

## Message from The Water Conservation Team of Cork County Council

Cork County Council is continuously working to conserve water. It has a dedicated Water Conservation Team whose mission is to reduce water loss and maximise the value of economic investment while protecting and facilitating improved management of finite water resources. The motto of the Water Conservation Team is:

### *Water is Life Don't waste it*

You, as a non-domestic customer can play your part in conserving water and reduce your water bills as a result. You can do this by raising awareness among your staff, teachers and pupils of water conservation. They are all water consumers. When water usage is reduced, there is also less wastewater produced and you pay less. The water charges you pay are based on what you use in your school.



Some leaks are obvious but many are not easily detected. 40% of water production in Cork County each year is unaccounted for.

### *FACT*

*The scientific formula for water is H<sub>2</sub>O. This means that each water molecule has two hydrogen atoms joined to an atom of oxygen. A tiny drop of water will contain millions of water molecules.*



*Water exists in three states on the Earth. solid (ice, snow or frost) liquid (in lakes, oceans, rain, dew, fog or mist) gas (steam or water vapour).*

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*Water is an excellent solvent. It dissolves materials, acts as a cleanser and dilutes many wastes. Because it is such a good solvent, pure water is rarely found in nature.*

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*Water is the only common, safe substance which can exist in all three states at the same time on the surface of the Earth.*

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*One litre of pure water weighs 1 kg.*

## Introduction

Cork is the largest Irish County, covering an area of approximately 7,453 sq. km, with 1,200km of main channel rivers. Major rivers include the Bandon, Blackwater, Glashaboy and the Lee all of which flow from west to east in direction. In addition there are approximately 2,000 km of streams and many lakes of note in the county. The largest lake being Carrigadrohid and Inniscarra. Inniscarra provides the largest source of drinking water in the County.



Inniscarra Waterworks

Water abstracted from Inniscarra and Carrigadrohid Reservoirs is treated before it is piped to up to 95,000 people in the surrounding areas in Cork County. The Lee is also the source of drinking water for those living in Cork City. Groundwater is an important contribution to drinking water sources and is used widely in North Cork. The population of Cork County is 361,877 [2006 CSO] with approximately 100,000 households.



The photo above is of Inniscarra dam. It is 21.3 meters high and the reservoir behind it is 9 sq.km in size. It is one of 15 large dams in Ireland. It's original purpose was for the generation of electricity.

*Arrange a school tour of Inniscarra Waterworks, contact 021 4532700*

### Who manages your water supply?

Water Services in Cork County are undertaken by Divisional Services who manage the provision of water services for the communities in North, South and West Cork. Water Services Operational staff are responsible for the operation and maintenance of all water supplies and sewerage schemes throughout each Division. The County purifies and supplies water in compliance with the European Communities (Drinking Water) Regulations, (S.I. No. 278 of 2007) to approximately 40,000 non-domestic customers and 100,000 homes across the county.



Map of Cork County's 3 Divisional areas

### Who monitors your drinking water?

The Environment Directorate situated in Cork Harbour Regional Supply Scheme [Inniscarra Water Treatment Plant] has responsibility for monitoring, analysing and reporting on the quality of water in Cork County in accordance with EU and national legislation.

The Water Laboratory at Inniscarra is where a comprehensive monitoring programme of public and private drinking water supply schemes is undertaken. Staff here also implement a protocol with Water Services Department and the HSE regarding exceedance of quality standards in drinking water, conduct follow-up investigations and corrective actions.

In addition, the Water Laboratory complies with the following:

- Water quality monitoring returns to the Environmental Protection Agency (EPA).
- Monitoring and administration of the Blue Flag scheme and designated bathing areas.
- Monitoring of rivers under Salmonoid, Phosphorus and Abstraction Regulations.
- Monitoring of lakes under Phosphorus and Abstraction Regulations.

## BELIEVE IT OR NOT!

*The contamination of groundwater by arsenic in Bangladesh is the largest poisoning of a population in history, with millions of people exposed. The main source of arsenic in drinking water is arsenic-rich rocks through which the water has filtered.*

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*Water, water, everywhere,  
Nor any drop to drink.*

*– Samuel Taylor Coleridge,  
The Rime of the Ancient Mariner.*

*The composition of ocean salt is very complex with salinity measured by the concentration of dissolved salts. Fresh water is defined as having less than 0.1% of dissolved salts, by contrast human blood is around 0.9% salt, and the ocean is classified as 'highly saline' with over 1.0% dissolved salts and up to 3.5% by weight. That's about three times as salty as human blood and more salt than we can safely metabolise.*

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*Did lead poisoning contribute to the fall of the Romans?*

*Lead in the form of lead carbonate  $PbCO_3$  contaminated the homes of the Romans. Drinking water was transported along lead-lined aqueducts, through lead pipes and stored in lead cisterns. Water was drunk from lead pewter vessels.*

*In Cork, water distribution schemes do not use lead piping. Any older schemes had old cast iron pipes replaced. Lead levels in drinking water are monitored regularly along with other metals.*



## Conducting a water audit

### What is it?

A water audit is an assessment of how much water is used and how much water can be saved in the school. Conducting a water audit involves calculating water use and identifying simple ways for saving water in the school.

### What are the benefits of conducting a water audit?

Conducting a water audit can help you save money by reducing your water bill. Conducting a water audit will make you aware of how you use your water and help to identify ways you can minimise water use by implementing certain conservation measures. It is possible to cut your water usage by as much as 25 percent without drastically modifying your school practices.

### For my school

#### How do I calculate water usage in my school?

##### Calculating Water Use From Your Water Bill.

If you are metered the bill you receive tells you how much water you have used. The bill contains information regarding the amount of water consumed and average daily consumption during the billing period [every 6 months]. If the average daily consumption is not provided, you can calculate it by dividing the total amount of water used by the number of days in the billing period. Determine whether your water is measured in cubic meters (m<sup>3</sup>), or litres (L).

##### Calculating Water Use With A Meter\*

If you wish to maintain tight control of your water usage then you can read your water meter frequently to obtain this information. Locate the location of the meter at the property line or boundary (figure 1). Lift the lid with the aid of a screw driver and remove polystyrene foam [frost protection] if present. Pull the inner meter lid to view the meter face. You only need to note the digit readings on the black background. Only these figures are used in the bill. The figures in red are fractions of a digit and move rapidly. These figures will not be on your bill.

All newly installed meters will be calibrated in cubic metres (1000 litres). Older models may be in cubic feet, gallons. To obtain your water use over a 24 hour period, read your meter at the same time on two consecutive days. You may want to measure water use for several days and then calculate a daily average.

Calculate your water use with the assistance of the score sheet on the CD attached.



(figure 1)



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*Have quick shower instead of a bath.*

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*Turn off the tap when brushing your teeth.*

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*Turn off the tap while shaving.*

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*Wash windows and your car with a bucket and sponge first followed by a short hosepipe rinse.*

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*Put the plug in the sink when washing your hands or a dish when washing vegetables.*

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*Use soiled dish water for watering garden pots.*

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*Do just one thing each day to save water.*

## Locating your water meter

### How does my water usage rank?

The average Irish citizen uses about 150 – 160 litres of water per day. The EU average is 160 litres. This includes indoor as well as outdoor water usage. To calculate the per person daily water usage rate, divide your daily water usage by the number of people in your school.

Cork County Council is preparing a web site on water conservation for schools. The site will allow you to plot your monthly water usage and compare to other schools in the county.

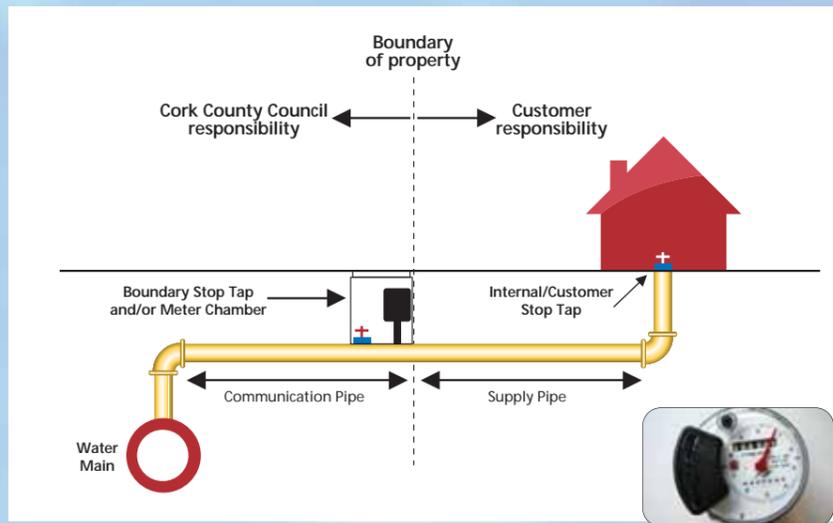


Figure 1

### Can saving water reduce my carbon dioxide emission?

Saving water also saves energy. Substantial amounts of energy are used in pumping and treating water. Remember that 1 cubic metre of water weighs 1 metric tonne. Water is pumped considerable distances through a pipe network before it reaches you the customer. Reduce your carbon footprint by using water wisely and reducing water wastage.

### Estimated Water Loss Through Leaks

Size of Leak	Water lost per day Litre (l)	Water lost per month Litre (l)	Water lost per year Cubic Metre (m <sup>3</sup> )
1 Drop per second	4	130	1.6
1.6mm stream	318	9,671	116.0
3.2mm stream	984	29,933	359.2
6.4mm stream	3,501	106,489	1,277.9



*Water regulates the earth's temperature.*

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*Water expands by 9% when it freezes. Frozen water (ice) is lighter than water, which is why ice floats in water.*

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*1.2 billion people worldwide do not have access to clean water.*

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*Although a person can live without food for more than a month, a person can only live without water for approximately one week.*

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*Human brains are 75% water.*

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*Human bones are 25% water.*

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*Human blood is 83% water.*

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*Less than 1% of all the water on earth is available or clean enough to drink. The rest is salty or frozen.*

## How to Check for Leaks

An average of about 14% of water is lost through leaking fixtures or pipes. You pay for all water passing through and recorded on your meter including any leakage.

**An easy way to check whether you have leaks in your school is to monitor readings on your water meter. Choose a quiet period [after school finishes].**

Turn off all water fixtures inside and outside your school.

Check the reading on your water meter.

Wait one hour, ensuring that no one uses any water, and then check the meter again.

If the meter reading has changed, you have a leak somewhere in your school.

### Pipes

A leaky pipe above ground is usually obvious. Visually inspect all pipes in your school and look for watermarks on walls or ceilings.

A leaky pipe below ground is usually not so obvious.

In the school yard, if the ground in a particular area appears continuously wet or if water is continuously present at the surface of the ground, this may well indicate a leaking pipe. If a pipe is leaking, repair or replace it as soon as practically possible. Do not forget you are paying for the water that is leaking. The larger and longer the leak – the larger the bill.

### Toilets

Leaking toilets are common and can be a large source of water loss. A leaking toilet can waste anywhere from several litres to more than 200 litres per day.

Older toilet cisterns had external overflow pipes and leakage was easily identifiable.

Newer leaking toilet cisterns are not as easily identifiable as the older systems.

#### Check the following:

The toilet may be leaking if

- you have to jiggle the handle to make a toilet stop running.
- you regularly hear water running sounds from a toilet that is not being used.
- it periodically turns the water on (*runs*) for 15 seconds or so without anyone touching the handle.

Even if your toilet does not display any of the above symptoms, it could still be silently leaking. These silent leaks can go undetected for long periods of time, potentially wasting thousands of litres of water.

To check your toilet for silent leaks, carry out the following:

- Remove the cover on the toilet cistern and set it aside.
- Remove any in-cistern bowl cleaners and flush the toilet so that water in the cistern and the bowl are clear.
- Add dye to the cistern (*You can use dye capsules from a hardware store, but food colouring or powdered fruit drink mixes work well*). Use enough dye so that the water has a deep colour.

- Wait for 30 minutes (*Do not use toilet during this time period*).
- If after 30 minutes the water in the bowl contains dye, then the toilet is leaking (*A properly operating toilet will store water in the cistern indefinitely without any water running into the bowl*).

There are two possible culprits when a toilet leaks, the flush valve or the refill valve.

To determine which valve is responsible for the leak, draw a pencil line on the inside of the cistern at the water line. Turn off the water supply for the toilet (*often located behind the toilet*) and wait for 20 to 30 minutes. If the water level remains the same, it means the leak is occurring at the refill valve (*unit in the cistern connected to the incoming supply pipe generally with a float connected to it*). If the water level falls below the pencil mark, the flush valve (*unit located in the centre of the cistern*) is leaking.

### Taps

A leaking tap is easily identified, but do you know how much water can be wasted from what seems like an insignificant drip? - 40 litres per day! Drips can usually be eliminated by replacing worn washers, or by tightening or repacking the tap gland with plumbing tape.

### Aerator on taps

Retrofitting your taps with aerators will help save water. An aerator is a small circular screen that is screwed into the tap. It reduces flow by adding air to the water, giving the sensation of more water with less volume. An aerator can reduce your water use as much as a half. Aerators are inexpensive and easy to install.

## Implementing School Water Efficiency Programme

*A School Water Efficiency Programme will help schools to save water and promote water awareness throughout the county. The programme offers simple solutions to water conservation, through simple measures.*

Schools are excellent organisations to implement water conservation. Students can be an enormous resource for ideas on using less water in their daily activities.

An added benefit is that the conservation measures students learn at school will be taken home and put into practice. However, before engaging the student body, educators and administrative staff must be committed to supporting new and potentially challenging efforts to reduce water consumption.

**Consider the following steps to implement a successful water conservation programme at your school:**

### Initiate a School-Wide Conservation Campaign

Make conserving water at your school an effort that affects all students, teachers, administrative staff, and even visitors and any volunteer helpers/parents.

Increase employee, faculty, and student awareness of water conservation.

Adopt a motto/slogan or character that represents the school's endeavours to reduce its water use.

Get everyone involved; send home notices that explain the school's intention to conserve water.

Conduct awareness raising contests for employees and students (e.g. slogans, raps or limericks).

Seek employee and student suggestions on water conservation; locate suggestion boxes in assembly areas.

Create colourful and fun posters on water education.

Start a 'Water Saving' team. Members of the team can monitor leaking taps, design posters on water saving tips etc.

Assign a water team member to install signs and track water consumption.

Install signs in all restrooms encouraging water conservation.

Make everyone aware of usage and reductions accomplished on a quarterly basis.

Incorporate water conservation into the student curriculum.

Feature a water-efficiency display in common areas to highlight the programme, the successes and failures.

### EXTERIOR AREAS and LANDSCAPING

In Ireland there is no shortage of rain!

However, in dry weather periods, water the landscape only when needed; two-to-three times a week is usually sufficient. Do not water the landscape every day.

Look for signs of wilt before watering and water only in morning or evening when evaporation is lowest.

Mulch around plants reducing evaporation and discouraging weeds.

Avoid excess run-off! By ensuring that sprinklers are directed to the landscaped areas and not pathways.

Make an inventory of outdoor water used for landscaped areas.

Where natural dry patches exist, plant drought tolerant plants and grasses.

Discontinue using water to clean paths, driveways and parking areas.

Consider using a motorised sweeper.

Install timers on sprinkler systems and monitor and vary the time intervals.

Investigate the advantages of installing drip irrigation systems which use water more efficiently.

Consider drought resistant varieties if replanting.

Refer to section on water hoses and rain harvesting under long term options on page 8.

## Short term measures without large costs

### BUILDING MAINTENANCE

Identify water usage.

Check water meter readings to know water use and determine periods of peak usage.

Identify patterns of water use. This may also help to identify any inconsistencies due to leaks or non-functioning equipment.

Check water supply system for leaks.

Turn off any unnecessary flows.

Repair dripping taps, showers and continuously running or leaking toilets.

Reduce the water used in toilet flushing by either adjusting the flush mechanism or installing toilet tank displacement devices (Hippo bags).

As appliances or fixtures wear out, replace them with reduced water consumption models.

Examine water supply to equipment currently not in use and consider disconnecting.

Check any compressors in use on site and service and upgrade if necessary.

Ensure that all hot water pipes are well insulated. Cold water pipes may require protection against frost.

Maintain boilers and avoid excessive boiler blow down. Monitor the total dissolved solids levels to assess determining when blow down is needed.

Monitor the water usage and practices of cleaners and maintenance contractors.

Review cleaning schedules which may require high volumes of water usage i.e. window cleaning.

### LONG TERM OPTIONS

#### Equipment Retrofits

Consider installing flow reducers and aerators on all taps and other plumbing fixtures where possible.

Retrofit toilets and urinals with low consumption valve replacement kits.

If only replacing a limited number of fixtures, replace heavily-used units in high traffic areas first.

If using hoses, ensure they are fitted with high pressure, low-volume nozzles with automatic shut off when not being operated.

Re-programme auto urinals to save on water use outside school term time.

#### Equipment Modifications/Purchases

Consider life cycle costing and replacement of water-using equipment such as dishwasher or refrigeration units with water efficient and air cooled models.

Investigate whether the installation of rainwater harvesting tanks are suitable for your school [to flush toilets or for watering the garden].

### SUMMARY

*Develop a water conservation programme where you:*

*Identify water-using sources, their purposes and related costs.*

*Install signs in all restrooms encouraging water conservation.*

*Identify options to use less water and set reduction goals.*

*Delegate responsibility for implementing options.*

*Offer incentives for constructive and useful ideas.*

*Form a water conservation team that will;*

- *Initiate a water awareness campaign in the school*
- *Publicise status of programme during school announcements or, in school newsletters and web site*
- *Chart progress*
- *Display results.*

*Reward those involved for their successes.*

## Water conservation systems

### 1. Water Butt

We are blessed with an abundant supply of water in Ireland, but, *'that's no reason to waste it'*. It takes energy to pump water through the distribution system. Buy a water butt or two.

Thousands of litres of rainwater can fall on your school roof in a year. Save on mains water by collecting rainwater and reuse it in various projects throughout the year.

In dry weather, water used outdoors can amount to 'saving' on the energy it takes to produce clean water and pump it to the tap - this will reduce climate change impacts.

### 2. Grey-water/rain harvesting systems

A building's domestic hot and cold water system distributes drinking quality water to all water use points in a building, regardless of how that water is to be used. However, drains from a building's roof and the surface-water collection system around the building gather rainwater directing it away from the building. Grey-water systems trap this rainwater from roofs and surface water drainage systems. The water is filtered to remove dirt and debris and then stored in water tanks as grey-water. Instead of piping fresh, domestic water to toilets and urinals, the harvested - grey-water can be used to reduce the requirement for fresh domestic water.

Grey-water systems require the installation of two distribution piping systems, one for domestic water and one for the grey-water. They are best suited for new construction and major renovation projects because it is difficult and expensive to install or retrofit the grey-water piping system in existing facilities.



Water Butt



Rain harvesting



Photo M. Stack ©

Handpumps were located in villages and traditionally used by communities long before water was piped to your house. Locate the nearest handpump closest to your school.

### 3. "Reduce Water Consumption with a Hippo!"

What is a Hippo? - "Hippo is made from durable heavy gauge polyethylene which inflates to a known volume when placed in the cistern. The Hippo sits in the water underneath the large cistern float. When the toilet is flushed, the water confined within the Hippo is the volume saved. The Hippo also has a small hole which acts as a relief valve allowing slow circulation of water to prevent stagnation and evaporation."

## What is happening nationally about water charges?



Comhshaol, Oidhreacht agus Rialtas Áitiúil  
Environment, Heritage and Local Government

The Government, on the 4th January 2008, announced details of the transitional arrangements which will apply to schools water services as part of the implementation of the EU Water Framework Directive (page 11).

The Government is committed to the full implementation of the Directive, which has as its objective, the promotion of water conservation and the efficient use of water as an important and scarce natural resource. The legal advice available to the Government is that, under the EU Water Framework Directive all non-domestic users must pay for water used. Schools, like other non-domestic water services users, must pay water charges. The legal advice also confirms that they will be required to pay the full cost of water services used by them on a metered basis, with effect from 1 January 2010. The Directive also requires that measures are put in place up to 2010 to move towards full cost recovery.

For the transition period the Government agreed that non-fee paying recognised schools will pay a flat rate per pupil.

The fee is as follows:

2007 – €3.00 per year, per pupil enrolled

2008 – €3.50 per year, per pupil enrolled

2009 – €4.00 per year, per pupil enrolled

For 2007, charges applied based on metering will be recalculated on the transitional flat rate with a credit given for any excess payment. In cases where arrears exist in relation to previous years, schools should discuss a payment arrangement with their Local Authority.

If actual usage, as recorded by a meter would produce a lower charge than the flat rate, the lower bill will apply for the transition period.

The new arrangements announced, afford schools the opportunity to put in place the necessary water conservation arrangements and practices and undertake necessary works to ensure that when full water charges are introduced in two years time, schools will have significantly reduced their water usage. By virtue of good water conservation, your school will be in a much stronger position to control water charges. Those schools with very high water consumption will be identified and contacted with a view to introducing measures to help them reduce water usage.

Water conservation issues will continue to be addressed by the Department of Education and Science as a matter of routine where new schools are being built or where major renovations are being carried out to existing schools under the schools modernisation programme.

Contact phone number:  
021 4276891



*3000 samples and 28,000 tests are undertaken by the Council's water quality laboratory in Inniscarra each year.*

...

*John Snow (1813 – 1858), a British physician is considered to be one of the fathers of epidemiology, because of his work in tracing the source of a cholera outbreak in Soho, England to poor water quality, in 1854.*

...

*Ancient Egyptians treated water by siphoning water out of the top of huge jars after allowing the muddy water from the Nile river to settle.*

...

*Hippocrates, known as the father of medicine, directed people in Greece to boil and strain water before drinking it.*

## Who protects our rivers, streams and lakes?

### Recent EU and National legislation protecting your drinking water source

The EU Water Framework Directive's (2000/60/EC) primary aim is to establish good water quality across Europe. Water is assessed in terms of status: the combined measure of its ecological, chemical and morphological quality. The Water Framework Directive (WFD) requires member states to prevent the decline in status of any waters and to achieve at least 'good status' by 2015 for all waters.

It is concerned with all 'natural' waters (and their uses), i.e. rivers and streams, lakes, groundwaters, estuaries and coastal waters (out to 1 nautical mile). It brings under one framework water-related directives including those dealing with bathing water, water taken from rivers and wells for drinking water supplies, sewage disposal and the protection of the aquatic habitats of many animals, fish and plants.

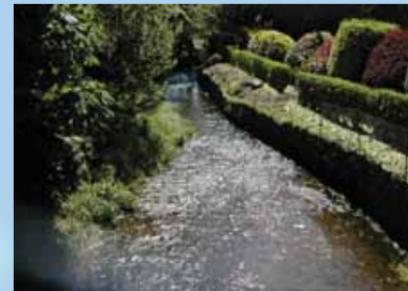
The WFD is being implemented on a natural water catchment basis. These are called River Basin District (RBDs) and there are 8 catchments on the island of Ireland. Their boundaries do not coincide with county boundaries. Therefore each RBD is managed jointly by the local authorities within which the waters are located. Each RBD has one co-ordinating local authority; for the South Western RBD (SWRBD) this is Cork County Council.

The South Western RBD encompasses Cork City, most of Counties Cork and Kerry and smaller areas of Counties Waterford, Limerick and South Tipperary. A river basin management plan was prepared by Cork County Council following consultation with the other local authorities [listed above], the Environmental Protection Agency, Fisheries Boards and other agencies. These bodies have water management roles, and set down the actions to be carried out to achieve the aims of the Directive.

SWRBD contact is :  
*Seán Ó Breasail*  
Cork County Council  
County Hall, Cork, Ireland.  
[sean.obreasail@corkcoco.ie](mailto:sean.obreasail@corkcoco.ie)



Inniscarra River Catchment



Belgooly stream



Careless actions by humans can cause harm to river ecosystems, polluting the water and sediments, with subsequent death of fish and fauna



# Green School Water Conservation Module



Green Schools is an international environmental education programme based on seven steps, which guides the school on the implementation of an environmental management system.

It is a fun programme linking and complementing the school curriculum. Those schools who are assessed and have reached the criteria standard, are awarded a Green Flag in recognition of this standard. In Cork County, there are 189 schools [national, secondary and special needs] registered to the programme [2008]. Cork County Council sponsors the programme in Cork County and plays an instrumental role in promoting and assisting the Green Flag programme and advising and assisting schools in their quest to achieve their flag.

Water conservation is the 3rd theme in the Green Schools programme. If you are registered you can download the water conservation training manual to assist your schools water conservation programme.

*Cork County Council actively supports the Green Schools programme. 71 schools have already become Green Flag Schools in the County [2008].*  
*58% of schools are now registered to the programme.*



Student at Green Flag Celebration

## Here is a summary of the Water Theme: *Courtesy of An Taisce*

### 1. Analyse the problem

*Before you even start to think about the solution you need to find out more about the problem. Does your school have a water meter? If so, can you calculate the average water consumption per day/week/ month/year? (and per student?) Does water consumption vary at different times of the year? Why? Where is the water used? How many taps, toilets, radiators etc. are present in the school? If there is no meter in the school, can you estimate the quantity of water used? (Number of times toilets flushed per day, usage of taps, etc.)*

### 2. Devise an action plan

*Once you understand the problem you have to think of ways to solve it. Try to involve as many people as possible. From that brainstorming list, work out the sensible ideas. As always, you should start with the simple 'no-cost' (i.e. ensuring taps are turned off properly, collecting rainwater for plants) and 'low-cost' (repairing leaks and drips) solutions. Raising awareness and promoting good habits should always be your first priority.*

### 3. Measuring success

*You must plan from the beginning how you will measure the success of your water management. This should include some form of regular monitoring, which will be detailed in your action plan (i.e. how/when/who will carry it out). If your school has a water meter then this will be by far the most effective way of measuring success. Otherwise, you may need to make estimations of usage through observations and calculations. Either way, make sure to display the details and results of your monitoring - graphs and charts are excellent for visualising changes over time. You cannot manage what you do not measure!*

### 4. Maintenance

*The most difficult thing in particular, is maintaining the reduced water consumption levels, as it is not as visible an issue as litter and waste. You will know from your regular monitoring if and when changes in water consumption (up or down) occur. As time goes on, you may need to adjust your action plan to help maintain the success of your water management, and to continually promote awareness.*

*If you want to receive the Water Module Handbook please contact the Green-Schools Team at [greenschools@antaisce.org](mailto:greenschools@antaisce.org)*

This product is manufactured using chlorine-free, environmentally-friendly materials: 50% recycled fibres and 50% pulp from a renewable forest. It is fully recyclable

