

# Neptune Solutions Brochure

May 2017



## **About Neptune Solutions**

Neptune Solutions was founded in March 2014 by Mike Mulvihill. Mike is a technical structural engineer who came across the idea when the Tsunami hit Thailand back in 2004. He believed that there was another way to protect communities from flooding without the big expense, as conventional products are time consuming and costly.

Mike did not realise the potential of the fluid retention device he had invented. In-fact over the next 2 years Mike had come up with 24 different applications that the retention device could be used for, such as;

Holding Tanks for gas, oil, waste & fresh water. The retention device could be used for transporting water across land by building an aqueduct.

Flood protection for communities, homes & business premises.

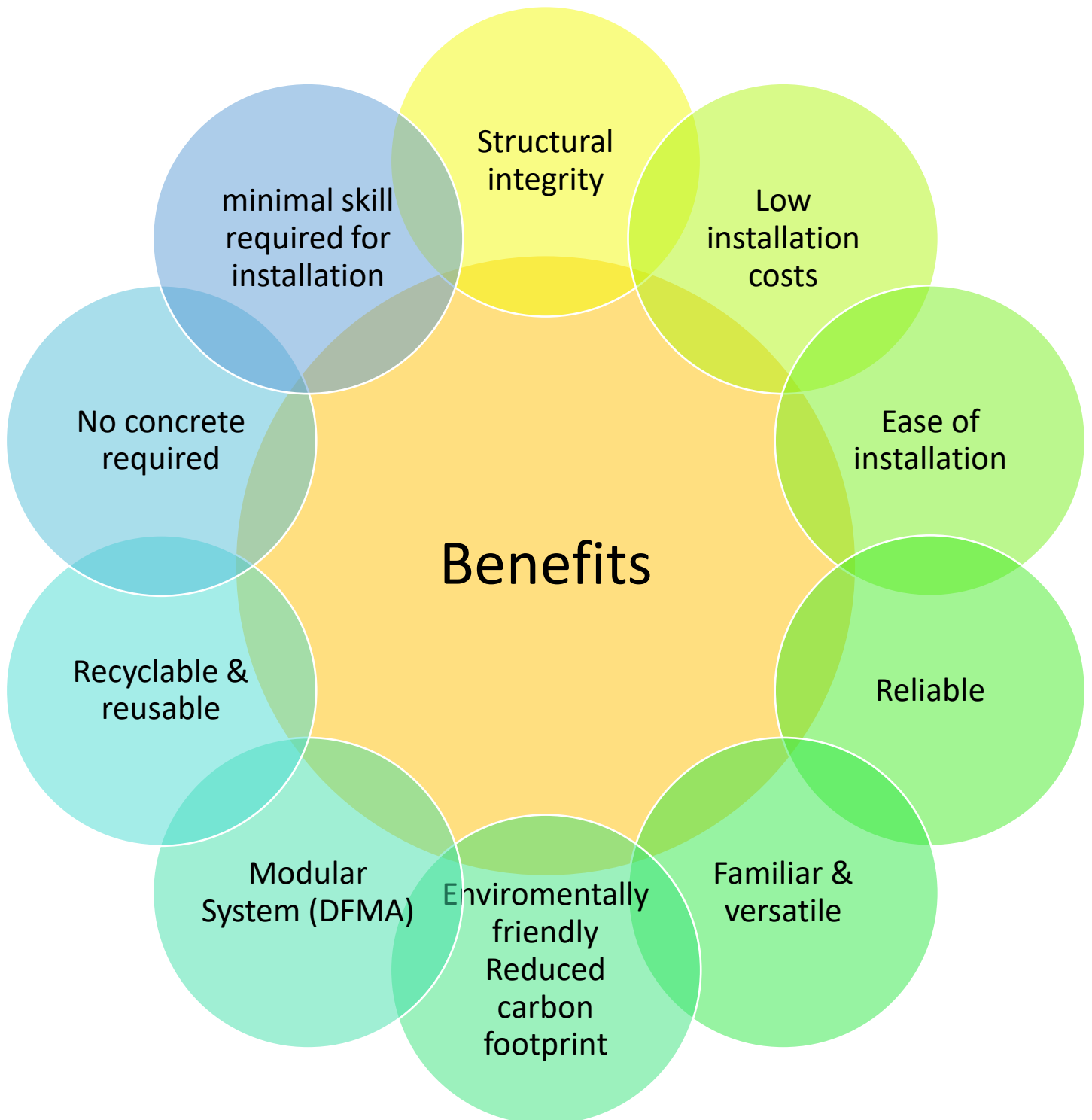
Soil & rock retention, Ideal for Railways where land slippages or floods cause disruptions to the rail network

## **About Michael Mulvihill**

Founder of Neptune Solutions

Mike has 25 years' hands on experience in the construction sector, his specialty included Building designs, Retaining walls, Facade, Propping and Needling. Mike worked closely with May Gurney and other contractors in the UK & Ireland.

## The Benefits of the Neptune Systems

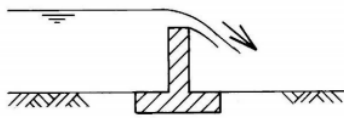




## The Current Solutions

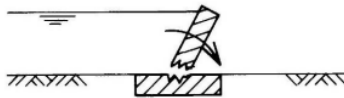
Current long term barrier solution available are from 1 – 10 Meters in height.

1. Concrete
2. Sheet Piles
3. *Gabion Baskets*



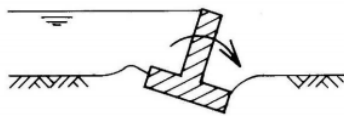
### **Overtopping leading to failure**

Overtopping of a defence does not necessarily result in failure – the defence may have been designed to be resilient if overtopped. However, if the defence collapses during overtopping, the consequences may be more severe than if there were no defence. Overtopping of an embankment can wash away the crest, leading to a breach.



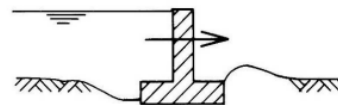
### **Structural failure**

In this case there is a structural failure of part of the defence, leading to loss of ability to retain water. A sudden collapse can be very dangerous, as it can lead to rapid inundation in the defended area without warning. A breach is the equivalent mode for an embankment. Collapse can also result from erosion of the riverbank if the defence is close to the river.



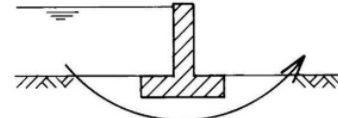
### **Rotation**

Here the defence has rotated under the action of the hydrostatic load, which may include uplift under the base of the wall. A partially rotated wall may remain stable for some time, but the defence level is likely to have been compromised and there remains a risk of collapse under future loading.



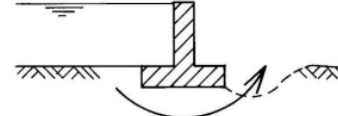
### **Sliding**

This may appear to be a 'safe' form of failure when viewed in cross section. In reality, the sliding may open up cracks between adjacent parts of the defence and the foundations may be compromised.



### **Seepage**

If the quantity is modest, seepage under the defence can usually be dealt with by pumping. Excessive seepage can lead to local flooding and may damage the foundations (see piping below). Seepage can occur through an embankment as well as under it, often as a result of damage by burrowing animals. Local collapse of the embankment may result.



### **Piping**

In extreme cases, seepage flow under a defence can cause the soil on the defended side to become buoyant, creating a void. This can lead to sliding or rotational failure of the wall, or a breach in an embankment. Flow through an embankment can also result in piping failure. The addition of a cutoff to lengthen the seepage path is often the most effective way to avoid piping failure.



Diagram above shows sheet piling failure.



\* Diagram above shows gabion basket failure

## Applications

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### The Flood Defence

Neptune Solutions retention device can be used for flood protection of communities, residential and commercial properties. Each Flood barrier can be raised at a later date if needed.

There are 3+ different designs of flood barrier

1. (Small) Low facing Flood protection for residential and commercial properties. Ranging from 0.5 Meters – 1 Meter in height.
2. (Medium) High facing flood protection for residential and commercial properties. Ranging from 1.5 Meters – 3 Meter in height.
3. (Large) Flood barrier for protecting communities from major flooding can be manufactured to fit any height required from 3 meters +.

Other purposes may be used for:

- Cofferdams
- Coastal defences
- Temporary defences
- Railway flood protection



## Holding Tanks

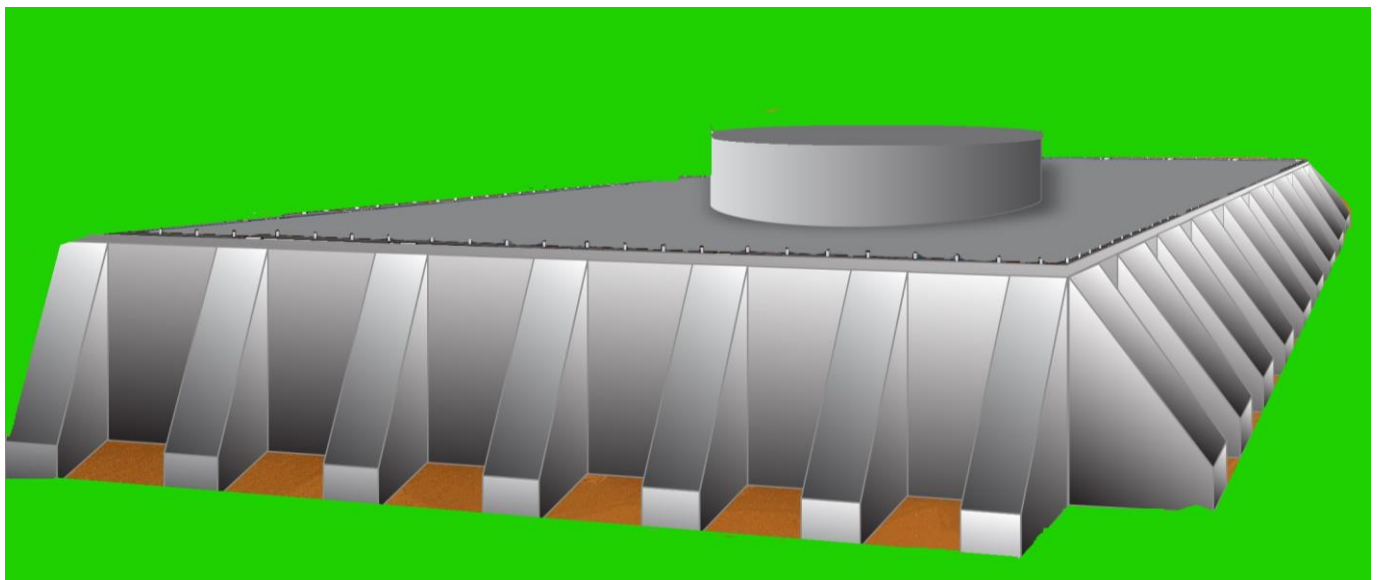
Neptune Solutions retention device can be used to create a holding tank for liquid, oil & gas storage.

Example sizes of holding tanks:

Volume (Cubic meter)	Length	Width	Height
100.86	4.1	4.1	6
1014	13	13	6
10086	41	41	6

Other purposes may be used for:

- Aqueducts
- Silt traps
- Precipitation tanks
- Storm tanks
- Intervention tanks for temporary works.
- Wastewater treatment plant
- Fisheries
- Agricultural tanks



## Aqueducts

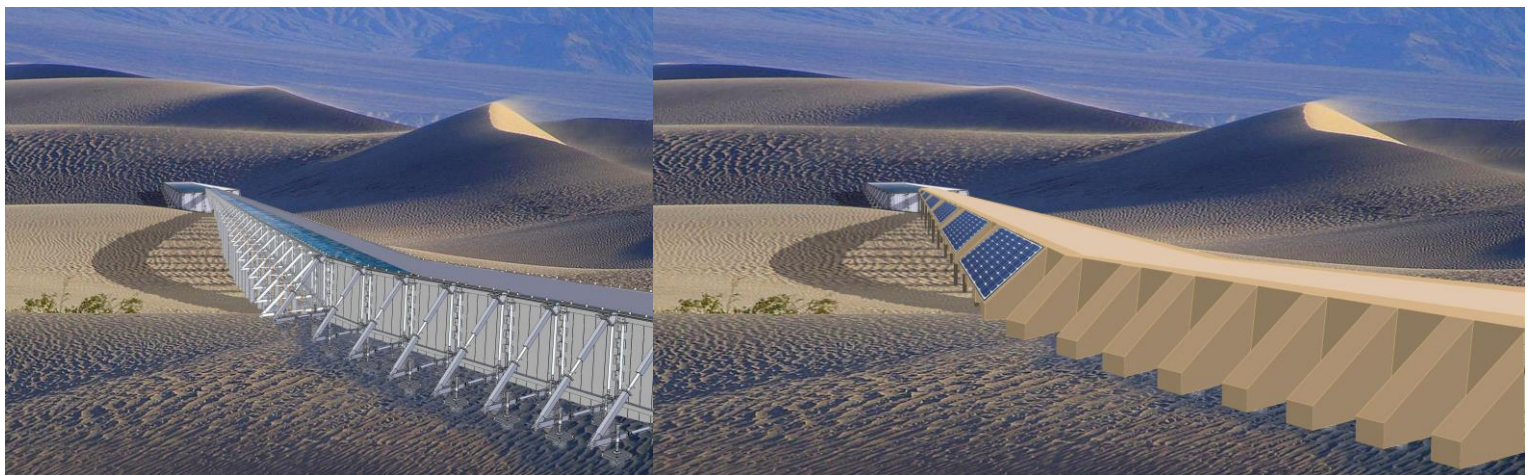
Neptune Solutions retention device can be used to create an aqueduct to move water across land.

The aqueducts can be built to any size to allow movement of water.

The idea of the aqueduct is to be able to transfer water between villages where water is scarce.

Solar panels and water turbines can be installed to the system to allow free electricity to be generated and power the pumps required to keep the water flowing. The system can be used on any terrain and can be designed to go over hills.

Using the aqueduct and holding tank you can create a water treatment facility and store the fresh water for the towns and villages. All of this can be done without the use of concrete so it is ideal for areas where concrete is not an option.



Aqueducts without Cladding

Aqueducts with cladding, solar panels and internal water and wind turbines

## Land Retention

Neptune Solutions retention device can be used for land slippages/slide prevention. For example, the front face of the medium barrier can withstand 220 tones of pressure. The bigger the barrier the more pressure it can withstand.

Ideal uses for

- Railway network to prevent disruptions to service due to landslides.
- Snow barriers.
- Prevents rocks from falling onto roads



## **Additional**

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### **Manufacturing**

Neptune Solutions retention device will be manufactured in the North West of England to help improve the local economy and job prospects. The system can be manufactured in any other location if required and does not require massive tooling costs.

The system is constructed of mild steel, protected with galvanizing and a 2 pack epoxy resin (used in marine environments) A clad option is available to protect further from weathering. Please see the cladding page for more information on clad options.

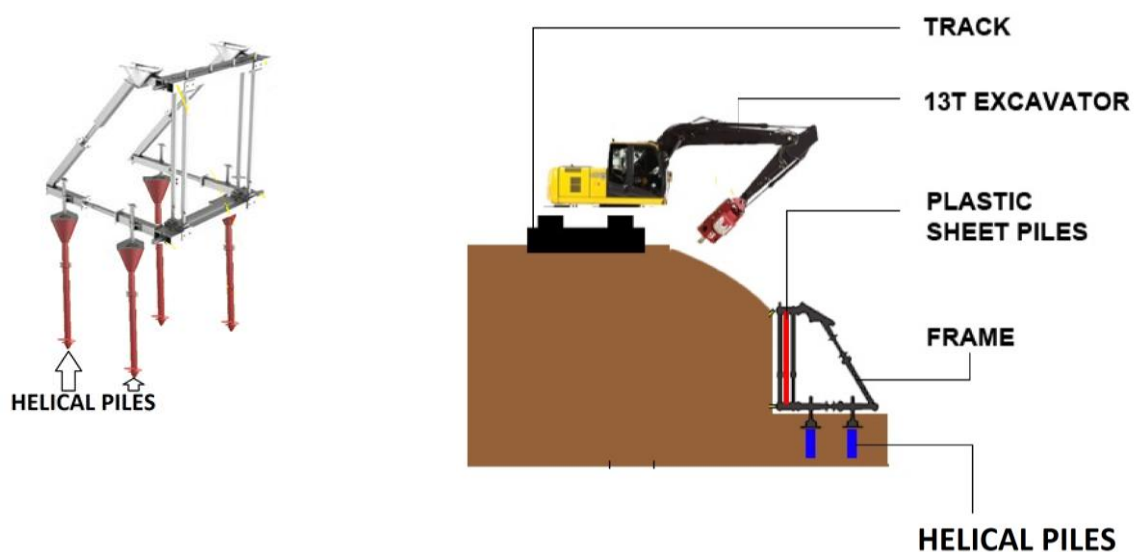
### **Installation**

The system requires very little ground preparations, It can be installed on any terrain in any locations It is ideal for countries where concrete cannot be sourced.

The system is delivered on site on the back of an articulated wagon pre packed as 4 sub-assemblies. Helical piles are positioned. The 4 sub-assemblies are bolted together using preset torque settings which requires minimum skill. The frame can then be lifted into position on the helical piles which have been pre-installed. The ancillaries can then be connected to the frame to complete.

Once the system is installed an independent surveyor will come to site to check and confirm everything is ok.

Illustration on right:





## The Installation Process



### STEP 1:

Put 1st sub assembly into position and bolt to helical piles.



### STEP 2:

Slide the 2nd Sub assembly into sub assembly (1) then bolt together to secure.



### STEP 3:

Slide the 3rd Sub assembly onto the top locking bracket of sub assembly (2) and sub assembly 1 & 3 are bolted together using 1 single pin (This component adjusts to accommodate uneven ground)



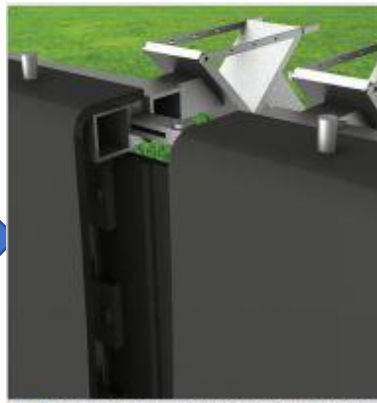
### STEP 4:

Once the assemblies have been locked into position and the pin put into place your frame will look like this.



### STEP 5:

The final process of installation is to hang the Rubber membrane on to the frames like so:

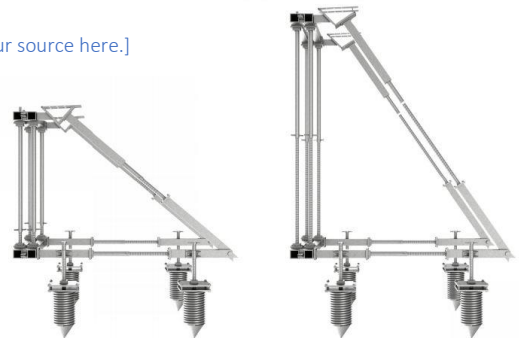


The expanding rubber mats are clamped in between the frames and the front mats hung over the bolts.

### STEP 6:

This rubber membrane is overlapped every 10+ meters and the pressure of water against the frame will seal itself.

[Cite your source here.]



### STEP 7:

Finished - The framework can be adjusted in height by turning the jacks.

## Cladding

Cladding can be installed to the system for aesthetics and beautification. Different colours and textures on the cladding available for customer requirements.

The cladding is UV protected but may fade after 35 years. This is to further protect the system from weathering and other factors.

The system can also be backfilled if needed.

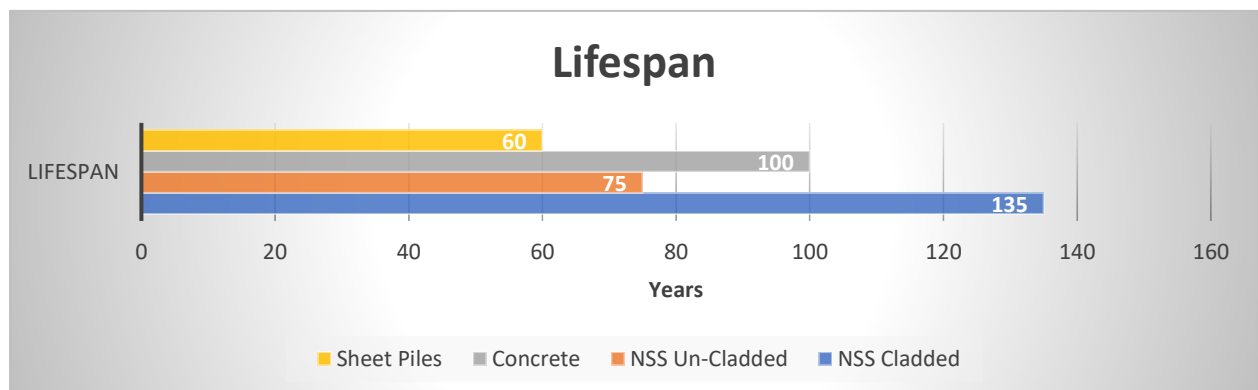
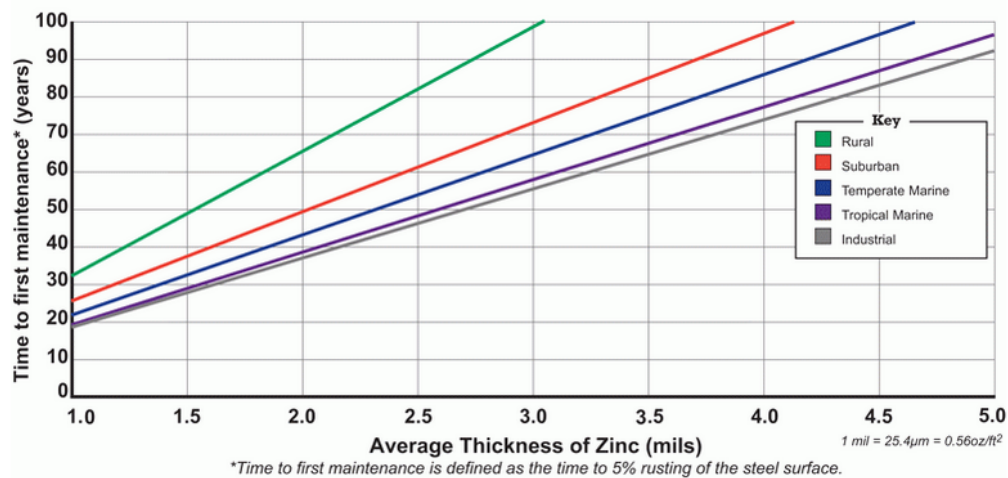
## Lifespan

The lifespan of the system depends on the customer requirements, Dependent on thickness of galvanizing and if other coatings and cladding are used.

We estimate by using the galvanizing, two pack epoxy and clad that the system will last up to 135 years.

Please see the chart below for estimated lifespan of galvanized steel in different environments.

If the system is backfilled, cathodic protection can be used which increases the lifespan further



## **Generate Electricity**

Solar panels, wind & water turbines can be installed onto the system to generate its own electricity. This can then be distributed to towns and villages or sold off to the electric companies to generate its own revenue.

Combined with an aqueduct and holding tank the electricity can be used to power the pumps to produce clean water which would benefit third world countries.

## **The Rapid Response Team**

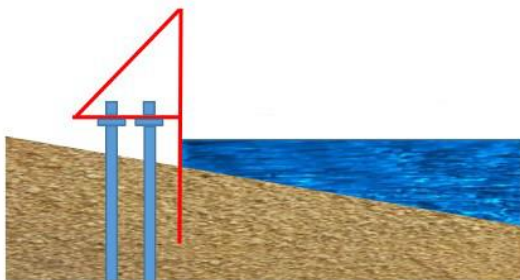
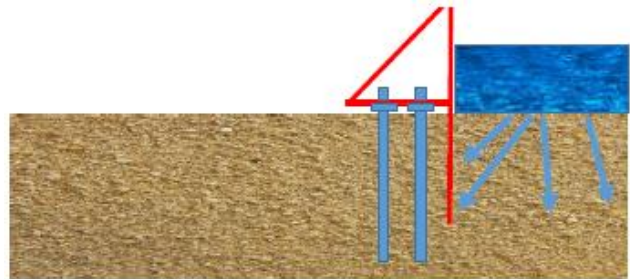
The rapid response flood barrier solution is ideal for a fast & easy installation to areas which are continuously being flooded and using long term flood barriers isn't an option.

High risk flood areas are identified and monitored to determine when floods might occur. When there is a high risk of flooding the rapid response, teams are allocated to such areas to deploy the flood barriers.

Local communities and staff can be trained to install the system or Neptune's rapid response team can install the system

## **Areas Neptune Can be Deployed**

As rivers overflow the Neptune System halts the flow of water above ground and also prevents the ingress of water as it seeps down below the surface



This illustration represents marshy, boggy ground where there is no solid foundation. The Neptune System can easily be installed above the water level.

## **Request Documents**

If you would like to find out more about Neptune Solutions including technical loadings, risk assessments, business plans email.

[hello@neptunesolutions.co.uk](mailto:hello@neptunesolutions.co.uk)

## **Links**

Website : [www.neptunesolutions.co.uk](http://www.neptunesolutions.co.uk)  
LinkedIn : <https://www.linkedin.com/in/michael-mulvihill-72985097/>  
Twitter : <https://twitter.com/MichaelMulvihi2?lang=en-gb>  
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