# Where Does the Wash-Water Go?

By Dave Moore Clerk of Works at STRI

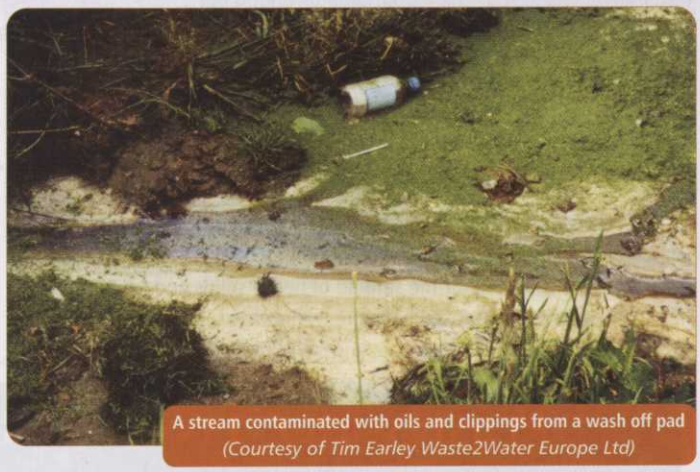
**Groundwater Regulations have been introduced recently in the UK in response to the EC Groundwater Directive. The legislation is directed at controlling pollution of groundwater, with special emphasis on drinking water. The impact of this new legislation will be far reaching as, for example, it places a limit on Pesticide contamination of one part pesticide to 10,000,000,000 parts water. The Environment Agency advise that just 250 grams of pesticide could be enough to exceed the permitted limit in the whole of London's water supply. With water consumption projected to increase at 2-3% per annum over the next decade it is essential that we preserve this fundamental resource to conserve it and avoid polluting it.**

In the past decade the quality of our rivers and coastal waters has been transformed by major investment in wastewater treatment, but increasing knowledge is highlighting new threats. There are concerns that the quality of water in the natural environment is declining. Pollution, depletion of water resources, climate change and bad planning decisions are all contributing to a deteriorating water environment. Nitrate and pesticide levels in many British waters, both ground and surface waters, are increasing. This pollution means that as well as harming the water environment, water companies have to clean pesticides and nutrients from drinking water before supplying to consumers.

The Joint Agency Groundwater Directive Advisory Group (JAGDAG) has been established to consider whether substances fall into any of the generic groups of substances in Lists I and II and also to consider whether the toxicity of specific substances in List I meet the criteria for low toxicity to enable them to be considered in List II. List I substances must be prevented from entering groundwater, and List II substances must be controlled to prevent pollution of groundwater. Oil, grease, petrol and diesel are classed as hydrocarbons and all fall into List I. All pesticides are classed as either organohalogen or CMT (carcinogenic, mutagenic or teratogenic) and are also categorised under List I. Ammonia, nitrites, nitrates, and biocides are categorised under List II. To ensure that the environment is protected, there is a European Commission proposal to make polluters pay for remedying the damage they cause. This means you, and your employer could be held liable for all the environmental damage caused.

We are all responsible for our environment in ensuring that the risk of pollution is minimised. One of the concerns that should be ringing alarm bells with anyone who uses grounds maintenance equipment is the effluent produced when washing off after use. The responsible person should have carried out a risk assessment, identified what is potentially in the washings, where the washings go, and evaluated the potential risk to the environment. Wash-off water from the daily cleaning of equipment contains contaminants such as oil, grease, diesel, petrol, detergents, top dressing, traces of chemicals and fertiliser, as well as the large collection of grass clippings, which are nutrient-rich containing around 5% nitrogen.

This wash-off effluent enters either sewers or sumps, ultimately ending up in watercourses and rivers. But how many greenkeepers are aware of where the drain goes which carries all the machinery wash off? Is it a foul-water or surface-water drain? It is illegal to discharge anything but clean water down a surface water drain, as you get from a downspout from the gutters of your buildings. Furthermore you must have a licence to discharge wash off water down the foul-water drain. It has also been noted that some use another illegal dumping area for foul water, by having



A stream contaminated with oils and clippings from a wash off pad *(Courtesy of Tim Earley Waste2Water Europe Ltd)*

a wash off pad that slopes away so that effluent eventually reaches a surface waterway. The aim of wastewater treatment is to discharge treated wastewater with minimal impact on the receiving watercourse.

Guidelines are clearly defined by the Environment Agency in their Pollution Prevention Guidelines (PPG's). The guidelines are an introduction to both pollution prevention and are produced by the Environment Agency for England & Wales, the Scottish Environment Protection Agency (SEPA) and the Environment and Heritage Service in Northern Ireland.

Equipment available for pre-treating wastewater on the scale required on a sports facility includes sealed septic tanks, oil-water separators, evaporators, and biological treatment plants.

**A Septic tank** is a multi-chambered system, which retains sewage from a property for sufficient time to allow the solids to form into sludge at the base of the tank, where it is partially broken down. The remaining liquid in the tank then drains from the tank and is usually disposed of by soakage into the ground, provided that the disposal does not generate a pollution risk to surface waters or groundwater resources (underground water). Environment Agency consent may be required for a discharge to a soakaway. Areas of heavy clay, steeply sloping sites or sites where the water table is less than one metre below the bottom of the soakaway are not suitable sites. Clean, uncontaminated roof or surface water must be excluded from the septic tank as this effectively reduces the tank's capacity and can cause solids to be flushed out of the tank, contravening the Agency's consent and impairing the efficiency of the soakaway. Septic tanks must be desludged and serviced every few months to ensure their effective operation. This work is expensive, and must be carried out by an operator registered by the Environment Agency for the handling and

# Where Does the Wash-Water Go?

disposal of such waste. The main problem with septic tanks is that they fill very quickly when washing off equipment with copious amounts of water. Further information can be obtained from The Environment Agency's PPG 4 (Disposal of sewage where no mains drainage is available) http://www.sepa.org.uk/guidance/ppg/pdfs/ppg04.pdf

**Oil-water solids separators** generally used a coalescing medium, which encourages the oil to float to the top of the water where it is skimmed off into an oil decanter. This is then ready for safe disposal with your waste oils and lubricants. The system has been available in the UK for a number of years now, and is well suited to washing down garage service areas, lorries, and heavy earthmoving equipment, but is not designed to be used for treating pesticide rinsings, or remove nutrient-rich grass clippings. Even if you use an oil/water separator, where both basic and enhanced oil separators are designed for the settling of heavy solids and separation of free hydrocarbons, it does not have the technology to deal with:

- Chemical contaminants such as, pesticides, fungicides, herbicides etc.
- Emulsified hydrocarbons (resulting from the addition of detergents or any water miscible compound, including heavy metals and totally dissolved solids (TDS).
- Biochemical Oxygen Demand (BOD). The amount of oxygen needed to degrade the organic matter contained in effluent biologically. The BOD is determined by the level of organic matter in the discharge into a watercourse. If the nutrient level is too high, the bacteria and other micro-organisms expand rapidly. In turn this uses up the available oxygen supply causing fish and other aquatic organisms to suffocate.

**Evaporators** are designed to heat large metal drums in an insulated chamber, thus evaporating off the water and allowing further contaminated wash-water to be added. Eventually the drum becomes full of a solid dried material that you would then seal and dispose of through a registered waste trader.

Small biological wastewater treatment units have been available in the United States for several years now but have only been available in the UK for the last two years. The size of the unit you would require depends on the amount of equipment you wash off, and the amount of pesticide rinsate that requires treatment. The two types that are available are the closed loop system that treats, re-circulates and re-uses water, and the discharge system which discharges to the foul water sewer system after a once through treatment. The most environmental friendly system is the closed loop system that takes wastewater, cleans it, and continually re-uses it, avoiding any risk of groundwater contamination. The closed loop system is the type the Environment Agency would prefer us to use, as there is a saving of up to 90% in the wash-water requirement.

**Biological Wastewater Treatment Systems** are aerobic bio-digesters, which incorporate the following simple process that enhances the ability of naturally occurring bacteria to break down and eliminate waste:

**Screening:** Wash water enters the Wastewater Treatment Unit via a sump; this water is then pumped up through a stone separator and grass clipping/sand strainer that prevents any large particles from entering the Unit. The screened effluent then enters a settlement chamber thus allowing finer particles to settle out. Further sumps can be added in chemical mixing areas, and refuelling points, and the outlet for these is directed straight into the biological treatment area, but at a slow rate thus not overburdening the demand on the microbes.

**Aeration:** The displaced liquid travels into the aeration chamber which contains a large concentration of active fixed-film aerobic bacteria that consume the organic waste material in the wastewater. Air is provided to the chamber by an air blower system and is used to ensure a constant flow of water to pass over a honeycomb material that supports the aerobic bacteria. The fixed film bacteria digest the organic contaminants fuels, oils, and pesticides, and the resulting waste is now carbon dioxide, water, and harmless detritus, which fall to the bottom of the tank where you find anaerobic bacteria that break down the nitrate.

**Clarification:** The displaced liquid travels into the clarification chamber where the fluid is kept as still as possible, allowing the sludge to flocculate and settle to the bottom. This settling process separates the sludge from the clear liquid, allowing clear water free of waste to escape out of the chamber to a foul water sewer (or on a closed loop system, recycled through a pressure system and discharged via wash-off hoses).

**Disinfection**: Some units are available where the effluent is disinfected with ozone, a very strong antiseptic, prior to final discharge.

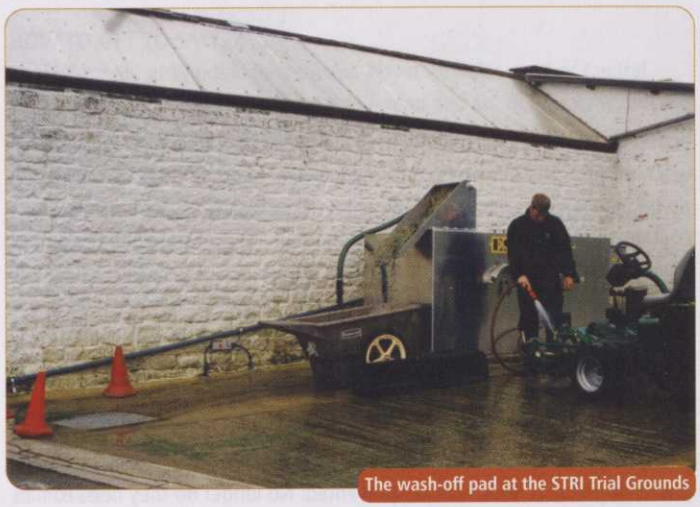
**The Closed Loop:** The treated water is now ready for re-use and is pressurised ready to deliver wash water through hose points. The clarified water is then filtered and made available for continual re-use via the wash-off hoses, which provide an excellent wash-off facility delivering 70–250 Litres min-1 (15-50 gpm) at a pressure of 3.3 bar (50 psi).

One of the first closed loop biological wastewater units from ESD Waste2Water to be installed in the UK, was at the STRI Trial Grounds for us to evaluate and demonstrate. It is now two and a half years since the unit was installed, and during that time we have found it to be very reliable. The system rapidly digests fuels and lubricants that enter the system through the normal daily washing of equipment, and totally digested an accidental 1-litre hydraulic oil spillage within two days. All the equipment used on the Trial Grounds is washed off on the wash-pad, including tractors, mowers, fertiliser distributors, and spraying equipment. Microbes are added to the unit at intervals between seven to ten days so that we have highly efficient bacteria at all times.

Spraying equipment is always rinsed out prior to cleaning with the washings sprayed onto areas adjacent to the treated areas, thus only traces of pesticides are added to the recycling unit during wash off. This presents no problem to the microbes. The hardest part was believing in what you were doing, as after many years of very careful spraying of several washings per spraying session, to ensure that the containers were thoroughly cleaned in an environmentally safe way, we now washed it down a drain albeit into a water recycle plant. The time saving using this new wash-off method could be significant for many clubs in addition to following Health & Safety best practise.

The latest addition to these closed loop biological treatment plants units are specialist chemical sprayer wash off pads. They are basically a large grid covered collection tank area on to which you drive your tractor and sprayer onto, designed for the collection of any spillages whilst chemical mixing takes place, as well as a designated chemical wash off pad. The contents are metered overnight into the bio-digester at a trickle rate so the microbes rapidly digest the chemical without being harmed, thus not turning the whole unit into a possible pesticide wash for your maintenance equipment.

The unit installed on the Trial Grounds was one of the early designs,



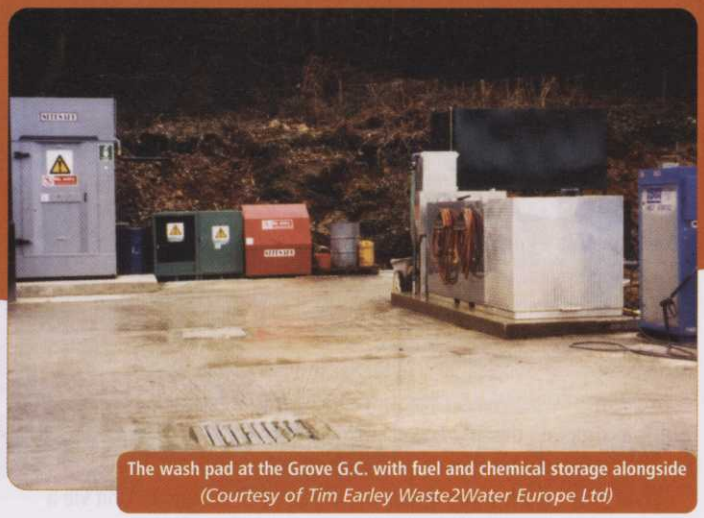
The wash-off pad at the STRI Trial Grounds

and consequently later models have been much improved to bring them into line with EEC regulations. Since installation ours has been updated to the latest electrical specifications, including the introduction of high-level water top-up inlet (as the original breeched European water regulations, which if used could have contaminated the water supply). Ball valves have also been fitted to each of the chamber outlets to enable easy access to draining the system, or recycling chambers as necessary. The latest design incorporates a security cover which I am told gives frost protection, thus allowing the system to be used all year round. A dedicated grass separator and dirt settlement tank has also been added as a first sediment chamber, which improves water quality and allows the sediment to be dropped directly into a wheelbarrow placed underneath. Sediment from the different chambers can be used in compost production as it is rich in microbial matter and free from harmful contaminants (providing the unit has been left to cycle for a couple of days prior to being emptied, and cleaned out).

During the winter months we have thoroughly cleaned the system by emptying the water and removing the polypropylene medium. This allowed us to shovel about 100 mm depth of sludge from the base of the chambers, and check the aeration parts for damage. Some of these were replaced due to cracks appearing in the rubber covers, and I would recommend these be checked as part of an annual maintenance programme. The sludge was used after testing for harmful contaminants, in our leaf mould heap to speed up the breakdown of the leaves. The polypropylene filtration medium was reinstalled and the tanks filled with water from the irrigation system borehole, reducing any effects of chlorine and chloramines, which could impact any microbes added within the first 48-hour period. A double dose of microbes were then added as you would when first starting the unit, and the air supply turned on to give a light aeration to the water.

You may remember a previous article in Greenkeeper International, where the forethought of one greenkeeper in the positioning of chemical and fuel storage adjacent to his newly acquired water recycling plant saved an environmental catastrophy. Thieves tried to steal his diesel, but

# Where Does the Wash-Water Go?



The wash pad at the Grove G.C. with fuel and chemical storage alongside
*(Courtesy of Tim Earley Waste2Water Europe Ltd)*

ended up spewing the contents over the top of the fuel tank bund onto his wash-off pad. The microbes consumed several hundred litres of diesel and no harm was done. With environmental risk assessments for groundwater contamination, thought should be given to all areas of possible environmental catastrophy, and whether it be accident or malicious act you could still face court action against you, as taking no action will land you in deeper trouble. At the Grove GC fuels, oils, and chemicals are all located adjacent to the wash-off pad, so any spillages will automatically be collected and biologically treated, thus showing they have assessed the risk and taken all action possible to safeguard the environment.

The Environment Agency has been given powers to intervene ensuring potential pollution incidents are prevented. No longer do they need to find pollution before they act. They are now able to issue enforcement notices requiring any business to install, upgrade, or replace, effluent treatment plant that has caused pollution incidents in the past or has been a persistent source of pollution. Businesses that breach enforcement notices face fines of up to £20,000 in the Magistrates Court and their directors face up to three months in prison. If an incident is sufficiently serious to prosecute in the Crown Court, businesses face unlimited fines and up to two-year jail sentences for directors. Even if a case is not taken to court, the costs of damage repairs still have to be met by the polluter. For example, restocking of fish can cost many thousands of pounds and you will find that the general policies of many insurance companies' no longer cover the costs of pollution clean up. Sports facilities are not exempt from these new regulations, so if you have not already done so, I would recommend that now is the time to review your current working practises and plan for the future, before the authorities do it for you.

**For further information contact the STRI on www.stri.co.uk**