

# Tessellations

News And Technical Updates From Tessella

Edition 58, Environmental Special

## Cost-effective Waste Data Management

With an increasing world population, the problem of achieving sustainable waste management is one of the most critical social, environmental and economic issues facing our consumer-based societies. The European Union throws away over 1.3 billion tonnes of waste each year. The UK alone produces over 400 million tonnes of waste, with 28 million tonnes of this coming from households. Most UK waste currently ends up in landfill sites, with only 17% of household waste being recycled or composted. The picture is similar in the US, with the Environmental Protection Agency reporting that 'household trash' accounted for 236 million tons (equivalent to 214 million metric tonnes) of waste a year. Internationally the problem is both huge and growing. However, increasing public awareness and concern for the environment is leading to more legislation and targets for waste reduction and recycling.

### Reduce, Reuse, Recycle

The European Union requires waste to be closely tracked and monitored by responsible agencies, and has issued a significant number of directives related to waste management, including an upcoming target to reduce landfill of biodegradable waste to 50% by 2013. 'Reduce, reuse and recycle' are the cornerstones of an environmentally friendly waste management policy.

Any form of waste disposal or recycling has the potential to harm the environment or human health, so the first line of action is to **reduce** the amount of waste produced in the first place. **Reuse** is the next best option; using a product again, either for the same or some new purpose. **Recycling** and **composting** methods include the collection and separation of materials that can be sent to markets for reprocessing. The remaining wastes can then be subjected to **recovery** options, which include a variety of biological and thermal techniques. The final option is disposal by **landfill**. This has become recognized as the least desirable part of the waste hierarchy and the emphasis for local authorities is to reduce dependence on landfill to a minimum.

### A groundbreaking contract

In the UK, **Waste Disposal Authorities** are responsible for the safe disposal of municipal waste collected by local councils, and for the development of plans to help the UK meet the tough European Union landfill reduction targets. West Sussex County Council is one such Waste Disposal Authority. Its Waste Management Services team is responsible for the safe disposal of municipal waste, collected by the seven District and Borough Councils in West Sussex plus the waste deposited at household waste recycling sites. In early 2004 West Sussex County Council signed a multi-million pound **Private Finance Initiative** (PFI) deal for the provision of a new waste management service.

The Recycling and Waste Handling Contract aims to deliver a recycling rate of 45% of household rubbish by 2015. This groundbreaking contract is the largest ever signed by the County Council, worth £540 million over the 25-year timescale. As a result, the PFI contractor now runs the county's eleven household waste recycling sites, waste transfer stations and composting facilities, and will also operate new facilities as they come online.

### Cost-effective monitoring

Performance measurement, incentives and information sharing are key components of effective Public Private Partnerships. Innovative IT systems are needed to drive down the management costs of such contracts. West Sussex County Council needs its IT system to:

- Enable the Council to collate, reconcile and report data from all its waste service providers
- Catalogue the types of waste managed within the County
- Define waste management facilities used by the County Council and its contractors
- Define valid disposal routes for each type of waste
- Maintain a register of vehicles authorized to carry waste
- Record targets for each waste management contractor
- Define how the performance of contractors should be monitored

Tessella was commissioned to develop and support an e-GIF compliant, web-based system to meet these needs and to enable **cost-effective monitoring** of both the PFI contract and the waste services within West Sussex. A roaming capability was implemented, using Pocket PC 2003 devices, to allow the Council to monitor and inspect waste management facilities. The system produces statutory reports and Best Value Performance Indicators relating to the waste being collected and processed, and allows contractor **performance** to be monitored through an issues and deduction framework specified in the performance-based contract.

Key to the success of the development was the early involvement of all relevant stakeholders within the Council, and the involvement of a representative of the Waste Collection Authorities. The final system was delivered to West Sussex County Council in April 2005, on time and under budget. The Council now has an integrated and extensible system to efficiently manage their key waste management contract, and the system has been well received by the various waste service providers.

### Extending the model to other contracts

For further information on how this system can be used to monitor other waste service provisions, or extended to monitor other types of contract, please email [info@tessella.com](mailto:info@tessella.com)



Tessellations is published by Tessella Support Services plc. Our aim is to provide you with interesting information on topical technology issues and to outline key projects which we hope you will find of use. We hope you enjoy this Environmental Special issue. Your input and feedback is always appreciated; please send to The Editor (Alison Smith) at [info@tessella.com](mailto:info@tessella.com)

## Enhancing flood warning in the UK ...

Of all the types of natural disaster, flooding is one of the most frequent and costly. The effects of the floodwater, and the associated flows of mud and debris, can be devastating – with both loss of life and severe damage to property and infrastructure. Clean-up operations can last a considerable period of time and prove highly inconvenient and expensive for businesses and homeowners alike.

Recent events such as the New Orleans flooding following hurricane Katrina, flooding in Bangladesh and India, and several high-profile incidents in the UK (such as the Boscastle floods), serve to illustrate the potential impact of flooding.

In some areas, flooding can be prevented by using barriers, dedicated flood locations or additional waterways. However, in other areas this is not possible, and there is a real need to get advanced warning of potential floods and take appropriate action, including bringing temporary flood defences into place and possibly evacuating houses and businesses.



(© UK Environment Agency)

Whilst certain parts of the world have lived with and responded to the threat of floods for very many years, flooding has more recently become a real issue within the UK.

Due to recent floods, the concern over rising sea levels, and the increasing pressure for development on flood plains, the UK Environment Agency (a public body working to protect and improve the environment) is enhancing its flood warning capability in a multi-year programme to develop a robust and resilient automated forecasting system. The system must be capable of operating under stress during a flood event.

Tessella has teamed up with WL | Delft Hydraulics, a specialist consultancy based in the Netherlands, to provide the required National Flow Forecasting System.

### Operational flow forecasting

To provide *advanced warning* of a flood event, forecasters need the ability to predict the level or flow of water at particular locations in a region, and hence must:

- Obtain the appropriate data; e.g. from river gauges (telemetry data), rainfall (actual and forecast), and tidal data
- Create a mathematical and software model of the river network; which may be very simple (e.g. comparing current water levels with known historic data) or more sophisticated (e.g. modelling the physics of the water flow)
- Provide the model with available data and use it to predict the water levels and flows at points within the river network

To produce an operational forecasting capability, the process of predicting water levels and flows has to be undertaken for a large number of key locations. If the predicted water levels cross threshold values then alarms are raised. Well-defined procedures are in place to disseminate flood warnings, both to the public and to the appropriate emergency services.

An operational flow forecasting system has a number of key requirements:

- The ability to run pre-defined models of water flow within a river network and generate predicted water level and flow information. It must also detect the crossing of water level thresholds at the prediction locations
- Allow automated operation, utilizing available data feeds as required. It must also be reliable and resilient; the forecast must be generated even during intense flood event periods
- The system must not be tied to a particular model or implementation of a model. The system should allow models to be 'plugged' into the system with minimal effort

### The National Flow Forecasting System

The UK *National Flow Forecasting System* under development is based on Delft Hydraulics' existing single-user flow forecasting application and utilizes the concepts of distributed 'compute engines' to provide a scaleable, resilient multi-user system (an example of Grid Computing). The new system is being developed in Java, and makes use of the Java Messaging Service to provide the communication and data distribution infrastructure.

Tessella's role is to provide the controlling components that ensure that forecasting tasks are dispatched, monitored and managed. Also within this scope is the central storage of data and its synchronization between the various distributed local data stores. The use of multiple instances of the system (with associated replication of the data between them), together with automated fault identification and rectification, helps ensure that the solution provides the required resilience.

In addition, Tessella is ensuring that the new system, including the associated hardware and infrastructure software, is integrated into the Environment Agency's current operational organization. This includes working with the Agency's support teams to define monitoring and management tasks to aid successful delivery of the complete system.

### Looking to the future

The National Flow Forecasting System will allow the UK Environment Agency to improve its flood forecasting capability, both in its day-to-day operation and in the future development of new modelling techniques.

The new system has been rolled out to three 'early adopter' regions (Northeast, Midlands and Southern), and is now being extended to the five remaining regions, such that all of England and Wales will be covered by the end of 2006.

Tessella is also providing consultancy and guidance on the future expansion of the system, including potential rollout to new customers throughout the world. To find out more please contact +44 (0) 1235 555511 or email [info@tessella.com](mailto:info@tessella.com)



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## Innovation whilst protecting the environment ...

Public awareness of environmental issues, such as climate change, the depletion of the ozone layer, flooding, pollution, waste and habitat management, has increased over the past few years, leading to legislation, taxation and changing technologies that affect all businesses. This has brought the work of those organizations which affect the environment to the forefront, as they research these and other issues and investigate the fundamental science behind them.

### Focus on energy and chemical

The world's energy and chemical businesses face new challenges in the 21<sup>st</sup> century from an ever-increasing demand for energy and chemical products, offset by dwindling natural reserves, and a need to consider environmental and safety issues. Greater competition drives the need for consolidation and cost reduction, and the challenge for many of Tessella's clients is to stay ahead of the game by taking maximum advantage of advances in technology, while ensuring an ever-decreasing environmental impact.

Over a number of years, Shell Global Solutions\* and Tessella have developed a good business relationship based on the successful delivery of numerous varied projects, ranging from long-term support and development of hazard management software for Shell Global Solutions HSE Consultancy, through to enterprise-scale, data-driven web applications for oil sample tracking.

Shell Global Solutions HSE Consultancy specializes in the management of loss prevention and accident hazards at large chemical and industrial sites. They use software models, validated by experiment, which now form the basis of a number of commercial hazard analysis products. These applications include:

- FRED (Fire, Release, Explosion and Dispersion), which is used to help predict the consequences of the accidental or intended release of chemical products from process, storage, transport or distribution operations
- Shepherd which incorporates a number of tools to help provide rapid consequence assessment and risk ranking to assist in gaining regulatory approval and compliance

Tessella has been working with Shell Global Solutions (UK) for the last five years, supporting development and providing ongoing assistance with these commercial applications.

### Focus on water

Tessella staff – working with a major petrochemical company – have developed an extensive set of tools for modelling potential groundwater contamination hazards at service stations. The tools allow the user to model the movement of pollutants from the forecourt into local watercourses and the wider water table. These models are deployed around the globe by consultants using a questionnaire-based data entry model to help gather local data and thus determine if there is a risk to the quality of drinking water for the local community.

### Focus on nuclear

Decommissioning the nuclear legacy is a global challenge. Over 400 reactors and nuclear installations worldwide are scheduled for decommissioning over the next few decades. Within the UK there are a number of facilities over 50 years old, which were not designed with easy decommissioning in mind. Decommissioning programmes vary in scale and scope, however some will not return nuclear power stations to green field sites until the end of the 21<sup>st</sup> century.

With respect to decommissioning, software can be used to model the spread of radio nuclides through the local environment, biosphere and wider geosphere, over human timeframes as well as millennia.



Remote sensing can be used to monitor decommissioning activities in ever greater detail, halting activities at the first sign of potential environmental impact. Sophisticated assay systems can determine the precise radiological fingerprint of waste in near real time, thus ensuring accurate inventories are maintained and waste is packaged in the appropriate manner.

Tessella is committed to supporting the international nuclear community as it faces the decommissioning challenge over the coming decades.

### Focus on environmental science

Measuring, monitoring and modelling the environment have their own problems. Better instrumentation and huge improvements in available computer power have led to more data being produced, which leads, in turn, to issues of data handling, storage and processing. Furthermore, the analysis, quality control and visualization of these large and often complex datasets can also be problematic. New technologies, such as distributed computing and hand-held PCs, offer new opportunities, but also mean that a whole new set of skills have to be acquired.

Tessella has many years of experience working with environmental science organizations to implement cost-effective, reliable and innovative solutions. The scientific and engineering backgrounds of our staff mean that we are able to understand the complex requirements of our clients and work with them to develop high-quality, easy-to-use applications tailored to their needs.

For more information please email [info@tessella.com](mailto:info@tessella.com)



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(\* Shell Global Solutions is a network of independent technology companies in the Shell Group. In this newsletter the expression 'Shell Global Solutions' is sometimes used for convenience where reference is made to these companies in general, or where no useful purpose is served by identifying a particular company.)

## Waste Data Management

The collection and management of waste data is an ever-increasing problem for Local Authorities, as local and national reporting requirements continue to grow.

Tessella's web-based Waste Data Management System provides a flexible solution, specially designed for Local Authorities to provide fit-for-purpose quality data to meet all analysis and reporting needs.

Our e-GIF compliant system provides capabilities for collection, validation, analysis and submission of waste data by all parties involved in the waste collection and disposal processes.



Tessella has over 15 years' experience of working with environmental organizations to implement cost-effective and reliable software solutions. Please contact the Marketing Team on +44 (0) 1235 555511 or [info@tessella.com](mailto:info@tessella.com) to discuss your potential requirements.

## National Groundwater Modelling

Groundwater models have been in use by the UK Environment Agency and its predecessors for many years. They have traditionally been developed to assist particular regional or local studies and are often complex and expensive.

It has been realized that a centrally co-ordinated, strategic approach was required based upon the need for a managed run-time environment. In addition, there is potentially a wide user base for the models and results (abstraction monitoring, pollution tracking etc), but currently it is not efficient for non-technical experts to use the models.

It was recognized that there are strong links between the proposed IT Strategy for Groundwater Modelling and the National Flow Forecasting System, and therefore Tessella, together with WL | Delft Hydraulics and the Environment Agency, have embarked on a phased pilot project to provide the required Groundwater system.

## Good news for Public Sector clients

Tessella's inclusion in the latest round of OG buying solutions' Catalyst frameworks means that Public Sector customers now have a fast and easy route to obtaining our Consultancy and Specialist Solutions services. Tessella has recently been awarded three framework agreements with OG buying solutions, having been successful during a competitive process, fully compliant with EU Directives. The framework agreements allow customers throughout the public sector to place orders with Tessella under standard terms and conditions of the agreements.



Tessella is included in the **ICT Consultancy** and **Specialist Solutions** frameworks (in the lots covering 'Applications Development' and 'Electronic Document & Records Management Solutions').

Under the ICT Consultancy framework Tessella can provide consultancy on the design of ICT applications (bespoke or customized COTS) to deliver customer IT strategies and projects. It can include the design of stand-alone applications or middleware to ensure effective systems integration as well as advice on application design management. The Specialist Solutions framework offers customers an end-to-end solution, and can include solutions identification, design, development, implementation, integration, data take-on, data migration, systems security, user training, maintenance and support, managed services and review services. The category also includes bespoke (custom-built) applications design and development, and the ongoing maintenance and support of applications during their life cycles. This may include prototyping, the tailoring of existing products, data migration and user training.

The inclusion of Tessella in both these frameworks allows us to offer customers services covering the early identification and analysis of problem areas in their businesses, right through to the implementation of ICT-based solutions.

OG buying solutions helps customers save money by providing public sector organizations with a route to high quality products and services that enable them to buy the things they need quickly, efficiently and at highly competitive prices.

## Tessella – Providing innovative solutions to scientific, technical and engineering problems

Tessella uses its unique blend of scientific, engineering and IT skills to solve the most complex of technical and business problems in a highly cost-effective way.

We have a proven 25-year history of excellence, adding value to demanding public sector and commercial R&D based customers. Tessella now comprises Tessella Support Services plc, Tessella Inc and Analyticon Ltd.

Tessella's services cover software design and development, IT consultancy, infrastructure support and project management. Our enviable reputation for providing high-quality, low-risk, value for money services is backed up by many successful, high-profile projects, plus a high level of repeat business.

Formed in 1994, and joining the Tessella group of companies in 2005, Analyticon specializes in the design of solutions requiring mathematical modelling, analysis and creative thinking. For each problem we develop a fundamental understanding within the 'big picture' context – so our solutions fit. We focus on the details however intricate – so our solutions work.

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Since 1980, Tessella has been fortunate to work with many clients in industry sectors including Energy and Chemical, Environmental, Instrumentation, Life Sciences, Manufacturing and Engineering, Public Sector, Transport and Utilities; extracting relevant technologies and experience from each sector and applying them in novel ways to clients' problems in other areas.

