VIRGINIA DEPARTMENT OF TRANSPORTATION

LOCATION AND DESIGN DIVISION

INSTRUCTIONAL AND INFORMATIONAL MEMORANDUM

GENERAL SUBJECT: NATURAL CHANNEL DESIGN	NUMBER: IIM-LD-233 IIM-ENV-03-001
SPECIFIC SUBJECT: Information Requirements for Projects Involving Natural Channel Design Principles	DATE: August 9, 2004
	SUPERSEDES:
LOCATION AND DESIGN DIVISION APPROVAL: Mohammad Mirshahi, P.E. State L & D Engineer Approved August 9, 2004	ENVIRONMENTAL DIVISION APPROVAL: Earl T. Robb State Environmental Administrator Approved August 9, 2004

EFFECTIVE DATE

- This memorandum is effective for all projects scheduled for the January 2005 advertisement and all subsequent advertisements.

PURPOSE

- This IIM establishes minimum requirements for projects involving natural channel design principles to fully document, to the extent necessary, compliance with Natural Channel Design practices and principles; VDOT standards, guidance and specifications; state and federal regulatory requirements; and all appropriate and necessary construction considerations. This IIM further references a Quality Assurance/Quality Control (QA/QC) process by which all natural channel design projects will be reviewed for consistency with this IIM and any applicable regulatory requirements.

POLICY

- Natural channel design principles will be used, to the extent practicable, in all stream restoration and relocation projects.

- Natural channel design principles are encouraged as a means of effectively addressing localized bank erosion.

- VDOT recognizes the value and importance of peer review and Quality Assurance/Quality Control (QA/QC) processes in delivering quality products within established and accepted time frames. An interdisciplinary QA/QC team managed by the Central Office Environmental Division, Natural Resources Section, will administer this process for all natural channel design projects.

- All in-stream activities require coordination with district environmental staff to ensure that water quality permits are obtained and environmental commitments adhered to, as required. The project manager is responsible for ensuring that coordination is conducted.

REPORTING AND DOCUMENTATION

Reporting and documentation detail is dependent upon several factors including:

- FEMA Floodplain Designation
- Project Permit and Compensatory Mitigation Requirements
- Project Scope

FEMA Floodplain Designation

- All projects within a FEMA Flood Insurance Rate Map-designated 100-year floodplain require review and approval by a River Mechanics Engineer regarding the level of analysis necessary for the project.

Project Permit and Compensatory Mitigation Requirements

- Project permit and compensatory mitigation requirements may vary from project to project and can determine the degree to which natural channel design components are required. Consideration of and adherence to permit requirements should be evaluated at the earliest possible time in the project development process.

Project Scope

Projects are separated into several categories: 1. local instream structures, 2. associated structures, and 3. relocation and restoration. Generally, instream and associated structures are defined as those structures directly associated with roadway drainage structure installation, repair or replacement, or bank protection (e.g., erosion protection). Relocation and restoration involve use of natural channel design principles to relocate existing channels,

create new channels or restore degraded channels and are not always associated with roadway drainage structures. The project scope, along with the remaining items listed above, will determine the degree to which documentation and QA/QC review is required.

- Local instream structures include individual structures or groups of structures (weirs, rock vanes, log vanes and other similar structures) intended to protect, or improve the function of, existing roadway drainage structures or address discrete erosion concerns. Some minor channel modification may be required to relocate the thalweg, remove sediment deposits, or reshape the local cross-section. In many cases, these projects may require limited data collection or design and may serve to retrofit existing structures.

  Applicability

  - No channel modifications required other than minor modifications necessary for proper installation and function of the structure(s) itself
  - The structure is intended to provide scour protection, redirect thalweg alignment, reduce bank erosion or restore channel geometry (i.e., bankfull width and depth) in the vicinity of an existing structure (culvert or bridge) or to a localized area
  - Structure placement is not part of a larger natural channel design project

  Requirements

  - The project manager must complete and submit an Abbreviated Plan, as described in the Plan Requirements Section.

  - Structure design, with respect to natural channel design features, must be performed under the supervision of, or reviewed and approved by, a Hydraulic Engineer and an Environmental Stream Team member.

  - Permit application must be coordinated with the District Environmental Section.

- Associated Structures includes any individual roadway structure designed in accordance with natural channel design principles. Examples of these structures include, but are not limited to, placement of floodplain culverts to carry the 10-year (Q_{10}) and greater design floods, base flow culverts designed to carry the 2-year (Q_2) discharges, and box culverts or bridge spans properly sized to accommodate floodplain deposition.

  Applicability

  - Channel modifications may be required to improve functionality and are limited to the minimum extent necessary upstream and downstream of the structure. All modifications must be in compliance with current permit regulations and must include natural channel design features.
  - Associated Structures are not part of a larger natural channel design project.

Requirements

- The project manager must complete and submit an Abbreviated Plan as described in the Plan Requirements Section.
- Structure design, with respect to natural channel design principles, must be performed under the supervision of, or reviewed and approved by, a Hydraulic Engineer and an Environmental Stream Team member.
- Permit application must be coordinated with the District Environmental Section.

- Restoration and Relocation may include relocation of sections of existing channels to restore stable channel geometry, channel relocation associated with road crossings, installation of instream structures, bank stabilization and other natural channel design features included as part of a compensatory stream mitigation proposal. Restoration restores flow control and habitat features to a degraded or unstable stream reach and is often part of a compensatory stream mitigation proposal. Relocation includes movement of channel sections to accommodate structure or roadway design requirements. Channel work at either end of an Associated Structure is not included in this category. Channel relocation that employs natural channel design principles is typically considered as compensation for channel impacts on a 1:1 basis. Restoration and Relocation projects can be subdivided into small and large scale projects and have different reporting and documentation requirements, as described in the Plan Requirements Section.

Applicability

- All channels
- All projects

Requirements

- The project manager must provide the information listed under Plan Requirements, as required, below.
- Conceptual and Final Design plans must be submitted to the Central Office Natural Resources Section for Quality Assurance/Quality Control review by a multidisciplinary team.

PLAN REQUIREMENTS

- The degree to which documentation is required for plan assemblies for projects employing natural channel design principles is dependent upon project scope, as described below.

- Hydraulic data contained on form LD-295A must be provided with the summary sheet for all projects, unless otherwise approved by the Hydraulic Engineer.

- Additional information may be required by permit agencies. The project manager is responsible for coordinating with district environmental staff prior to finalizing plans to determine if any additional information may be required.

Abbreviated Plan

- For Instream Structures and Associated Structures, the Project Manager will complete and submit a Natural Channel Design Project Summary Sheet to the District Environmental Manager and the Natural Resources Section Manager (Central Office, Environmental Division) for review. A copy should be placed in the project file.

- Plan view, profile and cross section drawings will be attached to document each structure.

Small-Scale Projects

- For projects less than 300 feet long, plans should include the following:

  Conceptual Plan

  - Site Location Map
  - Reference reach measurements (bank full width and depth, valley slope, channel slope, bed material characterization)
  - Existing site conditions (including survey data)
  - Conceptual plan view of channel design
  - Buffer width, if applicable
  - R/W requirements, as applicable

  Final Plan

  - Project Summary Sheet
  - Design storm discharges ($Q_{1.5}$, Q_2 and Q_{10} discharges, at a minimum)
  - Proposed typical channel cross section(s) and plan view showing thalweg and bank full features
  - Grading Plan - Proposed Design with Profile (including alignment data)
  - Gradient control structures and locations
  - Structure Details
  - Summary Sheet with approximate quantities for stream channel
  - General notes for Grading, E&S control, and Incidentals (See IIM-LD-110)
  - Sequence of Construction
  - Planting Plan
  - Quantities of plants, seed, fertilizer, and other incidental items required for the compensation site.
  - Erosion and Sediment Control Plan
  - Transport or other applicable construction estimate
  - Applicable Special Provisions and Copied Notes for construction

Large-Scale Projects

For projects exceeding 300 feet in length, in addition to the items above, Final Plan documentation shall also include:

- Natural Channel Design supporting data and analyses
- Written summary – Project history and design considerations
- Plant schedule with planting season
- Monitoring plan and Success Criteria

NOTE: Some projects in small, intermittent or first order perennial watersheds that exceed the length thresholds above may be appropriately addressed with the information required for a *Small-Scale Project* (excluding required items such as the monitoring plan and success criteria). Individual exceptions must be reviewed and approved by the Central Office, Environmental Division Stream Restoration Specialist and the Location and Design Division River Mechanics Engineer, or their designees.

PLAN SUBMITTAL AND REVIEW

- The Natural Resource Section, Central Office Environmental Division, will serve as a central clearing house and contact point for QA/QC review of natural channel design projects. Reviews will be conducted by an interdisciplinary team.

- Individual or associated structures do not require QA/QC review, however, submittal of the Abbreviated Plan is required.

- Individual stream restoration plans will require submittal and review according to the QA/QC process timelines.

CONSTRUCTION

- All natural channel construction will be conducted under the review or supervision of properly trained environmental staff designated by the Environmental Division Administrator, or his designee. In general, this will be assigned to the Division's Stream Restoration Specialist. Associated Structure construction should be conducted with the assistance of the District River Mechanic, or his designee.

SPECIAL PROVISION

- Project specific Special Provisions will be included for all Restoration and Relocation projects.

- Examples of Special Provisions for natural channel design and associated structures can be found at the VDOT Environmental Division's web site (http://coweb/environmental/), in the Natural Resources Section, Natural Channel Design web page.

NATURAL CHANNEL DESIGN
PROJECT SUMMARY SHEET

Project Number: _____ Permit Number: _____ Project Name: _____

PPMS / UPC / CSC Number: _____ HUC: _____ City or County: _____

Latitude: _____ _____ _____ FEMA Floodplain: ☐ Yes ☐ No District: _____

Longitude: _____ _____ _____ Residency: _____

USGS Quad. (Attach): _____ Date: _____

Site Location: _____

Site Description (include goals and objectives)

Type: (check ONE box only)

		Intermittent l.f.	Perennial l.f.
☐ Instream Structure *	☐ Channel Relocation	_____	_____
☐ Associated Structure *	☐ Channel Restoration	_____	_____

* For instream structures and associated structures, attach plan and profile view drawings

Geomorphic Description:

Bankfull width	_____	Floodprone width	_____	Channel slope	_____
Bankfull depth	_____	Bankfull cross sectional area	_____	Valley slope	_____
Bankfull Q	_____				

Bed Material

☐ Bedrock ☐ Boulder
☐ Cobble ☐ Gravel
☐ Sand ☐ Silt/clay

Rosgen Class: _____
Valley Type: _____

Hydraulic Analysis Complete:

☐ Based on the scope of the project, additional hydraulic analysis is not required. (Attach documentation.)

☐ This project has been reviewed and provides a hydraulically equivalent replacement structure that does not require additional coordination or review. See attached LD-1095A.

Design storm data provided by a Hydraulic Engineer:

Design Storm	**cfs**	**Design Storm**	**cfs**
$Q_{1.5}$ Discharge:	_____	Q_{10} Discharge	_____
Q_2 Discharge:	_____	Other: _____	_____

☐ Additional hydraulic analysis is provided in the attached documents. See attached LD-1095A.

Notes:

Place one copy of the completed form in the project file and provide one copy of this form to:
C.O. Environmental Division
Natural Resources Program Manager
1201 East Broad Street
Richmond, VA 23219