

Revision of the NRA's Drainage Standards

NRA National Roads Conference 2014



Revision of the NRA's Drainage Standards

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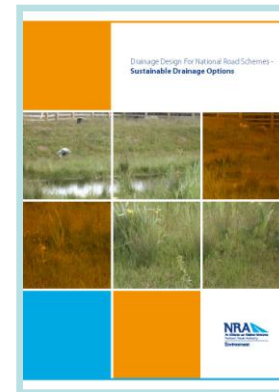
Revision of the NRA's Drainage Standards

Background

Background

April 2008 – September 2011: NRA Research Fellowship Programme

- NRA funded Post-Doctoral Research Fellowship to look at the impacts of national road drainage systems on surface and ground water.
- Result: NRA's drainage standards need to be expanded to promote the use of SuDS and to maximise the environmental benefits achieved from drainage systems.



Drainage Design for National Road Schemes – Sustainable Drainage Options (NRA, 2014).

'Analysis and development of road drainage systems for different geological environments in Ireland.' (Dr. William O'Keeffe/Paul Johnston/Dr. Vincent O'Malley)

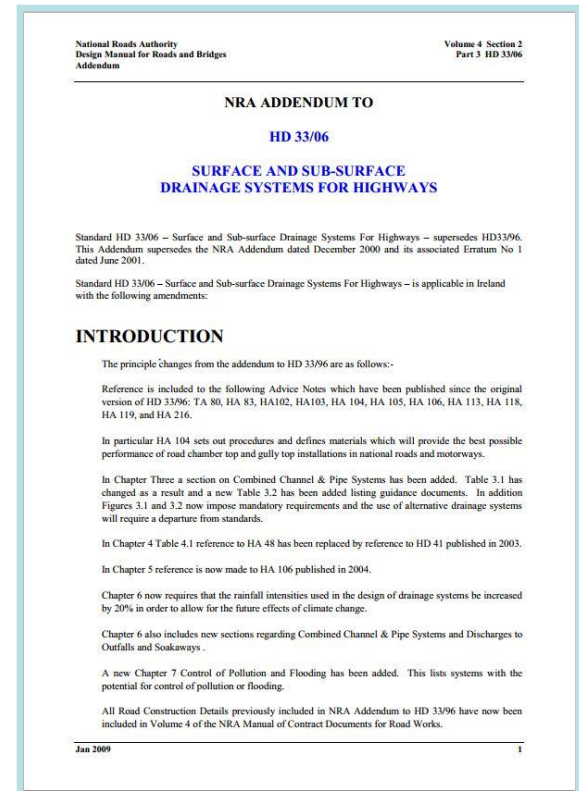
'Environmental impact of road drainage on ground water quality' (Dr. William O'Keeffe/Paul Johnston/Dr. Vincent O'Malley)

Revision of the NRA's Drainage Standards

Current NRA Drainage Standards

Current NRA Drainage Standards

- Volume 4 (Geotechnics and Drainage) and of NRA Design Manual for Roads and Bridges (NRA DMRB):
 - NRA Addendum to UK HD 33/06 *Sub-Surface Drainage Systems for Highways*.



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Current NRA Drainage Standards

Current NRA Drainage Standards

- NRA Manual of Contract Documents for Road Works (NRA MCDRW):
 - Volume 1: NRA Specification for Road Works – Series 500 – Drainage and Service Ducts;
 - Volume 2: Note for Guidance on the Specification of Road Works – NG Series 500 – Drainage and Service Ducts;
 - Volume 3: Method of Measurement for Road Works and Notes for Guidance on the Method of Measurement for Road Works; and,
 - Volume 4: Road Construction Details (RCDs).

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Future NRA Drainage Standards

Future NRA Drainage Standards

- Revised NRA Design Manual for Roads and Bridges (NRA DMRB)(1 amended and 13 new documents).
- Revised NRA Manual of Contract Documents for Roadworks (NRA MCDRW).



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Future NRA Drainage Standards

NRA Design Manual for Roads and Bridges ['DMRB']: Volume 4

Draft NRA HD 33/14 *Drainage Systems for National Roads* [Continued]

- Guidance on the selection of the types of drainage systems for national road projects.
- Use of grassed surface water channels permitted.
- Extended capping as a means of sub-surface drainage.
- Nearside linear drainage channels not permitted.
- 20m³ spillage containment capacity.



Nearside linear drainage channels.

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Future NRA Drainage Standards

NRA Design Manual for Roads and Bridges ['DMRB']: Volume 4

Draft NRA HD 33/14 *Drainage Systems for National Roads*

- Over-the-edge drainage permitted where embankment >1.5m.
- 'Encouragement' of combined filter drains in cuttings.
- Maximum length of carrier pipe between access chambers is 100m.
- 'No worsening' of flow rates up to and including the 1 in 100 year storm.



Combined filter drain on the
N5 Ballaghderreen Bypass.

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Future NRA Drainage Standards

NRA DMRB: Volume 4

Draft NRA HD 45/14 *Road Drainage and the Water Environment*

VULNERABILITY RATING	SOURCE PROTECTION AREA *		RESOURCE PROTECTION Aquifer Category					
			Regionally Important		Locally Important		Poor Aquifers	
	Inner (SI)	Outer (SO)	Rk	Rf/Rg	Lm/Lg	L1	Pl	Pu
Extreme (E)	R3 ¹	R3 ¹	R2 ²	R2 ²	R2 ¹	R2 ¹	R2 ¹	R2 ¹
High (H)	R2 ⁴	R2 ³	R2 ¹	R1	R1	R1	R1	R1
Moderate (M)	R2 ⁴	R2 ³	R1	R1	R1	R1	R1	R1
Low (L)	R2 ⁴	R1	R1	R1	R1	R1	R1	R1

Example of a Groundwater Protection Response Matrix: On-site Treatment Systems (GSI/EPA) .

- Guidance on the assessment and management of impacts on the water environment.
- *'SuDS should be considered in the first instance over conventional drainage systems.'*
- Adoption of the methods laid down in UK HD 45/09 for assessing:
 - impacts of routine runoff on surface waters.
 - pollution risks from accidental spillages.
- Reference to the OPW's website for information on assessing flood impacts.
- **Groundwater Protection Response: A 'brand new' risk assessment and management tool dealing with discharges of routine runoff to groundwater.**

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Future NRA Drainage Standards

NRA DMRB: Volume 4

Draft NRA HA 33/14 *Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control*

- Guidance on the design of:
 - earthworks drainage,
 - road network drainage,
 - attenuation, and
 - pollution control.
- Design process flowcharts & worked examples.



N21 Castleisland Bypass:
Example of an attenuation pond.

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Future NRA Drainage Standards

NRA DMRB: Volume 4

Draft NRA HD 119/14 *Grassed Surface Water Channels for Road Runoff*

- Information on the hydraulic and structural design of grassed surface water channel for road drainage.
- Lined GSWCs **not** permitted.
- More onerous requirements in relation to sub-soil in Series 500 of the Spec.
- May only be used in cuttings and in embankments < 1.5m in height.



M17 Gort to Crusheen:
Finished topsoil profile.



N22 Tralee Bypass:
Laying of Cl. 804 with adapted machinery.



N5
Ballaghaderreen
Bypass:
Outlet.



M17 Gort to Crusheen:
Lined GSWC construction.

N52 Carrickbridge to Clonfad:
Finished GSWC.



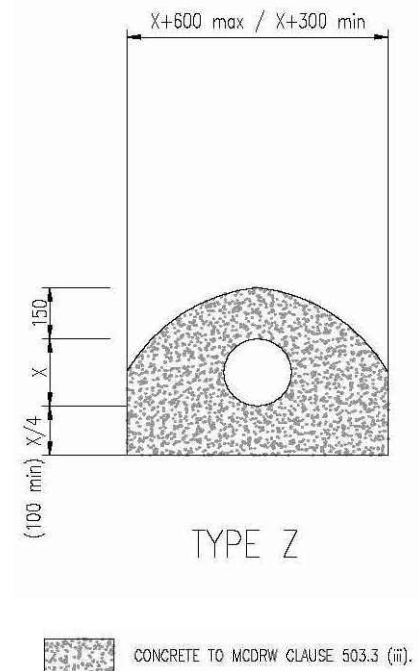
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NRA DMRB: Volume 4

Draft NRA HD 40/14 *Determination of Pipe and Bedding Combinations for Drainage Works*

- Description of the method of selecting suitable combinations of drainage pipes and bedding types to meet given loading requirements.
- UK HA 40 to be used *'except that all pipes under carriageway shall be encased in concrete.'* NRA Addendum to HD 33/06.
- *'Type Z is for use with any type of pipe for permanent protection against mechanical damage.'* Draft NRA HD 40/14.



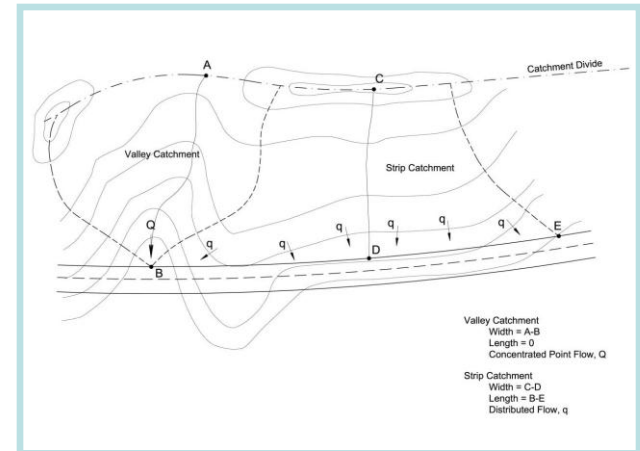
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Future NRA Drainage Standards

NRA DMRB: Volume 4

Draft NRA HD 106/14 *Drainage of Runoff from Natural Catchments*

- Design information aimed at minimising the flooding problems associated with runoff from road-adjacent catchments.
- Details methods for:
 - Estimating runoff from natural catchments; and,
 - Determining suitable earthworks drainage.



Extract from UK HA 106/04.

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Future NRA Drainage Standards

NRA DMRB: Volume 4

Draft NRA HD 107/14 *Design of Outfall and Culvert Details*

- Guidance on:
 - Detailing of outfall structures to road drainage systems; and,
 - Design of culverts including scour, but excluding hydraulic design.
- Matters regulated by Section 50 of the Arterial Drainage Act, 1945, are not covered in this standard.



Example of 'rock armour' headwall.



Watercourse culvert.

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Draft NRA HD 78/14 Design of Outfalls for Surface Water Channels

- Information on suitable outlet layouts for different types of surface water channels and provides methods for designing each type according to the flow rate in the channel.

Draft NRA HD 37/14 Hydraulic Design of Road-Edge Surface Water Channels

- Description of the method of determining the length of road between outlets that can be drained by a given size of surface water channel constructed along the edge of the road.

Draft NRA HD 102/14 Spacing of Road Gullies

- Design information for determining the length of road between gullies.



M3 Clonee to Kells:
Concrete surface water
channel and outlet.

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NRA DMRB: Volume 4

Draft NRA HD 103/14 Vegetated Drainage Systems for Road Runoff

- Guidance on how vegetated drainage systems may be used to convey, store and treat road runoff.

Draft NRA HD 118/14 Design of Soakaways

- Guidance on how soakaways shall be incorporated into systems used to treat and store runoff prior to discharging to ground.

Draft NRA HD 83/14 Safety Aspects of Road Edge Drainage Features

- Guidance on safety aspects of road edge drainage features.



M18 Gort to Crusheen:
Constructed wetland.



M18 Gort to Crusheen:
Hybrid Wetland with sediment
forebay.

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NRA DMRB: Volume 4

Draft NRA HD 39/14 *Edge of Pavement Details*

- Guidance on the use of the various types of edge pavement details.

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Future NRA Drainage Standards

- Draft NRA Manual of Contract Documents for Road Works (NRA MCDRW):
 - Draft Volume 1: NRA Specification for Road Works – Series 500 – Drainage and Service Ducts
 - Improved layout, organisation and cross-referencing;
 - Inclusion of lightweight aggregate as bedding and filter material.
 - Specification for:
 - geosynthetic clay liners and impermeable membranes.
 - petrol interceptors.
 - rock armour.



'Rock armour' training works.



Use of Geosynthetic clay liners on M17 Gort to Crusheen.



Petrol/Oil interceptor on M6 Galway to Ballinasloe.

Revision of the NRA's Drainage Standards

Future NRA Drainage Standards

- NRA Manual of Contract Documents for Road Works (NRA MCDRW):
 - Draft Volume 2: Note for Guidance on the Specification of Road Works – NG Series 500 – Drainage and Service Ducts
 - Draft Volume 3: Method of Measurement for Road Works and Notes for Guidance on the Method of Measurement for Road Works

Revision of the NRA's Drainage Standards

Future NRA Drainage Standards

- NRA MCDRW:
 - Draft Volume 4: Road Construction Details (RCDs)
 - Complete revision, e.g. cross-referencing, and multiple amendments.
 - New RCDs illustrating 'Road Drainage Typical Sections,' e.g. for grassed surface water channels.
 - New RCD illustrating 'rock armour scour protection.'



N22 Tralee Bypass:
Grassed Surface Water Channel.

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Future NRA Drainage Standards

- Draft Volume 4: Road Construction Details (RCDs)
 - Significant revisions to RCDs for 'Access Chambers,' including:
 - Reductions in plan areas;
 - Removal of steps, handholds and ladders to encourage:
 - working from surface; and,
 - entry in accordance with health and safety legislation, e.g. accompanied manhole entry *via* tripod and winch.
 - Concrete apron added around covers to prevent damage to landscape machinery during maintenance.



M3 Clonee to Kells:
Manhole.

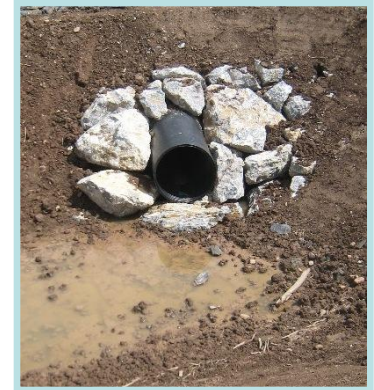
Accompanied
manhole entry
with tripod and
winch.



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Future NRA Drainage Standards

- Draft Volume 4: Road Construction Details (RCDs)
 - RCD/500/19, 20 & 21 to be replaced by new RCD/500/53;
 - Reinforced Concrete (insitu or pre-cast) headwalls now required;
 - Rendered concrete blockwork headwalls (pipes <300mm) only exception; and,
 - Rock armour/gabions headwalls prohibited.



'Rock armour' headwall.



Reinforced concrete headwall with gabion training works.

Revision of the NRA's Drainage Standards

Conclusion

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- Future NRA's Drainage Standards.

Revision of the NRA's Drainage Standards

List of Stakeholders

Technical Committee

- **Albert Daly** NRA
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- David Morgan TCD
- **Declan Bowles** Arup
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- **Gavin O'Donnell** Arup
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Arup

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Contact Details for Comments

Any comments?

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