

AMBIT ENGINEERING, INC. CIVIL ENGINEERS AND LAND SURVEYORS 801 Islington Street, Suite 31, Portsmouth, NH 03801 Phone (603) 430-9282 Fax 436-2315

14 January 2019

Wetland Inspector New Hampshire Department of Environmental Services Wetlands Bureau 29 Hazen Drive / P.O. Box 95 Concord, New Hampshire 03302

Re: NHDES Minimum Impact Expedited Wetland Application Tax Map 12, Lot 1-8 32 Cedar Point Road Durham, New Hampshire

Dear Wetland Inspector:

This letter transmits a New Hampshire Department of Environmental Services (NHDES) Minimum Impact Expedited Wetland Application request to permit 281 sq. ft. of permanent impact to tidal waters, and 1,705 sq. ft. of permanent impact to the previously developed 100' Tidal Buffer Zone for shoreline stabilization and construction of a stone/granite patio which will provide foot access to the previously approved tidal docking structure (DES File: 2018-00708).

The stabilization of the existing slope consists of placement of rip rap toe protection, followed by a section of Pyrawall (see Pyrawall Detail Sheet and Pyrawall Product Data), followed by a section of Armormax (see Armormax Detail Sheet and Armormax Product Data).

The rip rap toe protection is needed to provide protection from tidal action and wave energy, and also provides a structural foundation for the slope above it. The rip rap toe will be constructed of 2-3 ton stones, a base course of 6"-18" stones located directly landward, and a geotextile fabric which allows water to pass through, yet keeps the fine grained material in place, critical to long term stability. The rip rap toe is essential to a stabilization project such as this, as it serves as the foundation that the slope is built upon (see rip rap toe protection Detail on Sheet C3).

The Pyrawall product is an engineered wrap-face vegetated solution that consists of two components, the Pyramat turf reinforcement mat, and a fiber composite internal bracing. The two components when used together create a reinforced soil wall or slope system that provides permanent erosion protection. The Pyrawall will be vegetated by seeding within the wall lift and hydroseeding on the outside of the product. Live stakes will also be planted in the wall lift composed of native shrub species (see planting notes on Revetment Permit Plan-Sheet C2). The Pyrawall is held in place via backfilling and engineered earth anchors desinged specifically for the product.

The Armormax product is a flexible erosion control application designed for steep slope stabilization, in this case approximately 75%-90% slope, yet allowing for vegetation to be planted further improving the functionality. The Armormax is a high performance turf reinforcement mat that will be installed along a portion of the slope, secured by engineered earth anchors. The Armormax product will be vegetated by seeding the soil with 60% of the total seed mix underneath the mat, and then spreading the remainig 40% of the seed mix with a thin layer of soil on top of the mat. The soil placed on top of the Armormax will then be covered with an erosion control blanket (Landlok-see Slope Stability Installation Details), to

prevent erosion until vegetation is established. Additionally, live stakes will also be planted within the Armormax mat composed of native shrub species (see planting notes on Revetment Permit Plan-Sheet C2).

It is our belief that construction of a rip rap toe, and utilization of the Pyrawall and Armormax products along the steep slope (approximately 75%-90% slope) demonstrates the need for an engineered solution to provide shoreline stabilization on the site, given the severe slope. It is also our belief that using traditional vegetated and/or biodegradeable shoreline stabilization methods would not be applicable to this site as those methods would not provide the necessary structural stability on a 75%-90% slope. The proposed products provide structural stability which will hold the slope in place preventing slope failure, while also providing a vegetative component that will provide an increased erosional and stormwater quality improvement in regards to the adjacent tidal resource.

It is also our belief that this stabilization design represents the least impacting alternative, given site conditions and constraints, while allowing reasonable use of the property. It is our opinion that the proposed project meets Env-Wt 404.01 as the stabilization method is practical given the severe slope. The project meets Env-Wt 404.03 as the untable bank cannot be cut back to a flatter slope as it would encroach into the fill extension for the previously approved septic leach field (DES File: 2018-01046). Lastly, the project meets Env-Wt 404 as the horizontal distance between the bottom of the slope and the top of the slope is limited, the proposed design requires a structural rip rap toe, however the design does incoporate a vegetated stabilization solution above the rip rap toe, ensuring a stable slope, while accomodating seeding/planting which will provide added beneift in terms of water quality entering Little Bay.

Attached to this application you will find a plan set which depicts the existing conditions, jurisdictional areas, abutting parcels, existing structures, proposed work, cross sections of the proposed revetment, and design & installation details provided by Propex Geosolutions.

In order to complete the application package for this project, the DES Wetlands Bureau rules in Chapter Env-Wt 300 have been thoroughly reviewed, specifically Env-Wt 302.04 (b) and Env-Wt 302.04(c). Items listed in rule Env-Wt 302.04 (b) are addressed below.

1. Type of wetlands impacted;

The project proposes no wetland impacts. The impacts are to the previously developed 100' Tidal Buffer Zone. The wetlands located adjacent to the property are part of a larger tidal wetland system (Little Bay). The tidal wetlands associated with the site are classified as an estuarine intertidal unconsolidated shore mud wetland system that is regularly flooded by the tide (E2US3N).

2. The surface area of the wetlands that will be impacted;

The project proposes no wetland impacts. The impacts are to the previously developed 100' Tidal Buffer Zone.

3. The relationship of the proposed wetlands to be impacted relative to nearby wetlands and surface waters;

The project proposes no wetland impacts. The impacts are to the previously developed 100' Tidal Buffer Zone. The wetlands located adjacent to the property are part of a larger tidal wetland system.

4. The impact to abutting owners pursuant to RSA 482-A:11, II; There are no impacts to the abutters interests.

5. Lack of alternatives with lesser wetlands and surface water impacts.

The project proposes no wetland impacts or surface water impacts. The impacts are to the previously developed 100' Tidal Buffer Zone.

Items listed in rule Env-Wt 302.04 (c) are addressed below.

1. The extent to which a project impacts beach or tidal flat sediment replenishment and movement of sediments along a shore;

The project proposes no impact to a beach or tidal flat. There will be no impacts to sediment replenishment or the movement of sediments along a shore.

2. The impact on a tidal wetlands ability to dissipate wave energy and storm surge;

There will be no impacts to the tidal wetland that exists on site which functions to dissipate wave energy and/or storm surge.

3. The impact of project runoff on salinity levels in tidal environments.

The project will have no impact on the lots ability to contain stormwater or runoff and provide treatment before it enters adjacent resource areas.

Please contact me if you have any questions or concerns regarding this application.

Respectfully submitted,

Steven D. Riker, CWS NH Certified Wetland Scientist/Permitting Specialist Ambit Engineering, Inc. 17 August, 2017

To Whom It May Concern

RE: New Hampshire Department of Environmental Services Application for residential site re-development for Manisha P. Heiderscheidt 2010 Revocable Trust, 32 Cedar Point Road, Durham, NH.

This letter is to inform the New Hampshire Department of Environmental Services and the Town of Durham, in accordance with State Law that Ambit Engineering is authorized to represent me as my agent in the approval process.

Please feel free to call me if there is any question regarding this authorization.

Sincerely,

Benedict G. & Manisha P. Heiderscheidt, Trustees Manisha P. Heiderscheidt 2010 Revocable Trust 21 Caverno Drive Lee, NH 03861 603-988-8128 NHDES-W-06-012



WETLANDS PERMIT APPLICATION

Water Division/ Wetlands Bureau Land Resources Management



Check the status of your application: www.des.nh.gov/onestop

RSA/Rule: <u>RSA 482-A</u> / <u>Env-Wt 100-90</u>	<u>0</u>	, , .									
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Administrative		Administrativ	ve		A		è	Chec	k No.:		
Use Only		Use Only				Use Only		Amou	unt:		
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1. REVIEW TIME: Indicate your Revi	ew Time be	elow. To det	termine r	eview tin	ne, refer	to <u>Guidan</u>	ce Docume	<u>nt A</u> fo	or instructio	ons.	
Standard Review (Minimum	, Minor or N	/lajor Impac	:t)			Expedited F	Review (Mir	nimum	n Impact or	nly)	
2. MITIGATION REQUIREMENT: If mitigation is required a Mitigation-Pr if Mitigation is Required, please refer t	e Applications the <u>Deter</u>	on meeting rmine if Miti	must occ gation is	cur prior Require	to subm d Freque	itting this W ently Asked	/etlands Pe I Question.	rmit A	Application.	To de	etermine
Mitigation Pre-Application Mee	ting Date: I red	Month:	Day:	Year:							
3. PROJECT LOCATION: Separate wetland permit applications	must be sul	bmitted for	each mu	inicipality	that we	etland impac	cts occur wi	ithin.			
ADDRESS: 32 Cedar Point Road							TOWN/C	ITY:	Durham		
TAX MAP: 12	BLOCK:				lot: 1	-8		UNI	T:		
USGS TOPO MAP WATERBODY NAME:	Little Bay	/			🗆 NA	STREAM V	VATERSHE	O SIZE	:		🛛 NA
LOCATION COORDINATES (If known):	(:1,201,06	3.2099 Y:	230,382	2.7430		Latitude	e/Longitude	D U	ITM 🛛 Sta	te Plan	е
4. PROJECT DESCRIPTION: Provide a brief description of the proje of your project. DO NOT reply "See A	ect outlining ttached" in t	the scope the space p	of work. provided l	Attach a below.	dditiona	Il sheets as	needed to	provid	de a detaile	ed expl	lanation
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5. SHORELINE FRONTAGE:											
□ NA This does not have shoreline	frontage.		SHC	RELINE	FRONT	ГАGE: 77 f	eet				
Shoreline frontage is calculated by de straight line drawn between the prope	termining th rty lines, bo	ne average oth of which	of the dis are mea	stances on a sured at	of the ac the nori	tual natural mal high wa	l navigable ater line.	shore	eline frontag	ge and	а
6. RELATED NHDES LAND RESOU Please indicate if any of the following To determine if other Land Resources	RCES MAN permit appl Manageme	NAGEMEN lications are ent Permits	T PERMI e required are requ	IT APPL d and, if r uired, refe	ICATION required er to the	NS ASSOC , the status Land Resc	of the appl	FH TH ication agem	IIS PROJE n. <u>ent Web P</u>	CT: age.	
Permit Type		Permit Re	equired	File	e Numb	er Pe	rmit Applic	ation	Status		
Alteration of Terrain Permit Per RSA 4 Individual Sewerage Disposal per RSA Subdivision Approval Per RSA 485-A Shoreland Permit Per RSA 483-B	185-A:17 A 485-A:2	☐ YES ☐ YES ☐ YES ☐ YES	× NO NO NO NO NO				APPROVE APPROVE APPROVE APPROVE] PENDIN] PENDIN] PENDIN] PENDIN		DENIED DENIED DENIED DENIED
7. NATURAL HERITAGE BUREAU & See the Instructions & Required Attac	& DESIGNA	ATED RIVE	RS:	ns to cor	nplete a	& b below.					
a. Natural Heritage Bureau File ID:	NHB <u>19</u>	0161	<u> </u>								
 b. Designated River the project is date a copy of the application N/A 	s in ¼ miles was sent to	s of: o the <u>Local I</u>	River Ma	nageme	nt Advis	; and ory Commit	<u>ttee</u> : Month	:	Day:	Year:	

8. APPLICANT INFORMATION (Desired permit holder)					
LAST NAME, FIRST NAME, M.I.: Heiderscheidt, Benedict, G. & Heiderscheidt, Manisha, P.					
TRUST / COMPANY NAME: Manisha P. Heiderscheidt 2	010 Rev. M	AILING ADDRESS: 21	Caverno D	Drive	
TOWN/CITY: Lee			STATE: NH	ZIP CODE: 03861	
EMAIL or FAX: b.heiderscheidt@comcast.net		PHONE: 603-988-	8128		
ELECTRONIC COMMUNICATION: By initialing here:, I hereby authorize NHDES to communicate all matters relative to this application electronically.					
LAST NAME, FIRST NAME, M.I.:					
TRUST / COMPANY NAME:	Μ	AILING ADDRESS:			
TOWN/CITY:			STATE:	ZIP CODE:	
EMAIL or FAX:		PHONE:			
ELECTRONIC COMMUNICATION: By initialing here, electronically.	I hereby authori	ze NHDES to communic	cate all matters	s relative to this application	
10. AUTHORIZED AGENT INFORMATION					
LAST NAME, FIRST NAME, M.I.: Riker, Steven, D.		COMPANY	NAME: Ambi	t Engineering, Inc.	
MAILING ADDRESS: 200 Griffin Road, Unit 3					
TOWN/CITY: Portsmouth			STATE: NH	ZIP CODE: 03801	
EMAIL or FAX: sdr@ambitengineering.com PHONE: 603-430-9282					
ELECTRONIC COMMUNICATION: By initialing here <u>S</u> , electronically.	I hereby authori	ze NHDES to communic	cate all matters	s relative to this application	
11. PROPERTY OWNER SIGNATURE: See the Instructions & Required Attachments document for	r clarification (of the below statemer	nts		
By signing the application. Lam certifying that:					
 I authorize the applicant and/or agent indicated on this form to act in my behalf in the processing of this application, and to furnish upon request, supplemental information in support of this permit application. I have reviewed and submitted information & attachments outlined in the Instructions and Required Attachment document. All abutters have been identified in accordance with RSA 482-A:3, I and Env-Wt 100-900. 					
 I have read and provided the required information outlined in Env-Wt 302.04 for the applicable project type. I have read and understand Env-Wt 302.03 and have chosen the least impacting alternative. Any structure that I am proposing to repair/replace was either previously permitted by the Wetlands Bureau or would be considered grandfathered per Env-Wt 101.47. 					
7. I have submitted a Request for Project Review (RPR) Form (<u>www.nh.gov/nhdhr/review</u>) to the NH State Historic Preservation Officer (SHPO) at the NH Division of Historical Resources to identify the presence of historical/ archeological resources while coordinating with the lead federal agency for NHPA 106 compliance.					
 I authorize NHDES and the municipal conservation commission to inspect the site of the proposed project. I have reviewed the information being submitted and that to the best of my knowledge the information is true and accurate. I understand that the willful submission of falsified or misrepresented information to the New Hampshire Department of Environmental Services is a criminal act, which may result in legal action. I am aware that the work I am proposing may require additional state, local or federal permits which I am responsible for obtaining. The mailing addresses I have provided are up to date and appropriate for receipt of NHDES correspondence. NHDES will not forward returned mail. 					
Agent-See Authorization	Steven D. F	iker		1 / 14 / 2019	
Property Owner Signature	Print name legi	bly		Date	

Irm@des.nh.gov or (603) 271-2147 NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095 www.des.nh.gov

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MUNICIPAL SIGNATURES

12. CONSERVATION COMMISSION SIGNATURE				
 he signature below certifies that the municipal conservation commission has reviewed this application, and: Waives its right to intervene per RSA 482-A:11; Believes that the application and submitted plans accurately represent the proposed project; and Has no objection to permitting the proposed work. 				
>	Print name legibly	Date		
DIRECTIONS FOR CONSERVATION COMMISSION				
1. Expedited review ONLY requires that the conservation	commission's signature is obtained in the	space above.		

2. Expedited review requires the Conservation Commission signature be obtained **prior** to the submittal of the original application to the Town/City Clerk for signature.

3. The Conservation Commission may refuse to sign. If the Conservation Commission does not sign this statement for any reason, the application is not eligible for expedited review and the application will be reviewed in the standard review time frame.

13. TOWN / CITY CLERK SIGNATURE

As required by Chapter 482-A:3 (amended 2014), I hereby certify that the applicant has filed four application forms, four detailed plans, and four USGS location maps with the town/city indicated below.

	Defect as an a low?hite	Taxas (Other	Data
Town/City Clerk Signature	Print name legibly	Town/City	Date

DIRECTIONS FOR TOWN/CITY CLERK:

Per RSA 482-A:3,I

- 1. For applications where "Expedited Review" is checked on page 1, if the Conservation Commission signature is not present, NHDES will accept the permit application, but it will NOT receive the expedited review time.
- 2. IMMEDIATELY sign the original application form and four copies in the signature space provided above;
- 3. Return the signed original application form and attachments to the applicant so that the applicant may submit the application form and attachments to NHDES by mail or hand delivery.
- IMMEDIATELY distribute a copy of the application with one complete set of attachments to each of the following bodies: the municipal Conservation Commission, the local governing body (Board of Selectmen or Town/City Council), and the Planning Board; and
- 5. Retain one copy of the application form and one complete set of attachments and make them reasonably accessible for public review.

DIRECTIONS FOR APPLICANT:

1. Submit the single, original permit application form bearing the signature of the Town/ City Clerk, additional materials, and the application fee to NHDES by mail or hand delivery.

14. IMPACT AREA: For each jurisdictional area that will be/has been impacted, provide square feet and japlicable, linear feet of impact Permanent: impacts that will remain fand will be restored to pre-constructions) after the project is complete. Temporary: impacts not intended to remain (and will be restored to pre-constructions) after the project is complete. JURISDICTIONAL AREA PERMANENT Sq. Ft. / Lin. Ft. Forested wetland Impermanne: impacts de pre-constructions) after the project is complete. FORESTONAL AREA PERMANENT Sq. Ft. / Lin. Ft. Forested wetland Impermanne: impacts de project is complete. Sq. Ft. / Lin. Ft. Sq. Ft. / Lin. Ft. Serue wetland Arre Impermanne: impacts de project is complete. Sq. Ft. / Lin. Ft. Serue wetland Impermanne: impacts de project is complete. Serue wetland Impermanne: impacts de project is complete. Serue wetland Impermanne method is a project is complete. Impermanne method is a project is complete. Impermanne methone <th colsp<="" th=""></th>	
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Previously-developed upland in TBZ 1,705 ATF	
Docking - Lake / Pond 🗌 ATF	
Docking - River	
Docking - Tidal Water	
Vernal Pool ATF	
TOTAL 1,986 / /	
15. APPLICATION FEE: See the Instructions & Required Attachments document for further instruction	
Minimum Impact Fee: Flat fee of \$ 200	
Minor or Major Impact Fee: Calculate using the below table below	
Permanent and Temporary (non-docking) sq. ft. X \$0.20 = _\$	
Temporary (seasonal) docking structure: sq. ft. X \$1.00 =	
Permanent docking structure: sq. ft. X \$2.00 = _\$	
Projects proposing shoreline structures (including docks) add \$200 = _\$	
Total = \$ 200.00	
The Application Fee is the above calculated Total or \$200, whichever is greater =\$	

Irm@des.nh.gov or (603) 271-2147 NHDES Wetlands Bureau, 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095 www.des.nh.gov







NH DES Wetland Application Manisha P. Heiderscheidt 2010 Rev. Trust Shoreline Stabilization

SITE PHOTOGRAPHS

Durham, NH





Site Photograph #3

January 2019

Site Photograph #4

January 2019

ABUTTER'S LIST JN 2552.16

Client: Manisha P. Heiderscheidt 2010 Revocable Trust Project Address: 32 Cedar Point Road, Dover, NH

MAP	LOT	NAME(S)	PO BOX	STREET ADDRESS	CITY/STATE/ZIP
12	1-10	Thomas J. Fleming		30 Cedar Point Road	Durham, NH 03824
12	1-6	Craig S. Harris		34 Cedar Point Road	Durham, NH 03824



AMBIT ENGINEERING, INC. CIVIL ENGINEERS AND LAND SURVEYORS 801 Islington Street, Suite 31, Portsmouth, NH 03801 Phone (603) 430-9282 Fax 436-2315

14 January, 2019

Craig S. Harris 34 Cedar Point Road Durham, NH 03824

RE: New Hampshire Wetland Application for shoreline stabilization for Manisha P. Heiderscheidt 2010 Revocable Trust, 32 Cedar Point Road, Durham, NH.

Dear Property Owner,

Under NH RSA 482-A this letter is to inform you in accordance with State Law that a Wetlands Permit will be filed with the New Hampshire Department of Environmental Services (DES) Wetlands Bureau for a permit to **impact jurisdictional wetlands and the previously developed 100' Tidal Buffer Zone forshoreline stabilization**, on behalf of your abutter, Manisha P. Heiderscheidt 2010 Revocable Trust.

This letter is sent to inform you as an abutter to the above-referenced property (according to local Municipal records) that **Manisha P. Heiderscheidt 2010 Revocable Trust** proposes a project that requires construction in the previously developed tidal buffer zone, and jurisdictional wetland areas.

Plans are on file at this office, <u>and once the application is filed</u>, plans that show the proposed project and wetland and other jurisdictional impacts will be available for viewing during normal business hours at the office of the **Durham** clerk, **Durham town offices**, or <u>once received by</u> <u>DES</u>, at the offices of the DES Wetlands Bureau, (8 a.m. to 4 p.m.) (603) 271-2147. It is suggested that you <u>call ahead</u> to the appropriate office to ensure the application is available for review.

Please feel free to call if you have any questions or comments.

Sincerely,

Steven D. Riker NH Certified Wetland Scientsist/Permitting Specialist

CERTIFIED MAIL/Return Receipt Requested

J:\JOBS2\JN2800's\JN 2800's\JN 2801\2017 Site Re-development\Applications\NH DES Wetlands\Fleming Abutter Letter 2801.docx



AMBIT ENGINEERING, INC. CIVIL ENGINEERS AND LAND SURVEYORS 801 Islington Street, Suite 31, Portsmouth, NH 03801 Phone (603) 430-9282 Fax 436-2315

14 January, 2019

Thomas J. Fleming 30 Cedar Point Road Durham, NH 03824

RE: New Hampshire Wetland Application for shoreline stabilization for Manisha P. Heiderscheidt 2010 Revocable Trust, 32 Cedar Point Road, Durham, NH.

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Sincerely.

Steven D. Riker NH Certified Wetland Scientsist/Permitting Specialist

CERTIFIED MAIL/Return Receipt Requested

J:\JOBS2\JN2800's\JN 2800's\JN 2801\2017 Site Re-development\Applications\NH DES Wetlands\Fleming Abutter Letter 2801.docx

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₽-	34 CEDAR POINT ROAD	
	DURHAM, NH 03824	3
	PS Form 3800, April 2015 PSN 7530-02-000-9047	See Reverse for Instructions





ARMORMAX[®] ENGINEERED EARTH ARMORING SOLUTIONS



The ARMORMAX[®] Engineered Earth Armoring Solution is the most advanced flexible armoring technology available for severe erosion and surficial slope stability challenges. ARMORMAX[®] can be used in erosion control applications where additional factors of safety are required, including protecting earthen levees from storm surge and wave overtoppping, and stream, river and canal banks from scour and erosion. In addition, this system is ideally suited to protect storm water channels in arid and semi-arid environments where vegetation densities of less than 30% coverage are anticipated. For slope stability applications, the system can be further engineered to provide surficial slope stabilization to resist shallow plane failures. Consisting of our PYRAMAT[®] woven three-dimensional High Performance Turf Reinforcement Mat (HPTRM) with X3[®] fiber technology and Engineered Earth Anchors, you can count on the ARMORMAX[®] Engineered Earth Armoring solution to hold its ground.



Durable Armoring System Lightweight protection layer securely anchored to the subgrade for long-term design life



Withstands Extreme Hydraulic Stresses

The PYRAMAT® HPTRM component of ARMORMAX® has been tested at CSU comparable to traditional armoring methods



Resists Non-Hydraulic Event Damage

High strength survivability woven surface resists non-hydraulic stresses like debris and main- tenance operations

Secures Erosion Control Applications

Anchors act as tie-down mechanisms, securing the HPTRM firmly to the ground for additional safety factors





Stabilizes Slope Stability Applications

Engineered to provide surficial slope stabilization to resist shallow plane failures

OTHER FEATURES & BENEFITS

- Supports the EPA Green Infrastructure initiative
- Recognized as a stormwater Best Management Practice (BMP) and is proven to reduce erosion and reinforce vegetation for low-impact, sustainable design
- Easy to handle, lightweight components for rapid installation
- Use of lightweight equipment and unskilled labor facilitates installation with limited site access
- Aesthetically pleasing and more cost effective than conventional methods such as rock riprap and concrete paving

Outperforms and is more cost effective than conventional methods, including:

- ✔ Rock riprap
- Rock slope protection
- ✔ Gabions
- Concrete blocks or paving
- ✔ Fabric formed revetments

WOVEN THREE-DIMENSIONAL HPTRM PROTECTION LAYER FEATURING X3[®] FIBER TECHNOLOGY

- ✓ Unique X3[®] fiber shape provides over 40% more surface area than conventional fibers to capture the moisture, soil and water required for rapid vegetation growth
- ✓ Exhibits extremely high tensile strength as well as superior interlock and reinforcement capacity with both soil and root systems
- ✔ Maximum ultraviolet protection for long-term design life
- ✓ Netless, rugged material construction stands up to the toughest erosion applications where high loading and/or high survivability conditions are required

ENGINEERED EARTH ANCHORS SECURE THE MAT TO THE GROUND

- ✓ Made of corrosion resistant material to provide considerable mechanical strength and durability during installation and in service
- Connected to a zinc-aluminum coated carbon steel or stainless steel tendon to fully enhance corrosion resistance particularly at the soil air interface
- ✓ As the load exerted on the soil by the ARMORMAX[®] system increases, a body of soil above the anchor is compressed and provides resistance to any further anchor movement, permanently securing the mat to the ground

EROSION CONTROL APPLICATIONS

The figures below illustrate the ARMORMAX[®] system for erosion control applications. The system is comprised of the PYRAMAT[®] HPTRM and typically Type B1 Engineered Earth Anchors.



SLOPE STABILITY APPLICATIONS

The figures below illustrate the ARMORMAX[®] system in slope stability applications. The system is comprised of the PYRAMAT[®] HPTRM and typically Type B2 anchors as specified by the project engineer. Propex may be able to provide preliminary design information.



SHALLOW PLANE FAILURE



APPLY ARMORMAX SYSTEM



VEGETATION GROWTH







PROPEX EROSION CONTROL PRODUCT GUIDE OF PERMANENT SOLUTIONS



ARMORMAX KEY PHYSICAL PROPERTIES

Material Composition: Proprietary ultraviolet protection package in PYRAMAT HPTRM, and the durability of the anchor provides long-term design assurance.

Tensile Strength: PYRAMAT HPTRM boasts 4000 x 3000 lb/ft (58.4 x 43.8 kN/m) of tensile strength, which exceeds the U.S. EPA definition of a High Performance Turf Reinforcement Mat.

Seedling Emergence: PYRAMAT HPTRM features X3[®] fiber technology, which offers 40% more fiber surface area to capture the critical sediment and moisture needed to increase seed germination within the first 21 days. Flexibility: Allows the system to conform and maintain intimate contact with the prepared subgrade.

Anchor Loading Capacity: Based on anchor size, tendon length and on-site soil parameters the anchor foot provides up to an ultimate of 500 to 3000 lbs of pullout resistance per anchor.

Actual holding strengths depend upon soil characteristics, anchor type and installation techniques.

PROPERTY	TEST METHOD	ENGLISH	METRIC
ORIGIN OF MATERIALS		•	
% U.S. Manufactured		100%	100%
PHYSICAL		*	e
Thickness ²	ASTM D-6525	0.40 in	10.2 mm
Light Penetration (% Passing) ³	ASTM D-6567	10%	10%
Color	Visual	Green	or Tan
MECHANICAL			
Tensile Strength ²	ASTM D-6818	4000 x 3000 lbs/ft	58.4 x 43.8 kN/m
Elongation ²	ASTM D-6818	40 x 35 %	40 x 35 %
Resiliency ²	ASTM D-6524	80%	80%
Flexibility ⁴	ASTM D-6575	0.534 in-lb	616,154 mg-cm
ENDURANCE		•	
UV Resistance $\%$ Retained at 6,000 hrs 4	ASTM D-4355	90%	90%
UV Resistance $\%$ Retained at 10,000 hrs 4	ASTM D-4355	85%	85%
PERFORMANCE			
Velocity (Vegetated) ^{4, 5}	Large Scale	25 ft/sec	7.6 m/sec
Shear Stress (Vegetated) ^{4, 5}	Large Scale	16 lb/ft ²	766 Pa
Manning's n (Unvegetated) ^{4, 6}	Calculated	0.028	0.028
USACE / CSU Wave Overtopping	Large Scale	USACE Approved	
Seedling Emergence ⁴	ASTM D-7322	296%	296%
	÷	8.5 ft x 90 ft	2.6 m x 27.4 m
RULL SIZES		15.0 ft x MR	4.6 m x MR
TYP	E B1 ANCHOR PROPER	RTIES	
PHYSICAL		ENDURANCE/ COMPONEN	T MATERIALS
Anchor Head Length	3.4 in	Anchor Head	Die cast aluminum

PHYSICAL	ENDURANCE/ COMPONENT MATERIALS		
Anchor Head Length	3.4 in	Anchor Head	Die cast aluminum
Anchor Head Width	1.0 in	Cable Tendon	Zinc-aluminum carbon steel
Anchor Head Bearing Area	2.5 in ²	Load Bearing Plate	Die cast zinc
Anchor Head Weight	0.1 lbs	Load-Lock Mechanism	Die cast zinc w/ceramic roller
		Crimped Ferrule	Aluminum
PERFORMANCE		MECHANICAL	
Load Range (Cohesive through Non Cohesive Soils)	Up to 500 lbs	Ultimate Strength	1,100 lbs
Embedment Depth	Up to 5 ft	Working Load	800 lbs

NOTES:

1. The property values listed above are effective 07/13/2015 and are subject to change without notice.

 Minimum average roll values (MARV) are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported.

3. Maximum Average Roll Value (MaxARV), calculated as the typical plus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any sample taken during quality assurance testing will meet to the value reported.

4. Typical Value.

5. Maximum permissible velocity and shear stress has been obtained through vegetated testing programs featuring specific soil types, vegetation classes, flow conditions, and failure criteria. These conditions may not be relevant to every project nor are they replicated by other manufacturers. Please contact Propex for further information.

6. Calculated as typical values from large-scale flexible channel lining test programs with a flow depth of 6 to 12 inches.

7. Master Roll (MR) is to be up to 600 feet in length.



WORLD CLASS ENGINEERED EARTH SOLUTIONS & SERVICES

Propex GeoSolutions is one of the largest geosynthetic and erosion control manufacturers in the world, offering full service engineering support for multiple applications, all while creating an Engineered Earth Solution. Our solutions are guaranteed to outperform conventional methods, capitalizing in various markets such as Transportation, Slope Stabilization, Shoreline Restoration, and Flood Control.

Applications include:

- Roadway Stabilization
- Pavement Rehabilitation
- Canal, Stream, and Channel Protection
- Slope Protection and Stabilization
- Drainage and Filtration
- Earthen Levee Protection

We provide industry leadership, setting standards for quality innovation, and pride ourselves in offering the most comprehensive and advanced technical services and support in the market. Our number one goal is to provide 100 percent customer support.

The many features and benefits of our Engineering Services Team includes:

- Product Selection
- Design Support
- Surficial Slope Stability Analysis
- Erosion Control Analysis
- Paved and Unpaved Roadway Design
- Installation Support
- Construction Details
- Inspection and Validation Testing
- Market Advancement
- Industry Organization Participation
- Product and Application Research



Contact our Engineering Services Team Hotline at 423.553.2465 or email GeoEngineering@propexglobal.com to let us help with your next project.



ENGINEERED EARTH SOLUTIONS

CONTACT THE PROPEX TEAM TODAY:

1.800.621.1273 PROPEXGLOBAL.COM





PYRAWALL[®] is an Engineered Wrap-Face Vegetated Solution consisting of two components:

- PYRAMAT[®] 75 High Performance Turf Reinforcement Mat (HPTRM)
- Fiber-composite internal bracing

PYRAWALL is a reinforced-soil wall and/or steepened slope system that provides permanent erosion protection and mechanical slope stabilization from initial construction. The expected design life of PYRAWALL is up to 75 years because it does not corrode and it has superior UV resistance, strength, and durability in the most demanding environments.





The internal braces are designed to integrate with PYRAMAT 75 HPTRM and provide internal structure during construction to facilitate placing and backfilling of PYRAWALL. The bracing members are designed to interlace through PYRAMAT 75 HPTRM resulting in superior material connection and system performance throughout the project's design life.

The PYRAMAT 75 HPTRM component of PYRAWALL is manufactured at a Propex facility with ISO 9001:2008 certification and has property values listed below¹. Propex also performs internal Manufacturing Quality Control (MQC) tests that have been accredited by the Geosynthetic Accreditation Institute – Laboratory Accreditation Program (GAI-LAP).



ENGINEERED EARTH ARMORING SOLUTIONS[™]

www.propexglobal.com

Propex Operating Company, LLC · 4019 Industry Drive · Chattanooga, TN 37416 · ph 800 621 1273 · ph 423 855 1466

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particular purpose, or arising from provision of samples, a course of dealing or usage of trade.



PYRAMAT 75 HPTRM PROPERTIES

PROPERTY	TEST METHOD	ENGLISH	METRIC
ORIGIN OF MATERIALS		•	
% U.S. Manufactured		100%	100%
PHYSICAL			
Thickness ²	ASTM D-6525	0.40 in	10.2 mm
Light Penetration (% Passing) ³	ASTM D-6567	10%	10%
Color	Visual	Green	or Tan
MECHANICAL			
Tensile Strength ²	ASTM D-6818	4000 x 3000 lbs/ft	58.4 x 43.8 kN/m
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UV Resistance % Retained at 3,000 hrs 4	ASTM D-4355	90%	90%
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Shear Stress (Vegetated) ^{4, 5}	Large Scale	16 lb/ft ²	766 Pa
Manning's n (Unvegetated) ^{4, 6}	Calculated	0.028	0.028
USACE / CSU Wave Overtopping	Large Scale	USACE A	pproved
Seedling Emergence ⁴	ASTM D-7322	296%	296%
ROLL SIZES	•	8.5 ft x 120 ft	2.6 m x 36.6 m

NOTES:

1. The property values listed above are effective 01/01/2019 and are subject to change without notice. Values represent testing at time of manufacture.

2. Minimum average roll values (MARV) are calculated as the typical minus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any samples taken from quality assurance testing will exceed the value reported.

3. Maximum Average Roll Value (MaxARV), calculated as the typical plus two standard deviations. Statistically, it yields a 97.7% degree of confidence that any sample taken during quality assurance testing will meet to the value reported.

 Typical Value.
 Maximum permissible velocity and shear stress has been obtained through vegetated testing programs featuring specific soil types, vegetation classes, flow conditions, and failure criteria. These conditions may not be relevant to every project nor are they replicated by other manufacturers. Please contact Propex for further information.

6. Calculated as typical values from large-scale flexible channel lining test programs



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