



**SCOTTISHPOWER**  
Energy Wholesale



# Damhead Creek Power Station EMAS Statement 2012

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## CONTACTS

Damhead Creek Power Station  
Kingsnorth, Hoo,  
near Rochester,  
Kent ME3 9TX  
telephone: 01634 257600

ScottishPower Energy Wholesale:  
[www.spenergywholesale.com](http://www.spenergywholesale.com)

# Welcome to Damhead Creek

## INTRODUCTION

Welcome to the fifth Damhead Creek Power Station EMAS Statement, which describes how the station is improving its environmental performance.

2012 was an eventful year for the power station as it started to get in shape to meet ever-tightening environmental legislation.

The new Industrial Emissions Directive (IED) will introduce strict new targets for our emissions to air when it comes into force at the start of 2016. Station staff recognised it was essential to get ready now – particularly by improving our control of a key emission, called oxides of nitrogen (NO<sub>x</sub>).

NO<sub>x</sub> is formed from the nitrogen content of air when it is burned with natural gas at our combined cycle gas turbine (CCGT) power station. This year the station embarked on a multi-million pound project to reduce the amount of NO<sub>x</sub> that the station produces by improving our combustion hardware and fine-tuning its operation.

For more than half the year, the plant was either shutdown or operating at reduced load as we worked towards implementing a solution. At times, up to 200 contractors were on site for the outage that also included the complete overhaul of our two gas turbines and steam turbine.

It's been a huge investment in the future of Damhead Creek, aimed at helping ensure we comply with future legislation and improving our efficiency.

The successful delivery of the outage – without a Lost Time Accident – was just one of the highlights of a busy year. Station staff aim to achieve continuous improvement of our environmental performance and site-led projects have continued to reduce our use of key resources, such as water and energy, and improve our control of waste.

As Station Manager, it is particularly gratifying that all these activities have been delivered without an environmental breach or notifiable environmental incident – that's six years now with an unblemished record.

The station also continues to enjoy a good relationship with stakeholders and the local



community on the Isle of Grain – there were no justified community complaints in the current three-year EMAS period.

Damhead Creek is also the steward of a 32-hectare wildlife area established to mitigate the environmental impacts of the station's construction and operation. Habitat improvements were carried out on the mitigation land during 2012 and ongoing monitoring has shown it is rich in biodiversity.

Our 2012 EMAS Statement has been externally verified, and it is hoped it will give stakeholders confidence in our people, plant and processes – and underline our commitment to being 'Trusted with the Environment'.

Damhead Creek has an open policy on communication with our stakeholders. If you would like further information, or to comment on how we could improve performance further, we would really like to hear from you.

**LEE WARREN, Station Manager**



# EMAS Statement



*Gas turbine rotor blades are exposed during the 2012 outage that involved up to 200 contractors*



## Station supplies electricity for 800,000 homes

Damhead Creek, near Rochester, Kent, is an 800 megawatt (MW) combined cycle gas turbine (CCGT) power station that has supplied electricity to businesses and homes in southeast England since 2001.

The gas-fired station was built in 2000 on land that was used as a gasworks in World War 1, producing hydrogen for airships. The station was commissioned in 2001 and, three years later, was acquired by ScottishPower, which is part of the IBERDROLA Group.

Damhead Creek's main generating plant consists of two gas turbines and a steam turbine, and it can generate enough electricity to meet the needs of 800,000 homes. CCGT technology is one of the more efficient forms of thermal electricity generation and creates fewer emissions per unit of electricity compared with conventionally-fired thermal power stations.

The station has an air-cooled condenser to condense the exhaust steam, minimising the use of process water and avoiding the need for cooling water to be extracted from the Medway Estuary.

In January 2011, the UK Government approved proposals submitted by ScottishPower for a second CCGT at Damhead Creek.

Damhead Creek 2 will have 1000MW capacity – enough to supply up to 1.5 million homes – and will be built on land east of the current station. Construction work is expected to begin in 2015.

### ENVIRONMENTAL MANAGEMENT SYSTEM

Damhead Creek's Environmental Management System (EMS) provides the structure and systems for developing, implementing and delivering the station's environmental policy. The station's EMS was recertified to the international standard ISO 14001 in November 2011 and is due for recertification in 2013.

In 2011, the auditor commented on employees' "excellent" understanding of the environmental issues relating to the plant, process and operation. The audit concluded: "Good internal communication continues to be a strong point, ensuring that staff awareness of requirements is maintained."

"A positive approach is taken to quality, environmental and health and safety risk management in all operations and maintenance activities. The EMS continues to be well managed and suitable for the processes and activities carried out on site."

Two minor non-conformities were found – both of a technical nature, with no impact on the station's environmental integrity. A Health, Safety and Environment Forum meets monthly to discuss relevant issues. While day-to-day implementation of the EMS is carried out by the site's Environmental Team Leader with the help of key station personnel.

## Key Issues for Damhead Creek

### Pollution Prevention & Control

Damhead Creek operates under strict conditions set out in a Pollution Prevention & Control (PPC) permit, issued and monitored by the Environment Agency (EA) under the Pollution Prevention and Control Regulations 2000.

The PPC Regulations are driven by the EU's Integrated Pollution Prevention and Control (IPPC) Directive and require the use of Best Available Techniques (BAT) to eliminate or minimise polluting emissions.

PPC permits cover emissions to air, land and water, as well as noise, vibration and heat loss. They also cover the use of energy and raw materials, waste reduction and the management of potential risks.

Damhead Creek is opted-in to the Large Combustion Plant Directive (LCPD) via the National Emission Reduction Plan (NERP) and must measure its emissions to air using a Continuous Emissions Monitoring System (CEMS) and report the results annually.

The station's CEMS equipment on both gas turbines meets the Monitoring Certificated Standards (MCERTS) standard required by the EA. Quarterly Compliance Assessment Reports are submitted by the station to the EA which provide information on emissions to air and water and other aspects covered by the PPC permit.

### Running Regime

**Damhead Creek was closed down or running on reduced load for more than half of 2012 while outage work took place. As a result, our generated output has been reduced significantly compared with a normal year of operations.**

The power station generated a total output of 3,361 GWh in 2012 – down 42% compared with the 2011 figure (5,745 GWh). See table below for five years' figures.

Since March 2011, the CCGT has been providing an ancillary service to National Grid to help ensure the integrity of power supplies to the nation through a frequency control contract.

Damhead Creek's role during the contract period has been to operate in a way that smooths out the peaks and troughs in supply and electricity demand, and by reacting to any potential shortfall by other generators. This has been particularly

### KEY ISSUES

**Damhead Creek operates within legislation and regulations that cover a multitude of environmental factors, including emissions to air, our use of resources such as water, and waste produced by the plant. This section reports on how the power station monitors and continually improves its environmental performance.**



*A contractor removes insulation around the combustion chamber of one of the turbines*

important now that wind generation has started to play a greater role in providing the UK's energy, yet wind production is by its nature less predictable than other forms of generation. Under the frequency control contract, Damhead Creek has normally operated at around 75-80% of full capacity, with a reduction in efficiency as a result.

The plant adjusts its output automatically to prevent deviations in the 50Hz network frequency – increasing or decreasing generation as necessary to keep the system stable.

Damhead Creek will be alert for further opportunities to provide such ancillary services to National Grid. Normally, the station would operate a two-shifting running regime – starting up and shutting down operations to take advantage of opportunities to generate in the electricity market.

### Global Climate Change

**ScottishPower is committed to reducing emissions of the greenhouse gas carbon dioxide (CO<sub>2</sub>) across its energy portfolio in support of the reduction targets set by the UK Government.**

The primary mechanism for reducing CO<sub>2</sub> across power generation and heavy industry throughout Europe is the EU Emissions Trading Scheme (EU ETS) that effectively puts a price on carbon.

An overall CO<sub>2</sub> cap is set and carbon allowances are distributed through a National Allocation Plan (NAP). Participants in EU ETS must ensure the amount of carbon they produce is within their allowances – or they may have to buy extra allowances to cover increased emissions.

EU ETS requires each eligible installation to produce an annual greenhouse gas emissions report for the previous calendar year, which must be externally verified before being submitted to the regulator by the end of March. This enables the installation's CO<sub>2</sub> emissions to be balanced with carbon allowances set by the NAP.

In 2012, station staff prepared for Phase III of EU ETS, which will start from January 2013. The new, more-rigorous third phase will see changes in how allowances are allocated, including the removal of free allowance allocation for sites purely generating electricity.

Following a site inspection, which examined the station's procedures for complying with the new phase of EU ETS, the EA confirmed the station's submission was in order and a permit would be issued on 1st January 2013.

Modern CCGT gas stations, like Damhead Creek, typically produce only 40% of the CO<sub>2</sub> produced by a conventional coal-fired power station for the same amount of electricity output. Damhead Creek strives to ensure the optimum efficiency and performance of our generating plant to maximise electricity output – Damhead Creek typically operates at just under 55% delivered thermal efficiency – resulting in less fuel used and lower carbon emissions per unit of gas.

### ELECTRICITY GENERATED

	2012	2011	2010	2009	2008
Gross Electricity Output	3,361	5,745	6,058	5,775	5,602





*The gas turbine strip down is well underway and, right, GT compressor blades are exposed*

In 2012, the station produced 1,252,412 tonnes of CO<sub>2</sub> – just under half the total amount in 2011 due to the reduced operational hours during the year.

A more accurate comparison is the amount of emissions per GWh of electricity produced.

This shows that in 2012, Damhead Creek produced 373 tonnes of CO<sub>2</sub> per GWh, slightly up on 2011 (368t/GWh) but figures have been relatively stable over the past five years.

Combustion chambers, incorporating hot ceramic liners, help ensure most of the carbon in the fuel is converted into CO<sub>2</sub> rather than carbon monoxide (CO), a gas that is highly poisonous if inhaled by humans.

As part of the Section 36 submission for the proposed new CCGT at Damhead II, a plot of land has been set aside for potential development as a Carbon Capture facility. This would facilitate Carbon Capture and Storage for both CCGTs if required by future legislation.

### **Acidification and Air Quality**

**Natural gas is the cleanest of all fossil fuels used for electricity generation.**

Compared with coal and oil-fired generation, combustion of natural gas releases relatively small amounts of sulphur dioxide (SO<sub>2</sub>) and NO<sub>x</sub>, and virtually no ash or dust. SO<sub>2</sub> and NO<sub>x</sub> emissions can affect air quality and disrupt ecosystems through acid rain damage to vegetation and water courses.

Damhead Creek must control its emissions to air of SO<sub>2</sub> and NO<sub>x</sub> under the terms of the LCPD and IPPC, while concentration-based emission limits for SO<sub>2</sub> and NO<sub>x</sub> have been set by the EA as part of the station's PPC.

At present, Damhead Creek comfortably meets its emission limits for SO<sub>2</sub> and NO<sub>x</sub>.

However, emission limits will be further constrained from 1st January 2016 with the launch of the Industrial Emissions Directive (IED). Damhead Creek has opted-in to the IED and is confident of meeting the new tighter

rules imposed by the legislation.

The IED will consolidate seven existing directives, including the LCPD, the IPPC Directive and the Waste Incineration Directive (WID) into one cohesive piece of legislation.

The directive focuses on limiting air pollutants such as SO<sub>2</sub>, NO<sub>x</sub> and dust and will significantly tighten emission limit values for large combustion plants and other industries throughout the EU. It also strengthens the concept of Best Available Technology (BAT) in controlling emissions and introduces new requirements for monitoring, plant inspections and compliance reporting.

### **Oxides of nitrogen**

A key consideration for Damhead Creek in recent years has been how the station will respond to tighter emission limits for NO<sub>x</sub>.

The station has historically experienced high-release concentrations of NO<sub>x</sub> and, prior to 2007, has reported breaches of 50mg/Nm<sup>3</sup> concentration – its former emissions limit for oxides of nitrogen.

As a result, the EA agreed to vary the plant's PPC permit to allow an increase in the station's NO<sub>x</sub> emissions limit to 60mg/Nm<sup>3</sup>.

Meanwhile, ScottishPower began to investigate the cause of the issue and identify a possible solution with the manufacturers of the gas turbines (GTs), Mitsubishi Heavy Industries.

This has been brought into focus by the provisions of the IED, which require the station to comply with a future NO<sub>x</sub> emission limit of 50mg/Nm<sup>3</sup>. Damhead Creek produces thermal NO<sub>x</sub>. Thermal NO<sub>x</sub> forms when nitrogen in the air reacts with oxygen during the high temperature combustion process with natural gas. More NO<sub>x</sub> is produced as the turbines work harder while the gradual deterioration of the GTs may also have played a part.

# Damhead Creek EMAS Statement 2012

In 2012, a major project began involving staff from the station and elsewhere in ScottishPower, and experts from Mitsubishi Heavy Industries, to improve the combustion performance of the station's two Mitsubishi 701F gas turbines.

The improvement work, initially carried out on GT2, included fitting new hardware – such as new designs of burners, nozzles and combustion baskets – while the turbine's operation was also fine tuned, including adjustments to the temperatures involved in the combustion process.

The work was carried out during the major outage – that ran from May to November in 2012 – and which saw both GTs and steam turbine stripped down and refurbished. GT1 underwent modifications to its burner hardware that had previously been proven on its sister unit.

Both units had returned to service by the final month of 2012 and the station began a period of efficiency testing, monitoring and evaluation to assess the success of the GT2 improvement work in reducing NO<sub>x</sub> emissions towards the future 50mg/m<sup>3</sup> limit.

Improvements have been seen in NO<sub>x</sub> production on both gas turbines and across all loads since tuning and restart following the outage – although there is further progress to be made. A decision will be made at a future date on introducing the latest modifications on GT2 to GT1.

There is no 'off the shelf' solution to reducing NO<sub>x</sub> on these machines but through engineering innovation, working together with Mitsubishi, the station believes it will be able to achieve the new ELV in 2016.

The total amount of NO<sub>x</sub> produced in 2012 was 773 tonnes – less than half (42%) of the 1862 tonnes produced in the previous year as a result of the constrained operation due to the major unit outages. However, NO<sub>x</sub> figures per kg/GWh were also significantly less – down from 324kg/GWh in 2011 to 230kg/GWh in 2012.

## Sulphur dioxide

In 2012, Damhead Creek agreed with the EA a significant change in the way its SO<sub>2</sub> emissions are calculated to correct a historical error.

It was the station's position that the chemical equation used by the station since 2008 was erroneous – resulting in reported emission figures being up to 27 times higher than expected for a modern CCGT.

Station staff lobbied the EA through the Joint Environmental Programme (JEP) to agree a new, accurate calculation of the emissions to prevent future over-reporting – and this was successfully concluded in 2012.

JEP is a research programme, funded by the UK's leading generators – including ScottishPower – into the environmental impacts of electricity generation.



As a result of the change in calculation and reduced generation activity in 2012, total annual SO<sub>2</sub> figures for Damhead Creek have been substantially reduced – from 115.6 tonnes in 2011 to just 1.66 tonnes in 2012 (0.49kg/GWh) – and figures are now in line with similar CCGT plants of the same age.

## Volatile Organic Compounds

Volatile Organic Compounds (VOCs) are organic chemical compounds that have significant vapor pressures and can affect the environment and human health.

At Damhead Creek, VOC emissions arise mainly as a result of fumes from hot oil used by the station's GTs and steam turbine.

External UKAS/MCERTS qualified contractors have in the past monitored VOCs emissions four times a year at the station stacks, while studies have been carried out into the feasibility of fitting VOC abatement.

In 2012, the station gained acceptance from the EA that there was little more that

could be done to clean up the light oil fumes.

A change in the monitoring schedule was also agreed with the EA and Damhead Creek moved during the year from a quarterly to an annual monitoring methodology. The station's PPC will be amended to reflect the new reporting arrangement.

In 2012, the station emitted a total of 22.5 tonnes of VOCs compared with 37.9 tonnes in the previous year – a reflection of the reduced number of station running hours.

## Gas Supply Management

The UK has moved from being a net exporter of natural gas to a net importer as North Sea gas reserves began to decline, resulting in a national debate on security of supply.

In 2005, ScottishPower signed a 10-year gas supply agreement with Statoil of Norway to receive 500 million cubic metres of natural gas a year via a North Sea pipeline.

The agreement helps support the



*Production technician Stephen Harwood in the control room at Damhead Creek Power Station*

continued stability and security of supply for our CCGTs and domestic gas customers. The company is looking at other ways of diversifying its gas sources as UK supplies continue to decline.

From October 2010, ScottishPower has had an annual LNG regasification capacity of up to 2.75 bcm at the Isle of Grain importation terminal that supplies Damhead Creek.

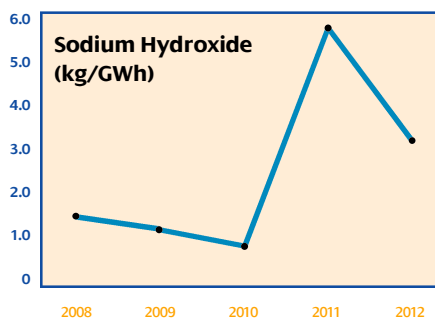
### Use of Water

**Damhead Creek requires a secure supply of clean water for use in steam generation and the station's offices and workshops.**

In recent years, the station has moved towards being mainly self-sufficient in water through the extraction of borehole water and installation of a water recovery plant.

In 2009, a new borehole was drilled into a freshwater aquifer 200m below ground that can supply the station with around 306 litres of water per minute, offsetting an equivalent amount of townswater.

## KEY ISSUES



Borehole water is used for making process steam along with recycled process water from a blowdown blast cooler. This supply is treated in the station's water recovery plant, which was commissioned in 2010.

The use of borehole water has achieved considerable further savings – most of the station's potable water needs are now supplied from the borehole, recycled water and water recovery plant.

In 2012, borehole water made up 54% of water supplied to the station – a total of 44,279m<sup>3</sup>. Again reflecting the reduction in the station's operation during the year, this figure was down on the amount extracted in 2011 (55,230m<sup>3</sup>).

Meanwhile, 37,046m<sup>3</sup> of townswater was supplied to the site in 2012. As a result of water-saving initiatives, in the space of six years the station has reduced by a third the volume of townswater it uses – from 31.25 m<sup>3</sup>/GWh in 2006 to 11.02 m<sup>3</sup>/GWh in 2012.

In 2011, boreholewater abstraction was constrained by technical difficulties at the groundwater abstraction plant.

This resulted in a greater proportion of townswater being used – with a significant increase in the quantities of Sulphuric Acid and Sodium Hydroxide used to process this water in the station's water treatment plant (WTP).

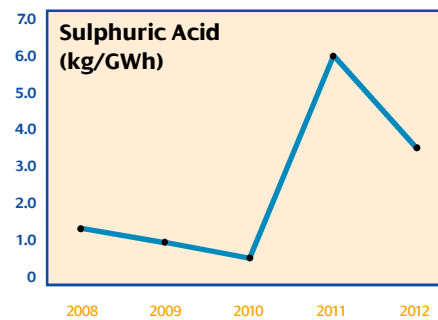
This spike in WTP chemical use is shown clearly in the graphs shown above.

Damhead Creek's air-cooled condenser (ACC) returns exhaust steam to water for reuse in the system, and avoids the need for cooling water to be abstracted from the environmentally-sensitive Medway Estuary.

The ACC tubes covers an area of more than 105 hectares and consists of 36 large cooling fans that force air over a heat exchanger.

Only small quantities of water, such as water treatment plant effluent, treated sewage and surface water run-off, are discharged from the site into the estuary.

This discharge is sampled and analysed monthly by an external laboratory to ensure the waste water meets PPC permit conditions and the results form part of the station's CAR to the EA.



### Use of Energy

**Station staff are committed to ensuring its processes and operational activities are energy efficient.**

In recent years, several projects have been completed to ensure continuous improvement in performance and staff have shown an innovative approach to reducing works power use in particular.

Nevertheless, the amount of electricity imported for works use increased in 2012 as a result of the major outage and increased number of personnel on site.

In the current EMAS Statement period, a number of energy-saving initiatives have been advanced:

- Jet washing the condensers on the ACC has improved their efficiency and reduced the number of fans required to condense the steam.

The ACC is prone to fouling from fibrous airborne material, such as pollen, blossom, dust and insects, which sticks to condenser fins and affects their performance.

As a result, more fans are required to maintain the condensers at an optimum temperature therefore cleaning made the heat exchange process more efficient.

Jet washing has also improved the heat exchange rate of the closed circuit cooling water (CCCW) system that is also susceptible to fouling from airborne particles.

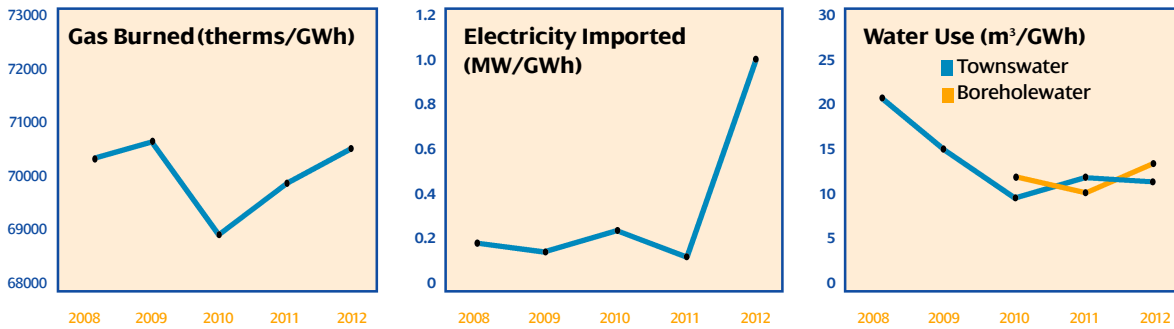
After cleaning, the number of fans required to operate over a 24-hour period was reduced from 10 to only four, with electricity savings and improvements in efficiency. Going forward, a system software programme is being developed to give early warning of the need for condenser cleaning, based on feedback about plant conditions.

- LED lighting was fitted during the station's 2011 outage at the heat recovery steam generator (HRSG). Three LED high bay fittings replaced old sodium lights, with resulting savings in electricity costs and maintenance bills. Station staff have also noticed improved colour rendition while the LEDs are more durable and environmentally-friendly, being free of mercury and lead.

- Energy and water efficiency were



# Damhead Creek EMAS Statement 2012

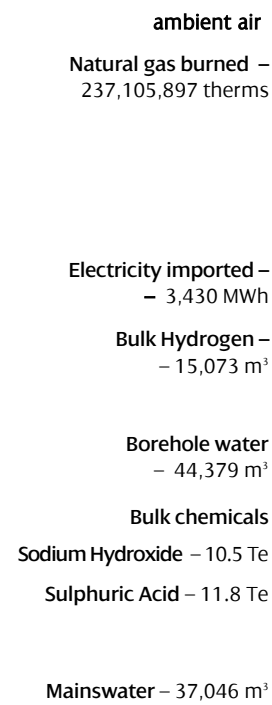


## DAMHEAD CREEK PROCESS DIAGRAM

Our process diagram (right) shows the inputs and outputs at Damhead Creek Power Station during 2012

- Natural gas is delivered to the station via a three kilometre underground pipeline that links in to Transco's national transmission system.
- The natural gas is burned in two gas turbines (GTs), which are similar to the large jet engines found on aeroplanes, to heat compressed air.
- The hot gas expands through the turbine blades at 3,000 rpm, forcing a shaft to rotate and drive a generator. In conventional coal-fired power stations, the hot exhaust gases are lost to the atmosphere, resulting in wasted heat energy.
- At Damhead Creek, however, these hot exhaust gases, at a temperature of 548°C, are reused to heat water-filled tubes in two large boilers called Heat Recovery Steam Generators until it turns to steam.
- Waste gases from this part of the process are released to the atmosphere through the station's twin 75-metre high chimneys.
- Steam from the Heat Recovery Steam Generators passes through a steam turbine, expanding as it does so that its heat energy drives the turbine rotor at 3,000 rpm.
- Exhaust steam flows to the station's air-cooled condenser (ACC) that cools it back into water to be recycled at the Heat Recovery Boilers. Damhead Creek's ACC works like a giant radiator, with 36 cooling fans, each 10-metres in diameter, forcing air over a heat exchanger with a surface area of 105 hectares.
- In 2012, 54% of our process water was sourced from an underground aquifer and mixed with recycled process water in a Water Recovery Plant. Mainswater is used for domestic purposes. All water is treated at an on-site demineralisation plant.
- Water discharges are released to the Damhead Creek and are comprised of water treatment plant effluent (waste water), boiler blowdown (water drainage), treated sewage and surface run-off water.

## >> INPUTS



## RESOURCE USE

	2012		2012	2011	2010	2009	2008
Net Gas Burned (therms)	237,105,897	therms/GWh	70,546	69,398	68,901	70,710	70,260
Townswater Use	37,046 m³	m³/GWh	11.02	12.47	9.31	15.33	20.74
Boreholewater Use	44,379 m³	m³/GWh	13.2	9.61	12.55	-	-
Electricity Imported	3,430 MWh	MWh/GWh	1.021	0.147	0.217	0.167	0.196
Sodium Hydroxide	10,500 kg	kg/GWh	3.12	5.88	0.73	1.12	1.41
Sulphuric Acid	11,780 kg	kg/GWh	3.5	5.90	0.49	0.85	1.30

## EMISSIONS TO AIR AND WATER

	2012		2012	2011	2010	2009	2008
Carbon Dioxide, CO <sub>2</sub>	1,252,412 Te	Te/GWh	372.63	368.14	366.5	374.7	376.29
Carbon Monoxide, CO	13.69 Te	kg/GWh	4.07	5.77	17.69	10.3	9.6
Oxides of Nitrogen, NO <sub>x</sub>	773 Te	kg/GWh	111.23	324	268	290	412
Water Discharged	92,923 m³	m³/GWh	27.65	15.91	17.98	17.33	19.09

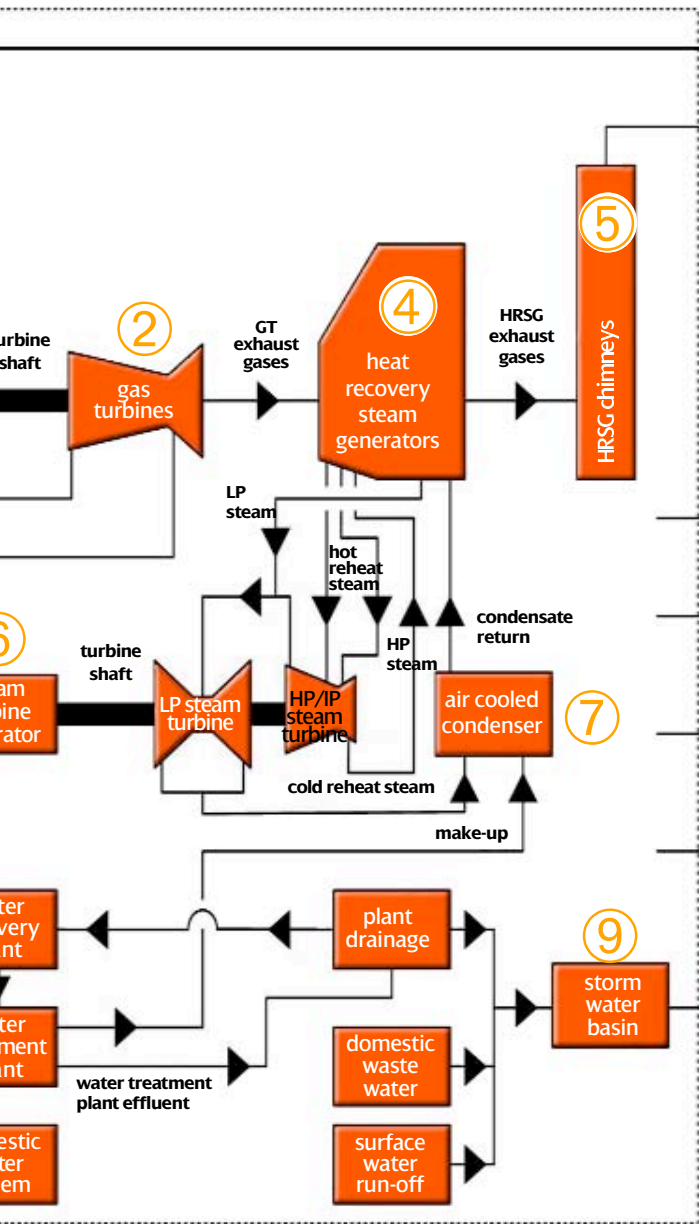
## WASTE PRODUCED

	2012
Non-Hazardous Solids (tonnes)	78
Hazardous Solids (tonnes)	12
Non-Hazardous Liquids (litre)	62,100
Hazardous Liquids (litre)	22,840

## WASTE RECYCLED

	2012
Non-Hazardous Solids (tonnes)	40.22
Hazardous Solids (tonnes)	0.004
Non-Hazardous Liquids (litre)	0
Hazardous Liquids (litre)	10,040





Electricity exported  
- 3,361 GWh

Emissions to air  
**CO<sub>2</sub>** - 1,252,412 Te  
**CO** - 13.69 Te  
**NO<sub>x</sub>** - 773 Te  
**SO<sub>2</sub>** - 1.66 Te

>> **OUTPUTS**

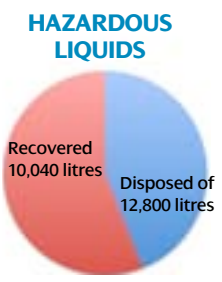
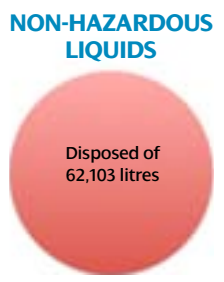
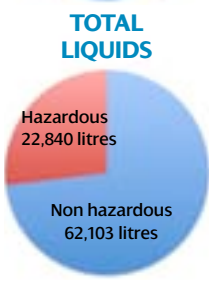
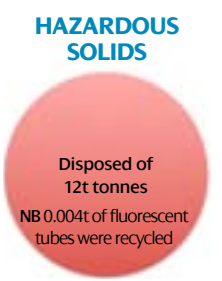
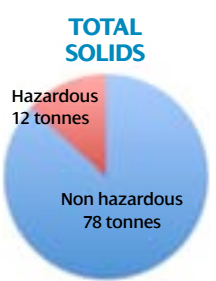
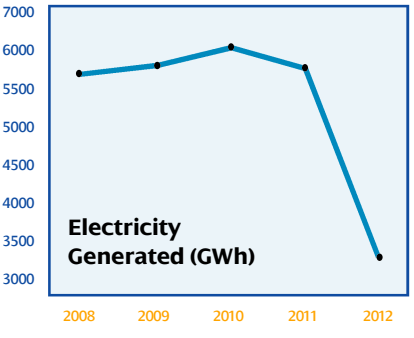
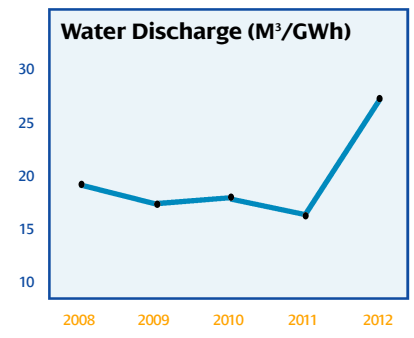
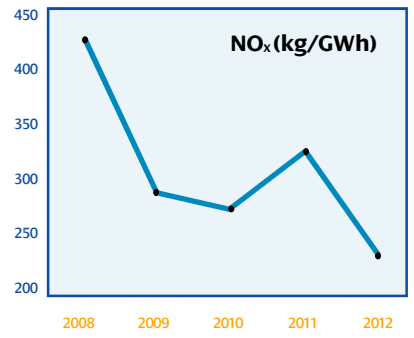
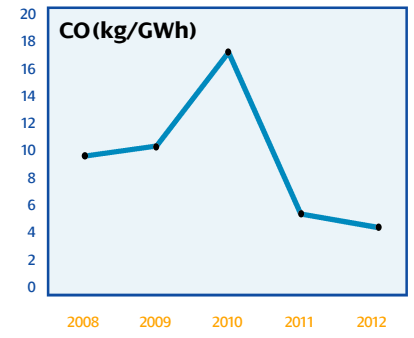
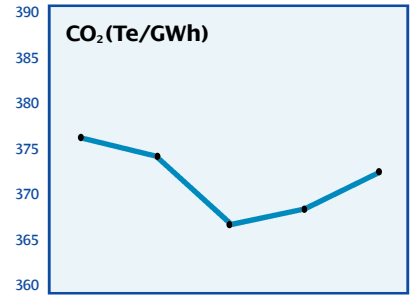
VoCs - 22.5 tonnes

Methane - 95.2 tonnes

Total waste -  
 89.9 tonnes solid  
 84,943 litres liquid

Waste recovered -  
 40.2t non-hazardous solids  
 0.004t hazardous solids  
 10,040 litres hazardous liquid

Total water discharged  
 - 92,923 m<sup>3</sup>



# Damhead Creek EMAS Statement 2012

covered in a Toolbox Talk in November 2011 as part of a 'Switch Off' campaign. This included raising the awareness of turning off equipment when not in use, using timers on lights and using thermostats to reduce heating. Timers were installed on water heaters in September 2011.

- Meters have been installed on the ACC to monitor electricity usage and help identify any changes made to the DCS logic to determine and improve energy efficiency.

- A programme was completed in 2010 to install inverters on all of the HRSG roof exhauster fans to reduce their operational speed, with potential electricity savings of 25% and a reduction in operational noise.

- Damhead Creek updated its Energy Efficiency Plan in June 2012 as part of its PPC permit improvement conditions. This technical document describes the metering arrangements in place for gas and electricity usage, how the station uses energy, identifies areas where heat and energy are lost in the station's process and suggests possible areas for improvement.

The station continues to benefit from successful projects implemented in recent years to secure significant energy savings, such as optimisation of the station's heat transfer processes, especially in summer when ambient temperatures are higher.

## Continuous Improvement

**Staff at Damhead Creek aim to achieve a continual improvement in the station's efficiency, performance, reliability, compliance and controllable losses.**

As a result of the major outage in 2012, it is anticipated there may be a slight improvement in efficiency as a result of better combustion performance.

For instance, redesigned blades were fitted as part of GT overhaul that will improve air flows, helping efficiency while reducing NO<sub>x</sub> formation. Regular cleaning of the turbine air coolers, which preheat gas for combustion, to minimise fouling by airborne particles has also improved the operation of the GTs and helped them run better.

Meanwhile, work has been carried out to ensure the continued excellent environmental compliance of the station.

- During the 2012 outage, when work was carried out 24 hours a day, a number of ad hoc noise surveys were carried out with a handheld noise meter both within the site and externally. This helped ensure that outage work was within noise parameters stated by Medway Council.

- The main gas feed to the station was pigged and inspected in 2012 to improve safety and ensure compliance.

- Protection of the environment was, for the first time, an integral part of the site induction process for contractors and new



*Recycling and waste disposal bins in place for use by contractors during the station's 2012 outage*

staff. The induction covered issues such as noise and waste – and the environmental safety message was reinforced by regular Toolbox Talks.

- In 2012, a survey was carried out using a remote camera to check the condition of the plant drains as part of the updated site protection monitoring plan to meet the requirements of the EA. This follows on from work done in 2009 to monitor the condition of the station's road drainage system.

- The Storm Water Basin pH transmitter was upgraded to MCERT certified equipment to ensure the station meets current legislation.

- During 2012 the station identified a problem with the efficient throughput of demineralised water in its water treatment plant, which depends on a mixed bed chemical regeneration with dilute sodium hydroxide (NaOH) used to remove silica.

The station identified that the optimum NaOH concentration of 4% was not being reached, which affected the complete removal of silica during the mixed bed reaction. Work is now under way to replace the NaOH dosing pumps and the concentration analysers, which had been found to "drift" shortly after calibration, as well as checking the function of the dosing pump discharge non return valves.

This should rectify the problem by delivering the correct strength of NaOH and ensuring the complete removal of silica through efficient mixed bed regeneration.

## Waste

**ScottishPower encourages the efficient use of resources including minimising waste and promoting reuse and recycling.**

The station recycles materials, where possible, although quantities are low in line with the size of the site. Among the items uplifted for recycling are wood, scrap metal, electrical equipment, paper and card, waste oil, plastic, batteries and fluorescent tubes.

A total of 89.9 tonnes of solid waste and 84,943 litres of liquid waste were produced at Damhead Creek during the year – both show a sharp increase on the previous year.

The major outage in 2012 resulted in an increase in septic tank sludge, waste solids and liquid, although this presented greater opportunities for recycling.

Separate waste skips and containers and recycling facilities were made available for contractors involved in the turbine overhaul. This enabled the station's environmental team to calculate, where possible, separate totals for outage waste and that which had arisen from normal plant activities.

The outage has generated a large amount of scrap metal – including two valves that weighed a total of three tonnes. About 44% (40t) of our solid waste was recovered or recycled in 2012 – including four tonnes of paper/card, six tonnes of waste wood and 29.5 tonnes of iron/steel.

Damhead Creek is investigating the categorisation of septic tank sludge which is removed from site by tanker for drying and incineration before being sent to landfill. A total of 50,750 litres of sludge was removed in 2012 – 81% of our total liquid waste.

Station staff have argued that most of the sludge is comprised of water, which is separated out and recycled – therefore there should be a corresponding reduction to their overall liquid waste figures.

In 2012, a new waste management procedure was compiled – essentially a one-stop shop for information relating to waste streams, how they are handled and who is responsible for implementing policy.

This has helped ensure clarity about waste and recycling activity on site ahead of changes to The Waste (England and Wales) Regulations 2011, which will require the segregation of certain wastes by 2015.

It will also enable station staff to better identify recycling activities and allow targeted action to reduce waste to landfill.



*Damhead Creek's mitigation land and some of our special species, from top, Water Vole, Brown Hare and Great Crested Newt, and below, Barn Owl*

Damhead Creek's landholdings include a mitigation area of 32 hectares that features a range of habitats that are rich in wildlife.

Planning conditions for the station's construction required the operators to retain existing habitats and create and manage new areas for biodiversity to help mitigate for the environmental impacts of the plant's construction and operation.

As a result, the station developed a mitigation strategy in liaison with Kent Trust for Nature Conservation, the Royal Society for the Protection of Birds and Natural England. The strategy will run for the lifetime of the station and is reviewed every five years by Medway Council, Kent County Council and Natural England.

The land on which Damhead Creek was built was reclaimed from the marsh hundreds of years ago but retains characteristics of a wetland site.

The mitigation area includes rivers and streams, standing open water and canals, intertidal mud and sand, reedbeds and coastal saltmarsh – all of which are priority habitats in the UK Biodiversity Action Plan (UK BAP), the Government's initiative to conserve vulnerable habitats and species.

The mitigation land habitats support a varied and important range of wildlife –

## BIODIVERSITY & CONSERVATION

**Damhead Creek adjacent to Medway Estuary and Marshes which are internationally important for wildlife. The 4,600-hectare estuary site has been recognised as a Site of Special Scientific Interest (SSSI), a Special Protection Area (SPA) and Ramsar site for its nesting and wintering bird populations.**

including many UK BAP species and others that are rare or vulnerable in Kent. Damhead Creek habitat management plan (HMP) for the mitigation area focuses on four key aims:

- Providing wildlife corridors to link retained features and conserve habitats of high ecological value
- Creating wildlife habitats
- Managing land to enhance its nature conservation value
- Protecting existing access.

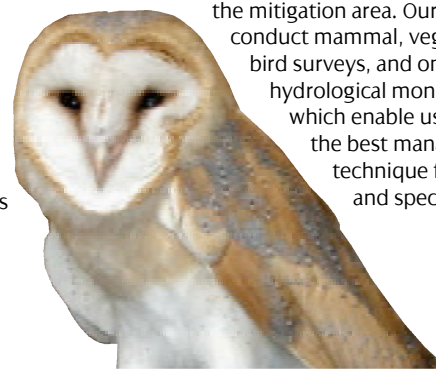
The HMP, which was reviewed and updated in 2012, aims to maintain, protect or enhance habitats such as wetlands, reedbeds, grasslands, native woodland, saltmarsh and scrub.

It also targets pro-active measures

to improve conditions for key species including Water Vole, Great Crested Newt and Barn Owl. The work also benefits large numbers of common species and plants.

Careful hydrological monitoring is critical to the area's ecosystem. The mitigation land is drained by a network of channels, weirs, ditches and outfalls that must be maintained on a regular basis.

Ecological studies are also carried out to help ensure the successful management of the mitigation area. Our experts conduct mammal, vegetation and bird surveys, and ongoing hydrological monitoring, which enable us to apply the best management technique for habitats and species.





# Damhead Creek EMAS Statement 2012

## BIODIVERSITY & CONSERVATION

Damhead Creek's Habitat Management Plan was reviewed and updated in 2012 to reflect key targets at the mitigation land.

Many objectives remain unchanged, such as specific work to maintain open water, wetland and grassland communities in good condition for their wildlife communities.

But some new projects have been included and others – concerning Sand Martins and European Mink, which are not present on site – removed from the revised plan.

In 2012, bee hives were introduced to help pollinate flowers on the mitigation land and in recent years have expanded our nestbox programme for Barn Owls.

Up to three pairs of Barn Owls have nested at Damhead Creek in the past – although no attempts were made in 2012, and this followed on from a generally poor breeding season for birds the previous summer.

Damhead Creek commissioned a breeding birds survey in 2011 that found 50 species present from May to July.

More than half (27) of the birds recorded were species of conservation concern due to their declining UK populations or reduction in range. Five UK BAP birds nested or may have nested in 2011: Cuckoo, Song Thrush, Linnet, Reed Bunting and Lapwing.

Other notable breeding species included the Amber-listed Stock Dove, Whitethroat, Green Woodpecker, Little Grebe, Dunnock and Mallard, while Pochard and Shelduck likely nested at the mitigation pools.

Nevertheless, the number of overall and breeding species was reduced on totals in the 2009 breeding survey – when 80 species were found and 29 nested.

The surveyors felt that work to the east of

the mitigation land to build a series of large storage warehouses may have caused temporary disturbance to the station's birds.

A wintering bird survey carried out in 2011/2012 also reported a slight reduction in species' numbers – from 29 in 2011 to 27 in the latest survey. The estuary area of the site was most productive, holding good numbers of wildfowl and wading birds.

Construction work off site may also have contributed to fewer Water Voles present in some areas of the mitigation land during a vole survey in 2011 – although surveyors noted that the vole population was stable and increasing elsewhere. The last survey in 2009 had found the Water Vole population at Damhead Creek to be at a record high.

In response, habitat improvements for Water Voles has been carried out during 2012 and included ditch clearance at the Berry Wiggins Drain – the main channel running through the mitigation area.

This was the first time that dredging has been carried out in three years and a wide corridor was cleared of vegetation along the drain to improve foraging habitat.

Invasive scrub has also been removed and the heights of the water channels that drain the area adjusted, providing more flexibility as staff strive to create ideal conditions for the reedbed's wildlife community.

Going forward, ecologists will start to carry out monitoring for Smooth Newts, fish and uncommon species of invertebrate.

The station will also consider putting in place artificial 'tennis ball' nestboxes along the southern perimeter for the UK BAP mammal Harvest Mouse, which was first found on the site in 2007.

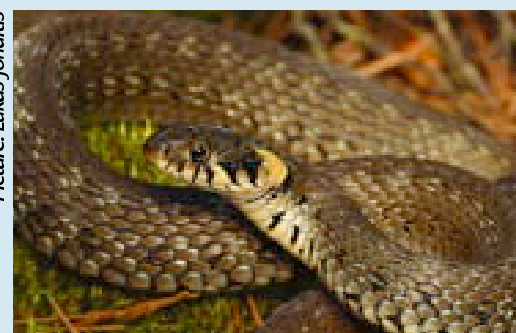


The Berry Wiggins Drain after ditch and vegetation clearance work was carried out in 2012

Picture: Blue Leaf Nature



Picture: Lukas Jonaitis



Picture: Laurent Lebois





*Viviparous Lizard (above) and left, Grass Snake (top) and Slow Worm (below) were monitored*

## SPECIAL SURVEY HIGHLIGHTS SCALE OF STATION'S REPTILE POPULATION

A summer survey for reptiles at Damhead Creek has highlighted the importance of the mitigation land for three key species.

Healthy populations of Slow Worm, Grass Snake and Viviparous Lizard were recorded at the site during seven visits made by ecologists.

All three species are legally protected and are listed as priorities for conservation action in the UK BAP due to the many threats the face, particularly loss of habitat.

Surveyors monitored all the likely sites on the mitigation land where reptiles could occur and put in place artificial cover – such as corrugated metal sheets – for the lizards and snakes to hide beneath.

Slow Worm, a legless lizard, was the most common and widespread species – on 17th July, more than 100 were counted, including many juveniles.

The maximum count of Viviparous Lizard was 31 adults and 2 juveniles on 18th June. Both types of lizard preferred drier areas of the site, with the Wetland Creation Area, in the southwest of the site, the hotspot for sightings.

Grass Snake was less abundant although it was recorded on most visits and it was thought to associate closely with ditches and pond margins. The highest count was three on 28th September.

## Keeping a watch on scarce plants

Several scarce plant species occur on the mitigation land and are subject to biannual monitoring.

Over the years, the fortunes of some species have fluctuated as a result of competition from more vigorous plants and other ground conditions.

In the most recent vegetation survey, carried out in 2011, it was noted that some of the target species were stabilising or showing a slight increase.

Oak-leaved goosefoot, Annual beard-grass, Perennial glasswort and Brackish water crowfoot were all thought to have benefitted from increased ground disturbance at the site, such as on beside vehicle tracks.

However, the surveyors concluded three species – Divided sedge, Curved hard-grass and Sea barley – appear now to be absent from the site.



*The station's Dave Allsop with the goat herd*

## Goat squad hired to keep site clear

Damhead Creek purchased a herd of 47 goats to control vegetation on land earmarked for Damhead Creek 2.

The use of the goats – along with 120 sheep and seven horses – did the job efficiently, while minimising disruption to the special wild animals on the 12ha site.

Station staff were concerned at the potential impact of mechanical plant on protected species such as Great Crested Newt, reptiles and breeding birds.

The conservation grazing approach removed grass and brambles gradually, giving wildlife time to move on or adapt.

A local farmer grazed his sheep on the land and looked after the welfare of all the livestock during the project. Once the land was cleared, one-way fencing was erected to stop wildlife from re-entering the site – and the goats were presented to the farmer as a thank you from the station.

# Damhead Creek EMAS Statement 2012



## STAKEHOLDERS

Damhead Creek works closely with the community and other stakeholders to fulfil the station's obligations as a good and trusted neighbour.

The station has an open policy on communications with stakeholders and welcomes feedback on its activities and operations.

Staff at Damhead Creek work closely with our regulator, the Environment Agency, to ensure the station meets its environmental responsibilities.

Damhead Creek has an excellent track record of environmental compliance – there have been no breaches of consent or justified community complaints in the three years since our last EMAS Statement.

The station reported a pollution incident to the EA in September 2012, when a neighbouring landowner's sewage treatment plant spilled over and waste solids contaminated a pond on the mitigation land. Damhead Creek facilitated efforts by the EA to re-oxygenate the water body.

The station liaises closely with conservation groups – including Natural England, Medway Council, the RSPB and Kent Trust for Nature Conservation – to develop and implement the management strategy for the mitigation area to promote biodiversity.

Damhead Creek continues to support local schools and groups with donations, where this is possible. In 2012, the station donated a mini snowplow and gritter to Allhallows Primary School in Rochester to promote safety in cold weather conditions (pictured above).

## TARGETS & ACHIEVEMENTS

Damhead Creek has a rolling programme of environmental objectives aimed at continual improvement in performance in key areas such as emissions, waste, water and energy use. This section summarises recent major achievements and highlights key targets for the year ahead.

### Achievements 2010

#### Energy use

- Inverters were installed on the final five HRSG roof fans to reduce fan speed by 25%
- The closed cooling water setpoint was increased by 4°C in the logic
- The logic was adjusted in HRSG 1+2 preheater circuits so that the preheater pumps run less when circuit temperature is above 60°C
- Further energy saving ideas were implemented as reported in the energy efficiency report prepared by the Carbon Trust.

### Achievements 2011

#### Energy use

- A project is ongoing to change fluorescent tubes to new high frequency T5 lighting.

#### Waste

- Waste removal was optimised to reduce visits to site by waste disposal company.

#### Water Usage

- DCS modifications were ongoing at the water recovery plant to maximise the recovery of water.

#### Emissions to water

- A site drains inspection was carried out as part of the site protection monitoring programme on oily water drains.

### Achievements 2012

#### Emissions to air

- A major outage was delivered to improve NO<sub>x</sub> performance.

#### Stakeholders

- An EMAS Statement was produced for the station which was verified by an EMAS assessor in 2013

- Quarterly environmental bulletins were delivered to staff.

#### Outage delivery

- Environmental risk assessments were carried out for key outage activities
- Weekly environmental spot checks were conducted at key areas of plant
- An outage nuisance noise plan was produced to minimise the risk of nuisance noise complaints from the community.

#### Resource use

- We investigated ways to optimise use of process chemicals.

#### Biodiversity

- Damhead Creek's biodiversity action plan was reviewed and updated.

#### Water Use

- A project improved our water treatment plant's mixed bed efficiency
- A small drains survey was completed.

#### Waste

- Waste segregation was improved to increase recycling and reduce disposal costs.

### Targets for 2013

#### Compliance

- Maintain ISO 14001 accreditation
- Maintain compliance with PPC.

#### Protecting the environment

- Manage land contamination at Damhead Creek 2

#### Waste

- Deliver quantified reduction and reuse/recycling targets for five key waste streams

#### Energy Use

- Identify projects to reduce energy consumption in two areas of significant energy use
- Implement two energy efficiency projects, install additional water metering as required and review 12 months' metering data

#### Water Use

- Implement two water efficiency projects, install additional water metering as required and review 12 months' metering data.

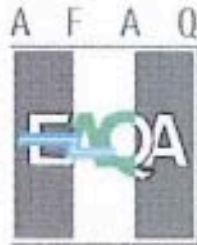
## ABOUT EMAS

The EU Eco-Management and Audit Scheme (EMAS) is a management tool for companies to evaluate, report and improve their environmental performance.

The core elements of EMAS are performance, credibility and transparency. Registered companies, such as Damhead Creek, are compelled to continually improve their environmental performance and provide evidence that they comply with relevant legislation.

Under EMAS, the station must produce a Statement of its performance against environmental objectives which is approved by a third-party EMAS verifier.





## Environmental verifier's declaration on verification and validation activities

AFAQ-EAQA Ltd with EMAS Environmental Verifier registration number UK-V-0010 accredited for the scope of NACE Code 35.1 declares to have verified that the organisation as indicated in number UK Parliament a eco-manage

By signing t

- the v requi
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**new certificate  
to be supplied  
after EMAS  
assessment**

NOTE: This document shall only be granted by a Competent Body under Regulation (EC) No 1221/2009. This document shall not be used as a stand-alone piece of public communication.

Done at Damhead Creek Power Station on 14/12/2010.

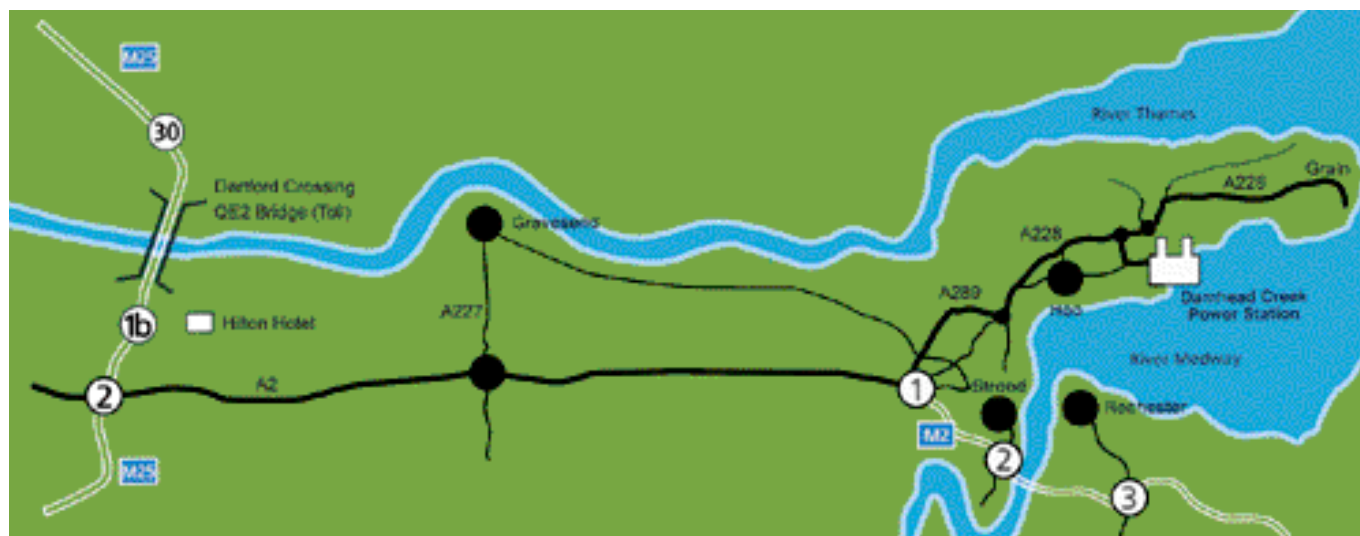
Signature:

A handwritten signature in black ink, appearing to read 'D Brownsword'.

D Brownsword,

Nominated Verifier

## Damhead Creek EMAS Statement 2012



**From M25 take junction 2 for the A2 (towards Canterbury or Dover). After approx. 10-15 minutes' drive, branch off on to the A289 (towards the Isle of Grain). At the roundabout, take the A228 (towards Grain). At the next roundabout, Damhead Creek Power Station is signposted.**

ScottishPower is part of the IBERDROLA Group, one of the four largest energy companies in the world by market capitalisation. ScottishPower Generation Holdings Ltd operates ScottishPower's diverse generation portfolio, which includes coal and hydro power stations, and Combined Cycle Gas Turbine stations like Damhead Creek.

For more information on our activities, visit ScottishPower's website: [www.scottishpower.com](http://www.scottishpower.com)

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