

Dublin City Centre catchment analysis - optimising a new drainage/sewerage scheme for a smarter greener Eco city

J.R. Earle*, A. Conway**, P. Baggeridge*** S.P Blacklocke****

*Water Framework Directive (WFD)-Eastern River Basin District (ERBD) Project Manager, Dublin City Council, 4th Floor, Marrowbone Lane, Dublin 8, Ireland rayearle@utvinternet.ie

**City Centre Sewerage Scheme (CCSS) Senior Engineer, Dublin City Council, Block 1, Floor 4, Civic Offices, Wood Quay, Dublin 8, Ireland adrian.conway@dublincity.ie

***City Centre Sewerage Scheme (CCSS) Project Manager, , Dublin City Council, Block 1, Floor 4, Civic Offices, Wood Quay, Dublin 8, Ireland paul.baggeridge@dublincity.ie

**** Independent Environmental/Economic Consultant and Hydrofor Project Manager, University College Dublin, Clonskeagh, Dublin 4 sean-blacklocke@sean-blacklocke.com

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Background

Dublin historically is a typical example of the traditional linear metabolism approach to urban water and wastewater management namely “clean water in, dirty water out” via high energy demanding and fast flowing hard engineering installations that were often bereft of any serious considerations for natural water systems and the assessment of alternatives to balance environmental, social and economic needs. This out-dated model has become increasingly unsustainable internationally with the emergence of high-density mega cities pushing the urban infrastructure and landscape to its limits in terms of both water quantity and water quality issues. Today in Dublin, water for beneficial uses, including drinking water, is increasingly becoming scarce while at the same time the risk of stormwater related flooding and coastal flooding is increasing reflecting the climate change phenomenon.

Existing System and Nature of the Challenges

The 3,500 hectares City Centre Catchment contains four rivers namely the Liffey (57 Combined Sewer Overflows (CSOs)), Camac (17 CSOs), Poddle (mainly culvert with 8 CSOs) and Tolka (7 CSOs). It is drained by 25,000 manholes, over 100 km of pipeline, 2 no. 19th century 1,200 mm trunk interceptor sewers to intercept flow from entering the main river Liffey and 1 no. 2,400 mm trunk main. There are 7 no. pumping stations and a main lifting pump to the single treatment works at Ringsend with construction of a long sea outfall underway as the existing wastewater treatment site is insufficient in size to upgrade treatment to meet nutrient effluent standards and land designations prevent expansion.

A recent study completed in 2005 found that, as a largely combined drainage system, its environmental performance in terms of spillages from CSOs was not compliant with the requirements then in place and the more onerous Water Framework Directive standards will have to be achieved by 2027. Other issues identified in the study included the likely passing forward to treatment of excessive volumes of surface water and infiltration and issues around hydraulic capacity and structural integrity of the drainage system.

The key project drivers are a) age of the catchment infrastructure – structural deficiencies, b) existing capacity issues – hydraulic deficiencies, c) development pressures in the catchment and critically d) the EU Environmental Directives and especially the Water Framework Directive which encompasses Urban Wastewater Treatment, Bathing Waters, Habitats, Drinking Water, Flooding and Priority Substances.

The EU Water Framework Directive and associated Legislation

The eight River Basin Management Plans (RBMPs) compiled in accordance with the Water Framework Directive (WFD) for the entire Island of Ireland identify that approximately 84% of all surface water bodies will need some form of remedial work

to reach Good Ecological Potential (GEP) or Good Ecological Status (GES) over the first six year cycle to 2015 or in subsequent cycles by 2021 or 2027. All eight RBMPs were adopted on 6th July 2010 including Ministerial Comment with subsequent publication and submission to the EU Commission. Dublin City Council also adopted the ERBD Plan with an extended deadline of 2027 to reach GES.

As implementation of the eight RBMPs gets underway in accordance with the established objectives and measures for each water body to reach GEP/GES under WFD by 2015, 2021 or 2027, the focus of water policy makers and regulators in Ireland, the UK and Europe is now turning towards the inextricably linked issues of flood risk management, energy conservation, water scarcity and in particular, climate change. The WFD is driven by ecology but requires the mitigation of floods and droughts whereas the FD is driven by considerations of Human Health, Economic Assets, Ecological Value and Cultural Heritage and requires coordination of implementation with the WFD

A New Vision for Dublin Water

Dublin now wishes to embrace all appropriate emerging technologies to support a smarter greener city and integrate all the planning, sociological, ecological and other disciplines to merge the new water paradigm with the equally important and emerging concepts relating to landscape, transportation, energy and other infrastructural requirements. In particular Dublin wishes to optimise ICT sensory and management applications and the leading edge urban water/wastewater concepts including a) the three “R’s” – reduce, reuse, recycle, b) cyclical metabolism for Conservation, c) a holistic paradigm reflecting Integrated Water Resource Management (IWRM), d) sustainable drainage systems (SuDS), e) water sensitive ecological planning, f) water centric sustainable communities, g) flood resilient cities and h) net zero carbon footprint.

The evaluation of a new City Centre Sewerage Scheme (CCSS) will address all of the above and will in addition consider opportunities arising for the restoration of urban streams, enhancement of pollution assimilative capacities, the use of stormwater as a resource and ultimately the integration of micro-scale components (e.g. green roofs and walls, riparian zone design, pervious pavements and water reclamation) to deliver a truly efficient, healthy, aesthetic and economically friendly Eco city for all.

Conclusions

A key issue therefore is how to assess the retrofitting and upgrading of existing infrastructure against newly planned and constructed options such as Deep Tunnel Systems or Predominantly Green Systems and how a combination of options might best suit Dublin City Centre. The paper will examine how to a) assess all existing information and identify gaps b) undertake efficient and effective surveys as required, c) develop robust, validated and reliable hydraulic and WQ models, d) detail the structural, hydraulic and environmental deficiencies and critically e) present detailed capital and running costs for a preferred option evaluated against all the Eco city criteria cited above.