EXECUTIVE SUMMARY

Background

The Greater Dublin Strategic Drainage Study (GDSDS) requires the recommendation of policies for the future provision and management of drainage services in the region. These drainage policies are to assist Local authorities in complying with their legal responsibilities, their planning and development objectives and are to, in so far as practicable, conform to good international practice. A particular requirement from the Study is that Policies adopted across the region should facilitate a uniform and consistent approach to urban drainage infrastructure planning, design, construction and operation.

The drainage policies will also result in improved customer service. In the case of Inflow, Infiltration and Exfiltration, the policy should concentrate on minimising such flows, thus facilitating future development and reducing costs for providing, operating and maintaining collection, pumping and treatment facilities

This volume of the drainage policies is entitled “Inflow, Infiltration and Exfiltration” and is concerned with identification of similar approaches for the Local authorities to adopt to reduce, and maintain control of these flows, which are adversely affecting the sewerage and drainage systems of the region.

Inflow and Infiltration both cause increases in the legitimate flows in the sewerage system. Inflow is where surface waters enter the foul sewerage system directly, and Infiltration is where the increased flows are due to groundwater entering the foul system through faults in the pipework, manholes and chambers. Inflow and Infiltration cause reduced capacity for legitimate sewage flows, increased pressure on treatment capacity and encourage structural deterioration and damage. The most significant effect for the Dublin Region is that the capacity of the foul system and treatment facilities is compromised, resulting in restrictions in their ability to service new developments.

Exfiltration causes reduced flows in the foul system, due to leaks and outflows from faults and openings in the pipework, manholes and chambers. Exfiltration of foul flows results in contamination of the surrounding soils and possible pollution of groundwater.

Since both Infiltration and Exfiltration involve flows passing through physical defects in the sewerage fabric, they often occur together in conjunction with fluctuating groundwater levels. This continuing flow mechanism can result in erosion of surrounds and foundations to pipes and manholes. In serious cases failure of the asset or ground subsidence has resulted.

Since most exfiltration involves relatively modest flows leaving the system, it is much more difficult to identify than infiltration. However since exfiltration relies on the same defects in the sewerage fabric, it frequently occurs along with infiltration.

Policy Objectives

The approach requires application of Best Management Practices (BMPs) from international experience, so that the following objectives are achieved:

- The presence and causes of inflow, infiltration and exfiltration (I/I/E) in the region’s sewerage systems are recognised;
- I/I/E in the region’s sewerage systems will be identified and flow quantities estimated;
- Survey and reduction works will be carried out with optimum cost-benefit;
- Specifications and practices for sewerage construction will be imposed to minimise I/I/E;
- Asset management systems will be targeted to minimise I/I/E and its adverse effects on the operation of the sewerage system and the overall environment.

Current Situation in the Dublin Region

The Drainage Departments in the Dublin Region have long suspected that there are substantial quantities of inflow and infiltration in the sewerage systems of the Region. These suspicions have been confirmed by verification of the hydraulic models under the GDSDS. Existing approximate infiltration flows for the Ringsend WwTW catchments are:

Catchment	Infiltration Flows in l/s
Grand Canal System	615
City Centre/ Docklands	558
Dun Laoghaire	338
Rathmines & Pembroke High Level	500
Total Infiltration Flow	2011 l/s

The flow to full treatment at Ringsend WwTW is 11m3/s; 2011l/s comprises 18% of this flow. At a daily sewage discharge per household of 650 litres, 2011l/s corresponds to 267,300 households.

Significant increases in flows have been measured in both the 9B and 9C trunk sewers following storms, as can be seen from the flow monitor results contained in Appendix A. Such increases indicate that surface water runoff (up to 5 times DWF) is entering the separate Blanchardstown foul system, and up to 8 times DWF for the Lucan Clondalkin 9B system. These are the main sewers discharging to the Grand Canal Tunnel Sewer and Ringsend WwTW. There is widespread pollution of aquifers from sewage exfiltration to the groundwater.

The infiltration situation for all the GDSDS foul/combined catchments is demonstrated in the tables contained in Appendix B. The worst affected catchments are City Centre/Docklands and Dun Laoghaire West Pier East with infiltration exceeding 50% of DWF. The least affected catchments are North Dublin, Shanganagh and Bray. Most catchments have infiltration in the order of 30% to 40% of DWF.

Exfiltration is difficult to identify except where major pipe defects or breaks occur, allowing significant escapes of flow. No such instances were detected during the GDSDS. However we can be confident that exfiltration is occurring in tandem with infiltration.

The causes for this situation are typical of those affecting sewerage systems worldwide, and can be summarised as:

- Faults in the sewerage fabric, due to age of the assets, ground movement, surface loadings, inadequate designs, deterioration of materials and defects in construction;
- Operational faults, such as missing or damaged manhole covers, faulty flap valves, openings allowing inflow at high river and tidal levels;
- Illegal stormwater connections due to poor supervision of construction and local modifications to accommodate drainage of extensions, patios and driveways

Control of Inflow, Infiltration and Exfiltration

Most I/I/E occurs in relatively small quantities throughout the extent of the sewerage system, and is hence difficult, time-consuming and expensive to identify. For that reason a control policy based on reiterative reduction, based on homing-in from the general area to particular significant sources, is the most cost-effective approach.

The most cost-effective policy is to minimise I/I/E in the first place. This can best be done by strictly controlling the quality of new and renovated sewerage installations, and by ensuring that best quality materials and construction techniques are used, to provide a long-lasting leak-free system. Connections must also be correctly made, and private drains and abandoned sewers managed to minimise the risk of leakage. Rigorous checking by Council Inspectors will ensure that sewerage construction will achieve its maximum life with minimum defects.

Policy for Inflow Infiltration and Exfiltration

The policy principles are to:

- Adopt an Infiltration Reduction Procedure to reduce inflow, infiltration and exfiltration flows in the existing sewerage systems in the most cost-effective manner; the Local Authorities should conduct a pilot study into I/I/E reduction to establish the cost-effectiveness of such reduction programmes in the Dublin area.

- Adopt sewerage construction specifications and procedures to ensure that new and renovated sewerage systems avoid the defects which result in inflow, infiltration and exfiltration

Policy Acceptance and Implementation

Acceptance of the Policy across the region will require implementation at various levels, as follows:

Council Drainage Departments: carry out pilot area for I/I/E reduction to establish the cost-effectiveness of reduction programmes in the Dublin area; agreement to adopt the Infiltration Reduction Procedure, based on the results of the pilot area investigation, showing assessment and renovation requirements, and associated costs; agreement to carry out future maintenance of sewer system models to support the Infiltration Reduction Procedure.

Council Legal Departments: agreement to requirement that private lateral drains be surveyed and renovated as a condition of sale of premises;

Council Drainage Inspectorate: agreement to extension of construction inspections to include private drains;

Council Drainage Department and Inspectorate: agreement on setting up of programme of public education and local investigations to identify mis-connections of stormwater flows to the foul system;

Council Drainage Operations Department: correction of faulty flap valves, manhole covers and other openings potentially allowing inflow into the sewerage system;

Water Services Authorities: agreement to setting up and maintenance of register of water source boreholes, and liaison with Drainage Departments on borehole location and usage of yield with respect to the presence of sewerage systems;

Other Regional Policies being adopted from the GDSDS will support this Policy, as follows:

Environmental Management Policy: adoption of SuDS to minimise the risk of stormwater runoff being mis-directed to the foul system;

New Development Policy: changes to construction specifications and inspection procedures to improve quality and durability;

Regional Drainage GIS: collection, maintenance and presentation of information to support risk management for I/I/E and the Infiltration Reduction Procedure.