























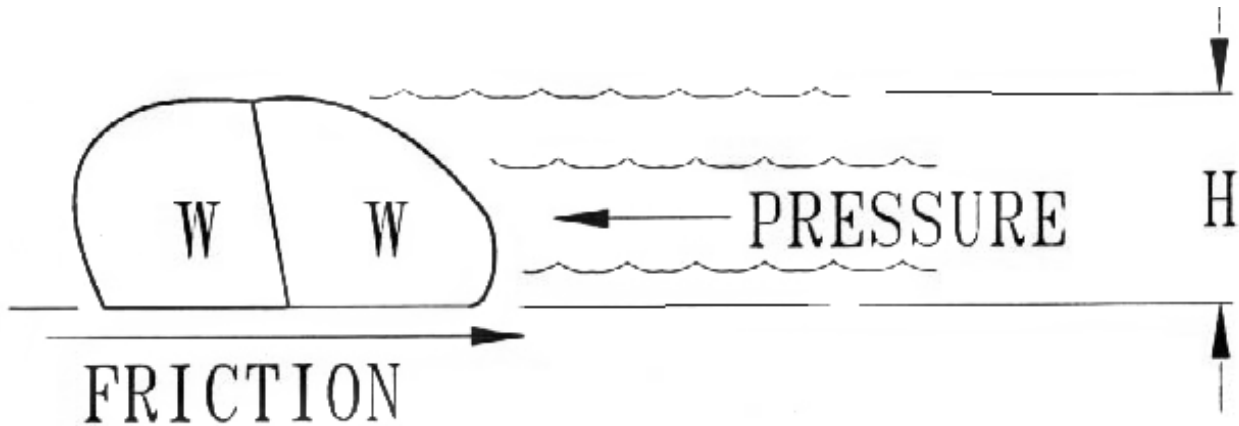


## Symbol Key:

D = Width of AquaDam®  
 H = Head of water  
 W = Weight of water in an *inner* tube.  
 P = Pressure  
 f = Frictional force  
 N = Normal force  
 ρ = Density of fluid  
 g = Gravitational constant

## Sliding

The second method of failure is for the AquaDams to slide sideways. The resistance to sliding is provided by the friction between the ground and the structure at its base. The applied force to cause sliding is the applied pressure of the detained water.



## Assumptions

We assume that the supporting surface is smooth and flat. Any deviation from a smooth surface will add greater opposition to sliding and so, our estimations will tend to be conservative.

## The Sliding Model

Again, we assume that the inner tubes are generally rectangular to facilitate the calculations and we regard the extreme case where the depth of the detained water is equal to the height to the dam.

$$\text{Frictional Force} - \text{Pressure Force} = 0$$

Or

$$\sum F_x = m \cdot \rho g H^2 = 0$$

Deriving the term for the coefficient of friction as simply:

$$M = \frac{1}{2} H/D$$

**Table 3. Coefficient Of Friction For Sliding:**

Inflated Height (In Inches)	Inflated Width (In Inches)	Coefficient of Friction for Sliding
12"	24"	.25
24"	46"	.26
36"	68"	.26
48"	120"	.02
72"	186"	.19
84"	282"	.15

Looking at Table 3, the value of the coefficient of friction would allow the dam to slide on a smooth flat surface. Coefficients of friction in the range 0.10 to 0.25 are appropriate for quiet slippery surfaces, for example greasy plate steel, railway wheels. In most cases, the surface under the AquaDams will be comparatively rough and will have a far greater coefficient of friction with the AquaDams and hence will pose an even greater opposition to sliding.

The principles used to create the AquaDams are simple yet effective. The stable non-rolling wall of water conforms to the surface beneath it creating a tight seal. The AquaDams will not tip or move even if the water level raises to the top of the structure. AquaDams provides a lightweight, reusable and environmentally friendly method of water control.

**Table 4. Maximum Depth Using Coefficient For Sliding:**

<b>Inflated Height (In Inches)</b>	<b>Inflated Width (In Inches)</b>	<b>Recommended Maximum Depth</b>	<b>Coefficient Of Friction For Sliding</b>
<b>12"</b>	<b>24"</b>	<b>8"</b>	<b>.11</b>
<b>24"</b>	<b>46"</b>	<b>18"</b>	<b>.15</b>
<b>36"</b>	<b>68"</b>	<b>28"</b>	<b>.16</b>
<b>48"</b>	<b>120"</b>	<b>36"</b>	<b>.11</b>
<b>72"</b>	<b>186"</b>	<b>54"</b>	<b>.11</b>
<b>84"</b>	<b>282"</b>	<b>72"</b>	<b>.11</b>

# Frequently Asked Questions:

Many factors influence the selection of a dam or water retaining system. When considering whether to use AquaDams® or some other system questions will come to mind about how it works, will it work in a particular circumstance and so on. Below you will find many of the most commonly asked questions about AquaDams® and how to use them.



## What materials are used to manufacture AquaDams?

AquaDams® are made from polypropylene geo-textile for the outer tube and polyethylene for the inner tubes. In some larger sized dams or dams that are to be used in cold conditions (less than -20C) have inner tubes may be made of PVC.

## Do AquaDams meet current laws and regulations as they apply to water retention systems?

AquaDams® are designed to meet the United States Environment Protection Authority (EPA) guidelines under Section 404 (40 CFR §230.1) as well as the Clean Water Act. The Clean Water Act and Section 404 guidelines prohibit discharges of dredge or fill material when a practicable alternative exists. AquaDams provide a practicable alternative in many circumstances as they do not use any fill material and have no adverse effect on the aquatic ecosystem.

There are many world-wide and national laws that forbid the pollution of streams, rivers, and waterways, such as the New South Wales Clean Waters Act of Australia. Unlike temporary earth dams, sheet piling or sandbagging, AquaDams® introduce no pollutants to the waterway during installation or removal and do not disturb either the bottom or the bank. AquaDams® complies with every international and national laws concerning environmental practices.



## Aquadams® Have been Approved and/or Used By The Following Government Agencies:



## **Are AquaDams available for rental?**

AquaDams are available for rental at very reasonable rates. Our team of AquaDams experts will install the AquaDams and remove them when the job is done.

## **Are AquaDams permanent structures?**

No, AquaDams are temporary structures designed and intended to be used for the duration of a job, flood emergency or stream diversion.



## **How long can an AquaDams remain in place?**

The outer woven geo-textile tube contains UV inhibitors to prevent damage due to sunlight exposure. A properly maintained AquaDams can remain in place for over a year in direct sunlight. Stored properly, the shelf life of an AquaDams is indefinite.

## **What warranty do AquaDams come with?**

AquaDams are fully warranted against defects in manufacture and materials. As there are many factors that influence the operation of an AquaDams no warranty can be extended to customer installations.

## **Can an Engineer's Certificate be obtained for an AquaDams?**

Certification by a Professional Engineer involves two areas of responsibility, one the dam itself and the second, that AquaDams has been correctly installed for the prevailing conditions and will perform as expected. AquaDams Pty Ltd is able to arrange certification if the dam has been installed by AquaDams Pty Ltd, or under its direction, in many circumstances.

## **How high an AquaDams do I need?**

The height of AquaDams is determined by the height of the water to be contained or diverted, the stream bed slope, water velocity and the maximum projected changes in the water levels after the installation of the dam. Lateral pressures from flowing water, as in a river, may require multiple AquaDams installed parallel with each other across the flow. Depending upon the strength of the current the above water depths need to be lowered. That is, a bigger dam is required for a smaller water depth.

## Water Depth

The height of the water to be contained by the AquaDams is the most important criterion in selecting the proper AquaDams size.

Consider a diversion channel installation. For a diversion channel of approximately the same width as the stream, a good rule of thumb for determining the water height after diversion is: Add 1) Max Water Depth along Site, 2) Average Water Depth along the Site and 3) Difference in elevation between the installation and the divert water sites. These three numbers equal the height of the water that will be found at the installation after the AquaDams is installed and the water flowing through the diversion channel.

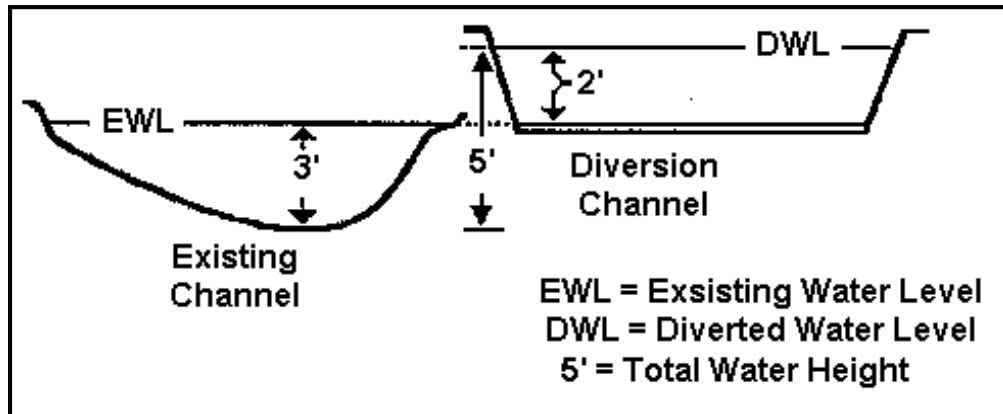


Figure 1. The height of the water to be retained by the AquaDams is related to the maximum depth of water at the installation site, the average depth of water along the installation site and the difference in the water levels between the installation site and the diversion point.

## How does Water Velocity influence the size?

When an AquaDams® is used to stem a water flow, some consideration must also be given to the velocity of the water running around the end of the AquaDams® during installation. When the water flow is being pinched off during installation, the water velocity will increase and depending on the firmness of the stream/river bed that the AquaDams® is being laid over; may cause some undercutting around the end of the AquaDams® as it is being installed. This would result in an increase in the height of the water to be retained and should be considered in the above when determining the maximum water height. Current velocity will also play an important part in the installation of an AquaDams®. For example, during installation an AquaDams® has to be filled to a higher capacity so as to prevent it from rolling down stream. Once the AquaDams® is installed in flowing water, the water will begin to pool in front of it and the flow at near the AquaDams® will be minimal.

## Are there limitations related to the flow periods?

As long as the maximum water depth during the life of the project is accounted for, the AquaDams® will remain stable for the duration of the project. In the event of unexpected increases in water levels, most AquaDams® can be removed in one day without any damage to the environment and then reinstalled after the water levels return to normal. A second option would be to increase the height of the installed AquaDams® by pumping more water into the structure and temporarily super-inflating it. For example, a 1.4m AquaDams® could be super-inflated to 2m in height under the right conditions.



## What type of site bottom is required?

Select a site that is flat and devoid of wire, reinforcing bars, sharp objects, garbage, glass or dead vegetation such as fallen timber and so on. An AquaDam® can be installed on top of most types of soils or fluvial bottom materials, including flat lying bed rock, mud, sand, gravel, small rocks and vegetation. Preferably the slope of the riverbed should be flat. Remember to remove any materials from the site bottom that could puncture it or prevent a proper seal from occurring.



## What lengths do AquaDams come in?

AquaDams® come in stock lengths of 50feet and 100feet. Several AquaDams can be joined together with the patented coupling collars to achieve virtually any length of AquaDams®. Custom lengths can also be made upon request.

## How do you inflate an AquaDams®?

AquaDams are normally inflated with water from the installation site. This generally involves using a small gas powered portable pump and pumping into the open ends of the AquaDams' same time letting the dam unroll across the stream or waterway.

## Does Cold Weather effect the AquaDams®?

AquaDams® have been used in temperatures as low as -40C. At very low temperatures the water inside the dam will freeze. If attempts are made to move the AquaDams® under freezing conditions the ice inside the AquaDams® will crack and break exposing sharp edges or points that may damage the inner tubes. It is best to wait until the thaw before attempting to move the AquaDams®.



## Does Hot Weather effect the AquaDams®?

No. AquaDams® have been used in hot and humid environments in Florida and along the Gulf of Mexico.

## **How does erosion around the AquaDams affect its usefulness?**

AquaDams® are flexible and conforms to the ground and surrounding area to provide an effective seal. Even if the ground is eroded away after installation, the AquaDams® will fill the gaps to maintain the seal. The AquaDams® itself is not susceptible to erosion and does not use fill materials which can be washed out. By eliminating the use of fill materials, AquaDams® also meet the demands of EPA guidelines and Clean Water Act laws avoiding fill discharge. If an AquaDams® is placed on a soft base which will allow water to permeate its subsurface and undercut the structure, it will have a tendency to sink as the base is washed out. This problem would present itself with any water retention system. If this problem is a possibility with any given site it should be considered as a factor in selecting a particular AquaDams size®. A larger AquaDams® provides a larger footprint to resist undercutting or sinking and to insure that the retention depth will stay within recommended values if sinking should occur. Any leakage through the ground or subsurface would be directed to a small pump in order to keep the dewatered areas dry.

## **How long and what effort is required to install an AquaDams?**

The US Army Corps of Engineers performed a comparative study of installation times for sandbag dams and AquaDams®. A group of trained people could install a 4' x 100' sandbag dam in a little over 4 hours whereas two Corps personnel could install a 4' x 100' AquaDams® minutes.

The exact number of laborers and time required to install AquaDams® are related to size of structure, terrain, water depths, and water flows. Usually it takes the following: 1 to 3 laborers in the water, 1 laborer on the pump, and 3-4 laborers using ropes. So it takes only 5 to 8 laborers to handle a project. This is considerably less effort than it takes to use sandbags.



## **Can an AquaDams be used mid-stream?**

AquaDams® have been used successfully in the middle of streams and lakes as well as the edges. When used in the middle of a body of water, the first AquaDams® serves as a stable platform and work area after it is deployed. Any subsequent AquaDams® required by the project can be deployed with pumps and equipment placed on the first AquaDam® thereby eliminating the need for boats to convey the equipment to and from the shores or banks. The fact that the AquaDams® acts as a walkway and work platform becomes especially important when work activities are in mud.

## **Are there limitations to the size of the work area within the AquaDams retention basin?**

It is important that adequate clearance between the work area and the AquaDams® be provided when the retention basin is established. Adequate clearance will reduce the potential threat of puncturing a structure if heavy equipment is used in the work area next to the AquaDams®. Do not crowd your work area if possible.

## **Are additional areas required for placement of pumps or other equipment?**

No additional area is required outside of the work area since AquaDams® form a platform like surface when deployed. Pumps, if needed, can be placed on the AquaDams® themselves. Other than water and pumps, AquaDams do not require any equipment or fill material for maintenance. As long as the structures remain filled with water they will continue to perform effectively.

## **Does AquaDams provide an installation and removal service?**

Yes, AquaDams® provides a full range of services from initial site planning and advice, then on to installation and finally removal and cleanup if required.

## **Are AquaDams reusable?**

Under most conditions AquaDams® can be reused. Even a punctured AquaDams® can easily be patched. As long as the AquaDams® is not irreparably damaged during the deflation, it can be pulled from the water and stored for another project.