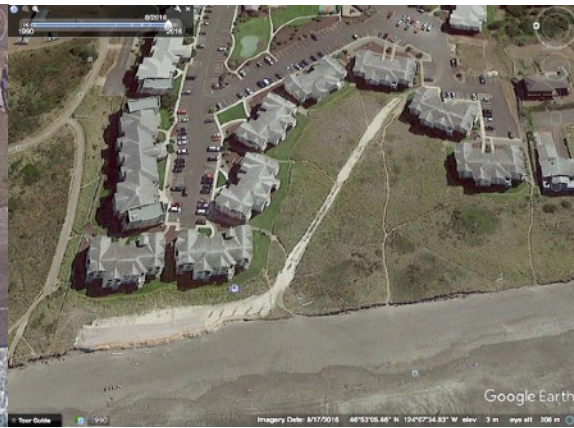


WESTPORT BY THE SEA DUNE EROSION COMMITTEE
FINAL REPORT WITH RECOMMENDATIONS
Published May 15, 2017 (ver 10 updated 11/05/2018)
The Way We Were!



August 8, 2009 ↓

↓ August 17, 2016



Feb 9, 2017 ↓

↓ Feb 10, 2017



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INTERNET ACCESS TO FINAL REPORT AND ATTACHMENTS

We welcome the Westport by the SEA (WBTS) Phase I/II and Phase III Board of Directors (BOD) and owners in both Homeowners' Associations (HOA) to this WBTS Dune Erosion Committee (the Committee) FINAL REPORT.

Not all mail servers and personal computer systems can handle large attached files. Therefore, we have designed this Portable Document Format file (PDF) for easy "as needed" access to all 14 attachments. All "[atch xx](#)" listings throughout the report are hyperlinked to that attachment's document. Once an attachment document appears in your website browser, you may read and/or download the document. Operation of the website links within the Final Report has been verified on MAC and PC computers and iPhone and Samsung smartphones. **Should an embedded attachment link not work or if you would like to view the attachments from a centralized location, click [FINAL REPORT ATTACHMENTS](#)** for a folder of all attachments to view and/or download. These files are on the DropBox server and there is no need to download the DropBox "app" to view. If asked to do so or you see an option to use the DropBox "app", decline and allow your Internet browser to access the file.

There are other [blue underlined items](#) (not this one) which have embedded Internet links to that item's website. Also note, clicking on the items in the Table of Contents will take you directly to that page.

For BEST viewing of the FINAL REPORT, view the PDF file of the report after downloading it to your computer from the Internet or as delivered via an email attachment. Viewing the report within an Internet browser may not in all cases maintain the original fonts and format.

This FINAL REPORT is a major recap of dune erosion history at WBTS and **may be updated** for minor editorial reasons as well as revisions with new information. **All versions, if there should ever be more than this original version, will be dated and archived in the [DUNE COMMITTEE FINAL REPORT](#).** There will be a History of Updates in that [DUNE COMMITTEE FINAL REPORT](#) folder listing the changes from one version of the report to the other. **We recommend you occasionally check to see if there are any updates to the FINAL REPORT available for downloading.**

If there are any questions or problems or you would like an email with the 14 FINAL REPORT attachments included, please email [WBTS Dune Committee](#). (mvlanduse@comcast.net)

PROLOGUE

This FINAL REPORT represents seven months of effort from dedicated owner “volunteers” whose only goal was to find a solution to our dune erosion that was ***Doable, Durable, Affordable, and Permittable***. To transfer the history and results of that effort via pen to paper is no easy task. *Who would have thought “Dune Erosion” would be so complicated?* From the science of dune erosion, to multifaceted engineering plans to mitigate that erosion, to complex and restrictive local, state, and federal environmental permitting requirements, none of these are black and white issues that can be easily reviewed. There are no straight forward easy answers or conclusions.

What lies ahead for the WBTS BODs is the biggest decision they will probably ever face. The length of this report reflects the importance of this decision with the details needed so it may “stand alone” as a document capable of answering the majority of questions the Committee would expect. Please read the report carefully and re-read to absorb the details from which; (1) decisions were made in developing the Committee’s approach to recommendations and; (2) the details from which the two WBTS BODs will make critical and expensive decisions.

For those who merely want to “cut to the chase” the Committee certainly understands, so check out the Summary (pg 28), Recommendations (pg 29), and Conclusions (pg 30). However, reading the narrative will give the reader a deeper understanding of this complicated and necessary dune solution.

There have been dune erosion reports in the past that have not been released for owner discussion and formal BOD vote. Time is of the essence. The Committee does not expect an immediate vote from the BODs, but we hope the BODs eventually proceed with a formal vote. Whether that vote is a “Yes” or a “No” or a hybrid decision; it is important that a vote be taken and stress the importance for the BODs to report their decision to owners.

To both our WBTS BODs and the owners, we thank you for your time and consideration.

The WBTS Dune Erosion Committee

OVERVIEW

The detailed history of events and where we are now is best summarized as follows:

- From OCT 2016 to mid FEB 2017, the Dune Committee looked for a short-term alternative to sand and logs used in MAR 2016 and FEB 2017 by WBTS.
- A more durable erosion mitigation solution was not found that could be permitted in time for the 2016-2017 winter storms, so the Committee began to focus on longer-term solutions.
- Both BODs agreed WBTS needed to hire professional engineering. The Committee hosted site surveys in DEC 2016 and MAR 2017 for engineers preparing proposals for “study” contracts of short and long-term solutions.
- Site survey engineers highlighted the very temporary and precarious nature of our current sand and log refurbishment and in MAR 2017, the Committee developed Revised Criteria STEP 1, 2, and 3. STEP 1 is a 2-3 year short-term solution more durable than sand and logs to be in place by NOV 2017. STEP 2 is a study for a long-term solution that would combine with the solution of STEP 1. STEP 3 is the design and permitting of the STEP 2 solution to be followed by construction of that design.
- Only one firm, Golder Associates, in their 3/28/2017 proposal was confident a solution could receive environmental approval in time for NOV 2017. That timetable was based on their being hired in time to extend and amend the current WBTS HOA 3 Exemption from Shoreline Management Substantial Development Permit (commonly referred to by both geotechnical engineers ((geotech)) and laymen as the “emergency permit”) prior to that permit’s expiration date of 5/31/2017.
- Golder, now in late May 2017, sees only a very slight chance they can meet permit requirements for STEP 1 completion by NOV 17. That slight chance requires contracting Golder as soon as possible via their 3/14/2017 proposal for an *Options Evaluation Assessment* of long-term plans addressing STEPS 2 and 3.
- If Phase III successfully extends the current emergency permit with the narrative suggested by Golder, once under contract, Golder can begin the long-term design and permitting process and along the way, there might be an opening to implement STEP 1 by NOV 2017 for this winter’s storms.

- For WBTS, protection from storms this winter will probably be left to the current WBTS “self-help” project of sand and logs, but WBTS will need either an extension of the current HOA 3 emergency permit or a new emergency permit under which to perform the work.
- The Committee believes “going professional” with an engineering firm, though more expensive, has many benefits with design and shoreline permits and may well be cheaper in the long run.
- Highly successful dynamic revetment techniques at North Cove and Willapa Bay have been embraced by Washington State environmental agencies and would be a less expensive “self-help” approach with dynamic revetment versus sand and logs.

Stormy Weather!



INTRODUCTION

The awareness of beach erosion by our condominium owners began in earnest with a January 26, 2007 Westport by the Sea Study by Pacific International Engineering (PIE) ([atch 1](#)) commissioned by Drs. William and Chris Monson in building 8. Shortly after, on September 11, 2007, our HOA contracted another study by PIE ([atch 2](#)) with its Dune Erosion Report Summary 2007-09-11 ([atch 3](#)). More studies and discussion followed which brings us to where we are today. If we do not act proactively we are accepting the fact that buildings 7 and 8 could be undermined, possibly condemned, or require very expensive repair with eventually a similar threat to buildings 1, 6, and 9 to follow.



- This is not WBTS but it is indicative of what can happen to us -

The temporary sand, log, straw bale, and coir mat repair was necessary protection for what is left of our beachfront and was allowed via an emergency permit that lets you protect your property with the understanding this allows you the time to implement a longer-term solution. It is not an emergency permit to be extended ad infinitum; you must show plans working towards a fully developed project to be approved via a Shoreline Substantial Development Permit (SDP).

The discussion about *waiting until we have an immediate threat to a building* and then reacting is a high-risk gamble. The logistics of having contractor's equipment standing by "at the ready" on short notice at higher cost, stockpiling (rock) materials, **and** making the right decision at the right time based upon forecasts poses significant challenges.

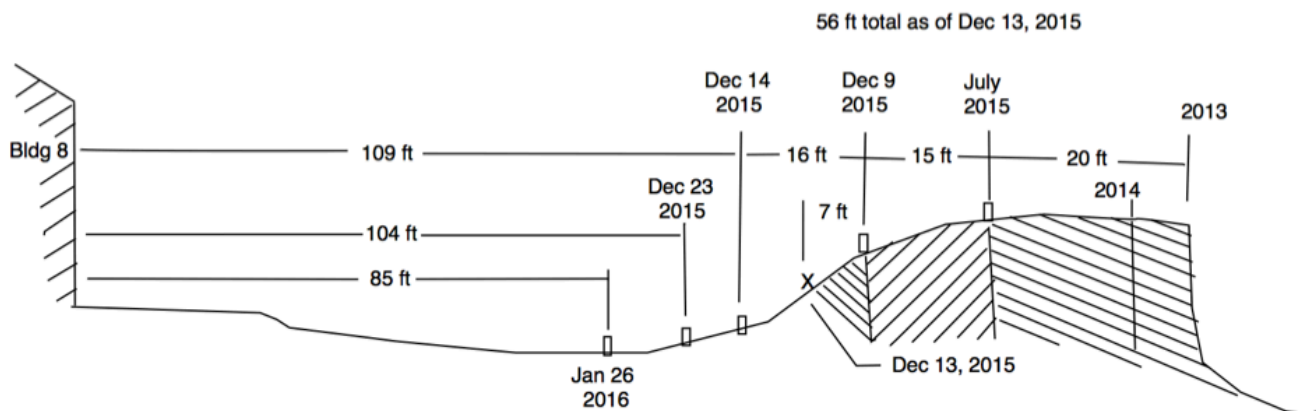
Who is qualified, and who will bear the responsibility of making that decision? Next winter's storm season will come soon, and we will not be prepared unless we contract for and build a durable means of protecting our beachfront now.

Click on this link for a short video taken March 9, 2016 on the south lawn adjacent to building 7.

[March 9, 2016 Video - Ocean Threat to Building 7](#)

The threat is not only to our property but also to the safety of our people. Logs were reported "flying vertically and horizontally" over the dunes to the south and north in front of a ground floor condominium and could just as easily have flown through a window with devastating effects. Are we willing to take that chance for another winter; are we willing to accept the responsibility of not taking better action when we had the opportunity? The Dune Erosion Committee believes there is opportunity to act now with a better alternative.

DISCUSSION



75 feet of Dune lost from 2013 to JAN 2016

[Detailed Pictures and Graphs of Dune Remaining - March 18, 2017](#)

HISTORY

In October 2016, the Phase III Board commissioned the Dune Erosion Committee to find a short-term solution more "durable" than the March 2016 erosion mitigation work of replenished sand and anchored logs in front of condo buildings 7 & 8. From mid October 2016 through the 2016-17 winter season, the Committee concentrated on

finding that short-term solution and soon learned there were very few options, if any, which could be implemented in time for the winter season. Short-term solutions the Committee was aware of that could be permitted in time were no better than our sand and logs. Long-term solutions required a Shoreline Substantial Development Permit that could take up to at least a year to complete.

2016-2017 winter storms eroded as much as 6-11 feet in front of building 8 from the dune repair of March 2016. Though there is disagreement about the amount of eroded dune and opinion the March 2016 repair held well, the Committee's documentation shows a 6-11 foot loss of dune from 3/1/2016 to 11/20/16, which most likely occurred in the 45 days prior to 11/20/16. The sand bag and coir mat March 2016 repair in front of building 7 eroded approximately 15 feet.

Pictures taken 11/20/2016



Exposed logs once buried by the dune



The far right (seaward) of mat at former base of dune face

Pictures 11/20/2016 – The March 2016 dune washed out from under the coir mat, uncovered 4 logs that had been buried in the March 2016 repair, and the dune face receded eastward 6-11 feet. Notice the coir mat laying 6-8 feet on the sand in front of the dune base. When the dunes were repaired in March 2016, the coir mat hung straight down across the dune face and did not extend onto the beach toward the water. The dune eroded and washed away from under the coir mat; as the dune moved eastward, the coir mat that was once vertical across the dune face is now lying horizontally flat on the beach. There were up to 30 feet of coir mat from the top edge of the dune face lying horizontally toward buildings 7 & 8. Some of that coir mat now lays vertical across the dune face because, as previously stated, the dune eroded 6-11 feet.

The countering opinion is quoted as saying, *“I measured the distance from Bldg. 8 to the dune edge yesterday at my standard reference point. Distance is now 84 feet. Last Feb before our repair action the distance was 90 ft. I didn’t remember to measure immediately after the repair action. . . That said, I believe it is safe to say the dune face has remained essentially static since our repair.”*

Regardless of how much dune was lost from the March 2016 repair, all we had at our disposal for WBTS were the admirable efforts allowed by the HOA 3 emergency permit to once again save buildings 7 & 8 from the ocean with sand and logs. Owners are grateful for those efforts managed by Phase III’s BOD, but keep in mind it cost a total of **\$80,000** for those two years of temporary fixes with no guarantee this approach will work again for the coming winter of 2017-18. WBTS should begin serious consideration and action now for an alternative method even though it may cost more initially (but less over time), it won’t need \$40,000 worth of additional refurbishment every year AND will provide better protection.

[Pictures of WBTS Beach Erosion](#)

CRITERIA, STUDIES, and SOLUTIONS

With no success in finding a better short-term fix but instead only options of LARGE projects in size, cost, and permit complexity, the Committee determined it was time for WBTS to commission the help of professionals. On 11/19/2016, the Phase III Board granted the Committee permission to contact engineering firms for proposals to study and recommend solutions. The Committee was to present proposals to the Phase III Board for their review and ultimate selection for contract. The first site survey in preparation for proposal was completed 12/13/2016 by GeoResources LLC. On 1/21/2017, the Phase III BOD authorized up to \$5,000 for a “study” contract once they approved a proposal. The study’s purpose was to recommend options for erosion mitigation that the Phase III BOD might approve and then contract for full design and Shoreline SDP.

On 02/18/2017, due in part to concerns from the Phase III BOD, the Committee did not have an adequate set of “criteria” to guide firms in the scope of their proposal, the Phase III BOD Vice-President asked the Committee to wait until after 4/1/2017 before scheduling any further site surveys. Since the site surveys were at no cost to WBTS and the Committee had already scheduled two geotech engineers with very tight schedules, surveys were accomplished 3/6/2017 with Golder Associates and 3/18/2017 with Mott MacDonald. As directed by the Phase III BOD, these surveys were not to be hosted by committee members but suggested there would be no problem if hosted by owners.

In comparison to a previous WBTS **\$12-\$15,000** commissioned geotech report in 9/11/2007 ([atch 2](#)) and a **\$2,450.89** 2/20/2016 commissioned quick-look consultant report ([atch 4](#)) . . . a **\$5,000** geotech study contract for the Dune Committee was rather limited in what it could provide. Nonetheless, the Committee did have initial criteria to guide the purpose of the site surveys for their proposals:

- Assess the erosion at the Westport by the Sea complex. Survey the current dune condition in relation to historical data to provide an analysis of how much and at what rate we are losing our dune line
- Prepare a detailed soils and geotechnical analysis to provide as best possible an evaluation of future erosion threat in comparison to past years
- Develop conceptual options to:
 - Protect WBTS this winter and beyond if the permitting timeline allows
 - Design a long-term/more permanent plan that will protect against the 100-year storm
 - Develop a preliminary permitting strategy matrix for the various conceptual options to include federal, state and local permits/approvals requirements and the general timelines associated with obtaining authorizations for the various conceptual options
- Cost breakdown of the above and estimated construction cost and timelines for engineering and construction; and the best time of the year for the construction to take place and completion timeframe.

With those criteria, two geotech firms produced proposals - GeoResources LLC on 3/15/2017 and Golder Associates on 2/27/2017 and 3/14/2017. (Golder had two more proposals 3/28/2017 and 4/17/2017 with Revised Criteria.) Engineers conducting the site surveys all had similar comments:

ON-SITE SURVEY ENGINEER COMMENT

"You can see for yourself, it's not doing the job (the dune mitigation constructed in Feb 2017). It's impossible to predict how much more erosion is going to occur in one year or any one storm, but you can see what you've got there is vulnerable and if you did have a big event, it wouldn't do the job. What you want is to buy yourself a little bit more security that will see you

through a bigger event as well as the overall erosion trend we see accelerating and getting aggravated from where it is now. That's the rationale behind wanting to do a relatively short-term fix but a fix that gives you more than just a one year or one storm type of security. You've seen that over the past couple of years. You've been working away at putting sand, mats, and things like that. They do help but they are very short-term help and so you're getting to the stage where your dune is basically gone – and it's not there anymore – you've got to do something to restore some kind of dune protection. That's what keeps the flood water out and you have to do something to protect against further loss of land in front of those properties if you're going to try to hold the line. THEN we can look at the long-term at what can be viable there".



Beach in 2013 with red line of where dune is now

REVISED CRITERIA – WHY STEP 1 as WBTS #1 PRIORITY

After hearing site survey engineers voice concerns on the lack of “durability and effectiveness” of our current dune condition and to abide by the Committee’s original charter to find an option other than sand and logs against the winter storms, the Committee refocused on the #1 priority for WBTS; saving the remaining dunes from the coming 2017-18 winter storms. *Before you have heart surgery, you must stabilize the*

patient. It is much the same with the dunes, *stabilize what you have and then go in for the big fix*.

During the 3/18/2017 Phase III Annual HOA Meeting, owners made it clear we have waited too long and wanted the erosion stopped. They were not convinced by either the Phase III Board President or Dune Erosion Committee representative that the 11/19/2016 Phase III Board plan of proposals, studies, and re-proposals under which the Committee was operating would ever lead to a contract for design, permitting, and construction. And those homeowners' doubts were correct!

The Committee wrestled with this dilemma of criteria leading to proposals for nothing more than studies instead of actionable solutions in time for the coming winter storms. This was the key topic of Committee meetings just before and after the March 25, 2017 Phase I/II Annual HOA Meeting where again, owners wanted something "more" to be done NOW and they wanted transparency in BOD and Committee activity on WBTS dune erosion!

Any sizeable long-term project to protect the existing dune face and WBTS from anything greater than a nominal winter storm will take at least 6 - 9 months to a year for permitting. Preventing further dune loss now had to be #1 priority.

The Revised Criteria for Proposals 3-28-17 ([atch 5](#)) contains a 3-step process and the basics of those criteria were reviewed on March 26, 2017 by then Committee Chairman, Patti Fiorito, with the Phase III BOD President, Bob Parnell. Though no significant concerns with the Revised Criteria were raised at that meeting, the Committee offered a more in-depth review to coordinate these criteria with the Phase III BOD. No further discussion seemed required by Phase III, so on March 28, 2017, the Committee distributed Revised Criteria to geotech firms to concentrate on a **contract** proposal (not a study) for full design and permit approval of a 2-3 year dune retention solution to be in place by NOV 2017. This is called STEP 1 in the Revised Criteria. A long-term durable solution could be studied then designed in STEP 2 and constructed in STEP 3 to complement the work already done for STEP 1. It is important to note the Committee reached out four times from March 26, 2017 to April 1, 2017 via phone call messages and emails offering to informally provide a Committee status update, discussion, and review for agreement on the Revised Criteria.

REVISED CRITERIA HIGHLIGHTS

The 3/28/2017 Revised Criteria is a 3-step process: ([atch 5](#))

1. **STEP 1 - Immediate Priority** – proposal for an "actionable contract" to provide a fully engineered 2-3 year plan via the approval of an emergency permit to be in place by NOV 2017 for the entire 712 feet of WBTS beachfront.

2. **STEP 2 - "Study Contract" for long-term options assessments** after implementation of the 2-3 year plan. A long-term STEP 2 or 3 proposal was not required at this time; only proposals for STEP 1 implementation so as to put all effort into achieving the STEP 1 implementation goal of NOV 2017.

3. **STEP 3 - contract full engineering design** to use the final recommendation of STEP 2's options assessment to implement a long-term solution.

The 3/28/2017 Revised Criteria ([atch 5](#)) detailed other issues reflecting research and concerns with the construction process and methods to mitigate damage from construction truck access between condominium buildings and along the dune face. The criteria also addressed investigating engineering advantages to the durability of the project if we expanded our erosion mitigation efforts past our northern and southern *flanks*. The criteria added a much-needed bracket of potential financial commitment for STEPS 1, 2, and 3 so engineers would not waste time on options outside the limit of WBTS finances. In no way do these financial brackets give carte blanche approval to design the most expensive solution or commit WBTS finances. Every proposal has progress checkpoints where Go/No-Go decisions can be made. Proposals are on a monthly-charge basis, and if the direction of design, permits, or costs is not to WBTS liking, the contract can be terminated. And, as will be repeated again, the cost estimate of our recommended Golder proposal is the least expensive for like-work of all the contractors and is well within the cost norms of past engineering studies commissioned by WBTS.

GEOTECHNICAL ENGINEERING PROPOSALS

Four of seven geotech engineering firms the Committee contacted for a proposal said their expertise would not be in line with the issues at WBTS or did not respond to the Request for a Proposal. The three firms that responded were Golder Associates Ltd/BergerAGAM, GeoResources LLC, and Mott MacDonald. Of those three, Golder Associates Ltd/BergerAGAM and GeoResources LLC submitted finalized proposals. Mott MacDonald submitted a letter indicating their inability to address the short-term priority of Revised Criteria STEP 1.

GOLDER ASSOCIATES LTD. and BergerABAM

GOLDER ASSOCIATES LTD

Coastal & Marine Services Group
“Work with us - We deliver”
Project offices Redmond, WA
Regional Headquarters Vancouver, BC
<http://www.golder.com>

BergerABAM

Geotechnical and environmental
permitting specialist
Federal Way, WA with offices in Seattle
and Vancouver, WA
<http://www.abam.com/>

Golder Associates Credentials

Golder Associates Ltd. is dedicated to excellence with extensive experience as a global company providing consulting, design, and construction services in earth, environment, and related areas of energy with 17 years of experience on Washington’s coastline and over 30 years experience with similar coastal erosion issues worldwide. With that global footprint and plenty of local presence, they provide independent consulting, design and construction services in their specialist areas of earth, environment and energy. Golder Associates Ltd. was honored with the prestigious Canada’s Best Managed Companies designation for the 18th consecutive year, and this year marks the 11th year Golder has achieved platinum member status. The 2017 Best Managed program recognizes the best-in-class of Canadian-owned and managed companies demonstrating strategy, capability and commitment to achieve sustainable growth.

BergerABAM Credentials

BergerABAM is a consulting firm offering services in the areas of planning, civil and structural engineering, environmental services, public involvement, construction management and support, and underwater inspection services. Founded in 1951, the firm's capabilities have grown to cover a wide spectrum of management, planning, and

engineering services. In 1988, the firm formed an affiliation with the Berger Group Holdings, Inc. (BGH) affiliated companies, one of the largest consulting groups in the world. As a member of BGH, BergerABAM became a part of a global team of resources located throughout the United States and 50 foreign countries. BergerABAM takes pride in designing an approach that is innovative, client-oriented, and economical with proven experience with projects in the area. They know the people and the territory for permits along the Western Washington coastline. BergerABAM is committed to high quality, cost-effective, and innovative solutions that protect public safety, foster environmental stewardship, and promote sustainable development practices. They demonstrate their commitment to clients through leadership, integrity, and honesty.

History of Golder Associates Proposals

Golder has been the most responsive and submitted four proposals to amend to differing criteria and reduced time available to effect STEP 1 completion.

OVERVIEW OF SUBMITTED GOLDER ASSOCIATES PROPOSALS

2/27/2017 (preliminary) – submitted per phone call request for minimal beach erosion conditions study - inconsequential in light of other proposals

3/14/2017 (initial study) ([atch 6](#)) – site survey on 3/7/2017 and study contract proposal, and as of May 5, 2017, suggested starting point with Golder services- **\$15,977**

3/28/2017 (Revised Criteria) ([atch 7](#)) – based on Revised Criteria and accomplishing STEP 1 by NOV 2017 – complete design and permitting based on existing HOA 3 emergency permit **\$41,281**

4/17/2017 - adjusted the cost of the 3/28/2017 proposal for a simpler permitting process - **\$34,141** – based on having started earlier with less work required amending HOA 3 emergency permit – inconsequential due to changing time constraints

3/14/2017 REVISED PROPOSAL TO PROVIDE A REVIEW OF COASTAL EROSION ISSUES AT WESTPORT BY THE SEA CONDOS AND A SITE VISIT ([atch 6](#))

After a site survey on 3/7/2017, Golder submitted this study contract proposal. It originally reflected the Committee’s initial set of criteria.

This proposal would have studied a broad range of potential solutions after assessing the erosion at WBTS. It develops erosion mitigation alternatives and confirms the permitting requirements that will be needed for implementation of those alternatives. Golder proposes four tasks as follows: **\$15,977.00**

- Task 1. Review and summary of existing data related to coastal erosion along Shoreline fronting the WBTS property
- Task 2. Site visit and characterization of current site conditions
- Task 3. Development of conceptual options for erosion mitigation
- Task 4. Permitting pathways for each conceptual option

The deliverable for this proposal is a technical memorandum documenting each task described above, including the permitting needs discussion and supporting matrix. The technical memorandum is expected to provide the basis to move forward with additional phases that include permitting, final design and construction of a preferred option in a timely manner. Golder can provide a draft technical memorandum within 4 weeks of the kickoff call.

3/28/2017 REVISED PROPOSAL TO PROVIDE A REVIEW OF COASTAL EROSION ISSUES AT WESTPORT BY THE SEA CONDOS AND A SITE VISIT ([atch 7](#))

Based on Revised Criteria to accomplish STEP 1 by NOV 2017, this proposal addresses a complete design with Shoreline permitting based on amending the existing HOA 3 emergency permit. **\$41,281**

This proposal studies a broad range of potential solutions after assessing the erosion at WBTS. It develops erosion mitigation alternatives and confirms the permitting requirements that will be needed for implementation of those alternatives.

Golder understands that for Revised Criteria Step 1, WBTS would like Golder to prepare engineering designs and assist with the permitting of an emergency/immediate priority coastal erosion and coastal flood mitigation concept that would provide medium term (2 to 3 year) mitigation of erosion and flood hazard for approximately 712ft of the WBTS beach front. WBTS would like to construct the immediate priority preferred option by November 2017.

Golder further understands that WBTS would like Golder to consider longer-term mitigation of coastal and dune erosion that extend the medium term (2 to 3 year) mitigation option to a longer timeframe. These longer-term mitigation options, Step 2

and Step 3 would follow after the development and implementation of Step 1. Golder proposes to develop a work plan for Steps 2 and 3 following the permitting phase for Step 1.

Golder proposes the following tasks to meet the objectives of immediate priority for STEP 1:

- Task 1. Review and summary of existing data related to coastal erosion along Shoreline fronting the WBTS property
- Task 2. Site visit and characterization of current site conditions
- Task 3. Development of a preferred concept for erosion mitigation
- Task 4. Permitting for the preferred concept
- Task 5. Final design, specifications and tender support package for the preferred concept
- Task 6. Construction support services
- Task 7. Work plan for long-term mitigation

Golder Preliminary Design Solution for STEP 1

Golder's solution can only be defined in the design process once under contract. Based on information via a 4/27/2017 phone conversation, if Golder had been commissioned in time to use the fast track emergency permit schedule for a STEP 1 NOV 2017 completion date, Golder might have proposed the following:

The most likely option would be a hybrid structure to have the best chance of success in terms of getting an emergency permit exemption and would provide 2-3 years of protection and longer with maintenance. This hybrid approach would possibly reconstruct the dune with a robust core of either geotube or rock fill material. This would provide a stable core within the dune and in front would be a dynamic revetment augmented with sand or small cobble to prevent the beach from scouring away in front of the dynamic revetments. The research and design would define how big the stone needs to be for the dynamic revetment and how much of a mix of gravel, cobble, and sand. How to maintain this geotech solution is a key factor in the design process.

Shoreline Permit Time Constraints

Starting April 27, 2017, and ending May 5, 2017, the Committee had over five hours of detailed discussion with division and project managers at Golder and BergerABAM on their proposals and permitting options for WBTS.

Since Golder's key proposals were submitted 3/28/2017, their proposal assumed for planning purposes they would be commissioned by mid-May at the latest. Their timetable and costs, based on expert analysis, confirmed they could have "tagged" on to and amended the current HOA 3 emergency permit that expires May 31, 2017. If this permitting approach had failed, Golder was confident there was time to successfully generate a new emergency permit (at a slight delay and a bit more cost) and still meet the NOV 2017 implementation date for STEP 1. If the new emergency permit request had failed, Golder would have applied for a full Shoreline Management Substantial Development Permit with not much hope it could meet the NOV 2017 date, but maybe JAN or FEB 2018 (more time and more cost).

If Golder's 3/28/2017 proposal ([atch 7](#)) has a contract "kickoff" even as late as July 1st, and if HOA 3 obtains a 3rd extension to the current emergency permit from the City of Westport, Golder still believes there is a chance to finish STEP 1 by NOV 2017. Not under contract, Golder graciously provided a suggested narrative for HOA 3 to use in requesting a 3rd emergency permit extension from the City of Westport. (see next page)

The delay in getting this information to the WBTS BODs rests primarily with the Committee's desire to provide the BODs with two viable proposals. To that end, the Committee entered a protracted and ultimately unsuccessful attempt from 3/4/2017 to 4/19/2017 to get Mott MacDonald to propose something other than an expensive buried revetment that had potential for STEP 2 and 3, but totally failed to meet the Committee's STEP 1 Revised Criteria.

Golder Change in Approach to Long-Term "with an eye" on STEP 1

Because of the delay in hiring Golder after their proposal was written, it is now unlikely we can now meet STEP 1 completion by NOV 2017 as addressed in the 3/28/2017 proposal ([atch 7](#)). After recent phone conversations with Golder senior management and project managers, the Committee recommends we begin with the Golder proposal of 3/14/2017 ([atch 6](#)). By going with this 3/14/2017 proposal, we get the ball rolling and move away from concentrating on the short-term need to have something in place by NOV 2017. Golder will now take a look at longer-term and longer-lasting solutions. If along the way the permit process does allow Golder to do something by NOV 2017, then Golder will *take that opportunity*. Otherwise, the dunes will be left to fend for themselves unless WBTS continues one more year with our temporary short-term fix that has been mostly successful to date; another reason for HOA 3 to extend their emergency permit is *explained in the narrative below*:

1. Commencing with a study of conceptual options as outlined and quoted in Golder's proposal of 3/14/2017 ([atch 6](#)), this work would identify a range of possible approaches for the site including short, intermediate and longer term shore protection alternatives and would also identify likely permitting pathways and approximate costs. This work could be completed relatively quickly. (Estimate: \$16k; 4 weeks)

2. Suggested Narrative for Extension Request of Emergency Permit - WBTS HOA 3
proceed to inquire in writing to City of Westport regarding an extension to the existing emergency permit for 2017 indicating that it would allow them to work on an emergency solution over the summer while they are also developing and evaluating options for a longer-term solution with the services of a consultant. It is clear that such a longer term solution would not be ready to be put in place in 2017 and therefore a further emergency measure is required in winter 2017/18. The 12/19/2016 City of Westport ([atch 8](#)) approval of the Emergency Dune Restoration Time Extension Request indicates after 5/31/2017 further dune work at WBTS will require shoreline substantial permitting including a State Environmental Policy Act (SEPA) Threshold Determination; therefore, it appears a 3rd extension to the HOA 3 Shoreline permitting requirement will not be granted. However, Golder Associates contends there is discretion at the City level and the rules are not hard and fast. If the extension request is properly written showing WBTS has engaged an engineering firm for a long-term design requiring a substantial development shoreline permit, the City of Westport will most likely grant another extension to the HOA 3 emergency permit.

3. Proceed to develop a longer-term solution once the initial study of conceptual options (item 1 above) is complete. This work would proceed along the lines of Golder's proposal of 3/28/2017 ([atch 7](#)) with the following possible elements:

a. Interim/emergency concept design for 2017 (\$15k engineering – no permitting effort required if the extension requested in item 2 is granted)

b. Long-term concept design and permitting

(1) \$40k/\$50k for engineering design and permitting depending on the overall requirements/support during construction estimated at \$1640 per day for engineering support, but may require additional support depending on conditions of permitting

(2) Note the long-term permitting will take time (perhaps 6 to 9 months or more) and it will be important to start very soon after completing item 1 options assessment

Golder Summary of Costs and Options

- Phase 1 - Start off with the 3/14/2017 proposal. This looks at the details for the permit possibilities for the actual time frame and conditions and shows for sure what long or short term options are doable and permitable – **\$15,000**
- Phase 2 – if phase 1 shows a possible solution for NOV 2017 that will cost an additional **\$15,000** for permitting and design.
- Phase 3 – whether or not you do phase 2, phase 3 is the long-term and costs an additional - **\$40 - \$50,000**
- Do Phase 1, 2, and 3 - total of **\$70-\$80,000** for full permitting and design
- Do just Phase 1 and 3 - total of **\$55-\$65,000** for full permitting and design

MOTT MacDONALD

[Mott MacDonald](#), formerly Coast & Harbor Engineering, was the firm WBTS employed for the Federal Emergency Management Agency (FEMA) WBTS Flood Zone Appeal. Since the Mott MacDonald WBTS site survey 3/18/2017, their approach has focused on dike revetments between the current dune face and WBTS buildings. Their 4/4/2017 letter ([atch 9](#)) informed the Committee they had decided not to submit a proposal because the emphasis of work did not fit well with their skills and approach to solving engineering problems, and the Nov 2017 STEP 1 could not be meet with their proposed solution from a permitting timeframe requirement.

Mott MacDonald sees cobble stone dynamic revetment as a possible choice. But because they are not experienced with this technique, they did not include it in their proposal analysis.

Mott MacDonald recommended with their 4/19/2017 letter ([atch 10](#)) that WBTS skip STEP 1 and proceed direct to STEPS 2 and 3. Their long-term proposal “A” ([atch 11](#)) has sound concepts and should be considered in the future when STEP 2 and 3 are pursued. *They did not research the details of the permits available for a NOV 2017 STEP 1 to the same depth as Golder, and in fact, they did not look at all!*

An “Emergency Proposal B” was submitted 4/21/17 as a rock revetment with permitting to take place after the fact. This plan of building a buried revetment approximately eight feet inside the remaining dune and beachfront was not acceptable to the Committee. It sacrifices even more of our remaining dune and beachfront while not protecting the beach environment. Buildings 7 and 8 are already precariously close to the ocean and have NO beachfront left to lose. The two Proposals “A” & “B” are in Mott MacDonald Proposals A-B (4-21-2017) ([atch 11](#)).

Mott MacDonald’s Step 2 and 3 proposal “A” is for a more durable solution. Step 2 would consist of preliminary engineering to evaluate both intermediate term (2 to 5 years) and long-term (beyond 5 years) solutions for protecting the buildings and utilities.

Mott MacDonald’s cost of Step 2 could be **\$50,000 to \$100,000**. **The permitting cost estimate is not included**. In comparison, Golder’s high-range cost estimate for a similar long-term solution is at most **\$75-\$80,000** and includes the cost of a full Shoreline Management Substantial Development Permit.

Step 3 would consist of a final engineering design of the permitted solution and for obtaining bids for construction. Their tasks would include preliminary design and analysis of alternatives, coastal engineering analysis, and coordination with environmental permitting specialists and a legal advisor. Step 3 could be 10% to 15% of construction cost. They have not developed a construction cost estimate at this time. Therefore, costs can vary a great deal depending on the final design concept and other factors.

Only because of Mott MacDonald’s excellent credentials on large projects did the Committee continue to encourage them from 4/4/2017 to 4/19/2017 to come forward with a proposal, even on modified terms, but ultimately their proposal is not as thorough or complete as required for a positive recommendation.

No permitting costs were included with Mott MacDonald’s proposal. The permitting company that has been partnering with Mott MacDonald for the last 15 years is [Grette Associates of Tacoma, WA](#).

GEORESOURCES LLC

[GeoResources LLC](#) proposes to work with contractors to install a series of 3 sheet pile walls, in the area between the existing northern condominium units and the shoreline. The top of the walls will be staggered, so that the one closest to the beach will be lower than the dune surface, the middle wall will be at the dune surface, and the one closest

to the condominiums will be about 2 to 3 feet above grade. The GeoResources LLC proposed engineering cost for this project is \$13,645. The [Soundview Consultants](#) permitting cost is estimated to be in the range of \$28,350 - \$33,350. Therefore the engineering and permitting cost range would be \$41,995 - \$46,995.

5/12/17 Email Update to Construction Costs of GeoResources LLC 3/15/2017 Proposal

The construction cost for 3 rows of sheet pile walls is a range of \$320 to \$370 per lineal feet X 712 feet = \$227,840 to \$263,440. This does not include the protection barrier required on the ocean side of the western most wall, nor the sand and grass added to cover the wall tops. In addition, the ground underneath the rows of sheet piles will have to be cleared of logs and debris to allow the installation of the vinyl sheet piles. Total cost estimate with a high is \$310,435 for three rows of sheet piles.

This GeoResources LLC proposal ([atch 12](#)) a long-term solution; therefore there was no Step #1 proposal presented. The permit requirements for this GeoResources LLC proposal will be managed by the proposal of Soundview Consultants ([atch 13](#)).

NORTH COVE DYNAMIC REVETMENT

Think of dynamic revetment as nothing more than LARGE grains of sand – cobble stones instead of sand. With 8-10 inch sized cobble and gravel fill, cover the dune face at a 20-30 degree angle and over the top of the dune and back eastward for about 3 feet. The cobble is flared out towards the water from the base of the dune 20 -30 feet. This gives dynamic protection as the cobble absorbs the wave energy by slightly moving about instead of standing firm like jetty rock. It is much like a runaway truck heading down the mountain road. Do you put up a large solid concrete wall for the truck to crash and disperse its energy harmfully, or do you have a gravel ramp the truck can turn onto for its wheels to sink into and gently dissipate the energy of the truck as it comes to a stop? Wave action on the dynamic revetment is much the same. Instead of waves hitting a hard wall of protection with un-dissipated wave energy then washing away the sand from behind, under, and around the “protection”, with dynamic revetment, that wave energy is instead dissipated and sand coming *in* with the waves is *deposited* over the cobble. Due to the reduction in wave reflective energy, dynamic revetment also protects the beach area around its perimeter from eroding; a very important point for acceptance by the Department of Ecology.

The Committee has been impressed with the success of dynamic revetment at Washaway Beach since even before our site surveys with Mr. David Cottrell on 2/26/2017 and 3/17/2017.

[Presentations of David Cottrell and Relevant Coastal Erosion Information](#)

Mr. Cottrell, Chairman of the Grayland Drainage District No 1, is also the project manager for their work with buried and dynamic revetment projects at North Cove working with [Ken Miller Construction](#). Together, the two have started a new-age trend in successful and inexpensive dynamic revetment that addresses the environmental concerns of government agencies and uses material indigenous to our Western Washington beaches (gravel and cobble rock).

There was doubt cast our way when the Committee first started talking about [Washaway Beach](#), but after a meeting 5/9/2017 in Tokeland with the Shoalwater Tribal Council, Pacific County Commissioner, representatives from WSDOT, US Army Corp of Engineers, Department of Ecology, State Congressman, Pacific Conservation District, and Washington Sea Grant, the Committee believes WBTS BOD members may see the possibilities of this approach for WBTS.

Mr. Cottrell has recently been granted authority by the Department of Ecology to use dynamic revetment along an entire mile of Washaway beach and Willapa Bay to build up dynamic revetment on the seaward side of their buried revetment. It should be noted that the dune on the ocean side of the buried revetment eroded up to that revetment, which will now be rebuilt and protected by a new "dynamic" revetment. We can learn from his methods and success and how well he did obtaining the minimum required permitting. He is now a self-approving authority for SEPA, which essentially allows him to determine if there is a requirement for an environmental impact statement.

One key to Mr. Cottrell's success is not only does he have a handle on the technique and design; he works with the agencies from within the permit system seeking what they need in order to approve a plan. As Golder also says time and time again, if you work within the agencies, you can really get a lot done. Golder emphasizes the involvement of a knowledgeable customer point of contact (WBTS project manager) creates a powerful team to assist the geotech firm as they together work within the agencies.

The Committee spent considerable time researching the possibilities of dynamic revetment with Ken Miller. His construction company has earned the highest trust from the Department of Ecology and Army Corps of Engineers in how to properly apply dynamic revetment. Ken Miller construction surveyed our property at WBTS for the best way to deliver the cobble revetment material, apply it across the dunes most effectively, reduce the wear and tear of construction equipment on our property, and to do all this a very cost effective rates.

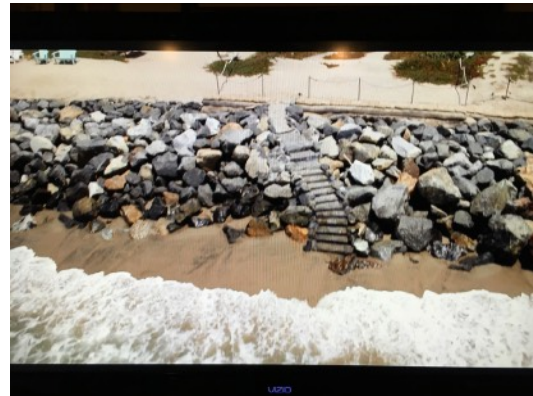
Golder is still the recommendation for overall management of any project, especially long-term. Though the Committee believes very strongly the umbrella of professional oversight is critical for best success and ultimate best dollar value of protection over the years, self-help in going the “North Cove” way is an option for WBTS.

Videos of Storm Action with Dynamic Revetment - Washaway Beach

Nature’s Way

Design with Nature – Oregon Cobble Berm

This dynamic revetment at the tall banks of Washaway Beach is not attractive, but it is very effective. Be sure to look at the videos. If selected, WBTS would have revetment up and over the top of the dunes. It can be quite attractive if constructed like the beach with the stairway. (WBTS cobble would be gravel size up to 8-10 inches in diameter.)



OTHER ISSUES

WBTS PROJECT MANAGER/POINT OF CONTACT

With dune erosion planning and permitting, nothing is Black and White and the complexities of concerns and planning are many. There is no such thing as a turnkey operation, no matter how well you write the contract. Any dune erosion mitigation project must have the involvement of a customer representative as a single point of contact. The customer should also be prepared to provide some measure of daily oversight during periods of active design, permitting, or construction. Without a WBTS point of contact, Board members themselves will need to participate in various contractual points of interface.

- Coordinate the detailed drafting of a geotechnical contract
- Host contractor site surveys to stay in the loop of ever changing issues
- Represent WBTS in permit application meetings - Geotech firms confirm it is extremely helpful to have owner representation when they meet with government permit agencies.
- Attend project milestone reviews and provide status updates to the Boards
- Attend the project-kickoff teleconference call between the design and permitting team and WBTS HOA

The self-help dune erosion mitigation of the past two winters was managed by Phase III BOD members and took a great deal of their time. Can they or do they want to continue with those demands and responsibilities? For the successful outcome of any dune erosion mitigation program, Boards must ask themselves WHO will represent the interests of WBTS?

The Committee does have a recommendation on how to fill this position if the BODs wish to discuss.

CONSTRUCTION ACCESS

Seeing the unavoidable harm construction equipment created between buildings 2 & 3 in March 2016 and between buildings 6 & 7 in FEB 2017, the Committee discussed several options to mitigate damage from construction across the entire 712 feet of WBTS beachfront. After extensive consulting with a local contractor, the Revised Criteria ([atch 5](#)) address options that both reduce damage to our property caused by construction vehicles backing up and turning around while also enhancing the overall strength of erosion mitigation by adding protection to our northern and southern flanks.

We researched property ownership on the north boundary of WBTS with Grays Harbor County, the City of Westport, and a representative of Washington State Parks. There are options for construction access to our dunes and further options for placement of materials upon the beachfront.

Now



What's been lost!



SUMMARY

Golder Associates and BergerABAM were by far the most proactive and involved in generating a viable proposal to meet WBTS needs. They submitted their first proposal 2/17/2017 based on previous studies they had done; then updated that proposal on 3/14/2017 ([atch 6](#)) after their 3/7/2017 site survey, and again a proposal dated 3/28/2017 ([atch 7](#)) to address the Committee's Revised Criteria. They revised that proposal 4/17/2017 to addressing a reduction in permit costs in anticipation of a change in the permitting process.

It is too late now at the end of May 2017 for Golder to definitely be able to address STEP 1 implementation for NOV 2017, but if commissioned to begin the study of conceptual options as outlined in their 3/14/2017 proposal, they provide the least expensive professional engineering and permitting costs, and if given a *kickoff* date prior to July 1, 2017, and if HOA 3 is able to extend their current emergency permit, there is a *chance* STEP 1 might be doable by NOV 2017.

The Committee is confident Golder Associates and BergerABAM will provide service above and beyond the standard of care commensurate with other professionals in the business. They want to do the work and are assured they will be successful.

The Mott MacDonald plan of building a buried revetment inside (approximately eight feet) of the remaining dune and beachfront was not acceptable to the Committee. It sacrifices even more of our remaining dune and beachfront while not protecting the beach environment. Buildings 7 and 8 are already precariously close to the ocean and have NO beachfront left to lose.

The GeoResources LLC proposal is not considered by the Committee as being suitable to stand up to the impact of intense winter storms.

North Cove Dynamic Revetment

Golder is still the Committee's recommendation for management of any project, particularly long-term. Though the Committee believes very strongly their umbrella of professional oversight is critical for best success and ultimate best dollar value of protection over the years, self-help in going the "North Cove" way is an option for WBTS.

RECOMMENDATIONS

1. Immediate Commissioning of Golder Associates and BergerABAM

Recommend commissioning Golder Associates Ltd. to accomplish the "*Options Evaluation Assessment*" of their 3/14/2017 proposal ([atch 6](#)). It is the least costly stepping stone approach for a long-term solution while also remaining ready for the opportunity of an opening in the shoreline permit process allowing implementation by NOV 2017 of the high priority Revised Criteria STEP 1 to protect the dunes from the coming winter storms.

Our recommendation emphasizes **we must not delay** the decision to contract and begin the project. The Committee is confident the team of Golder Associates Ltd. and BergerABAM will provide service above and beyond the standard of care commensurate with other professionals in the business. They want to do the work and are assured they will be successful.

2. WBTS HOA 3 Extend their Current Emergency Permit beyond 5/31/2017 -

Recommend WBTS HOA 3 expedite efforts to extend the current HOA 3 emergency permit expiring 5/31/2017. This is needed for WBTS's "self-help" with sand and logs this winter should we have no other option. It will also save time and money for WBTS when hiring any engineering firm to design and shoreline permit a dune erosion mitigation plan.

3. Consider North Cove Option

The Committee's first recommendation is to commission Golder to lead the WBTS dune erosion mitigation effort via their 3/14/2017 proposal. In so doing, we have a professional partner to assist in both design and Shoreline SDP efforts. If Golder can't get a shoreline permit within a particular timeframe, it is unlikely the North Cove project can do any better. Therefore, as an alternative primarily for financial reasons, the Committee recommends the WBTS BODs take a careful look at the possibilities with the North Cove project. For a cost comparison analysis between Golder and North Cove construction costs, see [atch 14](#).

CONCLUSIONS

We are running out of time. Winter and more erosion are on the way, and further delay will only jeopardize our beachfront. The fact that we have in the past extended the sand and log emergency repair permit with the City of Westport is an important factor to consider going forward regarding future permits. The temporary permit is designed to be an interim measure to buy us some time while we design and permit a long-term and substantial solution. Engineers and permitting professionals advise WBTS needs to approach the permitting process immediately before May 31, 2017 to establish a "place mark" with the current HOA 3 emergency permit. This is necessary even if WBTS does nothing more than another sand and log approach this coming winter. *But, we do not really know all our options until we begin the process.* Time is of the essence.

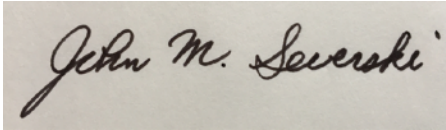
As heard at the Annual HOA Meetings, owners expect a meaningful and significant response to the problems of dune erosion. Are we going to balk at an initial cost of approximately **\$16,000** for Golder Associates 3/14/2017 proposal to get this project underway after spending **\$80,000** on sand and logs? It is the responsibility of the Phase I/II and Phase III Boards of Directors to explore a means of alternative financing for this project, and it is their fiduciary responsibility to act in the best interest of the owners of WBTS.

The time has come to hire the professionals, trust their judgment, and follow their advice. Golder Associates Ltd. is an outstanding geotech firm and they are confident in the science of their approach and in the "doability" of the permit process. It would be tragic to lose this opportunity to decisively take action when the need to address the ocean threat is so real.

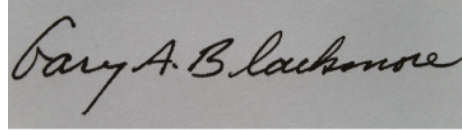
The old adage holds true, *"Pay me now or pay me later."* That is essentially what the ocean is telling us, *"Pay now for proper fiduciary protection of our beachfront or pay later with loss of our property."*

It is unlikely WBTS will ever again have as in-depth a report of ***Doable, Durable, Affordable, and Permittable*** options and solicited proposals from a more devoted group of owner volunteers. We honestly believe what our research shows and our recommendations are the only options with merit.

The WBTS Dune Erosion Committee looks forward to a productive discussion of these issues at a Joint Board Review Session with the Board of Directors of Phase I/II and Phase III. We hope the BODs will encourage owner attendance and vote “in the near future” on these recommendations and inform owners of that vote.



JOHN M. SEVERSKI
Dune Committee Co-Chair
(as of 3/29/17)
Final Report Author
Phase I/II Board Member



GARY A. BLACKMORE
Dune Committee Co-Chair
(as of 3/29/17)
Final Report Author
Phase III

Additional Committee Members

Phil LaGrandeur
Dune Committee Chair (Oct 2016 to 3/18/17)
Final Report Editor
Former Phase III Board Member

Patti Fiorito
Dune Committee Chair (3/18-29/17)
Phase III Board Member
Final Report Reviewer

Paula LaGrandeur
Active Member
Phase III
Final Report Reviewer

Suzy & Jay Wakefield
Contributors
Phase I/II

Jean Veldwyk
Phase III

Toni Bailey
Active Member
Phase III
Final Report Reviewer

Keith Burk
Contributor
Phase III

Gary Parker
Contributor
Phase III

ATTACHMENTS

[Atch 1 - Monson Beach Erosion Study WBTS 2007-01-26](#)

[Atch 2 - Dune Erosion Report for WBTS 2007-09-11](#)

[Atch 3 - Dune Erosion Report Summary 2007-09-11](#)

[Atch 4 - Recommend Cobble vs Sand 2-20-2016](#)

[Atch 5 - Revised Criteria for Proposals 03-28-17](#)

[Atch 6 - Golder Proposal 03-14-2017](#)

[Atch 7 - Golder Proposal 03-28-2017](#)

[Atch 8 - Emergency Permit Extension 12-19-2016](#)

[Atch 9 - Mott McDonald Ltr 4-04-2017](#)

[Atch 10 - Mott McDonald Ltr 4-19-2017](#)

[Atch 11 - Mott McDonald Proposal A-B 4-21-2017](#)

[Atch 12 - GeoResources LLC Proposal 3-15-2017](#)

[Atch 13 - Soundview Consultants Permitting 3-15-2017](#)

[Atch 14 - Construction Cost Golder vs Dynamic Revetment](#)

ABBREVIATIONS AND TERMS

BOD - Board of Directors

Committee - WBTS Dune Erosion Committee

Emergency Permit - Exemption from Shoreline Management Act Substantial Development Permit (*as commonly referred to by both professionals and laymen*)

FEMA - Federal Emergency Management Agency

Geotech – geotechnical engineers

HOA - Homeowners' Association

PDF - Portable Document Format

PIE - Pacific International Engineering

SDP - Shoreline Substantial Development Permit

SEPA - State Environmental Policy Act

SEPA is the 1st step where it is determined if an Environmental Impact Statement (EIS) is required. Then you submit a JARPA (Joint Aquatic Resource Permit) application through your County Planning Department. That application works for both the HPA (Hydraulic Project Approval) issued by Dept. Fish and Wildlife and the Shorelines Substantial Development Permit that is issued by your County Planning Dept.

WBTS - Westport by the SEA

[Shoreline Terms and Definitions](#) (not in the body of the report)

An understanding of Definitions, Acronyms, and Agencies is needed to navigate the complexities of Shoreline Permits for any dune erosion project at WBTS. This folder of Shoreline Terms is a compilation of the information one will need to understand in dealing with any WBTS project.

ONLINE REFERENCES

Links to WBTS Dune Erosion Committee Archive Documents, Videos, and Pictures (Click on the underlined BOLD)

Status Reports – this is a folder of committee status reports reviewing current Committee work and the time line for completion of the FINAL REPORT.

Photographic Archive– this is a folder of photos and videos of WBTS dunes from the 1930's to today.

Documents and Reports – a folder with a variety of studies nationwide on beach erosion mitigation techniques, WBTS erosion-specific-documents from building elevation permits to Westport City granted emergency permit approval, request for Corps of Engineer Beach Replenishment, “worm” charts measuring dune erosion, and much more.

Previous Erosion Studies – a folder of previous geotechnical studies on the state of WBTS dune erosion, conclusions, and recommendations.

FINAL REPORT and RECOMMENDATIONS

NOTE: If using a smartphone, there is no need to download the DropBox APP. Simply select the “View in Browser” option for viewing access.

EXPLANATION OF VERSION UPDATES

8/8/2017

1. **VERSION 1** - “ver1 FINAL REPORT 5-15-2017” dated 5/15/2017
2. **VERSION 2** - “ver2 FINAL REPORT 5-15-2017” updated 5/16/2017
 - a. Updated atch 14 narrative for clarity and typos. Cost figures all the same.
 - b. Updated FINAL REPORT on pg 25 with new link.
[Design with Nature – Oregon Cobble Berm](#)
3. **VERSION 3** - “ver3 FINAL REPORT 5-15-2017” updated 5/16/2017
Corrected 2 minor typos in text of report
4. **VERSION 4** - “ver4 FINAL REPORT 5-15-2017” updated 5/17/2017
 - a. The video link for David Cottrell was incorrectly identified. More information is now available about dynamic revetment via that link.
 - b. The Table of Contents now shows page numbers that have links to pictures.
 - c. Very minor typos and three word changes for better reading.
5. **VERSION 5** - “ver5 FINAL REPORT 5-15-2017” updated 5/17/2017
Removed (3) extraneous “ “ “ pg 16
6. **VERSION 6** - “ver6 FINAL REPORT 5-15-2017” updated 5/18/2017
 - a. Added significant link to library of Definitions, Acronyms, and Agencies needed to navigate the complexities of Shoreline permits. See pg 33, Shoreline Terms and Definitions.
 - b. Added the email address for Dune Committee on pg 3 for those who do not have automatic email browser connection to hyperlinks.
7. **VERSION 7** - “ver7 FINAL REPORT 5-15-2017” updated 5/25/2017
 - a. Added (2) \$ signs and changed \$5000 to \$5,000 on pg 10 and 11
 - b. Added change page to end of Final Report
 - c. Added “Source: WBTS” under chart on pg 8. NOTE: this info has always been available in the link below the pg 8 chart - [Detailed Pictures and Graphs of Dune Remaining - March 18, 2017](#)
 - d. Corrected Spelling Error in title of Atch 4 pg 32

8. **VERSION 8** - “ver8 FINAL REPORT 5-15-2017” updated 8/8/2017
Reestablished links to some attachments due to archive reorganization. No changes to narrative or attachments.

9. **VERSION 9** - “ver9 FINAL REPORT 5-15-2017” updated 12/16/2017
Updated link to Ken Miller Construction website on pg 24. No changes to narrative or attachments.

10. **VERSION 10** - “ver10 FINAL REPORT 5-15-2017” updated 11/05/2018
Updated corrupted link to Atch 4 “Recommend Cobble vs Sand 2-20-2016” on page 11 and page 32. Some narrative on pg 3 is now highlighted in **RED** for added emphasis. No changes to narrative or original attachments.