



November 12, 2007

Tenders Board
Ministry of Finance, 3rd Floor
Cecil Wallace Whitfield Building
West Bay Street
Nassau, Bahamas
P. O. Box N-3017

Dear Tenders Board Members:

A Joint Venture

**Re: Dredging of Nassau Harbour
& Installation of Mooring Dolphins**

George V. Cox &
Company Ltd.
Mount Royal Ave.
P. O. Box N 204
Nassau, Bahamas

Tel: (242) 322-3121
Fax: (242) 323-3489

Cox & SHAL Consultants are pleased to submit the original and three copies of our Proposal to provide Consulting Engineering Services for the Nassau Harbour Dredging & Mooring Dolphins Project. These services include planning, site investigations, Environmental Impact Assessment, final design, preparation of drawings and contract documents and construction management.

SHAL Consulting
Engineers Limited
20 Packham Circle
Suite 202
Brampton, Ontario
Canada L7A 2N6

Tel: (905) 495-7272
Fax: (905) 846-0957

Cox & SHAL have assembled a Team of professionals who offer extensive local knowledge and comprehensive international experience relevant to all aspects of the Project. All of the Team members have had considerable experience within the Bahamas over the years and most are well known to Ministry of Works and Transport staff.

We believe that our Team has the most to offer to this Project since SHAL Consulting Engineers were responsible for the design of the Nassau Harbour Port Expansion Project, constructed in 1989-90. This Project included extensive dredging to create the current Entrance Channel and Harbour dredge limits. As a result of this past experience, we are very familiar with conditions within the Harbour and surrounding area and can anticipate many of the issues associated with the current Project.

We trust that you find our Proposal of interest, particularly the first part of Section B: Project Approach and our listing of past projects given in Section A2: Relevant Experience. We look forward to the opportunity to meet with the Selection Committee to discuss the technical details of our Proposal as well as conducting a thorough review of our proposed fees. We appreciate the opportunity to submit this Proposal and look forward to hearing from the Selection Committee.

Signed copies of Addenda Nos. 1, 2 and 3 are attached.

Yours very truly,

Cox & SHAL Consultants

PROJECT MANAGEMENT

ENGINEERING

PLANNING

George V. Cox
President

MOWT/A2/131/CP1007 ADDENDUM NO. 1

REQUEST FOR PROPOSALS FOR CONSULTANCY SERVICES FOR THE DREDGING OF THE NASSAU HARBOUR AND INSTALLATION OF MOORING DOLPHINS

Owner: Ministry of Works & Transport

Project Name: Consultancy Services for the Dredging of the Nassau Harbour and Installation of Mooring Dolphins

Consultancy Package No. MOWT/A2/131/CP1007
Consultancy Services for the Dredging of the Nassau Harbour and Installation of Mooring Dolphins
Nassau, Bahamas.

Date of Issue: 2007 October 25

This Addendum modifies the Request for Proposals Document by additions, deletions, clarifications, corrections, or other types of modifications. Addendum No. 1 is to be considered part of the Request for Proposal Documents through its issuance by the Employer. Upon receipt of this Addendum, the Proposers shall review the identified additions, deletions, clarifications, corrections, or other types of modifications as may be included herein and include same in their tender to be submitted on the noted date, as though such additions, deletions, clarifications, corrections, or other types of modifications as may be included herein where part of the original Request for Proposals Documents (inclusion in and modification of the Request for Proposals Documents).

It is required that this Addenda be signed in the Acknowledgment of Receipt below, and a copy of this page returned to the Employer for the record. By returning the signed page, the Proposer states that they have reviewed the contents of Addendum No. 1 and that all items listed as included in the Addendum (on page 2 of the Addendum) are present.

Attach this sheet, signed as required, to the Tender Submission.

Acknowledgment of Receipt of Addenda

Name: _____

Title: _____

Date: _____

MOWT/A2/131/CP1007 ADDENDUM NO. 2

REQUEST FOR PROPOSALS FOR CONSULTANCY SERVICES FOR THE DREDGING OF THE NASSAU HARBOUR AND INSTALLATION OF MOORING DOLPHINS

Owner: Ministry of Works & Transport

Project Name: Consultancy Services for the Dredging of the Nassau Harbour and Installation of Mooring Dolphins

Consultancy Package No. MOWT/A2/131/CP1007
Consultancy Services for the Dredging of the Nassau Harbour and Installation of Mooring Dolphins
Nassau, Bahamas.

Date of Issue: 2007 October 29

This Addendum modifies the Request for Proposals Document by additions, deletions, clarifications, corrections, or other types of modifications. Addendum No. 2 is to be considered part of the Request for Proposal Documents through its issuance by the Employer. Upon receipt of this Addendum, the Proposers shall review the identified additions, deletions, clarifications, corrections, or other types of modifications as may be included herein and include same in their tender to be submitted on the noted date, as though such additions, deletions, clarifications, corrections, or other types of modifications as may be included herein where part of the original Request for Proposals Documents (inclusion in and modification of the Request for Proposals Documents).

It is required that this Addenda be signed in the Acknowledgment of Receipt below, and a copy of this page returned to the Employer for the record. By returning the signed page, the Proposer states that they have reviewed the contents of Addendum No. 2 and that all items listed as included in the Addendum (on page 2 of the Addendum) are present.

Attach this sheet, signed as required, to the Tender Submission.

Acknowledgment of Receipt of Addenda

Name: _____

Title: _____

Date: _____

MOWT/A2/131/CP1007 ADDENDUM NO. 3

REQUEST FOR PROPOSALS FOR CONSULTANCY SERVICES FOR THE DREDGING OF THE NASSAU HARBOUR AND INSTALLATION OF MOORING DOLPHINS

Owner: Ministry of Works & Transport

Project Name: Consultancy Services for the Dredging of the Nassau Harbour and Installation of Mooring Dolphins

Consultancy Package No. MOWT/A2/131/CP1007
Consultancy Services for the Dredging of the Nassau Harbour and Installation of Mooring Dolphins
Nassau, Bahamas.

Date of Issue: 2007 November 06

This Addendum modifies the Request for Proposals Document by additions, deletions, clarifications, corrections, or other types of modifications. Addendum No. 3 is to be considered part of the Request for Proposal Documents through its issuance by the Employer. Upon receipt of this Addendum, the Proposers shall review the identified additions, deletions, clarifications, corrections, or other types of modifications as may be included herein and include same in their tender to be submitted on the noted date, as though such additions, deletions, clarifications, corrections, or other types of modifications as may be included herein where part of the original Request for Proposals Documents (inclusion in and modification of the Request for Proposals Documents).

It is required that this Addenda be signed in the Acknowledgment of Receipt below, and a copy of this page returned to the Employer for the record. By returning the signed page, the Proposer states that they have reviewed the contents of Addendum No. 3 and that all items listed as included in the Addendum (on page 2 of the Addendum) are present.

Attach this sheet, signed as required, to the Tender Submission.

Acknowledgment of Receipt of Addenda

Name: _____

Title: _____

Date: _____

COX & SHAL PROPOSAL
FOR
DREDGING OF NASSAU HARBOUR
& INSTALLATION OF MOORING DOLPHINS

TABLE OF CONTENTS

The Table of Contents has been set up to correspond to the Proposal Format given on page 8 of the RFP.

Cover Letter

Addenda Nos. 1, 2 and 3 Signing Sheets

A TEAM MEMBER INFORMATION

- A1 Contact Information
 - 1.1 Cox & SHAL Consultants
 - 1.2 Blue Engineering
 - 1.3 Baird & Associates
 - 1.4 Trow Associates
 - 1.5 Hydrographic Consultants Ltd

- A2 Relevant Experience
 - 2.1 Cox & SHAL Consultants
 - 2.2 Blue Engineering
 - 2.3 Baird & Associates
 - 2.4 Trow Associates
 - 2.5 Hydrographic Consultants Ltd

- A3 Team Responsibilities

- A4 Key Personnel & Qualifications of Firms
 - 4.1 Cox & SHAL Consultants
 - 4.2 Blue Engineering
 - 4.3 Baird & Associates
 - 4.4 Trow Associates
 - 4.5 Hydrographic Consultants Ltd

- A5 Comparable Projects
 - 5.1 Cox & SHAL Consultants
 - 5.2 Blue Engineering
 - 5.3 Baird & Associates

- 5.4 Trow Associates
- 5.5 Hydrographic Consultants Ltd

B. PROJECT APPROACH

- B1 Phase 1 Planning/Preliminary Engineering
- B2 Phase 2 Site Investigations
- B3 Phase 3 Design, Documents & Tendering
- B4 Phase 4 Contract Administration & Review During Construction

C. FEE ESTIMATE

D. PROJECT SCHEDULE

E. REFERENCES

Appendix A Team Experience

- A1 Cox & SHAL Consultants
- A2 Blue Engineering\
- A3 Baird Associates
- A4 Trow Associates
- A5 Hydrographic Consultants

Appendix B Key Personnel CVs

- B1 Cox & SHAL Consultants
- B2 Blue Engineering\
- B3 Baird Associates
- B4 Trow Associates
- B5 Hydrographic Consultants

COX & SHAL PROPOSAL
FOR
DREDGING OF NASSAU HARBOUR
& INSTALLATION OF MOORING DOLPHINS

As requested in Clause 3 E of the RFP, we have made an effort to keep our Proposal as brief and simple as possible while providing a concise description of our capabilities, past relevant experience and proposed Project Methodology. Supporting documentation is included in the Appendices.

The format of our Proposal follows the format requested in pages 8 and 9 of the RFP.

A. TEAM MEMBER INFORMATION

The following Firms form part of Cox & SHAL's Project Team.

Cox & SHAL Consultants	Prime Consultant
Blue Engineering	Environmental Impact Report and Permits
Baird & Associates	Coastal Engineering
Trow Associates	Geotechnical Investigation
Hydrographic Consultants	Hydrographic Surveys

A1 Contact Information

1.1 Cox & SHAL Consultants

Cox & SHAL Consultants is a long standing joint venture established between the Bahamian firm of George V. Cox & Co. Ltd. and SHAL Consulting Engineers Limited of Toronto. Of note, SHAL Consulting Engineers were responsible for the design of the last dredging project carried out in Nassau Harbour in 1989-90.

George V. Cox & Co. Ltd. is a well known Bahamian firm of Civil and Structural Consulting Engineers who have very extensive experience throughout New Providence and all of the Family Islands.

SHAL specialize in the planning and design of Ports and Marine Structures. Many of their projects have included a dredging component. SHAL have been active in the Caribbean since 1970 and within the Bahamas since 1980, with Bahamian work carried out in New Providence and the many of the Family Islands.

Cox & SHAL Consultants will be the Prime Consultant for this Project. All other firms listed will act as sub consultants to Cox & SHAL and will report to and act under the direction of Cox & SHAL. The designated Project Manager is Mr. Tom Hluchan of SHAL. Contact information is as follows.

Mr. Tom Hluchan
Project Manager
Cox & SHAL Consultants
20 Packham Circle, Suite 202
Brampton, Ontario L7A 2N6

Tel: 905-495-7272
Fax: 905-846-0957
Email: shal@shal.ca

The alternate contact person is:

Mr. George Cox
Principal
Cox & SHAL Consultants
No. 4 Hawkins Hill
P. O. Box N-204
Nassau, Bahamas

Tel: 242-322-3121
Fax: 242-323-3489
Email: gvcc@gvcox.com

Mr. George Cox is authorized to sign on behalf of Cox & SHAL Consultants and is the authorized official signing this Proposal on behalf of Cox & SHAL.

Names of Key Personnel and their Project roles are given in Section A3 of our Proposal and CVs are included in Appendix B.

SHAL Consulting Engineers were responsible for the design of the Nassau Harbour Port Expansion Project carried out in 1989-90. This included the cross berth and the northern most cruise ship pier as well the dredging to deepen and enlarge the approach to the Harbour as well as the Turning Basin within the inner Harbour.

Tom Hluchan was the principal involved during execution of that project.

1.2 Blue Engineering

Blue Engineering is a Bahamian Consulting Engineering firm who specialize in Civil, Structural and Environmental Engineering Consultancy Services.

Michelle Lakin is the Principal of the Firm who will be responsible for the Environmental aspects of the Project. Contact information is as follows;

Michelle Lakin is the Principal of the Firm who will be responsible for

Michelle Lakin B.Eng, C.Eng, C.Env, MICE
Blue Engineering Ltd.
P. O. Box SS 6328, Nassau, Bahamas

Tel/fax: 242-393-4496
Cell: 242-434-0766
Email: blueengineering@coralwave.com

1.3 Baird & Associates

The Principal responsible for the Coastal Engineering aspects of the Project will be Mr. Kevin MacIntosh. Contact information is as follows.

Mr. Kevin MacIntosh
Baird & Associates
1185 Hunt Club Road, Suite 500
Ottawa, Ontario K1V 0Y3

Tel: 613-731-8900
Fax: 613-731-9778
Cell: 613-867-6323
Email: kmacintosh@baird.com

Baird & Associates have extensive experience in the Caribbean and have been responsible for project management and coastal engineering on a number of projects within the Bahamas. Kevin MacIntosh and Baird Associates are known to many senior members of the Ministry of Works and Transport.

Names of Key Personnel and their Project roles are given in Section A3 of our Proposal and CVs are included in Appendix B.

1.4 Trow Associates

The Principal responsible for the Geotechnical Investigation and Report will be Mr. Chris Thompson. His contact information is as follows.

Mr. Chris Thompson
Technical Director
Trow Associates
1595 Clark Boulevard
Brampton, Ontario
L6T 4V1

Tel: 905-793-9800

Fax: 905-793-0641
Cell: 647-274-5247
Email: christhompson@trow.com

He is past President, CEO and Chairman of this very large, well known Canadian Geotechnical Engineering firm and has extensive experience with projects throughout the Caribbean.

Chris Thompson was responsible for the geotechnical investigations carried out as part of the dredging program during the expansion of Nassau Harbour in 1989-90 and is very familiar with conditions in Nassau Harbour and at Arawak Cay, the proposed dredged material disposal site.

Names of Key Personnel and their Project roles are given in Section A3 of our Proposal and CVs are included in Appendix B.

1.5 Hydrographic Consultants Ltd

The principal responsible for the hydrographic survey work will be Mr. Rob Roman. His contact information is as follows.

Mr. Rob Roman
Principal
Hydrographic Consultants Ltd
P. O. Box 1448
Bellaire, Texas 77402-1448

Tel: 713-664-8066
Fax: 713-675-5144
Cell: 832-798-1486

Mr. Roman has extensive experience throughout the Caribbean and Central and South America.

Names of Key Personnel and their Project roles are given in Section A3 of our Proposal and CVs are included in Appendix B.

A2 Relevant Experience

2.1 Cox & SHAL Consultants

SHAL Consulting Engineers and Cox & SHAL Consultants have completed the following projects relevant to the Nassau Harbour Dredging Project.

Cox & SHAL or SHAL were Prime Consultant on all of these projects and performed the following functions.

- Project Management
- Client Liaison
- Preliminary Engineering Design & Studies
- Arrange & Interpret Site Investigations
- Final Design & Preparation of Drawings & Contract/Tender Documents
- Quantity Calculations & Cost Estimates
- Issue for Tender & Respond to Tenderers Queries
- Review Tenders & Issue Tender Evaluation Report
- Assist with Contract Award
- Contract Administration & Review During Construction
- Certify Project Completion

Client references for the most relevant projects are given in Section E of our Proposal.

Representative Bahamian Marine Experience

- Nassau Harbour Cruise Berth Expansion & Dredging
- Marsh Harbour Port Expansion & Dredging, Abaco
- Potter's Cay West Expansion, Nassau
- Potter's Cay East Expansion, Nassau
- Kelly's Wharf Reconstruction, Nassau
- Nassau Shipyards Dockwall, Nassau
- Malcolm Park Seawall, Nassau
- Woodes Rogers Walk Seawall and Widening, Nassau
- Cruise Berth & Dredging, Morgan's Bluff, Andros
- Coastal Docks, Morgan's Bluff, Andros
- Water Barge Dock Reconstruction, Morgan's Bluff, Andros
- Drigg's Hill Harbour Design, Andros
- Cruise Berth & Dredging, Governor's Harbour, Eleuthera
- Harbour Island Marine Terminal Pre-Engineering, Eleuthera
- Coastal Docks, George Town, Exuma
- Economic Evaluation of Port Sites, Exuma
- Family Islands Infrastructure Inventory
- Hurricane Floyd Damage Assessment
- Hurricane Frances & Jean Damage Assessment
- Inter-Island Dock Inventory
- Crystal Palace Beach Studies, Nassau, N. P.

- Cruise Berth Pre-Engineering, San Salvador
- Marina Study, Exuma
- British Colonial Marina Pre-Engineering, Nassau
- Paradise Island RoRo Ramp, N. P.
- Clifton Pier Dock Assessment, New Providence
- Emerald Bay Marina, Design Check, Exuma
- Highbourne Cay Study, Exuma Cays

Representative Dredging Projects:

- Nassau Harbour Dredging, Nassau
- Morgan's Bluff Dredging, Andros, Bahamas
- Governor's Harbour Dredging, Eleuthera, Bahamas
- Marsh Harbour Access Channel and Basin, Abaco, Bahamas
- Bellefield Landing Access Channel and Basin, North Caicos
- South Dock Access Channel and Basin, Providenciales, Turks & Caicos Islands
- Deep Water Harbour Dredging & Reclamation, Bridgetown, Barbados
- Caicos Cruise Port Access Channel and Basin, East Caicos
- Montego Bay Shoreline Nourishment, Jamaica
- Whitby Harbour Dredging, Whitby, Ontario
- Access and Berth at Sunoco Dock Nos. 1 & 2, Sarnia, Ontario
- Access and Berth at Shell Bunker Dock, Sarnia, Ontario
- Access and Berth at Polysar Dock, Sarnia, Ontario
- Harbourfront Marina, Toronto
- Coast Guard Base, Parry Sound, Ontario
- Coast Guard Base, Prescott, Ontario

Other Caribbean Experience

- Deep Water Harbour Expansion, Bridgetown, Barbados
- South Dock Expansion, Providenciales, Turks and Caicos Islands
- Caicos Cruise Port, East Caicos, Turks and Caicos Islands
- Fishing Harbour, Bridgetown, Barbados
- U.S. Naval Mooring Piers, Antigua
- Bellefield Landing, North Caicos, Turks and Caicos Islands
- North to Middle Caicos Bridge and Causeway
- Frederiksted Cruise Ship Pier, U.S. Virgin Islands
- Philipsburg Cruise Ship Terminal Study, St. Martin
- Puerto La Cruz Cruise Ship Terminal Study, Venezuela
- Margarita Island Cruise Ship Berth Study, Venezuela

2.2 Blue Engineering

Blue Engineering has completed the following projects relevant to the Nassau Harbour Dredging Project.

- Little Bell Island EIA, Exuma Land and Sea Park Exuma, Bahamas
- Point House EIA, Lyford Cay, Nassau, Bahamas
- Hurricane Floyd Rehabilitation Project
- Baha Mar WWTP, Cable Beach, Nassau, Bahamas
- Baha Mar Permanent Generator Plant, Cable Beach, Nassau, Bahamas
- Royal Island Resort, Royal Island, Bahamas
- Lake Pointe EIA
- Spanish Wells Dredging, Spanish Wells, Bahamas

2.3 Baird & Associates

Baird & Associates have carried out the following coastal engineering projects which are relevant to this Project.

- Glass Window Causeway & Bridge, Eleuthera
- Cotton Bay Beach Restoration, Eleuthera
- Beach & Bluff Restoration, Church Bay, Eleuthera
- Welches Beach and Shore Protection, Barbados
- Rockley to Coconut Court Waterfront Improvement, Barbados
- Hometown Coastal Infrastructure Project, Barbados
- West Coast Beach & Reef Restoration Project, Barbados
- Worthing Beach Water Quality Study and Emergency Repairs, Barbados
- Mandahl Bay Waterfront Development, U.S. Virgin Islands
- Needham's Point Breakwater Reconstruction, Barbados
- Hodges Bay Club Waterfront Development, Antigua
- Crane Beach Access Improvements, Barbados
- Rainbow Reef Hotel Waterfront, Barbados
- Fishing Hole Road Storm Surge Assessment, Grand Bahama
- Elbow Cay Beach Restoration, Abaco
- Rendezvous Hotel Waterfront Improvement, St. Lucia
- Sewer Outfall and Shore Protection, Roseau, Dominica
- Four Seasons Development, Barbados
- Four Seasons Development, Hog Island, Grenada
- Tourism & Fishing Jetties, St. Lucia
- Northwest Coastal Conservation Project, Phases I & II, St. Lucia
- Cancun Beach Nourishment, Mexico
- Coastal Erosion Study, Mauritius
- Keta Sea Defense Project, Ghana, West Africa

2.4 Trow Associates

Trow Associates have been responsible for carrying out geotechnical engineering studies for the following projects relevant to this Project.

Bahamian Experience

- Nassau Harbour Cruise Berth Expansion & Dredging
- Marsh Harbour Port Expansion & Dredging, Abaco
- Potter's Cay West Expansion, Nassau
- Potter's Cay East Expansion, Nassau
- Malcolm Park Seawall, Nassau
- Woodes Rogers Walk Seawall and Widening, Nassau
- Cruise Berth & Dredging, Morgan's Bluff, Andros
- Coastal Docks, Morgan's Bluff, Andros
- Cruise Berth & Dredging, Governor's Harbour, Eleuthera
- Coastal Docks, George Town, Exuma

Caribbean Experience

- Bridgetown Deep Water Harbour Expansion, Barbados
- Frederiksted Cruise Ship Berth, St. Croix, U.S. Virgin Islands
- South Dock Port Expansion, Providenciales, Turks and Caicos Islands
- South Jetty Dock Modifications, Grand Turk, Turks and Caicos Islands
- South Caicos Dredging Access Study, Turks and Caicos Islands
- East Caicos Cruise Ship Port, Turks and Caicos Islands
- North and Middle Caicos Causeway, Turks and Caicos Islands

2.5 Hydrographic Consultants Ltd

Hydrographic Consultants have been responsible for carrying out hydrographic surveys for the following projects relevant to this Project.

- Carnival Cruise Berth Dredging Survey, Grand Turk, Turks and Caicos Islands
- Bellefield Landing Reef Dredging Survey, Turks and Caicos Islands
- Pipeline Route Survey, Curacao, Netherlands Antilles
- Kiawah Development Marina Construction Surveys, St. Kitts, St. Kitts & Nevis
- Grand Turk Beach Profile Monitoring, Grand Turk, Turks and Caicos Islands
- Camamu Basin Multi Beam Survey, Brazil
- Port of Manta – Surveys for Port Expansion, Ecuador
- Breakwater Side Scan Sonar Survey, Tampico, Mexico
- Sub Bottom Investigation Surveys, Campeche, Mexico
- Lake Conroe and Livingston Dam Side Scan & Multi Beam Surveys, Texas
- Los Angeles Harbor – Harbor Deepening Project Surveys, California
- Port of Long Beach – Side Scan Sonar Surveys, California
- Port of Houston Bayport Container and Cruise Terminal, Texas
- Port of Houston Maintenance Dredging, Texas
- Bolivar and Galveston Ferry Landing Surveys, Texas
- Port of Houston Dredge Disposal Site Surveys, Texas
- Gulf Energy LNG Facility Dredging Survey, Mississippi

Relevant Work For Dredging Firms

- Marinex Dredging – St Kitts Dredging Surveys, St. Kitts & Nevis
- Great Lakes Dredge & Dock - Magnetometer Surveys, Texas
- Norfolk Dredging – Dredging Surveys Throughout U.S.
- Manson Construction – Dredging Surveys LA Harbor, California
- Manson Construction – Side Scan Sonar Surveys for Pipeline Route, Florida
- Continental Dredging – Dredging Surveys Throughout Houston, Texas

A3 Team Responsibilities

Briefly, Team responsibilities will be as follows.

Cox & SHAL Consultants	Prime Consultant Client Liaison Planning & Preliminary Engineering Design Arrange & Interpret Site Investigations (Environmental, Coastal, Geotechnical, Hydrographic) Final Design Preparation of Drawings & Contract/Tender Documents Cost Estimates Contract Administration & Review During Construction
Blue Engineering	Environmental Impact Report Liaison with the BEST Commission & Regulatory Agencies Environmental Testing Applications for Permits & Approvals
Baird & Associates	Coastal Engineering Deep Water Wave Climate Wave Transformation Into Harbour Beach Stability Assessment & Mitigation East Breakwater Assessment & Repairs
Trow Associates	Geotechnical Investigation Mobilize Barge & Drill Rig Boreholes, Sampling & Compressive Strength Tests Collect Before Dredging Chemical Test Samples Geotechnical Report with Soil & Rock Parameters
Hydrographic Consultants	Hydrographic Survey Real Time Kinetic (RTK) Survey Methodology Using GPS Breakwater & Shoreline Configuration Navigational Aids & Marine Data GIS Data Dredging Quantities by Digital Terrain Modelling

A4 Key Personnel & Qualifications of Firms

The qualifications of the firms giving data relevant to this Project are given in Section A2 above and in Appendix A.

The following describes the key individuals within each firm and their responsibilities during Project execution. CVs for each of these individuals are given in Appendix B.

4.1 Cox & SHAL Consultants

The following senior individuals from Cox & SHAL will be play significant roles in ensuring that this Project achieves Government's goal of enlarging the Harbour to facilitate the next generation of cruise ships. For the sake of brevity, names are given followed by their Project responsibilities.

Tom Hluchan SHAL Consulting	Project Manager Client Liaison Sub-Consultant Direction and Liaison Planning & Preliminary Engineering Final Design & Documents Cost Estimates Contract Administration Conduct Monthly Site Meetings
George Cox G. V. Cox	Senior Project Review Quality Assurance Local Coordination
Adrian Rollins G. V. Cox	Assistant Project Manager Day to Day Local Contact Nassau Based Facilitator Planning & Preliminary Engineering Daily Review During Construction
Andy Birkhans SHAL Consulting	Senior Marine Structural Engineer Preliminary Engineering of Dolphin Alternatives Final Design of Mooring Dolphins

4.2 Blue Engineering

The senior principal of Blue Engineering will play a significant role in acquiring the permits and approvals required to allow this important Project to proceed.

Michelle Lakin	Environmental Impact Report Liaison with the BEST Commission & Regulatory Agencies Environmental Testing Applications for Permits & Approvals Environmental Follow Up
----------------	---

4.3 Baird & Associates

The following specialists from Baird Associates will carry out the necessary coastal engineering studies to develop wave climate data for purposes of breakwater design and to assess beach stability adjacent to the proposed southerly dredge limits.

Kevin MacIntosh	Project Manager for Baird's tasks Peer review QA/QC
Rob Nairn	Direction of field activities Task leader for sediment/beach stability assessment Review of wave modeling results
Douglas Scott	Task leader for wave modeling and analyses Offshore wave hindcast and hurricane modeling QC for wave transformation results
Michael Fullarton	Wave transformation modeling Definition of wave climate outside and inside harbour

4.4 Trow Associates

The following key personnel from Trow Associates will be involved in the Geotechnical Investigation to identify the all important characteristics of the coral rock to be dredged, which will determinate to a large extent the unit prices quoted by major dredging contractors.

Chris Thompson	Principal Geotechnical Engineer Arrange for Drilling Contractor Coordinate Mobilization & Fieldwork Supervise lab testing Geotechnical evaluation Geotechnical Investigation Report
Stan Gonsalves	Review of soil and rock test samples Review of Geotechnical Investigation Report Quality assurance for all aspects of geotechnical work

4.5 Hydrographic Consultants

The following key personnel from Hydrographic Consultants will be responsible for using the latest technology to establish water depths relative to Lowest Astronomical Tide in the existing Harbour and Approach Channel, within the proposed new areas to be dredged, as well as alongside the existing beaches to allow beach stability analysis to be carried out. HCL also have the capability to

provide a side scan survey to identify potential obstructions to dredging such as sunken vessels or other debris that could affect dredging.

Rob Roman Hydrographic Survey Manager
 Quality Assurance
 Data Processing & Deliverables
 Dredging Volume Quantity Calculations

Tim Seward Field Operations Manager
 Mobilize Survey Vessel
 Hydrographic Survey data collection
 GIS data collection

A5 Comparable Projects

The major component of this Project is dredging and dredged material disposal/stockpile to suit environmental conditions. The secondary component involves the structural design of mooring dolphins of sufficient strength to resist the forces imposed by the largest of the cruise ships. The third major component of this Project is the repair to the east breakwater.

To accomplish this, expertise is required in Port planning, marine engineering, structural marine design, sea defenses, environmental impact and mitigation, coastal engineering, geotechnical investigations and hydrographic surveys. The Project Team proposed provides all of this expertise.

Many of the projects listed in Section A2 of our Proposal have included most of these elements and can be considered as proof of the Team's experience relevant to the Dredging of Nassau Harbour and installation of mooring dolphins.

We are highlighting below a few projects which are particularly relevant.

5.1 Cox & SHAL Consultants

Cox & SHAL or SHAL Consulting Engineers were responsible for the following projects.

Nassau Harbour Port Expansion

Cox & SHAL were responsible for the planning, design and review during construction of the expansion of Nassau Harbour in 1989-90. This Project included a preliminary engineering stage during which a large number of options were investigated in terms of dredging limits, the type and orientation of new cruise berths and number of new berths. The dredging configuration and structures eventually chosen are those that were final designed and built in 1989-90.

Once decisions were made as to the dredge limits, depths and structure type, Cox & SHAL carried out final design, prepared construction drawings and specifications and provided full time review during construction. A major component of the Project was dredging of the Harbour to suit the largest cruise ships at the time as well as the controlled placement of dredged material near the mid point of Arawak Cay for use as construction material.

As a result, Cox & SHAL are very knowledgeable of conditions that might affect the proposed enlargement of the Harbour. The principals involved during that Project are available to provide their experience during execution of the current Project.

This Project had a value at the time of US \$ 31.5 million and was carried out under the close supervision and review of the Ministry of Works and Transport.

Morgan's Bluff & Governor's Harbour Cruise Berths

Although never used as cruise berths, SHAL designed these two major Family Island ports as docking facilities to serve cruise ships once the distant approach channels to these locations were dredged. To date this has not been done; however, these berths have been used extensively by ever larger mailboats calling to deliver break-bulk and container cargo.

The work carried out at the time was similar to that carried out for the Nassau Harbour Expansion. A number of alternative port and dredging configurations were investigated during a preliminary engineering stage, leading to final design, documents and review during construction. Both of these Projects involved dredging and land reclamation as well as breakwaters.

These Projects had a combined value of US \$ 12.7 million and were carried out under the close supervision and review of the Ministry of Works and Transport.

Potters Cay East & West Expansion

SHAL Consulting Engineers were responsible for the lengthening of Potters Cay in the east and west directions to accommodate an increasing number and longer length mail boats.

The planning and design included similar exercises as described above for the Nassau Harbour Expansion and Morgan's Bluff and Governor's Harbour berths.

This Project had a value of US \$ 8.5 million and was carried out under the close supervision and review of the Ministry of Works and Transport.

Marsh Harbour Port Expansion

Cox & SHAL Consultants were retained by the Ministry of Works and Transport to carry out a Feasibility Study of the best means of providing proper docking facilities on Abaco. This included a review of a number of alternate sites as compared to expanding the modest facilities that were being used at the time. The feasibility study, which included an economic evaluation, recommended the expansion of the existing facility.

Cox & SHAL were further retained to provide a concept design and to prepare Contract/Tender Documents to allow the project to be tendered as a Design/Build project. Upon receipt of Tenders, Cox & SHAL provided a Tender Evaluation Report and assisted Government with a value engineering exercise to lower the cost of the Project without endangering the end result. Once the contractor was selected, Cox & SHAL provided contract administration and full time resident review during construction.

The work involved dredging of an approach channel and turning basin, land reclamation, new dockwalls, three RoRo berths, Domestic and International warehouses, an Administration Building and a By-Pass Road. The value of this Project was US 12.5 million.

5.2 Blue Engineering

Point House, Lyford Cay, Nassau, Bahamas

Blue Engineering was responsible for the planning, assessment, design and review during construction of alterations to Point House of Lyford Cay. This Project included alterations to the property and surrounding properties to the east and west as well as the provision of a new boat basin. Alternative options were investigated in terms of the extent of dredging limits, the type and orientation of new breakwaters and number of new breakwaters.

Blue Engineering liaised with various local organizations in the collection of information with regards the existing conditions and through the approval and permitting processes. Blue Engineering worked closely with the BEST Commission and other regulatory agencies including the Ministry of Works, Lands and Surveys and the Docks Committee to a successful solution.

5.3 Baird & Associates

We are highlighting below a few projects, which are particularly relevant.

Glass Window Bridge, Eleuthera

Baird & Associates was retained by the Ministry of Works and Transport to assess options for replacing Glass Window Bridge on Eleuthera. The study consisted of detailed metocean studies to define design conditions on both the Atlantic and Bight sides of the island. This included numerical modeling of the entire North Atlantic, as well as detailed simulations of hurricanes such as Hurricane Floyd. Various options were assessed, which led to the construction of a physical model of the proposed causeway design. The unique part of this design is that under extreme hurricane conditions, the causeway is completely submerged and must retain its structure while subject to wave attack. Baird has recently completed final design of the project and is awaiting funding for implementing the design.

Fishing Hole Road, Grand Bahama

This study focused on a recent development to the northwest of Freeport and concerns over storm surge and flooding during hurricane events. The study required first surveying the network of channels that exist in the area, in addition to roadways and causeways that affect flow patterns throughout the area.

A finite element model was created of the area that allowed the simulation of tides and storm surge in response to a passing hurricane, with the numerical model ADCIRC. The model assessed changes to the structures and how these changes could impact flooding in adjacent areas. Wave modeling was also completed to assess the design conditions for any structures that may be recommended.

Rockley to Coconut Court Waterfront Improvements, Barbados

Baird & Associates began a series of projects for the Barbados Coastal Zone Management Unit (CZMU) to assess numerous project sites around the island and to complete coastal infrastructure works to improve these sites. The most significant of these projects is the Rockley to Coconut Court stretch of shoreline, along the southwest coast of the island.

The work for the CZMU included a large amount of numerical modeling to provide an offshore wave climate, as well as nearshore wave conditions for sediment transport predictions. The metocean part of the study also included extensive hurricane modeling, including verification of the models with recorded wave data from Hurricane Ivan in 2004.

Physical model studies were again used to assist in optimizing the design, leading to the final design of the structures. The one kilometer stretch of shoreline is presently under construction, with a budget of about nine million U.S. dollars, and should be completed in the summer of 2008.

5.4 Trow Associates

Trow Associates were responsible for carrying out all of the Geotechnical Investigations for the projects carried out by Cox & SHAL and SHAL as described in Section 5.1 above.

5.5 Hydrographic Consultants

Hydrographic Consultants were responsible for the following projects which include dredging and volume computations.

Carnival Cruise Berths – Grand Turk, Turks and Caicos Islands

Since 2005, Hydrographic Consultants has worked for Carnival Cruise Lines to perform survey work in support of their Grand Turk Cruise Terminal in the Turks and Caicos Islands. The work has included;

- 1) Construction Management – Hydrographic Consultants oversaw the dredging contractor's payment surveys for construction of the terminal as well as performing an independent payment quantity calculation.
- 2) Hydrographic Surveys – Hydrographic Consultants performed a complete survey of the project after completion of the dock facility. Deliverables included cross-section and plan view bathymetric maps of the facility.
- 3) Monitoring – Hydrographic Consultants performs annual hydrographic surveys to provide up-to-date conditions of the terminal. Other annual surveys include topographic beach profile surveys to monitor conditions around the pier and any impacts the construction of the facility may have on the adjacent beaches.

Port of Manta Expansion – Manta, Ecuador

Hydrographic Consultants was hired to perform a multi discipline hydrographic survey at Manta Harbor, Ecuador. The purpose of the survey was to provide all coverage and data necessary for design and development of plans & specifications for dredging and pier construction at the Port of Manta. The construction was part of the Hutchison Port Holdings concession by the Manta Port Authority to expand and operate a new container terminal at this location.

Hydrographic Consultants performed a complete hydrographic survey of the existing dock, anchorage and future wharf site, a total of 130 million square feet. The hydrographic survey was completed using multi beam technology in areas deeper than 10 feet and single beam technology for the areas shallower than 10 foot.

Additional work performed for this project included a side scan sonar survey of the future dredging area to locate sunken vessels or other debris that could impact dredging; sub bottom sonar survey for geotechnical analysis of dredge materials and future wharf foundation; magnetometer survey to locate any buried iron debris that could impact dredging operations.

Aside from the logistics of transporting and performing a survey of this magnitude overseas; Hydrographic Consultants was also able to electronically send each day's data to our Houston office for processing. As such, Hydrographic Consultants was 1) able to provide a higher level of quality control by having data processing keep pace with field acquisition; 2) supply all final deliverables in a timely basis – all processed data for each technology and final report were provided within 20 days of completing the field survey (the bathymetric data was provided to the client within 7 days of demobilizing the project).

Port of Houston Authority – Bayport Container and Cruise Terminal Construction

The Bayport Container and Cruise Terminal represents the most recent expansion of the Port of Houston Authority dock facilities. Since 2004, Hydrographic Consultants has performed hydrographic surveys for both the general contractor constructing the facility and the Port of Houston Authority. The surveys performed have been for both dredge payment and monitoring of construction progress.

A unique feature of this project is the different types of survey technologies used for the hydrographic surveys. Hydrographic Consultants has had to employ survey technology that allow accurate positioning around ships, under wharf and cranes. To overcome the problem with surveying in this environment, Hydrographic Consultants uses a robotic laser tracking system to position the survey boat in addition to an echosounder that provides a digital version of the analog sounding scoll. Both of these technologies have allowed Hydrographic Consultants to perform accurate and timely surveys of the on-going construction at an active dock facility.

For the hydrographic survey effort, Hydrographic Consultants has prepared cross-sectional drawings showing dredging progress relative to the dredging prism; bathymetric plan view maps of the site; dredge payment quantity calculations; and 3-D modeling of the under dock dredging and revetment construction. The 3-D model includes the entire dock structure, pilings, dredge prism and revetment design.

B. PROJECT APPROACH

SHAL Consulting Engineers were responsible for the Design and Review During Construction of the Nassau Harbour Port Expansion. This included a new north pier, connecting cross berth (fully open to allow for the strong tidal flow) and dredging of the Harbour and Approach Channel. Construction was carried out in 1989-90 with dredged material disposal near the mid point of Arawak Cay.

A detailed description of our Project Approach is given below, providing a description of the Tasks that will be carried out. However, we would like to start off this Section with a description of our knowledge of the Harbour and Project requirements.

As noted in Item xii on page 11 of the RFP, we appreciate the Ministry's recognition that proponents may wish some of the material presented as part of their Proposal to be considered as being Proprietary, not to be passed on to other proponents. We would appreciate it if Government would consider the following paragraphs as Proprietary Information up to the point identified as being non proprietary.

We believe that this Proprietary information falls within "Other Considerations" as described in the RFP, page 2, Clause 4.5.

Knowledge of Project Requirements

The 1989-90 dredge limits for the Harbour and Approach Channel were chosen to suit the largest of the cruise ships calling at the time. Consideration was also given to ensuring that the existing steel sheet pile structures at Prince George Wharf were not undermined. Dredged depths were relative to Mean Low Water Springs with the Harbour dredged to 37 feet and the Approach Channel dredged to 39 feet to allow for rough weather while ships were still within exposed sea conditions.

We note that it is proposed that the Harbour and Approach Channel be dredged to 40 feet below Datum. We would suggest a greater depth within the Approach Channel to allow for greater keel clearance (over hard rock) while ships are still exposed to large waves.

Cox & SHAL propose that the Project start with a Preliminary Engineering effort which will include meeting with Ministry staff to gain their background knowledge of current and upcoming Port needs and to discuss the rationale behind the dredge limits suggested by the RFP. With the limits shown, we are concerned about the proximity of dredging to the south shore beaches, particularly alongside the beach at the British Colonial Hotel. We would also like to confirm that the proposed dredge limits do not endanger the stability of the existing steel sheet pile structures, both at Prince George Wharf and adjacent to Arawak Cay.

The dredge limits shown adjacent to Arawak Cay appear to be excessive for cruise ship needs, adding to the cost of the Project and endangering the stability of the full length of beach adjacent to the Fish Fry. However, the proposed dredge limits suggest that the Ministry may be planning to provide for a new marginal wharf to accommodate cargo handling, as opposed to the previously proposed finger pier at that location. If that were the case, dredge depths need not be a full 40 feet. We would like to explore this further with Ministry staff during Project start-up.

To further explore the dredge limits needed, we propose to meet with shore captains at the various cruise ship companies whose new-build ships are of the next, very large generation. We would

acquire details of ship length, beam and draft and we would explore with them ship manoeuvrability (bow thrusters and multiple azipods) and confirm their safe operating limits. We have successfully carried out this exercise in the past in connection with the planning of other cruise ship facilities.

Based on our past experience, we recognize the need to keep the Port in operation and to schedule the work to allow this to happen with no interruption to ship movements and minimal interruption to construction activities. This will be thoroughly investigated during the Preliminary Engineering stage.

Except for senior Public Works Department staff, most current staff are not aware that, prior to the 1989-90 dredging, the Fish Fry beach was not nearly as well developed and as popular as it is today. It is well known that the previous dredged material was deposited on Arawak Cay; however, many do not know the relationship between that dredging and the build up of the south shore beaches.

Cutter suction dredging involves pumping approximately 90 percent water and 10 percent solids. At the point of discharge, the heavier material settles first and the finer material flows away from the discharge pipeline. The finer the material the further it flows. During the 1989-90 dredging, the outflow was directed to the south of Arawak Cay, creating some additional land reclamation in this local area. However, the fines were carried further to the east and contributed to the enhancement of these previously challenged beaches. A repetition of this sort of approach is something that we would like to explore as part of the Preliminary Engineering effort.

Also with respect to dredging, the height of discharge and particularly the distance to discharge have a very pronounced effect on dredging production. The greater the distance, the lower the production and hence the higher the unit rate offered by the contractor. If the distance is (as a rule of thumb) greater than 5,000 feet, often an intermediate booster pump is required. A booster pump is essentially a second dredge without the cutter head, obviously adding to the cost of the Project. Since the distance between the eastern limit of dredging and the containment area on Arawak Cay is in the order of 8,000 feet, it is important to investigate all other potential containment areas that might be available to keep dredging costs reasonable.

The east and west breakwaters on either side of the Entrance Channel were built in 1968 using 35.5 ton precast concrete "tribars" as slope protection. The east breakwater extending from Paradise Island was damaged in the early 1990's by very powerful swells (rather than waves), created by the convergence of two powerful storms in the North Atlantic. The convergence of these storms has become known as the Perfect Storm, as depicted in the film. Although capable of standing up to waves over the previous 25 years, the swells caused by the Perfect Storm resulted in the portion of the east breakwater closest to Paradise Island becoming breached and collapsing. Over the past 15 years, this has allowed an excessive amount of wave energy to enter the Harbour, causing disruptions to the cargo handling operations near the east end of Arawak Cay.

The wave climate (both normal and hurricane related) in the vicinity of these breakwaters will be investigated by Baird & Associates, a consulting engineering firm in the forefront of modern coastal engineering technology. Their work includes the use of the latest numerical modeling programs as well as extensive experience with physical hydraulic models. Based on the results of their wave analyses, Baird will advise whether the east breakwater should be repaired using the same type of armour units, or whether a physical hydraulic model would be the recommended approach. (Note the cost of a physical hydraulic model study is not included in our Proposal.)

We note that the Ministry is currently proposing to widen the Approach Channel to such an extent that it requires the removal of about 300 feet of the west breakwater. This has the distinct

disadvantage of allowing more wave energy to enter the Harbour, further disrupting cargo handling operations and potentially, affecting beach stability. The before and after effects of eliminating a portion of this breakwater can be investigated as part of Baird's nearshore wave transformation study. However, in anticipation of a negative result, we will also investigate a realignment of the Approach Channel such that the removal of a portion of this breakwater can be reduced or, hopefully, eliminated altogether. This of course would require input from the cruise ship operators.

Based grain size analysis, an investigation of the potential sources of natural beach replenishment and nearshore wave transformation models, Baird will also investigate beach stability. This will be done for the dredge limits established following discussions with Ministry personnel and cruise ship operators as compared to those currently proposed in the RFP.

In the event that it is found that the proposed dredging will cause deterioration of the beaches, mitigation measures will be needed. This could include a further adjustment of dredge limits; however, that might not be practical in light of the established requirements of the cruise ship operators. One possible preventative measure might include the installation of a low submerged breakwater a reasonable distance away from the top of the dredge cut. This would act to create a perched beach, preventing the fine sand from slipping into the dredge cut. Geometry will dictate the height of this type of submerged breakwater; however, care would have to be taken to prevent it from being a hazard to small craft. If that were the case, the submerged breakwater would have to well marked to warn boats of the potential hazard. This will form part of the beach stability assessment and, if necessary, mitigation plan.

We are also fortunate in having Trow Associates as part of our Project Team. Trow were responsible for all of the geotechnical aspects of the previous Port Expansion Project and the senior principal engineer involved at that time is also heading up the currently proposed Geotechnical Investigation. The experience gained from the last project will be very useful in planning the current fieldwork, analysing boreholes test results and providing recommendations with respect to soil and rock properties.

Another interesting aspect of our proposed geotechnical investigation involves giving prospective dredging companies the opportunity to visit the drill barge during the fieldwork to view first hand the core samples retrieved. This is a procedure that we have carried out in the past. Whereas, dredging companies will rely to a large degree on the results of compressive strength tests on core samples reported by Trow, we know from past experience that they would like to augment this information with their own observations carried out during the drilling process. This has the potential of leading to lower unit prices for the dredging.

The RFP refers to five mooring dolphins being required. We'd like to explore with Ministry staff whether these are intended to be mooring dolphins only, or whether they will be combined mooring and breasting dolphins. This perhaps is also dependent on the outcome of data gathering sessions with the cruise ship operators. The distinction between mooring dolphins and combined mooring/breasting dolphins is as follows. If combined mooring/breasting dolphins are intended, five dolphins will be required since they will line up with the breasting face of each of the piers. If it is intended that the dolphins be for mooring bow lines only, then only three dolphins will be required, located on the centreline of each pier. If the latter is the case, the savings in reducing the number of dolphins from five to three will more than cover the cost of our fees and expenses.

This is a good example of how money spent up front on engineering can save a substantial amount during construction.

This is the end of material considered as being Proprietary.

We propose that the Project be phased as follows, with Phases 1 and 2 being carried out concurrently to maintain the proposed schedule.

Phase 1	Planning/Preliminary Engineering
Phase 2	Site Investigations
Phase 3	Final Design, Documents & Tendering
Phase 4	Contract Administration & Review During Construction

The methodology that we propose to use to carry this Project to a successful conclusion consists of a series of inter-related Tasks as described in the following sub-sections of Section B of our Proposal. Sub-sections are B1 to B4 to correspond to Phases 1 to 4.

When reference is made to Project Team or Team Members, it is intended that designated Ministry of Works and Transport staff be included as Team Members, involved in day to day activities and decisions as the Project proceeds.

B1 Phase 1 Planning/Preliminary Engineering

Prior to going into Final Design, a Planning/Preliminary Engineering investigation will be carried out to start up the Project and to confirm Governments intentions and to gain input from Port users. The following Tasks will be carried out during Phase 1.

Task 1.1 Project Start-Up

- Meet with Ministry of Works and Transport & Port Department personnel
- Confirm Terms of Reference
- Establish Lines of Communication
- Visit the Site with Ministry personnel

Task 1.2 Gather Existing Data

- Acquire existing drawings, reports and background data
- Review existing data
- Provide a summary report of data for use by Team Members
- Recommend steps to acquire additional data that might be required for Project execution
- Visit sites adjacent to dredge boundaries
- Assess potential dredge disposal locations

Task 1.3 Site Investigation Terms of Reference

- With input from Team Members, confirm the TOR for each site investigation
 - Environmental Studies
 - Coastal Engineering
 - Geotechnical
 - Hydrographic
- Discuss the merits of enhancing site investigations, e.g. Include side scan sonar to augment hydrographic survey or, use physical hydraulic model for breakwater design?

Task 1.4 Technical Meetings with Government Agencies

- Meet with Public Works Department to review intent of proposed dredge limits
- Explore constraints such as potential for undermining existing structures
- Confirm intent of mooring dolphins, i.e. whether breasting/mooring or just mooring
- Discuss operating procedures with Port Department
- Investigate existing navigational aids
- Meet with BEST to confirm their requirements
- Initiate applications for permits and approvals
- Discuss proposed phasing of dredging
- Investigate whether there are other phasing options; e.g. cruise ships arrivals are greatest early in the week. Investigate how this might be an advantage to phasing.

Task 1.5 Contact Cruise Ship Operators

- Contact cruise ship operators calling at Nassau
- Establish the draft & length of new-build ships
- Discuss approach channel requirements
- Confirm ship turning manoeuvrability requirements
- Discuss keel clearance in the Approach Channel (rough weather) & Turning Basin
- Provide a brief summary report of cruise ship requirements

Task 1.6 Preliminary Engineering Evaluation

- Evaluate cruise operators needs relative to proposed dredge limits
- Evaluate dredge cuts relative to existing structures
- Evaluate pros and cons of alternate disposal sites
- Assess potential for destabilizing beaches
- Discuss alternative methods of breakwater repair
(Latter two dependent on results of coastal studies)
- Investigate phasing of dredge operations

Task 1.7 Preliminary Engineering Report

- Provide results of preliminary engineering evaluation
- Incorporate plans showing agreed dredge limits & disposal areas
- Provide sketch details of dolphins
- Provide recommendations with respect to breakwater repairs
- Include cost estimates based on hydrographic survey quantities and mooring dolphin details

Task 1.8 Submit for Ministry Approval

- Submit the Draft Preliminary Engineering Evaluation Report
- Receive and discuss Ministry review comments
- Incorporate review comments
- Submit Final version of Report

B2 Phase 2: Site Investigations

A number of site investigations are necessary to establish dredging quantities, assess the nature of the material to be dredged, check the dredged material for potential contamination and disposal means, adopt measures which will ensure stability of nearby beaches and assist in determining the best method of east breakwater repair.

The following are Tasks describing the Site Investigations that will be carried out.

Hydrographic Surveys

Since Coastal Engineering analysis is dependent on water depths, the Hydrographic Surveys will be given high priority.

The following is a list of equipment that will be mobilized to site. This equipment will be shipped out of the Bahamas on completion of the work and it is assumed that all equipment will be exempt from duties, taxes, etc.

1. Trimble SPS750 Base Station
2. Trimble 5700 RTK Rover station – Both for Control and Beach & Breakwater Topo Survey.
3. Trimble DSM 232 with RTK option – Hydrographic Survey GPS
4. Trimble Trimmark III radio (450-470 Mhz) – RTK shore based telemetry
5. Odom Hydrotrac survey grade echosounder
6. 200 Khz Ultra Shallow Operation Transducer. (3 degree beam)
7. Coastal Oceanographic “Hypack” Hydrographic Survey software
8. Trimble “Geomatics Office” RTK Processing Software – Control and Topographic Survey
9. HSP – Helmsman Display
10. Pentium Laptop with Ruggedized 4 port PCMCIA serial card.
11. Bar Check – Calibration method for echo sounder.
12. Onset electronic pressure tide gauges (2)

Task 2.1 Mobilize To Nassau

Hydrographic Consultants will pre-test all equipment prior to shipment to Nassau. All survey data files will be prepared and checked in Houston. Mobilization includes shipping of equipment to Nassau and travel of survey crew from Houston, Texas to Nassau.

Task 2.2 Pre- Survey Coordination

Prior to undertaking any work Hydrographic Consultants will coordinate with the client to ensure that the survey plan covers the project limits and that no changes have been made to the channel design. Hydrographic Consultants will also obtain berthing schedules, ensure that client is aware of our presence and equipment on-site; and coordinate access to any restricted areas that may need to be covered in the survey.

The survey line coverage proposed is shown on Figure 1.

Note that the survey line layout has been designed to provide an accurate quantity calculation with survey lines perpendicular to the existing bottom contours. Transects perpendicular to the constantly changing side slope alignment is critical to an accurate quantity calculation.

Hydrographic Consultants will also coordinate with the Ministry for the GIS data collection; agreeing on aids and features and the associated attributes to be collected for the task.

Task 2.3 Control Survey

Hydrographic Consultants will coordinate with the Lands and Surveys Department to obtain local vertical and horizontal control for the survey effort. Vertical control should be relative to the Project Vertical Datum, or have a known relationship to the Project Vertical Datum.

After locating and verifying the control, the survey crew will use the RTK (Real Time Kinetic GPS Technology) to check the closure of the local control. If the local control has proper closure; 1) Hydrographic Consultants will set a survey monument on the West end of Paradise Island for the RTK base station; 2) After setting the RTK base station monument, the survey crew will occupy the monument and a check will be made back to the Government provided project control for quality control. 3) Finally, the crew will check at existing pier structures to make sure that the horizontal control is in agreement with their project location.

Task 2.4 Set Up Hydrographic Survey Vessel

Hydrographic Consultants will prepare a local hired boat for performing the hydrographic survey. Preparation includes installing mount for RTK antenna and echo sounder transducer. After installation of the equipment, the survey crew will check and calibrate all equipment. Calibration consists of latency test, bar check of echo sounder and verification that the vessel positioning system matches project control.

Task 2.5 Hydrographic Survey

The RTK reference station will be set at the point established during the control survey. Survey crew will acquire data along the transects shown on the survey layout. Water elevations will be obtained by RTK at the survey boat in addition to a redundant tidal recording system that the crew will deploy daily. Daily quality control checks will include: 1) pre and post survey bar check calibration of the echo sounder to check the speed of sound and transducer draft; 2) system verification of the survey software by occupying a known point; 3) pre and post survey water elevation checks.

Task 2.6 Topographic Survey of Shoreline

Using a RTK backpack system based from the same RTK reference station used for the hydrographic survey, a one man crew will obtain survey data along the shoreline to ensure that the entire dredging prism is covered. Additionally, the topographic survey along the shoreline will provide necessary baseline information for monitoring of existing beaches along the project.

Task 2.7 GIS Data

Using the RTK system, Hydrographic Consultants plans to obtain the coordinate locations of all the aids and marine features that the Ministry needs to have documented.

Task 2.8 Final Data Check

Prior to any demobilization, the survey crew will consult with the hydrographic survey manager and project manager to make sure that all work has been completed and covers the requirements of the project. After approval from both the hydrographic and project managers; demobilization can begin.

Task 2.9 Project Demobilization

All equipment will be removed from the survey vessel and packed for shipment back to Houston, Texas. Survey crew will travel from Nassau back to Houston, Texas.

Task 2.10 Processing Deliverables

Hydrographic survey data will be post-processed and all the deliverables required for review and comment will be submitted. After the data has been processed, volume computations can be undertaken. Deliverables will include AutoCAD drawings, GIS nav aids data and quantity calculations.

Geotechnical Investigation**Task 2.11 Mobilization and Demobilization**

- Establish field investigation schedule
- Mobilize drilling and sampling equipment, barge and tug to site and demobilize at the end of the drilling operations
- Mobilize geotechnical technician to the site

Task 2.12 Fieldwork

- Establish location of boreholes using GPS methods, as follows:
 - Phase 1A 8 boreholes to 45 feet depth
 - Phase 1B 3 boreholes to 45 feet depth
 - Phase 2A 5 boreholes to 45 feet depth
 - Phase 2B 2 boreholes to 45 feet depth
 - 1 borehole at the east mooring dolphin to 100 feet depth
 - 2 boreholes at the west mooring dolphins to 100 feet depth
- Drill and sample boreholes sampling the overburden at 2.5 feet intervals with a split barrel sampler undertaking Standard Penetration Tests and taking HX size core of the bedrock. The 2.5 to 4.0 feet depth samples would be taken by procedures acceptable to BEST for environmental sampling
- Establish elevation at the boreholes from tidal gauges
- Store samples in suitable airtight containers
- Produce field logs of each borehole

Task 2.13 Site Visit by Geotechnical Engineer

- Visit the site by the project geotechnical engineer in the early stages of the fieldwork
- Review the site conditions and drilling procedures and modify them, if required
- Meet with personnel of other members of the consortium to ensure that the appropriate information is being obtained
- Discussions with Government geologists about the expected stratification at the site

Task 2.14 Environmental Sampling

- Deliver the 3 feet depth samples to Blue Engineering

Task 2.15 Geotechnical Laboratory Testing

- Moisture content tests on all soil samples
- Grain size distribution tests on one soil sample per borehole
- Unconfined compression tests on two sections of bedrock core per borehole

Task 2.16 Geotechnical Analysis and Reporting

- Produce report quality logs including data on SPTs, moisture contents, % core recovery and RQD of bedrock cores and soil and bedrock descriptions for all boreholes
- Make graphical presentations of grain size distributions of tested samples
- Tabulate unconfined compression test results
- Analyse the data for:
 - Dredgability of materials above 40 feet depth
 - Provision of geotechnical engineering parameters for mooring dolphins

- Produce a draft report summarizing the factual data obtained and commenting on the geotechnical engineering aspects of the project
- Distribute the draft report to other members of the consortium and the client for review and comment
- Finalize Geotechnical Report

Environmental Impact Report & Approvals

Task 2.17 Environmental Impact Report and Approvals Start-Up

- Meet with Ministry of Works, BEST, Department of Environmental Health Services EMRAD Unit and Port Department
- Confirm Environmental requirements
- Acquire existing data
- Review existing data
- Visit site with agencies as appropriate

Task 2.18 Mobilization

- Establish field investigation locations and schedule with BEST and drilling and testing contractor.

Task 2.19 Fieldwork

- Establish location of samples using GPS methods as follows (all at a depth of 3 feet);

Phase 1A - A total of 8 samples

Phase 1B - A total of 3 samples

Phase 2A - A total of 5 samples

Phase 2B - A total of 3 samples

- Visit site as necessary during sampling to ensure sampling procedures are acceptable.
- Collect samples and field logs.

Task 2.20 Chemical and Biological Testing

- Conduct analysis for;
 - a) Arsenic
 - b) Copper
 - c) Cadmium
 - d) Lead
 - e) Mercury
 - f) Zinc
 - g) Nickel

for all 3 foot depth soil samples collected during and after dredging activities. This allows for a total of 38 samples.

- Conduct analysis for;
 - a) Fecal Coliforms
 - b) Total Coliforms
 - c) Total bacteria

For all water samples obtained before and during dredging activities. This allows for a total of 38 samples.

Task 2.21 Environmental Analysis and Reporting

- Produce sample test results in report form
- Analyze data for acceptability of material for re-use/disposal and other chemical and biological assessments of the data as required by agencies including but not limited to BEST.
- Produce a draft report summarizing the factual data obtained and commenting on the environmental aspects of the project including consideration to possible mitigation measures.
- Distribute the draft report to other members of the consortium and the client for review and comment.
- Finalize Environmental Report.
- Produce a log of all correspondence and communications during the application and review process.
- Provide co-ordinated responses to comments during the notice period with the Ministry of Works.

Task 2.22 Permit Assistance

- Collect all necessary supporting documentation for permits from all relevant regulatory agencies including but not limited to BEST Commission.
- Prepare and submit applications for permits.
- Produce a log of all correspondence and communications during the application and review process.
- Provide coordinated responses to comments during the notice period with all relevant agencies.

Coastal Engineering

Task 2.23 Wave Climate

- Assemble available wind and wave information from the area
- Complete 20 year wave hindcast for North Atlantic using WaveWatch III
- Complete 20 year wave simulations using detailed nested grid for study area
- Assess historical hurricane tracks and probabilities
- Complete hurricane simulations with WAVAD model
- Assess pressure setup and surge from hurricanes

Task 2.24 Nearshore Wave Modelling

- Assemble nearshore bathymetric data and create a numerical grid for harbour area
- Complete nearshore wave transformation modelling
- Extract coefficients for wave height and direction at locations throughout harbour
- Determine 20 year wave history at key locations

Task 2.25 Beach Assessment

- Survey beach cross section and planform
- Integrate these data with the hydrographic survey
- Sediment sampling throughout beach region
- Complete sieve analyses and composition assessment
- Complete wave and beach modelling to determine beach stability and equilibrium shape/profile

Task 2.26 Coastal Engineering Report

- Provide a description of all coastal engineering analysis
- Include descriptive drawings and diagrams
- Provide recommendations concerning the design conditions for the breakwater, as well as the changes in wave conditions within the harbour.
- Compare before and after dredging conditions
- Provide recommendations on alternatives that may be considered to mitigate possible problems with beach stability
- Submit Draft Report
- Receive, discuss and incorporate review comments

B3 Phase 3 Design, Documents & Tendering**Task 3.1 Final Design & Documents**

- Detailed design to recognized standards
 - Dredge limits
 - Disposal areas & settling basins
 - Mooring dolphins
 - Breakwater repairs
 - Modifications to navigation aids
- Tender/construction drawings
- Technical specifications
- Tender Package
 - Instructions to Tenderers
 - Form of Tender
 - Form of Contract
 - Unit Price Table (Bill of Quantities)
 - General Conditions of Contract

Task 3.2 Submit For Approval

- Submit Documents to Ministry for approval
- Submit Documents to other Agencies for final approval
- Provide clarification & discuss review comments
- Amend Drawings and Documents

Task 3.3 Pre-Tender Cost Estimate

- Quantify Project elements based on drawing detail
- Take into account scheduling and construction techniques
- Prepare cost element for each major component
- Provide overall Pre-Tender cost estimate

Task 3.4 Tendering

- Assist Ministry in issuing to tender
- Conduct a Tenderers site briefing
- Respond to Tenderers queries
- Issue Addenda if required
- Review and compare Tender amounts and unit prices
- Obtain Tender clarification if required
- Prepare Tender Evaluation Report
- Recommend award of construction contract

B4 Phase 4 Contract Administration and Review During Construction**Task 4.1 Contract Administration**

- Project Manager will conduct monthly site meetings
- Evaluate proposed construction methods
- Review submittals
- Review contractors progress relative to schedule
- Inspect work for consistency with drawings and specifications
- Certify progress payments and monitor budget
- Interpret drawings and specifications
- Prepare change orders if necessary
- Identify and follow up on deficiencies
- Certify final completion
- Prepare As-Built Drawings

Task 4.2 Resident Construction Review

- Provide daily site visits by Resident Engineer
- Ensure construction carried out per drawings & specifications

- Report on field conditions requiring design modifications
- Liaise with Design Office/Project Manager on a daily basis
- Liaise with Client and approval agency personnel
- Submit regular reports to the Ministry reporting on quality and progress
- Verify monthly quantities of work
- Contribute to site meetings
- Coordinate testing and quality control

C FEE ESTIMATE

Please note that the fees for certain elements of our Proposal are negotiable, depending on possible revisions to the scope of work included in our Proposal.

During Project Start-Up, discussions will be held with Ministry staff to review the proposed scope of work associated with each of the site investigations. For example, the cost of the Geotechnical Investigation included in our Proposal is higher than we would like to see. It is a fair price for the number of boreholes proposed; however, through discussion, there is the potential to reduce the number of boreholes and hence the cost. This approach might apply to other elements of the Project as well.

Spreadsheets summarizing the time spent by Cox & SHAL and Sub-Consultants are given on the following pages. Daily Rates are given for each individual together with the number of days spent of each Task giving a Cost for each Task. Disbursements are included within each spreadsheet.

Fee & Expense Summary

	Fees	Expenses	Total
Cox & SHAL Consultants	367,760	83,200	450,960
Blue Engineering	61,390	incl	61,390
Baird & Associates	79,344	18,100	97,444
Trow Associates	55,000	332,406	387,406
Hydrographic Consultants	<u>19,938</u>	<u>18,325</u>	<u>38,263</u>
Total	US \$ 583,432	US \$ 452,031	US \$ 1,035,463

Hydrographic Survey

Hydrographic Consultants Ltd. fees for the Hydrographic Survey are based on providing a single beam survey with coverage as shown in Figure 1, given in Section B of our Proposal. This will provide accurate mapping of water depths suitable for determining accurate dredge quantities which can be used for payment purposes.

Fees do not include a side scan sonar survey. This is a survey which HCL are capable of performing and which could be added to the scope of work following discussions with Ministry staff during Project start-up. The side scan sonar survey would identify any sunken boats or other potential obstructions to the dredge equipment.

Environmental Impact Assessment and Permits

Blue Engineering fees respond to the environmental requirements set out in the RFP and include two sets of 19 chemical and biological tests.

Coastal Engineering

Baird Associates fees correspond to the Coastal Engineering Tasks described in Section B of the Proposal. Fees are based on numerical modelling rather than a physical hydraulic model. In the case of the breakwater, current fees allow for a reconstruction of the breakwater rather than a complete new design. During Project start-up this can be discussed further.

Baird feel that in the case of a complete new design of the breakwater, a physical model would be appropriate and they would submit a separate proposal to carry out this work if it is decided to take this approach.

Geotechnical Investigation

Trow Associates provided the geotechnical investigation for the Nassau Harbour Expansion constructed in 1989-90 and have a very good understanding of subsurface conditions. Their fee estimate is based on providing cored boreholes to a 45 foot depth at locations corresponding to the environmental sampling locations. These will be augmented by cored boreholes at each of the mooring dolphin locations extending down to 100 feet. These are necessary to identify solid bearing strata to allow piled mooring dolphins to be considered during the Preliminary Engineering stage.

Holes will be cored and samples taken to allow for compressive strength tests to be carried out. These compressive strength tests are extremely important to the dredging contractors and could have a significant impact on the dredging prices submitted. In practice, the more information provided, the better the chances that the Government will obtain truly competitive prices which do not include large contingencies.

Trow will hire Toney Drilling of Florida to do the necessary drilling. Toney will mobilize a small jack up barge, drill rig and crew for the work. The jack up barge will elevate the barge above water level, reducing the time lost due to wave conditions which is particularly important when drilling boreholes in the outer Approach Channel. Drilling costs are based on a total of 21 boreholes with 18 to a 45 foot depth and 3 to a 100 foot depth.

Trow's work is further described in Task format in Section B of the Proposal.

Contract Administration and Review During Construction

We are of the opinion that this work could be carried out over an eight month construction period. Therefore, fees for Resident Review during construction are based on an eight month duration. Since George V. Cox & Co. Ltd. are based in Nassau, it is proposed the Resident Engineer spend approximately fifty percent of his time at the Project site. We believe this would be appropriate once the contractors start up pains are resolved and matters become routine.

Fees for Contract Administration are based on a nine month duration to allow for tidying up contractual matters.

Task Number and Task Description		George Cox			Adrian Rollins			Resident Engineer			Tom Hluchan			Andy Birkhans			SHAL Support			CAD Operator			Total			
		Principal Engineer			Assistant Project Manager						GVC Support			Project Manager									Senior Engineer			Cost
		Days	Rate	Cost	Days	Rate	Cost	Days	Rate	Cost	Days	Rate	Cost	Days	Rate	Cost	Days	Rate	Cost	Days	Rate	Cost	Days	Rate	Cost	Cost
PH 1	PRELIMINARY ENGINEERING																									
1.1	Project start-up	1.0	1,080	1,080	1.0	840	840						1.0	1,200	1,200									3,120		
1.2	Gather existing data				4.0	840	3,360						3.0	1,200	3,600									6,960		
1.3	Site Investigation TOR				1.0	840	840						1.0	1,200	1,200									2,040		
1.4	Technical Meetings	1.0	1,080	1,080	3.0	840	2,520						8.0	1,200	9,600									13,200		
1.5	Contact Cruise Operators												5.0	1,200	6,000									6,000		
1.6	Prelim. Engineering Evaluation												15.0	1,200	18,000	4.0	1,000	4,000	2.0	400	800			22,800		
1.7	Prelim. Engineering Report	1.0	1,080	1,080	4.0	840	3,360			2.0	320	640	3.0	1,200	3,600	2.0	1,000	2,000	3.0	400	1,200	10.0	480	4,800	16,680	
1.8	Ministry Review												0.5	1,200	600									600		
	Final Report												1.0	1,200	1,200							1.0	480	480	1,680	
PH 2	SITE INVESTIGATIONS																									
	Hydrographic Survey																									
2.1	Mobilize				1.5	840	1,260						0.5	1,200	600									1,860		
2.2	Pre-Survey Coordination				0.5	840	420																	420		
2.3	Control Survey																									
2.4	Set Up Survey Vessel				0.5	840	420																	420		
2.5	Hydrographic Survey																									
2.6	Topo Survey (Shoreline)																									
2.7	GIS Data																									
2.8	Final Data Check																									
2.9	Project Demobilization																									
2.10	Process Deliverables												0.5	1,200	600									600		
	Geotechnical Investigation																									
2.11	Mobilization												1.5	1,200	1,800									1,800		
2.12	Field Work				3.0	840	2,520																	2,520		
2.13	Principal Engineer Visit				1.0	840	840																	840		
2.14	Environmental Sampling																									
2.15	Lab Testing																									
2.16	Analysis & Report												1.5	1,200	1,800									1,800		
	Environmental																									
2.17	Environmental Start-Up				0.5	840	420						0.5	1,200	600									1,020		
2.18	Fieldwork Confirmation																									
2.19	Fieldwork																									
2.20	Chemical/Biological Testing																									
2.21	Env. Analysis & Reporting				0.5	840	420						0.5	1,200	600									1,020		
2.22	Permit Assistance																									
	Coastal Engineering																									
2.23	Wave Climate												0.5	1,200	600									600		
2.24	Near Shore Wave Modeling												0.5	1,200	600									600		
2.25	Beach Assessment				0.5	840	420						0.5	1,200	600									1,020		
2.26	Coastal Engineering Report												1.5	1,200	1,800									1,800		
PH 3	DESIGN, DOCS & TENDERING																									
3.1	Final Design & Documents	2.0	1,080	2,160	3.0	840	2,520			5.0	320	1,600	38.0	1,200	45,600	25.0	1,000	25,000	20.0	600	12,000	12.0	480	5,760	94,640	
3.2	Ministry Review																									
3.3	Pre-Tender Cost Estimate												4.0	1,200	4,800									4,800		
3.4	Tendering	0.5	1,080	540	3.0	840	2,520			2.0	320	640	6.0	1,200	7,200									10,900		
	Tender Evaluation												2.0	1,200	2,400									2,400		
	Contract Award				0.5	840	420						4.0	1,200	4,800									5,220		
PH 4	CONTRACT ADMIN/REVIEW																									
4.1	Contract Administration				20.0	840	16,800						63.0	1,200	75,600	6.0	1,000	6,000	11.0	400	4,400			102,800		
4.2	Resident Review							90.0	640	57,600														57,600		
	Fee Sub-Total	5.5		5,940	47.5		39,900	90.0		57,600	9.0		2,880	162.5		195,000	37.0		37,000	36.0		18,400	23.0		11,040	367,760
	Disbursements at Cost																									
1.1	Per Diem Allowance												115.0	300	34,500									34,500		
1.2	Travel												21.0	1,500	31,500									31,500		
1.3	Car Rental												115.0	80	9,200									9,200		
1.4	Printing													1,500										1,500		
1.5	Communication													2,500										2,500		
	Disbursement Sub-Total												4,000		75,200									4,000		
	TOTALS			5,940			39,900			57,600			6,880			270,200			37,000			22,400			11,040	\$ 450,960.00

09.11.07

Proposal for Environmental Engineering Services for Nassau Harbour Dredging Project, Nassau, Bahamas**3.0 Cost of Service**

The following is based on a daily rate of \$630.

		DAYS	TOTAL
Task 2.17	Environmental Impact Report and Approvals Start-Up	6	\$ 3,780
Task 2.18	Mobilization and Demobilization	2	\$ 1,260
Task 2.19	Fieldwork	10	\$ 6,300
Task 2.20	Chemical and Biological Testing	15	\$ 9,450
Task 2.21	Environmental Analysis and Reporting	14	\$ 8,820
Task 2.22	Permit Assistance	6	\$ 3,780
Budget for Collecting and Testing 19 samples after dredging			\$ 28,000
		<u>Total</u>	<u>53</u>
			<u>\$ 61,390</u>

Please note that the above fees are for work carried out in 2007/2008 and are subject to change should work extend past that time.

LEVEL OF EFFORT	Principal	Sen. Eng.II	Reg Prof	Staff Prof	Senior Tech	Support	Direct	Item Total
	Daily Rate (US \$):	\$1,480	\$1,296	\$976	\$744	\$672	\$480	
1.0 WW3 Modeling								
1.01 WW3 Simulations - full grid		0.5	2				\$700	\$3,430
1.02 Prepare nested grid and boundaries		0.5	1		1		\$350	\$2,761
1.03 Run Inner Grid, Verify, QA/QC	0.25	1	3				\$1,050	\$5,874
2.0 Hurricane Modeling								
2.01 Prepare Grid			1		1			\$1,730
2.02 Assess storm frequency and plan runs	0.25	2	2					\$5,160
2.03 Complete WAVAD Simulations	0.25	0.5	3				\$1,050	\$5,193
2.04 Assess pressure setup		0.5						\$680
2.05 Reporting QA/QC		2	1			1		\$4,250
3.0 Neashore Wave Modeling								
3.01 Prepare Bathy and grid (pre and post dredge)		1	2					\$3,410
3.02 Simulate full range of Ht, Per, Dir (pre and post)		0.5	4				\$1,400	\$6,180
3.03 Extract Results at breakwater & other locs			3					\$3,074
3.04 Simulate specific hurricane events (pre and post)		0.5	2				\$700	\$3,430
3.05 Comparison with Boussineq Model		1	4				\$1,400	\$6,860
3.06 Reporting QA/QC	0.5	2	1			1		\$5,027
4.0 Sediment and Beach Assessment								
4.01 Site Visit to assess sediment and to measure profiles		5		5			\$7,750	\$18,460
4.02 GIS beach comparisons		1		5			\$3,000	\$8,267
4.03 HydroSed/COSMOS modeling	0.5	2		2			\$700	\$5,761
4.04 Recommendations for Protecting the Beach	1							\$1,554
4.05 Reporting QA/QC	1	2		2		1		\$6,342
Miscellaneous Costs (=5% of labor)								\$3,778
Total Days	3.75	22	29	14	2	3		
Total Cost (\$)	\$5,550	\$28,512	\$28,304	\$10,416	\$1,344	\$1,440	\$18,100	\$97,444
								\$97,444

Task Number and Task Description		Chris Thompson			Stan Gonsalves			Raymond Lam			CADD OP.			Laboratory Testing			Subtotal		Drilling Contractor Disbursements				Total
		Principal Engineer			Principal Engineer			Field Engineer / Technologist															
		Days/LS	Rate	Cost	Days/LS	Rate	Cost	Days/LS	Rate	Cost	Lump Sum	Rate	Cost	Unit: Each	Rate	Cost	Days/Lump Sum	Cost	Unit	Unit Price	Quantity	Total	Cost
2.11	Mobilization and Demobilization																						
	2.11.1	Establish Field investigation schedule						0.5	\$700.00	\$ 350.00						0.5	\$ 350.00					\$ 350.00	
	2.11.2	Mobilize drilling and sampling equipment						0.5	\$700.00	\$ 350.00						0.5	\$ 350.00				\$ -	\$ 350.00	
	2.11.3	Mobilize technician to the site			\$ -				1.0	\$700.00	\$ 700.00			\$ -			1.0	\$ 700.00				\$ -	\$ 700.00
	Task Total		0.0	\$ -		0.0		\$ -	\$ -			\$ -			0.0	\$ 1,400.00				\$ -	\$ 1,400.00		
2.12	Fieldwork																						
	2.12.1	Establish location of boreholes using GPS methods			\$ -			28.0	\$700.00	\$ 19,600.00			\$ -			28.0	\$ 19,600.00				\$ -	\$ 19,600.00	
	2.12.2	Drill and sample boreholes			\$ -					\$ -			\$ -			0.0	\$ -				\$ -	\$ -	
	2.12.3	Establish elevation at the boreholes from tidal gauges																					\$ -
	2.12.4	Store samples in suitable airtight containers			\$ -			5.0	\$700.00	\$ 3,500.00			\$ -			5.0	\$ 3,500.00				\$ -	\$ 3,500.00	
	Task Total		0.0	\$ -		0.0		\$ -	\$ -			\$ -			0.0	\$ 23,100.00				\$ -	\$ 23,100.00		
2.13	Site Visit by Engineer																						
	2.13.1	Visit the site by the project geotechnical engineer	7.0	\$2,000.00	\$ 14,000.00							\$ -			\$ -	7.0	\$ 14,000.00				\$ -	\$ 14,000.00	
	2.13.2	Review site conditions & drilling procedures & modify them, if req'd			\$ -							\$ -			\$ -	0.0	\$ -				\$ -	\$ -	
	2.13.3	Meet with personnel of other members of the consortium														0.0	\$ -					\$ -	
	2.13.4	Discussions with government geologists			\$ -							\$ -			\$ -	0.0	\$ -				\$ -	\$ -	
	Task Total		7.0	\$ 14,000.00		0.0		\$ -	\$ -		0.0		\$ -	0.0	\$ 14,000.00					\$ -	\$ 14,000.00		
2.14	Environmental Sampling																						
	2.14.1	Deliver the 3 feet depth samples to Blue Engineering			\$ -						\$ -			\$ -			\$ -				\$ -	\$ -	
	Task Total		0.0	\$ -		0.0		\$ -	\$ -		0.0		\$ -	0.0	\$ -					\$ -	\$ -		
2.15	Geotechnical Laboratory Testing																						
	2.15.1	Moisture content tests			\$ -						\$ -			\$ -	50.0	\$10.00	\$ 500.00	50.0	\$ 500.00			\$ -	\$ 500.00
	2.15.2	Grain size distribution tests			\$ -						\$ -			\$ -	21.0	\$150.00	\$ 3,150.00	21.0	\$ 3,150.00			\$ -	\$ 3,150.00
	2.15.3	Unconfined compression tests													50.0	\$60.00	\$ 3,000.00	50.0	\$ 3,000.00				\$ 3,000.00
	Task Total		0.0	\$ -		0.0		\$ -	\$ -		0.0		\$ -	121.0	\$220.00	\$ 6,650.00	121.0	\$ 6,650.00			\$ -	\$ 6,650.00	
2.16	Geotechnical Analysis and Reporting																						
	2.16.1	Produce report quality logs			\$ -			1.0	\$2,000.00	\$ 2,000.00			\$ -			1.0	\$ 2,000.00				\$ -	\$ 2,000.00	
	2.16.2	Make graphical presentations			\$ -					\$ -	1.0	\$1,000.00	\$ 1,000.00			1.0	\$ 1,000.00				\$ -	\$ 1,000.00	
	2.16.3	Tabulate unconfined compression test results	0.5	\$1,500.00	\$ 750.00												\$ 750.00					\$ 750.00	
	2.16.4	Analyse the data	2.0	\$1,500.00	\$ 3,000.00												\$ 3,000.00					\$ 3,000.00	
	2.16.5	Produce a draft report	3.5	\$1,500.00	\$ 5,250.00												\$ 5,250.00					\$ 5,250.00	
	2.16.6	Distribute the draft report to other members of the consortium			\$ -											\$ -						\$ -	
	2.16.7	Finalize geotechnical report	2.0	\$1,500.00	\$ 3,000.00	1.0	\$1,500.00	\$ 1,500.00				\$ -				3.0	\$ 4,500.00				\$ -	\$ 4,500.00	
	Task Total		8.0	\$ 12,000.00		1.0	\$ 1,500.00	\$ 2,000.00		1.0	\$ 1,000.00	\$ 1,000.00		0.0	\$ -	\$ 16,500.00				\$ -	\$ 16,500.00		
Disbursements																							
1.1	Per diem allowances	7.0	\$400.00	\$ 2,800.00				33.0	\$300.00	\$ 9,900.00						40.0	\$ 12,700.00	days	\$ 825.00	\$ 28	\$ 23,100.00	\$ 35,800.00	
1.2	Air Ticket	1.0	\$1,500.00	\$ 1,500.00				1.0	\$1,000.00	\$ 1,000.00						2.0	\$ 2,500.00	LS	\$ 3,300.00	\$ 1	\$ 3,300.00	\$ 5,800.00	
1.3	Car Rental	7.0	\$80.00	\$ 560.00				33.0	\$80.00	\$ 2,640.00						40.0	\$ 3,200.00	days	\$ 80.00	\$ 28	\$ 2,240.00	\$ 5,440.00	
1.4	Travel Time			\$ -				1.0	\$1,000.00	\$ 1,000.00						1.0	\$ 1,000.00	LS	\$ 1,650.00	\$ 1	\$ 1,650.00	\$ 2,650.00	
1.5	Drill Supplies / Core Boxes			\$ -						\$ -							\$ -	LS	\$ 1,000.00	\$ 1	\$ 1,000.00	\$ 1,000.00	
1.6	Drill Rig Mobilization (Drill Rig/Barge)			\$ -						\$ -							\$ -	LS	\$ 28,600.00	\$ 1	\$ 28,600.00	\$ 28,600.00	
1.7	Drill Rig De-Mobilization (Drill Rig/Barge)			\$ -						\$ -							\$ -	LS	\$ 13,200.00	\$ 1	\$ 13,200.00	\$ 13,200.00	
1.8	Transportation of Drill Rig/Barge to Port			\$ -						\$ -							\$ -	LS	\$ 2,860.00	\$ 1	\$ 2,860.00	\$ 2,860.00	
1.9	Drill Rig/Barge (Transit/Standby)			\$ -						\$ -							\$ -	LS	\$ 5,500.00	\$ 1	\$ 5,500.00	\$ 5,500.00	
1.10	Barge Rental (Standby)			\$ -						\$ -							\$ -	days	\$ 1,100.00	\$ 5	\$ 5,500.00	\$ 5,500.00	
1.11	Barge & Drill Rig Rental (Production)			\$ -						\$ -							\$ -	days	\$ 4,400.00	\$ 24	\$ 105,600.00	\$ 105,600.00	
1.12	Crane Rental			\$ -						\$ -							\$ -	LS	\$ 5,500.00	\$ 1	\$ 5,500.00	\$ 5,500.00	
1.13	Drill Rig Rental (Standby)			\$ -						\$ -							\$ -	Hours	\$ 240.00	\$ 40	\$ 9,600.00	\$ 9,600.00	
1.14	Production Drilling			\$ -						\$ -							\$ -						
	1.14.1 Split Spoon Sampling			\$ -						\$ -							\$ -	FT	\$ 66.00	\$ 105	\$ 6,930.00	\$ 6,930.00	
	1.14.2 Rock corning			\$ -						\$ -							\$ -	FT	\$ 92.00	\$ 783	\$ 72,036.00	\$ 72,036.00	
	1.14.3 Casing			\$ -						\$ -							\$ -	FT	\$ 28.00	\$ 600	\$ 16,800.00	\$ 16,800.00	
	1.14.4 Jet Probe			\$ -						\$ -							\$ -	FT	\$ 28.00	\$ 105	\$ 2,940.00	\$ 2,940.00	
	Task Total		15.0	\$ 4,860.00		0.0		\$ -	\$ -		68.0	\$ 14,540.00		0.0	\$ -	\$ 19,400.00				\$ 306,356.00	\$ 325,756.00		
Totals			30.0	\$ 30,860.00		1.0	\$ 1,500.00	\$ 2,000.00		1.0	\$ 1,000.00	\$ 1,000.00		121.0	\$ 6,650.00	\$ 16,500.00				\$ 306,356.00	\$ 387,406.00		

Hydrographic Consultants - Nassau Harbour Survey

TASK	Labor	Equipment	Travel & Expenses	Total Cost	Duration (Days)
1 Mobilization to Nassau	\$2,145	\$677	\$4,659	\$7,481	1
2 Control/Pre-Coordination Survey	\$1,788	\$1,128	\$314	\$3,230	1
3 Setup Survey Vessel & Project	\$1,430	\$704	\$644	\$2,778	1
4 Hydrographic/Topographic Survey	\$8,580	\$6,666	\$1,568	\$16,814	5
5 Demobilization	\$1,430	\$338	\$792	\$2,560	1
6 Data Processing + Deliverables	<u>\$4,565</u>	<u>\$725</u>	<u>\$110</u>	\$5,400	5
Sub - Total	\$19,938	\$10,238	\$8,087		
Grand Total Hydrographic Survey w/Deliverables				\$38,263	
A.1 GIS Data Acquisition	\$1,788	\$1,210	\$314	\$3,312	1
A.2 GIS Data Processing	\$935	\$100		\$1,035	1
Grand Total GIS Data of Marine Features				\$4,347	
TOTAL: GIS + Hydro Survey				\$42,610	

- Note:** 1- Survey Vessel Rental Rate is part of Equipment Fee
 2- Weather downtime built into Survey Duration
 3- Estimate assumes **no import duty fees on equipment or work visa permit fees required**
 4- Mobilization expenses include all airfare and hire car fees for entire project

D PROJECT SCHEDULE

The following sheet shows our proposed Project Schedule which has been arranged to meet the target dates set out in the RFP. It is based on authorization to proceed being given by the Ministry by December 20, 2007. Allowing for the Christmas period, work will start the week of January 7, 2008.

Preliminary Engineering: As noted elsewhere, we feel that the Phase 1 of Project execution should include a Preliminary Engineering effort to clarify the Ministry's intent with respect to dredge limits, effects on adjacent structures and beaches and the recommended approach to breakwater repair. This Phase will draw heavily on the results of the Site Investigations which will provide the data necessary to allow the proper analysis of Project elements, leading to recommendations for final design.

Site Investigations: In order to meet the Ministry's required schedule, we propose that work on the site investigations start as soon as possible, with work carried out concurrent to the Phase 1 Preliminary Engineering effort. As information becomes available from the site investigations, it will be used as part of the preliminary engineering evaluation to assist in arriving at recommendations affecting final design.

Note that the Hydrographic Survey is a key component of the site investigations since the coastal engineering near shore wave transformation analysis cannot be carried out until accurate water depth information is available.

The Environmental Impact Report and Permit Assistance will also start immediately to confirm BEST requirements with respect to this particular Project. A draft Environmental Impact Assessment Report will be available for Ministry and BEST review within six weeks of start-up. The Permit Assistance will be an ongoing effort through meetings and following up with the relevant agencies.

Final Design, Documents & Tendering: Final design and preparation of construction drawings, specifications and Tender/Contract Documents will begin immediately after review and acceptance of the Preliminary Engineering Report.

To maintain the Ministry's schedule, final design will be started prior to the final results being available from the Coastal Engineering assessment. However, we can work around this by concentrating on the mooring dolphins first and making assumptions regarding dredge limits, to be modified as required to suit the outcome of the coastal engineering studies.

After Ministry review and acceptance of the Tender Documents, as suggested by the RFP, the tendering period will be one month. Cox & SHAL will evaluate Tenders and within two weeks provide a Tender Evaluation Report with an award recommendation. It is assumed that the Construction Contract will be awarded in mid July or sooner.

Contract Administration and Review During Construction: We have assumed that the construction duration will be 8 months after full mobilization and that a Resident Engineer will be provided over that period. Nine months of Contract Administration is assumed to allow for tidying up contractual matters after completion of construction. Based on these assumptions, Project completion would be end of April 2009.

Blue Engineering

1. Ms. Melanie Roach
Director of Public Works
Ministry of Works and Transport
John F. Kennedy Drive
P. O. Box N-8156
Nassau Bahamas
Tel: 242-302-9527/28
2. Mr. Khader Alikhan
Ministry of Works and Transport
John F. Kennedy Drive
P. O. Box N-8156
Nassau Bahamas
Tel: 242-302-9538
3. Mr. Howard Barrett
Ministry of Works and Transport
John F. Kennedy Drive
P. O. Box N-8156
Nassau Bahamas
Tel: 242-302-9773

Baird & Associates

1. Ms. Melanie Roach
Director of Public Works
Ministry of Works and Transport
John F. Kennedy Drive
P. O. Box N-8156
Nassau Bahamas
Tel: 242-302-9527/28
2. Dr. Leo Brewster
Coastal Zone Management Unit
Bay Street
St. Michael
Barbados
Tel: 246-228-5950
3. Mr. Robert Lansing
Cotton Cay Homeowners Association
270 East Westminister Rd. Suite 300
Lake Forest, IL 60045 U.S.A.
Tel: 847-234-1123

Hydrographic Consultants

1. Mr. Andrew Theiss
Port of Houston Authority
Houston, Texas
Tel: 832-250-2899
2. Mr. Marc Stearns
Manson Construction
Los Angeles, California
Tel: 562-432-6918

3. David Eller
Gahagan & Bryant Associates
Long Beach, California

Tel: 310-521-8127