled and grouted foundation.
The lucker winch is tied back to the hold back foundation using wires that are also suitably sized. OCS is very familiar with both type of foundation used and have designed and utilized these for a number of projects.

### 4.6 Land Fall Site (LFS) Set up

The landfall site will serve as the base of pre-trenching operations as well as beach pull activities. The landfall site will include site office, accommodation (if necessary), power and lighting, compressed air supply, communication with internet, logistics and transportation and amenities suitable for 24 hour manning, fire fighting and emergency facilities. For safety and security purposes it is normal that border fences are erected around the work site. Proper layout including craneage will have to be planned to ensure coverage. The LFS set up is critical as it will support all preparation works for a successful beach pull to avoid delays to the critical path of the pipelay spread. A dedicated ERP will be prepared for each LFP set up to ensure compliance with regulatory requirement

### 4.7 Pull Wire deployment

Pull wire as noted will be suitably sized for the beach pull operation. Depending on the length required for the beach pull, several reels of wire may be required and suitable craneage to be available at the LFS or in the vicinity. For the beach pull operation, the pull wire will have to be deployed from the lucker winch on shore up till offshore location where the socket end will be recovered by the pipe lay barge to be connected to the start up head to commence beach pull operation. The pull wire deployment will be performed prior to the arrival of the main pipe lay barge.

Pull wire deployment is critical as an incorrectly deployed pull wire will have significant impact to the pulling operation and affects the final pull alignment making the pipeline to be outside the allowable corridor. In cases where a narrow corridor are imposed for the shore approach section, an incorrectly place pull wire may make contact to adjacent subsea asset posing a threat of damage.

OCS has successfully deployed pull wire using a shallow floating pontoon (in most instances, either a pull barge or a pre-trench spread) where the excavator and spuds positioning the pull cable along the required alignment while attaching the cable buoyancy on. At the final location where the end socket will be position (for recovery by the pipelay barge) a clump weight with a marker buoy will be install. Timing of the pull wire deployment
also plays a big part in the planning as the pull wire is to be deployed just in time for the pipe lay barge arrival. If deployed too early, the pull wire may risked being drifted away from current or disturbed by external factors (e.g., fishermen, fishing boat, etc)

![Pull wire cable buoy](image1.png)  ![Pull wire cable buoy at end (awaiting recovery)](image2.png)

### 4.8 Buoyancy

Buoyancy is required for all beach pull operations to reduce pipe weight that generate drag force due to friction and results in higher pull load. Increase load will cause the pipe and cable to “bite” into the soil/mud and attract significant friction loads which could go beyond the designed pulling capacity of the Linear pull winch.

Two (02) types of buoyancy units are normal used during beach pull operation, one for pull wire and one for buoyancy for pipeline. Both may use the same buoyancy units (meant for pipeline) however the buoyancy for the pull wire will require a smaller dimension.

The buoyancy attached to the pull wire will be installed when the wire is deployed, with the purpose of keeping the wire out of the mud/seabed during the main pull. Without the buoyancy, the pull wire will likely lie on the seabed for the entire length of the pull and will subsequently attract very significant load. Size and location of the buoyancy unit on the cable will have to be properly assessed to ensure only sufficient (minimum) contact to the mudline and still keep the pull wire within the required corridor (against it being moved/drift due to current)

Larger buoys will be strapped onto the pipeline on board the pipe lay barge during welding out and pulling from the beach. The buoy will float the pipe reducing the pull load on the lucker winch set up at the LFS. The buoyancy units will be attached to the pipe with 32mm wide x 0.8mm thick steel strapping. The size, quantity and location of the buoyancy unit will be project specific depending on the pipe size weight, length of pull and pull capacity available.

OCS has successfully performed numerous beach pull with a correctly sized equipment (LPW, pull wire, buoyancy units, etc) for each project.
Pipeline buoyancy will house facility to allow it to be “stripped” from the water surface without having divers to cut the straps.

### 4.9 Pull Barge Option

For locations where the ground foundation does not allow for the setting of the Linear Pull Winch, a pull barge option is to be used. Where pull barge option is considered, the Linear pull winch are mobilised and secured on to a pull barge acting as a floating pontoon. All support equipment complementing the Linear Pull Winch (e.g., Power pack, Hydraulic spool, Cable reels) will be mobilised and secured onto the pull barge. The pull barge is then towed to location and it will then manoeuvre itself using spuds and excavator.

### 4.10 Execution Procedures

OCS will provide project specific execution procedures for every project which address all elements of the shore approach project. These procedures must be approved by the client. OCS will ensure that the procedures address all constraints posed by individual project site conditions and the specific scope of work.

### 4.11 Equipment Testing

OCS will ensure that all equipment mobilised is fully tested before leaving the OCS facility. Client representatives will be invited to witness the testing programme. For more difficult jobs, further specific testing may be required which will be determined on a case by case basis.

### 4.12 HAZID

Specific HAZID and risk identification sessions will be conducted to identify and propose mitigation measures for site hazards which may be posed by operations.

### 4.13 Equipment Mobilisation and Demobilisation

OCS will provide a procedure for equipment mobilization and demobilisation which will be in accordance with client requirements. The procedure will ensure the right equipment, properly prepared is in the right place at the right time.
4.14 Personnel

OCS will provide a team of qualified personnel to co-ordinate and operate the equipment on a 24 hour basis. Key personnel will be the same as those who tested and mobilized the equipment. The OCS proposed organization chart is in section 2.

4.15 Site Operations

Typical procedures for site operations are included in this document. OCS will work closely with the client to ensure post trenching activities are closely coordinated with other activities on the project.

4.16 Surveys

Typically the pre-trenching barge will be fitted out during mobilisation with a survey spread including positioning system, land survey and echo sounder or similar to map the trenched seabed features. The position of the pre-trench barge relative to the proposed pipeline route will be shown on the survey screen/computer on the barge to ensure the barge is in correct position during excavation works. This will be supplemented with the land survey equipment based on the shore which will give a visual indication of pipeline route and barge position.
5.0 OCS CLIENT BASE

OCS has built up a significant customer base during eight (8) years of operations. OCS past and present clients are listed below. References can be provided on request:

<table>
<thead>
<tr>
<th>NO</th>
<th>CLIENT NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asia Petroleum Developments / Salamander Energy (Indonesia) [*]</td>
</tr>
<tr>
<td>2</td>
<td>Bumi Amarda</td>
</tr>
<tr>
<td>3</td>
<td>Chevron (Thailand)</td>
</tr>
<tr>
<td>4</td>
<td>Clough Sapura JV (Australia) [*]</td>
</tr>
<tr>
<td>5</td>
<td>DOF Subsea.</td>
</tr>
<tr>
<td>6</td>
<td>EMAS (Singapore)</td>
</tr>
<tr>
<td>7</td>
<td>Franklin Offshore (Singapore)</td>
</tr>
<tr>
<td>8</td>
<td>Galoc (Philippines)</td>
</tr>
<tr>
<td>9</td>
<td>GF1 (Thailand)</td>
</tr>
<tr>
<td>10</td>
<td>Global Industries (Malaysia)/Technip</td>
</tr>
<tr>
<td>11</td>
<td>Hako Offshore (Singapore)</td>
</tr>
<tr>
<td>12</td>
<td>Heerema (Netherlands)</td>
</tr>
<tr>
<td>13</td>
<td>HESS (Indonesia) [*]</td>
</tr>
<tr>
<td>14</td>
<td>Kangean Energy (Indonesia)</td>
</tr>
<tr>
<td>15</td>
<td>Larsen &amp; Toubro (Malaysia/India)</td>
</tr>
<tr>
<td>16</td>
<td>M3 Energy (Malaysia)</td>
</tr>
<tr>
<td>17</td>
<td>McConnell Dowell CCC JV (Australia)</td>
</tr>
<tr>
<td>18</td>
<td>MRTS Engineering Ltd (Russia)</td>
</tr>
<tr>
<td>19</td>
<td>Newfield Peninsula Malaysia (Malaysia)</td>
</tr>
<tr>
<td>20</td>
<td>Nippon Steel (Indonesia)</td>
</tr>
<tr>
<td>21</td>
<td>NorCE (Singapore)</td>
</tr>
<tr>
<td>22</td>
<td>NuCoastal (Thailand)</td>
</tr>
<tr>
<td>23</td>
<td>Offshore Marine Contractors</td>
</tr>
<tr>
<td>24</td>
<td>Origin Energy (Australia)</td>
</tr>
<tr>
<td>25</td>
<td>PT Timas Suplindo (Indonesia)</td>
</tr>
<tr>
<td>26</td>
<td>Petronas Carigali Ketapang 2 Ltd (Indonesia) – PCK2L [*]</td>
</tr>
<tr>
<td>27</td>
<td>Sapura Acergy (Malaysia)</td>
</tr>
<tr>
<td>28</td>
<td>Sarku (Malaysia)</td>
</tr>
<tr>
<td>29</td>
<td>Sea Drill (Singapore)</td>
</tr>
<tr>
<td>30</td>
<td>Star Petroleum (Indonesia)</td>
</tr>
<tr>
<td>31</td>
<td>Swiber (Singapore)</td>
</tr>
<tr>
<td>32</td>
<td>TLO Sapura Crest (Malaysia)</td>
</tr>
<tr>
<td>33</td>
<td>Vietsovpetro (VSP) (Vietnam)</td>
</tr>
</tbody>
</table>
### 6.0 PIPELINE PRE-TRENCH AND SHORE APPROACH - TRACK RECORD

<table>
<thead>
<tr>
<th>YEAR</th>
<th>PROJECT</th>
<th>CLIENT / OPERATOR</th>
<th>SCOPE OF WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>HCML BD Project Pre-Trenching / Shore Approach Beach Pull / Post Trench</td>
<td>Client: PT Timas Suplindo Operator: Husky-CNOOC Madura Ltd (HCML)</td>
<td>OCS was contract by Timas to provide provide management, engineering services and suitable equipment and personnel to prepare, plan and manage and execute the 16” Gas Pipeline shore approach with 4.8km pre-trenching, hold back design and installation, 4.8km beach pull and a 1km post trench section. Project was completed in August 2016</td>
</tr>
<tr>
<td>2014</td>
<td>Petronas Ketapang (Indonesia)</td>
<td>Client : PT Timas Suplindo Operator : Petronas (PCK2l) Indonesia</td>
<td>OCS was contracted by PT Timas laying 110km of 12” pipeline from on shore to offshore with pre-trenching for first 4km and subsequent 4km beach pull. The work was completed in 2014</td>
</tr>
<tr>
<td>2009</td>
<td>Serica Kambuna Field Development</td>
<td>Client: PT Timas Suplindo Operator: Asia Petroleum Development (APD) Salamander Energy</td>
<td>• 14” x 39.0 km pipeline, including 5500m beach pull section for nearshore approach  • Super duplex pipeline section, expansion spool and riser in the platform approach area (400m)  • Pipeline pre-commissioning (flood, pig, testing)  • Pre-trenching and pipe burial (jet) for 13.0 km section of 14” pipeline, 2.0m TOP cover  • Seabed: Black stiff consolidated silt clay</td>
</tr>
<tr>
<td>2006</td>
<td>John Brooks Field Development</td>
<td>Client : Apache Energy Ltd (Australia) Operator : Apache Energy Ltd (Australia)</td>
<td>• Laying of DN450 55km Gas export line with a 7km beach pull in Varanus Island, with rock bolting as the major stabilization method.  • Hold back for the Linear pull Winch was a drilled and grouted steel tendons.</td>
</tr>
<tr>
<td>2005</td>
<td>Camau Gas Pipeline Project</td>
<td>CLIENT : VSP OPERATOR : PVGAS</td>
<td>• Installation of a 297km 18’ gas pipeline from offshore (BRB platform to Land Fall Point) covering near shore excavation and pre trenching, beach pull preparatory work (LPW on pull barge), hold back sheet pile wall.</td>
</tr>
</tbody>
</table>
SUBJECT: HCML BD PROJECT PRE TRENCH/SHORE APPROACH BEACH PULL/POST TRENCH

Project Details:
Husky-CNOOC Madura Ltd. (HCML), plans to develop the Madura Strait Block BD gas reserves for sales gas to buyers in Java Island. This field is located offshore in the Madura Strait East Java, about 65 km east of Surabaya and about 16km south of Madura Island. The project includes development of a wellhead platform; an offshore spread moored Floating, Production, Storage and Offloading (FPSO) with gas processing facilities; Gas metering Station (GMS); flexible risers from wellhead platform to FPSO; and a 16” x 52.924km export gas pipeline from WHP to GMS.

Project Scope:
OCS scope for this project is to provide management, engineering services and suitable equipment and personnel to prepare, plan and manage and execute the 16” Gas Pipeline shore approach with 4.8km pre-trenching, hold back design and installation, 4.8km beach pull and a 1km post trench section. Project was completed in August 2016.

Pipeline/Trench Information:
- Pipeline Size: 16”
- Pipeline wt: 11.1mm
- Pipeline Grade: API 5LX65
- Pipeline length: 52.9km
- Water Depth: 60m @ Pltf
- Beach Pull Length: 4.8km
- Pre-trench: 4.8km
- Post trench: 1km
- Cover: 2m T.O.P

Pictures:
PRE TRENCH AND PULL BARGE
Completed Beach pull
SUBJECT: KETAPANG BUKIT TUA (PETRONAS) PRE TRENCH/SHORE APPROACH BEACH PULL

Project Details:-
PC Ketapang II Ltd (PCK2L) is developing the Bukit Tua Field, in Ketapang Block, East Java. Bukit Tua, is located 35 km north of Madura Island and 110 km northeast of Gresik at a water depth of approximately 57m. The development consist of unmanned Well Head Platform (WHP) which is tied back to a spread-moored Floating Production, Storage and Offloading (FPSO), anchored approximately 900 m from the WHP. The Full Well Stream (FWS) from the wells are separated into gas and liquid streams in the production separator on WHP. The gas and liquid are evacuated to the FPSO via two separator single phase 16” and 8” liquid infield flowlines. Associated gas is compressed and conditioned on the FPSO and exported via a 12” gas pipeline to WHP and there onwards via a 12” gas export pipeline to the Onshore Receiving Facilities (ORF) in Gresik.

Project Scope:-
OCS scope for this project is to provide project management and engineering services to prepare, plan and manage the installation of the new facilities comprising WHP platform, 1x12”x110km pipeline and 3x in field pipelines (8", 12" and 16") including shore approach and preparation with 4km pre-trenching, 4km beach pull, pipelay, post trenching and pre-commissioning. Project was completed in 2014

Pipeline/Trench Information:-
- Pipeline Size: 12"
- Pipeline wt: varies
- Pipeline Grade API 5LX60
- Pipeline length 110km
- Water Depth 57m @ Pltf
- Beach Pull Length 4km
- Pre-trench 4km
- Post trench 25km
- Cover 2m T.O.P

Pictures:
Pre-Trench, Pull wire deployment and recovery
Pictures:

Beach Pull Operations
Beach Pull Operation and cofferdam
Pictures:

LPW hold back and spooler
**EXPERIENCE LIST DATABASE**

**SUBJECT: KAMBUNA (APD/SERICA) PRETRENCHING AND SHORE APPROACH & BEACH PULL**

**Project Details:**
Asia Petroleum Development (APD) Ltd developed the Glagah Kambuna Field located approximately 70km North East of Medan, North Sumatera. An offshore wellhead platform (WHS-A) will produce gas and condensate, which will transport to the Onshore Receiving Facilities (ORF) by a 14” Pipeline for further processing. The pipeline is 42 km long from the Kambuna platform in the straits of Malacca to the landfall site. OCS was contracted by PT TIMAS Suplindo (main contractor to APD) for the installation of the export pipeline from the wellhead platform to shore crossing at Pangkalan Brandan, North Sumatera.

**Pipeline/Trench Information:**
- **Pipeline Size:** 14”
- **Pipeline wt:** 11.5mm to 11.9mm
- **Pipeline Grade:** API 5LX65
- **Total Pipeline length:** 42 km
- **Water Depth:** 35 m Deepest
- **Beach Pull Length:** 5km pull
- **Pre-trench:** 5km to nearshore
- **Post trench:** 8km till 13m WD
- **Cover:** 2m T.O.P

**Project Scope:**
OCS scope for this project is to provide management and engineering and technical services to prepare, plan and manage the installation of the 14” pipeline including shore approach, beach preparation, nearshore preparation, beach pull execution, pipelay, pre and post trenching and pre-commissioning. The project was completed in 2009.

**Pictures:**

[Pre-Trenching Barge Mob and excavation]
Pre Trench Barge 5km excavation to start of beach pul location, spoil bank on both side for back filling, and pull barge set up/mob with linear pull winch, spooler, HPU and cable buoys
Pull Barge and Cable Buoyancy deployment
Cable buoys deployed and hold back sheet pile wall
Pictures (continued)

Pipelay barge and buoyancy attachment, pull barge with head arrival
Pipeline pulling head at target location
EXPERIENCE LIST DATABASE

SUBJECT: JOHN BROOKS (APACHE ENERGY LTD) SHORE APPROACH & BEACH PULL

Project Details:
Apache Energy Limited (AEL) were developing of the John Brookes Field. The field consist of a 18” diameter x 55km Gas Export pipeline from John Brooks field to Varanus Island. John Brooks gas field lies in 47m-60m of eater, 55km north west of Varanus Island. Varanus Island is located in the North West Shelf of Western Australia. The development consist of a single unmanned six (06) slot wellhead platform tied back to the exsting Varanus Island hub. The work scope includes

- Transportation, installation, stabilization, tie-in, testing and pre-commissioning of the 457.2mm (18”) Ø x 55km long export pipeline system, including 100m CRA spools, crossing and localized stabilization and free span correction.
- Jacket, Piles and Topside Fabrication, Transportation and Installation.

Pipeline Beach Pull Information:

- Pipeline Size: 18” Diameter
- Pipeline wt: 11.5mm to 11.9mm
- Pipeline Grade: DNV HFW 450 IDU
- Total Pipeline length: 55 km
- Water Depth: 60 m Deepest
- Beach Pull Length: 7km pull
- Pre-trench: N/A
- Post trench: N/A
- Cover: Not applicable as stabilization were using rock bolting

Project Scope:
This scope were managed and completed by OCS personnel while their careers were still with McDermott, however the experience stays with the people with the significant relevance being a record 7km beach pull. The project was completed in 2006

Pictures:
Hold back design, wire buoyancy deployment and pull operation.
Pictures (continued)

Beach Pull Operation
Pipe arrival and completion of beach pull
## Project Details:
The PM3 – CaMau Gas Pipeline Project is part of the Gas Power Fertilizer Coordination Project to supply natural gas to the Integrated Power and Fertilizer Plants in CaMau province of Vietnam. PetroVietnam – CaMau Gas Power Fertilizer Project management Board (CPMB) is the owner of the gas pipeline. The CaMau development consist of an 18” pipeline that stretches from the on shore tie in point at Trung Uong Dyke to PM3 BR-B platform. Some 297km away.

## Pipeline/Trench Information:
- **Pipeline Size:** 18”
- **Pipeline wt:** 12.7mm (varies)
- **Pipeline Grade:** API 5LX65
- **Total Pipeline length:** 297 km
- **Water Depth:** varies
- **Beach Pull Length:** 3km pull
- **Pre-trench:** 3.5km to nearshore
- **Post trench:** 7km from pre-trench
- **Cover:** 3m T.O.P

## Project Scope:
This scope were managed and completed by OCS personnel while their careers were still with McDermott, however the experience stays with the people with the significant relevance being a shore approach in very soft soil condition. The scope of works involved beach and nearshore preparation (pre-trenching with excavator barge), beach pull execution (with pull barge), pipelay, pre-trenching and pre-commissioning. The project was completed in 2006.

## Pictures:
Pictures (continued)

Pull Barge Set Up
Beach Pull Operation
Pipe pulling head arrived
7.0 UTILITY BARGE (OCS UB1) GENERAL DESCRIPTION

OCS operates a multipurpose utility barge with the capability of performing a comprehensive scope of work supporting the shore approach including, pre-trenching, pull barge, near shore and post trenching. Each supporting piece of equipment has its own equipment passport which is maintained from project to project. This helps to ensure that only appropriately maintained equipment is supplied to projects.

The barge will be RINA classed (but generally in accordance with ABS standards) and generally non ballastable but with special above deck tanks for barge trimming and non self propelled barge and will be designed to be towed.

Two ballast tanks will be provided for trimming the heel of the barge where necessary. Extra thick plate will be provided on the keel of the barge to cater for grounding with double plates at spud well and fender areas and deck strengthening to accommodate excavators and crane. Deck timbers will be provided in excavator and crane tracking areas. Handrails will be heavy duty 6”.

Pads will be provided for winch foundations at the bow and stern of the vessel to facilitate installation of a mooring winch and Linear pull winch (for pull barge option). These are integrated with provisions for excavators.

The barge will be positioned with an 8 point mooring system and/or 2 vertical spuds depending on specific operations. The mooring winches are proposed to be Air winches (with central and local controls). The air compressor, cooler and dryer is proposed to be on the top deck whereas the Air receiver tank(s) and the winches are proposed to be in a machinery room below the deck level. The general philosophy is that below deck machinery will be related to air power only with no electrical (other than lighting) or diesel engine related ignition sources.

A power pack on deck (either diesel driven compressor) or generator driving an electric compressor with air cooling and drying facilities will provide compressed air to the below deck facilities

A small generator (50 kW?) will provide suitable electrical power to operate the above deck equipment and power the accommodation/work module.

Mooring wires will be routed through an integrated system of sheaves, handrail conduits and fairleads purpose designed from the start to address all concerns normally related to installation of above deck moorings. The mooring wires will also be utilised for spud handling and the mechanisms for changing from mooring to spud configuration with the mooring winches used (configured in two parts to provide the necessary lifting power) will be provided.

External spud wells designed for 24” spuds will also be provided with fendering to moor vessels on the spud handling side. Spuds will be high grade preferably ex pipeline material. Additional fendering will be provided between the spud wells to provide mooring continuity. Personnel access and egress facilities will be integrated into the spud wells. Fendering for hull protection will be provided on all sides of the vessel.
Lifting padeyes designed for the maximum total live weight of the vessel will be incorporated to facilitate transport to work locations where towing is not practical and for use as a test weight in certain circumstances.

The foundation (Pedestal) for a utility knuckle boom crane of approximately 5 ton capacity will be provided on the starboard side.

The vessel will be painted inside and out with hard wearing paint systems suitable for the marine environment.

The key equipment components for supporting the OCS UB1 are listed in Section 8
8.0 EQUIPMENT SPECIFIC DESCRIPTION

The following is a general description of the equipment supplied by OCS for pipeline shore approach work scope:

<table>
<thead>
<tr>
<th>NO</th>
<th>DESCRIPTION</th>
<th>CAPACITY / DIMENSION (mm)</th>
<th>WEIGHT</th>
<th>QTY</th>
</tr>
</thead>
</table>
| 1  | Utility Barge c/w with built in  
   - 8 nos 10T mooring winch with 28mm dia. X 500m wire rope and 1.5T anchors,  
   - 2 nos 24\" OD vertical Spuds housed in spud wells on port side  
   - 5T knuckle boom (starboard side)  
   - 50 kW (tbc) power supply (3 Phase, 50 Hz, 240V)  
   - Air supply  
   - Rigging storage container  
   - Office facilities and amenities  
   - Personnel access on portside (between spud wells) | 48765L x 12191Wx3048H | TBC MT | 01 EA |
| 2  | Portable deck Equipment | | | 02 EA |
| i  | Excavator – Caterpillar 375, c/w extended 9m long arm and 2m³ buckets | 80mT | 03 EA |
| ii | Crawler Crane | 80T (TBC) | | 01 EA |
9.0 PRINCIPAL EQUIPMENT DATA SHEETS

9.1 Utility Barge

Figure 9.1 3D model of OCS UB1
9.2 Excavators (CAT375)

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Shipping Length of Unit</td>
<td>48.3 ft</td>
<td>14710 mm</td>
</tr>
<tr>
<td>B. Shipping Height of Unit</td>
<td>15.4 ft</td>
<td>4600 mm</td>
</tr>
<tr>
<td>C. Max Cutting Height</td>
<td>47.6 ft</td>
<td>14500 mm</td>
</tr>
<tr>
<td>D. Max Loading Height</td>
<td>34 ft</td>
<td>10350 mm</td>
</tr>
<tr>
<td>E. Max Reach Along Ground</td>
<td>52.4 ft</td>
<td>15960 mm</td>
</tr>
<tr>
<td>F. Max Vertical Wall Digging Depth</td>
<td>30.8 ft</td>
<td>9590 mm</td>
</tr>
<tr>
<td>G. Max Digging Depth</td>
<td>35.6 ft</td>
<td>10840 mm</td>
</tr>
<tr>
<td>H. Max Vertical Wall Digging Depth</td>
<td>30.8 ft</td>
<td>9590 mm</td>
</tr>
</tbody>
</table>

**Dimensions**
- **A**: Width to Outside of Tracks: 11.4 ft (3480 mm)
- **B**: Length of Track on Ground: 15.1 ft (4600 mm)
- **C**: Ground Clearance: 2.9 ft (890 mm)
- **D**: Height to Top of Cab: 12 ft (3650 mm)
- **E**: Tail Swing Radius: 13.8 ft (4200 mm)
- **F**: Counterweight Clearance: 5.2 ft (1600 mm)

**Undercarriage**
- **G**: Track Gauge: 9 ft (2750 mm)
- **H**: Shoe Size: 24 in (610 mm)
9.3 Crawler Crane

Please refer to next page.
9.4 Linear Pull Winch (Typical)

The 400 Tonne linear winch can haul in horizontal loads under automatic or manual mode. The unit is equipped with contactless limit switches which aids in continuous operation without delay.

**Winch Specifications:**

<table>
<thead>
<tr>
<th>Two gripper wedges can be fitted with adapters to suit:</th>
<th>115mm diameter wire rope</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>87mm diameter wire rope</td>
</tr>
<tr>
<td></td>
<td>74mm diameter wire rope</td>
</tr>
<tr>
<td></td>
<td>64mm diameter wire rope</td>
</tr>
<tr>
<td></td>
<td>Special sizes are available upon request</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Effective pull in speed</th>
<th>4m/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder Stroke</td>
<td>1000mm</td>
</tr>
</tbody>
</table>

**Linear Winch Dimensions**

<table>
<thead>
<tr>
<th>Width</th>
<th>2375mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>11800mm</td>
</tr>
<tr>
<td>Flange Diameter</td>
<td>900mm (without davits installed)</td>
</tr>
<tr>
<td>Weight</td>
<td>40,000kgs</td>
</tr>
</tbody>
</table>
10.0 ISO CERTIFICATION

Certificate of Registration

This certificate has been awarded to

Offshore Construction Specialists Pte Ltd
36 Kian Teck Road, Singapore 628781, Singapore

in recognition of the organization’s Quality Management System which complies with

ISO 9001:2015

The scope of activities covered by this certificate is defined below

Provision of Project Management and Consultancy Services for Oil and Gas Construction Facilities

Certificate Number: 41576/R/0001/SA/En
Issue No: 1
Date of Issue: 06 November 2016
Date of Issue: 06 November 2016
Date of Issue: 05 November 2019

Issued by: [Signature]
On behalf of the Director
Certificate of Registration

This certificate has been awarded to

Offshore Construction Specialists Pte Ltd
36 Kian Teck Road, Singapore 628781, Singapore

in recognition of the organization's Quality Management System which complies with

ISO 9001:2015

The scope of activities covered by this certificate is defined below

Provision of Project Management and Consultancy Services for Oil and Gas Construction Facilities

Certificate Number: 41578/C00011/UK/En

Date of Issue: 06 November 2016

Date of Issue: 01 April 2017

Issue No: 2

Expiry Date: 06 November 2019

Issued by: [Signature]

On behalf of the Scheme Manager
11.0 NATA CERTIFICATION

NATA
ACCREDITED LABORATORY

National Association of Testing Authorities, Australia

(ABN 69 004 379 748)

has accredited

Offshore Construction Specialists Pte Ltd
Singapore

following demonstration of its technical competence to operate in accordance with

ISO/IEC 17025

This facility is accredited in the field of

MECHANICAL TESTING

for the tests, calibrations and measurements shown on the Scope of Accreditation
issued by NATA

Jennifer Evans
Chief Executive Officer

Date of issue: 25 August 2016
Date of accreditation: 15 July 2013
Accreditation number: 19122

NATA is Australia’s government-endorsed accreditor of laboratories, and a leader in accreditation internationally. NATA is a signatory to the international mutual recognition arrangements of the International Laboratory Accreditation Cooperation (ILAC) and the Asia Pacific Laboratory Accreditation Cooperation (APLAC),