REQUEST FOR PROPOSAL
RFP No. 240820
LIONS BAY BEACH JETTY REPAIR PROJECT

Issue Date:	August 26th, 2024
Closing date and time:	Proposals must be received before 2:00 pm Pacific Standard Time on September 13th, 2024.
Submission address:	Proposals must be submitted electronically by e-mail to: Ross Blackwell, CAO cao@lionsbay.ca and be titled in the subject line: RFP No. 240820 LIONS BAY BEACH JETTY REPAIR PROJECT
Proposal results:	Proposals will not be opened publicly. Results will be communicated to all bidders.
Addenda:	It is solely the responsibility of the bidder to ensure that it has obtained, prior to the closing date and time, any addenda issued by the Village of Lions Bay. Addenda will be posted on the municipal website.
Contact person:	All inquiries related to this Request for Proposal are to be directed, by e-mail, to the following person. Information obtained from any other source is not official and should not be relied upon: Jurgen Franke, Project Manager jurgen@jteplus.ca

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1 PROJECT OVERVIEW

The municipality of the Village of Lions Bay ("Municipality") seeks proposals from qualified proponents for the implementation of the Lions Bay Beach Jetty repair project ("Project"). The Project aims to:

- repair/remediate/restore an existing rock and log jetty ("Jetty"),
- replace an existing log breakwater with a floating large-diameter HDPE pipe,
- install underwater rock berms to reduce wave action,
- build up pathways to meet the new crest height of the Jetty and
- place a new layer of sand over the beach (reference Dwg No: 1043-D-03.1 General Arrangement dated May 31, 2024, in Appendix D).

The Project will enhance the Jetty's ability to withstand current and wave conditions, which have eroded it and limited its ability to protect the beach from erosion. We seek a highly skilled and experienced proponent capable of implementing a high-quality Jetty restoration.

The Municipality intends to enter a contract with a qualified and responsible firm for the removal and disposal of old materials and the supply and installation of materials as set out in herein. Innovative approaches and suggestions are welcomed.

Any proponent desiring to be considered for the proposed services shall submit proposals in accordance with the instructions herein.

2 BACKGROUND

The site for the Project is the Lions Bay Beach Park in the Village of Lions Bay.

Storm events have lowered the crest of the existing Jetty over time by moving undersized boulders down the side slopes to the seabed adjacent to the slope toe. By reducing the effectiveness of the Jetty, the beach has experienced increased erosion due to storm waves, and the Jetty, in turn, has been undermined and destabilized by the erosion of beach sand. The Village has been forced to replenish beach sand from offsite sources annually to help counter erosion and Jetty instability.

The Village is undertaking the Project to repair the Jetty with new boulder armor (of sufficient mass) to establish an adequate crest height and length that will protect the beach and mitigate the loss of sand. As part of the Project, the Municipality is also looking to replace the existing anchored breakwater with new and place a new layer of sand over the beach (see Dwg No: 1043-D-03.1 General Arrangement).

The Village has contracted the services of Balanced Advisors Limited, which produced an Environmental Effects Determination for the Project (Balanced Advisors Limited, "1043-EED-01.1" dated Jun 17, 2024). Balanced Advisors has determined that no regulatory action is required in relation to:

- Fisheries Act or DFO interests, referenced below from Section 10.4, of the Balanced Advisory Jun 17, 2024, report:

  "No regulatory action is warranted in relation to the Fisheries Act or DFO interests. Fish and fish habitat protection provisions of the Fisheries Act include prohibition of:
  - *Any activity or undertaking that would result in harmful alterations, distributions, or destruction of fish habitat (HADD).*
  - *Any activities or undertaking, other than fishing, that results in the death of fish.*

  Balanced QEPs have determined that the Project will not contravene any fish or fish habitat protection provisions of the Fisheries Act: The Jetty repair will not result in:
  - *Any substantive death of fish.*
  - *Any substantive HADD.*

  Accordingly, there is no need to submit the Project to DFO for review or otherwise involve DFO in the Project."

- Canadian Navigable Waters Act (CNWA), referenced below from Section 10.5, of the Balanced Advisory Jun 17, 2024, report:

  "Under CNWA (Transport Canada 2021):
  - *Howe Sound, including the Project site isa navigable water.*
  - *Approval is not required for repair and/or maintenance of existing works within navigable waters.*

  The Project will involve repair of the existing rock mound jetty. Accordingly, no TC/NPP approval is required for the Project."

- Species and Ecosystems at Risk (SEAR), referenced below from Section 10.6, of the Balanced Advisory Jun 17, 2024, report:

  "No regulatory action is warranted in relation to the federal Species at Risk Act (SARA), the federal Migratory Birds Convention Act or the provincial Wildlife Act.
  In the opinion of Balanced QEPs it is unlikely that any species at risk is associated with the Project site, is dependent on the biophysical features of the site, or will be adversely affected by the Project."

  And further in the same section,

  "…in the view of Balanced QEPs it is unlikely that the Jetty repair would have any substantive adverse effect on any birds."

- Canadian Environmental Protection Act (CEPA), referenced below from Section 10.7, of the Balanced Advisory Jun 17, 2024, report:

  "The Project includes the placement of materials on the seabed. It is the opinion of Balanced QEPs that ECCC would not have any interest in the Project, and if ECCC were to consider the Project, they would

likely view the proposed limited placement of rock on the seabed to be an ecologically beneficial us of the rock and waive any requirement for formal application or permitting."

- British Columbia Environmental Assessment Act (BCEAA), referenced below from Section 10.8, of the Balanced Advisory Jun 17, 2024, report:

  "The Project does not meet the criteria for BCEEA review. No regulatory action is required in relation to BCEEA."

- In addition, Balanced Advisors have determined that the Lions Bay Beach Jetty Repair Project does not meet the criteria for an Impact Assessment Act (IAA) review, referenced below from Section 10.9, of the Balanced Advisory Jun 17, 2024, report:

  "The Project is not a designated activity and is unlikely to be designated as such. Accordingly, the Project does not meet the criteria for IAA review."

The Municipality intends to contract an entity ("Contractor") to deliver the Project as proposed and described by the documentation provided in this RFP.

Due to grant funding requirements and consideration for Fisheries and Oceans Canada (DFO) Least Risk Fisheries Windows (Aug 16—Jan 21 annually), the Project must be executed quickly. On-the-ground construction must begin no earlier than October 1, 2024 (to accommodate use of the beach park by the public), and be fully completed by December 20, 2024, to allow all claims for grant payment to be submitted by Dec. 31. Proponents should be aware that ocean tides during this period are smaller than at other times of the year, and that November is usually the rainiest month locally.

3 SCOPE OF WORK

The Contractor will be responsible for the following:

3.1. Removal of Existing

- Removal/relocation of existing material as required to undertake the construction of new Jetty as per Document 1043-D-01.3 General Arrangement.
- Log breakwater. Anchoring lines, anchors may remain and be reused.

3.2. Build/Install the Following

- New Jetty as per Document 1043-D-01.3 Jetty Repairs General Arrangement. Selection of materials should be carefully considered.
- High-Density Polyethylene (HDPE) breakwater and associated anchoring lines as per Document 1043-D-03.1. Existing lines and anchors may be reused if they are deemed by agreement of the Contractor and the Municipality to be in serviceable condition.
- New layer of suitable sand over the beach at the completion of Jetty repairs

3.3. Provision of Services

- Construction management.
- General contractor.

- Construction.
- Closeout, including as-built drawings if applicable.

3.4. Design/Build Requirements

All design and construction are to conform to BC Building Codes 2024.

General Construction Requirements

- To maximize enhancement and protection of the environment, accommodate uncertainty in relation to the current structure, and due to the nature of repair materials as delivered to the Project site, the Project will follow a design-build adaptive field-fit approach.
- Existing material is to be reutilized where the design allows, and reuse is economically feasible.
- Additional material required to complete the design is to be sourced from offsite aggregate material suppliers
- Materials are to be massed and placed to withstand storm wave height and energy and provide suitable protection for the beach. The necessary mass of individual boulders had been determined by CMO Consultants Ltd (Appendix E, CMO Consultants Ltd).
- The preferred transportation method for materials and machinery to site is by barge to minimize disturbance to park users. Land transport can be accommodated via the neighboring marina, with permission to access site through the marina being the responsibility of the Contractor to negotiate and manage.

4 PROJECT BUDGET

The total available budget, comprising 75% grant funding for the works described is **$200,000** (including freight charges, incidentals, and all applicable taxes).

5 SCHEDULE

Proposals: received before 2:00 pm Pacific Daylight Time on Sept 13th, 2024.

Public Evaluation/Engagement Process (pending Municipality's requirements): TBD.

Contract Award: October 2024

Project Completion: December 20th, 2024

Site Meeting: A mandatory site meeting will be held on Wednesday September 4th at 11:00am at the Jetty. This meeting will allow proponents to assess the site, ask questions, and gain a thorough understanding of the project scope and site conditions.

6 SUBMISSION REQUIREMENTS

Interested proponents are invited to submit a comprehensive proposal that includes the following components:

6.1 Cover Letter

- An introduction to your operating entity, its interest in the Project, and a summary of why it is qualified to undertake it.

6.2 Project Understanding and Approach

- A detailed description of your understanding of the Project scope and objectives, and your approach to managing and executing it.

6.3 Design and Construction Plan

- Concept-level plans for design and construction, including drawings, specifications, methodologies, and any innovative solutions you propose.
- Concept-level renderings for the overall design layout of the entire area of construction (i.e., entrance to the beach level, public furniture, removed trees) that can be utilized for public consultation purposes.
- Provide references to relevant standards and guidelines, such as BC Building Codes, CSA, and local building codes.

6.4 Experience and Qualifications

- Information on your experience with similar projects, including case studies, and qualifications of key team members who will be involved in the Project. Include relevant certifications and any awards or recognitions received.
- References from previous clients, including contact information and a brief description of the project undertaken.

6.5 Timeline

- A detailed project timeline demonstrating your ability to complete the Project on schedule, ensuring alignment with the required start date. Include milestones and key deliverables.

6.6 Cost Estimate

- A detailed and itemized cost estimate for the Project, including a breakdown of costs for each component, (see Section B Asset Listing for Cost Breakdown for a list of elements to be costed) contingency plans, and potential cost-saving measures.

6.7 Sustainability Plan

- Your approach to sustainability in the design and construction process, highlighting environmentally friendly practices, materials you plan to use, and how you will minimize the environmental impact of the Project.

6.8 Quality Control and Safety Plan

- A detailed plan on how you will ensure quality control and safety throughout the Project, including any certifications or standards you adhere to and your safety record on similar projects.

7 SELECTION PROCESS AND AWARD

Request for Proposals is a method of procurement permitting discussions with proponents and revisions to proposals prior to award of a contract. The Municipality's Evaluation Committee ("Committee") will evaluate design proposals. The Committee may conduct discussions with any proponent who submits an acceptable or potentially acceptable proposal. Proponents shall be accorded fair and equal treatment with respect to any opportunity for discussion and revision of proposals. During such discussions, the Committee shall not disclose any information derived from one Proposal to any other proponent.

The Municipality intends to enter into a contract with the proponent who has the highest overall scoring results from the evaluation process. The Committee shall have sole discretion to determine the qualifications, responsibility, and capabilities of proponents, the reasonableness of price, and other factors. Any decision in this respect shall be binding. The Committee will evaluate Proposals in a closed session, using the following criteria to evaluate the proposals received:

- Understanding of the Project and approach……10%
- Experience and qualifications……10%
- Quality control and safety plan……10%
- Design and construction plan……35%
- Cost estimate……35%

The Municipality reserves the right to reject any or all proposals or request written clarification of proposals and supporting materials. Interviews in person, by phone or by email may be conducted to clarify certain elements.

8 GENERAL INSTRUCTIONS

1. A proposal will not be considered if it is deemed incomplete.
2. Late proposals will not be considered and will be returned unopened.
3. Telephoned and faxed proposals will not be accepted. For clarity, only proposals received by email will be accepted. Proposals submitted by any other means other than email will be deemed unacceptable.
4. Modifying a proposal after the RFP closing date will not be allowed.
5. It is the responsibility of proponents to satisfy themselves as to the full requirements of this RFP.
6. While the Municipality has made considerable efforts to ensure an accurate representation of information in this RFP, the information contained herein is supplied solely as a guideline for proponents. The information is not guaranteed to be accurate, nor is it necessarily comprehensive or exhaustive. The Municipality will assume no responsibility for any oral information or suggestion(s).
7. Proponents are solely responsible for their own expenses in preparing a response and subsequent discussions, if any. The Municipality will not be liable to any proponent for any claims, whether for

costs or damages incurred by the proponent in preparing the response, loss of any anticipated profit in connection with any final contract, or any other matter whatsoever.

8. All documents, reports, proposal submissions, working papers, or other materials submitted to the Municipality shall become the sole and exclusive property of the Municipality and, as such, are subject to BC and Federal Freedom of Information legislation. To request confidentiality, proponents must submit a covering letter with their proposal detailing the specifics of their request.
9. Except as expressly and specifically permitted in these General Instructions, no proponent shall have any claim for any compensation of any kind whatsoever as a result of participating in the RFP, and by submitting a proposal, each proponent shall be deemed to have agreed that it has no claim.
10. In this section, “Immediate Relative” means a spouse, parent, child, sibling, or sibling-in-law, and “Principal” means a person with more than 10% ownership or control.
11. Proponent warrants that the Municipality does not employ or contract its principals, officers, directors, agents, or employees with authority to bind it, or their Immediate Relatives.
12. If any principal, officer, director, agent employee, or other representative of a proponent with authority to bind same makes any representation or solicitation to any elected official, employee or contractor of the Municipality with respect to their proposal, whether before or after the submission, the Municipality shall be entitled to reject or not accept it.
13. The personnel named in the proponent’s proposal would be expected by the Municipality to remain in their positions throughout the Project. If key personnel leave or cannot continue fulfilling their role, suitable replacements must be proposed. Accepting the proposed replacement is at the sole discretion of the Municipality.
14. Any and all addendums made by the Municipality to this RFP will be forwarded to all proponents.
15. Proponents responding to this RFP agree to the terms and conditions herein.
16. The Municipality’s standard contract terms and conditions are provided in Appendix xxx. Alternatively, the Municipality may elect to utilize an MMCD short or long-form contract.

9 BEST OFFER

1. The Municipality will notify all proponents whether their proposal has been selected or not, and feedback will be provided if requested.
2. A contract is formed only when the Municipality issues a purchase order to the selected proponent.

APPENDICES

A REFERENCES

Bidders shall supply three performance references:

Municipality Name: _____

Address: _____

City: _____

Telephone Number: _____

Person to Contact: _____

Municipality Name: _____

Address: _____

City: _____

Telephone Number: _____

Person to Contact: _____.

B ASSET LISTING FOR COST BREAKDOWN

Removal/relocation of existing
Material as required to undertake the construction of the new Jetty
Log breakwater.
Existing walkways
Build/install
New Jetty as per Document 1043-D-01.3 Jetty Repairs General Arrangement, including approach path
New breakwater and associated anchoring lines.
New layer of sand over the beach at the completion of Jetty repairs.

C CONTRACTUAL Ts & Cs FOR INFORMATION OF PROPONENTS

1. Release And Indemnification

1. The Contractor hereby releases the Municipality, its officers, employees, agents, and assigns from all costs, losses, damages and disbursements, including, but not limited to, those caused by personal injury, death, property damage, loss and economic loss arising out of, suffered or experienced by the Contractor, its officers, servants, agents and sub-contractors in connection with their performance of the Services under this Agreement except to the extent such loss arises directly out of the negligence of the Municipality.
2. The Contractor shall take all precautions reasonably necessary to ensure the safety of the Contractor's personnel and all persons employed, contracted, or sub-contracted by the Contractor to perform the Services.
3. The Contractor shall be responsible for any applicable WorkSafe BC assessments relating to any work under this Agreement. The Contractor must remain in good standing with WorkSafe BC and comply with all Workers Compensation Board legislation in the Province of British Columbia.
4. The Contractor hereby agrees to indemnify and save harmless the Municipality from and against all costs, losses, and damages (including, but not limited to, any and all third-party claims, economic loss, damage to property, injuries, and death) arising from any errors, omissions or negligent acts of the Contractor, its officers, servants, agents, and sub-contractors in the performance of the Services under the Agreement.
5. The Contractor's release and indemnification provisions herein shall survive the expiration or termination of the Term of this Agreement.

2. Insurance

1. The Company shall obtain and maintain, at all times, insurance in the following manner and amounts:
    a. Comprehensive general liability providing coverage for a minimum of $5,000,000 per occurrence against liability for bodily injury or death and/or damage to property on an all-risk basis. The Village of Lions Bay shall be listed as an "Additional Insured" under this Policy;
    b. Motor vehicle insurance for public liability providing for a minimum of $2,000,000 covering the use or operation of all motor vehicles and trailers owned, leased, hired, or controlled by the Company and used or operated in the performance of the contract;
2. If the Contractor hires a sub-contractor to perform any work related to the Services, the Contractor shall, in turn, cause such sub-contractor to obtain Commercial General Liability insurance on the same terms as outlined in (i) above. Such insurance shall name the Municipality as an additional insured and shall include coverage for all operations required for the Contractor's work under this Agreement, including, but not limited to, excavation, blasting, shoring, underpinning, and pile driving.

3. The foregoing insurance requirements shall not reduce the Contractor's obligations to release and indemnify the Municipality as outlined in Section 7.0.
4. Such Policy shall include:
    a. The Municipality and its officers, employees, officials, agents, representatives, and volunteers as Additional Insured
    b. Cross liability and a waiver of subrogation or recourse against the Municipality
    c. Thirty (30) days prior written notice of cancellation or reduction in coverage in favour of the Municipality, to be delivered by registered mail to the attention of Ross Blackwell (CAO) at the Municipal Hall, 400 Centre Road.
    d. The Proponent shall be responsible for any deductibles or reimbursement clauses within the Policy.
    e. The Proponent shall give the Municipality a Certificate of Insurance prior to the Proponent programs' commencement and within two weeks of the expiry date of the Policy to evidence renewal of the Policy and continuous coverage.
    f. The Municipality shall be under no obligation to verify that the coverage outlined is adequate for the Proponent's needs.
    g. All Proposals shall be irrevocable and remain open for acceptance for at least (60) sixty days after closing time, whether another Proposal has been accepted.

3. Compliance With Laws And Resolution Of Disputes

1. The Contractor shall comply with all applicable federal, provincial, municipal, and regulatory laws, statutes, regulations, or bylaws. This Agreement and all disputes arising out of or in connection with this Agreement or in respect of any defined legal relationship associated with it or derived from it shall be governed by the laws of the Province of British Columbia.

4. Worksafe BC Requirements

1. The Proponent must be registered and remain in good standing throughout the terms of the contract with WorkSafe BC and will be required to provide evidence of same.

5. Workers Compensation Board

1. The Contractor shall be deemed to be the Prime Contractor within the meaning of Part 3 Division 3, Section 118 (1) of the *Workers Compensation Act* [RSBC 1996] Chapter 492. The Contractor shall have a written safety program in place that meets the requirements of Part 3 of the *Workers Compensation Act* and Part 3 of the WCB OHS Regulation.
2. The Contractor's attention is drawn to Part 20 of the WCB OHS Regulation. Before starting construction work, the Contractor shall furnish the Workers Compensation Board with the written notice of the Project as required by the above-mentioned regulations with a copy to the Municipality. The notice shall state that the Contractor is the Prime Contractor.

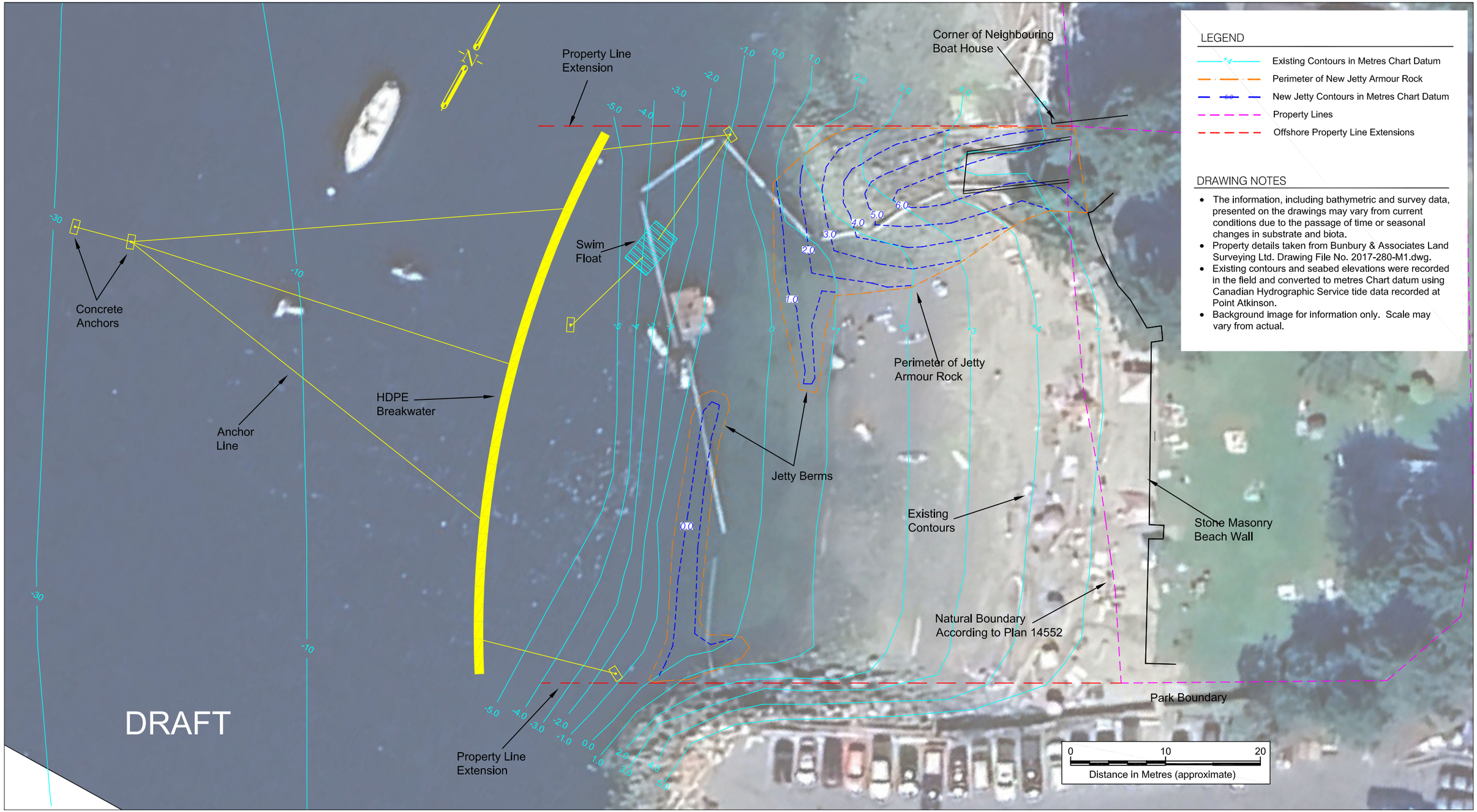
3. The Contractor shall ensure that all Workers Compensation Board safety rules and regulations are observed during the performance of this contract, not only by the Contractor but also by all subcontractors, workers, material suppliers, and others engaged in the performance of this contract.
4. In addition, the Contractor is to complete a Form 30M33, issued by the Workers Compensation Board, relating to the operation of equipment or work being done in proximity to overhead power lines.
5. Photocopies of the notice and the completed Form 30M33 form are to be delivered to the Municipality.
6. The Contractor shall indemnify the Municipality and hold the Municipality harmless from all manner of claims, demands, costs, losses, penalties, and proceedings arising out of or in any way related to unpaid Workers Compensation Board assessments owing from any person employed on the work by the Contractor, by its sub-contractors or by any other person doing or contracting to do all or any part of the work of this contract or arising out of or in any way related to a failure to observe safety rules, regulation and practices of the Workers Compensation Board, including any penalties levied by the Workers Compensation Board.

6. Ownership Of Materials and Copyright

1. Any drawings, audio-visual materials, plans, models, designs, specifications, software, reports, and other similar documents or products produced by the Contractor for the benefit of the Municipality as a result of the provision of the Services (the “Material”) may be used by the Municipality in any manner that the Municipality deems necessary.
2. All materials shall be transferred and delivered by the Contractor to the Municipality without further compensation immediately following the expiration or sooner termination of the Agreement, provided that the Municipality may, at any time or times prior to the expiration or sooner termination of this Agreement, give written notice to the Contractor request in delivery by the Contractor to the Municipality of all or any part of the materials in which event the Contractor shall immediately comply with such request. Unless otherwise directed by the Municipality, all materials created electronically must be provided in an electronic format acceptable to the Municipality.
3. The Contractor hereby transfers ownership in and to the Materials and assigns to the Municipality and patent or copyright in the Materials. The Contractor agrees that title to the Materials is to be considered to have been transferred, and any copyright in the Materials is to be considered to have been assigned by the Contractor to the Municipality upon its creation.
4. The Contractor hereby irrevocably waives, in favor of the Municipality, the Contractor’s moral right in respect to the Materials. The Contractor shall obtain in writing, from any other source used, all required approvals, assignments, waivers, including waivers of moral rights, releases of interest, and acknowledgments necessary to transfer ownership to any patent or copyright in the Materials to the Municipality.

5. The Contractor hereby represents and warrants that any portion of the Materials produced by the Contractor shall not infringe any patent or copyright of any other industrial or intellectual property rights, including trade secrets.

D APPENDIX



LEGEND

- Existing Contours in Metres Chart Datum
- Perimeter of New Jetty Armour Rock
- New Jetty Contours in Metres Chart Datum
- Property Lines
- Offshore Property Line Extensions

DRAWING NOTES

- The information, including bathymetric and survey data, presented on the drawings may vary from current conditions due to the passage of time or seasonal changes in substrate and biota.
- Property details taken from Bunbury & Associates Land Surveying Ltd. Drawing File No. 2017-280-M1.dwg.
- Existing contours and seabed elevations were recorded in the field and converted to metres Chart datum using Canadian Hydrographic Service tide data recorded at Point Atkinson.
- Background image for information only. Scale may vary from actual.

Bunbury & Associates Land Surveying Ltd.
File No. 2017-280-M1.dwg

Background image courtesy GoogleEarth.

References

Client

Village of Lions Bay
PO Box 141, 400 Centre Road,
Village of Lions Bay, B.C.
V0N 2E0

Author

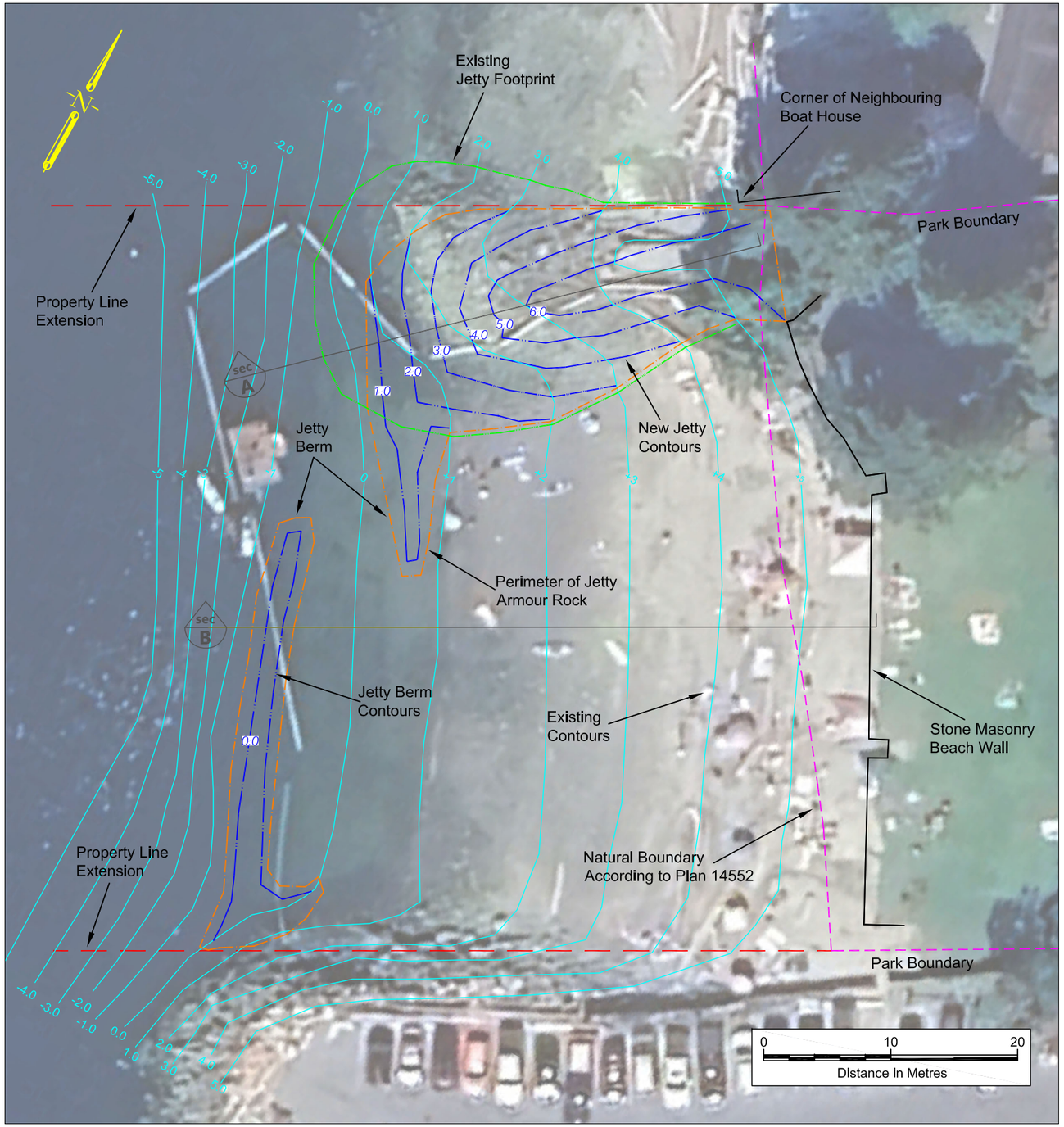
BALANCED
ADVISORS LIMITED
1047 Belvedere Drive, North Vancouver, B.C. V7R 2C6

Checked by	SC
Drawn by	xie
Date	May 31, 2024
Scale	see barscale
Inspectors	SC/BC
Paper	11 x 17

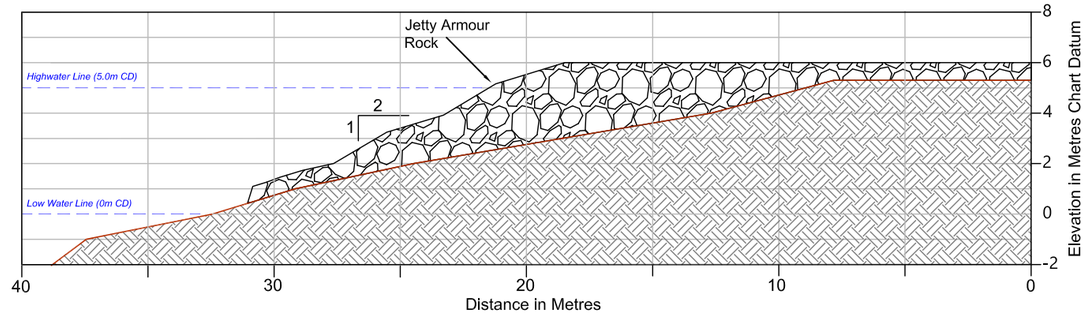
PROJECT

HDPE Breakwater,
Lions Bay Beach Park,
Village of Lions Bay, British Columbia

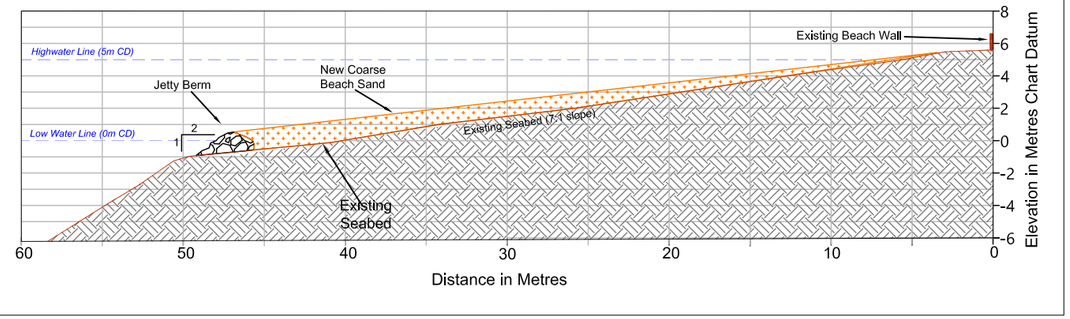
DWG. No.: 1043-D-03.1 General Arrangement



Section A



Section B



LEGEND

- Existing Contours in Metres Chart Datum
- Perimeter of New Jetty Armour Rock
- New Jetty Contours in Metres Chart Datum
- Property Lines
- Offshore Property Line Extensions
- Existing Jetty Footprint

DRAWING NOTES

- The information, including bathymetric and survey data, presented on the drawings may vary from current conditions due to the passage of time or seasonal changes in substrate and biota.
- Property details taken from Bunbury & Associates Land Surveying Ltd. Drawing File No. 2017-280-M1.dwg.
- Existing contours and seabed elevations were recorded in the field and converted to metres Chart datum using Canadian Hydrographic Service tide data recorded at Point Atkinson.
- Background image for information only. Scale may vary from actual.

Bunbury & Associates Land Surveying Ltd.
File No. 2017-280-M1.dwg

Background image courtesy GoogleEarth.

References

Client

Village of Lions Bay
PO Box 141, 400 Centre Road,
Village of Lions Bay, B.C.
V0N 2E0

Author

BALANCED
ADVISORS LIMITED
1047 Belvedere Drive, North Vancouver, B.C. V7R 2C6

Checked by	SC
Drawn by	xie
Date	June 3, 2024
Scale	see barscale
Inspectors	SC/BC
Paper	11 x 17

PROJECT

Jetty Repairs,
Lions Bay Beach Park,
Village of Lions Bay, British Columbia

DWG. No.: 1043-D-01.3 General Arrangement

E APPENDIX

Scott Christie
Balanced Advisors Ltd.
1047 Belvedere Drive
North Vancouver BC V7R 2C6

May 30, 2024

Re: **Report on Wave Climate and Rock Size for Lions Bay Jetty Repairs**

CMO Consultants Ltd. (CMO) has been retained by Balanced Advisors Ltd. (Balanced) to determine the following:

- The design waves at the Lions Bay Beach Park Jetty that is located on the north side of the public beach.
- The stable rock size required for repairing the Jetty, assuming a slope of 2H:1V.

The wave heights have been determined for the 1 in 50 year storm from the North and South Sectors using the professional wave model MIKE 21, which CMO runs under licence with the Danish Hydraulic Institute (DHI), and the results are as follows:

- From the North sector, the waves are Hs = 2.8 m, Tp = 5.4 s.
- From the South sector, the waves are Hs = 2.3 m, Tp = 5.7 s.
- Hs is the Significant Wave Height, which is defined as the average of the highest 33% of the waves in a sea state, in metres.
- Tp is the Peak Spectral Wave Period, which is the period of the most energetic waves in a sea state, in seconds.

The preliminary calculations of required rock size is characterized as:

- For the head of the Jetty:
  - D50 = 1.25 m, the cubic dimension of the mean rock size.
  - W50 = 5,125 kg, the weight of the mean rock size.
  - The thickness of two layers of armour rock is 2.5 m.
- For the body of the Jetty:
  - D50 = 1.0 m, the cubic dimension of the mean rock size.
  - W50 = 2,650 kg, the weight of the mean size rock.
  - The thickness of two layers of armour rock is 2 m.
- The rock is assumed to be good quality granite with a density not less than 2,650 kg/m^3.

Additional detailed Jetty design would address:

- rock placement to accommodate wave conditions from the north and south as well as at different points along the Jetty;
- toe, height and width;
- incorporation of existing materials in the core; and,
- the effects of climate change and sea level rise.

References

US Army Corps of Engineers, Shore Protection Manual, 1984.

Thank you for the opportunity to be of service.

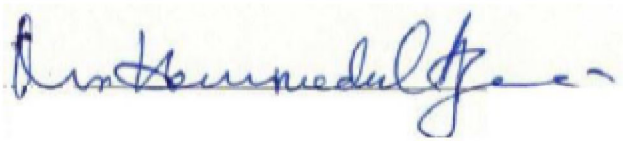
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