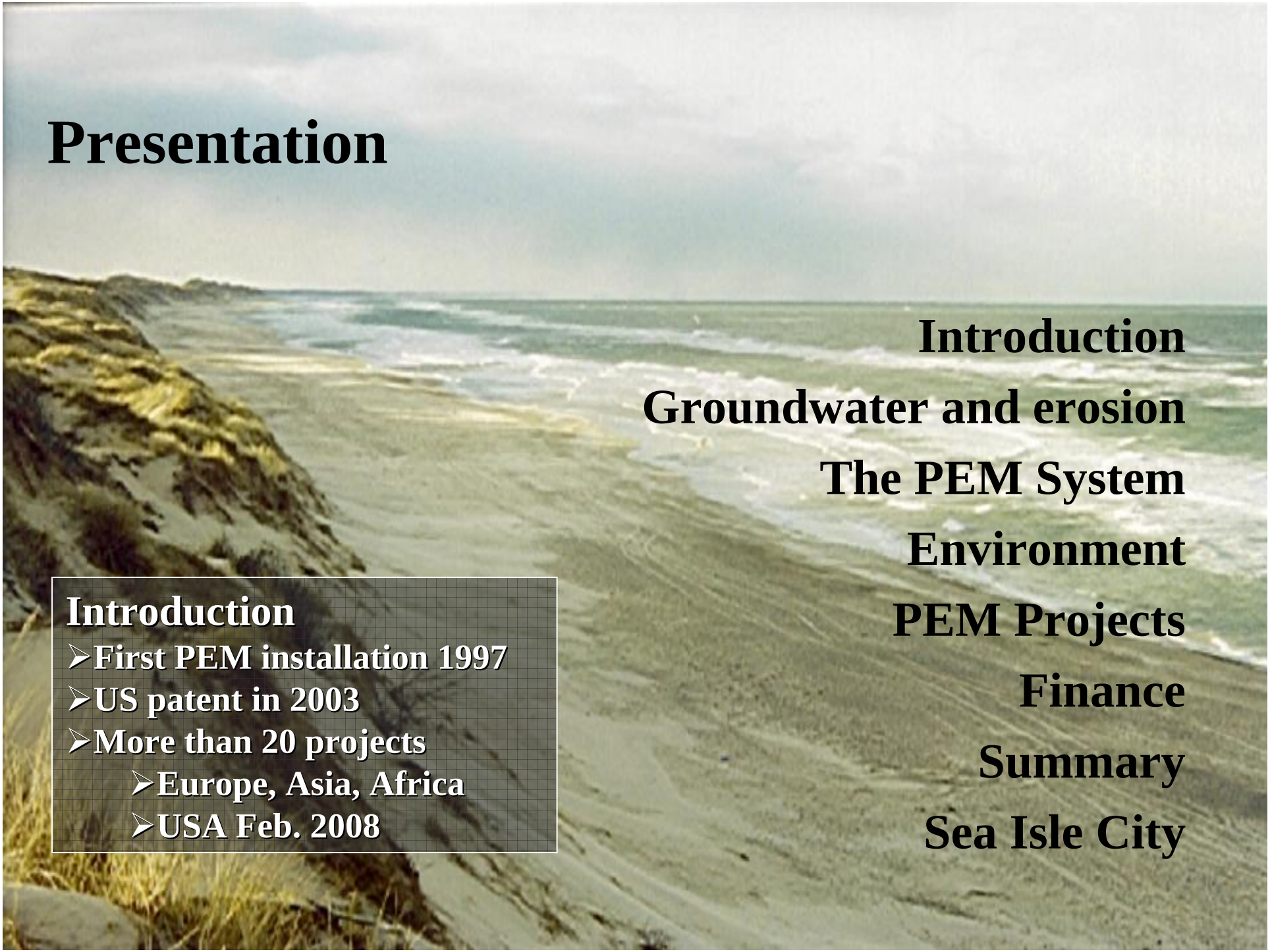
The PEM System

PEM - PRESSURE EQUALIZING MODULES

January 10, 2009
SICTA
Sea Isle City , New Jersey

Kenneth W. Christensen, President
EcoShore Int'l, Inc.

Presentation



Introduction

Groundwater and erosion

The PEM System

Environment

PEM Projects

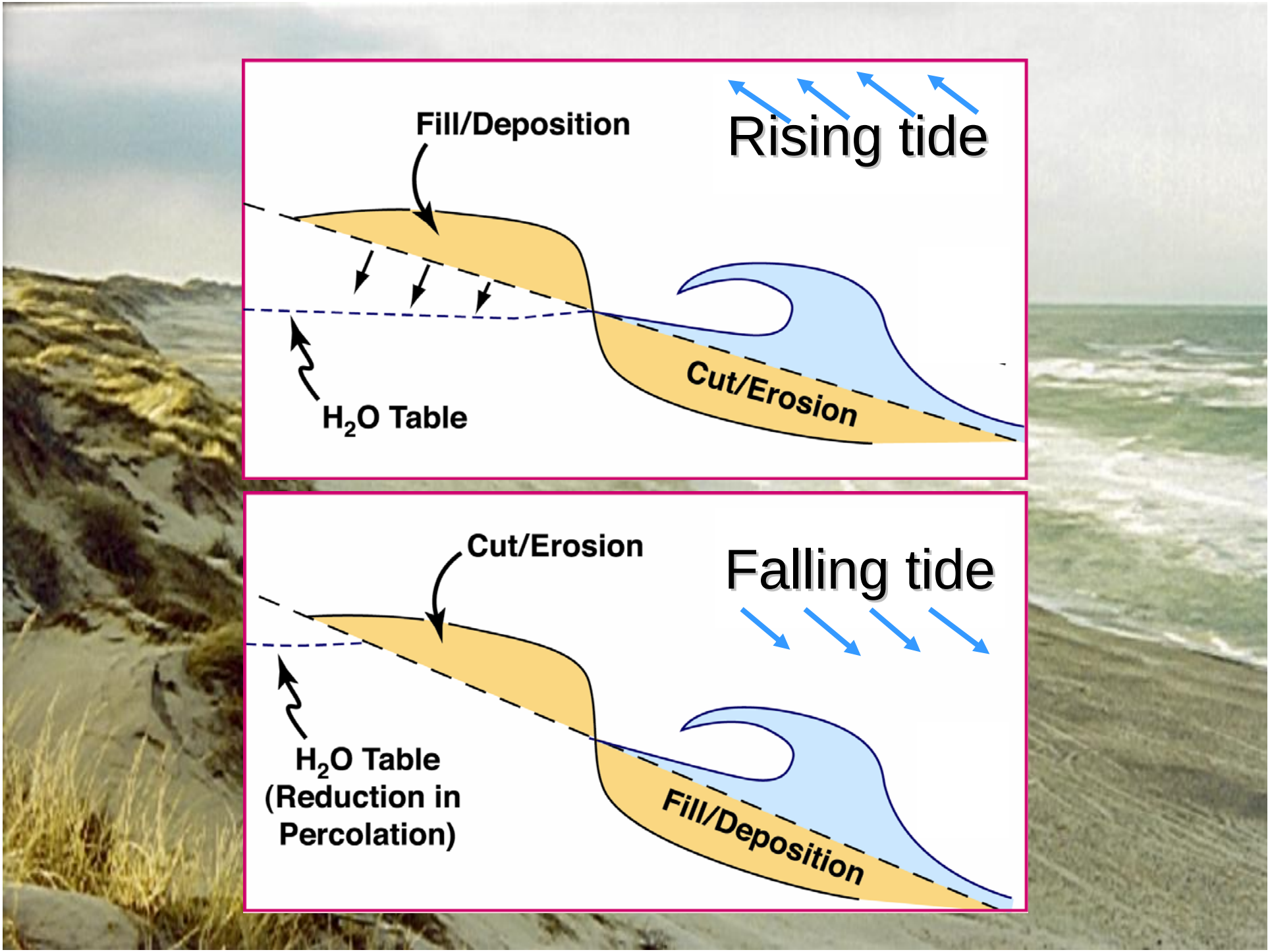
Finance

Summary

Sea Isle City

Introduction

- First PEM installation 1997
- US patent in 2003
- More than 20 projects
  - Europe, Asia, Africa
  - USA Feb. 2008


Fill/Deposition
Rising tide
H_2O Table
Cut/Erosion
Cut/Erosion
Falling tide
H_2O Table
(Reduction in
Percolation)
Fill/Deposition

The following mechanism was proposed: (a): On the uprush, if the beach is dry (*i.e.* the watertable is low), the uprush will infiltrate into the sand and hence slow down, causing greater deposition of the sediment suspended in the uprush. If the beach is wet (a high watertable), there will be less infiltration, hence less deceleration and therefore less deposition. (b): On the backwash, the outflow of groundwater causes fluidisation of the upper layer of sand, and hence augments offshore transport of sediment.

Grant

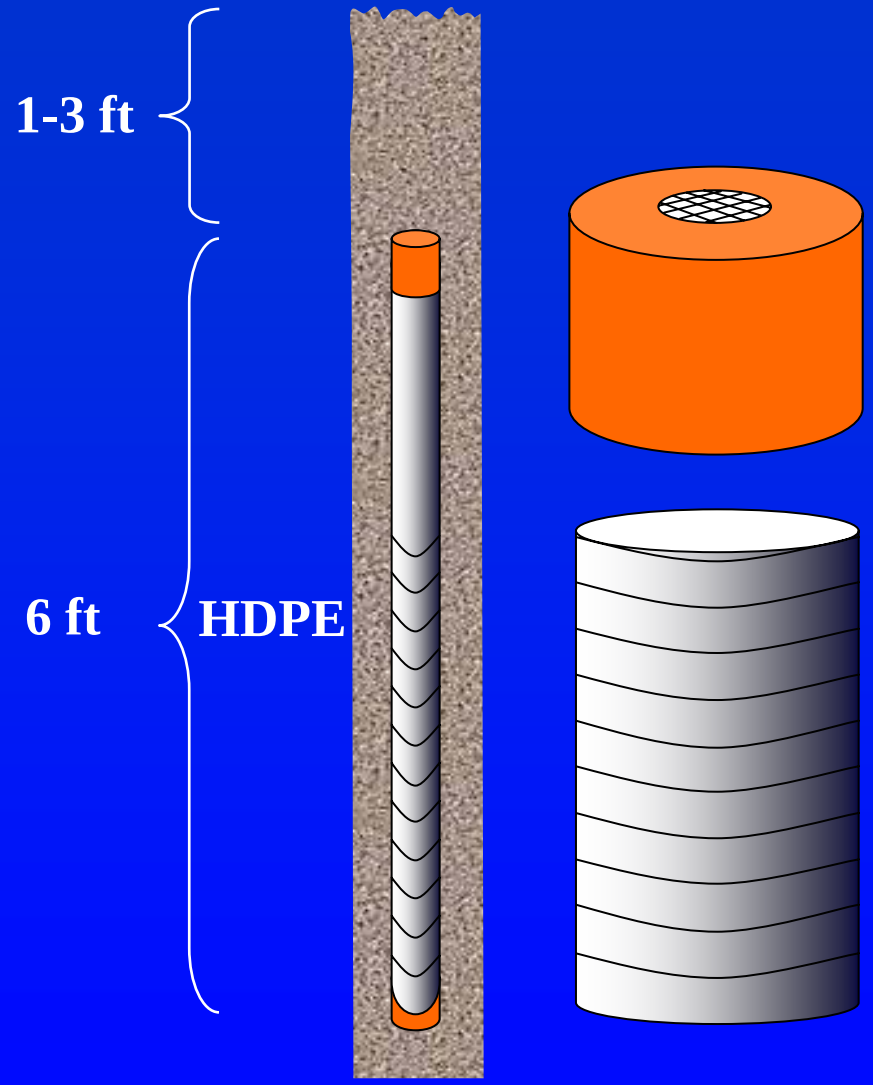
"In a qualitative sense, the role of elevated beach groundwater in promoting beach face erosion and lower beach water table in promoting onshore accretion, is now well established"

Turner and Leatherman, 1997,

Beach Dewatering as a 'Soft' Engineering Solution to Coastal Erosion – A History and Critical Review. *Journal of Coastal Research,13 (4) , 1050-1063*

Sea Isle City 5th st. Jan 10 falling tide

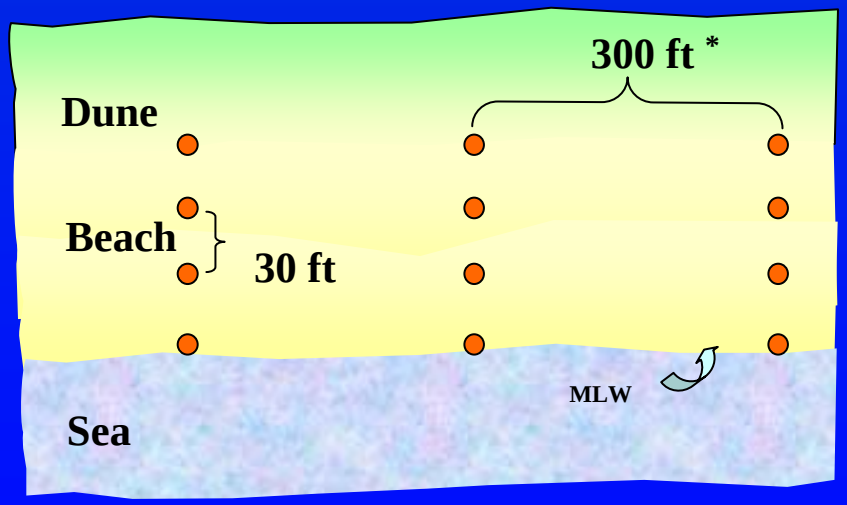
PEM System



Diameter 2.5 inches

PEM is designed to improve drainage of the beach

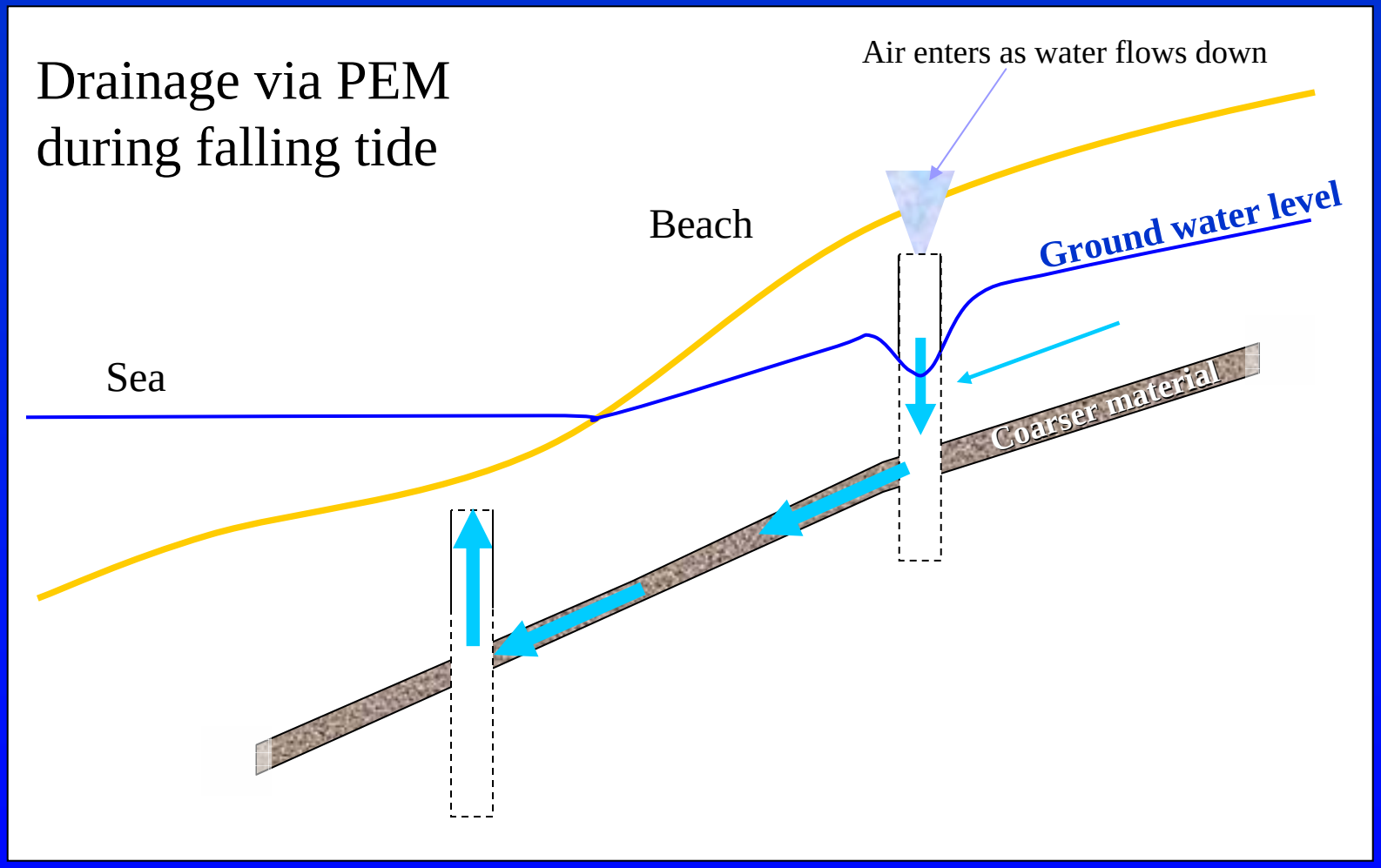
Plan view



* Every installation is tailor made

PEM Function

PEM Function

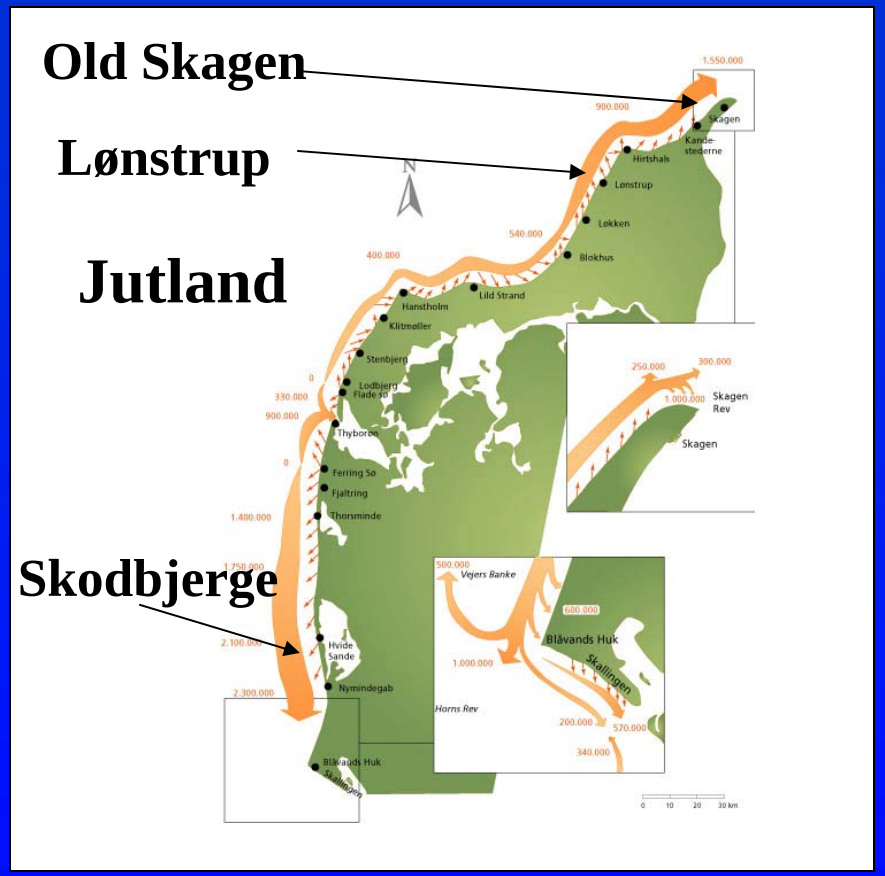


PEM and the environment

- **Minimal-invasive technology**
  - **Covers approx. 0.0005% of the beach**
  - **Point pressure reduction – local effect**
  - **No known harm to flora or fauna**
  - **Invisible installation**
  - **No impact on areas in the sea**
  - **Rapid installation**
- **Reduced CO2 emissions compared to other techniques**
  - **Little energy to mobilize/install/remove**
  - **No energy used during operation**
- **No effect on surfing conditions**

Approved for use in an European Union Habitat Area

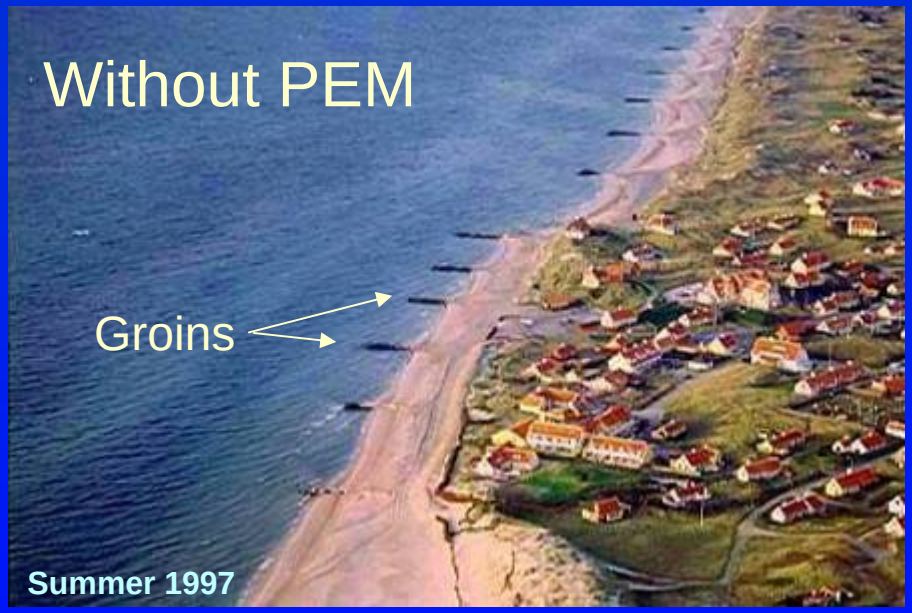
Projects



Erosion West coast of Jutland 2 x 2.5 million cubic yards/year

Old Skagen North 1998-2001

PEM placed near groins



Before PEM installation

18 months after PEM installation

Old Skagen North 1998-2001

July 2002

8 months after removal of the PEMs

Old Skagen South, 1999-2002
Result of 3-year Official Test

After 12 months:

- *PEM area had gained 8.4 cubic yards per shore yard*
- *In the middle of the test area, gains were over 30 cubic yard per shore yard*
- *All other areas lost from 1 to 20 cubic yards per shore yard*

After 2 years:

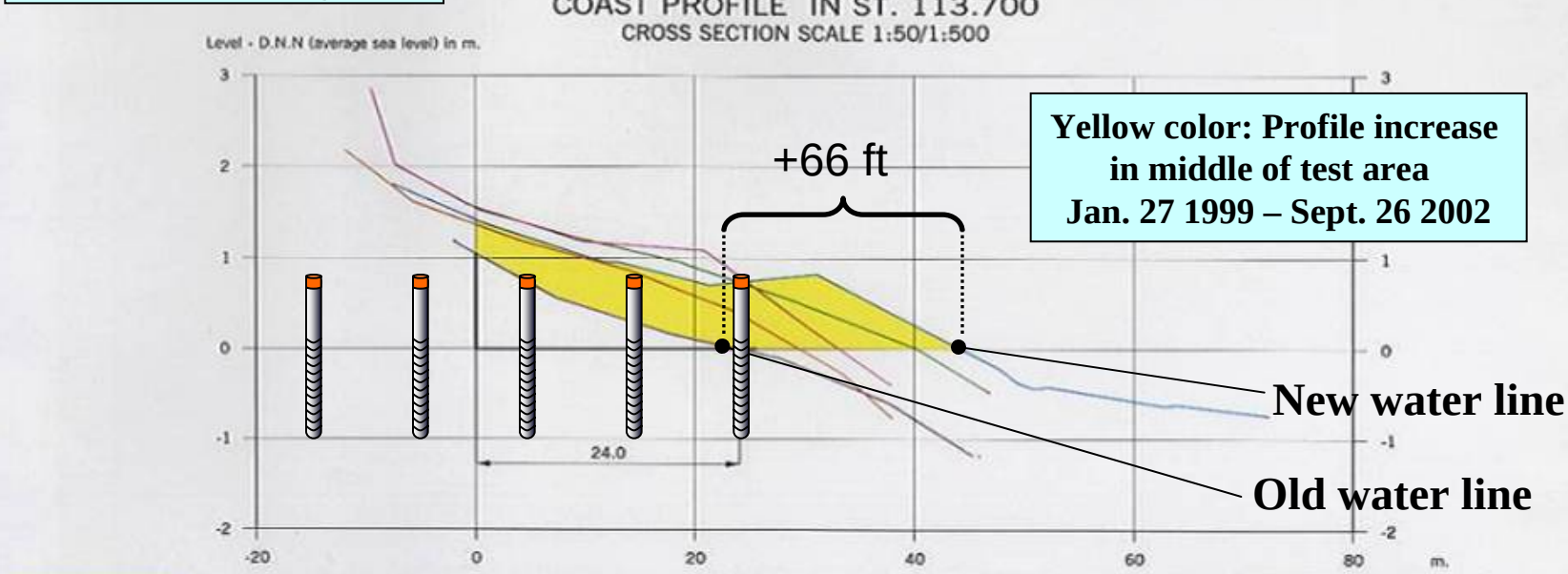
- *Test area with PEM had stabilized and showed no further growth*

After 3 years:

- *The difference between the test area and other areas remained the same*

3-year Official Test
Old Skagen South 1999-2002

Result after 3 years



Yellow color: Profile increase in middle of test area Jan. 27 1999 – Sept. 26 2002

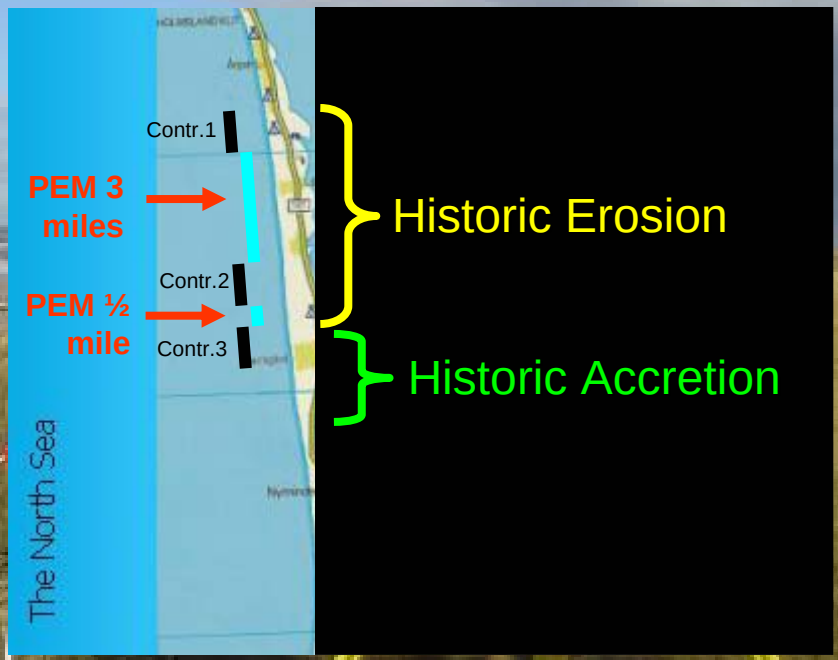
Profile-increase between 27. January 1999 and 26. Sep. 2002
Profile-erosion between 27. January 1999 and 26. Sep. 2002
Shore level 27. January 1999
Shore level 18. January 2000
Shore level 26. January 2001
Shore level 26. Marts 2002
Shore level 23. September 2002
Reference line - beach area

Date	27.01. 1999	18.01. 2000	25.01. 2001	26.03. 2002	23.09. 2002
Profile increase/erosion (m³/m) *	-	+23,31	+22,30	+12,25	+24,58
Change in profile width (m) *	-	+16,2	+9,4	+5,3	+20,3
Change in profile middle height (m) *	-	+0,73	+0,74	+0,48	+0,66
Average inclination of beach (°)	2,37	2,32	2,61	2,68	1,82

* Difference from 27. January 1999

14.8

Profil width = From reference line (0.00) to the cut of the ground surface with level 0.00

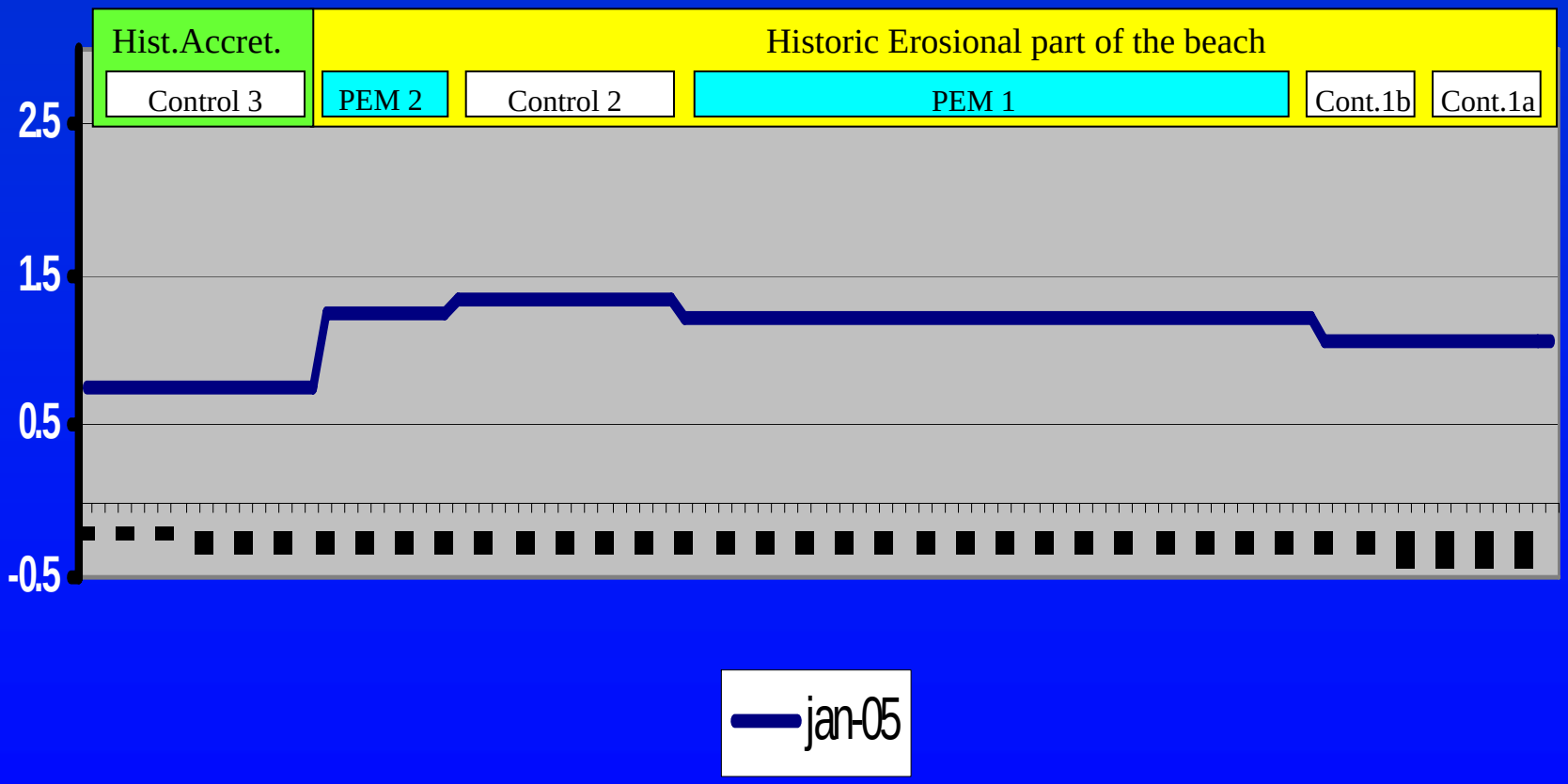


Skodbjerge, Denmark
Jan 19, 2005

Natural eroding beach

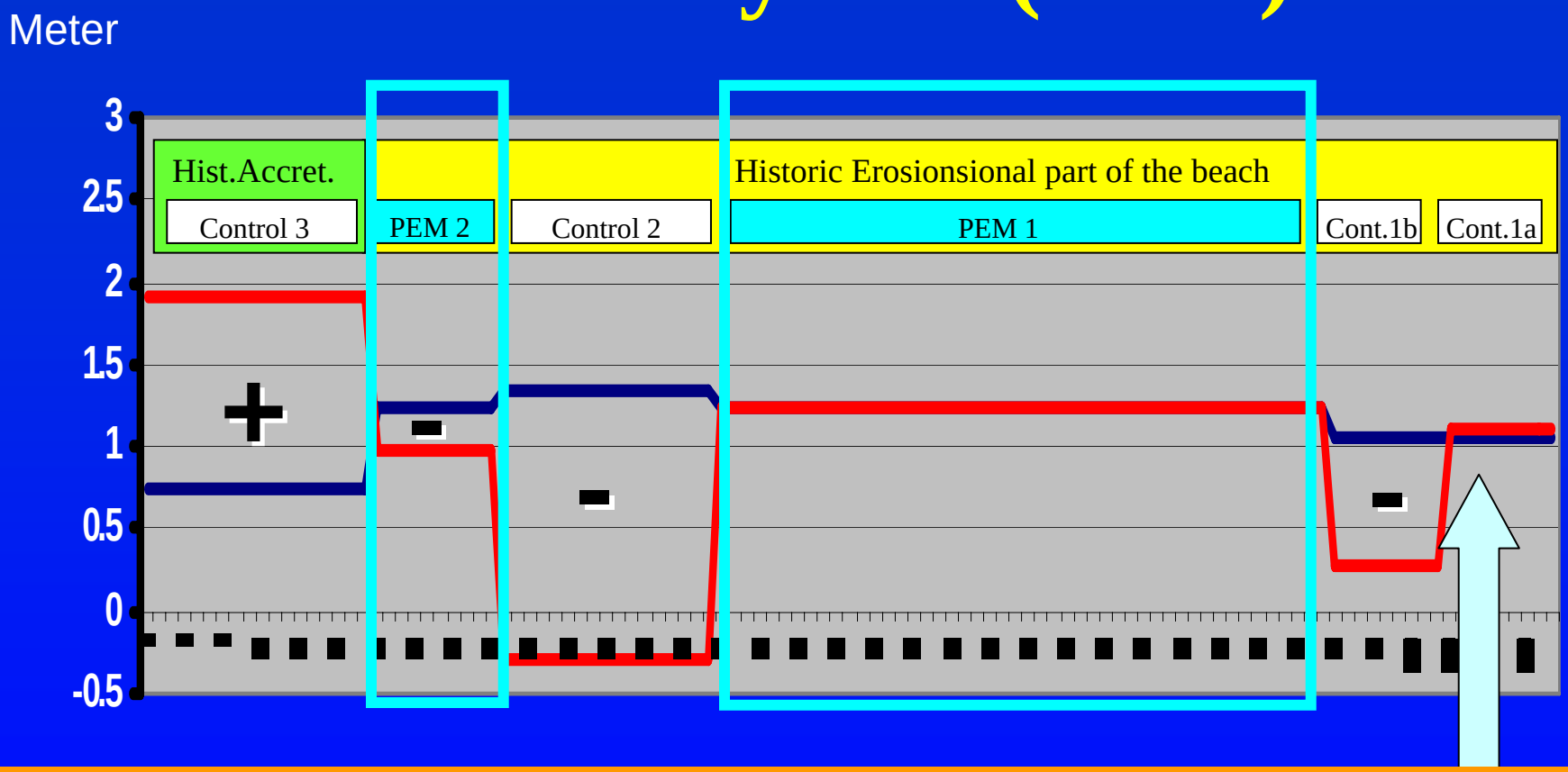
Skodbjerge 3 years results preliminary (ABL)

Meter



Avg. Beach Level (ABL) from level 4 m in the dune and 100 m towards the sea

Skodbjerge preliminary results 3 years (ABL)



Conclusion:

Where you have accretion PEM will not change that

Where you have erosion PEM will minimize erosion

Teluk Chempedak, Malaysia

PEM combined with Beach Nourishment

Double layer PEM

Purpose:

Prolong the lifespan of beach nourishment (normal life 3-4 yrs)

Installed:

PEM #1: First set July 2003

Nourishm. 230,000cy.: May-July 2004

PEM #2: Second set Aug 2004

Status:

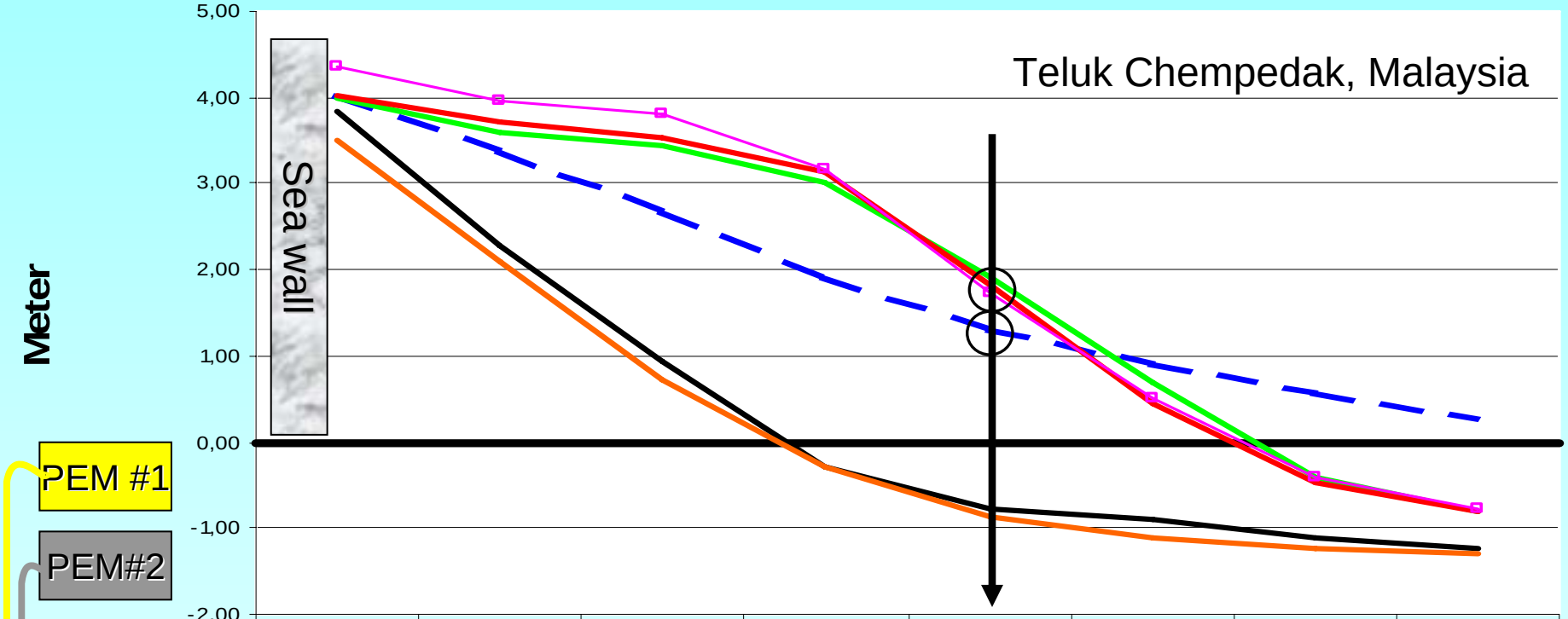
2007: Beach is stable

Expected lifetime: >10 years

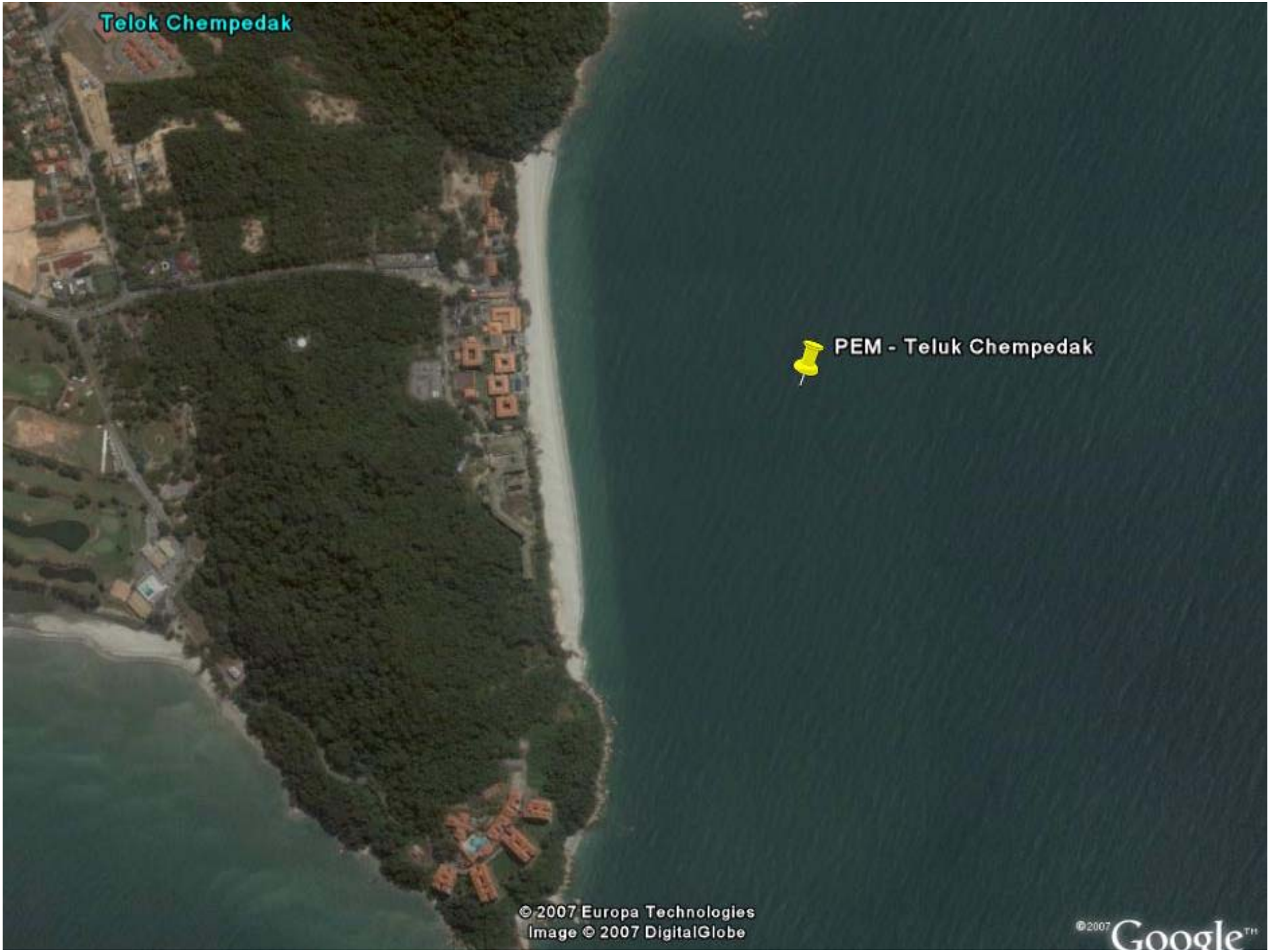
The PEM System combined with Beach Nourishment

Average beach elevation at X meter from the dune

Black line: Project Start
Orange line: After PEM1
Dotted blue line: Beach nourishment design
Green, red and purple lines: After 2nd set PEM was installed



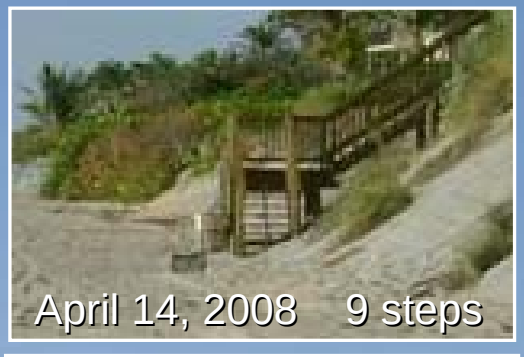
	0	10 m	20 m	30 m	40 m	50 m	60 m	70 m
March 03	3,83	2,29	0,93	-0,28	-0,78	-0,91	-1,12	-1,23
March 04	3,50	2,11	0,72	-0,28	-0,87	-1,10	-1,22	-1,30
Design	4,03	3,39	2,67	1,90	1,31	0,89	0,57	0,26
March 05	3,99	3,60	3,43	3,02	1,92	0,68	-0,40	-0,81
March 06	4,02	3,71	3,53	3,13	1,82	0,44	-0,47	-0,82
March 07	4,36	3,96	3,81	3,16	1,74	0,50	-0,40	-0,78


Telok Chempedak
PEM - Teluk Chempedak
© 2007 Europa Technologies
Image © 2007 DigitalGlobe
©2007 Google™

Hillsboro Beach Florida

- 2 miles
  - 1 mile PEM
  - 2 x 0.5 mile control
- Final Permit Feb. 14, 2008
- Installation completed Feb. 28, 2008
- Approx 100 PEMs installed
- 3-year project

The Beach is Building


April 14, 2008 9 steps


June 20, 2008 8 steps


Aug 21, 2008 5 steps


Sep 10, 2008 4 steps

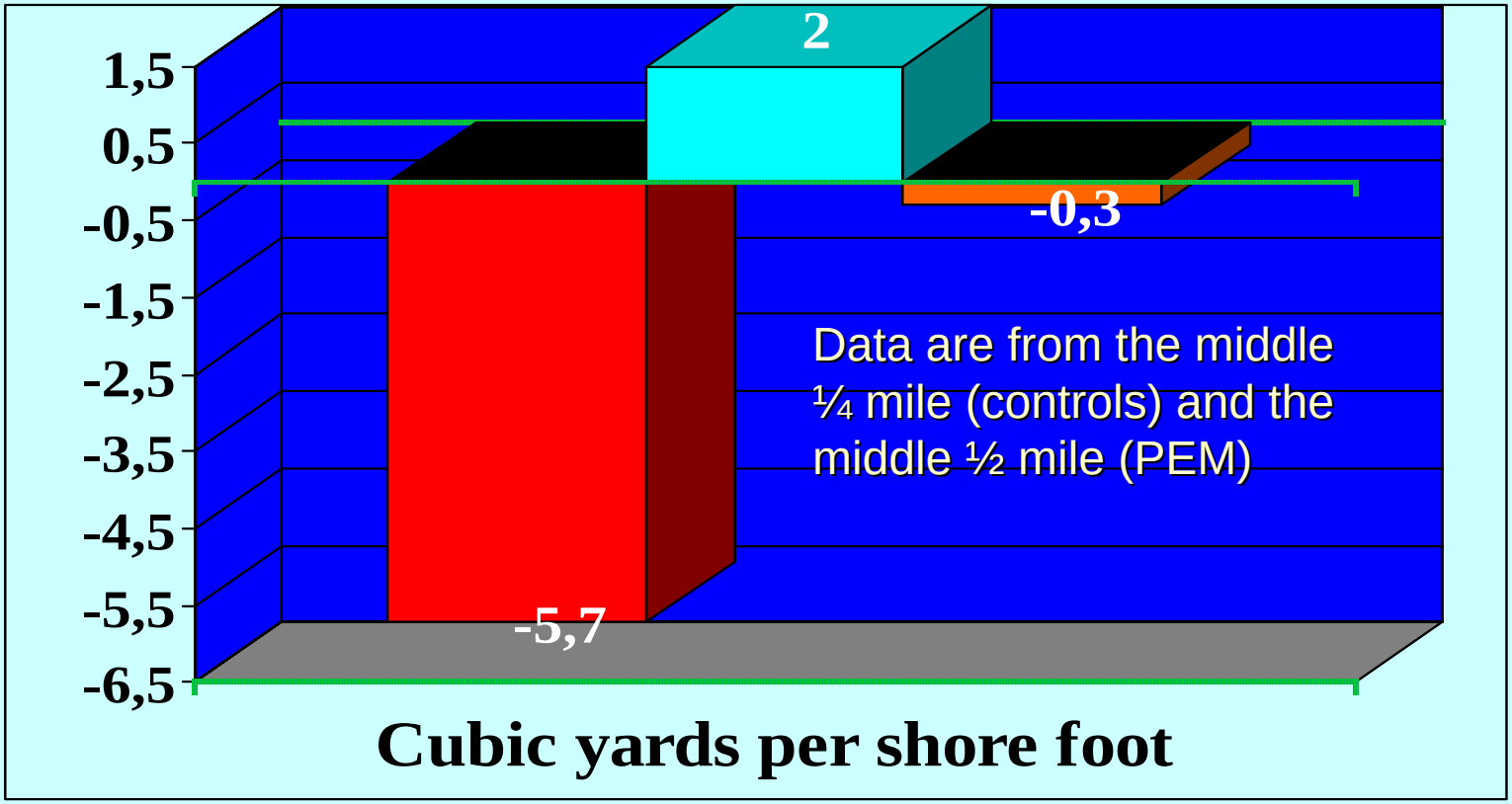
9 steps

Hillsboro Beach April 14, 2008

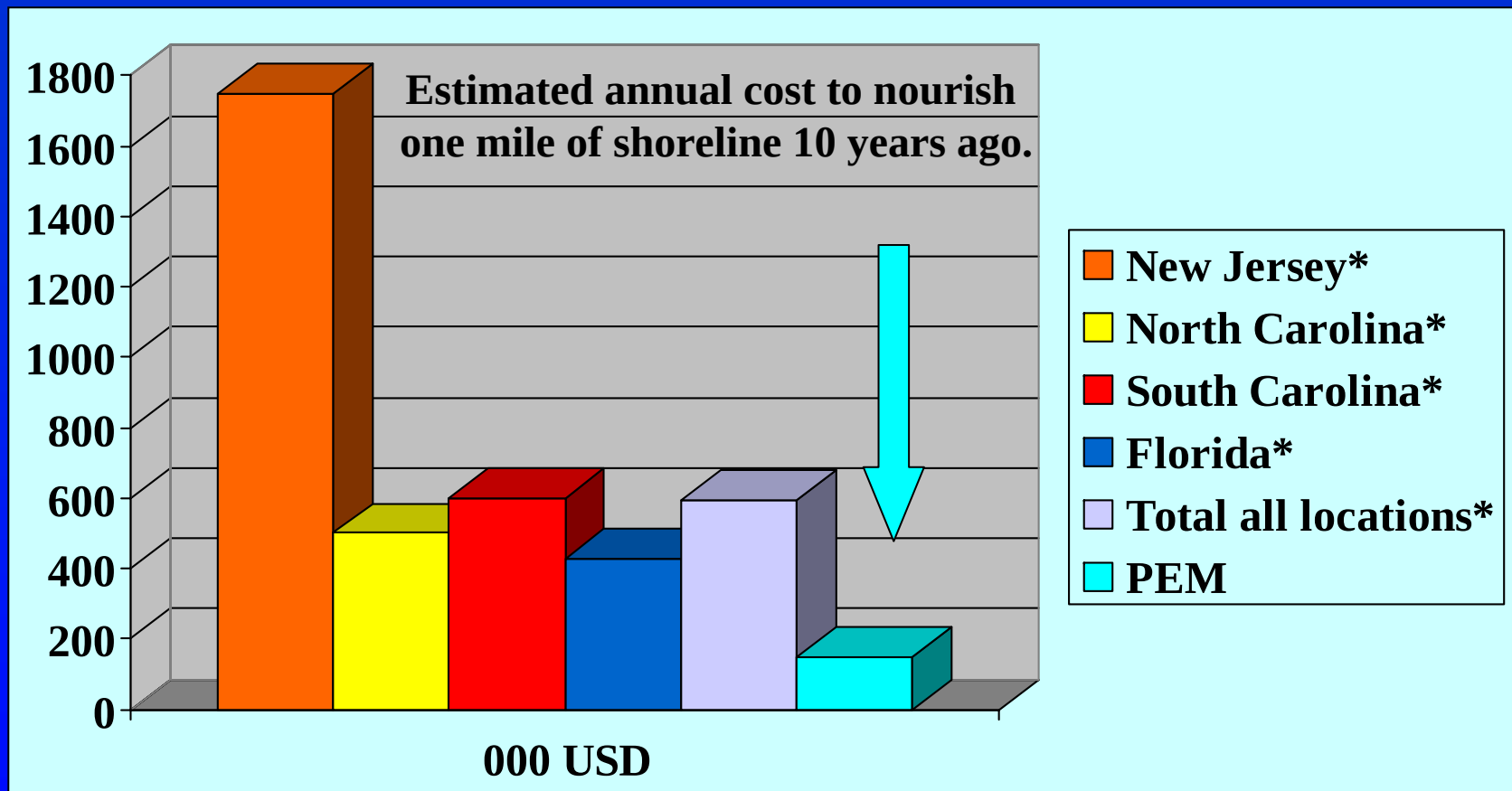

During installation at very low tide – Feb 22, 08
1
Sand added – May 27, 08
2
Spring tide and hurricane Ike result in erosion
2 days before 6 months survey – Sep 13, 08
3
Two weeks after hurricane Ike the sand is back – Oct 2, 08
4

Hillsboro Beach
Results after 6 months (prelim.)

Sand loss or gain in cubic yards per shore foot from R-mon. line to –5ft



Economy



*Arthur.C.Trembanis and Orrin.H.Pilkey,Duke University,1998

Financial comparison - Florida

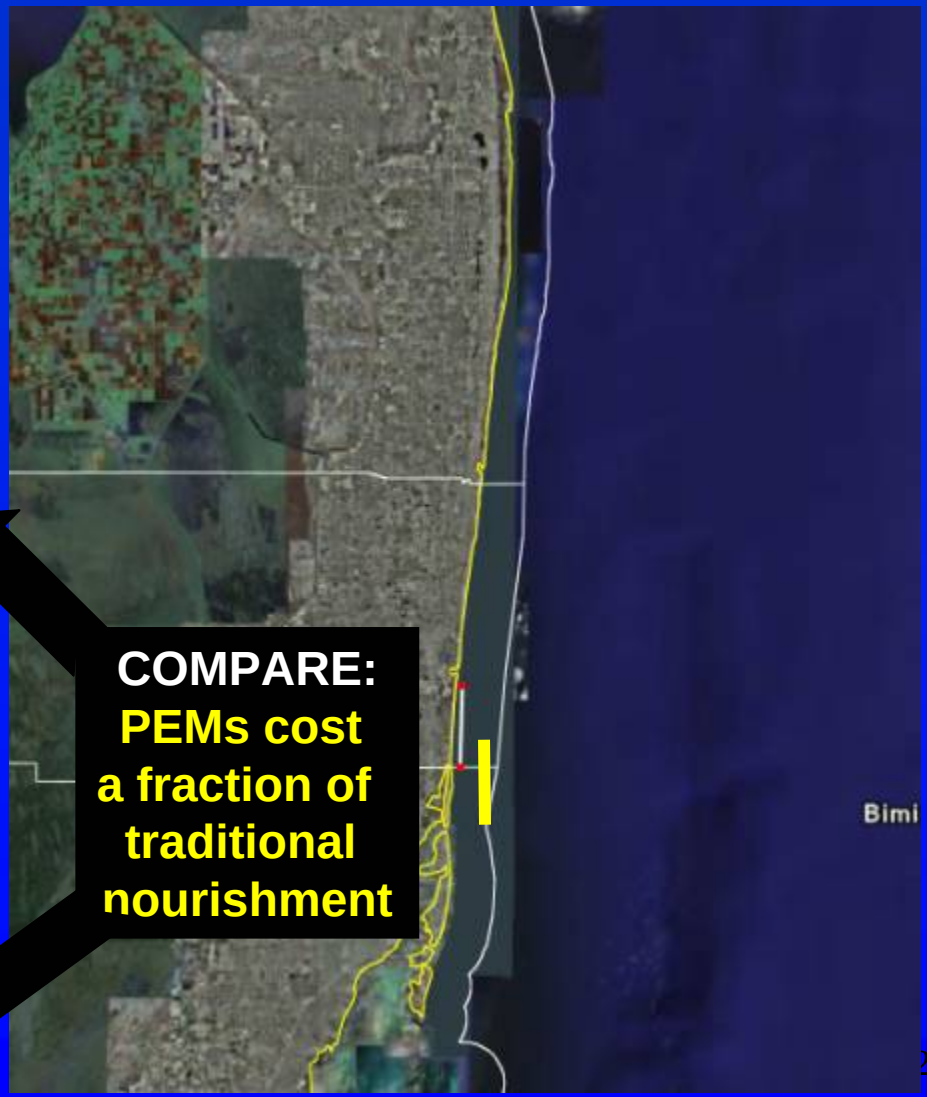
Broward III - 6.8 miles

Beach nourishm. 6.8 m

- Costs $44.5 mill
- 6 years life time
- More than $1 million/mile/year

PEM 6.8 m

- excl. environmental monitoring
- Costs approx. $1 mill./yr (6.8 miles)
- Less than $200,000/mile/year



COMPARE: PEMs cost a fraction of traditional nourishment

NJ Ocean City cost comparison

Traditional nourishment of 2 miles of beach

- **Project costs $6 million**
- **3-4 years life time**
- **10 year cost is $15-20 million**

PEM project 2 miles of beach

- **Pre study and install $ 0.25 million**
- **Yearly lease $ 0.35 million**
- **10 year cost is $ 3.75 million**

PEM Partners

- **Malaysia**
  - **MRCB**
- **USA**
  - **EcoShore Int'l, Inc.**
- **Holland**
  - **Royal BAM Group**
  - **Rijkswaterstaat**

://www.mrcb.com.my/english/compprofile/passion.html

COMPANY PROFILE

Company Profile | Core Activities | Investor Relations | Career Development

Company Profile
- CEO's Message
- Passion For Excellence Programme
- Group Structure
- Our Heritage
- Our Commitment
- Brand Identity
- Corporate Citizen
- Company Background
- Board Of Directors
- Major Shareholders
- Credentials
- Corporate Song

Company Profile

CEO's Message

The Passion for Excellence campaign, first mooted in 2003 to re-energize and motivate MRCB employees to attain higher levels of excellence, has borne positive results.

I am pleased to see that the 'passion to excel' culture has been accepted at all levels within the MRCB Group. The campaign and the Group Key Performance Indicators (KPI) System have provided the much needed zest and motivation to perform beyond the expectations of our current targets and business performance.

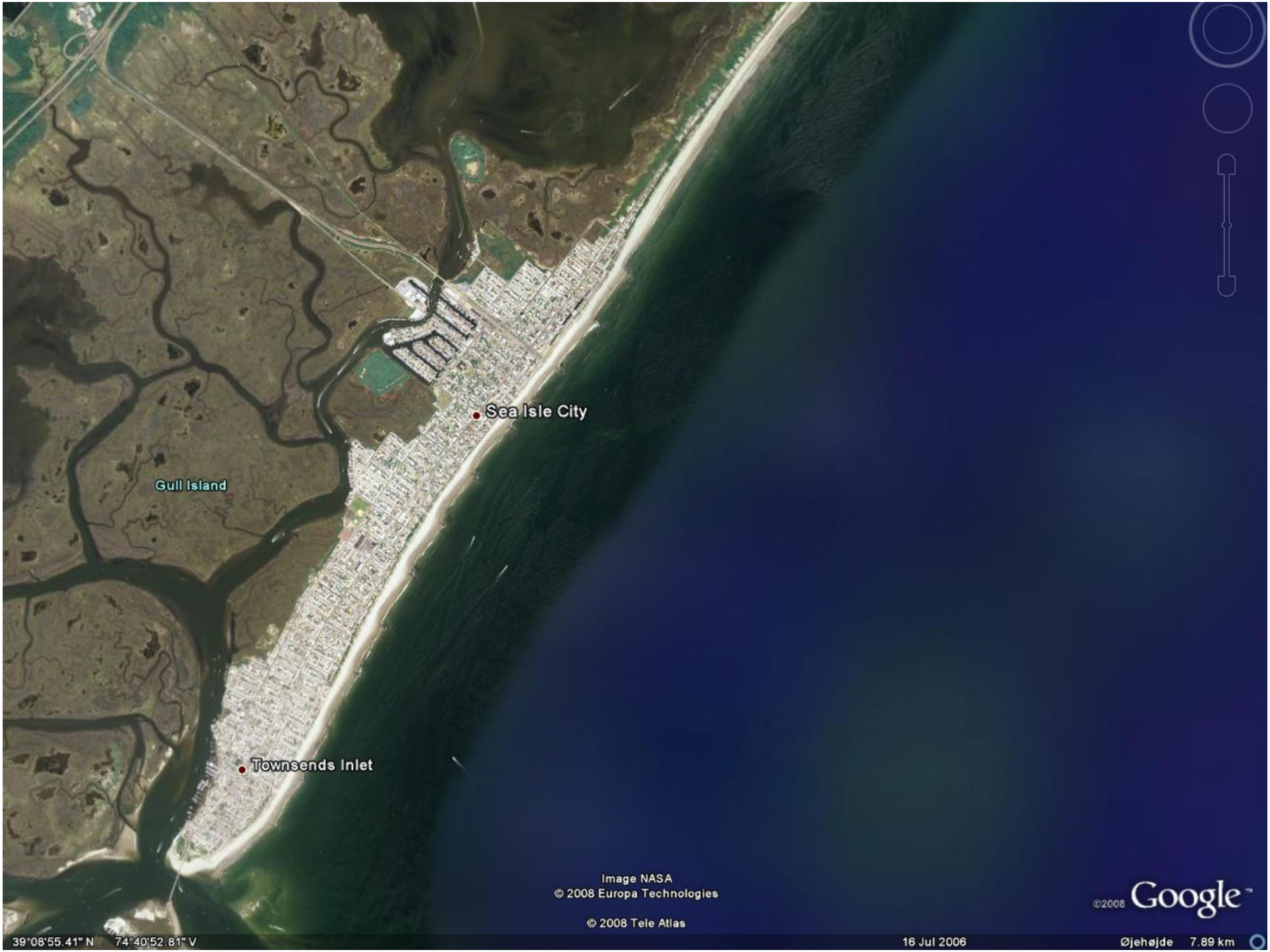
Our Business units and support staff have taken initiatives to further improve and enhance its delivery of high standard products and services. Implementation of such initiatives have resulted in

Other equally impressive achievements include the development of innovative technologies particularly in environmental services. Our Pilot Pressure Equalisation Module (PEM) System used to rehabilitate the Teluk Cempedak Beach in Kuantan has shown significant positive results in the protection of one of the country's best known beaches. The PEM System is the first of its kind technology in Malaysia and the Asian region.


BAM formed a joint venture with the Dutch Coastal Authorities / Army Corps (Rijkswaterstaat)
11 km (7 miles) PEM project installed at Egmond an See
PEM in the Netherlands
JUL 20 2008

Summary of PEM

- **On suitable sites, PEM is highly efficient**
- **Retains sand from beach nourishment**
- **Deposits sand from littoral drift**
- **No power costs**
- **Many independent modules & no moving parts**
- **Subsurface & invisible**
- **Minimal impact on environment**
- **Competitive price**


Sea Isle City
Gull Island
Townsends Inlet
Image NASA
© 2008 Europa Technologies
© 2008 Tele Atlas
©2008 Google
39°08'55.41" N 74°40'52.81" V
16 Jul 2006
Øjehøjde 7.89 km

ACTIVITIES DURING A PEM PROJECT

Coastal investigation

- Data collection/analysis of coastal processes
- Sediment sampling and analysis
- Design of the installation
- Pre-installation survey of beach, sea floor and flanks
- Installation of PEM in a grid
- Logging PEM positions via GPS
- Signage and information for the public
- Mobilization/demobilization
- Final clean-up of beach
- 12-months survey of beach, sea floor and flanks

You will receive:

- As-Built certificate
- Map with the location of each PEM
- Aerial photos before and after
- Pre-installation survey
- 12-months survey
- Final Report

LEASE

- Lease of PEM installation
- Servicing
- Annual report

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- Final Report

$50,000 plus $50,000 per mile

LEASE

- Lease of PEM installation
- Servicing
- Annual report

$125,000 mile/year
$225,000 first mile/year

End of Presentation

For further information please go to www.ecoshore.com

On Site Tests prior to PEM project

Geological and Hydrological Investigation

TEMPORARY PEM INSTALLATION

AND

TEMPORARY MONITORING WELLS

+

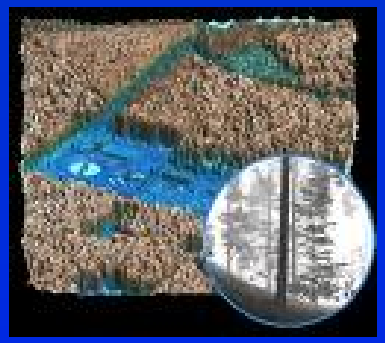
TESTS

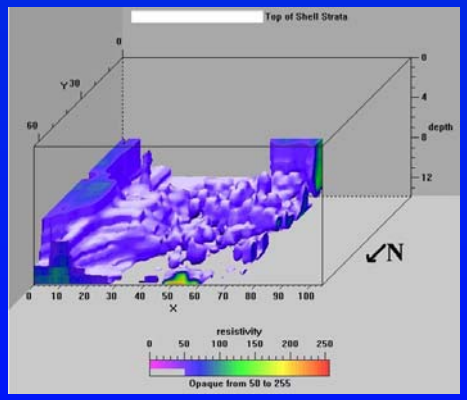
=

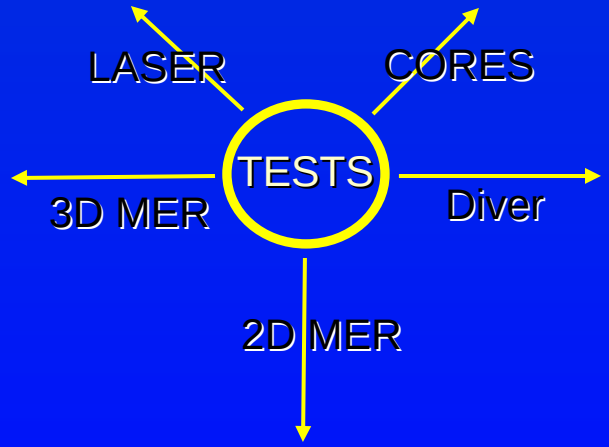
SCIENTIFIC EVIDENCE AND FAST PERMITTING

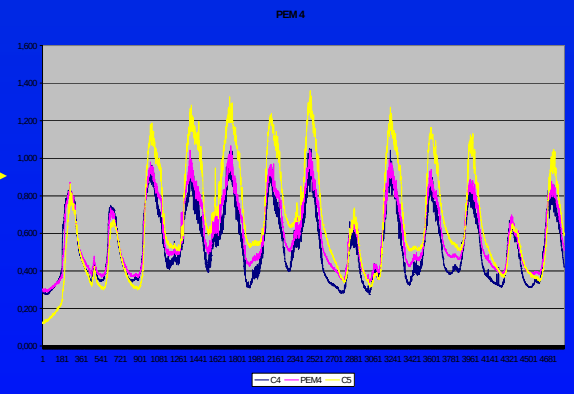
On Site Tests prior to PEM project

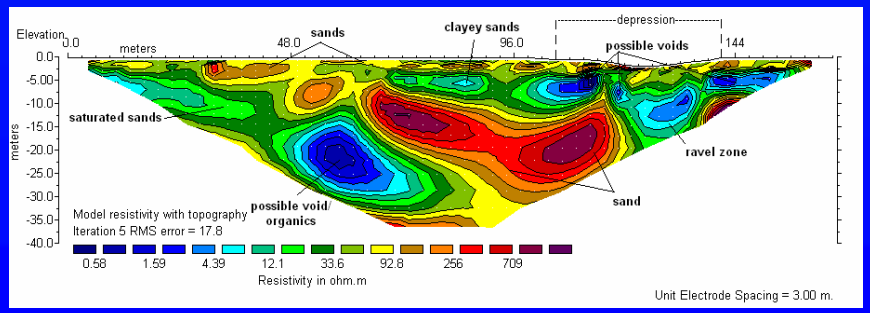
Geological and Hydrological Investigation











PEM activities

TESTS PRIOR TO PEM PROJECT - before permitting

- **Geological and Hydrological Investigation**
  - Installation of water wells and PEMs for 4- 8 weeks in 2 selected beach areas (2 x 300ft)
  - Monitoring of beach elevation before and after test (Laser method) in test and control areas
  - Core samples of beach in test area
  - Survey of ground/groundwater with 2D and 3D Multi-electrode Electrical Resistivity (MER) before and after
  - Installation of pressure transducers to record pressure (water level) in wells and PEMs before, during and after
  - Report

ACTIVITIES DURING PEM PROJECT - after permitting

- **Coastal investigation**
  - Data collection and analysis of coastal processes, beach and offshore profiles
  - Sediment sampling and analysis
  - Design of the installation
  - Pre-installation survey of beach, sea floor and flanks
  - Installation of PEM in a grid
  - Logging PEM positions via GPS
  - Signage and information for the public
  - Mobilization/demobilization
  - Final clean-up of beach
  - 12-months survey of beach, sea floor and flanks
- **You will receive:**
  - As-Build certificate
  - Map with the location of each PEM
  - Aerial photos before and after
  - Pre-installation survey
  - 12-months survey
  - Final Report

PEM activities and costs

TESTS PRIOR TO PEM PROJECT - before permitting

- **Geological and Hydrological Investigation**
  - Installation of water wells and PEMs for 4 - 8 weeks in a selected beach area
  - Monitoring of beach elevation before and after test (Laser method) in test and control area
  - Core samples of beach in test area
  - Survey of ground/groundwater with 2D and 3D Multi-electrode Electrical Res… (MER) before and after
  - Installation of pressure transducers to record pressure (water level) in wells and PEMs before, during and after
  - Report

$70 - 90,000

ACTIVITIES DURING PEM PROJECT - after permitting

- **Coastal investigation**
  - Data collection and analysis of coastal processes, beach and offshore profiles
  - Sediment sampling and analysis
  - Pre-installation survey of beach, sea floor and flanks
  - Installation of PEM in a grid
  - Logging PEM positions via GPS
  - Signage and information for the public
  - Mobilization/demobilization
  - Final clean-up of beach
  - Aerial photos before and after
  - Pre-installation survey and 12-months survey
  - Final Report

$50,000
plus
$50,000 per mile

- **Lease**
  - Lease of PEM installation
  - Servicing
  - Annual report

$125,000 mile/year
$225,000/year for first mile

Extra slides

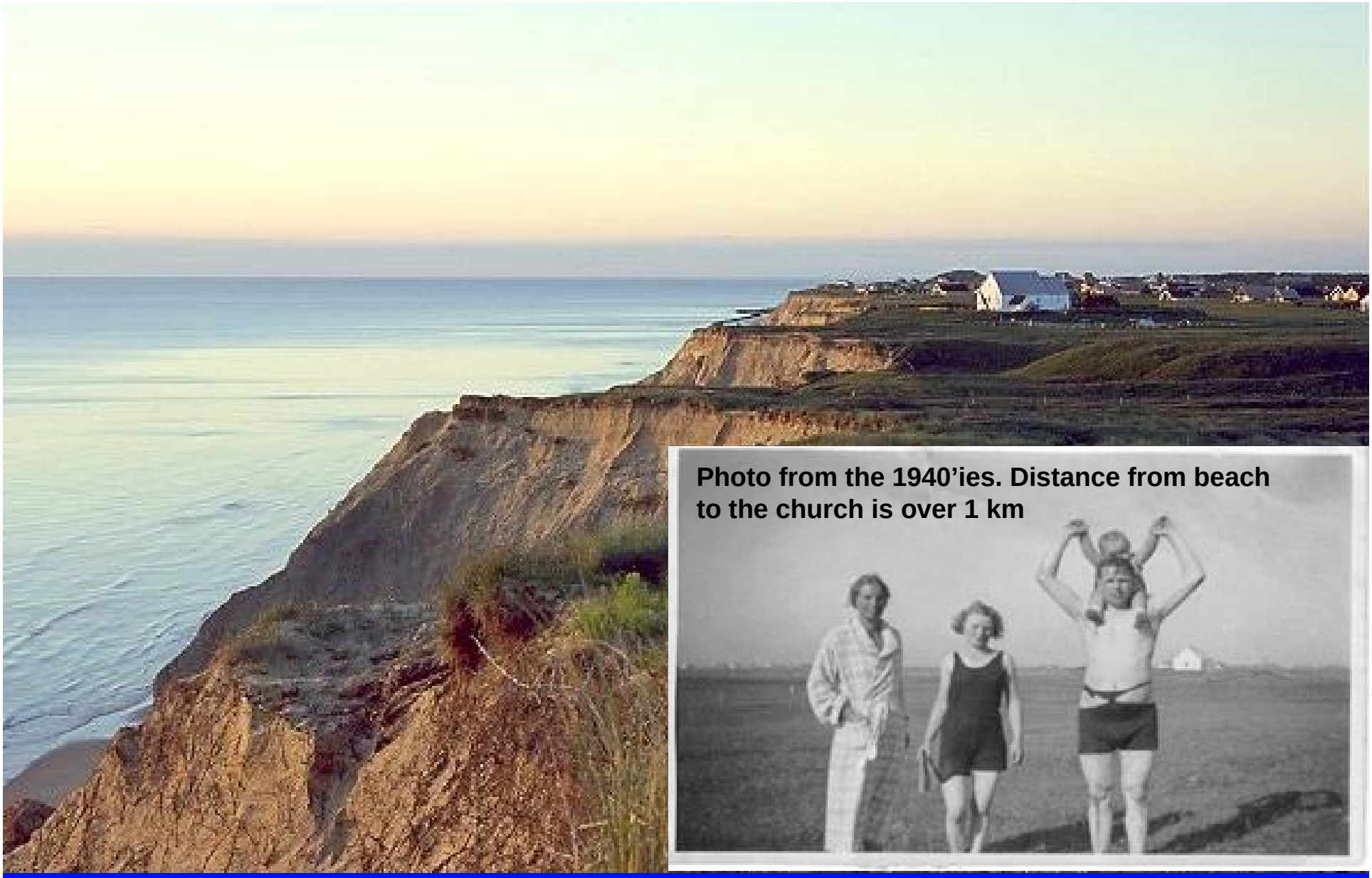
PEM and storms

”During the Storm "FAY", our beach endured an exceptional high tide and extremely rough water. These conditions had little or no effect on our beach. Fortunately, it caused no erosion. When the tide receded we were pleased to find that our beach was seemingly in the same conditions as before the storm.
In my personal opinion, the PEM System accomplished all that we hoped it would. We continue to monitor our sand levels and expect continued success with the system”.

Commissioner Tom Puleri

PEM installed for 24 mths

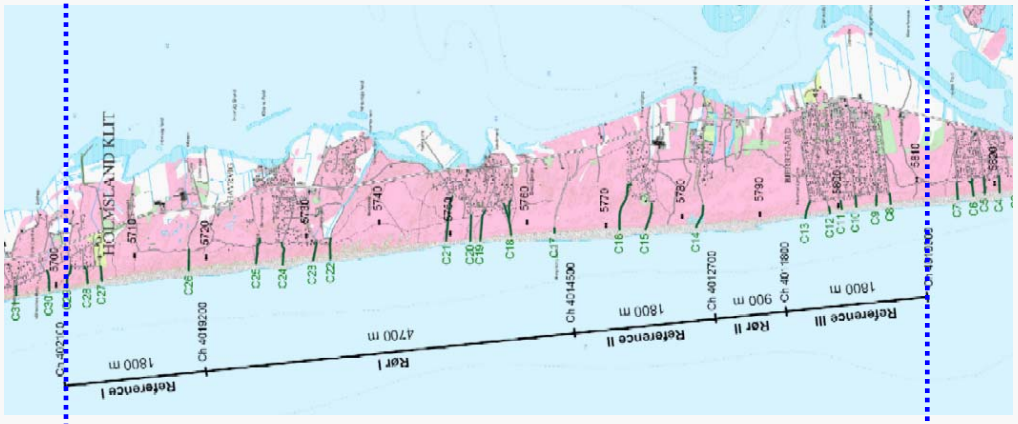
No PEM installed



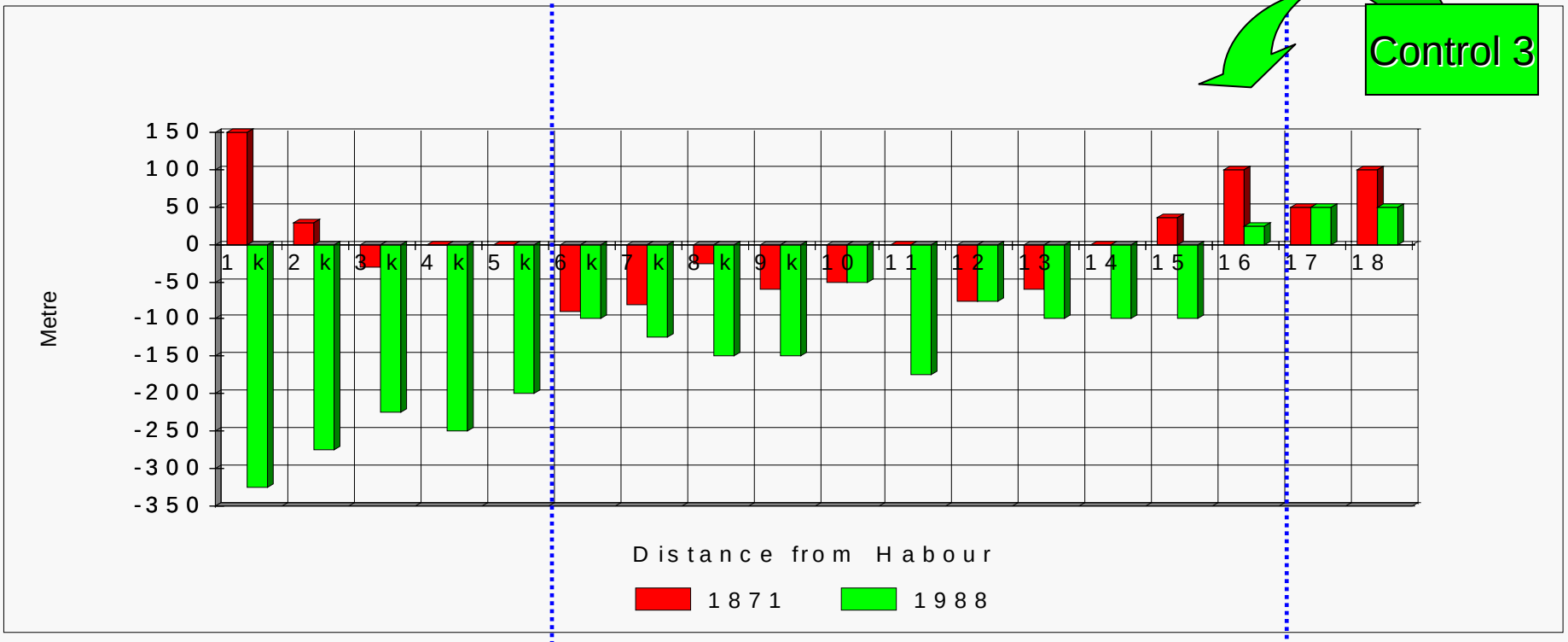
Maarup Church
Built around year 1200


Distance from church to MWL at project start 213 ft.
Distance 4 years later 262 ft.


N


HOLMSLAND KLIT
Reference I
Ref I
Reference II
Ref II
Reference III
1800 m
4700 m
1800 m
900 m
1800 m

Control 3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6 k
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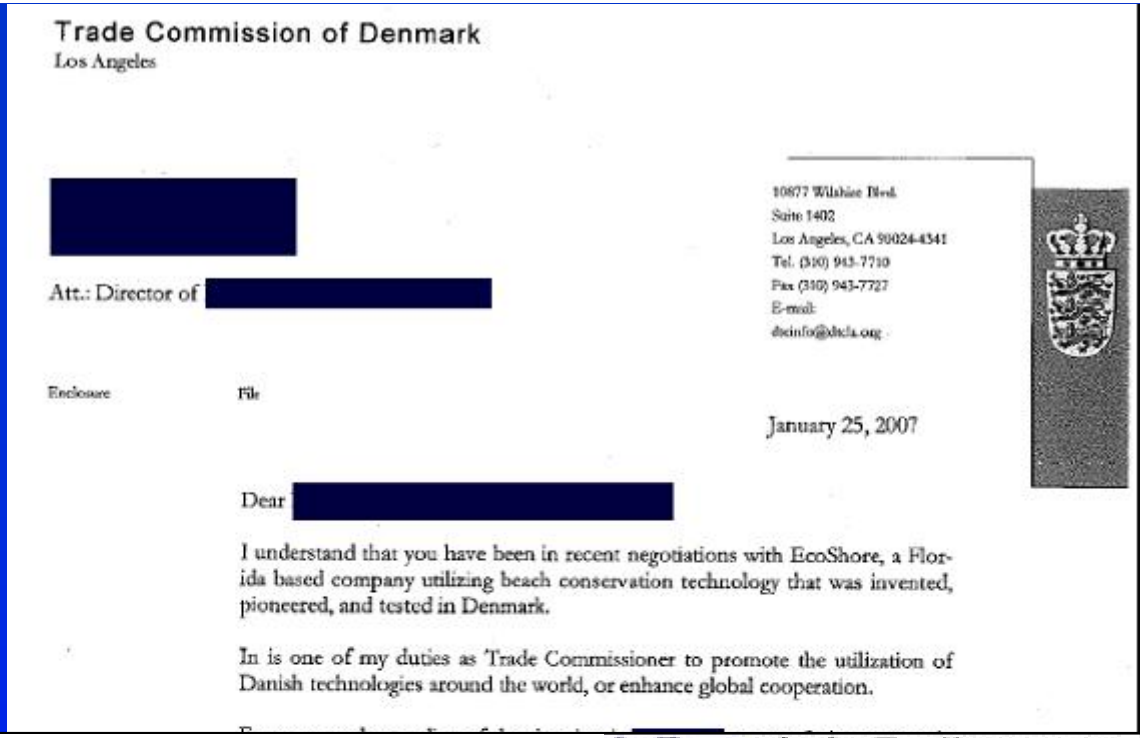
17
18
Distance from Habour
1871
1988

Who is EcoShore

- Exclusive US licensee
  - PEM US patent 2003
- Location
  - Boca Raton, FL
- Kenneth Christensen
  - President and owner
  - Bus. Degree, Copenh. Business School
  - Senior positions in Danish companies
  - CEO of environmental companies



Trade Commission of Denmark
Los Angeles

[redacted]

Att.: Director of [redacted]

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E-mail:
dtcinfo@dtcla.org

Enclosure File

January 25, 2007

Dear [redacted]

I understand that you have been in recent negotiations with EcoShore, a Florida based company utilizing beach conservation technology that was invented, pioneered, and tested in Denmark.

In is one of my duties as Trade Commissioner to promote the utilization of Danish technologies around the world, or enhance global cooperation.

In Denmark, the EcoShore PEM system has increased the recreational opportunities while enhancing erosion protection.

Our experience with EcoShore has been outstanding, and they have been pioneers in introducing technologies that have proved successful at enhancing natural processes to protect oceanfront structures.

Our experience with Kenneth Christensen the President and owner of EcoShore is excellent and long lasting. He has a very good reputation and has held several senior positions among the Danish top 10 companies. It is also the understanding of the Trade Commission of Denmark that Ecoshore is laid on a solid financial foundation.

I wish you the best in your future contract negotiations with Ecoshore.

If there is anything that I can do as Trade Commissioner to facilitate contract negotiations, please do not hesitate to contact me.