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Transport Infrastructure Ireland

TII RESEARCH

RESEARCH PROJECT TITLE: DRAINAGE DESIGN FOR NATIONAL ROAD SCHEMES – SUSTAINABLE DRAINAGE OPTIONS

START DATE: October 2009

END DATE: February 2013

CONTRACTOR: Trinity College Dublin

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DESCRIPTION: This research project was developed to provide guidance on the use of sustainable drainage systems for national road schemes in Ireland. The content and structure is based on several site visits, examining drainage designs on national road schemes (both in construction and in operation). Consultation with design engineers and hydrologists was an essential element of the project. The key findings are outlined in relation to current design practice. Based on these findings, recommendations are developed to promote a more sustainable drainage design approach to suit the requirements of specific hydrological environments. The guidance is based on road projects, constructed with a Design and Build, and Public Private Partnership (PPP) approach but the guidance is also suited to projects designed by the employer.

OBJECTIVES:

- To review current practices of drainage design on national road schemes in Ireland
- To promote the use of sustainable designs, both for conveyance and storage (e.g. grassed channels, wetlands, etc.), so that these systems become the preferred option rather than the current conventional systems (e.g. kerb and gully, concrete channels, detention basins, etc.)
- To develop the most appropriate design, based on a risk assessment protocol, taking account of the risks to both surface waters and groundwaters



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- To present guidance on the design and use of the various sustainable drainage components such as grassed channels, swales, wetlands, attenuation ponds and combined filter drains. The necessary field and desktop surveys required to construct an appropriate design are described. A number of case studies are outlined, considering differing hydrological environments with different levels of sensitivity

BENEFITS: The research facilitates the development of efficient and cost-effective design options for road drainage systems, appropriate for the unique geological conditions encountered in Ireland.

RESEARCH FINDINGS:

- Road runoff contains pollutants such as suspended solids, heavy metals and hydrocarbons (e.g. polycyclic aromatic hydrocarbons (PAHs)). These pollutants represent a risk to both surface waters and groundwaters if the runoff does not undergo treatment. The pollutants are both in the sediment bound phase and soluble phase
- Vegetated systems represent the most effective method of achieving the treatment objectives
- The key factors that determine the concentration of pollutants in road runoff are traffic volumes and rainfall intensity
- The factors influencing the transport of contaminants from road runoff to groundwater are related to the nature of the pathways and include parameters such as the clay content and sorption characteristics of the soil, the thickness and permeability of the sub soil and the thickness of the unsaturated zone. It is also a function of the type of drainage design. A risk assessment procedure for determining the impacts of road runoff on groundwater and surface water is described in the guidance document



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