

Inn Island Erosion Protection

- Issue:
- a. Bank has eroded , creating a steeper slope, reducing island surface.
 - b. Erosion due to wave action from boats and wind, heavy foot traffic and fluctuating water levels.
 - c. Sand bags previously deployed as interim measure are still present, but vandals and waves have induced deterioration and ineffectiveness.

Purpose of remediation:

- a. to prevent future erosion of the island.
- b. to improve access to swim area for safety and enjoyment purposes.

Decisions we need to come to:

- a. what lenth of the inn island frontage do we want or, or need to protect. One bid is for 165 feet. I suspect this is the entire lenth.
The sand bags are 80 ft. Our other actual bid is for 110 ft.
- b. how much "beach" do we want? How much do we need?
- c. In what order of importance do we assign funtionality, safety, aesthetics and durability? How time consuming/costly is maintenace.
- d. We have been advised that natural methods are preferable for permitting.

There are two basic overall types of erosion control which have been proposed as follows:

- a. a bulkhead with a stair or stairs to the water
- b. creating a slope generally using sandbags, crushed rocks to create the base, covered with a durable top

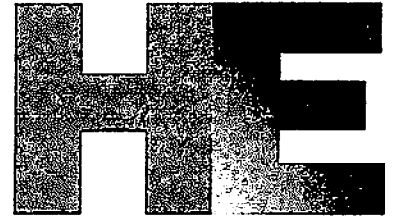
The following are summaries of bids, information, or plans we've received.

Proposed by	Type	Height	Length	Primary Material	Permit Included	Bid without sales tax	Special Features	Omissions	Pros	Cons
Hansen Excavation, LLC - on 9-5-18 I sent owner a list of further questions.	rock Wall	4' tall	110'	Rock	no	\$41,032.69	2 stairs, stair width and number of steps per stair is unknown	No mention of fencing a 4' drop would require	natural, durable, probably low maintenance. Probably simple and quick	Not necessarily the best looking, no beach so to speak. Access limited to stairs
Integrated NW Construction, LLC	bulkhead	4'	165'	Wood, concrete pilons	no	\$82,500.00	bid includes extensive detail for below water treatments to prevent loss of material under the bulkhead	No mention of fencing a 4' drop would require	Beautiful. Best bid in terms of details	No mention is made for number of stairs. No real access to beach other than the stairs.

Proposed by	Type	Height	Length	Primary Material	Permit Included	Bid without sales tax	Special Features	Omissions	Pros	Cons
Ken Martig	Covered Slope	2'	???	concrete blocks 16" x 24" x 4"	no - will probably need better schematics for permitting purposes	estimated \$70 per lineal foot for materials, matching amount for labor - cost for 100' approx \$14,000	no stairs / fencing required		Simple. Probably wouldn't need specialized equipment to build	Engineering work to get permit probably challenging, tough to get contractor to do,
Proposed by	Type	Height	Length	Primary Material	Permit Included	Bid without sales tax	Special Features	Omissions	Pros	Cons
Proposed by Tetra-Tech - Covering Vegetated GeoGrid	Covered Slope	?	?	geotextile fabric, rocks & plants	no - dont' think so	\$20 - \$50 per lineal foot	Natural.		Soil bioengineering allows slope stability, plants between also adds to that. Used in other locations with variable water levels	No beach, no matter the slope. Toe requires armoring using rocks or logs or other. May require 12 mos for plants to establish, costs can vary based on plants, type and amounts of materials used.
Proposed by	Type	Height	Length	Primary Material	Permit Included	Bid without sales tax	Special Features	Omissions	Pros	Cons
Proposed by Tetra-Tech - Covering Articulating Concrete Blocks (ACB)	Covered slope	?	?	Connected blocks with openings for plants, soils	no - I don't think so	\$10 - \$20 per SQUARE FOOT			Durable bank with low maintenance, vegetation can be installed between blocks for stability, good resilient option for high use areas	Proper design specs are CRITICAL, plants may take a year to fully root. Not particularly "natural" which may make it harder to obtain permit
Proposed by	Type	Height	Length	Primary Material	Permit Included	Bid without sales tax	Special Features	Omissions	Pros	Cons
Proposed by Tetra-Tech - Slopetame(2) Erosion Control System	Covered slope	?	?	Erosion control blanket - plastic rings and geotextile fabric, plants	no - I don't think	unknown			Very similar to Vegetated Geo-Grid	Very similar to Vegetated Geo-Grid

Hanson Excavation LLC
86 SE Banjo LN
Shelton, WA 98584
(360)239-6792
jared@hansonex.com

Estimate



Hanson Excavation LLC

ADDRESS

Lake Limerick Country Club

ESTIMATE # **DATE**
1098 05/12/2018

ACTIVITY	QTY	RATE	AMOUNT
Island Rock Wall	1	41,032.69	41,032.69

This Price is for the installation of a Granite rock built bulkhead around the front of the island to prevent further erosion from waves. The wall dimensions are 4' high by approx 110' long. The wall would have 2 sets of stairs built in for water access from the island. The wall will be backed with clean crushed rock to promote drainage and have a heavy duty fabric against the native soil to prevent any washout of native material from crashing waves. The Cost is inclusive of all materials, Trucking, labor, equipment, and temporary bridge to access the island. The site will be restored to preexisting conditions or better. The disturbed Grass areas will be restored with topsoil. We will leave the grass seeding application and watering to the Country Club.

Tax would be applied if applicable.

TOTAL

\$41,032.69

Accepted By

Accepted Date

8

Integrated NW Construction, LLC
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60 N. Lake Cushman Rd, Suite 109
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(206) 310-4239
Caralyn@integratedNWconstruction.com
www.integratedNWconstruction.com



ESTIMATE

ADDRESS

Brian Smith
Lake Limerick Homeowner's
Association
701 E Ballantrae Dr
Shelton, WA 98584

ESTIMATE # 1272

DATE 07/03/2018

EXPIRATION DATE 08/02/2018

DATE	ACTIVITY	QTY	RATE	AMOUNT
07/03/2018	Bulkhead Install bulkhead using Alaskan yellow cedar (AYC) up to 165 lineal feet and 4' high Bulkhead piles shall be 6x6 AYC, buried 4' into ground, encased in concrete Piles shall be spaced every 6 - 8 feet, depending upon engineered drawings Bulkhead faceboards shall be 3x12 AYC attached to piles using 3/8" Timberlocks and 5/8" lag bolts Face boards shall extend underground on bottom run by 6" Bulkhead shall be capped using 3x12 AYC, with all edges routed for round-over Geo-technical fabric shall be installed behind bulkhead and attached to soil 4" rip-rap shall be installed up 12" on back of bulkhead 7/8"-minus shall be installed on top up to 24" 5/8"-minus shall be installed on top of the 7/8"-minus and made flush with ground One set of stairs shall be installed for access to beach - Client to choose orientation of stairs	1	82,500.00	82,500.00T

NOTE: We discussed placing rocks on the lake, however after looking at the bridge and the way it is constructed, there is no way to get a machine over there. Rocks would have to be placed from the water. This is something that we can sub-contract out, but we don't have the machinery to place that size of rock from the water. We suggest facing the bulkhead with rip-rap and 7/8 gravel as an alternative that would

SUBTOTAL	82,500.00
TAX (8.8%)	7,260.00
TOTAL	\$89,760.00

cut costs. This is not in our estimate.

Also, the costs of permits, permit services, drawings, reports, etc. are not included in this estimate.

Accepted By

Accepted Date



Integrated NW Construction, LLC

"Where Experience Equals Results"

Contractor's License: INTEGNC850J7

253-888-5314

Electrical License: INTEGNC850LT

Bulkhead, Stairs, Dock, & Pier

Stairs, Retaining Walls, & Fence

Military and Senior Discount

Sunroom Addition

Picnic Pavilion w/ Bathroom

Bulkhead, Stairs, Dock, & Pier

- Fully licensed, bonded, and insured
- Permit application submission or assistance
- Experienced with requirements for shoreline projects
- Solid relationship with permitting agencies (F&W, ACOE, Mason County etc.)
- Quality craftsmanship with solid warranties on work
- Additions, garages, docks, piers, decks, bulkheads, staircases, new construction, and more!

EMAIL US TODAY!
Sales@integratedNWconstruction.com
www.integratedNWconstruction.com

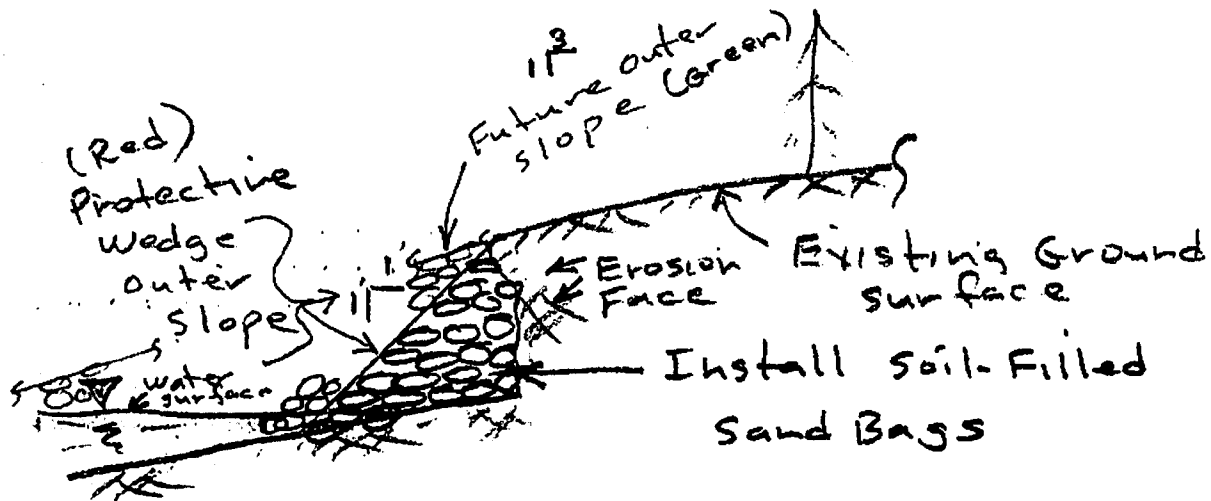
Ken Mantig
360 507 0489

(1/15/17)

Lake Limerick

Inn Island

Shoreline Erosion control



Fill Poly-weave Sandbags with soil from stockpile by water Tank

Fill Bags \approx 80% full

Stack against Erosion Face, Forming sandbag wedge with outer slope of 1' Vertical Height to 1' Horizontal Run

Note, once protective sand Bag wedge (shown in Red) is installed, continue adding Sand Bags (shown in Green) until the slope becomes 1:3, V.to H.

Note: If the "Red" Protective Sand Bag Wedge is installed ASAP, there will be no need for the "Protective Log Boom" to be installed.

Proposed by Ken Martig

Natural Bank

Cost Estimate (use 2' High Bank)

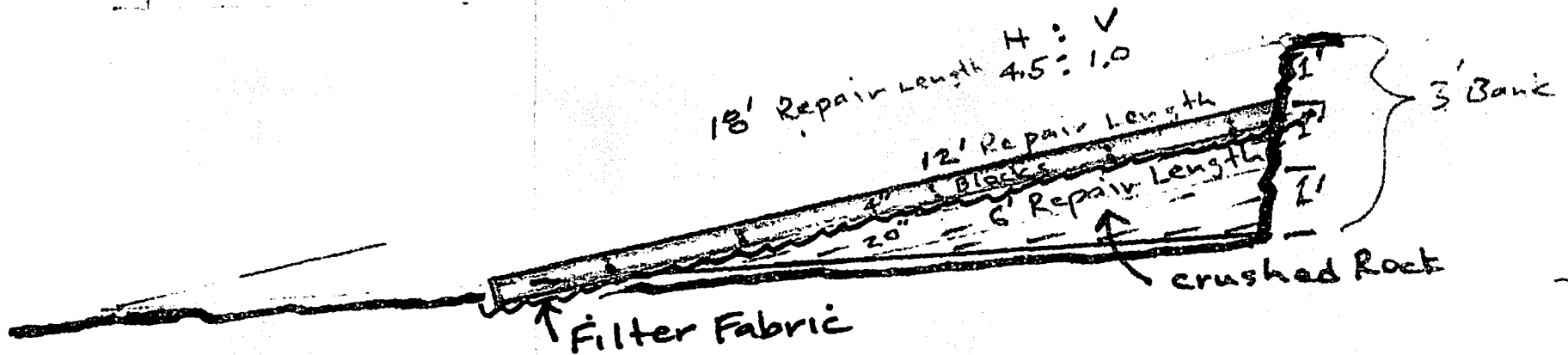
Bank Restoration

- Given:
- Bank Height is 2.0'
 - use 2' wide strip (cost per 2 L.F. of Repair)
 - Blocks are 16" x 24" x 4"

Find:

Material
cost

- # of Blocks Req'd = 12 L.F. = 1,33 = 9 Blocks @ \$3.5 = \$28
- sq ft of Filter fabric = $L \times W = (12' + 4') \times (2') = 28 \text{ ft}^2 @ 0.12 = \4
- Crushed Rock
 $V \approx \left[\frac{(12' \times 2')^{1/2}}{2.7 \text{ ft}^3/\text{yd}^3} \right] \times (2') \approx 0.9 \text{ yds} \times \$40 = \$35$
Total $\frac{\$67}{\$67}$ say \$70 per 2 L.F.



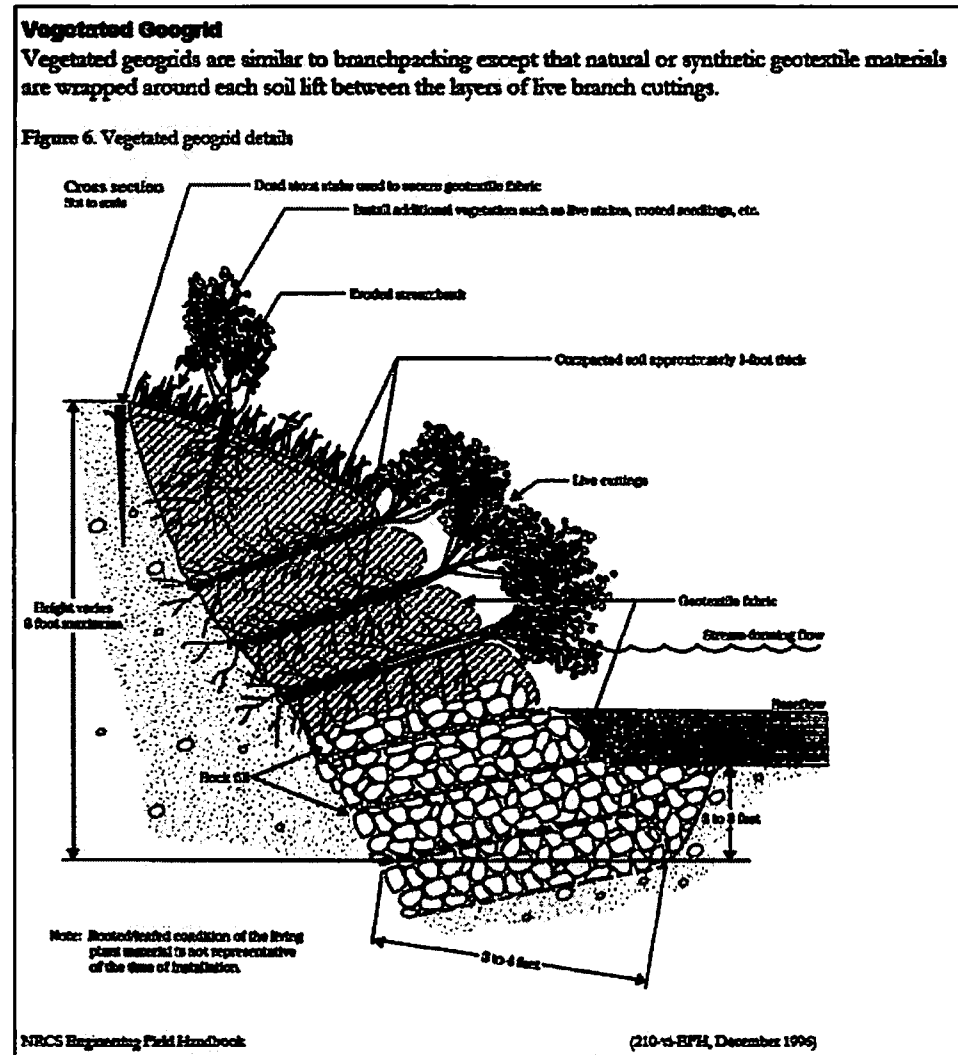
Labor cost Approximately the same as Material cost

Summary: Each Linear Foot of 2'-High Bank Restoration

Total Estimated cost per Foot
 $\frac{\$70 \times 2}{2} = \underline{\underline{\$70 / \text{L.F.}}}$ of 2'-High Bank Restoration

Vegetated GeoGrid

- Utilizes “wraps” of geotextile fabric around soil or compacted gravel-borrow, vegetation between wraps
- Outer layer of wraps can be overlain with fabric and covered with turf or slope-reinforcing structure
- Estimated Material Costs: ~\$20-\$50/linear foot



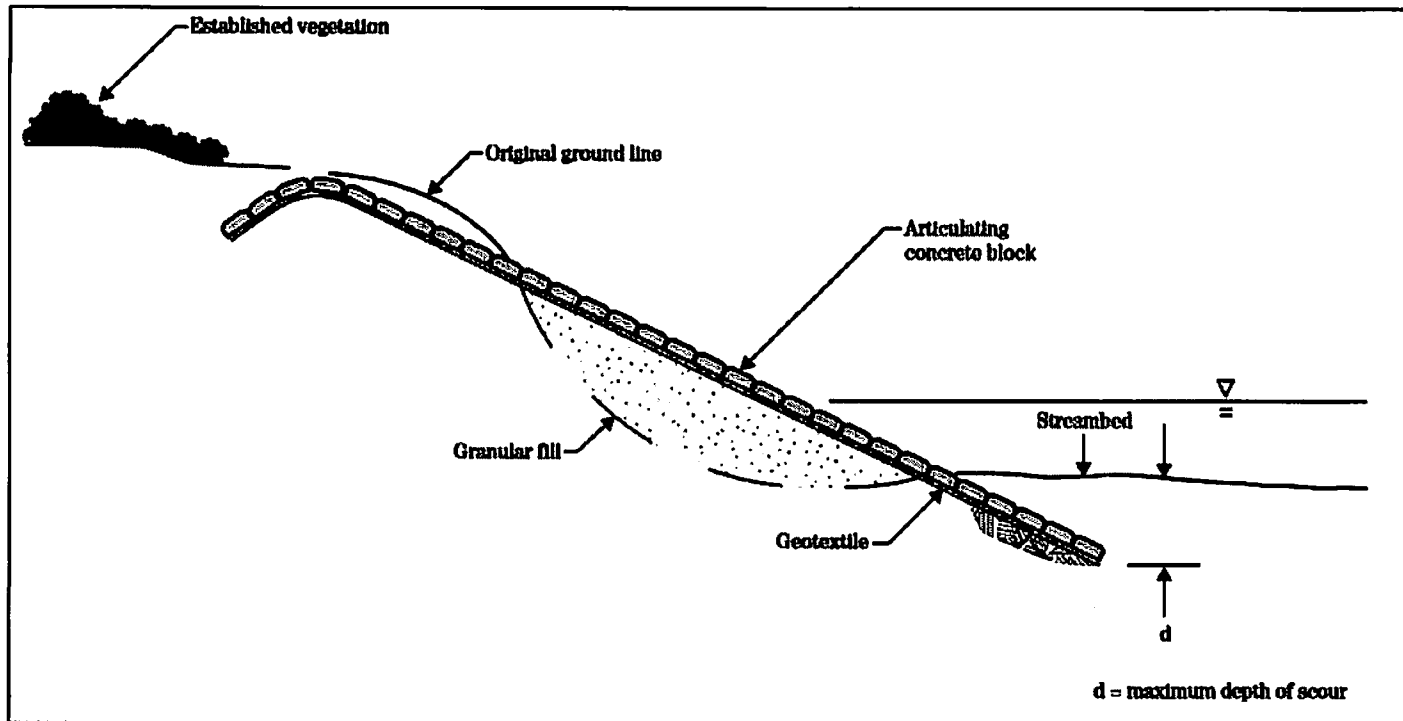
Vegetated GeoGrid

Example Photos (FEMA)



Articulating Concrete Blocks (ACB)

- Utilizes small concrete blocks connected by cabling
- Blocks are overlain on a geotextile fabric and granular filter to retain soil but still allow porewater to pass through
- Estimated Material Costs: ~\$10-\$20/square foot



Slopetame² Erosion Control System

- Erosion control blanket that utilizes plastic rings and geotextile fabric to stabilize banks and provide erosion protection along slopes
- Vegetation can be planted inside the rings allowing the roots to anchor in to the soil
- This option could be used by itself or in conjunction with other methods
- Pros/Cons very similar to Vegetated GeoGrid

