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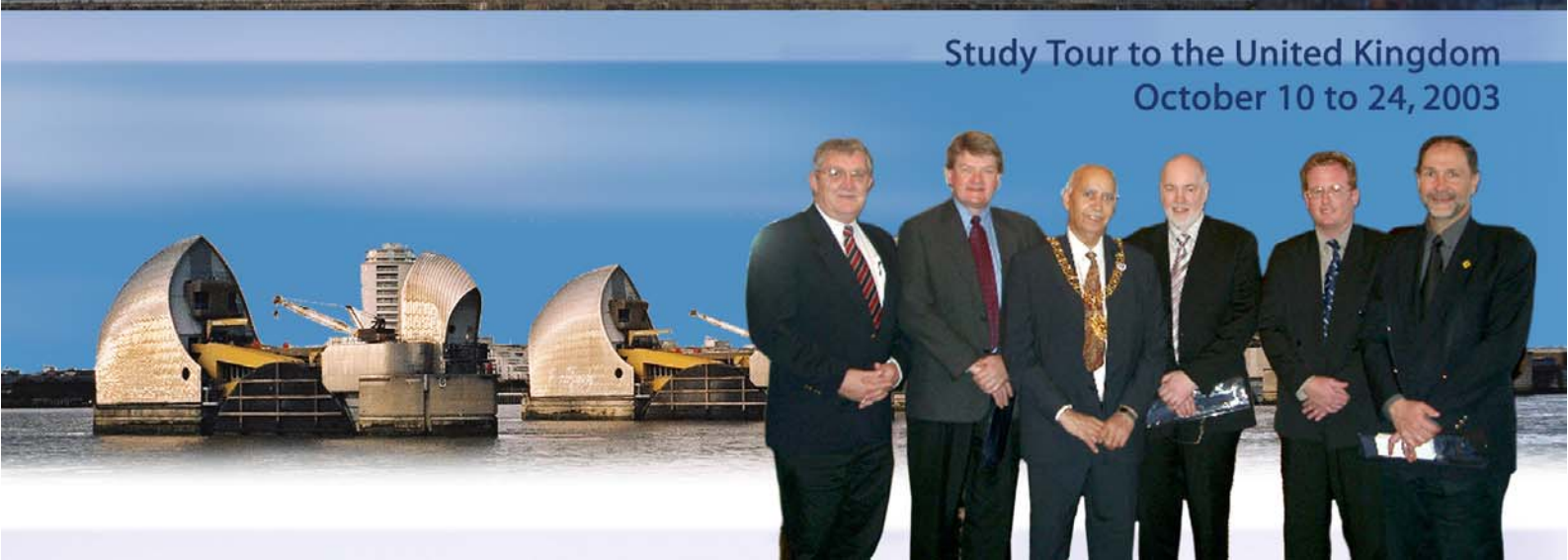
Draft Report



Foundation for the Advancement of Local Government Engineering



Study Tour to the United Kingdom
October 10 to 24, 2003



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1. Introduction and Objectives

1.1 Introduction

This report has been prepared in fulfilment of the requirements of the participants of the 2003 IPWEA National Study Tour to the United Kingdom.

Five engineers attended the Study tour to the UK including tour leader and coordinator, Chris Champion who is the National Chief Executive Officer of the IPWEA.

Table 1.1 presents the names and occupations of participants of the 2003-study tour to the UK.

■ Table 1.1 Study Tour Participants

Participant	Title	Based in:
Chris Champion	National CEO IPWEA and Team Leader	Sydney, NSW
John Bonker	Chief Executive Officer	Town of Victoria Park, WA
Stewart McLeod	Director Technical Services	Dubbo City Council, NSW
Claude Cullino	Director of City Development	City of Manningham, Victoria
Tom Bradshaw	Senior Engineer, Sinclair Knight Merz Limited.	Brisbane, Queensland

All participants are qualified Civil Engineers acting in senior management roles in Local Authorities and/or perform works on behalf of Local Authorities / Public Works organisations in their respective states. All participants are members of the Institute of Public Works Engineering Australia (IPWEA).

The duration of the study tour was two weeks in total and commenced on the 10th October 2003 in Edinburgh and finished on the 24th October 2003 in London. The following Council's were visited during the course of the tour.

- Perth and Kinross County Council;
- East Riding of York Council;
- Coventry City Council;
- Oxfordshire County Council;
- Hertfordshire County Council (public private consortium, Hertfordshire Highways).

Refer to **Figure 1.1** Locality Plan showing the location of the above listed Council's.

Also attended during the study tour was the SOLACE Conference in Edinburgh. This conference commenced on the 14th October and finished on the 16th October. SOLACE stands for the Society of Local Authority Chief Executives and Senior Managers in the UK.

1.3 Objectives and Topics of Interest

The objectives of the 2003 National study tour to the UK were to:

- enhance the personal and professional development of individuals attending the tour;
- provide an opportunity for participants to exchange ideas and learn about the way Local Authorities in other Countries conduct their businesses to improve the delivery of services to customers; and
- introduce new and innovative ideas to improve the way in which services are delivered in Australian Local Authorities.

Before the tour commenced, participants were requested to put forward ideas, interests and suggested topics for discussion with Local Authorities managers from the Council's visited in the UK.

Not all topics put forward were covered in discussions with the Local Authorities. Some issues however, such as the Comprehensive Performance Assessment process and the effect it has had on local authorities in the UK were discussed at length with every Council visited.

Below is a description of the topics discussed with the various Councils.

■ Table 1.2 Topics of Discussion

Topic	Issue
Local Government Management Practice	Comprehensive Performance Assessment (CPA) Community Safety Partnering in Hertfordshire
Water Supply and Wastewater	Demand Management Sewer Inflow Infiltration
Water Quality Management and Flooding	Water Quality Management Flooding
Infrastructure Asset Management	Asset Management (Roads and Highways) in Hertfordshire

The above topics are discussed **Chapters 4, 5, 6 and 7** of this report.

2. UK Local Government Structure

2.1 Local Government Structure

Local Authorities in the UK generally comprise three government tiers.

Table 2.1 below provides an indication of the services likely to be provided by the different tiers of Local Government in the UK.

■ **Table 2.1 Local Government Structure**

Local Government	Services Provided		
Tier 1 – County Council	Adult Education Adoption Bridges Children's Services Civil Marriages Countryside service County Records Disabled Services Early Years Education Elderly Services	Emergency Planning Fire and Rescue Gritting of Roads Land Use Planning Libraries Museums Music Registration of Births Deaths and Marriages Road Maintenance	Road Safety Schools Social and Health Care Trading Standards Transport Planning Waste Disposal Waste Recycling Welfare of Animals Youth Offending
Tier 2 – District Council	Refuse Collection Water and Sewerage	Maintaining of electoral register and collecting Council tax.	Community Service Local Roads
Tier 3 – Town and Parish Councils	Local services such as maintaining of community halls, allotments local churchyards etc.		

Note: This information has been taken from literature provided by specific Local Authorities. The range and type of Services delivered may vary between Council's.

Not all local government in the UK is tiered. Some single tiered Authorities exist. The range of services managed by Local Authorities differs between the various tiers.

In comparison to the government structure in Australia and Queensland, the County Council role in the UK takes on a similar role to the State Government (refer literature in **Appendix A** for further information). District Council's take on a similar role to City Councils and Parish Council's to town and Shire Council's in Australia.

2.2 Privatisation

Privatisation of many services throughout the UK was implemented under the Thatcher government in the 1980's.



According to Perth and Kinross Council staff, Scotland's water and sewerage service is fully privatised. York of East Riding Council commented also that most water and sewerage services throughout England and Wales are privatised. Staff from York of East Riding Council commented that private household connections and some minor reticulation sewers remained under the control of the District Council's after privatisation occurred. This led to confusion to customers in that they did not know who to contact in the event of a system fault (such as a sewer blockage) and problems to the Council (in the way of customer complaints etc) when the privatised company chose not to accept responsibility for local reticulation mains.

In summary, the main concern associated with privatisation of the sewerage service is considered to be the interface between the public sewer network system and the Council controlled system (minor reticulation mains). Before privatisation occurred, District Council's maintained all sewers and there was very limited confusion.

2.3 Engineering in Local Government

The number of engineers employed by Local Authorities in the UK appears relatively small in comparison to the size of the Council. York of East Riding Council has 17,000 staff for a population of about 320,000. There are 67 Councillors, 300 Section Managers, 19 Department Heads, and 50 office staff in York of East Riding Council. Out of the 50 office staff, there is about 10 professional staff, three of which are qualified engineers.

County Council's in the UK place more importance on services such as social services and education. Teachers in the UK are employed directly by the Local Authority.

Outsourcing of services such as water and sewerage, roads and transport etc also plays a major role in limiting the number of professional staff employed directly by the Council's.

3. SOLACE Conference

3.1 Overview

SOLACE (Society of Local Authority and Chief Executives and Senior Managers) was founded in 1974 and is a professional membership organisation aimed at promoting effective local government in the UK.

About 300 delegates (consisting mainly of Chief Executives and Senior Managers from various Local Government organisations in the UK) attended the SOLACE conference in Edinburgh on the 14th to 16th October 2003.

Innovation and diversity in Local Government was the main theme for the conference. Papers presented were generally aimed at reducing the gap between Local Government and Communities.

One of the speakers at the conference was Shay McConnon, who is the Founder of People First (an international training and consultancy group). Shay spoke about leadership, winning relationships in businesses and the processes that work and don't work in workplace and community relationships. The paper was made interesting via the inclusion of a magic show as part of the presentation. Shay could be described as a very interesting person with a lot of ability in "getting the message across" to the audience.

Appendix B of this report contains a CD of the various information collected by participants including papers presented at the SOLACE conference. Also contained in the information CD Rom are some photos taken by participants John Bonker and Stewart McLeod during the tour.

The SOLACE conference also discussed the comprehensive performance assessment process recently implemented into UK local government. This process is discussed briefly later in this report (refer **Chapter 4**).

3.2 Countries Represented

Several countries were represented at the SOLACE conference including:

Australia	South Africa	Canada	Portugal
UK	Malta	Belgium	
Slovakia	New Zealand	United States	

Representatives from all countries made a short presentation at the international dinner held at the Dundas Castle, South Queensferry, Edinburgh.



Each representative spoke about the concerns and problems that Local Government in their respective countries faced and the work that was needed to improve the way services were delivered.

The representative from Slovakia (who spoke with the assistance of a translator), mentioned that the main concern in Local Government in his country were associated with the significant number of relatively small Local Authorities and a need to amalgamate to increase level of funding for new infrastructure etc.

Concerns in Local Government varied significantly across the various nationalities but had some common themes such as financial and funding constraints, staffing, privatisation and internal management processes just to name a few.

Like all conferences, there was much opportunity to meet the delegates, network and exchange ideas and also enjoy the social atmosphere. Social activities included a dinner for international delegates, a “party @ 10” where delegates rejoined as a group after a free evening, a formal conference dinner and a fun run.

4. Local Government Management Practice

4.1 Comprehensive Performance Assessment

Comprehensive Performance Assessment (CPA) is a performance assessment framework for Local Authorities in England. Audit commission inspectors used the process to assess the performance of Council's, in particular the delivery of a range of services to customers and to assist in improving areas of weakness.

Local Authorities in the UK are structured differently to Local Authorities in Australia. The range of services managed also vary quite significantly. A brief description of the management structure and type of services delivered by UK Local Authorities is provided in **Chapter 2** of this report.

The CPA process assesses all services and ranks each using a rating system. Some services (such as Education and Social Services) are considered more critical than others and therefore attract a higher weighting in the assessment process. These services are referred to as core services and are major factors in determining the final rating of the Council.

All County Council's and single Tier Authorities are assessed. Councils are scored in accordance with the following rating system:

- Excellent
- Good
- Fair
- Weak
- Poor

Council's assessed as excellent, must have high quality services, effective leadership and management, have well managed and targeted finances, be very community orientated, ambitious and focused.

The higher score or rating provided to a Council enables certain benefits, for example increased funding from Central Government resulting in a greater and more flexible scope to deliver services (without government intervention); relaxed inspections by Auditors, and reduction in the number of management plans needed to be produced.

Whilst benefits were reduced to Council's assessed as weak, Government grants were provided to assist in areas where improvement was most needed. Councils rated as "weak" or "poor" are generally subjected to ongoing scrutiny and inspections by audit commission inspectors.

Revenue for Council's operations, administration etc is made up of direct Council taxes (<30% in total), Government reimbursement on specific services and government grants on specific services. The CPA process and the associated rating given to Council's by auditors governs funding decisions for specific services from Central Government.

Some Council's previously have found the CPA process very difficult to comprehend and frustrating as the audit commission inspectors have come across as having very limited knowledge and understanding of Council's business but still managed to rate the Councils. York of East Riding Council staff advised that on one occasion, Council staff walked out on Audit Commission inspectors during a routine visit.

Council's are also subjected to a fee for every inspection carried out by audit commission inspectors. This means that Council's rated as "weak" or "poor" would be subject to higher costs in comparison to Councils rated as "fair", "good" and "excellent".

Further information in relation to the CPA process in England can be sourced through the Audit Commission website, <http://www.audit-commission.gov.uk>.

4.2 Community Safety

The following issues concerning community safety and crime prevention were discussed with Coventry City Council.

- Crime and Disorder (topics covered include burglary, vehicle crime, robbery, violent crime, anti-social behaviour and youth offending); and
- Drugs (topics covered include treatment, young people, availability and communities).

Coventry CC has been granted significant funding in recent years (in the order of 2.5 Million pound) from Central Government to implement strategies and crime prevention measures in city crime "hot spots". Council works in partnership with local police to assist in the process.

Target levels, which were set in line with Police figures from previous years, were achieved in the first 12 months the strategies were put in place, thus indicating the positive effect of some of Council's efforts. By achieving the set target levels, Council put themselves in a reasonable position to receive further government grants / funding for crime and prevention measures and strategies for future years.

Council anticipates that achieving of set targets in future years will become more difficult, therefore it is imperative that crime prevention strategies and measures are periodically reviewed and new systems put in place.

Examples of some of the strategies put in place by the Council and Police to control Burglary in Coventry include:

- the provision of window locks (free of charge) to the public;
- police sending post cards to repeat offenders to make them aware of their presence and their history of crime;
- availability of benefits in the way of cheaper home insurance (by insurers) in neighbourhood watch areas;
- distribution of crime related material to the community promoting crime awareness; and
- barricading off areas behind houses (ally ways etc) suited to burglary by constructing large fences with locked gates.

A strategy implemented by Council and the police to reduce vehicle related crime, specifically to assist in identifying untaxed vehicles and unlicensed driving, involved the use of closed circuit television (CCTV) facilities and linkages to a national database. Vehicles can be identified as they pass certain checkpoints (that are facilitated with CCTV systems) and are pulled over for closer investigation and necessary action. This strategy was promoted worldwide.

Another strategy referred to as “Operation Cubit” (a joint operation with the Driver Vehicle Licensing Agency) was put in place to mitigate concerns with abandoned vehicles and public unsightliness. This ongoing strategy empowers Police to impound abandoned vehicles and squash them if taxes are not paid within a certain date. Squashing is performed in public to promote awareness amongst the community to discourage vehicle abandonment.

Violent crime in Coventry is another significant concern to Coventry City Council. Measures such as the use of role models are implemented to reduce “hate crime” (eg racial prejudice) and domestic violence. Alcohol related violent crime is controlled via placing security staff on buses and at taxi ranks during peak holiday periods such as Christmas and New Years.

Discussions with Council staff members revealed that there was significant effort and control measures put in place to control crime in Coventry. Recent statistics indicate that efforts are paying off in most areas however, there is still significant opportunity for Council to improve. Council plans to focus efforts in future years to reduce commercial burglary and repeat victimisation.

4.3 Partnering in Hertfordshire

Hertfordshire Highways, a partially privatised arm of the Hertfordshire County Council assumes the role of managing the highway assets owned and operated by the Hertfordshire County Council.

Hertfordshire Highways comprises staff from the Hertfordshire County Council (referred to as the “client”), UK based consultants, Mouchel and contractors, Amey Lafarge. Opus International consultants provide specialist advice on an as required basis to the consortium.

This relatively new concept of a 3 way partnership was developed to provide a more responsive service to the public, create opportunity for cost savings, ownership of works by the client and contracting parties and the production of higher quality assets. Whilst there have been some difficulties, the overall influence of the partnering process has been positive for the Hertfordshire County Council.

The responsibility of the 3 entities are well defined. Consultants Mouchel, comprising of about 300 staff, form the “design arm” of the Hertfordshire Highways Group and Amey Lafarge are predominantly the contractors for any capital works, maintenance etc.

Hertfordshire County Council employ about 150 staff within the Hertfordshire Highways group. The responsibility of the County Council is predominantly administration works, service monitoring, coordination of the organisation.

The group deliver services to a budget of about £50M per year.

Whilst the three organisations are separate entities and have defined responsibilities, to the public they are branded as one organisation, Hertfordshire Highways. The community doesn’t disseminate between the separate organisations.

Further information on the partnering process can be obtained via the Hertfordshire website - www.hertsdirect.org.uk.

The positive steps taken by the Hertfordshire Highways and the County Council in managing their highway assets contributed towards them receiving an “excellent” rating by auditors of the CPA process and the highest ranking by a local authority in the UK.

5. Water Supply and Wastewater Issues

5.1 Demand Management

Demand Management is not of high importance to most Authorities in the UK. Comments received from the Council's in response to implementing demand management practices in their local area, was they were more concerned about having to deal with "too much" water rather than not enough.

Demand management in the UK focuses more on implementing management practices and measures in an effort to delay infrastructure upgrading and reduce loading on sewer systems rather than saving water resources.

Demand management issues such as recycling of wastewater, installation of water meters, "pay for use" rating policies, and implementation of water saving devices and measures are also not considered of high importance. York of East Riding Council staff advised that less than 50% of properties in East Riding are metered.

Perth and Kinross Council in Scotland appeared surprised when advised about the extensive application of recycled waste water in Australia, in particular the price that some irrigators in Australia were prepared to pay for recycled waste water and the extensive amount of infrastructure put in place for effluent reuse schemes in Australia.

In regards to consumption metering, UK Council's generally allow customers to choose their own rating method for their water consumption. For instance, customers can opt to have their water consumption metered and charged via a "pay for use" rating system or alternatively opt for a fixed charging system. Most properties for which a fixed charging system was applied were not metered.

One issue of contention that was reported on National UK television during the tour, was the requirement for Thames Water to renew existing water supply infrastructure. Some authorities estimate that about one third of Britain's total reticulated water supply is lost through leaking mains and other distribution infrastructure.

Charges to customers were expected to increase by up to 70% to account for the significant expense to replace water mains etc. It was reported that the significant increase in charges would impact heavily on low socio-economic areas. Thames Water was also in the process of reviewing their charging system to customers to enable funding of asset depreciation and other previously unrecovered costs.

Environment Agencies in the UK has developed a newsletter called "The Demand Management Bulletin" which is aimed at Local Authorities and Water Service Providers and the community.

The newsletter promotes the benefits of saving water, the use of water efficient plants, irrigation practices and various demand management practices adopted in other countries. Demand Management in Australia was discussed at length in the newsletter.

Environment Agencies anticipate that once the benefits of demand management are realised (eg. long-term cost savings in infrastructure upgrading), UK Council's will become more diligent in implementing measures to reduce consumption.

5.2 Inflow and Infiltration

Inflow and Infiltration into sewer systems in the UK is a major concern and many sewer networks have been designed specifically to accommodate significant sewer flow increases during wet weather.

Combined sewer and stormwater systems are also prevalent in the UK, which compounds the problems associated with inflow during wet weather.

Whilst some local authorities and regulatory bodies have taken steps to separate stormwater and sewerage systems (ie via the introduction of policies and regulations for new and existing developments), it is suspected that many cross connections will remain in place for many years to come. This is mainly due to the age of systems and the lack of information on the location of existing underground pipes and infrastructure.

In addition, the deteriorating condition of pipes is also contributing to exfiltration and subsequent pollution of streams and waterways. This is an area that the Environment Agencies in the UK are targeting by making Council's renew existing assets and setting new effluent quality standards for wastewater discharge to the environment.

Based on discussions with Perth and Kinross Council, it appears as though inflow infiltration conditions in UK sewer networks are significantly higher in comparison to conditions experienced in Australian cities and towns. The comparatively higher rainfall is also a major factor in this difference.

There appears to be no simple immediate solution to resolving the issues concerning inflow, infiltration and also exfiltration from sewers other than to design sewer systems to accommodate significantly higher inflows and to replace deteriorated mains.

Rectification of concerns with existing inflow / infiltration is considered to be cost prohibitive in the short term.

6. Water Quality Management and Flooding

6.1 Water Quality Management

Flooding and associated stormwater management issues are of high priority to Local Authorities and the Environment Agencies in the UK.

Coventry City and York of East Riding Council's provided insight into flooding problems experienced across the UK. Staff at Coventry City Council commented that continued urban development was considered to be one of the major causes of flooding problems and pollution (ie due to runoff of pollutants accumulated on road surfaces etc following heavy rainfall).

Based on literature, a significant amount of the streams and waterways in the UK are being polluted as a result of poor treatment methods / systems (or lack of) implemented at stormwater outlets and at sewage treatment plant discharge locations. Runoff from agricultural and farming areas (such as piggeries) is also a major concern. The Environment Agencies are developing strategies to reduce pollution by applying stringent regulations and conditions on the quality of stormwater runoff and sewage effluent being discharged to waterways.

Most Council's advised that some treatment is provided prior to discharge of stormwater and sewage to streams and waterways. Perth and Kinross Council commented that only primary treatment of raw sewage is provided prior to discharge in some places throughout Scotland.

Stormwater is treated using reed beds and first flush containment ponds. Some of the treatment systems put in place by Council's are illustrated in the photographs (ref **Appendix C**). Most systems have little effect in reducing pollutant runoff during major flood events.

6.2 Flood Mitigation Strategies

As mentioned previously, flooding is considered to be a high priority issue to many Councils in the UK. Funding is granted to local authorities annually to mitigate concerns with flooding. Money is mainly spent on flood mitigation strategies as well as infrastructure to reduce flooding concerns in developed areas.

Coventry City Council has formulated a policy aimed at limiting the maximum discharge from a single stormwater outlet from new developments. This policy is having a positive effect in minimising impacts caused by flooding.

Literature provided by the Coventry City Council contained information on a range of flood mitigation systems and techniques aimed at reducing flooding impacts caused by runoff from urban areas. These systems are also aimed at reducing pollution of receiving waterways.

These systems referred to as Sustainable Urban Drainage Systems (SUDS).

Some of the SUDS being employed throughout the UK include:

- Infiltration trenches
- Infiltration basins
- Filter drains
- Filter strips; and
- Detention basins, retention ponds and wetlands (similar to the systems commonly employed in Australia)

The photographs (ref **Appendix C**) contained in this section of the report illustrate some of the techniques and systems currently being employed.

Further information on the use of SUDS can be obtained through the UK based government agencies Scottish Environment Protection Agency (SEPA), the Environment Protection Agency for England and Wales and the Environment and Heritage Service (website – <http://www.sepa.org.uk>).

7. Infrastructure Asset Management (Highway Assets)

Hertfordshire Highways has adopted the New Zealand and Australian based asset management framework to develop a comprehensive and powerful asset management approach and system to assist in management of the County Council highway assets. The approach has been based on the IPWEA's International Infrastructure Maintenance Manual. The system was designed and developed by Engineering consultants, Opus International (based in New Zealand).

The aim of the asset management approach by Hertfordshire Highways is to *“provide the desired level of service in the most cost effective manner through acquisition, maintenance, operation, rehabilitation and disposal of assets to provide for the present and future owners of the asset”*.

Included in the range of assets managed by Hertfordshire Highways is:

- 4678km of roads with associated verges and drains;
- over 5300km of footpaths and cycleways;
- over 102,000 streetlights;
- 470 traffic signal sets including over 300 pedestrian crossings;
- over 118,900 road signs;
- over 1,000 bridges and other structures; and
- 4 winter maintenance depots and 61 spreader vehicles.

The replacement value of assets is estimated to be in excess of £3 billion (excluding land costs).

Like most asset management systems, the development process consumed considerable time and resulted in significant expenditure by the County Council. Opus International consultants advised that the information collection exercise alone for the asset management system resulted in expenditure of more than £100,000 (approximately AU\$250,000). Despite the expenditure and significant effort in developing the system, the outcome of the process has resulted in an extremely effective tool in managing Hertfordshire's highway assets.

Assets within the system are interfaced by the user via a computer database known as “HERMIS”. The system incorporates in-built asset value decay models developed by experienced asset management engineers that reasonably reflect the actual depreciation levels of various highway assets over their serviceable life.

Further information concerning the partnering process adopted by Hertfordshire Highways can be sought from the Hertfordshire County Council website (www.hertsdirect.org.uk).



Information on the Asset Management System developed by Opus International can be obtained through their New Zealand based website (www.opus.co.nz) or the Hertfordshire County Council website. The executive summary of the Asset Management Plan developed by Hertfordshire Highways is provided on the CD Rom in Appendix B.

The complete Asset Management Plan developed by Hertfordshire Highways is available at a cost of £500.

8. Conclusion

The 2003 National Study Tour to the UK provided a great opportunity for participants to gain an insight into the way UK Local Government Authorities conduct their businesses to deliver services to their customers. The approach to service delivery in the UK is somewhat different to the approach adopted by Australian Local Government Authorities. Whilst some deficiencies exist, many techniques and methods adopted by local authorities in the UK are considered superior in comparison to Local Government in Australia.

One of the main benefits offered through National Study Tours of this nature is the opportunity to introduce new and innovative ideas to Local Government in Australian states as well learning about the approaches that haven't resulted in a great success.

The study grant of provided by the Queensland Foundation of the IPWEA to fund this opportunity is considered to be a significant step towards enhancing Public Works and Local Government organisations in Queensland. The tour was also significant benefit to the personal and professional development of study tour participants.

The tour was a tremendous success and is highly recommended to any interested members of the IPWEAQ.

9. Acknowledgments

The 2003 National Study tour to the UK was a great success. This compliment extends to the tour group and in particular, the National IPWEA CEO, Chris Champion who made the two weeks in the UK a very enjoyable and knowledge gaining experience.

Chris's efforts in managing and coordinating the tour are very much appreciated.

A thankyou goes to the staff of Councils in the UK who donated their valuable time to meet with the tour group and discuss their local government experiences.

Acknowledgment also goes to the IPWEA Queensland foundation for making this overseas opportunity possible to its members. The IPWEA stands out amongst the vast range of affiliations that currently exist in the Public Works Engineering and Local Government profession and further opportunities of this nature will only enhance their already strong position and reputation.

A personal thankyou goes to the IPWEA Queensland Foundation.

Appendix A Oxfordshire County Council Management Structure



Appendix B Study Tour Information CD Rom

Appendix C Flooding and Water Quality Management

Photo 1 Sustainable Urban Drainage Systems

UK manufactured porous blocks, being laid on a bed of ground and crushed stone.

Porus surfaces are particularly appropriate for lightly contaminated runoff, close to the source.

The underlying materials provide a useful storage volume for peak storm events, for new or existing developments.



Photo 2 Sustainable Urban Drainage Systems

Car parks with impervious surfaces are a common feature in the urban environment.

Porous paving can be used to reduce the impact car parks on flooding and water quality, without compromising the car parks utility.

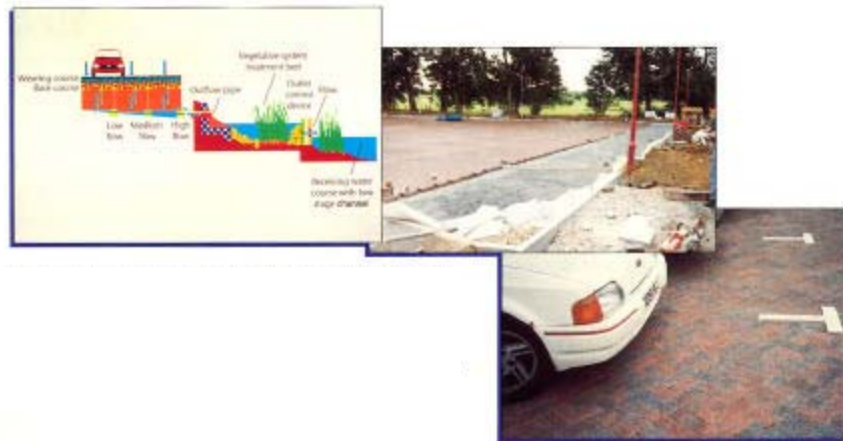


Photo 3 Sustainable Urban Drainage Systems

Here the parking area at a motorway service has been built with a porous blocks for the parking bays. The rainfall from the tarmac access roads runs onto these bays



Photo 4 Sustainable Urban Drainage Systems

Swale on A8000 near Edinburgh.

No kerbs or gullies are required.



Photo 5 Sustainable Urban Drainage Systems

This picture shows a filter strip that has been integrated into the pond design.

The gravel filter strip provides a rooting medium for plants between the two sections of the pond. This pond serves an industrial estate in Livingstone.



Photo 6 Sustainable Urban Drainage Systems

This large detention area provides attenuation and flow control for a retail park near Dunfermline.



Photo 7 Sustainable Urban Drainage Systems

Stenton ponds in Glenrothes acts as both a flood control system and a water treatment pond.



Photo 8 Sustainable Urban Drainage Systems

This wetland serves an industrial estate in Livingston.

In addition to providing a water treatment facility, it also provides wildlife interest.



Photo 9 Sustainable Urban Drainage Systems

Water features can be incorporated into both rural and urban settings to improve amenity value.

Roof water from the site flows to this attractive water feature at the Wheatley Service Area on the M40.



Photo 10 Sustainable Urban Drainage Systems

This newly constructed pond forms part of the treatment system for a major site in Southern England, which will provide a haven for local wildlife as the plants become established.



Photo 11 Water Quality Management

The Salmon Brook in London is an example of an urban watercourse affected by urban drainage.



Photo 12 Water Quality Management

Too many urban rivers are both culverted and polluted by surface water discharges.

This reduces water quality and biodiversity in our urban areas.

