

VDOT DRAINAGE MANUAL REVISIONS JULY 2016

Explanations:

“DDM” is an abbreviation for Drainage Design Memoranda

Numbers in parentheses pertain to the chapter and section number of that data, for example:

(3.4.2); “3” is for Chapter 3, “4” is for Section 4 of Chapter 3, and “2” is for Subsection 2 of Section 4

Chapter 1

- No Major Changes

Appendix 1

- 1A-1 – Addition of abbreviations and definitions from other chapters
- 1A-2 – Addition of symbology from other chapters

Chapter 2

- No Major Changes

Appendix 2

- 2A-1 - Deleted

Chapter 3

- Added Section 3.3.3 to detail hydraulics milestone deliverables
- Revised typical drainage description nomenclature for stormsewer pipe and culverts
- Revised pipe descriptions to add pipe types and joint types based on IIM-254 guidance
- Section 3.3.4.6.3 – Revised “Jacked Pipe” to “Trenchless Applications”

Appendix 3

- Removed 3A-1 content and added Drainage Summary Example
- Added 3A-2, 3A-3, 3A-4, and 3A-5 – Examples for Milestone deliverables

Chapter 4

- No Major Changes

Appendix 4

- 4A-1 - Deleted

Chapter 5

- Added and revised Appendices listing

VDOT DRAINAGE MANUAL REVISIONS JULY 2016

- Moved IIM-228 into various sections depending on if they were pertaining to survey of sinkholes (Section 5.4.3.13) or to reporting/design considerations of sinkholes (Section 5.5.2.1)

Appendix 5

- 5A-1 – Revised to be EQ-120 Form for Sinkholes
- 5B-1 – Incorporated Old LD-439 “Drainage Information Sheet” and deleted standard form.

Chapter 6

- Section 6.4.4.4 Replace 1994 USGS Rural Regression Equations and discussion with USGS 2011 Regression Equations
- Revised Figure 6-3 with Peak – Flow Regions 2005 Map vs. 1938 Map
- Section 6.4.4.5 Replace 1983 USGS Urban Regression Procedure and discussion with the USGS 2014 Urban Regression Equations
- Section 6.4.4.6 Simplify text and remove unneeded discussion. Update example.
- General Remove detailed examples for application of equations and processes.
- Section 6.4.1.1 Replaced reference to AASHTO Drainage Manual for travel time in lakes or reservoirs, since it had been removed, or does not exist. Replaced with reference to National Engineering Handbook, Chapter 15, Part 630.

Appendix 6

- 6A-1 – Deleted
- 6A-2 – Deleted
- 6C-2 – Removed County/City Designations and replaced with respective NOAA Atlas 14 data stations. Added the 1-yr storm events, and replaced all B,D&E values for the 2, 5, 10, 25, and 100-yr storm events based on the new data sets received from NOAA Atlas 14
- Renamed 11C-2 to 6B-1
- Renamed 11C-3 to 6B-2
- Renamed 11H-1 to 6K-1
- Renamed 11H-2 to 6K-2

Chapter 7

- Added Contents from IIM-LD-233 into Chapter 7, Sections 7.3.5, 7.5.4.3, 7.5.4.4, and 7.5.4.5
- Added policy item to Section 7.2.3 to remove any notations to “Grade To Drain” on the Plans
- Section 7.4.6, added definition of Rolled Erosion Control Product (RECP)
- Added recommendation for designer to use Tractive Force Method for ditch lining analysis, Section 7.4.6.1
- Expanded on Tractive Force Method, Section 7.4.6.2
- Added Section 7.4.6.1.1, Shear Stress in Bends
- Added new VDOT criteria on Geotextile Linings, Section 7.4.6.3

VDOT DRAINAGE MANUAL REVISIONS JULY 2016

- Added “Maximum Allowable Shear Stress” column to Table 7-1
- Added and Revised Ditch Lining Types in Table 7-1
- Notated that flumes shall not be lined with riprap in Section 7.4.6.3.2
- Added design procedures for Ditch Linings using the Tractive Force Method, Section 7.5.2.2
- Revised Figures 7-9 and 7-10 to comply with Tractive Force Method

Appendix 7

- 7A-1 – Deleted
- 7A-2 – Deleted
- 7B-1 – Revised LD-268 into two separate tables; one (1) for Permissible Velocity (LD-268V) and one (1) for Permissible Shear (LD-268S)
- Replaced Appendix 7E-01 for clarity
- Add Appendix 7B-06 with Natural Channel Design Project Summary Sheet

Chapter 8

- Section 8.3.1.7 – Changed terminology from “Foundation” to “Subsurface” to comply with Materials Division MOI
- Section 8.3.6.7 – Removed Methods definitions and made all-inclusive to pipe rehabilitation when pipe is not replaced
- Section 8.3.6.11 – Removed “Jacking Pipe” reference and added J&B, Microtunneling and Pipe Jacking as all acceptable methods for Trenchless Applications

Appendix 8

- 8A-1 – Deleted
- 8A-2 – Deleted
- Revised 8B-1 to revise the outdated LD-269 form

Chapter 9

- Section 9.4.8.3 – Limits added to location of Sag Inlets
- Section 9.4.8.4 – Additional criteria for minimum cover over pipes to comply with the standard
- Section 9.4.8.10 – Changed “Jacking Pipe” to “Trenchless Applications” to be consistent with Chapter 8 and with Materials Division MOI
- Section 9.5.2.3 – Design procedures inserted for Temporary Barrier Wall
- Revised Figures 9B-2 and 9B-3

Appendix 9

- 9A-1 – Deleted
- 9A-2 – Deleted
- Revised 9B-1, 9B-2 and 9B-3 in order to update the outdated LD-204, 229, and 347, respectively

VDOT DRAINAGE MANUAL REVISIONS JULY 2016

Chapter 10

- Added Contents from IIM-LD-11.28 into Chapter 10, Sections 10.2.2, 10.2.2.1, 10.2.2.2, 10.2.2.3, 10.3.1.1, 10.3.1.2, 10.3.1.8, 10.3.1.9, 10.3.1.10, and 10.3.1.11, and Chapter 1, Appendix 1A-01
- Added Contents from IIM-LD-246.3 into Chapter 1, Appendix 1A-01, and Chapter 10, Sections 10.3.1.3, 10.3.1.4, 10.3.1.5, 10.3.1.6, 10.3.1.7, and 10.3.1.11

Appendix 10

- 10B-1 – Added Section 10.1.16 for Slope Interrupter Devices

Chapter 11

- Global revisions
 - Eliminated references to “Regulatory Crosswalk” for the transfer of ESC and SWM programs from DCR to DEQ
 - Updated statutory and regulatory code references to reflect transfer of programs from DCR to DEQ
 - Updated URLs to reflect movement of program from DCR to DEQ
 - Abbreviation for “yr” used for word “year” throughout
- Section 11.1
 - Minor grammatical revisions and introduction of acronym “SWM” for word “stormwater management” used throughout Chapter 11
 - Minor formatting changes for unnumbered sub-sections for consistency
 - Deletion of previous revision date footnote to reflect new document
- Section 11.2
 - Renamed Sect. 11.2.1 from “General” to “Introduction”
 - Updated official name of revised VSMP Regulation
 - Updated URLs for VSMP Regulation and VESC Regulations to reflect movement of program from DCR to DEQ
- Section 11.3 added to include information for Part II.B SWM criteria from the VSMP Regulation and guidance provided by DEQ
- New Sections 11.4 and 11.5 added to address Part II.B SWM criteria from the VSMP Regulation and guidance provided by DEQ
- Previous Sections 11.3 to 11.6 renumbered to New Sections 11.6 to 11.9
- Section 11.6
 - Updated Section 11.6.1 to reflect application Performance-based Water Quality computations (still reflected the Technology-based approach only)
 - Removed references to IIM-LD-195 when the referenced items had been incorporated into the VDM
 - Added language on the special design of water quality orifices for extended detention facilities (where required orifice diameter < 3”)
 - Table 11-7

VDOT DRAINAGE MANUAL REVISIONS JULY 2016

- Added minimum treatment volume required for BMPs that did not include it in prior table
- Distinguished between bioretention/biofilter basins with 1xWQV and a Removal Efficiency of 50% vs. 2xWQV and a Removal Efficiency of 65%
- Added/updated names and Removal Efficiencies for Manufactured Treatment Devices (MTDs)
- Removed outdated footnote directing designer to only include new impervious area in the calculation of “Percent Impervious Cover” for the Technology-based water quality criteria
- Added note that the Flooding Criteria did not apply to linear development projects except in accordance with a watershed or regional SWM plan
- Added General Criteria from the Part II.C that were not included
- Removed “Part II.C” from sub-section headers as the entire section refers to Part II.C (redundant)
- Removed Section 11.3.4 on Exemptions from Part II.C criteria (outdated and discussed other sections and documents)
- Updated requirements for embankment investigation and design
- Added notes for SWM impounding structures located in FEMA floodplain
- Added prohibition for SWM facilities in sinkholes
- Added note regarding construction of SWM facilities within 5 miles of airport
- Moved section of fencing of SWM facilities
- Removed notes on special provisions and potential problems for different SWM facilities (now addressed through the VDOT BMP Design Manual of Practice)
- Section 11.7
 - Added language on application of offsite water quality compliance to part II.C projects (not previously addressed before amended VSMP Regulation)
 - Updated references to specifications for gaskets and leak resistant joints on culverts through dams
- Section 11.8
 - Removed references to “New” impervious area for calculation of WQV for BMP design (now requires WQV for all impervious areas draining to the BMP that are not diverted around the facility to prevent hydraulic overloading of the facility)
 - Updated references to rainfall data to include NOAA Atlas 14
- Section 11.9
 - Added following references:
 - Center for Watershed Protection, Virginia Runoff Reduction Method: Instructions & Documentation, March 28, 2011
 - Department of Conservation and Recreation, Technical Bulletin #6: Minimum Standard 3.11C Filterra Bioretention Filter System, Revised 11/01/02

VDOT DRAINAGE MANUAL REVISIONS JULY 2016

- Department of Environmental Quality, Guidance Memo No. 16-2001 - Updated Virginia Runoff Reduction Method Compliance Spreadsheets - Version 3.0, May 2016
- Updated misspelled names in other references

Chapter 11 - List of Tables

- New Tables 11-1 to 11-6 added to include Part II.B SWM criteria from the VSMP Regulation and guidance provided by DEQ
- Previous Tables 11-1 to 11-9 renumbered to Tables 11-7 to 11-15, respectively, for insertion of new Tables 11-1 and 11-6

Chapter 11 - List of Figures

- New Figures 11-1 to 11-6 added to include Part II.B SWM criteria from the VSMP Regulation and guidance provided by DEQ
- Previous Figures 11-1 to 11-9 renumbered to Figures 11-7 to 11-15, respectively, for insertion of new Figures 11-1 and 11-6

Appendix 11

- Removed 11A-1 content and added BMP Design Manual Part IIC standards
- Removed 11A-2 content and added BMP Design Part IIB standards
- App 11C-3; Revised all rainfall totals based on 2016 NOAA Atlas Data Release; Removed Arlington Station, Removed Greene County (Zone 2), Removed Rockbridge (Zone 2), Added 500 year storm
- Removed 11B-1, replaced with old 11D-1
- Removed 11C-1, replaced with old 11E-1
- Renamed 11C-2 to 6B-1
- Renamed 11C-3 to 6B-2
- Renamed 11D-1 to 11B-1
- Renamed 11E-1 to 11C-1
- Removed 11G-1, 11G-2 and 11G-3
- Renamed 11H-1 to 6K-1
- Renamed 11H-2 to 6K-2

Chapter 12

- Page 4 Section 12.2.4.1 Define design storm to be consistent with Chapter 6. Section 12.2.4.2 Clarify language with regard to the 1' freeboard event as needed by S&B. Section 12.2.4.5 Modify language on scour to allow lesser design storm if requested by S&B.
- Page 6 Section 12.3.4 Revise Section to expand upon HERS discussion and include Engineering Assessment of No Adverse Impact.

VDOT DRAINAGE MANUAL REVISIONS JULY 2016

- Page 9 Section 12.4.3 Revise FEMA Discussion to require documented comparison of hydrologic analysis results. Reference to OHW Removed. Section 12.4.4 Expand discussion to require Floodway analysis when applicable.
- Page 10 Section 12.4.5 Multiple LD293 forms and the LD294 form are consolidated into a single document. Expanded discussion in the section about Hydraulic Commentaries for permits.
- Page 23 Section 12.8.2 Redefine the OHW computation as Base Flow for the purposes of Causeway Design. The USACOE has a different OHW definition for jurisdictional determination purposes. Any engineering design references to OHW should refer to Base Flow as defined here.
- Page 24 Section 12.9 Daily Stream Flow Information – Deleted

Appendix 12

- 12A-1 – Revised to delete Definitions and Abbreviations, and to include new LD-293 Form
- 12B-1 – Revised from H&HA Report Distribution List to LD-23 S&B Data Sheet
- 12B-2 - Deleted
- 12B-3 - Deleted
- 12B-4 - Deleted
- 12B-5 – Deleted
- 12C-1, 2, 3, and 4 – Revised from LD-23 S&B Data Sheet to Tidal Bridge Scour Data and Worksheet, and renumbered subsequent appendices
- 12D-1 – Sample No Adverse Impact Memos

Chapter 13

- No Major Changes

Appendix 13

- 13A-1 – Deleted
- 13A-2 - Deleted

Chapter 14

- No Major Changes

Appendix 14

- 14A-1 - Deleted

Chapter 15

- DDM-7 Page 3-4 clarified to indicate that review may be provided by either district or central office hydraulics staff

VDOT DRAINAGE MANUAL REVISIONS JULY 2016

- DDM-8 VDOT'S Expanded Procedure for Estimating Bridge Scour using a variable D50 with depth and Estimated D50 based on Core Material added

Chapter 16

- No Major Changes

Appendix 16

- 16A-1 – Revised as noted:
 - Removed the following software:
 - HEC-1
 - winHY-8
 - ROUT/HYDRO
 - Watershed Modeling
 - Visual Urban
 - REGEQUAT
 - EFH-2
 - QUICK-2
 - QUICKPIPE
 - BCAP
 - CS Hydraulic Tools
 - QHEC12
 - VDOT-HGL
 - HEC-2
 - EDIT2
 - PLOT2
 - HY-9
 - COED
 - HY-7/WSPRO
 - WSPROGRAPH
 - SWITCH
 - GIANTP
 - CHECK2
 - PROJFLOTATION
 - HYPERCALC
 - Added the following software:
 - SWMSOFTVA
 - HydrologyVA
 - CulvertMaster
 - PFLOW
 - StormCAD
 - HYDRAULIC TOOLBOX

VDOT DRAINAGE MANUAL REVISIONS JULY 2016

- Terrain Navigator Pro
 - Flowmaster
 - Revised appropriate contacts and web addresses to respective software sources
- 16A-2 – Revised as noted
 - Removed the following software:
 - LP3SHELL
 - REGEQUAT