

**U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
NEW YORK CONSERVATION PRACTICE GUIDELINE**

LINED WATERWAY OR OUTLET

(ACRE)

468

REFERENCE

National Handbook of Conservation Practices - Code 468 - Lined Waterway or Outlet.

Commonly Associated Processes or Practices

The following conservation practices are commonly used in conjunction with this practice to address natural resource concerns and opportunities in New York. This does not imply that any or all of the listed practices must be included or that others may not be included in a conservation management system (CMS). Consult Section III of the Field Office Technical Guide for assistance in developing CMS.

Note: To determine whether a National or New York Conservation Standard applies to this and any other associated practices, check the following website: www.ny.nrcs.usda.gov. Click on the Technical Resources button, and look in the left-hand column for "eFOTG" on the next screen. Next, click on the "eFOTG" link, and look for the Conservation Standards in Section IV.

Table A: Commonly Associated Practice Standards or Processes

Number	Name	Job/Engineering Sheets
328	Conservation Crop Rotation	
329A	Residue Management, No-till and Strip Till	NY Jobsheets 21 and 22
329B	Residue Management, Mulch Till	NY Jobsheets 21 and 22
329C	Residue Management, Ridge Till	
340	Cover Crop	NY Jobsheet 16
344	Residue Management, Seasonal	
362	Diversion	NY ENG 22 and 23
NY393s	Filter Strip — Strip	NY Jobsheets 17 and 25a
412	Grassed Waterway	NY ENG 24 and 25, and/or 24A and 25A
585	Stripcropping	
590	Nutrient Management	
595	Pest Management	
600	Terrace	
606	Subsurface Drain	NY ENG 28 and 29

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620	Underground Outlet	NY ENG 28 and 29
633	Waste Utilization	
638	Water and Sediment Control Basin	
EFH-2	Estimating Runoff	NY ENG 20 or EFH Worksheets 1 and 2

OTHER REFERENCES

Engineering Field Handbook, Chapters 1- Engineering Surveys, 2- Estimating Runoff, 7- Grassed Waterways, and 16- Streambank and Shoreline Protection.

New York Plant Materials Technical Reference No. 11, "A Guide to Conservation Plantings on Critical Erosion Areas".

Design Note 24, "Guide for Use of Geotextiles".

Technical Release 62, "Engineering Layout, Notes, Staking, and Calculations".

NYS Consolidated Laws, Environmental Conservation Title 10, Water Pollution Control, Section 17-0803, SPDES Permits; Application.

Article 17 Environmental Conservation Law, 6NYCRR, Part 750, State Pollution Discharge Elimination System (SPDES).

<http://www.dec.state.ny.us/website/dow/PhaseII.html>

CULTURAL RESOURCES

Cultural resource reviews will be conducted for all ground disturbing practices, components, or other activities, as per the State Level Agreement between NRCS and the New York State Historic Preservation Officer.

INVENTORY AND EVALUATION

1. Determine if the waterway is suitable for the farm operation and the changes it could introduce into management, field access and cropping activities.
2. Evaluate the existing drainage patterns of the watershed.
3. Locate a suitable outlet and determine stability, safety, and property rights. Check the downstream area for the possibility of negative effects. Consider the necessity of permission for using the selected outlet. All easements and rights-of-way are the responsibility of the landowner. Under no circumstances should water be diverted out of its natural watershed, even if the "new" watershed is on the same property.
4. If the waterway is planned to serve as an outlet for other conservation practices (i.e. diversion, terrace, etc.), insure that the design channel will be suitable to safely discharge the additional flows.
5. Consider subsurface drainage for both steep and seep areas as they occur. Conduct random soil borings to determine depth of the soil profile and identify potential restrictive layers (fragipans or other restrictive subsurface layers such as dense basal till, or bedrock regardless of fracturing).
6. Locate proposed culverts for farm crossings or bridges as needed.
7. Consider temporary diversion of flow, if possible, until channel armoring is completed.

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8. Field Survey and Layout:

- 8.1 The survey notes are to be compiled as outlined in the EFH, Chapter 1 and Technical Release 62.
- 8.2 Establish a temporary benchmark (TBM) that will be serviceable throughout the construction period.
- 8.3 Stake out and survey the proposed centerline (typically at 50 foot intervals) of the waterway and cross sections at anticipated design grade changes, planned culverts, road crossings, and other pertinent features, i.e., buildings, roadways, etc. These cross sections should be spaced so as to reflect changes in topography and at a maximum of 100 feet.

DESIGN PROCEDURE :

Note: This Practice guideline is for use with rock armor only. If any other material is used, additional specialized training is required.

This design procedure requires selecting a trial channel dimension and stone size. The results are modified as needed to create the final design.

1. Determine the drainage area and identify the soil types and the land uses. Complete Worksheet 1 of EFH-Chapter 2.
2. Complete Worksheet 2, Chapter 2, of EFH to determine the peak flow or design capacity (Q). Consult the current Lined Waterway or Outlet Conservation Practice Standard (468) for the selection of the storm frequency for design. Consider the impact of other conservation practices on your design capacity, i.e., diversion or terrace outlets, etc.
3. If needed, select seeding mixture from Plant Materials Technical Reference #11, "A Guide to Conservation Plantings on Critical Erosion Areas." Record on back of NY-ENG 17 (Seeding Grasses and Legumes).
4. Plot profile along proposed centerline of the lined waterway and cross sections to determine design grade and depth for various sections.

Trial Design Steps:

5. Select a trial channel dimension (shape, depth and width) based on experience, or by using EFH Exhibits 7-4 or 7-5, Sheets 1 through 14.
6. Using the trial channel dimensions, calculate the area (A), the wetted perimeter (wp), and the hydraulic radius (r). Refer to EFH, Page 3-95, Exhibit 3-13, Elements of channel sections.
7. Select a rock size based on availability, cost, or experience. The dimension selected should represent 50 percent of the rock by volume or slightly larger. This is referred to as a "D₅₀".
8. Refer to Figure 1 from the 468 Lined Waterway or Outlet Conservation Practice Standard and select the appropriate Manning's "n" value.
9. Calculate the velocity (V), using Manning's Equation (EFH, Page 3-39, Equation 3-15) Using this velocity value, and the value for the area (a), solve for "Q" using the Continuity Equation, $Q=AV$. Refer to EFH, Page 3-15, Equation 3-4.

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10. If the trial Q is less than the design Q, select a larger section or channel dimension for step 6, above. Repeat the steps until the trial Q is equal to or slightly greater than the design Q.

Adjustment Steps for Final Design:

11. Increase the D₅₀ size by 33 percent to estimate the size of the largest rocks. Using this maximum rock size and the calculated velocity, check the stability using the Isbash Curve, found in EFH Chapter 16, Page 16A-1, Figure 16A-1. If the resultant point determined is above and to the left of the curve, the rock size and resultant velocity is stable. If the rock size selected results in unstable channel, repeat the steps above until the resultant rock size and velocity combination is stable.
12. Using Figure 2 from the Lined Waterway or Outlet Conservation Practice Standard, 468 determine if the design values for depth and velocity intersect below and to the left of the curve. If so, the design values are stable. If the rock size selected results in unstable channel, repeat the steps above until the resultant rock size and velocity combination is stable.
13. To determine the gradation for the rock, refer to EFH Exhibit 7-6, found on Page 7-48. Using the note at the bottom left of the page marked "for design", replace 25% and 75% with 50%.
14. Evaluate the need for bedding material. This is dependent on velocity, rock gradation, and soil characteristics. If needed, determine the thickness and gradation of the bedding layer. Note that non-woven geotextile is also an option. Refer to Design Note 24 "Guide for Use of Geotextiles" for additional information.
15. A statement requiring landowner/contractor to notify **Dig Safely NY** for proper utility notification is **REQUIRED** on the plan view drawing.
16. Design culverts or farm crossings as needed. Information for culvert design can be found in EFH Chapter 3, Hydraulics.
17. Determine your level of Job Approval Authority for the design class of this project, obtain approval from appropriate individual, if not qualified.
18. Assemble a complete design drawing package.

PERMITS AND NOTIFICATIONS

All permits, easements, and rights-of-way are the responsibility of the landowner as advised by their Technical Professional. **Dig Safely NY** (formerly the Underground Facilities Protection Organization, or UFPO) will be contacted according to the time required before construction to mark all applicable facilities in the construction area. This is the responsibility of the landowner and contractor.

Identification and the location of all other underground or overhead facilities not covered by **Dig Safely NY** is the responsibility of the landowner.

CONSTRUCTION LAYOUT AND INSPECTION

1. Provide copies of the construction specifications and drawings to the landowner. Explain all aspects of the job before a contractor is secured. Review the O&M plan with the landowner, to assure proper maintenance of the completed practice.
2. Thoroughly review the job with the landowner and contractor prior to construction. Insist on a follow-up on informing the utilities of the proposed construction. The landowner/contractor must call **Dig Safely NY** (formally UFPO) at least 2 working days prior to any ground disturbance.

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3. Schedule the construction start with the landowner and the contractor. Initial input on a project is important at the start. Plan the start of construction such that the completion time will permit optimal establishment of any vegetative cover needed on disturbed areas.
4. Mark the centerline stations with proposed cuts, set and mark offset grade stakes if needed, set slope stakes or flags for width of cut to show designed top width and depth. Mark stations and cuts on the flags or stakes.

CONSTRUCTION INSPECTION

1. Make random construction checks during implementation. The checks should include:
 - 1.1. Adherence to the design grade;
 - 1.2. The cross-section width at design depth at each design section change, and at any other design feature;
 - 1.3. Side slopes; and,
 - 1.4. Check rock gradation, bedding gradation, or geotextile (if used) to assure that the design requirements are met.

During the final construction check, assure that the

- 1.5. Outlet is stable and free of spoil and debris;
- 1.6. Construction spoil and debris are properly disposed of;
- 1.7. Completed earthwork is suitable for any required seeding establishment; and,
- 1.8. Any final seeding requirements have been installed in accordance with the seeding plan.

FINAL DOCUMENTATION REQUIREMENTS

All properly planned, designed, and installed conservation practices require documentation in the appropriate case file. Documentation must be sufficient to show:

1. The design conforms to the applicable standard;
2. The prepared construction drawings and specifications accurately reflect the design;
3. The installed practice meets the requirements of the construction drawings and specifications; and
4. The "As Built" condition of the practice. All drawings shall be identified "As Built" as drawn in red, and all changes shall be made in red.

REPORTING

Enter all documentation on the Conservation Plan (NRCS-CPA-68), Conservation Assistance Notes (NRCS-CPA-6/6A), and contract document (NRCS-LTP-11), if applicable.

Report the practice and applicable components in the NRCS progress reporting system. Be certain to report benefits for all applicable resources and resource concerns as allowed in the NRCS progress reporting system.

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OPERATION AND MAINTENANCE

Facilities, structures, and practices must be operated and maintained to ensure proper function and longevity. Periodic follow-up with the landowner is essential to ensure that all operation and maintenance (O&M) requirements are understood and followed.

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