SHOPPING DOCUMENT
For
G3.2- Topo-hydrographic survey equipment, satellite images and maps, including installation of equipment and training in surveying

Name of Project: Ayeyarwady Integrated River Basin Management (AIRBM) Project

IDA Credit No.: 5559-MM

Contract Name: Topo-hydrographic survey equipment, satellite images and maps, including installation of equipment and training in surveying

Reference Number: G 3.2

Date of Issue: October 13, 2016
INVITATION TO QUOTE

MINISTRY OF TRANSPORT AND COMMUNICATIONS

DIRECTORATE OF WATER RESOURCES AND IMPROVEMENT OF RIVER SYSTEMS (DWIR)
AYEYARWADY INTEGRATED RIVER BASIN MANAGEMENT (AIRBM) PROJECT

PROJECT MANAGEMENT UNIT

Wishes to purchase:

Topo-hydrographic survey equipment, satellite images and maps, including installation of equipment and training in surveying

1. The goods are required to be supplied by 6 weeks from the date of contract. The services are to be completed within 6 months from the date of contract.

2. Interested qualified eligible suppliers are invited to obtain a copy of the bidding documents free-of-charge from the address given below.

3. To be considered eligible and qualified a firm must

   a) Have completed at least two contracts for the supply of topo-hydrographic (rivers, lakes, marine etc.) equipment that included training in survey techniques within the last three years with a value of at least $100,000.

   b) Not be under any notice of disbarment issued by the Government, or the World Bank.

4. Bids must be delivered to the address given below at or before 13:30 p.m on 7 November 2016. Late bids will be rejected. Bids will be opened in public immediately thereafter at the address given below in the presence of the Bidders’ representatives and the project’s beneficiaries from the concerned local community who choose to attend.

5. The Purchaser shall award the Contract to the Bidder whose offer has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Documents, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.

6. All bids must be accompanied by a bid securing declaration as described in the bidding documents, any bid not accompanied by one will be rejected as non-compliant.

7. The address where the document may be inspected and obtained is:

   Ms. Ei Kyipyar Soe or Mr. Aung Min, National Procurement Officer, AIRBM Project,
8. In case of any difficulty in obtaining the bidding documents, interested parties may contact in writing:

Mr. Aung Myo Khaing, Component 3 Director
AIRBM Project, PMU Office,
No.400, DWIR Compound, Building (7), Lower Pazundaung Road, Pazundaung Township, Yangon, Myanmar
Telephone: +9595150213
E-mail: component3director@gmail.com

and

also send a copy of the communication to -
dwir.airbm@gmail.com; geerinck@gmail.com

9. The address for bid submission and bid opening is:

Ms. Ei Kyipyar Soe or Mr. Aung Min, National Procurement Officer
AIRBM Project, PMU Office,
No.400, DWIR Compound, Building (7), Lower Pazundaung Road, Pazundaung Township, Yangon, Myanmar

10. The Government of Myanmar and/or the World Bank will declare a firm ineligible either indefinitely or for a stated period of time, to be awarded a contract financed by the Government of Myanmar and/or the World Bank respectively, if it at any time determines that the firm has engaged in corrupt or fraudulent, coercive or collusive practices in competing for or in executing a contract. Please refer to Attachment 1 ‘The Bank’s Policy on Fraud and Corruption.'
SECTION 1. INSTRUCTIONS TO BIDDERS

1) **Goods:** DWIR, AIRBM Project, Project Management Unit (PMU), as the Purchaser, invites bids for the supply of *Topo-hydrographic survey equipment, satellite images and maps, including installation of equipment and training in surveying* as described in the Conditions of Contract (CC). The successful bidder will be expected to deliver the Goods within the time allowed under the Conditions of Contract.

2) Government of Myanmar has received funding from the World Bank towards the cost of the Ayeyarwady Integrated River Basin Management (AIRBM) Project. The Purchaser intends to apply a portion of the proceeds of the funding to eligible payments under the contract(s) for which these Bidding Documents are issued. No payment shall be made to persons or entities for any import of goods, if such payment or import is prohibited by a decision of the United Nation’s Security Council, taken under chapter VII of the Charter of the United Nation.

3) **Eligibility and Qualifications of the Bidder:** Only bidders that meet the following criteria will be eligible for an award of contract:
   a) Have completed at least two contracts for the supply of topo-hydrographic (rivers, lakes, marine etc.) equipment that included training in survey techniques within the last three years with a value of at least $100,000.
   b) Not be under any notice of suspension or debarment issued by the Government, or the World Bank.

   The bidder shall be required to provide documentary evidence with its bid to demonstrate that it meets the above requirements.

4) **Fraud and Corruption.** The World Bank requires that Borrowers or Recipients (including beneficiaries of the funds), as well as bidders, suppliers, contractors and consultants observe the highest standard of ethics during the procurement and execution of contracts. In pursuance of this policy, both the Government of Myanmar and the World Bank as details in Attachment 1 ‘World Bank Policy – Corruption and Fraudulent Practices’.

5) **Contents of Bid Documents:** The set of Bid documents comprises the documents listed below:

   - Invitation to Quote
   - SECTION 1. INSTRUCTIONS TO BIDDERS
   - SECTION 2. CONDITIONS OF CONTRACT FOR THE SUPPLY OF GOODS
   - SECTION 3. PRICE AND DELIVERY SCHEDULE
   - SECTION 4. TECHNICAL SPECIFICATIONS AND DRAWINGS
   - SECTION 5. FORM OF BID
   - SECTION 6. FORM OF CONTRACT AGREEMENT
   - SECTION 7. BID AND PERFORMANCE SECURING DECLARATION

6) **Documents Comprising the Bid:** The Bid submitted by the Bidder shall comprise the following documents:

   - Form of Bid
   - Price and Delivery Schedule
   - Bid and Performance Securing Declaration
The bid shall also comprise information about the proposed goods and a work program including delivery of the goods and conducting the services.

**All the pages of the bid shall be signed by an authorized person of the Bidder**

**7. Bid and Evaluation Criteria:**

The Bidder must bid for the whole required items, and the evaluation of bids shall also be for the whole package.

The Purchaser shall award the Contract to the Bidder whose bid has been determined to be the lowest evaluated bid and is substantially responsive to the Bidding Documents, provided further that the Bidder is determined to be qualified to perform the Contract satisfactorily.

**8. Bid Prices:** Prices should be quoted in USD for the Goods delivered at the final destination (Project Site) specified in the Price and Delivery Schedule, inclusive of all costs such as transportation, insurance required for conveying the goods to the final destination. Prices shall remain fixed and not subject to price adjustment during the period of performance of the contract.

The Client has obtained an exemption from payment of Income Tax on fees to consultants and Import Duties for any goods procured from overseas for the Project in the Client’s country as per the Order Letter No. 14/168/AaPhaYa (6/2016), dated 7 July 2016, issued by the Cabinet of the Government of Union of Myanmar.

**9. Validity of Bid.** The bid shall remain valid for the period of Seventy (70) calendar days counted from the deadline for submission of bids specified in Paragraph 12 of these Instructions. The Purchaser may request Bidders to extend the period of validity for a specified additional period. The Purchaser’s request and the Bidder’s responses shall be made in writing or by email. A Bidder may refuse the request for extension of bid validity in which case he may withdraw his Bid without any penalty. A Bidder agreeing to the request will not be required or permitted to otherwise modify its Bid.

**10. Language of the Bid:** All documents relating to the Bid and contract shall be in English language.

**11. Preparation and Sealing of Bid:** The Bidder shall prepare one original of the documents comprising the Bid as described in Paragraph 6 of these Instructions, and clearly marked “Original”. In addition, the Bidder shall also submit two copies which shall
be clearly marked as “COPY”. In the event of discrepancy between them the original shall prevail. The original and the copy of the Bid shall be signed by a person or persons duly authorized to sign on behalf of the Bidder. All the pages of the Bid where entries or amendments or corrections have been made shall be initialed by the person or persons signing the Bid. The Bidder shall seal the original and the copies of the Bid in two inner envelopes and one outer envelope, duly marking the inner envelopes as “ORIGINAL” and “COPY”. The inner and the outer envelopes shall be addressed to the Purchaser at the address provided in paragraph 9 the Invitation to Bid and shall provide a warning “DO NOT OPEN BEFORE THE SPECIFIED TIME AND DATE FOR BID OPENING” as defined in paragraph 12 of these Instructions. The inner envelopes shall indicate the name and full address of the Bidder. If the outer envelope is not sealed and marked as above, the Purchaser will assume no responsibility for the misplacement or premature opening of the Bid.

12. Place and Deadline for Submission of Bids: The Bids shall be delivered to the Purchaser NOT LATER than 13:30 p.m on 7 November 2016, at the address given in paragraph 9 of the Invitation to Quote. Any Bid received by the Purchaser after the deadline prescribed in this clause will be returned unopened to the Bidder.

13. Bid and Performance Securing Declaration: The Bid and Performance Securing Declaration should be in accordance with the form included in SECTION 7 BID AND PERFORMANCE SECURING DECLARATION and shall be valid for the warranty period described in paragraph 7 of the Conditions of Contract. Any Bid not accompanied by a Bid and Performance Securing Declaration will be rejected by the Purchaser as non-responsive. The execution of a bid securing declaration will result in the Bidder being held ineligible for all contracts let by the Government irrespective of the funding source for a period of two years from the date of the Purchaser’s execution of this Declaration unless, at a Bidder’s option, the Bidder pays to the Purchaser an administrative penalty of two percent (2%) of the total bid amount to the Purchaser. The Bid Securing and Performance Declaration will be executed:

   (a) if a Bidder withdraws its bid during the period of bid validity specified by the Bidder on the Bid Form or
   (b) if the Bidder does not accept the correction of its Bid Price pursuant to paragraph 17 of these Instructions.
   (c) if the successful Bidder fails within the specified time to sign the Contract:
   (d) if the successful bidder, once contracted commits a fundamental breach of contract leading to the Purchaser’s termination of the contract for reasons of the successful bidder’s default.

14. Modification and Withdrawal of Bids: No Bids shall be modified after the deadline for submission of Bids specified above in paragraph 12 of these Instructions. Withdrawal of a Bid between the deadline for submission of Bids and the expiration of the validity of the Bids as specified in paragraph 9 of these Instructions above may result in the execution of the Bid and Performance Securing Declaration.

15. Opening of Bids: The Purchaser will open the Bids in the presence of the bidders’ representatives and representatives of the project’s beneficiaries from the local community who choose to attend, at the time, date, and in the place specified in paragraph
12 of these Instructions. The bidders’ names, the Bid prices, the total amount of each Bid and any discounts, Bid modifications and withdrawals, the presence or absence of Bid Security or Bid Securing Declaration, and such other details as the Purchaser may consider appropriate, will be read out and recorded at the opening. The minutes shall be signed in original by all those present at the bid opening. Immediately upon conclusion of the bid opening proceedings, copies of the minutes shall be provided to the bidders and community representatives present at the bid opening. In addition, a copy of the minutes shall promptly be posted at a prominent and freely accessible location outside the office of the Purchaser, and also sent to all those who obtained the bidding documents but were not present at the bid opening.

16. Process to be Confidential: All information relating to the examination, clarification, evaluation and comparison of bids for the contract award shall not be disclosed until the award to the successful Bidder has been announced.

17. Evaluation and Comparison of Bids: The Purchaser will award the Contract to the Bidder whose Bid has been determined to be substantially responsive and compliant to the technical specification and standards therein and who has offered the lowest evaluated Bid and has been determined to be qualified to perform the Contract satisfactorily. In evaluating the Bids, the Purchaser will determine for each Bid the evaluated Bid Price by making any correction for any arithmetic errors as follows:

a. where there is a discrepancy between amounts in figures and in words, the amount in words will govern;

b. where is a discrepancy between the unit rate and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern;

If a Bidder refuses to accept the correction, his Bid will be rejected and Bid and Performance Securing Declaration executed.

18. Purchaser’s Right to Accept Any Bids and to Reject any or all Bids: The Purchaser reserves the right to accept or reject any bid, and to cancel the process of competition and reject all bids, at any time prior to the award of the Contract, without thereby incurring any liability to the affected Bidder(s).

19. Notification of Award and Signing of Contract: The Bidder whose Bid has been accepted will be notified of the award by the Purchaser prior to the expiration of the validity period of the Bid, by registered letter. The written notification of award will constitute the formation of the Contract.

20. Debriefing. After the award of contract has been announced an unsuccessful Bidder has the right to request a debriefing to ascertain why its bid was unsuccessful and the Purchaser the obligation to provide it. No commercial confidences will breached and no detailed information concerning other bids will be disclosed other than the information already read out at bid opening and the reasons for any and all bids rejection.

21. Complaints. A complaint may be made by any party at any stage of the procurement process. No complaint will be responded to during the evaluation period. Complaints
received during the evaluation period will be reviewed by the Purchaser and a response issued only after the evaluation is completed. Complaints shall be addressed to the Project Manager

Attn.: Mr. Win Hlaing, Project Director
AIRBM Project, PMU Office,
PMU Office, No.400, DWIR Compound, Building (7), Lower Pazuntaung Road,
Pazuntaung Township, Yangon, Myanmar
e-mail: dwir.airbm@gmail.com

The Project Manager will investigate the grounds for the complaint and, with the exception of those complaints received during the evaluation period as described above, respond to in writing within 14 calendar days of receiving the complaint. In the event that the response from the Project Manager does not satisfy the bidder or there is no response to the complaint it should be referred to the Republic of the Union of Myanmar Federation of Chamber of Commerce and Industry (UMFCCI). In such case, a copy of the complaint should also be sent to the World Mr. Greg Browder, Task Team Leader, World Bank email: gbrowder@worldbank.org with a copy to Ms. Ana Nunez Sanchez, e-mail: anunezsanchez@worldbank.org.

22. Publication of Award. The Purchaser shall

(i) notify in writing all participating bidders of the results of the bid evaluation promptly after the contract has been awarded, and

(ii) publish on the DWIR or Ministry website, promptly at the end of each quarter, a notice informing the general public of the availability of contract awards summary and contract registers in the office of the Purchaser.
SECTION 2. CONDITIONS OF CONTRACT FOR THE SUPPLY OF GOODS

Article 1 General Provisions

1. The Supplier confirms that he has examined, read and understood fully all the Contract Documents, being
   i. The Form of Contract,
   ii. the Conditions of Contract,
   iii. the Special Conditions of Contract
   iv. the Technical Specifications
   v. the Form of Bid submitted by the Supplier,
   vi. the Price and Delivery Schedule,
   vii. the Purchaser’s Notification of Award
   together form the Contract

2. The Contract shall be amended only by written agreement between the Purchaser and the Supplier.

3. The law applicable to the Contract shall be that of Myanmar. Every effort shall be made to resolve disputes amicably and without recourse or referral to third parties. Any dispute that cannot be resolved amicably shall be referred by either Party to the Chamber of Commerce for adjudication in accordance with the under the Rules of Conciliation and Arbitration of the International Chamber of Commerce.

Article 2 Purchaser’s and Supplier’s obligations

4. The Purchaser and the Contractor now agree as follows:
   • The Contract Price is................................................................. [insert amount in words and figures] This amount is for the full delivery of the goods and services listed in the Price and Delivery Schedule.
The Supplier shall supply: *topo-hydrographic survey equipment, satellite images and maps, including installation of equipment and training in surveying* on or before the delivery date and at the final destination (Project Site), as stipulated in the Price and Delivery Schedule, and conforming to the standards as stipulated in the Technical Specifications. The Supplier shall be responsible for fully insuring the Goods against loss or damage from “warehouse to warehouse” (final destination) on “All Risk basis”.

The Client has obtained an exemption from payment of Income Tax on fees to consultants and Import Duties for any goods procured from overseas for the Project in the Client’s country as per the Order Letter No. 14/168/AaPhaYa (6/2016), dated 7 July 2016, issued by the Cabinet of the Government of Union of Myanmar.

5. The Purchaser has the right to reduce the payment to the Supplier by 0.1% of the total price of the Contract for each day of delay beyond the delivery date shown in the Price and Delivery Schedule. The reduction is up to a maximum of 10%, then after the Purchaser may terminate the contract.

6. If war or natural disaster makes completion of the contract impossible, the Supplier may ask the Purchaser to release him from the Contract.

7. The Supplier guarantees that all goods supplied will be new and unused and carry a warranty of at least one year starting from the actual delivery date of the goods. Throughout this period the Supplier agrees to make good, at its own expense, any defect that appears during that time due to quality of materials or workmanship.

**Article 3 Payment Provisions**

8. Payments will be made according to the schedule and terms and conditions set out below:

<table>
<thead>
<tr>
<th>Steps of Payment</th>
<th>Amount</th>
<th>Payment Conditions</th>
<th>Scheduled date for Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payment by receipt of Satellite Images</td>
<td>10% of the Contract Value</td>
<td>Upon receipt, inspection and acceptance of the Satellite images</td>
<td>30 days after receipt of invoices</td>
</tr>
<tr>
<td>Payment by receipt of Instruments and Material</td>
<td>60% of the Contract Value</td>
<td>Upon receipt, commissioning, inspection and acceptance of the Instruments and Material</td>
<td>30 days after receipt of invoices</td>
</tr>
</tbody>
</table>
9. Processing of payments will be as follows:
   i. the purchaser will effect payment 10% of the Contract Value within 30 days after the receipt of invoice, inspection and acceptance of the Satellite images
   ii. the purchaser will effect payment 60% of the Contract Value within 30 days after receipt of invoice, commissioning, inspection and acceptance of the Instruments and Material
   iii. the purchaser will effect payment 30% of the Contract Value within 30 days after completion and acceptance of the Incidental Services and receipt of invoice.
   iv. Within 14 days of receiving the goods the Purchase will undertake any inspections and tests that it deems necessary. Provided that the goods pass any such inspection or tests and the training program & incidental services are completed the Purchaser will issue an acceptance certificate to the Supplier. The Supplier shall submit its commercial invoice with the original acceptance certificate attached and three copies of both, signed by the supplier as true and correct copies. The Purchaser will effect payment within 30 days of submission.
   v. In the event that after the expiry of 14 days after the delivery of the goods and services, the Purchaser does not provide the Supplier with an acceptance certificate (or issue instructions to repair or replace any defective goods), the Supplier shall submit its invoice in three copies signed as true and correct, and the Purchaser will effect payment within 30 days of submission.

10. Payment shall be made in USD.

11. If any payment is delayed for more than 1 calendar month after the due date for Payment, the Purchaser will pay interest to the Supplier at the rate of 0.3% of the amount of the payment for the first month and for each subsequent full calendar month during which payments are delayed.

12. If the Contract is cancelled because of the fault of the Supplier, the Purchaser has the right to obtain the goods from another source. The Supplier shall be liable for any purchase costs paid in excess of this Contract’s value.
Article 4   Fraud and Corruption

13. The World Bank requires that Borrowers or Recipients (including beneficiaries of the funds), as well as bidders, suppliers, contractors and consultants observe the highest standard of ethics during the procurement and execution of contracts according to the Attachment 1 ‘World Bank Policy – Corruption and Fraudulent Practices’
Article 5 Special Conditions

14. **Supplier’s main services: Support to Project A, DWIR Hydrographic Survey of Stretch 1**

   The Supplier will technically support DWIR by supplying the adequate survey equipment such as modern single beam echosounders, DGPS/RTK equipment, hydrographic mapping software. The Supplier’s 2 Experts will also commission, install and calibrate all the survey tools. The Supplier will order Satellite Imagery and assist in preparing the formats and layout for the Base Map. But most importantly the Supplier’s Experts, hereafter called the Support Team, will assist the DWIR Survey Team in conducting all the required work that is specified in Annex A called “DWIR Hydrographic Survey of Stretch 1”. The broad framework of both projects looks as follows:
**DWIR Surveying Team** will be responsible for the results of the topo-hydrographic surveys, including all preparations, logistics, vessels, personnel, and transport (called Project A). The topo-hydrographic surveys and mapping/charting activities include the following:

1. **Production of the Base Map**
   1.1 Initial set-up of draft GIS Base Maps
   1.2 Final outputs of the maps + database:
   1.3 Define the format for the different GIS Layers, and start prepare the layers
   1.4 Establish Control Points and Reference Points (= detailed Bench Marks)
   1.5 Topographic verification, surveys and updates
   1.6 Produce the GIS Base Maps
   1.7 Stitch all the maps for Stretch 1 together
   1.8 Combine all the layers

2. **Production of the Hydrographic Maps of Stretch 1**
   2.1 Definition and Inventory of the CD
   2.2 Prepare a detailed inventory of the Chart Datum (CD), and adjust where required
   2.3 Prepare and plan the Bathymetric Surveys
   2.4 Install temporary water level gauges installation
   2.5 Creating the planned lines.
   2.6 Start the bathymetric surveys
   2.7 Calibration
   2.8 Configuration of the geodetic data
   2.9 Bathymetric data processing
   2.10 Drafting the maps

3. **Production of the Navigation Charts of Stretch 1**
   3.1 The results of the Output 1 and 2 activities should be correctly attributed based on the results of the bathymetric surveys.
   3.2 Proof printing and checking of the hard copy charts

The Support Team will thus supply, import, commission, install and calibrate the survey equipment and instruments. It is evident that the Supplier will also be responsible for proper installation and training. Installation, training and assistance to support the DWIR Surveying Team in achieving all the Outputs as described in Chapter III of ANNEX A. Hence, close cooperation and coordination between the two teams will be crucial.

The Supplier shall inform the Purchaser of delivery date of the goods at least 3 working days in advance and the Purchaser shall ensure readiness of the trainees in Mandalay for training.
A tentative program is given below:

<table>
<thead>
<tr>
<th>Main Work by DWIR</th>
<th>Assistance by the Supplier’s 2 Experts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Senior Hydrographic Expert</td>
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<tr>
<td>October</td>
<td>November</td>
</tr>
<tr>
<td>1. Production of the Base Map</td>
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<td>Initial set-up of draft GIS Base Maps</td>
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<tr>
<td>Final outputs of the maps + database:</td>
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<tr>
<td>Derive the Base map format from the Satellite Imager</td>
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<tr>
<td>Topographic verification, surveys and updates</td>
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<tr>
<td>Establish Control Points and Bench Marks</td>
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<tr>
<td>Develop the GIS Base Maps</td>
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<tr>
<td>Stitch all the maps for Stretch 1 together</td>
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<tr>
<td>Add all the layers</td>
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<tr>
<td>The results of the Output 1 and 2 activities should be correctly attributed based on the results of the bathymetric surveys. Prepare the Navigation Charts for use by the skippers. Proof printing and checking of the hard copy charts</td>
<td></td>
</tr>
<tr>
<td>Contingency for back-stopping (valid for the year of 2017) for support to DWIR in case of anomalous maintenance or specific technical request for support by the company)</td>
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</tbody>
</table>

*to be completed by the Supplier*
In witness of what has been agreed above, the signatures of the authorized representatives of the two Parties are affixed below on the date shown.

<table>
<thead>
<tr>
<th>✦  Purchaser</th>
<th>✦  Supplier</th>
</tr>
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<tbody>
<tr>
<td>Name           : --------------------------------</td>
<td></td>
</tr>
<tr>
<td>Position       : --------------------------------</td>
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<tr>
<td>Date           : --------------------------------</td>
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</tr>
</tbody>
</table>

| Name           : -------------------------------- |
| Position       : -------------------------------- |
| Date           : -------------------------------- |
World Bank Policy - Corrupt and Fraudulent Practices


‘Fraud and Corruption:

1.16 It is the Bank’s policy to require that Borrowers (including beneficiaries of Bank loans), bidders, suppliers, contractors and their agents (whether declared or not), sub-contractors, sub-consultants, service providers or suppliers, and any personnel thereof, observe the highest standard of ethics during the procurement and execution of Bank-financed contracts. In pursuance of this policy, the Bank:

(a) define, for the purposes of this provision, the terms set forth below as follows:

   (i) “corrupt practice” is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

   (ii) “fraudulent practice” is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

   (iii) “collusive practice” is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

   (iv) “coercive practice” is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

   (v) "obstructive practice" is:

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1 In this context, any action to influence the procurement process or contract execution for undue advantage is improper.
2 For the purpose of this sub-paragraph, “another party” refers to a public official acting in relation to the procurement process or contract execution. In this context, “public official” includes World Bank staff and employees of other organizations taking or reviewing procurement decisions.
3 For the purpose of this sub-paragraph, “party” refers to a public official; the terms “benefit” and “obligation” relate to the procurement process or contract execution; and the “act or omission” is intended to influence the procurement process or contract execution.
4 For the purpose of this sub-paragraph, “parties” refers to participants in the procurement process (including public officials) attempting either themselves, or through another person or entity not participating in the procurement or selection process, to simulate competition or to establish bid prices at artificial, non-competitive levels, or are privy to each other’s bid prices or other conditions.
5 For the purpose of this sub-paragraph, “party” refers to a participant in the procurement process or contract execution.
(aa) deliberately destroying, falsifying, altering, or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede a Bank investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation, or

(bb) acts intended to materially impede the exercise of the Bank’s inspection and audit rights provided for under paragraph 1.16(e) below.

(b) will reject a proposal for award if it determines that the bidder recommended for award, or any of its personnel, or its agents, or its sub-consultants, sub-contractors, service providers, suppliers and/or their employees, has, directly or indirectly, engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question;

(c) will declare misprocurement and cancel the portion of the loan allocated to a contract if it determines at any time that representatives of the Borrower or of a recipient of any part of the proceeds of the loan engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices during the procurement or the implementation of the contract in question, without the Borrower having taken timely and appropriate action satisfactory to the Bank to address such practices when they occur, including by failing to inform the Bank in a timely manner at the time they knew of the practices;

(d) will sanction a firm or individual, at any time, in accordance with the prevailing Bank’s sanctions procedures, including by publicly declaring such firm or individual ineligible, either indefinitely or for a stated period of time: (i) to be awarded a Bank-financed contract; and (ii) to be a nominated;

(e) will require that a clause be included in bidding documents and in contracts financed by a Bank loan, requiring bidders, suppliers and contractors, and their sub-contractors, agents, personnel, consultants, service providers, or suppliers, to permit the Bank to inspect all accounts, records, and other documents relating to the submission of bids and contract performance, and to have them audited by auditors appointed by the Bank.”

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6 A firm or individual may be declared ineligible to be awarded a Bank financed contract upon: (i) completion of the Bank’s sanctions proceedings as per its sanctions procedures, including, inter alia, cross-debarment as agreed with other International Financial Institutions, including Multilateral Development Banks, and through the application the World Bank Group corporate administrative procurement sanctions procedures for fraud and corruption; and (ii) as a result of temporary suspension or early temporary suspension in connection with an ongoing sanctions proceeding. See footnote 14 and paragraph 8 of Appendix 1 of these Guidelines.

7 A nominated sub-contractor, consultant, manufacturer or supplier, or service provider (different names are used depending on the particular bidding document) is one which has either been: (i) included by the bidder in its pre-qualification application or bid because it brings specific and critical experience and know-how that allow the bidder to meet the qualification requirements for the particular bid; or (ii) appointed by the Borrower.
## SECTION 3. PRICE AND DELIVERY SCHEDULE

- Final Destination is DWIR Yangon Office.
- The goods are expected to be delivered within 6 weeks and the Services are expected to be completed within 6 months. The Bidders may propose their estimated delivery period for the relevant item of goods and services in Column (9) of the below table provided that the above mentioned overall time periods are not exceeded.

<table>
<thead>
<tr>
<th>Item No</th>
<th>Description of Goods</th>
<th>Country of Origin</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Price per item delivered at Final Destination (DWIR Yangon Office)</th>
<th>Total Price (Col. 5x6)</th>
<th>Expected Delivery Period (weeks from the date of Contract)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Satellite Imagery</td>
<td></td>
<td>Unit</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Obtain satellite imagery and feature mapping</td>
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<td></td>
</tr>
<tr>
<td>B</td>
<td>Equipment, Software and Instruments</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SE Survey - Specific GPS RTK surveying software</td>
<td></td>
<td>Unit</td>
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<tr>
<td>2</td>
<td>GNSS Solutions</td>
<td></td>
<td>Unit</td>
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<tr>
<td>3</td>
<td>AutoCAD</td>
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<td>Unit</td>
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<td>4</td>
<td>GIS software (Advanced)</td>
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<td>Unit</td>
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<td>5</td>
<td>Navigation Software</td>
<td>Unit</td>
<td>2</td>
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<tr>
<td></td>
<td><strong>Hardware</strong></td>
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<tr>
<td>1</td>
<td>Navigation Multifunctional Display</td>
<td>Unit</td>
<td>2</td>
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<tr>
<td>2</td>
<td>Single Beam Echo Sounder</td>
<td>Unit</td>
<td>2</td>
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<tr>
<td>3</td>
<td>Transponder</td>
<td>Unit</td>
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<td>4</td>
<td>RTK GPS surveying software</td>
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<tr>
<td>5</td>
<td>GNSS Receiver – 1 base and 3 rovers</td>
<td>Unit</td>
<td>1+1</td>
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<td>6</td>
<td>Toughbook</td>
<td>Unit</td>
<td>2</td>
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<tr>
<td>7</td>
<td>Office computers and monitors</td>
<td>Unit</td>
<td>3</td>
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<tr>
<td></td>
<td><strong>Ancillary Equipment &amp; Material for on board</strong></td>
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</tr>
<tr>
<td>1</td>
<td>Bracket for the Transponder</td>
<td>Unit</td>
<td>2</td>
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<tr>
<td>2</td>
<td>Car Battery - Gel type</td>
<td>Unit</td>
<td>4</td>
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<tr>
<td>3</td>
<td>Battery charger</td>
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<tr>
<td>4</td>
<td>AC/DC Invertor</td>
<td>Unit</td>
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<tr>
<td></td>
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<td>Mounting pole for Rover GPS</td>
<td>Unit</td>
<td>2</td>
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</tr>
<tr>
<td>E</td>
<td>1</td>
<td><strong>Mapping and Charting Equipment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>A0 Printer, Copier, Scanner</td>
<td>Unit</td>
<td>1</td>
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</tbody>
</table>

State currency of quotation (USD): Sub-Total for the Goods Only:

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
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<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>F</th>
<th><strong>INCIDENTAL SERVICES AND TECHNICAL ASSISTANCE</strong>&lt;sup&gt;(1)&lt;/sup&gt;</th>
<th>Senior Hydrographic Expert</th>
<th>GIS, Mapping and Survey Expert</th>
<th>Total costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unit cost</td>
<td>Quantity&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>total</td>
<td>Unit cost</td>
</tr>
<tr>
<td>1</td>
<td>Monthly Fees as indicated in Chapter 4.6 “Requirements/Specifications for the Incidental Services and Technical Assistance” **</td>
<td>Per month</td>
<td>4</td>
<td>Per month</td>
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<tr>
<td>2</td>
<td>Travel costs (regional tickets) and visa</td>
<td>Per round trip</td>
<td>4</td>
<td>Per round trip</td>
</tr>
<tr>
<td>3</td>
<td>Domestic travel</td>
<td>Per round trip</td>
<td>4</td>
<td>Per round trip</td>
</tr>
<tr>
<td>4</td>
<td>Accommodation lumpsum</td>
<td>Lump-sum</td>
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<td>Lump-sum</td>
</tr>
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<td>5</td>
<td>Local transport</td>
<td>Lump-sum</td>
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<td>Lump-sum</td>
</tr>
<tr>
<td></td>
<td><strong>TOTALS SERVICES UNDER F</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

** includes insurance. Also includes work at home office.

<sup>(1)</sup> Total Services Under F is lump-sum and the breakdown of the cost given above for Incidental Services and Technical Assistance is only for information purpose.

<sup>(2)</sup> These quantities are only the estimates and the Bidders shall make their own estimation necessary for completion of all the incidental services and technical assistances required under the Contract.
Totals of Goods and Services

<table>
<thead>
<tr>
<th>Item A : Supply and full delivery of satellite maps and feature mapping</th>
<th>Total (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item B: Supply and full delivery of Equipment, Software and Instruments</td>
<td></td>
</tr>
<tr>
<td>Item C : Supply and full delivery of Hardware</td>
<td></td>
</tr>
<tr>
<td>Item D : Supply and full delivery of Ancillary Equipment and Accessories</td>
<td></td>
</tr>
<tr>
<td>Item E : Supply and full delivery of Mapping and Charting Equipment</td>
<td></td>
</tr>
<tr>
<td>Item F : Incidental services and technical assistance</td>
<td></td>
</tr>
</tbody>
</table>

State currency of quotation (USD): **TOTAL**

---

Total Bid Price

In Words........................................................................................................................................

Authorized Signature of Bidder..................................................................................................

1. Currency to be used is USD. The price shall include all customs duties and sales and other taxes already paid or payable, transportation, insurances, and any other local charges for delivery of the goods up to final destination (DWIR Yangon Office Compound)

*Note:* In case of discrepancy between unit price and total, the unit price shall prevail.
SECTION 4. Technical Requirements/Specifications

The full description of the work by DWIR is detailed in Annex A. Summary of the work which requires assistance by the two experts supplied by the Supplier is described in the next table. An estimate of the days the two experts should provide is added per line in the table under each task. This comes to about 84 working days equal to 4 months per expert. A quotation should be provided per month.

Statement of Compliance Bidders must state here either “Comply” of “Not Comply” against each of the individual parameters of each Specification stating the corresponding performance parameter of the equipment offered. Statements of “Comply” or “Not Comply” of must be supported by evidence in a bidders bid and cross-referenced to that evidence.

A statement that is not supported by evidence or is subsequently found to be contradicted by the evidence presented will render the bid under evaluation liable for rejection. A statement either in the bidders statement of compliance or the supporting evidence that is found to be false either during evaluation or the execution of the contract may be regarded as fraudulent and render the bidder or supplier liable for prosecution.

4.1 Requirements/Specifications for Satellite Imagery and Feature Mapping

The Company will be responsible in obtaining the best Satellite Imagery and Features Map according to the specifications below, and they will be responsible for supplying, testing, delivering, commissioning, installing and calibrating of the required equipment. The Company will also be responsible for a technical follow-up and ensuring the guarantees are followed.

Under column (2) of below tables the Bidder is expected to note the properties of the proposed goods briefly and indicate whether it fully complies the specified technical properties or not. In addition, the Bidders shall provide detailed information about the proposed goods and catalogues separately.

Under column (3) of below tables the Bidder is expected to note the deviations from the specified technical properties. The Purchaser will decide whether those deviations are substantial or not.

4.1.1 ITEM A : Supply and delivery of Satellite Imagery and Features Map

There will be a need for satellite images of 2015 in the period between January – April for the selected area. The images need to be from the same year to have consistency. The period January-April is the lowest river level period.
1. Satellite Imagery and Features Map

- Satellite images of 2015 in the period between January – April for the selected area which is about 850 square kilometres
  - Pixel Resolution: 50cm and 2.00m (50cm)
  - Accuracy estimated at +/-1 pixels

Delivery, via FTP, includes:
- original imagery
- 50cm panchromatic and 2.00m four band bundled multi-spectral imagery
- orthorecified pan sharpened, natural and false colour imagery at 50cm
- JPEG images + x1 PDF plot setup to client requirements (suitable for printing) + 1:2,500 basic feature mapping in vector format (no elevation)

4.2 Requirements/Specifications for Equipment, Software and Instruments

4.2.1 ITEM B : Supply and delivery of Equipment, Software and Instruments

1. SE Survey or equivalent - Specific GPS RTK surveying software

Data collecting surveying software to be installed on the survey vessels onboard PC computer, used to connect the GPS RTK data (Co-ordinates) with the Echo Sounders depth soundings. Is used to record the elevation of the river surface, and at the same time this elevation data can then be calibrated to the known river levels observed by any river level stations along the river.

The software supports the widest range of popular and new release RTK GPS and conventional/robotic total stations. It
must be a complete data collections system for Real Time Kinematic (RTK) GNSS and Total Stations with in-field coordinate geometry. Can be utilized on standard Windows PC computers such as ruggedized laptops. Can also work seamlessly with ESRI maps or equivalent.

Other required features:
- Large hardware capability
- Large screen size & convenient touch screen usage
- More processing & graphic power (with aerial photo overlays)
- Import of MicroStation .dgn files and Import/Export of AutoCAD .dwg files must be possible.
- Output to Excel for simple data management.
- Graphical Stakeout Interface;
- Easy-select target feature;
- GNSS antenna library;
- Support for KML export of lines

2. **GNSS Solutions - CHC Post Processing software or equivalent**
   Essential DGPS post processing software for all Static DGPS surveys. To be used when setting up a base on a known National Geodetic reference and when establishing control points for the Sat. Imagery. Can also be used to post process RTK data, and directly downloaded into a .csv excel file.

3. **Relevant AutoCAD program or equivalent**
   Used as a separate tool to combine a host of data into different layers, such as Channel Design, Water Depths, Buoy Locations, Sat Image Base Maps, Cadastral survey such as; Ports, Villages, roads, tracks, streams, inlets, ponds, Islands, sandbars, rocks etc. Has been used by the DWIR surveyors and engineers for a long time.

4. **ArcGIS or equivalent software**
   Desktop geographic information system (GIS) software product used for mapping and location analysis. Allows users to visualize, analyze, edit, interpret, understand and output data to reveal relationships, patterns, and trends. Must allow users to explore spatial data within a dataset, symbolize features, and create maps. User-friendly, economical and easy to use. Easy to train people with and quite a versatile program. Will require intensive training, but much less than other software.

5. **Navigation Software**
   - Will be used to plan the surveys and sounding lines,
and track and record them.
- Must be same brand as the Navigation Multiple Display
- Must be able to use in WGS84 UTM format (That is a mapping format not a marine format)
- Must be very user-friendly.
- Must be able to record a minimum of 10,000 survey points
- Create and plan routes with a simple point and click interface
- Features built-in planning charts for the entire world
- Compatible with a wide range of chart formats including, Navionics Gold, Platinum, and raster charts
- Transfer Routes and Waypoints to the Multifunction Displays
- Planner by transferring waypoints and routes between your PC and a chartplotter or multifunction display.
- Supports importing and exporting waypoints/routes in the spreadsheet friendly .csv format

<table>
<thead>
<tr>
<th>Proposed goods complies the required technical properties?</th>
<th>Deviations (if any)</th>
</tr>
</thead>
</table>

1 year warranty on all above items

### 4.3 Requirements/Specifications for Hardware

#### 4.3.1 ITEM C - Supply and delivery of Hardware

**Description and Technical Specification**

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
</table>

**1. Navigation Multifunctional Display/Chartplotter**

- access radar, digital sonar, charts and navigation data instantly with compatible multifunctional displays
- Support for vector, raster, 3D bathymetric and aerial photo cartography
- Compatible with Maptech® BSB v2.0-v4.0 Raster Charts, Softchart Raster Charts, NDI Raster Charts and NOAA Raster Navigation charts (RNC)
- Plan waypoints and routes, then transfer them between
your PC, Raymarine multifunction displays
- networking through your PC’s ethernet port
- Built-in worldwide tides and currents database
- AIS target tracking
- 9.0” or 12.1” sunlight viewable LCD displays with LED backlighting.
- Built-in high-sensitivity GPS receiver.
- Wi-Fi video streaming and waypoint synchronization with iPhone and iPad mobile devices.
- Bluetooth connectivity for optional RCU-3 remote control and multimedia control.
- user interface for connections with GPS, echo sounder, compass, chart reader, AIS, etc.
- Dual-core main processor and dedicated graphics co-processor for ultrafast speed and performance.
- Composite video input for marine camera, thermal imager or entertainment source.
- Display 9” TFT backlit LED
- 800 x 480 pixels 12” TFT backlit LED
- 1280 x 800 pixels

2. CeeStar Single Beam (Multi Frequency) Echo Sounder or equivalent

The echo sounder must be portable and capable of fast deployment in vessels of opportunity;
Must have a rugged house protection;
Must demonstrate worldwide high figures of sales;
Must have the ability to accept various external inputs, including: the GPS, tide and heave inputs. When integrated with a Navigation survey software or similar software and a GPS the echo sounder must be a complete hydrographic survey system.
Specifications:
- Frequencies 200 kHz and 30 kHz
- Capable to capture Minimum depth of 0.30m
- Sound velocity – between 1393 m/s – 1590 m/s (user selected Via key pad)
- At 200 kHz, 8° beam width @-3dB
- Narrow Beam 200kHz 2.7° beam width @-3dB
- Dual 200/30 kHz 200/30 kHz, 8°/19° beam width @-3dB
- Maximum ping rate 6 Hertz
- Accuracy 1 cm ± 0.1% of depth
- Resolution 1 cm
- Backlit LCD with contrast control
- Operating temperature 0°C-50°C
-  Humidity 95%  non condensing
-  Ingress protection rating IP6
-  Low Power consumption 4 watts (approx operating time 12 hours)
-  Internal battery Rechargeable high capacity NiMH battery 10Ah
-  External power supply Nominal 11-30 Volts DC @ 2A (9-24 VDC range).  115 – 230 Volts AC
-  DC power cable & AC cable
-  External Data Interfaces:
  o  GPS input NMEA 0183
  o  GPS message GGA + VTG
  o  Heave input TSS 1
  o  Tide input
  o  Baud rate 4800 – 115200
  o  Data bits/parity/stop bits 8/N/1

3. **Transponder for the echosounder**

200 Htz would be required for this project as the river is very shallow (50Hz transponders are used for oceanic work where the depths are significant). The transponder is set in place into a custom made bracket and then immersed at least 50cm’s into the river. Set in an upright position, a cable is connected to the Echo Sounder directly. No special power connection are required for the transponder.

4. **Trimble RTK GPS systems or equivalent**

The project will require both an RTK GPS system and a ‘Static’ DGPS system.

DGPS is the common term for Differential Global Positioning System static survey measurements. Most RTK GPS systems can be used as a DGPS system. Must have 1 base and 3 rovers

Likewise with an RTK GPS system, a Base unit and a rover are used, coupled to UHF radios (for some brands an RTK Base GPS Unit can be used as a Rover unit and vice versa).

The RTK GPS base will be used with 3 rover units. The project may run with 2 survey vessels set up for echo sounding, in an intense area that requires urgent bathymetry. Both surveys vessels could then be set up the same with an RTK GPS rover on board, and both use the same base providing allowing the vessels to operate within the range of the system.

The system should be able to operate 25 klm away from the base, where an accuracy of +/- 10cms is required in X, Y & Z.
5. Carlson GNSS Receiver – 1 base and 3 rovers – or equivalent

220 channels with simultaneously tracked satellite signals
- GPS: L1C/A, L1C, L2C, L2E, L5
- SBAS: WAAS, EGNOS, MSAS
- Galileo: E1, E5A, E5B (test)
- BeiDou: B1, B2

Low noise carrier phase measurement
Performance specifications: Real Time Kinematics (RTK)
- Horizontal: 8 mm + 1 ppm RMS
- Vertical: 15 mm + 1 ppm RMS
- Initialization time: typically < 10 s
- Initialization reliability: typically > 99.9%
- Post Processing Static
  - Horizontal: 3 mm + 0.5 ppm RMS
  - Vertical: 5 mm + 0.5 ppm RMS
  - Baseline Length: ≤ 300 km

Communications:
- 1x RS232 serial port
- 1x high speed USB
- Integrated GSM/GPRS modem
- Integrated Bluetooth® class 2 450-470 MHz
Protocols: RTCM2.1, RTCM2.3, RTCM3.0, CMR, CMR+
input and output
NMEA0183 output
RINEX output for GNSS raw data

Base and rovers should be interchangeable
Must include external radio modem (operate 25 km RTK system)
3 controllers (1 base and 3 rovers)
Processing Software (Static & RTK)
External Battery Cable (Base)

Data Storage:
- 4 GB internal memory
- GPS device mounts as a USB external hard drive
Humidity: 100% condensation
Waterproof and dust proof: IP67 protected from temporary immersion to depth of 1 meter, floats
Shock: survives a 2 meter drop on to concrete
Battery life: Up to 6 hours

Tripods, mounting poles or other standing pods must be delivered for each unit for operational use.
6. Panasonic Toughbooks (fully Regged) or equivalent
   Need for a very strong notebook with bright screens to be used outdoors without the need for shielding.
   - Min 14" High Definition (720p) LED Display
   - Sunlight-viewable Touchscreen sunlight
   - Touchscreen,
   - Must have a strong carrying case
   - Drop and Spill-resistant
   - Spill-resistant keyboard
   - Must have Optional 4G LTE Multi Carrier Mobile
   - Broadband with Satellite GPS
   - Windows® 8.1 Pro 64-bit
   - CPU Intel® Core™ i5-4310U vPro™ Processor 2.0GHz with Turbo Boost up to 3.0GHz Intel Smart Cache 3MB
   - Expansion slots: PC card type II x 1, SD card (SDXC), ExpressCard/54 x 1
   - HDMI Type A
   - Serial D-sub 9-pin
   - USB 3.0 (x 2), USB 2.0 (x 2) 4-pin
   - 10/100/1000 Ethernet RJ-45
   - 2nd LAN 10/100/1000 (Ethernet)5,7 RJ-45
   - Battery operation: model—15 hours (long life battery)

7. Office PCs: Laptops and Large Screen Monitors
   **Laptop**:
   - Screen Size min 14 inches
   - Screen Resolution 1920 x 1080 pixels
   - Processor 2.4 GHz Core i7-5500U
   - RAM 8 GB DDR3L SDRAM
   - Hard drive min 500 GB
   - Processing speed up to 3 GHz
   - Wireless
   - Number of USB 3.0 Ports
   - Operating System Windows 10 (Licensed)
   - Processor Brand Intel
   - Battery Type Lithium Polymer (LiPo)
   - Graphic memory 4 GB
   **Monitors**
   - 24-28 inch screen
   - Min 2560 x 1440 QHD resolution for ultra-high definition images
   - Displays up to 99% of Adobe RGB color space for color performance
   - 12-bit color engine and 14-bit LUT
   - DisplayPort output enables daisy-chaining for multi-
display set up and easy cable management
- Flexible connectivity including 2 DisplayPort inputs (1 DisplayPort and 1 mini DisplayPort), HDMI, DVI, and 4-Port USB hub for peripherals and other USB devices
- Full ergonomic design for comfort and productivity

1 year warranty on all above items

4.4 Requirements/Specifications for Ancillary Equipment and Accessories

4.4.1 ITEM D : Ancillary Equipment and accessories

<table>
<thead>
<tr>
<th>Description and Technical Specification</th>
<th>Proposed goods complies the required technical properties?</th>
<th>Deviations (if any)</th>
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</thead>
<tbody>
<tr>
<td>1. Bracket for the Transponder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brackets for on-board use and tripods for land-use of the GPS units and RTL Antenna</td>
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<td></td>
</tr>
<tr>
<td>2. Optima Car Battery or equivalent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Car Batteries for the RTK UHF Radio. Must be ‘Gel’ type. Calcium copper lead alloys in durable polypropylene case. Must be manufactured with multi-stage vacuum filling. Cannot spill if the battery is tipped upside down.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. ProMariner Battery charger, or equivalent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery chargers for the above batteries. 12v/24v 20 Amp Input 90-260 VAC 50-60Hz Cables: min 6’ AC and DC Cable, 6’ Maintainer Cable Must have monitoring functions and displays for battery type, temperature, flooded, etc. Automatically charges and maintains your battery while distributing all remaining charging amps to other battery Automatic fan speed control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Automatic temperature compensation

4. **AC/DC Invertor**
The inverter from dc to ac voltage works by drawing power from the battery. It does use the power from the battery so the battery will need to be recharged as the device works as an inverter from dc to ac voltage.

Must be a true sine inverter

Must be larger than the wattage required for the above equipment.

5. **Mounting pole for Rover GPS**
Brackets for on-board use and tripods for land-use of the rover units.

---

### 4.5 Requirements/Specifications for Mapping and Charting Equipment

#### 4.5.1 ITEM – E : Mapping and Charting Equipment

<table>
<thead>
<tr>
<th>Description and Technical Specification</th>
<th>Proposed goods complies the required technical properties?</th>
<th>Deviations (if any)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
</tbody>
</table>

1. **HP A0 Printer, Copier, Scanner - or equivalent**

- A0 size
- Print, copy, scan
- At least 70 D prints per hour
- Scan speed up to 1.5 in/sec (color, 200 dpi); up to 4.5 in/sec (grayscale, 200 dpi)
- Resolution (color) 2400 x 1200 optimized dpi
- Print Technology: HP Thermal Inkjet
- Number of print cartridges 4 (cyan, magenta, yellow, black)
- Print languages: HP-GL/2, HP-RTL, TIFF, JPEG, CALS G4, HP PCL 3 GUI, URF
- Connectivity, standard: Gigabit Ethernet (1000Base-T); Wi-Fi; Hi-Speed USB 2.0 certified connector
- Connectivity: USB 3.0 to Gigabit LAN Adapter
- Network ready
- Memory 1 GB
- Non-printable area (cut-sheet) 0.2 x 0.2 x 0.2 x 0.2 in
- Guaranteed minimum line width 0.0028 in (ISO/IEC 13660:2001(E))
- Line accuracy +/- 0.1%
- Finished output handling: sheet feed; roll feed; input tray; media bin; automatic cutter
- Input tray: A4, A3; manual feed: A2, A1, A0
- Media sizes, custom Input tray: 8.3 x 11 to 13 x 19 in; manual feed: 13 x 19 to 36 x 74.7 in; roll: 11 to 36 in
- Media types Bond and coated paper (bond, coated, heavyweight coated, recycled, plain, bright white), technical paper (natural tracing, vellum), film (clear, matte), photographic paper (satin, gloss, semigloss, premium, polypropylene), self-adhesive (adhesive, polypropylene)
- Media sizes, standard 8.3 to 36-in wide sheets; 11 to 36-in rolls
- Roll external diameter 3.9 in
- Power Input voltage (auto ranging): 100 to 240 VAC (+/- 10%), 50/60 Hz (+/- 3 Hz), 1.2 A max
- Power consumption
- Operating temperature range 41 to 104ºF

10 extra cartridges for a period of 2 years normal chart production use

1 years warranty on all above items

### 4.6 Requirements/Specifications for the Incidental Services and Technical Assistance

The full description of the work by DWIR is detailed in Annex A. A summary of the work which requires assistance by the Supplier’s two experts is described under 4.6.1 (1). An estimate of the days the two experts should provide is added per line in the table under each task. This comes to about 2 X 84 working days equal to 4 months per expert. However, these time inputs for the experts are only the estimations and the Bidders are free to make their own estimation to deliver all the required services under Incidental Services and Technical Assistance.
Under column (2) of below tables the Bidder is expected to briefly note whether the proposed services comply with the required technical descriptions. In addition, the Bidders shall separately provide detailed information about their methodology and programming to be implemented for delivery of the services.

Under column (3) of below tables the Bidder is expected to note the deviations from the specified technical descriptions, if any and suggestions to improve the technical descriptions. The Purchaser will decide whether those deviations are substantial/acceptable or not.

4.6.1 ITEM – F : Incidental Services and Technical Assistance

<table>
<thead>
<tr>
<th>Description and Technical Specification</th>
<th>Proposed services complies the required technical descriptions?</th>
<th>Any suggestions to improve the technical description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
</tbody>
</table>

1 **Assistance/Training in Production of the Base Map**

1.1 Derive the Base map format from the Satellite Imagery *(estimated at 4 days for the Senior Hydrographic Expert and 6 days for the GIS, Mapping and Survey Expert)*

1.2 Initial set-up of draft GIS Base Maps, Define the format for the different GIS Layers *(estimated at 4 days for the Senior Hydrographic Expert and 4 days for the GIS, Mapping and Survey Expert)*

1.3 Topographic verification, surveys and updates, establish Control Points and Bench Marks, install, test and calibrate the equipment *(estimated at 6 days for the Senior Hydrographic Expert and 8 days for the GIS, Mapping and Survey Expert)*

1.4 Develop the GIS Base Maps, stitch the maps for Stretch 1 together, and add all the layers *(estimated at 4 days for the Senior Hydrographic Expert and 6 days for the GIS, Mapping and Survey Expert)*

2 **Assistance/Training in Production of the Hydrographic Maps of Stretch 1**

2.1 Prepare the Chart Datum (CD), and adjust
2.2 Install temporary water level gauges installation
(estimated at
6 days for the Senior Hydrographic Expert and
6 days for the GIS, Mapping and Survey Expert)

2.3 Prepare and plan the Bathymetric Surveys, create the planned lines, install, test and calibrate the equipment in and on the boats (estimated at
6 days for the Senior Hydrographic Expert and
2 days for the GIS, Mapping and Survey Expert)

2.4 Start the bathymetric surveys, calibrate, configure the geodetic data, bathymetric data processing (estimated at
20 days for the Senior Hydrographic Expert and
20 days for the GIS, Mapping and Survey Expert)

2.5 Draft the hydrographic maps (estimated at
6 days for the Senior Hydrographic Expert and
6 days for the GIS, Mapping and Survey Expert)

3 Assistance/Training in Production of the Navigation Charts of Stretch 1

3.1 Prepare the Navigation Charts for use by the skippers (estimated at
7 days for the Senior Hydrographic Expert and
9 days for the GIS, Mapping and Survey Expert)

3.2 Proof printing and checking of the hard copy charts (estimated at
3 days for the Senior Hydrographic Expert and
3 days for the GIS, Mapping and Survey Expert)

Contingency for back-stopping
(valid for the year of 2017) for support to DWIR in case of anomalous maintenance or specific technical request for support by the company) (estimated at
14 days for the Senior Hydrographic Expert and
10 days for the GIS, Mapping and Survey Expert)
4.6.1.1 Profiles and Capabilities Required

The Assistance by the company will be conducted by a Senior Hydrographic Expert (Team Leader) and a GIS, Survey and mapping Expert. Both of them will be present for all the activities described in Chapter 4.6 Requirements/Specifications for the Incidental Services and Technical Assistance, although the estimated number of days allocated to each expert is different. The estimated number of days is also indicated in Chapter 4.6. It is up to the company to clearly mention any suggested deviations.

It is clear that the DWIR Surveying Team will be responsible for the results of the topo-hydrographic surveys, including all preparations, logistics, vessels, personnel, and transport (called Project A) and the Senior Hydrographic Expert (Team Leader) and a GIS, Survey and mapping Expert will guide the DWIR to ensure the final products are made and produced with quality.

4.6.1.1.1 Profile requirements for the Senior Hydrographic Expert

<table>
<thead>
<tr>
<th>Profile requirements for the Senior Hydrographic Expert</th>
<th>Proposed expert satisfies the qualification requirements?</th>
<th>Specify any deviation from the qualification requirements.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Senior Hydrographic Expert will require at least 15 years successful experience in Topography and Hydrography. CV of the expert should reflect sufficient experience to demonstrate competence in the following fields:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Topographic leveling (up to second and first order).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Ground control surveys and geodetic networks.</td>
<td></td>
<td></td>
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<tr>
<td>3. Establishing benchmarks (including preparing description cards).</td>
<td></td>
<td></td>
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<tr>
<td>4. Establishing and working with water level gauges.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Establishing chart data (lowest low water levels for navigation).</td>
<td></td>
<td></td>
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<tr>
<td>7. IHO standards for S-57.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Hydrographic investigations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Charting and map referencing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. database design and management,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Image Processing Skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. AUTOCAD, CADCORE, ArcGIS …</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Experience in single beam and multibeam echo sounding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Experience in echosounding software such as Navigation Planning</td>
<td></td>
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</tr>
</tbody>
</table>
Furthermore, 15 years’ experience in:

1. Supply and transfer of highly specialized survey and communication equipment
2. Must show experience in hydrographic surveying and mapping, especially on fast flowing large rivers
3. Experience in training surveyors and designers
4. Experience of repair and maintenance of survey equipment
5. High experience in sailing hydrographic survey boats
6. Excellent written and oral communication skills (English)

## 4.6.1.1.2 Profile requirements for the GIS, Survey and Mapping Expert

<table>
<thead>
<tr>
<th>Profile requirements for the GIS, Survey and Mapping Expert</th>
<th>Proposed Experts satisfy the profile requirements</th>
<th>Deviation (if any)</th>
</tr>
</thead>
</table>

The GIS, Survey and Mapping Expert will require at least 10 years successful experience in GIS and mapping. CV of the expert should reflect sufficient experience to demonstrate competence in the following fields: for the expert’s experience in all of the following fields:

1. GIS mapping and database.
2. Image Processing Skills
3. remote sensing, analysis and delivery of imagery derived products.
4. AUTOCAD, CADCORE, ArcGIS …
5. Topographic leveling (up to second and first order).
7. Establishing and working with water level gauges.
8. Establishing chart data (lowest low water levels for navigation).
10. IHO standards for S-57.
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>8.</td>
<td>Hydrographic investigations.</td>
</tr>
<tr>
<td>9.</td>
<td>Charting and map referencing.</td>
</tr>
<tr>
<td>10.</td>
<td>Database design and management,</td>
</tr>
<tr>
<td>11.</td>
<td>Experience in single beam and multibeam echo sounding</td>
</tr>
<tr>
<td>12.</td>
<td>Experience in echo sounding software such as Navigation Planning</td>
</tr>
</tbody>
</table>
SECTION 5. 1. FORM OF BID

_______(Date)

To: _____________________________(Purchaser’s Name)

______________________________ (Purchaser’s Address)

We offer to supply in conformity with the Bidding Documents and in accordance with the Delivery Schedules specified therein, the following Goods [insert a brief description of the Goods]. The total price of our Bid, including any discounts offered, is [insert amount in words and figures].

We are not a Government owned entity or enterprise (or we are a government owned entity that is legally, commercially and managerially autonomous and not bidding for a contract to our supervising agency)

We are not suspended or debarred by the World Bank or other multilateral financial institution

This Bid and your written acceptance will constitute a binding Contract between us. We understand that you are not bound to accept the lowest or any Bid you receive.

We hereby confirm that this Bid will remain valid for 70 days after then Deadline for Submission of Bids.

We note and accept without reservation the Government’s and the World Bank’s (when other than the Government) right to audit and inspect any and all records relating both to the preparation of our Bid, and if our Bid is successful, the execution of the resulting contract according to the Attachment 1 – ‘World Bank Policy – Corruption and Fraudulent Practices’.

Authorized Signature: __________________________________________
Name and Title of Signatory________________________________________

Name of Bidder: ________________________________________________
Address: ________________________________________________________

Phone Number ____________________
Fax Number, if any ________________
SECTION 6. FORM OF CONTRACT AGREEMENT

AGREEMENT

This Agreement, made the __________ day of ______________ 20__, by and between

[insert name and address of Purchaser] (hereinafter called “the Purchaser”) and

[insert name and address of Supplier] (hereinafter called “the Supplier”).

Whereas the Purchaser invited bids for certain Goods viz., [insert brief description of Goods] and has accepted a Bid by the Supplier for the supply of those Goods in the sum of [insert Contract Price in words and figures] (hereinafter called “the Contract Price”).

Now this Agreement witnessed as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.

2. The following documents shall constitute the Contract between the Purchaser and the Supplier, and each shall be read and construed as an integral part of the Contract:
   (a) The Form of Contract,
   (b) the Conditions of Contract,
   (c) the Special Conditions of Contract
   (d) the Technical Specifications
   (e) the Form of Bid submitted by the Supplier,
   (f) the Price and Delivery Schedule,
   (g) the Purchaser’s Notification of Award

3. This Contract shall prevail over all other Contract documents. In the event of any discrepancy or inconsistency within the Contract documents, then the documents shall prevail in the order listed above.

4. In consideration of the payments to be made by the Purchaser to the Supplier as hereinafter mentioned, the Contractor hereby covenants with the Purchaser to execute and complete the Contract in conformity in all respects with the provisions of the Contract.
5. The Purchaser hereby covenants to pay the Supplier in consideration of the execution and completion of the Contract the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

In Witness whereof the parties thereto have caused this Agreement to be executed the days and year first before written

The Common Seal of


was hereunto affixed in the presence of:

Signed, Sealed, and Delivered by the said

in the presence of:

Binding Signature of Purchaser:

Binding Signature of Supplier:
SECTION 7. BID AND PERFORMANCE SECURING DECLARATION

[The Bidder shall fill in this form in accordance with the instructions indicated in brackets and submit it with the Bid.]

Date: [insert date]
Name of contract: [insert name]
Contract Identification No: [insert number]
Invitation to Quote No.: [insert number]

To: __________________________

We, the undersigned, declare that:

1. We understand that, according to your conditions, bids must be supported by a bid and performance securing declaration.

2. We accept that we shall be suspended from being eligible for bidding in any contract with the Purchaser and the Government of …… for the period of time of two years starting on the date of the Purchaser’s execution of this Declaration or pay 2% of the contract price as a penalty, if we are in breach of our obligation(s) under the bid conditions and contract conditions, because we:
   a) have withdrawn our Bid during the period of bid validity specified by us in the Bid Submission Sheet; or
   b) do not accept the correction of errors in accordance with the Instructions to Bidders of the Bidding Documents, or
   c) having been notified of the acceptance of our Bid by the Purchaser during the period of bid validity, fail or refuse to execute the Contract Form, if required, or
   d) committed a fundamental breach of contract leading to the Purchaser’s termination of the contract for reasons of our default.

3. We understand this bid securing declaration shall expire if we are not the successful bidder, upon the earlier of (i) our receipt of a copy of your notification that we were unsuccessful; or (ii) 30 (thirty) days after the expiration of our bid, or in the event that our bid is successful and we are awarded a contract we understand that this bid and performance securing declaration will expire upon successful completion of the warranty period specified in paragraph 7 of the Conditions of Contract.

4. We understand that if we are a JV, the Bid and Performance Securing Declaration must be in the name of the JV that submits the bid. If the JV has not been legally constituted at the time of bidding, the Bid Securing Declaration shall be in the names of all future partners as named in the letter of intent.

Signed [insert signature(s) of authorized representative] In the Capacity of [insert title]
Name [insert printed or typed name]

Duly authorized to sign the bid for and on behalf of [insert authorizing entity]

Dated on [insert day] day of [insert month], [insert year]
Annex A

Report: DWIR Hydrographic Survey of Stretch 1

I. Description and Rationale

1. Purpose, context and objectives of the project

1.1 Rationale and Purpose

Because of the lack of good maps an accident by a petroleum carrier, and these vessels form the majority of the fleet, will occur. The costs and losses resulting from such an accident can be huge. One of the first tasks to do is to develop the survey and charting functions of DWIR. This project deals with the hydrographic survey of Stretch 1 which needs a complete overhaul and update. DWIR will ensure that shipping of goods and passengers is conducted more efficiently and safe by improving the waterway operations, by introducing state-of-the art facilities for night-time navigation and an efficient waterway monitoring program, and by strengthening its own operational capabilities. That also involves their knowledge and expertise in Hydrographic Surveys and Charting. The DWIR needs to take full ownership and responsibility of maintaining the navigation channel and keeping it free from obstacles and shoals.

1.2 Immediate Objectives

The first Strategic Objective of the C3 Implementation Strategy reads: Shipping of goods and passengers is conducted more efficiently and safe by improving the waterway operations, by introducing state-of-the art facilities for night-time navigation and an efficient waterway monitoring program, and by strengthening the operational capabilities of DWIR.

The Immediate objectives relevant to this project is related to Hydrographic Surveys and Information: the required information and database for planning and operational adjustments to the navigation channel is available and is maintained.

The DWIR needs to take full ownership and responsibility of maintaining the navigation channel and keeping it free from obstacles and shoals. As stated in the 2015 Feasibility Report by Royal Haskoning:

“One can question if completely fixating a navigation channel in this dynamic river is the most sustainable solution; why not a hybrid solution where the river’s behaviour is dynamically controlled by river enhancement works including dredging and a aids to navigation system which is geared up for that. Hence Navigation with Nature”

DWIR will conduct hydrographic surveys, consisting of topographic and bathymetric surveys in Stretch 1 so that the hydrographic maps, and Navigation Charts can be available by early November of 2016. The results will then be used to design in detail where the new aids to navigation will come, and where it is required to do dynamic dredging (Project A).
As a support to this project adequate survey equipment such as modern single beam echosounders, DGPS/RTK equipment, hydrographic mapping software, and installation equipment etc. will be procured. A company will be hired to procure the Satellite Imagery, equipment and instruments, and to commission, install and calibrate the survey tools. Furthermore the ‘Support Team’ will assist the DWIR Survey Team with preparing the Base Map, the Hydrographic Surveys and Navigation Charts (project B).

1.3 The Geographical Project Area

The main goal is to make the Ayeyarwady River between Mandalay and Yangon better navigable for barges of minimum 1000 DWT, with an improved situation during the dry season. Because fixating a navigation channel over a distance of 950 km in hydrodynamically complex river such as the Ayeyarywady is a very challenging undertaking, it was decided to focus the physical works on Stretch 1, which is the area between Mandalay (Mingkun) and Old Bagan. Provision of night-time navigation would on the other hand be conducted over the whole stretch but for Phase 1 it will be concentrated on Stretch 1. Upgrading of the operational functions and hydrographic knowledge will in the future also be extended to cover the full stretch so that the concept of Navigation with Nature can be materialized for the whole river.
II. Overall methodology to obtain the Base Map and Navigation Charts

Satellite images are purchased from which a base map can be created. The information extracted from the Sat image would be: Towns, Ports, roads, tracks, major streams, Islands, permanent Sandbars and the demarcation of the river banks.

The features mentioned in Box 1, are known as “Cadastral” features and can be created in any format, therefore making future changes and additions easy. These can be created as a .dwg file, one of the easiest formats to create via a number of possible software programs, like AutoCAD.

“Map Info” software is used for the final GIS Base Maps. It is more user ‘friendly’ than ARC GIS and is cheaper.

Final Production: GIS Chart/Map

Channel Design can be incorporated into the chart, based on hydrographic Information gathered.

Bathymetric Surveys are conducted using a Single beam echo sounder coupled to a GPS RTK Base station and on board GPS rover. All the data can be collected into a specialized Toughbook laptop which is weather proof and absorbs shocks, using specific software.

 locations and type of Nav aids can be placed into the charts

GPS RTK Base

GPS RTK Base

UHF Antenna

Single Beam

Echo Sounder

Accuracy

Toughbook

Recording the Echo Soundings & Co-ordinates
III. Outputs and Activities

1. Production of the Base Map

1.1. Obtaining Satellite Imagery

Act. 1.1.1 Through the assistance of the Company (project B) an ‘Archive’ or ‘Library’ Satellite imagery of 2015 for the whole stretch between Mingun and Old Bagan will be assembled. As it is a braiding river and there are many secondary channels focus for satellite imagery is on the main channel for navigation, although it is still required for the full area. The area on land to be covered should be about 1 km. For an estimation: the area is covered by a longhaul distance of 205 km and average width of about 4.5 km. The exact area needs to be agreed upon with the PMU.

Chapter IV gives a detailed description of the technical requirements for Satellite Imagery and Feature Mapping. There will be a need for satellite images of 2015 in the period between January – April for the area as described above. The images need to be from the same year to have consistency. The period January-April is the lowest river level period.

1.2. Initial set-up of draft GIS Base Maps

Act. 1.2.1 Developing the GIS database:
GIS database in ArcView shape file format, file structure and its attribute should be follow the S-57 standard by the International Hydrographic Office, and the Regulations of the IHO for International (Int) Charts and Chart Specifications of the IHO, see website http://www.iho.int/iho_pubs/standard/S-4/S-4_e4.4.0_EN_Sep13.pdf
Act. 1.2.2 Define the different GIS Layers required for the part on the river banks, and the hydrographic part in the river. There will be different layers such as:

- river banks
- elevation contour lines (incl. spot heights)
- roads
- bridges
- overhead cables
- power lines pylons
- Pagodas
- Ports
- ferry stations
- communication towers
- fishing stakes
- Km- markers
- names of the villages/cities
- buildings
- monuments
- Tributaries
- island contours
- sand banks
- river depths
- river depth contours
- aids to navigation
- rocks
- groynes and river training infrastructure
- navigation channel, (polygons, edge-matched between sheets)
- etc.

Act. 1.2.3 Both of spatial and attributed data and related information are to be collected and analysed for further GIS database making. Copy them into different files. Saving all the data into the format of digital GIS database. It should be possible to derive the numerical data as well, for example: river depths according to position (x, y, z).

1.3. Topographic verification, surveys and updates

Act. 1.3.1 The existing topographic data on the river banks will be checked and updated by field survey and the topographic details of the satellite imagery must be cross-checked with field verifications and existing maps. The heights of the river bank are expressed in meters above the official Mean Sea Level datum. It is important to clearly mark the new river banks as they will have changed from the previous topo-hydrographic maps.

Act. 1.3.2 Control Points and Reference Points (descriptive bench marks) and Survey Summaries
The process of having to establish ground control points (DGPS Points) is required for the satellite imagery. Make an inventory of the existing control points and supplementary points wherever needed for the sounding and establish 20 new control points or more.

Reference Points (benchmarks) need to be established every 10 km with full description card (see attachment). The Reference Points should preferably be established at places which are not subject to erosion or human intervention. Best places are Pagodas, schools, government institutions,. If new Reference Points are to be established they need to be cast in large concrete monuments and Survey Summaries prepared. A list of the Reference Points and description cards in English need to be prepared. Field verification is required.

1.4. Developing the GIS Base Maps

Act. 1.4.1 Finalize the full GIS database and documentation on the GIS
Act. 1.4.2 Checking (quality control) and editing of the data.
Act. 1.4.3 The maps should be stitched together so that one continuous map can be prepared for the area between
Act. 1.4.4 The layers of the Aids to Navigation Design conducted in May 2016 and the channel should be incorporated into the new map.

2. Production of the Hydrographic Maps of Stretch 1

2.1 Definition and Inventory of the CD

Act. 2.1.1 Prepare a detailed inventory of the Chart Datum (CD). Establishing the correct level of the Chart Datum (= Lowest Low Water Level) is of the greatest importance as referencing to the Lowest Low Water Level (of the last 20 years) will be critical to the accuracy of the maps. If the CD is wrong, the soundings will be wrong and it may result in chart readings of river depths which are not correct, thus dangerous when relied upon as guidance for navigation.

Reducing the surveyed water depths to the CD will reveal which areas (1) are submerged at all times; (2) are submerged when the water level rises above CD; and (3) which areas are always dry. The method of depicting these areas is different:

a. the figures over area (1) are soundings, in other words the depths noted in meters, decimeters between the CD and the river bed.

b. the figures over area (2) are actually negative numbers that represent the difference between the CD and the actual level of the area. For example, if the area shows -0.5 (m), then it means that that area is 0.5 meter dry if the water would fall to its Lowest Low Water level.

c. These areas are Dry Areas and have topo-heights over them expressed in heights in meters above Mean Sea Level MSL.
2.2 Bathymetric Surveys

Act. 2.2.1 All necessary arrangements to prepare for the hydrographic surveys. Detailed hard-copy will be at scale 1/10,000. The scale of the electronic hydrographic maps can of course be changed.

All hydrographic and topographic surveys shall have an accuracy in the horizontal plane of +/- 0.10m and in the vertical plane of +/- 0.10m. It is important that as many bathymetric data are recorded and printed as possible along the sounding lines. Therefore an adjustable character font for the soundings on the maps need to be introduced. For example: for a sounding line covering 100m we need to have at least 6 recorded soundings. On the hard copy the fonts for the soundings will therefore have to be very small (if printed on a map of scale 1/10,000 the font height will be less than 2 mm).

Act. 2.2.2 Install temporary water level gauges installation.
Installing temporary and local water level gauges. Stage measurements and water level observations have to be based on leveling from the benchmark elevation. The CD has to be approved by the PMU and DWIR Management before proceeding.

The water level gauges are to be installed at suitable places to observe the water levels. The Zero of the Gauges should be linked to the benchmark marks by levelling in accordance with the 3rd order levelling standard. The level instruments using for levelling have to be calibrated prior to performing the levelling works.

Act. 2.2.3 Bathymetric surveys
The surveys will have to be conducted when the water levels are still at least two meters higher than their lowest levels or CD. That will allow the survey vessel to navigate in areas which are very shallow during the lowest low waters. That also means that areas which are normally dry during Lowest Low water (LLW) will be surveyed by bathymetry. During the mapping component, these areas will then be properly indicated as dry areas.

The area to be surveyed is from river bank to river bank. In case of doubt this must be discussed with the PMU and DWIR Management.

Bathymetric surveys shall be carried out with 200 meters interval distance between sounding lines at 200 meters maximum. However, in the difficult navigation areas the sounding lines should be at maximum 100 meters. Where rocks are present in or close to the navigation channel the sounding lines should be maximum at 50 meters.

As the soundings are done by single beam echosounder due care is taken that no wrecks or clear obstacles that have less water above them than the water depths measured by the surrounding sounding lines are left unidentified. That is why it is very important that local knowledge from fishermen and skippers is obtained to identify snags, rocks, wrecks or other obstacles.

Throughout the survey, the DGPS receiver and echo sounder send the measuring data continuously to the Toughbook computer via the serial ports. The DGPS sends positioning messages in NMEA 0183 format to the Toughbook every second; simultaneously the echo sounder with an output rate of 20 Hz sends the measuring depth message to the laptop every 0.05 second.

During the bathymetric survey operation, based on the positioning data from DGPS receiver, the survey vessel navigates in real time according to the planned lines displayed on the screen of laptop running by survey Module of a suitable hydrographic software. For each survey line and check line, all the sounding data contain the survey time. Positioning and depth data are to be logged and saved to the separate files for further data processing.
After the survey, all data files, parameters, water level data and sounding results for each survey line are to be further used.

2.2.4. Calibration.

The DGPS receivers and echosounder units are to be calibrated at the survey area to test the configuration data before the survey works are executed.

DGPS checks are to be performed at the field for the following purposes:

- To check the transformation of the WGS84 datum to the local datum setup to Hypack software;

- To calculate the transformation parameters to WGS 84 further construction of the GIS database.

- Calibration of the Echo Sounder prior to use e.g. measuring the bottom of the river with a sounding pole of line and make sure they correspond with the echo sounding reading, then adjust as necessary ... also, calibration of the echo sounder draft when its placed in the water. It is important to know the distance from the bottom of the sounder to the surface of the river.

2.2.5. Bathymetric Survey Preparations

- Creating the planned lines.
In order to carry out the bathymetric survey with the survey line spacing interval referenced to the required spacing and location, the planned lines are to be created.
In the survey area, the planned lines are to be created including planned survey lines. The planned survey lines areas are at a line spacing at intervals mentioned above.

- Configuration of the geodetic data.
The existing topographic map grid co-ordinate system used in the field for this project is to be confirmed. Details of this local datum and reference spheroid are to be given.

2.2.6. Bathymetric data processing

- Editing the observed water level data.
Based on the installed water level gauges, the water level data are observed at 30 minutes interval and reduced to vertical CD before editing.

- Sounding processing.
All raw files of the survey lines, check lines and observed water level data are checked daily for errors and inconsistencies. The water level and sound velocity data are then applied to the raw data files and then reformatted into the XYZ files.

- Making the draft of maps
The draft of maps contains the sounding label and contour lines and updated riverbanks. The contour lines are interpolated by hand. All of them are then exported into DXF format files for purpose of data checking.
3. **Production of the Navigation Charts of Stretch 1**

   a) The results of the Output 1 and 2 activities should be correctly attributed based on the results of the bathymetric surveys.

   b) Proof printing and checking of the hard copy charts

**IV. Implementation Arrangements**

The **DWIR Surveying Team** will be responsible for the results of the topo-hydrographic surveys, including all preparations, logistics, vessels, personnel, and transport under Project A. The outputs and activities have been described in Chapter III and the DWIR Surveying Team will need to prepare the following:

1. **Production of the Base Map**
   1.1 Initial set-up of draft GIS Base Maps
   1.2 Final outputs of the maps + database:
   1.3 Define the format for the different GIS Layers, and start prepare the layers
   1.4. Topographic verification, surveys and updates
   1.5 Establish Control Points and Reference Points (= detailed Bench Marks)
   1.6. Produce the GIS Base Maps
   1.7 Stitch all the maps for Stretch 1 together
   1.8 Combine all the layers

2. **Production of the Hydrographic Maps of Stretch 1**
   2.1 Definition and Inventory of the CD
   2.2 Prepare a detailed inventory of the Chart Datum (CD), and adjust where required
   2.3 Prepare and plan the Bathymetric Surveys
   2.4 Install temporary water level gauges installation
   2.5 Creating the planned lines.
   2.6 Start the bathymetric surveys
2.7 Calibration
2.8 Configuration of the geodetic data
2.9 Bathymetric data processing
2.10 Drafting the maps

3. Production of the Navigation Charts of Stretch 1
3.1 The results of the Output 1 and 2 activities should be correctly attributed based on the results of the bathymetric surveys.
3.2 Proof printing and checking of the hard copy charts

The Team will be responsible for arranging permission for surveys on stretches as mentioned.

The DWIR Survey Team will at regular intervals receive assistance by specialists of the company who will be selected to implement Project B. These specialists will be called the Support Team. The Support Team will order, import, commission, install and calibrate the survey equipment and instruments. It is evident that the company in charge of ordering the equipment and instruments will also be responsible for proper installation and training. Installation, training and assistance to support the DWIR Surveying Team in achieving all the Outputs as described in Chapter III. That means that this company will also order the Satellite Imagery and prepare the formats and layout for the Basemap. Hence, close cooperation and coordination between the two teams will be crucial.
V. Operational Data, Equipment and Instruments

In order to successfully implement the activities mentioned in Chapter II a range of equipment and instruments is to be urgently procured, commissioned and installed. This will be done through project **G3.1.1- Upgrading of the DWIR Hydrographic Equipment, Facilities and Services, or called Project B.** Even though the procurement is not part of the DWIR Hydrographic Survey of Stretch 1 the range of equipment is listed in Annex A.
VI. Schedule and Duration of the Project

<table>
<thead>
<tr>
<th></th>
<th>Main Work by DWIR</th>
<th>2016</th>
<th>2017</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>October</td>
<td>November</td>
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<tr>
<td>1. Production of the Base Map</td>
<td>to be completed by the Supplier</td>
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<tr>
<td>Initial set-up of draft GIS Base Maps</td>
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<tr>
<td>Final outputs of the maps + database:</td>
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<tr>
<td>Derive the Base map format from the Satellite Image</td>
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<tr>
<td>Topographic verification, surveys and updates</td>
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<tr>
<td>Establish Control Points and Bench Marks</td>
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<tr>
<td>Develop the GIS Base Maps</td>
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<td>Stitched all the maps for Stretch 1 together</td>
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<tr>
<td>Add all the layers</td>
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<tr>
<td>2. Production of the Hydrographic Maps of Stretch 1</td>
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<tr>
<td>Definition and Inventory of the CD</td>
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<tr>
<td>Calibration</td>
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<tr>
<td>Configuration of the geodetic data</td>
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<tr>
<td>Bathymetric data processing</td>
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<tr>
<td>Sounding processing</td>
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<tr>
<td>Drafting the maps</td>
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<tr>
<td>3. Production of the Navigation Charts of Stretch 1</td>
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<tr>
<td>The results of the Output 1 and 2 activities should be correctly attributed based on the results of the bathymetric surveys. Prepare the Navigation Charts for use by the skippers. Proof printing and checking of the hard copy charts</td>
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<tr>
<td>Contingency for back-stopping (valid for the year of 2017) for support to DWIR in case of anomalous maintenance or specific technical request for support by the company)</td>
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<td>to be completed by the Supplier</td>
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VII. Profiles and Capabilities Required

The Survey Team will require 4 DWIR experts and 8 DWIR surveyors with at least 10 years experience on surveying on and along the Ayeyarwady River, and more specifically in:

1. Topographic leveling (up to second and first order).
2. Ground control surveys and geodetic networks.
3. Establishing bench marks (including preparing description cards).
4. Establishing and working with water level gauges.
5. Establishing chart data (lowest low water levels for navigation).
6. Read and develop AUTOCAD files
7. Bathymetric surveys.
8. IHO standards for S-57.
9. Hydrographic investigations.
10. GIS mapping.
11. Charting and map referencing.
12. Experience in single beam and multibeam echosounding
13. Experience in echosounding software such as HYPACK
14. High experience in sailing hydrographic survey boats